CHAPTER

27

FLIGHT CONTROLS

MD-80
AIRCRAFT MAINTENANCE MANUAL

CHAPTER 27
FLIGHT CONTROLS

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GENERAL - DESCRIPTION AND OPERATION

1. Description

A. The flight controls consist of the control surfaces, trim control surfaces, indicating and warning systems, and the related mechanical, hydraulic, and electrical systems that control the airplane during flight and on the ground.

B. Control Surfaces (Figure 1)

(1) The control surfaces and their locations are listed as follows:

Table 1

Surface	Location
Ailerons	Outboard trailing edge of each wing
Elevators	Trailing edge of horizontal stabilizer
Rudder	Trailing edge of vertical stabilizer
Flaps	Trailing edge of each wing, inboard of ailerons
Spoilers	Three on trailing edge of each wing, on upper surface forward of flaps (two outboard flight spoilers one ground only inboard spoiler)
Slats	Six segments on leading edge of each wing

(2) For allowable damage to flaps, ailerons, elevators, rudder and fixed wing trailing edge structure constructed of fiberglass composite materials, refer to SRM 51-01, Page 1.

C. Control Systems (Figure 2)

(1) The ailerons provide lateral control of the airplane and are operated by aerodynamic boost control surfaces. A control tab on the trailing edge of each aileron is deflected and aerodynamic forces on the tabs move the aileron. The control tabs are controlled mechanically by the dual aileron control wheels in the flight compartment. The aileron control system also provides input through the lateral control mixers to the spoiler system, thus utilizing the spoilers as additional lateral control surfaces.

(2) The elevators provide longitudinal control of the airplane and are operated normally by aerodynamic boost control surfaces which consist of a control tab on the trailing edge of each elevator. The control tab is controlled mechanically by dual control columns in the flight compartment. A geared tab on each elevator trailing edge is mechanically linked to the horizontal stabilizer so that as the elevator moves, the geared tab is moved in the same direction as the control tab to provide additional aerodynamic control force. If both control tabs are deflected 10 degrees or more for downward movement of the elevator, an elevator power (hydraulic) control mechanism is operated to assist in driving the elevator down. An anti-float tab on each elevator trailing edge, located outboard of the geared tab, prevents excessive elevator down float at large airplane noseup horizontal stabilizer settings. The anti-float tab is mechanically connected to the stabilizer and is programmed by stabilizer position. The stabilizer starts to drive the anti-float tab from the faired position at 10 degrees airplane noseup and will drive the tab to 25 degrees trailing edge down during the last 2 degrees of airplane noseup stabilizer travel.

(3) The rudder provides directional control of the airplane about the vertical axis, and is actuated hydraulically. The hydraulic components are controlled mechanically by dual rudder pedals in the flight compartment. The control tab on the rudder trailing edge is locked hydraulically in faired position during hydraulic operation. If hydraulic pressure drops below 950(±150) psi, (6555(±1035) kPa) the control tab is unlocked and becomes an aerodynamic boost control surface operated mechanically by the rudder pedals. Manual operation may also be selected by closing a hydraulic power shutoff valve, controlled by a lever on the control pedestal. Maximum rudder travel is 22 degrees hingewise left or right of faired position, but as airspeed increases, rudder travel is progressively decreased by a limiting device until at a predetermined high airspeed, travel is restricted to approximately 2 1/2 degrees in each direction.

(4) The flaps increase the lift of the wing when partially extended during takeoff or landing approach, and increase drag to reduce speed when fully extended during landing. The flaps are actuated hydraulically and the hydraulic components are controlled mechanically by the flap/slat control lever on the control pedestal. A flap takeoff selection detent wheel, adjacent to the flap/slat control lever, allows the flaps to be set at the best position for takeoff at different field conditions.

(5) The two outboard flight spoilers, on each wing, supplement the ailerons in lateral control and also provide a speed-brake during flight. The spoilers are actuated hydraulically and when used as a lateral control aid, are controlled by the aileron control wheels. When used as a speedbrake, the hydraulic components are controlled by the speedbrake control lever on the control pedestal. The two outboard flight spoilers and the inboard spoiler (ground only) are also used during the landing roll to increase drag and thereby reduce speed. For ground operation spoilers may be set to actuate either automatically or manually. When the speedbrake control lever is set in the armed mode, spoilers will extend automatically when the main landing gear wheels spin up during landing roll.

(6) The slats are extended during takeoff or landing approach to increase the lift of the wing. They are actuated by a mechanical system that is hydraulically operated. The hydraulic components are mechanically/electrically controlled by the flap/slat control lever on the control pedestal. During takeoff the slats are partially extended when flap position is 0 degrees to 11 degrees. A slat auto extend system fully extends the slats automatically when the airplane approaches a stall condition.

D. Trim Control Surfaces

(1) The aileron trim tabs and the horizontal stabilizer are adjustable trim control surfaces that provide a means of adjusting the aerodynamic characteristics of the main control surfaces.

(2) The aileron trim tabs are controlled mechanically by cable systems from the aileron trim control knob on the control pedestal. As the tab on one aileron is moved up, the tab on the opposite aileron is moved down to provide lateral trim.

(3) Rudder trim is obtained by rotating the rudder trim control knob on the control pedestal. This moves the rudder trim and load-feel mechanism and the rudder pedals to a new neutral position. During power operation the hydraulic components move the rudder left or right in the amount of trim selected. During manual operation, the control tab on the rudder is moved so that aerodynamic forces on the tab move the rudder to the selected trim position.

(4) The horizontal stabilizer provides longitudinal trim and is controlled by the longitudinal trim control system. The system is electrically actuated and may be controlled by dual control handles on the control pedestal or by switches in the aileron control wheels. An alternate system of moving the horizontal stabilizer is electrically actuated and controlled by two levers on the control pedestal.

E. Indicating and Warning Systems

(1) Indicating and warning systems are used to show the position of the trim control surfaces and provide warning when certain controls are being used or should not be used.

(2) Mechanical indicators on the control pedestal show the amount of trim for the ailerons, rudder, and the horizontal stabilizer. A remote electrical indicator on the center instrument panel indicates the position of the flaps.

(3) Indicator lights on the annunciator panel in the flight compartment show when not to use spoilers in the automatic mode, when the rudder is in the manual mode of operation, when rudder travel is unrestricted, and when not to use the ground spoilers in the automatic mode. Slat indicator lights on the center instrument panel, adjacent to flap position indicator, come on when the slats are in takeoff or land position. The disagree light comes on while the slats are in transit or whenever slat position is not in agreement with flap/slat control lever position. Spoiler deployed indicator light comes on if any one of the spoilers is extended 8 to 12 degrees from faired position, with nose gear in ground mode.

WJE 401-403, 405, 409, 412, 873, 874, 880, 881, 883, 884, 892 PRE MD80-31-034

(4) A takeoff warning system sounds an intermittent audible warning if either left or right throttle is advanced for takeoff when the horizontal stabilizer, slats, flaps, or spoilers are not in proper position for takeoff.

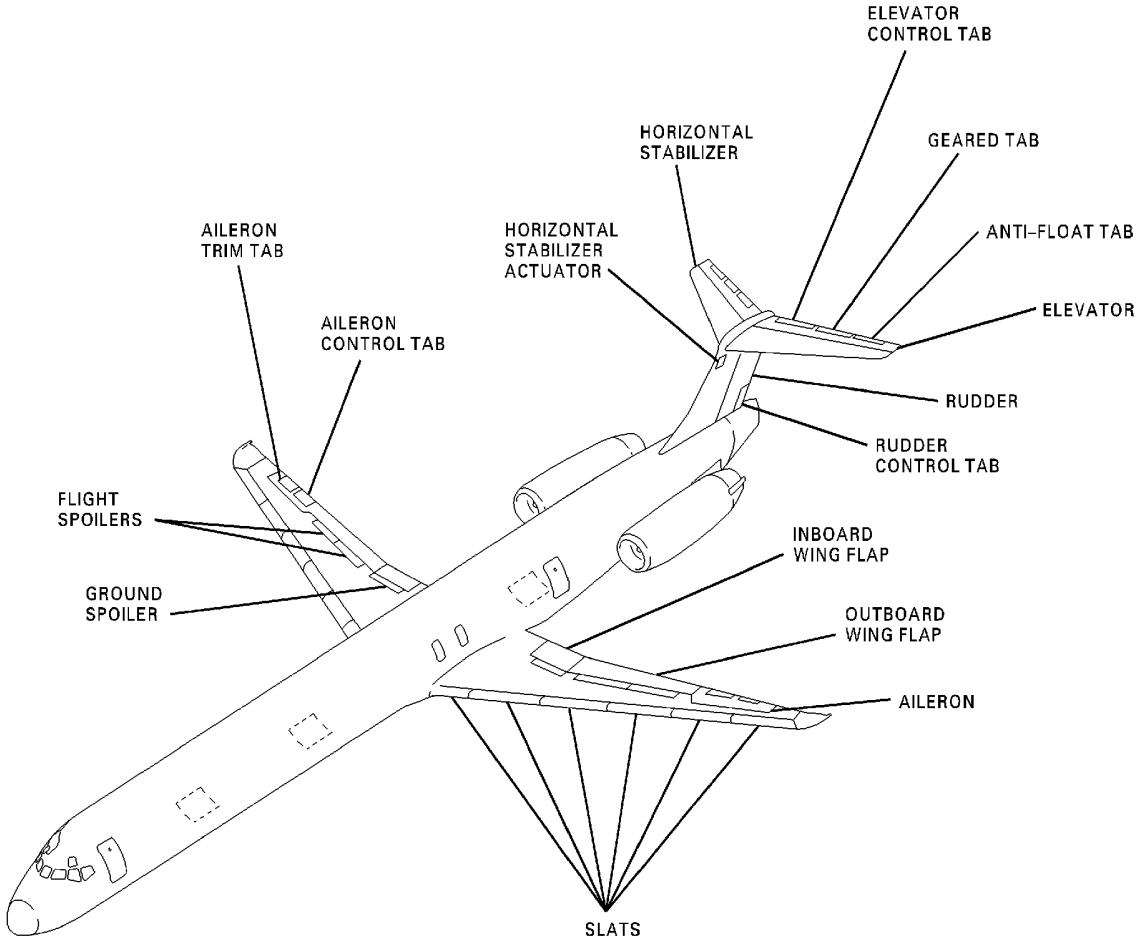
WJE 404, 406-408, 410, 411, 414-427, 429, 861-866, 868, 869, 871, 872, 875-879, 886, 887, 891, 893; WJE 401-403, 405, 409, 412, 873, 874, 880, 881, 883, 884, 892 POST MD80-31-034

(5) A takeoff warning system (central aural warning system, with or without voice option) sounds an intermittent audible warning if both throttles are advanced for takeoff power (greater than 2 1/8 inches (53.98 mm) forward of idle stop) when horizontal stabilizer, slats, flaps, or spoilers are not in proper position for takeoff.

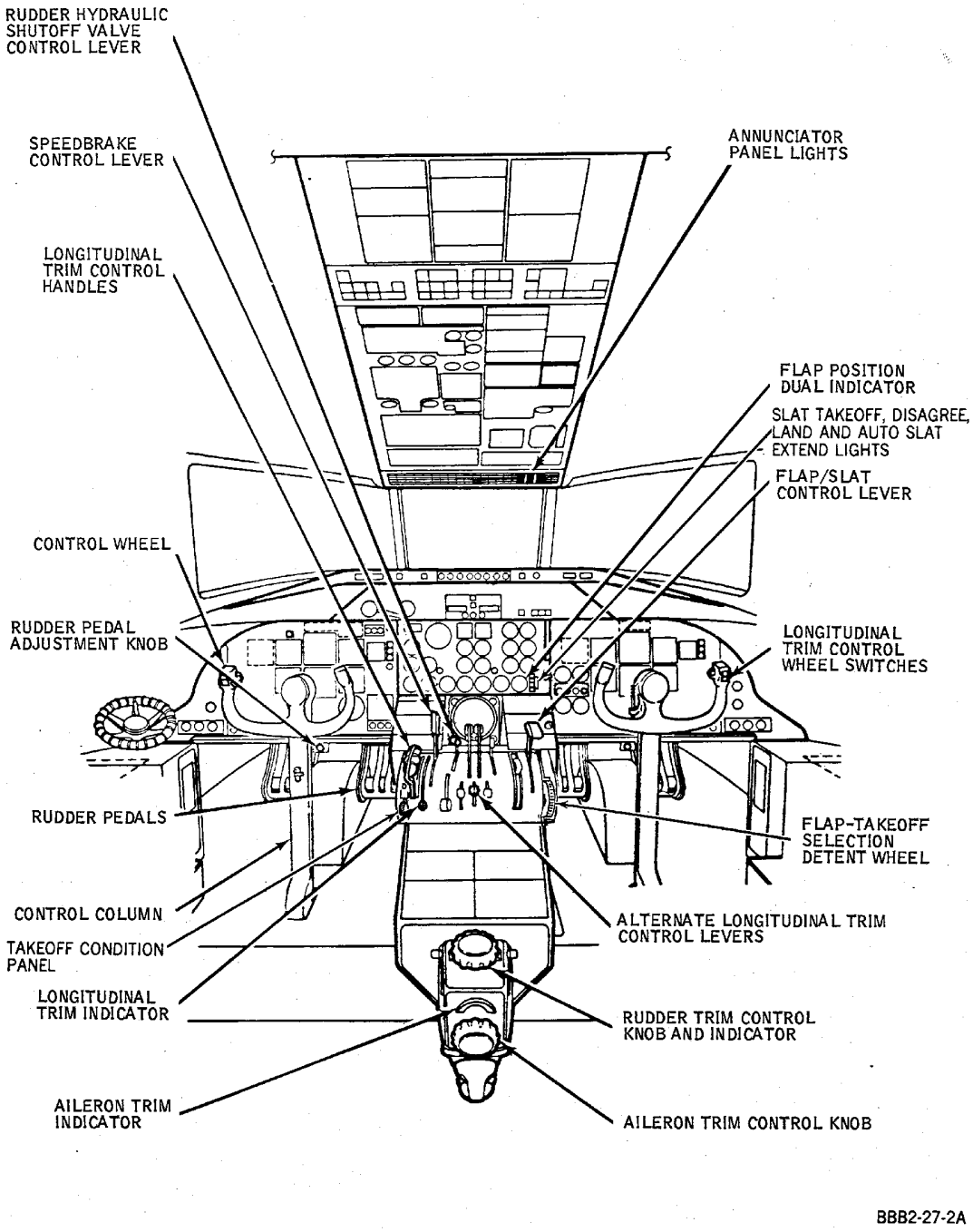
WJE ALL

(6) A landing gear warning system sounds a continuous audible warning if the flaps are extended past the approach position with the landing gear not down and locked.

(7) A stabilizer motion warning is sounded when the horizontal stabilizer is being moved by either of the three methods of control, or by the autopilot trim. The system provides a dual tone audible signal once for approximately each 1/2 degree of stabilizer movement.



Flight Controls -- Control Surfaces
Figure 1/27-00-00-990-801



Flight Controls and Indicators -- Flight Compartment
Figure 2/27-00-00-990-802

1. General

A. Flight control maintenance procedures involve extensive use of rig pins and the removal or disconnection of electrical connectors, hydraulic lines, and components. Flight control surface functions are interfaced with each other, causing more than one system to operate when the controls are actuated. Careful adherence to the following instructions will aid in maintaining a functional and trouble-free system.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

Name and Number	Manufacturer
Lubricant (MIL-G-81322) (DPM 5348)	Mobile Grease 28
Cleaner, Hand Wipe (MPN1793) (DPM 6380-1)	Brulin & Company, Inc. Richman, CA
Slot Seal Replacement Material, 10 ft. (MPN S2923584)	The Boeing Co.
Sandpaper, 180 Grit (MPN 80PA315)	Minn. Mining & Mfg. Co. St. Paul, MN
Adhesive Epoxy (MPN EC2216CLEAR) DPM 3279	Minn. Mining & Mfg. Co. St. Paul, MN
Sealant, Adhesive, Silicone (MPN RTV732WHITE50) (DPM 5614)	Dow Corning Corp. Midland, MI

3. Safety and Operating Precautions

WARNING: THE ELEVATOR RUDDER, SPOILERS, FLAPS, AND SLATS SURFACES ARE ACTUATED BY HYDRAULIC POWER AND CONTROLLED BY MECHANICAL AND/OR ELECTRICAL INPUTS.

BEWARE OF CONTROL SURFACES AND LINKAGE AFFECTED BY HYDRAULIC POWER FOR PRESSURIZATION OR DEPRESSURIZATION PROCEDURES. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

BEFORE DISCONNECTING CONTROL CABLES OR LINKAGE TO SURFACE ACTUATOR VALVES, DEPRESSURIZE HYDRAULIC SYSTEMS.

WHEN HYDRAULIC PRESSURE IS REQUIRED DURING MAINTENANCE PROCEDURES, MAKE CERTAIN THAT APPLICABLE CONTROLS ARE TAGGED TO PREVENT INADVERTENT OPERATION AND POSSIBLE INJURY TO PERSONNEL.

(WARNING PRECEDES)

WHENEVER HYDRAULIC POWER IS APPLIED, UNINTENDED MOTION OF CONTROL SURFACE, ACTUATOR, AND LINKAGE MAY RESULT WITHOUT NORMAL COMMAND OR WARNING IF CONTROL LINKAGE CONNECTION TO THE CONTROL VALVE OF CONTROL SURFACE IS DISCONNECTED.

A. Before pressurizing hydraulic systems, perform following checks.

(1) Make certain that landing gear control lever is in down position.

(2) Make certain that landing gear downlock pins are installed.

(3) Make certain that all other controls are in correct positions to prevent inadvertent operation of control surfaces or other equipment.

B. When working in main gear wheelwell areas, observe following precautions:

WARNING: RAPID MOVEMENT OF GROUND MAINTENANCE BYPASS LEVER MAY RESULT IN INADVERTENT OPERATION OF MAIN LANDING GEAR DOORS.

(1) Make certain that ground maintenance bypass lever, located on fuselage lower surface near forward edge of inboard doors, is in bypass position.

(2) Make certain that door safety locks (Part Number 3936851-1, -501 Douglas, or equivalent) are installed on piston rods of main gear inboard door actuating cylinders.

NOTE: Door safety lock 3936851-1 is used if aircraft is sitting on the gear. The -501 is used if aircraft is on jacks.

C. Before actuating or manually moving any control surface, perform the following checks to prevent possible injury to personnel or damage to equipment.

(1) Make certain that areas around surface to be moved and all related surfaces are clear of personnel.

(a) When ailerons are operated, spoilers may also move.

(b) When flaps are operated, slats will also move.

(2) Make certain that all tools or loose equipment are removed from control surfaces.

(3) Make certain that workstands or other ground equipment are not in position to cause damage to control surfaces.

WARNING: THE SAFETY BELT LUG DOES NOT MEET CURRENT FALL PROTECTION REQUIREMENTS. DO NOT USE THE SAFETY BELT LUG FOR FALL PROTECTION. OTHER METHODS MUST BE USED TO ENSURE ADEQUATE FALL PROTECTION.

(4) Safety belt attachment lug is located on top of vertical stabilizer for use by personnel performing maintenance on horizontal stabilizer actuating mechanism or elevator power control and follow-up mechanism.

D. When electrical connectors are disconnected, connectors must be capped or otherwise protected to prevent entry of fluid, moisture, or other foreign matter.

E. Disconnected hydraulic lines and component ports must be capped or otherwise covered to prevent entry of foreign matter into lines or components.

F. Removed O-rings should be discarded and replaced with new parts on installation. Lubricate new O-rings with hydraulic fluid only. New O-rings should not be unpacked until required. Make certain that only approved O-rings are used. O-rings used in the installation of flight control components are shown in Figure 201.

CAUTION: EXTREME CARE SHOULD BE TAKEN WHEN WORKING WITH HYDRAULIC FLUID TO PREVENT SPILLAGE. FLUID WILL ATTACK A WIDE RANGE OF MATERIALS INCLUDING RUBBER, COPPER, VARIOUS PLASTICS, AND PAINTS.

G. Keep spillage of hydraulic fluid to absolute minimum. Spilled fluid must be removed immediately to prevent seepage to adjacent areas and to prevent future false reports of leakage. If spillage occurs, wipe up fluid with dry cloth and wash contaminated area.

WARNING: PROLONGED EXPOSURE TO HYDRAULIC FLUID CAN CAUSE SKIN DEHYDRATION AND CHAPPING.

H. To prevent possible injury to personnel, the following precautions should be observed when working with hydraulic fluid.

(1) Wash hands thoroughly with soap and water before starting work.

(2) Apply barrier cream to hands, wrists, and forearms. Rub cream under fingernails and into creases of skin.

(3) Wear goggles when pressure testing components or systems, and whenever there is possibility of fluid splashing into eyes.

(4) If fluid contacts eyes, treat eyes immediately by rinsing thoroughly with clear cold water. Report the incident.

(5) Whenever fluid contacts skin, wash immediately with soap and hot water.

(6) If clothing becomes soaked with fluid, remove clothing as soon as possible, wash skin thoroughly, and put on clean clothing.

4. Rigging Procedures - General Notes

NOTE: It is acceptable to use one or more turnbuckles at any location in a Flight Control System to obtain correct cable tension and proper system adjustment. If this cannot be accomplished, other turn-buckles in the system regardless of location must be used. Also, the minimum number of threads on cable terminals must be buried and cable terminals must not bottom out within the turn-barrel.

A. In order to ensure constant cable tension measurement, the aircraft must be in a stabilized temperature environment. Prior to accomplishing cable tension checks, the aircraft must be located within a building at a stable temperature. If a building is not available and the aircraft will be out doors, readings are to be taken during the time period between three (3) hours after sunset and one (1) hour after sunrise. The purpose of this requirement is to avoid cable stretching and tightening caused by temperature differential resulting in erroneous flight control readings. This expansion and contraction phenomenon will also cause the fuselage and wing structure to change dimension as well.

B. Rig pins are used extensively during flight control rigging procedures. The rig pins used are steel drill rod listed by number, diameter, and length in Table 202.

C. Whenever using a rig pin, differentially adjust the applicable cable turnbuckle so that the rig pin can be freely removed and inserted. Under no circumstances, should rig pin holes be forced into alignment by stretching the cables. Rig pin holes must not spring out of alignment on pin removal. The purpose of these instructions is to ensure accurate repeatability of rigging checks. If any force is required to insert or remove a rig pin, the applicable cable turnbuckles must be adjusted, within tolerances, to eliminate the force.

D. Before tensioning any control cables, verify that complete runs are in proper fairlead holes and not wrapped around other cables.

E. No rigging procedure is complete until a check is made to assure that every rig pin, clamp, tool, or fixture is removed from the airplane.

F. No rigging procedure is complete until a check is made to assure that all bolts, nuts, cotter pins, lockwire, and turn-buckles clips have been properly replaced.

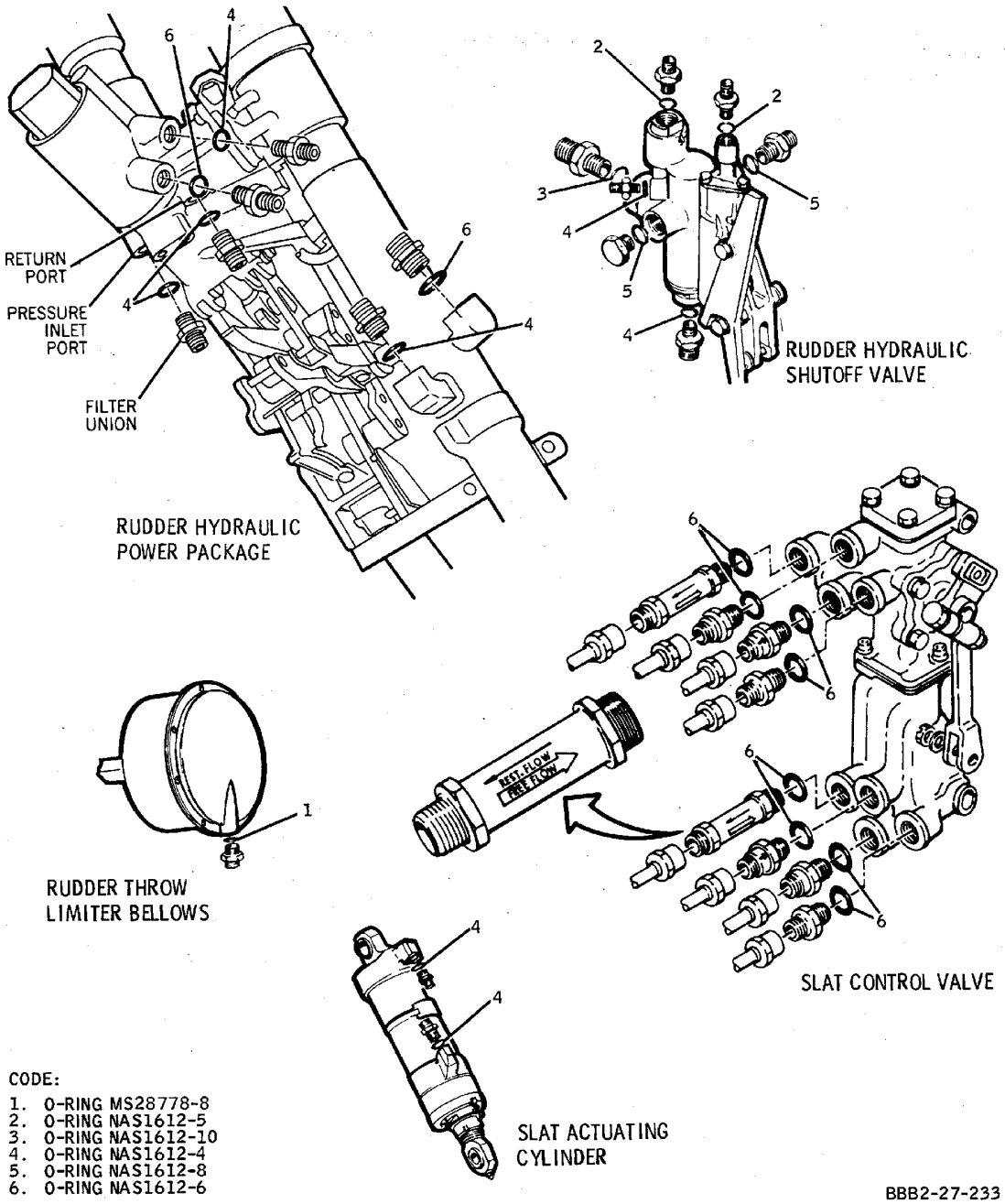
G. No rigging procedure is complete until entire length of cables being tensioned are inspected for proper routing and adequate clearance.

H. No rigging procedure is complete until system is cycled, cable tensions rechecked, and adjusted if necessary.

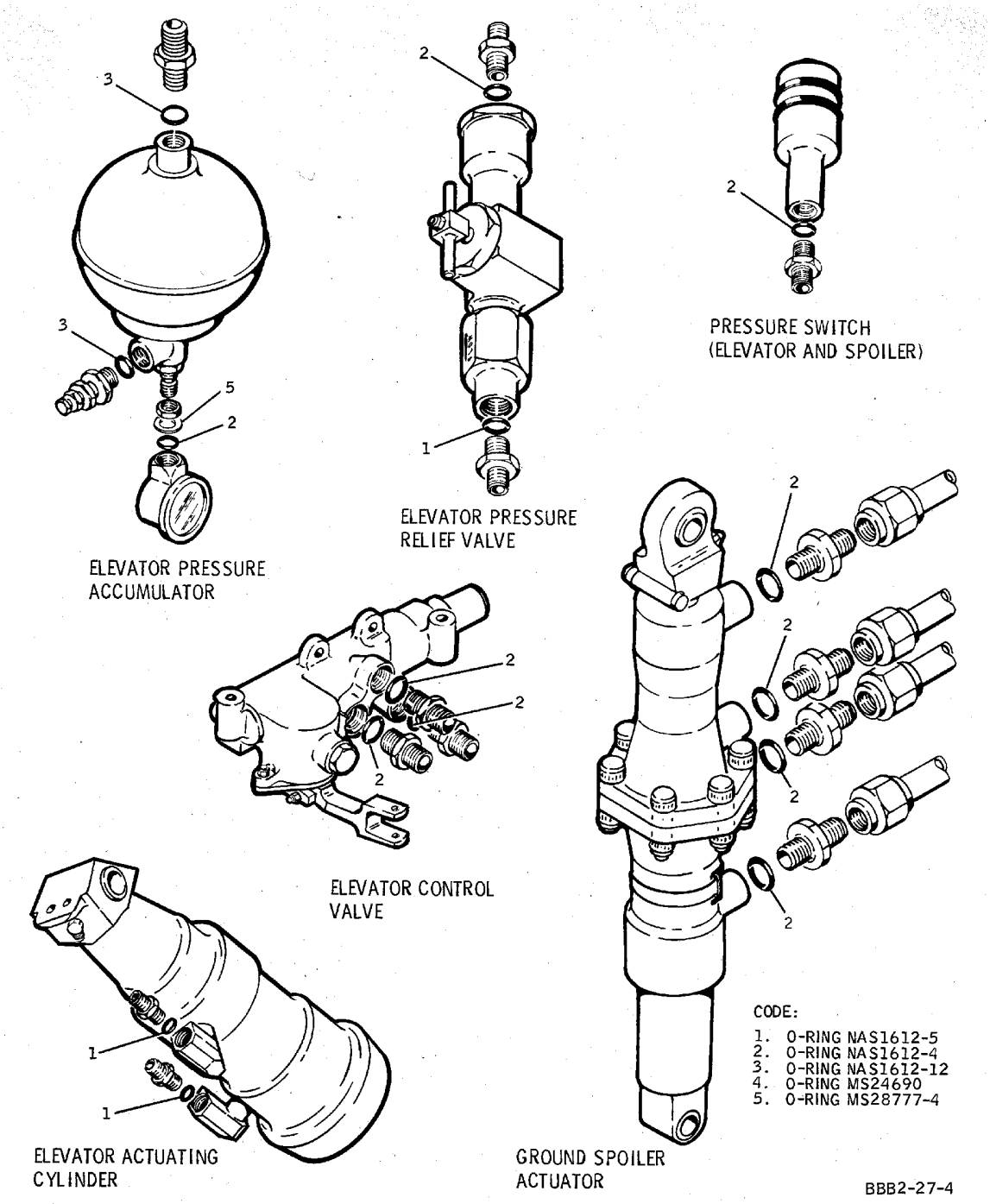
I. Reliable tensiometers should be used for measuring cable tensions. Cable tension accuracy should be within ±3 pounds (1.360 kg) on 1/16 (1.587 mm) and 3/32 inch (2.382 mm) diameter cables (except as noted in text) and ±10 percent on all other cables.

CAUTION: IF A LONG TURNBUCKLE BODY IS SUBSTITUTED FOR A SHORT ONE, CLEARANCE MUST BE CHECKED AT BOTH EXTREMES OF CABLE TRAVEL.

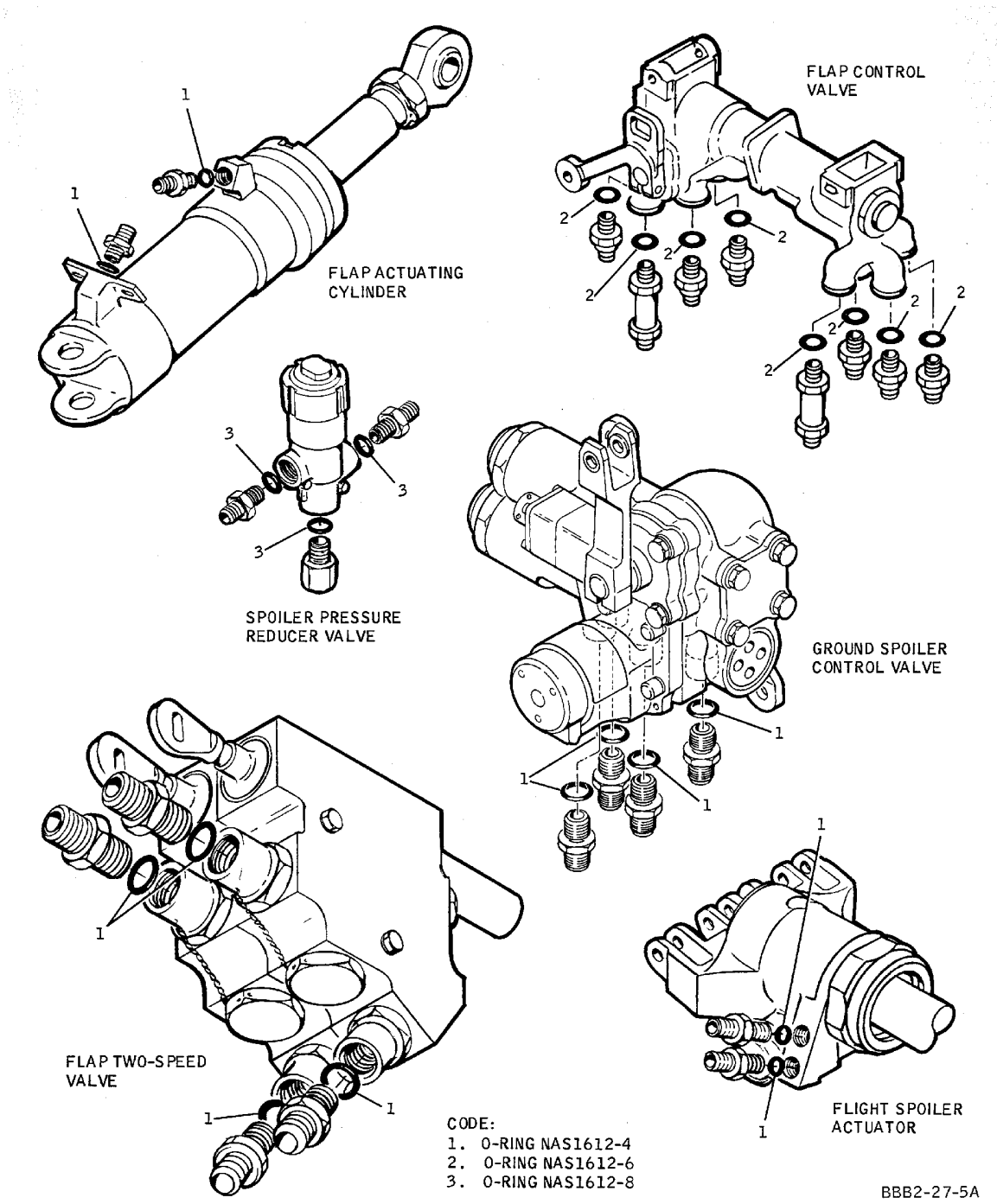
J. Long or short turnbuckle bodies (MS21251) with the same thread size may be used interchangeably. However, if the turnbuckle body is changed, the locking clip (MS21256) must also be changed (short clips with short turnbuckle bodies only, long clips with long bodies).



O-Rings -- Flight Control Components
Figure 201/27-00-00-990-803 (Sheet 1 of 3)



O-Rings -- Flight Control Components
Figure 201/27-00-00-990-803 (Sheet 2 of 3)



O-Rings -- Flight Control Components
Figure 201/27-00-00-990-803 (Sheet 3 of 3)

5. **Control Cables**

A. At each regular inspection, all cables, fairleads, pulleys, pulley guard pins, and seals should be inspected for wear and damage. Refer to PAGEBLOCK 20-10-17/201 for detailed information.

Table 202 Flight Control Rig Pins

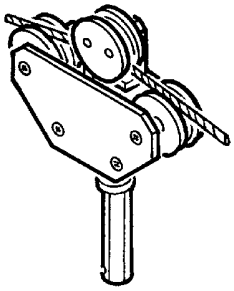
Rig Pin Hole Number	Rig Pin Number	Dia. x Length in Inches	No. Required	System
R-1	6-5	3/8 x 5 5/8	1	Elevator
R-2	R-2	3/8 x 10 1/2	2	Elevator
R-3	4-4	1/4 x 4 5/8	1	Aileron
R-4	8-7	1/2 x 7 5/8	2	Aileron
R-5	4-2	1/4 x 2 5/8	4	Spoiler
R-6	4-6	1/4 x 6 5/8	4	Spoiler
R-7	4-10	1/4 x 10 5/8	2	Lateral Control Mixer
R-9	5-5	5/16 x 5	1	Flap/Slat
R-11	6-4	3/8 x 4 5/8	1	Rudder
R-12	6-4	3/8 x 4 5/8	1	Rudder
R-13	4-3	1/4 x 3 5/8	1	Horizontal Stabilizer
R-22	4-3	1/4 x 3 5/8	1	Rudder Throw Limiter
R-8	5-3	5/16 x 3 5/8	1	Ground Spoiler
R-49	5-5	5/16 x 5	1	Flap/Slat

6. **Slat Drive Cable Pull-off**

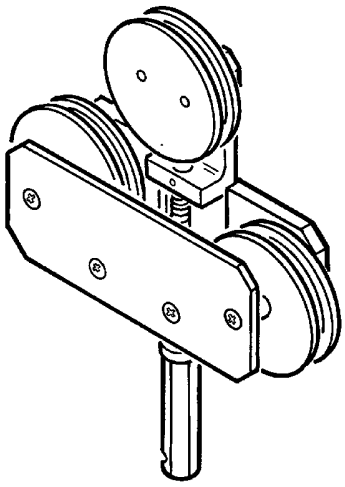
A. Allowable cable pull-off on all slat drive cable runs is measured as follows:

(1) Cable deflection measured 20 inches (506 mm) from pulley/cable or drum/cable tangent point must not exceed 29/32 inches (23.02 mm) to obtain alignment with cable groove. If measured distance from pulley is reduced one half (10 inches (254 mm)), then the permitted deflection must be reduced by one half (29/64 inches) (11.51 mm). Slat cables that meet this requirement may result in cable coming in contact with pulley flange. This is an acceptable condition.

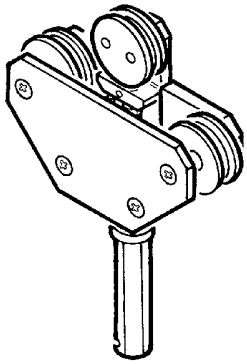
NOTE: Slat cables that are in rig may be checked for this pull-off condition by using slat cable pull-off checking tool, number 5962857-1.



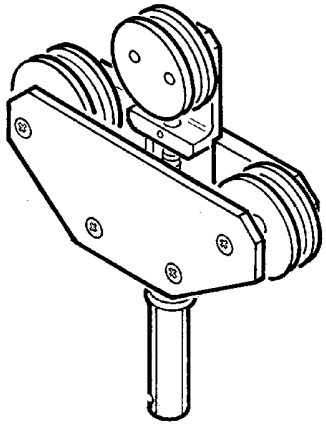
TYPICAL
TENSIONER ATTACHMENT



–503 FOR CABLES
5/16 INCH (7.94 MM)
AND 3/8 INCH (9.53 MM)
DIAMETER



–1 FOR CABLES
1/16 TO 3/16 INCH
(1.59 TO 4.76 MM)
DIAMETER

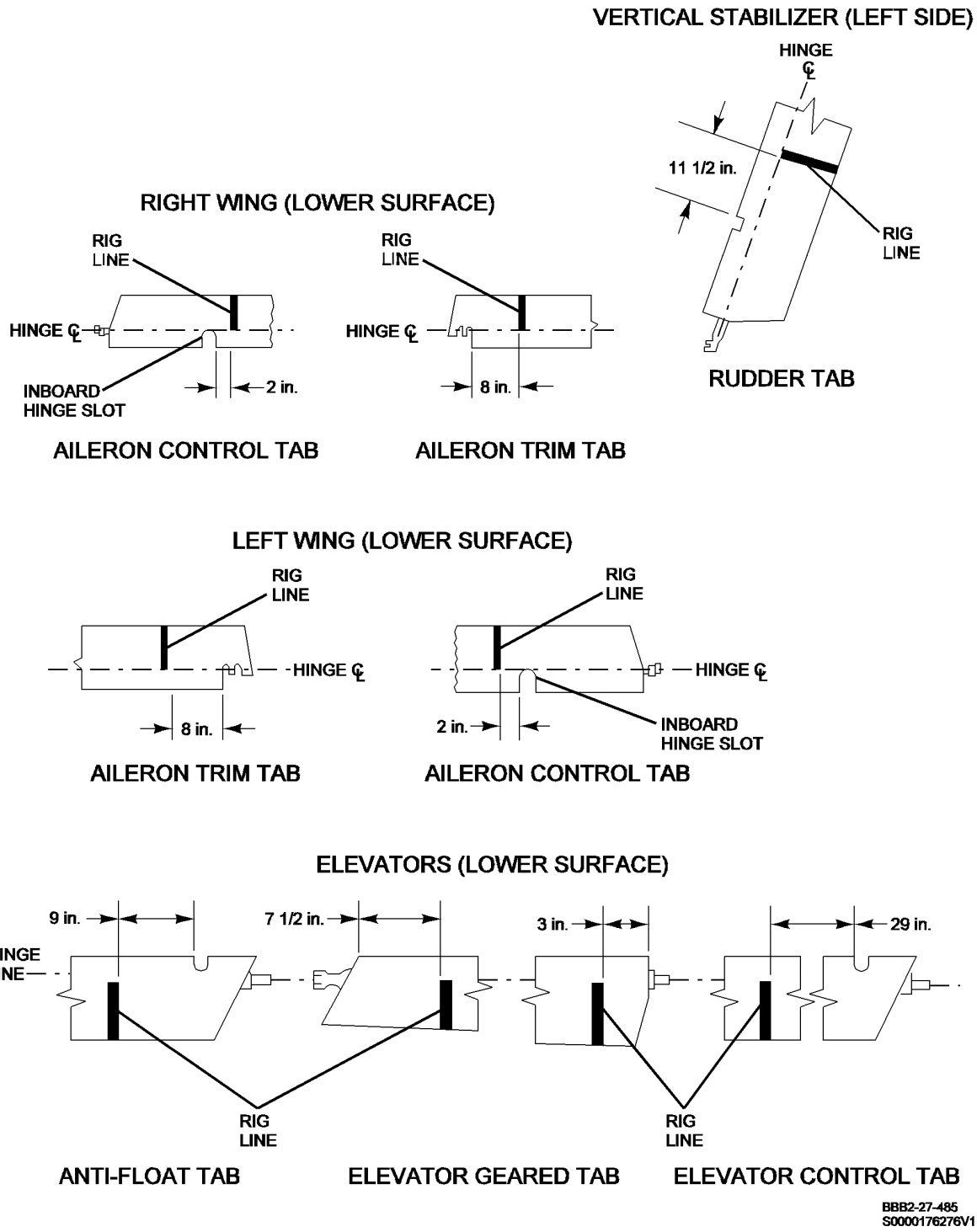


–501 FOR CABLES
3/16 INCH (4.76 MM)
AND 1/4 INCH (6.35 MM)
DIAMETER

BBB2-27-261A

Control System Cable Tensioner
Figure 202/27-00-00-990-804 (Sheet 1 of 2)

ME



WJE
WJE

Control System Cable Tensioner
Figure 202/27-00-00-990-804 (Sheet 2 of 2)

7. Control Cable Tension

A. Final rig Loads for each cable system shall be between maximum rig loads and minimum rig loads. Use applicable tension table to determine appropriate cable tension (maximum rig load preferred).

(1) The minimum and maximum rig loads reflect 120/130 percent of nominal (100 percent) cable tension.

(a) EXAMPLE:

- Cable rig loads for cable run No. 10 (1/8 inch cable) as shown in applicable cable tension table at 70°, the maximum rig tension load is 64 pounds, the minimum rig load is 59 pounds and the minimum allowable in-service rig load is 44 pounds.

8. Tab Rigging Protractor

A. Angular dimensions provided for checking aileron, elevator, and rudder tab travel, are measured by holding tab rigging protractor on rigging reference lines as shown in Figure 203.

(1) Move tab to neutral or faired position.

(2) Hold protractor on rigging reference lines and record position of pointer in degrees.

(3) Move tab to position required for check.

(4) Hold protractor on rigging reference lines and note difference in pointer position from reading obtained in Paragraph 8.A.(2).

9. Grease Seals - Control Surface Hinge Bearings

A. Hinge bearings, on flight control surfaces, that have grease seals which have lifted from their normal position, but are still intact, may remain in service as is.

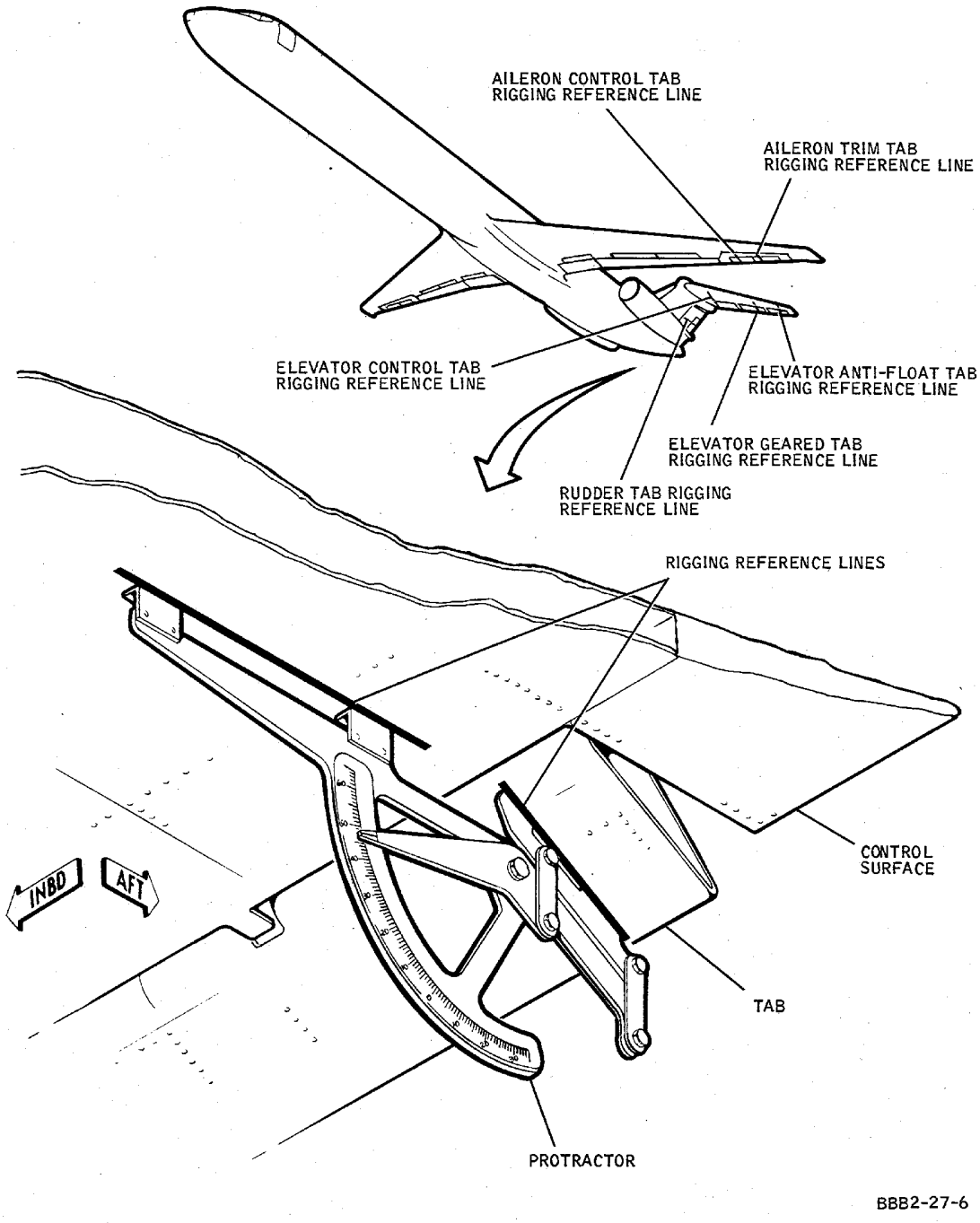
B. Nevertheless, when a bearing with lifted grease seal is found on base visit aircraft (visit of at least 5 days) the following requirements must be met:

(1) Bearing must be checked for smooth operation.

(2) Bearing radial play must not exceed 0.010 inch.

(3) Bearing is lubricated until clean grease flows out. (PAGEBLOCK 12-21-02/301)

NOTE: Excessive grease must be wiped off bearing.



Tab Rigging Protractor
Figure 203/27-00-00-990-805

10. Adjustment/Test General

NOTE: During procedures in paragraphs A. and B., the SPOILER DEPLOYED light, on annunciator panel, should come on when any spoiler is extended 10(±2) degrees. The light should go off when spoilers are retracted. Nose gear ground shift mechanism must be in ground mode for light to operate.

NOTE: During prolonged periods with the hydraulic systems unpressurized, the flaps may droop due to system lap leakage. This is a normal occurrence and will vary from aircraft to aircraft. Unpressurized flap droop in itself is not a problem (except for ground support equipment interference), as long as the flaps/slats position and operate properly with the hydraulic systems pressurized. If unpressurized flap droop is considered excessive on a particular aircraft, it should be reported so trouble-shooting can be performed at the next maintenance period.

A. Maintenance Operational Check (Preflight Test, except as noted by asterisk)

NOTE: The following procedure is used to check movement of flight control surfaces in relation to operation of controls in flight compartment. Detailed tests of individual control systems are included in the appropriate sections.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE ACTUATING ANY CONTROL SURFACE, MAKE CERTAIN THAT AREA AROUND SURFACES ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Rotate either aileron control wheel fully counterclockwise and make following checks:
   (a) Left aileron control tab moves down.
   (b) Left flight spoiler panels are extended.
   (c) Right aileron control tab moves up.
   (d) Right flight spoiler panels remain retracted.
   (e) Opposite control wheel is fully counterclockwise.

(3) Rotate either aileron control wheel fully clockwise and make following checks:
   (a) Right aileron control tab moves down.
   (b) Right flight spoiler panels are extended.
   (c) Left aileron control tab moves up.
   (d) Left flight spoiler panels are retracted.
   (e) Opposite control wheel is fully clockwise.

(4) Return aileron control wheel to neutral position and make following checks:
   (a) Both aileron control tabs are faired with aileron.
   (b) All flight spoiler panels are retracted.

(5) Manually move right aileron trailing edge up, then down. Check that left aileron moves in opposite direction.

(6) Rotate aileron trim control knob clockwise and make following checks:
   (a) Right aileron trim tab moves down.
   (b) Left aileron trim tab moves up.

(7) Rotate aileron trim control knob counterclockwise and make following checks:
  (a) Left aileron trim tab moves down.
  (b) Right aileron trim tab moves up.
(8) Return aileron trim control knob to neutral position.
(9) Open access door number 4432A.
(10) Move either control column to full forward position and make following checks:
  (a) Elevator control tab moves up.
  (b) Elevator moves down.
  (c) Elevator geared tab moves up.
  (d) Elevator hydraulic power light comes on.
  (e) Opposite control column moves to full forward position.
  (f) Control column returns to neutral position smoothly and without binding.
(11) Move either control column to full aft position and make following checks:
  (a) Elevator control tab moves down.
  (b) Elevator hydraulic power on light goes off.
  (c) Opposite control column moves to full aft position.
  (d) Control column returns to neutral position smoothly and without binding.
(12) Move both longitudinal trim control switches in either control wheel to 1.8(±0.3) degrees aircraft nosedown position and make following checks:
  (a) Make certain that screw drum actuator, in elevator variable load feel mechanism, extends.
  (b) Horizontal stabilizer leading edge moves up.
  (c) Longitudinal trim indicator pointer moves in nosedown direction.

    NOTE: During horizontal stabilizer movement in steps (11) through (16), the stabilizer motion warning horn should sound once for approximately each 1/2 degree of stabilizer movement.
(13) Move both trim control switches in either control wheel to 10 (+0.0, -0.5) degrees (0.175 (+0.0, -0.009) rad) aircraft noseup position and make following checks:
  (a) Check that screw drum actuator, in elevator variable load feel mechanism, retracts.
  (b) Horizontal stabilizer leading edge moves down.
  (c) Longitudinal trim indicator pointer moves in noseup direction.
  (d) Elevator anti-float tab remains faired to elevator.
(14) Use trim control switches in either control wheel to move horizontal stabilizer to 10 (+0.0, -0.5) degrees (0.175 (+0.0, -0.009) rad) aircraft noseup to 12.2(±0.5) degrees (0.253(±0.0009) rad) aircraft nose up. Elevator anti-float tab should move to 26.25(±3) degrees (0.458(±0.005) rad) full trailing edge down position measured at inboard end of anti float tab.
(15) Using trim switches return horizontal stabilizer to 0 degrees position, elevator anti-float tab should be faired with elevator.

CAUTION: TO PREVENT OVERHEATING OF STABILIZER ACTUATOR MOTOR WHEN OPERATING MOTOR TRIM SWITCH OR LEVER INDIVIDUALLY, DO NOT HOLD SWITCH OR LEVER OUT OF NEUTRAL POSITION LONGER THAN 3 SECONDS. BEFORE OPERATING SWITCH OR LEVER SECOND TIME, IF NECESSARY, ALLOW AT LEAST 20 SECONDS FOR MOTOR TO COOL.

(16) Momentarily move right trim (motor) control switch in either control wheel. Check that stabilizer remains stationary.

(17) Move both longitudinal trim control handles to nosedown position, then to noseup position. Check that handles return to neutral position when released and that trim indicator pointer travels in direction corresponding to handle selection.

(18) Move both alternate longitudinal trim control levers to nosedown position, then to noseup position. Check that trim indicator pointer travels in direction corresponding to lever selection.

(19) Return stabilizer to neutral position.

(20) Close access door number 4432A.

(21) Move rudder hydraulic power shutoff valve control lever to manual position. Check that rudder control manual light comes on.

(22) Move either captain's or first officer's left rudder pedal forward. Check that rudder control tab moves to right of neutral position.

(23) Move either right rudder pedal forward. Check that rudder control tab moves to left of neutral position.

(24) Move rudder hydraulic power shutoff valve control lever to on position. Check that rudder control manual light goes off.

(25) Move either left rudder pedal forward. Check that rudder trailing edge moves left of neutral position and that control tab remains faired with rudder.

(26) Move either right rudder pedal forward. Check that rudder trailing edge moves right of neutral position and that control tab remains faired with rudder.

(27) Return rudder pedals to neutral position.

(28) Rotate rudder trim control knob clockwise. Check that rudder trailing edge moves right of neutral position.

(29) Rotate rudder trim control knob counterclockwise. Check that rudder trailing edge moves left of neutral position.

(30) Return rudder trim control knob to neutral position.

WARNING: WHEN THE AIRCRAFT IS ON THE GROUND, WITH WEIGHT ON WHEELS, THE BITE TEST OF THE AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME THE FLAP/SLAT HANDLE IS MOVED FROM THE RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. THE SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

(31) Set flap/slat control lever to each detent successively. Allow flaps to stabilize at each position, then check flap position indicator reading in relation to lever setting.

NOTE: Slats are extended to mid position at 0 degrees to 11 degrees and fully extended at 15 degrees to 40 degrees flap position.

(32) Return flap/slat control lever to up/retract position.

(33) Place nose gear oleo switches in flight position.

WJE 873, 874, 886, 887, 892, 893

(34) Actuate right main gear up-limit proximity switch by placing a steel object over switch, auto spoiler actuator should move to retract position. Remove steel object.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 876-881, 883, 884, 891

(35) Simulate left and right main gear in up position by simultaneously placing a metal object over the left and right main gear up proximity switches for approximately 2 seconds.

NOTE: If proximity switches are not actuated simultaneously, the autospoiler do not use light will come on. To turn light off and reset monitor in auto-spoiler switching unit, open and close 26 vdc and 115 vac spoiler control circuit breakers.

WJE ALL

(36) Move speedbrake control lever aft and hold at extend position. Check that both flight spoiler panels on each wing are partially extended. Check that inboard ground spoiler on each wing is retracted.

(37) Rotate aileron control wheel fully counterclockwise. Check that flight spoiler panels on left wing are fully extended and panels on right wing are fully retracted.

(38) Rotate aileron control wheel fully clockwise. Check that flight spoiler panels on right wing are fully extended and panels on left wing are fully retracted.

(39) Return aileron control wheel to neutral position.

(40) Return speedbrake control lever to retract position. Check that all flight spoiler panels are retracted.

(41) Place nose gear oleo switch in ground position.

(42) Move speedbrake control lever up, aft, then up again. Check that flight and inboard ground spoiler panels on each wing are fully extended.

(43) Return speedbrake control lever to retract position. Check that all spoiler panels are retracted.

B. Takeoff Warning System Test

NOTE: The following procedure is used to test the entire take-off warning system. Individual flap, slat, spoiler and horizontal stabilizer takeoff warning tests are included in the appropriate sections. The nosegear strut must be compressed to the normal ground position during the test.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS. ENSURE ALL FLIGHT CONTROL SURFACES ARE FREE AND CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: SPECIFIC POSITIONING OF THROTTLE LEVERS, SPEEDBRAKE CONTROL LEVER, FLAPS, SLATS, AND HORIZONTAL STABILIZER APPLY ONLY TO FOLLOWING TEST PROCEDURES. NO ATTEMPT SHOULD BE MADE TO ADJUST VARIOUS SYSTEM TAKEOFF WARNING SWITCHES TO POSITIONS REFERENCED DURING THIS TEST. SEE APPROPRIATE SYSTEM ADJUSTMENT PROCEDURES FOR ADJUSTMENT OF TAKEOFF WARNING SWITCHES.

(1) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WJE 405-411, 884, 886, 887

(2) Using thumbwheels on TAKEOFF CONDTN calculator set FLAP dial at 20.0 and CG dial at 27.0. LONG TRIM dial should read 3.0(±.30). Reset FLAP dial at 8.0 and CG dial at 13.0. LONG TRIM dial should read 6.0(±.30).

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-881, 883, 891-893

(3) Using thumbwheels on TAKEOFF CONDTN calculator set FLAP dial at 4.0 and CG dial at 24.0. LONG TRIM dial should read 3.1(±.25). Reset FLAP dial at 8.0 and CG dial at 13.0. LONG TRIM dial should read 6.0(±.25).

WJE ALL

(4) Using DIAL-A-FLAP (DAF) thumbwheel set DAF indicator dial at 8.0(±1/2) degrees.

WARNING: BEFORE ACTUATING ANY CONTROL SURFACE, MAKE CERTAIN THAT AREAS AROUND SURFACES ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(5) Set flap/slat handle at DAF detent.

(6) Using pilots wheel trim switch run horizontal stabilizer in aircraft nose up direction until LONG TRIM position indicator reads 6.0(±1/2) nose up.

(7) Make certain that both throttles are in idle position (against aft stops).

(8) Make certain that parking brakes are released.

(9) Make certain that speedbrake control lever is in retract position (against forward stop with red arm label not visible).

(10) Open these circuit breakers and install safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	31	B1-831	CAWS OVERSPEED ENG FIRE HORIZ STAB

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
G	24	B10-194	STAB MOTION INDICATOR

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-876, 878-881, 883, 884, 891-893

(11) Move both throttles 2 1/8 inch (53.98 mm) forward of idle stops, as measured along curved top of pedestal from idle stop to aft edge of throttle lever. Takeoff warning horn and voice STABILIZER should not sound.

WJE 877, 886, 887

(12) Move both throttles 2 1/8 inch (53.98 mm) forward of idle stops, as measured along curved top of pedestal from idle stop to aft edge of throttle lever. Takeoff warning horn should not sound.

WJE 877

(13) Run horizontal stabilizer position towards aircraft nose up until takeoff warning horn sounds. LONG TRIM position indication should be between 7.0 and 7.5 when horn starts sounding.

(14) Run horizontal stabilizer position towards aircraft nose down until takeoff warning horn stops sounding and then starts sounding again. LONG TRIM position indication should be between 5.0 and 4.5 when horn starts sounding again.

WJE 886, 887

(15) Run horizontal stabilizer position towards aircraft nose up until takeoff warning horn sounds. LONG TRIM position indication should be between 7.0 and 7.7 when horn starts sounding.

(16) Run horizontal stabilizer position towards aircraft nose down until takeoff warning horn stops sounding and then starts sounding again. LONG TRIM position indication should be between 5.0 and 4.3 when horn starts sounding again.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-876, 878-881, 883, 884, 891-893

(17) Run horizontal stabilizer position towards aircraft nose up until takeoff warning horn and voice STABILIZER sounds. LONG TRIM position indication should be between 7.0 and 7.5 when horn and voice STABILIZER starts sounding.

(18) Run horizontal stabilizer position towards aircraft nose down until takeoff warning horn and voice STABILIZER stops sounding and then starts sounding again. LONG TRIM position indication should be between 5.0 and 4.5 when horn and voice STABILIZER starts sounding again.

WJE 401-403, 405, 409, 412, 873, 874, 880, 881, 883, 884, 892 PRE MD80-31-034

(19) With right throttle aft, pull left throttle aft until take-off warning horn and voice STABILIZER stops sounding. The left throttle should be forward no less than 1 1/4 inches (31.75 mm) from idle stop. Advance left throttle until takeoff warning horn and voice STABILIZER sounds. The throttle should be no more than 2 1/8 inches (53.98 mm) forward of idle stop when horn and voice STABILIZER initially sounds.

WJE 404, 406-408, 410, 411, 414-427, 429, 861-866, 868, 869, 871, 872, 875-879, 886, 887, 891, 893; WJE 401-403, 405, 409, 412, 873, 874, 880, 881, 883, 884, 892 POST MD80-31-034

(20) Perform functional test of Takeoff Warning System as follows:

NOTE: Make certain aircraft control surfaces are in non-takeoff mode.

(a) Make certain that both throttles are at idle stops.

(b) Make sure that these circuit breakers are closed:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	38	B1-832	CAWS, SSRS-1, LDG GR, T/O, A/P, SP BK, CAB ALT

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 404, 406-408, 410, 411, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-879, 886, 887, 891, 893; WJE 401-403, 405, 409, 412, 873, 874, 880, 881, 883, 884, 892 POST MD80-31-034			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY

WJE 417, 419, 421, 423, 865, 869, 871, 872 (Continued)

(Continued)

UPPER EPC, R AC BUS

Row	Col	Number	Name

WJE 404, 406-408, 410, 411, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-879, 886, 887, 891, 893; WJE 401-403, 405, 409, 412, 873, 874, 880, 881, 883, 884, 892 POST MD80-31-034

L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 404, 406-408, 410, 411, 414-427, 429, 861-866, 868, 869, 871, 872, 875-879, 886, 887, 891, 893; WJE 401-403, 405, 409, 412, 873, 874, 880, 881, 883, 884, 892 POST MD80-31-034

(c) Set parking brake.

(d) With left throttle at takeoff power setting (greater than 2 1/8 inches (53.98 mm) forward of idle stop); no warning should sound.

(e) Retard left throttle to idle stop.

WJE 401-403, 405, 409, 412, 873, 874, 880, 881, 883, 884, 892 PRE MD80-31-034

(21) Repeat Paragraph 10.B.(19) using right throttle.

WJE 404, 406-408, 410, 411, 414-427, 429, 861-866, 868, 869, 871, 872, 875-879, 886, 887, 891, 893; WJE 401-403, 405, 409, 412, 873, 874, 880, 881, 883, 884, 892 POST MD80-31-034

(22) Repeat Paragraph 10.B.(20)(a) through Paragraph 10.B.(20)(d), with right and left throttles at takeoff power setting (greater than 2 1/8 inches (53.98 mm) forward of idle stop); takeoff warning should sound.

WJE **WJE 414; WJE 412 POST MD80-31-034**

WJE NOTE: Other warnings may be heard.

WJE 404, 406-408, 410, 411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-879, 886, 887, 891, 893; WJE 401-403, 405, 409, 873, 874, 880, 881, 883, 884, 892 POST MD80-31-034

NOTE: On aircraft with CAWS voice option, other warnings may be heard.

WJE ALL

(23) Place left and right throttle forward of 2 1/8-inch (53.98 mm) position.

WJE 404, 406-408, 410, 411, 414-427, 429, 861-866, 868, 869, 871, 872, 875-879, 886, 887, 891, 893; WJE 401-403, 405, 409, 412, 873, 874, 880, 881, 883, 884, 892 POST MD80-31-034

(24) Perform the following:

(a) Place left throttle full aft/idle position. Takeoff warning stops.

(b) Place right throttle full aft/idle position. Takeoff warning remains off.

(c) Before proceeding with subsequent tests, position controls as follows:

1) Release parking brakes.

2) Make certain that left and right throttle levers are 2 1/8 in. (53.98 mm) forward of idle stop.

WJE 404, 406-408, 410, 411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-879, 886, 887, 891, 893; WJE 401-403, 405, 409, 873, 874, 880, 881, 883, 884, 892 POST MD80-31-034

3) Horizontal stabilizer LONG TRIM indication is in 0 (neutral) position.

WJE 414; WJE 412 POST MD80-31-034

WJE 4) Using thumbwheels on TAKEOFF CONDTN Calculator, set FLAP dial to 0 degrees
WJE and CG dial to 10.

WJE 5) Flap/Slat control lever is in the 0/EXTEND position.

WJE 404, 406-408, 410, 411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-879, 886, 887, 891, 893; WJE 401-403, 405, 409, 873, 874, 880, 881, 883, 884, 892 POST MD80-31-034

6) Flap/Slat control lever is in the DAF DETENT position.

WJE 414; WJE 412 POST MD80-31-034

WJE 7) Spoiler/Speedbrake lever is in full forward/RET position.

WJE 877, 886, 887, 893; WJE 873, 874, 892 POST MD80-31-034

8) Spoiler/Speedbrake lever is in full forward/RET position.

WJE 404, 406-408, 410, 411, 414-427, 429, 861-866, 868, 869, 871, 872, 876, 878, 879, 891; WJE 401-403, 405, 409, 412, 880, 881, 883, 884 POST MD80-31-034

9) Make certain that the landing gear control lever is in the down position.

WJE 404, 406-408, 410, 411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-879, 886, 887, 891, 893; WJE 401-403, 405, 409, 873, 874, 880, 881, 883, 884, 892 POST MD80-31-034

10) Make certain that the left and right throttle levers are greater than 2 1/8 in. (53.98 mm) forward of idle stop.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(25) Run horizontal stabilizer position towards aircraft nose up until LONG TRIM indication is 6.0 nose up. Make certain that takeoff horn is not sounding.

WJE 412, 414

WJE (26) Run horizontal stabilizer position towards aircraft nose up until LONG TRIM indication is 6.0
WJE nose up. Ensure that takeoff horn is not sounding.

WJE **WJE ALL**

(27) Remove the safety tags and close these circuit breakers:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	31	B1-831	CAWS OVERSPEED ENG FIRE HORIZ STAB

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
G	24	B10-194	STAB MOTION INDICATOR

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-881, 883, 891-893

(28) Using thumbwheels on TAKEOFF CONDTN calculator set FLAP dial and CG dial at 24.0. LONG TRIM dial should read 4.0(±.25). Move horizontal stabilizer position to 4.0(±0.5) nose up.

WJE 405-411, 884, 886, 887

(29) Using thumbwheels on TAKEOFF CONDTN calculator set FLAP dial at 24.0 and CG dial at 7.0. LONG TRIM dial should read 11.0(±.30). Move horizontal stabilizer position to 11.0(±0.5) nose up.

WJE ALL

(30) Push both throttles more than 2 1/8 inch (53.98 mm) forward from idle position.

WJE 877, 886, 887

(31) Slowly move flap/slat handle to 28/EXT detent; takeoff warning horn should be sounding.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-876, 878-881, 883, 884, 891-893

(32) Slowly move flap/slat handle to 28/EXT detent; takeoff warning horn and voice FLAP and SLAT should be sounding.

(33) Move flap/slat handle to 40/EXT detent; takeoff warning horn voice FLAP and SLAT should continue to sound.

WJE 877, 886, 887

(34) Move flap/slat handle to 40/EXT detent; takeoff warning horn should continue to sound.

WJE ALL

(35) Slowly move flap/slat handle forward until warning stops sounding; handle should be between 28/EXT and index mark (at 24 degrees (0.42 rad)).

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-876, 878-881, 883, 884, 891-893

(36) Move flap/slat handle through all detents to 0/RET; warning horn and voice FLAP should start sounding before handle reaches the 15/EXT detent and continue sounding.

WJE 877, 886, 887

(37) Move flap/slat handle through all detents to 0/RET; warning horn should start sounding before handle reaches the 15/EXT detent and continue sounding.

WJE 405-411, 877, 880, 881, 883, 884, 886, 887

(38) Using DIAL-A-FLAP (DAF) thumbwheel, set (DAF) to 24°(±1/2°). Move flap/slat handle aft into DIAL-A-FLAP (DAF) detent; warning horn should stop sounding.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-876, 878, 879, 891-893

(39) Using DIAL-A-FLAP (DAF) thumbwheel, set (DAF) to 24°(±1/2°). Move flap/slat handle aft into DAF detent; takeoff warning horn should stop sounding.

NOTE: Disregard other voice warnings.

WJE 877, 886, 887

(40) With throttle levers forward of 2 1/8 inch (53.98 mm) position, move speedbrake control lever 5/16(±1/8) inch (7.94(±3.18) mm) aft from forward stop, as measured along curved top of pedestal. Warning horn should sound. Move speedbrake control lever to full aft position. Warning horn should continue to sound.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-876, 878-881, 883, 884, 891-893

(41) With throttle levers forward of 2 1/8 inch (53.98 mm) position, move speedbrake control lever 5/16(±1/8) inch (7.94(±3.18) mm) aft from forward stop, as measured along curved top of pedestal. Warning horn and voice SPOILERS should sound. Move speedbrake control lever to full aft position. Warning horn and voice SPOILERS should continue to sound.

NOTE: Disregard other voice warnings.

(42) Move speedbrake lever to RET position. Warning horn and voice SPOILERS should shut off.

WJE 877, 886, 887

(43) With throttle levers forward of 2 1/8 inch (53.98 mm) position, flap/slat handle set at 28/EXT, speedbrake lever at EXT position and warning horn sounding, push both throttle lever forward against stop. Warning horn should continue to sound.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-876, 878-881, 883, 884, 891-893

(44) With throttle levers forward of 2 1/8 inch (53.98 mm) position, flap/slat handle set at 28/EXT, speedbrake lever at EXT position and warning horn and voice SPOILERS, FLAPS and SLATS sounding, push both throttle levers forward against stops. Warning horn and voice should continue to sound.

WJE ALL

WARNING: NORMAL ELECTRICAL POWER SUPPLY TO VARIOUS SYSTEMS INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPEN, MAKE CERTAIN THAT ESSENTIAL SERVICES ARE NOT INTERRUPTED AND THAT SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITIONS TO PREVENT INADVERTENT OPERATION OF EQUIPMENT WHEN CIRCUIT BREAKERS ARE CLOSED.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-876, 878-881, 883, 884, 891-893

(45) Open left ground control relay circuit breaker, located on upper main circuit breaker panel, to simulate extension of nosegear strut. Warning horn and voice SPEEDBRAKES should be sounding. Voice SPOILERS, FLAPS and SLATS should shut off.

WJE 877, 886, 887

Open left ground control relay circuit breaker, located on upper main circuit breaker panel, to simulate extension of nosegear strut. Warning horn should be silenced.

WJE ALL

(46) Remove the safety tags and close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 877, 886, 887

Warning horn should sound.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-876, 878-881, 883, 884, 891-893

Warning horn and voice SPOILERS, FLAP and SLATS should sound. Voice SPEEDBRAKES should be silenced.

WJE ALL

(47) Move both throttles to idle stop.

(48) Place speedbrake control lever in retract position (against forward stop with red arm label not visible).

(49) Place flap/slat lever in UP/RET detent.

(50) Open these circuit breakers and install safety tags:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-404, 875-879, 886, 887

(51) Place a steel object over right main gear up and latched proximity switch to simulate gear up.

WJE 405-412, 414-427, 429, 861-866, 868, 869, 871-874, 880, 881, 883, 884, 891-893

(52) Place a steel object over left and right main gear up and latched proximity switches to simulate gear up.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 877, 880, 881, 883, 884, 891

(53) Release speedbrake handle grip.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871, 872, 876, 878, 879, 891

(54) Move flap/slat control lever to 40-degrees detent. SPEED BRAKE EXTENDED indication, on overhead panel, should stay off over full range of flap travel. Aural warning should not sound.

WJE 401-411, 873, 874, 880, 881, 883, 884, 892, 893

(55) Move flap/slat control lever to 40-degrees detent. SPOILER/FLAP EXTENDED light should stay off over full range of flap travel. Aural warning should not sound.

WJE 877, 886, 887

(56) Move flap/slat control lever to 40-degrees detent. SPOILER/ FLAP EXTENDED light should stay off over full range of flap travel.

WJE ALL

(57) Rotate DAF thumbwheel to set DAF indicator dial at 5-degrees.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871, 872, 876, 878, 879, 891

WJE 401-404, 415-427, 429, 861-866, 868, 869, 871, 872, 876, 878, 879, 891

(58) Move flap/slat control lever to up detent and then to DAF 5-degrees detent and place speedbrake control lever in first detent. SPEED BRAKE EXTENDED indication, on overhead panel, should remain off. Aural warning should not sound.

WJE **WJE 412, 414**

WJE Move flap/slat control lever to up detent and then to DAF 5-degrees detent and place
WJE speedbrake control lever in first detent. SPOILER/FLAP EXTENDED light should remain off.
WJE Aural warning should not sound.

WJE 401-411, 873, 874, 880, 881, 883, 884, 892, 893

(59) Move flap/slat control lever to up detent and then to DAF 5-degrees detent and place speedbrake control lever in first detent. SPOILER/FLAP EXTENDED light should remain off. Aural warning should not sound.

WJE 886, 887

(60) Move flap/slat control lever to up detent and then to DAF 5-degrees detent and place speedbrake control lever in first detent. SPOILER/FLAP EXTENDED light should remain off.

WJE 401-412, 414, 873-876, 878-881, 883, 884, 892, 893

(61) Move flap/slat control lever to 11-degrees detent. SPOILER/FLAP EXTENDED light should come on and warning horn and voice SPEEDBRAKES should be sounding and remain on for flap settings from 11-degrees to 40-degrees.

WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891

(62) Move flap/slat control lever to 11-degrees detent. SPEED BRAKE EXTENDED indication, on overhead panel, should come on and warning horn and voice Speed Brakes should be sounding and remain on for flap settings from 11-degrees to 40-degrees.

WJE 877, 886, 887

(63) Move flap/slat control lever to 11-degrees detent. SPOILER/ FLAP EXTENDED light should come on and remain on for flap settings from 11-degrees to 40-degrees.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-874, 876, 878-881, 883, 884, 886, 887, 891-893

WJE 401-412, 414, 873, 874, 876, 878-881, 883, 884, 886, 887, 892, 893

(64) Move flap/slat control lever to up/ret detent and place speedbrake control lever in retract position. SPOILER/FLAP EXTENDED light should go off and aural warning should silence.

WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891

Move flap/slat control lever to up/ret detent and place speedbrake control lever in retract position. SPEED BRAKE EXTENDED indication should go off and aural warning should silence.

WJE 877

(65) Move flap/slat control lever to up/ret detent and place speedbrake control lever in retract position. SPOILER/FLAP EXTENDED light should go off.

WJE ALL

(66) Remove the safety tags and close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-404, 875-879, 886, 887

(67) Remove steel object from right main gear up and latched proximity switch.

WJE 405-412, 414-427, 429, 861-866, 868, 869, 871-874, 880, 881, 883, 884, 891-893

(68) Remove steel object from left and right main gear up and latched proximity switches.

WJE ALL

(69) To reset auto spoiler DO NOT USE light, do the following:

(a) Open and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(70) Rotate DAF thumbwheel to set DAF indicator dial at 23 1/2°(±1/2°) against stop.

(71) Move flap/slat lever to DAF 23-degrees detent.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-881, 883, 884, 891, 892

(72) Perform auto brake test as follows:

(a) Place ANTI-SKID switch to ARM position.

(b) Place AUTO BRAKE selector to T.O. position and set ARM/DISARM switch to ARM position.

(c) Place both throttles 2 1/8 inch (53.98 mm) inches forward of idle stop; takeoff warning horn and voice AUTO-SPOILER should sound.

NOTE: Disregard other voice warnings.

(d) Compress the grip on speedbrake handle and pull handle up to arm position; takeoff warning horn and voice AUTO-SPOILER should stop sounding. Place ABS selector to OFF position. Takeoff warning horn and voice AUTO-BRAKE should sound.

(e) Disarm speed brake handle by depressing grip and pushing handle down; takeoff warning horn and voice AUTO-BRAKE should stop sounding.

(f) Return both throttles to idle position and place AUTO BRAKE ARM/DISARM switch to DISARM.

WJE ALL

(73) Set parking brakes. PARKING BRAKE ON light should be on.

WJE 401-412, 414, 875-881, 883, 884, 886, 887

(74) Move both throttles forward, warning horn should sound.

WJE 415-427, 429, 861-866, 868, 869, 871-874, 891-893

(75) Move both throttles forward, warning horn and voice BRAKES should sound.

WJE 401-412, 414, 875-881, 883, 884, 886, 887

(76) Release parking brakes, warning horn should shut off. PARKING BRAKE ON light should be off.

WJE 415-427, 429, 861-866, 868, 869, 871-874, 891-893

(77) Release parking brakes, warning horn and voice BRAKES should shut off. PARKING BRAKE ON light should be off.

WJE ALL

(78) Return both throttles to idle position.

(79) Set parking brakes.

(80) Return flap/slat control lever to up-retract position.

NOTE: Paragraph 10.B.(81) through Paragraph 10.B.(88) check SPOILER DEPLOYED light.

(81) Place left hand spoiler system shutoff valve, located in main gear wheelwell, to OFF position.

(82) Slowly rotate aileron control wheel in clockwise direction approximately 90 degrees. Check that SPOILER DEPLOYED light, on annunciator panel, comes on. Return control wheel to neutral, SPOILER DEPLOYED light should go off.

(83) Slowly rotate aileron control wheel in counterclockwise direction approximately 90 degrees. Check that SPOILER DEPLOYED light comes on. Return control wheel to neutral, SPOILER DEPLOYED light should go off.

(84) Place left hand spoiler system shutoff valve in ON position. Place right hand spoiler system shutoff valve in OFF position.

(85) Slowly rotate aileron control wheel in clockwise direction approximately 90 degrees. Check that SPOILER DEPLOYED light comes on. Return control wheel to neutral, SPOILER DEPLOYED light should go off.

(86) Slowly rotate aileron control wheel in counterclockwise direction approximately 90 degrees. Check that SPOILER DEPLOYED light comes on. Return control wheel to neutral, SPOILER DEPLOYED light should go off.

(87) Place right hand spoiler system shutoff valve in ON position.

(88) Install safety lockpins in left and right spoiler system shutoff valves levers, making certain levers are positioned in ON position.

NOTE: Paragraph 10.B.(89) through Paragraph 10.B.(94) check SPOILER DEPLOYED light inhibitor system.

(89) Place both throttle levers 2 1/8 inches (53.98 mm) forward of idle stop, as measured along curved top of pedestal from idle stop to aft edge of throttle lever.

(90) Slowly rotate aileron control wheel in the clockwise direction approximately 90 degrees. Make certain that SPOILER DEPLOYED light remains OFF.

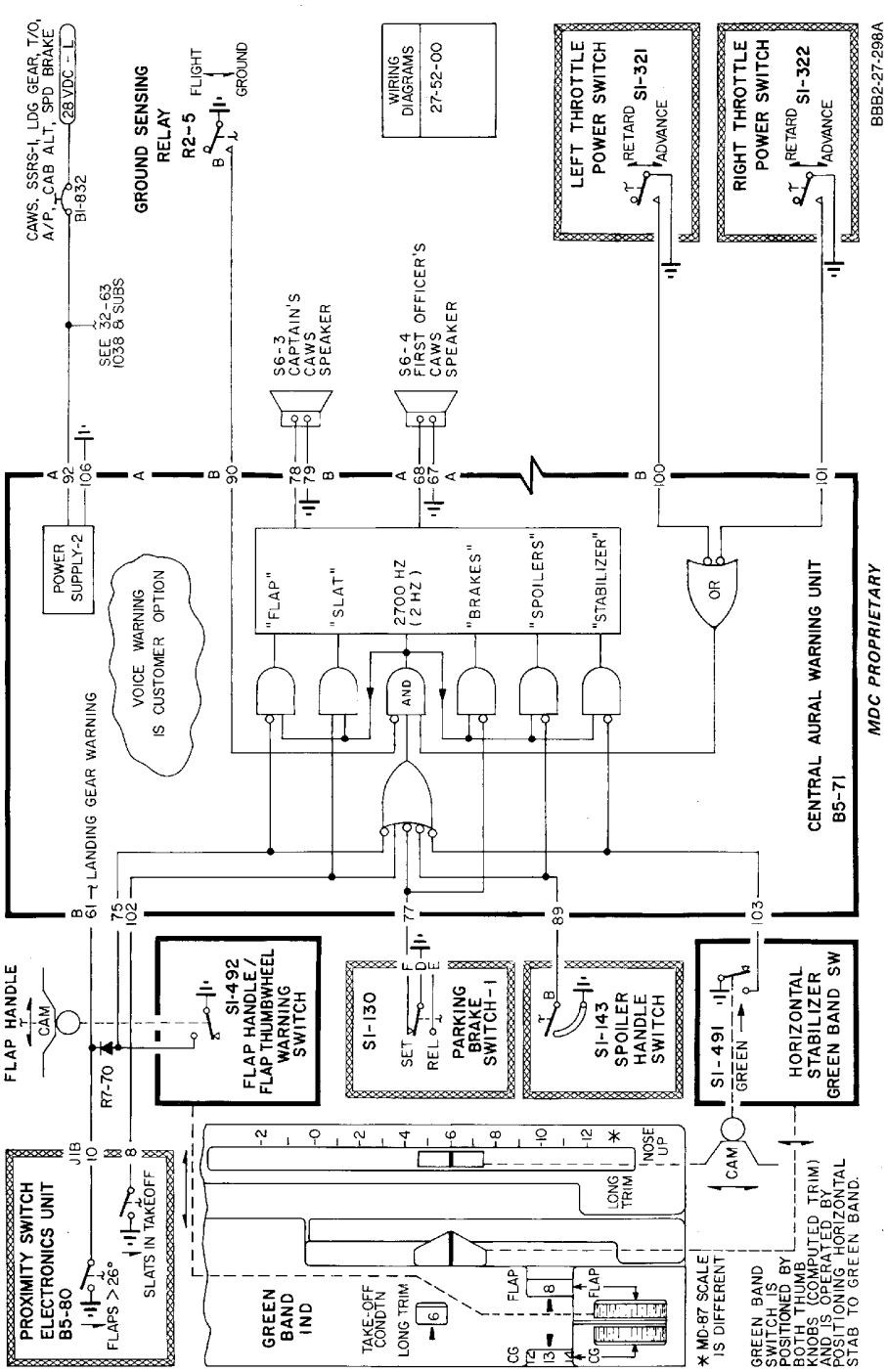
(91) Return control wheel to neutral.

(92) Slowly rotate aileron control wheel counterclockwise direction approximately 90 degrees. Make certain that SPOILER DEPLOYED light remains OFF.

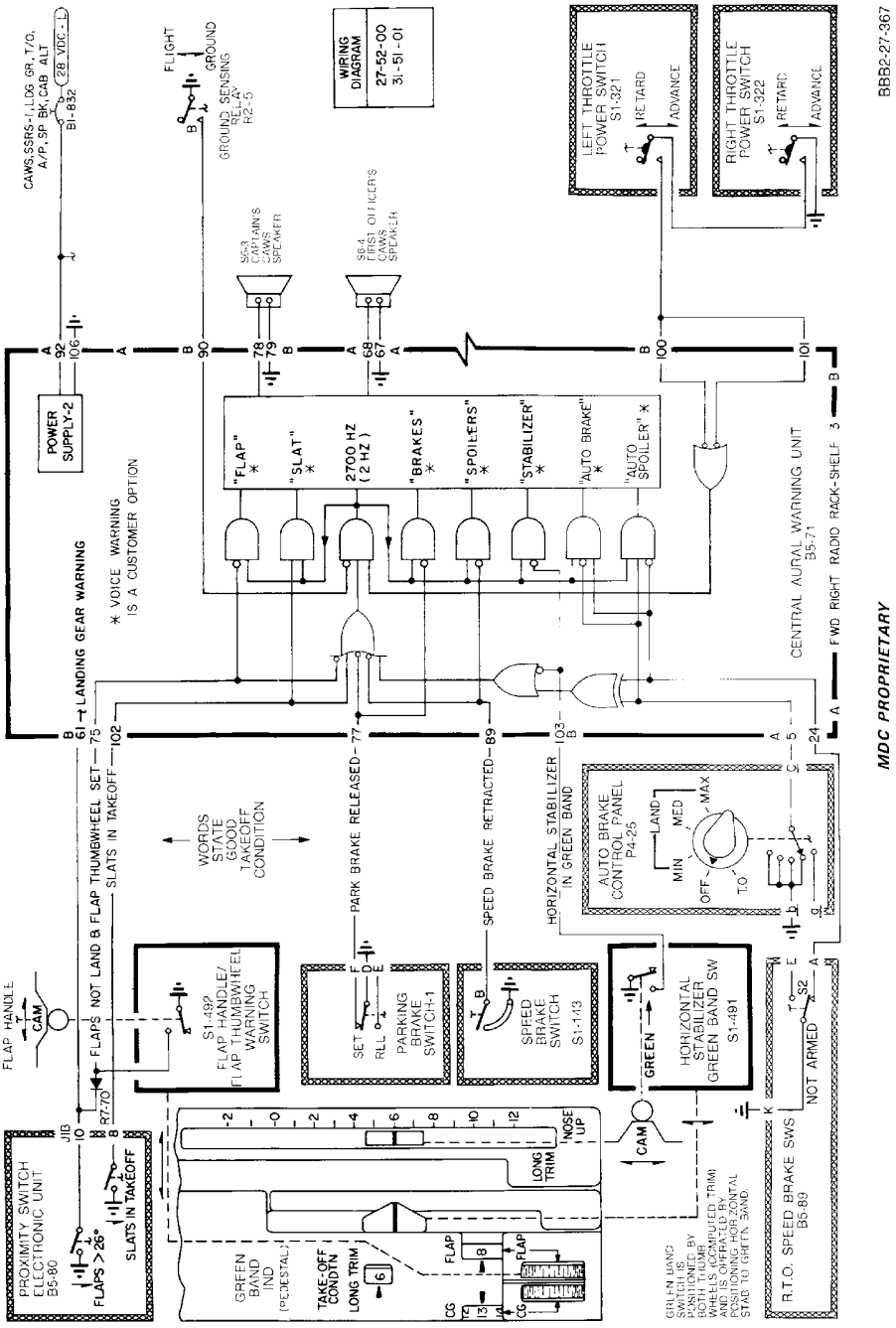
(93) Return control wheel to neutral.

(94) Return both throttle levers to idle position.

(95) Turn off hydraulic system pressure source.



Takeoff Warning -- Schematic
Figure 204/27-00-00-990-806 (Sheet 1 of 2)



Takeoff Warning -- Schematic
Figure 204/27-00-00-990-806 (Sheet 2 of 2)

GENERAL - ADJUSTMENT/TEST

1. General

A. This section contains standard procedures for flight checking the lateral and directional control systems, recommended production tolerances, and procedures for correcting out-of-tolerance conditions. Basic ground checks to be made, if any of the flight checks show out-of-tolerance conditions, are also included.

B. Fuel loading and engine thrust must be symmetrical during accomplishment of this procedure.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following items.

Table 501

Name and Number	Manufacturer
Yaw string (MIL-C-5040B)	
Spring scale (40-pound capacity) (18.143 kg)	John Chatilon & Sons

3. Adjustment/Test Lateral Control System

A. Test Aileron Breakout Forces

(1) Adjust indicated airspeed to 280 knots.

(2) Trim aircraft for level flight with wings level and yaw string centered.

(3) Rotate aileron control wheel clockwise. Record force required to start wheel moving.

(4) Rotate aileron wheel counterclockwise. Record force required to start wheel moving.

NOTE: Force required to start control wheel moving should not be less than three pounds (1.360 kg) or more than six pounds (2.721 kg). Refer to PAGEBLOCK 27-10-00/601, if force is not within limits.

B. Test Aileron Centering

(1) Trim aircraft for level flight with wings level and yaw string centered.

(2) Rotate aileron control wheel to 20 degrees left. Slowly release wheel. Check that wheel rotates to center position within tolerances at each airspeed setting.

NOTE: Airplane must be trimmed for each airspeed setting. Airspeed must not be reduced to less than 1.4 times stall speed. Tolerances are measured at rim of aileron control wheel. Twenty degrees is approximately equal to 2.45 inches measured at rim.

Table 502

Indicated Airspeeds	Tolerances (Rim)
160 knots	±1 inch
280 knots	±1/2 inch
350 knots	±1/2 inch

(3) Rotate aileron control wheel to 20 degrees right. Slowly release wheel. Check that wheel rotates to center position within tolerances at each airspeed setting.

C. Test Aileron Trim

(1) Turn rudder power on.

(2) Turn yaw damper off.

(3) Check that flaps are fully retracted.

NOTE: Record aileron trim indicator setting and number of units of trim required to attain hands off level flight with wings level and yaw string centered at specified airspeed below 21,000 feet altitude.

Table 503

Indicated Airspeeds	Tolerances
160 knots	±1 1/2 units
280 knots	±1 1/2 units
Vmo knots	±1 1/2 units

NOTE: During commercial flights, the dispatchability of an airplane is restricted as follows:

(a) Airplane requiring up to 1 1/2 aileron trim units, no restrictions are necessary.

(b) Airplane requiring 1 1/2 to 2 aileron trim units, no immediate action is required. The airplane may be dispatched for additional flights in order to confirm reported trim requirements and implement appropriate maintenance action.

(c) Airplane requiring 2 to maximum available aileron trim units, a limited number of scheduled flights are permitted for the purpose of routing airplane to maintenance base. Corrective action shall be taken upon arrival of airplane at maintenance base.

(d) Airplane requiring greater than maximum available aileron trim units, immediate corrective maintenance action is required.

NOTE: Continued operation of an airplane in excess of 1 1/2 aileron trim units will result in an increase in drag, and a subsequent increase in fuel usage.

(4) Reduce airspeed and place flaps in fully extended position. Maintain airspeed at 1.4 times stall speed.

CAUTION: TO AVOID CRACKING OF PLACARD AT ATTACHMENT SLOTS, TIGHTEN ATTACHMENT SCREWS TO TORQUE OF 1(±0.5) INCH-POUNDS (0.11(±0.06) N·M).

(5) Record aileron trim indicator setting and number of units of trim required to attain hands off level flight with wings level and yaw string centered.

NOTE: Aileron trim indicator change should not exceed ±1 1/2 units from the value recorded with flaps fully retracted, but total trim required not to exceed 2 1/2 units.

NOTE: Placard may be adjusted up to 1/2 unit maximum in either direction to indicate zero trim units for normal trimmed flight.

(6) Fully retract flaps.

D. Basic Ground Checks

(1) Check aileron control system for excessive friction. (PAGEBLOCK 27-10-00/601)

(2) Check lateral trim system for flap to aileron mismatch. (PAGEBLOCK 27-51-01/601)

NOTE: Ailerons may be rigged to trailing edge down side of tolerance band as required. One inch of aileron trailing edge movement at outboard end of aileron results in approximately 1 3/4-inches movement at inboard end of aileron.

(3) Check flight and ground spoiler panels are properly rigged. Panel trailing edges which deviate from these limits may contribute to unsymmetrical lateral trim. (FLIGHT SPOILER PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 27-61-01/201) (GROUND SPOILER PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 27-62-01/201)

(4) Check lateral trim system for unsymmetrical lateral trim. If trim is not within limits specified in Paragraph 3.C., accomplish following corrective action.

(a) Unsymmetrical Lateral Trim:

1) The aileron control tabs may be rigged differentially by as much as one degree (0.1 inch (2.5 mm) at the trailing edge) per surface to minimize wing heaviness and reduce the aileron trim required as a result. Refer to PAGEBLOCK 27-10-00/501, for control tab adjustment procedure.

NOTE: One degree of control tab deflection is equivalent to one unit of aileron trim as read on pedestal indicator.

NOTE: If differential aileron control tab rigging is insufficient, the aileron trim tabs may be rigged differentially by as much as one degree (0.1 inch (2.5 mm) at trailing edge) per surface to minimize wing heaviness. Refer to PAGEBLOCK 27-10-00/501 for trim tab adjustment procedures.

2) If differential aileron control and trim tab rigging is insufficient, flap up-stops may be rigged differentially to minimize wing heaviness.

NOTE: A degree difference between left and right flaps is equal to approximately one unit of aileron trim.

(b) If aircraft has tendency to roll left or right when flaps are extended, proceed as follows:

1) Adjust position of flap outboard fixed vane on both wings per PAGEBLOCK 27-51-03/201, to minimize roll tendency.

E. Test Aileron Trim Effectiveness

(1) Adjust indicated airspeed to 200 knots.

(2) Trim aircraft for level flight with wings level and yaw string centered.

(3) Rotate aileron control wheel counterclockwise to attain 20 to 30 degrees (0.35 to 0.52 rad) bank attitude.

(4) Move aileron trim indicator five units in clockwise direction.

(5) Release aileron control wheel and record time required for airplane to roll from wings level position to 30 degrees bank attitude in opposite direction from attitude attained in Paragraph 3.E.(3).

(6) Rotate aileron control wheel clockwise to attain 20 to 30 degrees bank attitude.

(7) Move aileron trim indicator five units in counterclockwise direction.

(8) Release aileron control wheel and record time required for airplane to roll from wings level position to 30 degrees bank attitude in opposite direction from attitude attained in Paragraph 3.E.(6) .

NOTE: Time required to roll 30 degrees at 200 knots should not exceed 10 seconds.

(9) Increase indicated airspeed to 280 knots and repeat Paragraph 3.E.(2) through Paragraph 3.E.(8).

NOTE: Time required to roll 30 degrees at 280 knots should not exceed 5 seconds. Refer to PAGEBLOCK 27-10-00/601, if excess time is required.

4. Adjustment/Test Rudder Control System

A. Test Rudder Throw-Limiter

(1) Turn rudder power on.

(2) Adjust indicated airspeed to 180 knots and check that rudder pedal travel is approximately one-half full travel.

(3) Gradually reduce indicated airspeed and check that rudder unrestricted light comes on at 157 knots minimum.

(4) Gradually increase indicated airspeed and check that rudder unrestricted light goes off at 176 knots maximum.

NOTE: Refer to PAGEBLOCK 27-20-06/201, if rudder throw-limiter operation is not within limits.

B. Test Rudder Breakout Forces

(1) Check that rudder power is on.

(2) Adjust indicated airspeed to 280 knots.

(3) Trim aircraft for level flight with wings level and yaw string centered.

NOTE: The yaw string is attached with tape at a point where the bottom of the center glass panel and the glareshield fuselage seam meet. The string should extend from the center of the middle glass panel to approximately 1 1/2 inches above glareshield.

(4) Depress left rudder pedal from neutral and record force required to start pedal moving.

(5) Depress right rudder pedal from neutral and record force required to start pedal moving.

NOTE: Force required to start either pedal moving should be linear and within a 3 to 2 ratio maximum.

(6) Turn rudder power off and repeat Paragraph 4.B.(3), Paragraph 4.B.(4) and Paragraph 4.B.(5).

C. Test Rudder Centering

(1) Trim aircraft for level flight with wings level and yaw string centered.

(2) Check that rudder power is off.

(3) Move rudder pedals alternately and release. Check that pedals return smoothly to center position without hesitation.

(4) Turn rudder power on and repeat Paragraph 4.C.(3).

NOTE: Refer to PAGEBLOCK 27-20-06/201, if rudder breakout forces are excessive or centering is not smooth.

D. Test Rudder Trim

(1) Check that rudder power is on.

(2) Check that yaw damper is off.

NOTE: Record rudder trim indicator setting and number of units of trim required to attain hands off level flight with wings level and yaw string centered at specified airspeeds. Airspeed must not be reduced to less than 1.4 times stall speed below 21,000 feet attitude.

Table 504

Indicated Airspeeds	Tolerances
160 knots	±1 unit

Table 504 (Continued)

Indicated Airspeeds	Tolerances
280 knots	±1 unit
Vmo knots	±1 unit

NOTE: During commercial flights, the dispatchability of an aircraft is restricted as follows:

(a) Aircraft requiring up to 1 rudder trim unit, no restrictions are necessary.

(b) Aircraft requiring greater than 1 and up to 1 1/2 rudder trim units, no immediate action is required. The aircraft may be dispatched for additional flights in order to confirm reported trim requirements and implement appropriate maintenance action.

(c) Aircraft requiring greater than 1 1/2 and up to 3 rudder trim units, a limited number of scheduled flights are permitted for the purpose of routing aircraft to maintenance base. Corrective action shall be taken upon arrival of aircraft at maintenance base.

(d) Aircraft requiring greater than 3 rudder trim units, immediate corrective maintenance action is required.

NOTE: Continued operation of an aircraft in excess of 1 rudder unit will result in an increase in drag, and a subsequent increase in fuel usage.

(3) Reduce indicated airspeed and place flaps in fully extended position. Maintain airspeed at 1.4 times stall speed.

CAUTION: TO AVOID CRACKING OF PLACARD AT ATTACHMENT SLOTS, TIGHTEN ATTACHMENT SCREWS TO TORQUE OF 1(±0.5) INCH-POUNDS (0.11(±0.06) N·M).

(4) Note rudder trim indicator setting and number of units of trim required to trim aircraft for hands off level flight with wings level and yaw string centered.

NOTE: Rudder trim indicator change should not exceed ±1 unit from the value recorded with flaps fully retracted.

(5) Fully retract flaps.

(6) Turn rudder power off and repeat note following step (2).

NOTE: If trim with manual rudder exceeds trim with power rudder more than ±1 unit move ground adjustable tab 1/16-inch (1.587 mm) at trailing edge for each additional unit of trim required. To trim airplane nose left adjust tab trailing edge left. To trim nose right adjust tab trailing edge right. Tab deflection should not exceed 1/2-inch (12.7 mm) at trailing edge.

NOTE: If a rudder control tab is replaced for cause not related to flight control characteristics of aircraft, the ground adjustable trim tab of replacement control tab can be set to match tab being replaced. Angular setting of ground adjustable tab on replacement unit can be set to match that of original unit within ±1.0 degree. No functional check flight is required if these conditions are met.

NOTE: Rudder trim placard should be adjusted to indicate zero trim units for normal trimmed flight.

E. Test Rudder Trim Effectiveness

(1) Turn rudder power on.

(2) Adjust indicated airspeed to 200 knots or 1.4 times stall speed.

(3) Trim aircraft for hands off level flight with wings level and yaw string centered.

(4) Move rudder trim indicator five units in counterclockwise direction.

(5) Maintain wings level attitude with yaw string centered by holding rudder against mistrim.

(6) Note rudder pedal force required to maintain desired flight attitude.

(7) Release rudder and maintain wings level attitude.

(8) Note yaw string deflection.

(9) Move rudder trim indicator five units in clockwise direction and repeat Paragraph 4.E.(5) through Paragraph 4.E.(8) .

NOTE: Force required to hold rudder against mistrim should be linear and within a 3 to 2 ratio.

NOTE: Yaw string deflection should be 3 1/2-inches (76.700 mm) minimum at top of windshield. Deflection should be approximately equal in each direction.

(10) Turn rudder power off and repeat Paragraph 4.E.(2) through Paragraph 4.E.(9).

NOTE: Yaw string deflection should be 1 3/4-inches (44.45 mm) minimum at top of windshield. Deflection should be approximately equal in each direction.

NOTE: Refer to RUDDER AND TAB - CHECK, PAGEBLOCK 27-20-00/601, if rudder trim effectiveness is not within limits.

TAKE-OFF WARNING SYSTEM - OPERATIONAL CHECK

1. General

A. This procedure has the operational test instructions for the takeoff warning system.

B. The takeoff warning system provides distinctive intermittent aural horn and voice warning when critical or potentially hazardous conditions exist. The warning system alerts the flight crew need for immediate attention or action. The warnings are heard through the flight compartment speakers or headsets.

TASK 27-00-00-710-801

2. Operational Check of the Take-off Warning System

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
29-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES
32-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES

B. Prepare for the Operational Check of the Take-off Warning System

NOTE: The following systems must be rigged before this operational check is made, Spoilers and speedbrakes (Section 27-60), Wing Flaps and wing flap buss (Section 27-50), throttles (Section 76-00) and horizontal stabilizer (Section 27-40). The nose strut must be compressed.

SUBTASK 27-00-00-941-002

(1) Make the landing gear safe for maintenance. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 32-00-00/201)

(2) Make sure the nose gear strut is compressed in ground mode condition.

(3) Pressurize the left and the right hydraulic systems. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

C. Operational Check of the Take-off Warning System

SUBTASK 27-00-00-710-001

(1) Do an operational check of the takeoff warning system as follows:

NOTE: The following procedure is used to test the entire take-off warning system. Individual flap, slat, spoiler and horizontal stabilizer takeoff warning tests are included in the appropriate sections. The nose gear strut must be compressed to the normal ground position during the test.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS. ENSURE ALL FLIGHT CONTROL SURFACES ARE FREE AND CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: SPECIFIC POSITIONING OF THROTTLE LEVERS, SPEEDBRAKE CONTROL LEVER, FLAPS, SLATS, AND STABILIZER APPLY ONLY TO THE FOLLOWING TEST PROCEDURES. NO ATTEMPT SHOULD BE MADE TO ADJUST VARIOUS SYSTEM TAKEOFF WARNING SWITCHES TO POSITIONS REFERENCED DURING THIS TEST. SEE APPROPRIATE SYSTEM ADJUSTMENT PROCEDURES FOR ADJUSTMENT OF TAKEOFF WARNING SWITCHES.

(a) Pressurize left and right hydraulic systems. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

WJE 405-411, 884, 886, 887

(b) Using thumbwheels on TAKEOFF CONDTN calculator set FLAP dial at 20.0 and CG dial at 27.0. LONG TRIM dial should read 3.0(±.30). Reset FLAP dial at 8.0 and CG dial at 13.0. LONG TRIM dial should read 6.0(±.30).

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-881, 883, 891-893

(c) Using thumbwheels on TAKEOFF CONDTN calculator set FLAP dial at 4.0 and CG dial at 24.0. LONG TRIM dial should read 3.1(±.25). Reset FLAP dial at 8.0 and CG dial at 13.0. LONG TRIM dial should read 6.0(±.25).

WJE ALL

(d) Using DIAL-A-FLAP (DAF) thumbwheel set DAF indicator dial at 8.0(±1/2) degrees.

WARNING: BEFORE ACTUATING ANY CONTROL SURFACE, MAKE CERTAIN THAT AREAS AROUND SURFACES ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(e) Set flap/slat handle at DAF detent.

(f) Using pilots wheel trim switch run horizontal stabilizer in aircraft nose up direction until LONG TRIM position indicator reads 6.0(±1/2) nose up.

(g) Make certain that both throttles are in idle position (against aft stops).

(h) Make certain that parking brakes are released

(i) Make certain that speedbrake control lever is in retract position (against forward stop with red arm label not visible).

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(j) Open this circuit breaker and install safety tag:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	31	B1-831	CAWS OVERSPEED ENG FIRE HORIZ STAB

Open this circuit breaker and install safety tag:

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
G	24	B10-194	STAB MOTION INDICATOR

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-876, 878-881, 883, 884, 891-893

(k) Move both throttles 2 1/8 inch (53.98 mm) forward of idle stops, as measured along curved top of pedestal from idle stop to aft edge of throttle lever. Takeoff warning horn and voice STABILIZER should not sound.

WJE 877, 886, 887

(l) Move both throttles 2 1/8 inch (53.98 mm) forward of idle stops, as measured along curved top of pedestal from idle stop to aft edge of throttle lever. Takeoff warning horn should not sound.

WJE 877

(m) Run horizontal stabilizer position towards aircraft nose up until takeoff warning horn sounds. LONG TRIM position indication should be between 7.0 and 7.5 when horn starts sounding

(n) Run horizontal stabilizer position towards aircraft nose down until takeoff warning horn stops sounding and then starts sounding again. LONG TRIM position indication should be between 5.0 and 4.5 when horn starts sounding again.

WJE 886, 887

(o) Run horizontal stabilizer position towards aircraft nose up until takeoff warning horn sounds. LONG TRIM position indication should be between 7.0 and 7.7 when horn starts sounding.

(p) Run horizontal stabilizer position towards aircraft nose down until takeoff warning horn stops sounding and then starts sounding again. LONG TRIM position indication should be between 5.0 and 4.3 when horn starts sounding again.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-876, 878-881, 883, 884, 891-893

(q) Run horizontal stabilizer position towards aircraft nose up until takeoff warning horn and voice STABILIZER sounds. LONG TRIM position indication should be between 7.0 and 7.5 when horn and voice STABILIZER starts sounding.

(r) Run horizontal stabilizer position towards aircraft nose down until takeoff warning horn and voice STABILIZER stops sounding and then starts sounding again. LONG TRIM position indication should be between 5.0 and 4.5 when horn and voice STABILIZER starts sounding again.

WJE 401-403, 405, 409, 415, 422, 425, 427, 861, 862, 866, 868, 873, 874, 880, 881, 883, 884, 891, 892

(s) On aircraft previous to ship 1640 and without S/B 31-34, with right throttle aft, pull left throttle aft until take-off warning horn and voice STABILIZER stops sounding. The left throttle should be forward no less than 1 1/4 inches (31.75 mm) from idle stop. Advance left throttle until takeoff warning horn and voice STABILIZER sounds. The throttle should be no more than 2 1/8 inches (53.98 mm) forward of idle stop when horn and voice STABILIZER initially sounds

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(t) On aircraft with S/B 31-34, or ships 1640 and subsequent, perform functional test of Takeoff Warning System:

NOTE: Make certain aircraft control surfaces are in non-takeoff mode.

WJE ALL

(u) Perform functional test of Takeoff Warning System as follows:

NOTE: Make certain aircraft control surfaces are in non-takeoff mode.

1) Make certain that both throttles are at idle stops.
2) Set the parking brake.
3) With the left throttle at takeoff power setting (greater than 2 1/8 inches (53.98 mm) forward of idle stop); no warning should sound.
4) Retard the left throttle to idle stop.
5) With the right throttle at takeoff power setting (greater than 2 1/8 inches (53.98 mm) forward of idle stop); no warning should sound.
6) Retard the right throttle to idle stop.

NOTE: On aircraft with CAWS voice option, other warnings may be heard.

WJE **WJE 412, 414**

WJE NOTE: Other warnings may be heard.

WJE **WJE ALL**

7) With right and left throttles at takeoff power setting (greater than 2 1/8 inches (53.98 mm) forward of idle stop), takeoff warning should sound.

NOTE: On aircraft with CAWS voice option, other warnings may be heard.

8) Place left throttle full aft/idle position. Takeoff warning stops.
9) Place right throttle full aft/idle position. Takeoff warning remains off.
   a) Before proceeding with subsequent tests, position controls as follows:
   b) Release parking brakes
   c) Make certain that left and right throttle levers are 2 1/8 in. (53.98 mm) forward of idle stop.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

d) Horizontal stabilizer LONG TRIM indication is in 0 (neutral) position.

WJE 412, 414

WJE e) Using thumbwheels on TAKEOFF CONDTN calculator, set FLAP dial to 0
WJE degrees and CG dial to 10.

WJE f) Flap/Slat control lever is in the 0/EXTEND position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

g) Flap/Slat control lever is in the DAF DETENT position.

WJE 412, 414

WJE h) Spoiler/Speedbrake lever is in full forward/RET position

WJE 873, 874, 877, 886, 887, 892, 893

i) Spoiler/Speedbrake lever is in full forward/RET position.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 876, 878-881, 883, 884, 891

j) Make certain that the landing gear control lever is in the down position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

k) Make certain that the left and right throttle levers are greater than 2 1/8 in. (53.98 mm) forward of idle stop.

(v) Run horizontal stabilizer position towards aircraft nose up until LONG TRIM indication is 6.0 nose up. Make certain that takeoff horn is not sounding.

WJE 412, 414

WJE (w) Run horizontal stabilizer position towards aircraft nose up until LONG TRIM indication is
WJE 6.0 nose up. Ensure that takeoff horn is not sounding.

WJE **WJE ALL**

(x) Remove the safety tags and close these circuit breakers:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	31	B1-831	CAWS OVERSPEED ENG FIRE HORIZ STAB

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
G	24	B10-194	STAB MOTION INDICATOR

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-881, 883, 891-893

(y) Using thumbwheels on TAKEOFF CONDTN calculator set FLAP dial and CG dial at 24.0. LONG TRIM dial should read 4.0(±.25). Move horizontal stabilizer position to 4.0(±0.5) nose up.

WJE 405-411, 884, 886, 887

(z) Using thumbwheels on TAKEOFF CONDTN calculator set FLAP dial at 24.0 and CG dial at 7.0. LONG TRIM dial should read 11.0(±.30). Move horizontal stabilizer position to 11.0(±0.5) nose up.

WJE ALL

(aa) Push both throttles more than 2 1/8 inch (53.98 mm) forward from idle position.

WJE 877, 886, 887

(ab) Slowly move flap/slat handle to 28/EXT detent; takeoff warning horn should be sounding.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-876, 878-881, 883, 884, 891-893

(ac) Slowly move flap/slat handle to 28/EXT detent; takeoff warning horn and voice FLAP and SLAT should be sounding.

(ad) Move flap/slat handle to 40/EXT detent; takeoff warning horn voice FLAP and SLAT should continue to sound.

WJE 877, 886, 887

(ae) Move flap/slat handle to 40/EXT detent; takeoff warning horn should continue to sound.

WJE ALL

(af) Slowly move flap/slat handle forward until warning stops sounding; handle should be between 28/EXT and index mark (at 24 degrees (0.42 rad).

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-876, 878-881, 883, 884, 891-893

(ag) Move flap/slat handle through all detents to 0/RET; warning horn and voice FLAP should start sounding before handle reaches the 15/EXT detent and continue sounding.

WJE 877, 886, 887

(ah) Move flap/slat handle through all detents to 0/RET; warning horn should start sounding before handle reaches the 15/EXT detent and continue sounding.

WJE 405-411, 877, 880, 881, 883, 884, 886, 887

(ai) Using DIAL-A-FLAP (DAF) thumbwheel, set (DAF) to 24°(±1/2°). Move flap/slat handle aft into DIAL-A-FLAP (DAF) detent; warning horn should stop sounding.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-876, 878, 879, 891-893

(aj) Using DIAL-A-FLAP (DAF) thumbwheel, set (DAF) to 24°(±1/2°). Move flap/slat handle aft into DAF detent; takeoff warning horn should stop sounding.

NOTE: Disregard other voice warnings.

WJE 877, 886, 887

(ak) With throttle levers forward of 2 1/8 inch (53.98 mm) position, move speedbrake control lever 5/16(±1/8) inch (7.94(±3.18) mm) aft from forward stop, as measured along curved top of pedestal. Warning horn should sound. Move speedbrake control lever to full aft position. Warning horn should continue to sound.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-876, 878-881, 883, 884, 891-893

(al) With throttle levers forward of 2 1/8 inch (53.98 mm) position, move speedbrake control lever 5/16(±1/8) inch (7.94(±3.18) mm) aft from forward stop, as measured along curved top of pedestal. Warning horn and voice SPOILERS should sound. Move speedbrake control lever to full aft position. Warning horn and voice SPOILERS should continue to sound

NOTE: Disregard other voice warnings.

(am) Move speedbrake lever to RET position. Warning horn and voice SPOILERS should shut off.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-876, 878-881, 883, 884, 891-893 (Continued)

(an) With throttle levers forward of 2 1/8 inch (53.98 mm) position, flap/slat handle set at 28/EXT, speedbrake lever at EXT position and warning horn and voice SPOILERS, FLAPS and SLATS sounding, push both throttle levers forward against stops. Warning horn and voice should continue to sound.

WJE ALL

WARNING: NORMAL ELECTRICAL POWER SUPPLY TO VARIOUS SYSTEMS WILL BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. MAKE CERTAIN THAT SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITIONS TO PREVENT INADVERTENT OPERATION OR SHUTDOWN OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(ao) Open these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-876, 878-881, 883, 884, 891-893

(ap) Warning horn and voice SPEEDBRAKES should be sounding. Voice SPOILERS, FLAPS and SLATS should shut off.

WJE 877, 886, 887

(aq) Warning horn should be silenced.

WJE ALL

(ar) Close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 877, 886, 887

(as) Warning horn should sound.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-876, 878-881, 883, 884, 891-893

(at) Warning horn and voice SPOILERS, FLAP and SLATS should sound. Voice SPEEDBRAKES should be silenced.

WJE ALL

(au) Move both throttles to idle stop.

(av) Place speedbrake control lever in retract position (against forward stop with red arm label not visible).

(aw) Place flap/slat lever in UP/RET detent.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(ax) Open these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-404, 875-879, 886, 887

(ay) Place a steel object over right main gear up and latched proximity switch to simulate gear up.

WJE 405-412, 414-427, 429, 861-866, 868, 869, 871-874, 880, 881, 883, 884, 891-893

(az) Place a steel object over left and right main gear up and latched proximity switches to simulate gear up.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 877, 880, 881, 883, 884, 891

(ba) Release speedbrake handle grip.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871, 872, 876, 878, 879, 891

(bb) Move flap/slat control lever to 40-degrees detent. SPEED BRAKE EXTENDED indication, on the overhead panel, should stay off over full range of flap travel. Aural warning should not sound.

WJE 401-411, 873, 874, 880, 881, 883, 884, 892, 893

(bc) Move flap/slat control lever to 40-degrees detent. SPOILER/FLAP EXTENDED light should stay off over full range of flap travel. Aural warning should not sound.

WJE 877, 886, 887

(bd) Move flap/slat control lever to 40-degrees detent. SPOILER/ FLAP EXTENDED light should stay off over full range of flap travel.

WJE ALL

(be) Rotate DAF thumbwheel to set DAF indicator dial at 5-degrees.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(bf) Move flap/slat control lever to up detent and then to DAF 5-degree detent and place speedbrake control lever in first detent. SPEED BRAKE EXTENDED indication, on the overhead panel, should remain off. Aural warning should not sound.

WJE 412, 414

WJE
WJE
WJE

(bg) Move flap/slat control lever to up detent and then to DAF 5-degree detent and place speedbrake control lever in first detent. SPOILER/FLAP EXTENDED light should remain off. Aural warning should not sound.

WJE 401-411, 873, 874, 880, 881, 883, 884, 892, 893

(bh) Move flap/slat control lever to up detent and then to DAF 5-degree detent and place speedbrake control lever in first detent. SPOILER/FLAP EXTENDED light should remain off. Aural warning should not sound.

WJE 886, 887

(bi) Move flap/slat control lever to up detent and then to DAF 5-degree detent and place speedbrake control lever in first detent. SPOILER/FLAP EXTENDED light should remain off.

WJE 401-412, 414, 873-876, 878-881, 883, 884, 892, 893

(bj) Move flap/slat control lever to 11-degree detent. SPOILER/FLAP EXTENDED light should come on and warning horn and voice SPEEDBRAKES should be sounding and remain on for flap settings from 11-degrees to 40-degrees.

WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891

(bk) Move flap/slat control lever to 11-degree detent. SPEED BRAKE EXTENDED indication, on overhead panel, should come on and warning horn and voice Speed Brakes should be sounding and remain on for flap settings from 11-degrees to 40-degrees.

WJE 877, 886, 887

(bl) Move flap/slat control lever to 11-degree detent. SPOILER/ FLAP EXTENDED light should come on and remain on for flap settings from 11-degrees to 40-degrees.

WJE 401-412, 414, 873-881, 883, 884, 886, 887, 892, 893

(bm) Move flap/slat control lever to up/ret detent and place speedbrake control lever in retract position. SPOILER/FLAP EXTENDED light should go off and aural warning should silence.

WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891

(bn) Move flap/slat control lever to up/ret detent and place speedbrake control lever in retract position. SPEED BRAKE EXTENDED indication, on the overhead panel, should go off and aural warning should silence.

WJE 877

(bo) Move flap/slat control lever to up/ret detent and place speedbrake control lever in retract position. SPOILER/FLAP EXTENDED light should go off.

WJE ALL

(bp) Remove the safety tags and close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-404, 875-879, 886, 887

(bq) Remove steel object from right main gear up and latched proximity switch.

WJE 405-412, 414-427, 429, 861-866, 868, 869, 871-874, 880, 881, 883, 884, 891-893

(br) Remove steel object from left and right main gear up and latched proximity switches.

WJE ALL

(bs) To reset auto spoiler DO NOT USE light, do the following:

1) Open and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(bt) Rotate DAF thumbwheel to set DAF indicator dial at 23 1/2°(±1/2°) against stop.

(bu) Move flap/slat lever to DAF 23-degree detent.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-881, 883, 884, 891, 892

(bv) Perform auto brake test as follows:

1) Place ANTI-SKID switch to ARM position.
2) Place AUTO BRAKE selector to T.O. position and set ARM/DISARM switch to ARM position.
3) Place both throttles 2 1/8 inch (53.98 mm) inches forward of idle stop; takeoff warning horn and voice AUTO-SPOILER should sound.

   NOTE: Disregard other voice warnings.
4) Compress the grip on speedbrake handle and pull handle up to arm position; takeoff warning horn and voice AUTO-SPOILER should stop sounding. Place ABS selector to OFF position. Takeoff warning horn and voice AUTO-BRAKE should sound.
5) Disarm speed brake handle by depressing grip and pushing handle down; takeoff warning horn and voice AUTO-BRAKE should stop sounding.

6) Return both throttles to idle position and place AUTO BRAKE ARM/DISARM switch to DISARM.

WJE ALL

(bw) Set parking brakes. PARKING BRAKE ON light should be on.

WJE 401-412, 414, 875-881, 883, 884, 886, 887

(bx) Move both throttles forward, warning horn should sound.

WJE 415-427, 429, 861-866, 868, 869, 871-874, 891-893

(by) Move both throttles forward, warning horn and voice BRAKES should sound.

WJE 401-412, 414, 875-881, 883, 884, 886, 887

(bz) Release parking brakes, warning horn should shut off. PARKING BRAKE ON light should be off.

WJE 415-427, 429, 861-866, 868, 869, 871-874, 891-893

(ca) Release parking brakes, warning horn and voice BRAKES should shut off. PARKING BRAKE ON light should be off.

WJE ALL

(cb) Return both throttles to idle position.

(cc) Set parking brakes.

(cd) Return flap/slat control lever to up-retract position.

D. Job Close-up

SUBTASK 27-00-00-942-001

(1) Remove all the tools and equipment from the work area. Make sure the area is clean.

——— END OF TASK ———

DEICING FLUID RESIDUE - INSPECTION/CHECK

1. General

A. This procedure has the inspection and check instructions for the aircraft deicing fluid residue.

B. The inspection and cleaning procedures should be followed for all aircraft which are operated from any airport at which the aircraft is exposed to de-icing/anti-icing fluids. If a specific aircraft has never been operated from an airport at which it might have been exposed to de-icing/anti-icing fluids, the inspections are not needed.

C. These inspection and cleaning procedures are being provided as a result of the appearance of residue from previously applied Type II and/or Type IV (thickened) de-icing/anti-icing fluids. In some cases those residues had been generated from fluids applied many months, or even years, earlier.

D. The frequency of the inspections should be based upon operator experience after the accumulation of data from at least one winter season. Inspection and cleaning should be performed for all of the locations specified.

2. Equipment and Material

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Material List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 601 Equipment and Material

Name and Number	Manufacturer
MLG door safety and gear downlock assy	ITEL 32-10-02
“Do Not Operate” tag	

3. Inspection - Deicing Fluid Residue Buildup

A. Inspect Aircraft Structures

(1) Pressurize the hydraulic system. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

WARNING: BEFORE YOU MOVE THE FLAP/SLAT HANDLE, MAKE SURE ALL PERSONS AND EQUIPMENT ARE CLEAR OF THE AREAS AROUND THE FLAPS AND SLATS. THIS WILL HELP PREVENT INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(2) Fully extend flaps by placing slat/flap handle in 40°/LAND detent.

NOTE: Lowering the flaps gives access to the rear spar area through the opening between the spoiler panels and the Bent Up Trailing Edge (BUTE) doors.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left and right hydraulic systems. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

(4) Make the landing gear safe for maintenance. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 32-00-00/201)

NOTE: Opening the Main Landing Gear (MLG) doors gives access to the aileron control and bus cables, flight spoiler control system cables and the lateral control mixer assemblies that run through the MLG wheel wells.

(5) Attach the DO NOT OPERATE tags to the controls that follow:

- flap/slat handle
- flight spoiler handle
- aileron/elevator control column
- rudder pedals
- hydraulic system control panel.

(6) Visually inspect the areas for presence of dry or rehydrated residue on hardware or structure.

NOTE: Dry residue normally a thin film, may be hard to see. Rehydrated residue can be a gel-like substance which can be visibly thick.

(a) If residue is found or suspected, spray area with a fine mist of warm water to rehydrated residue.

NOTE: Rehydrating residue makes it easier to identify.

NOTE: The water should be warm to help prevent water from freezing on cold surfaces and to speed up process.

NOTE: Do not clean at this time. This is for identification only.

(7) Verify hydration of residue on hardware or structure.

(a) Wait for minimum of 15 minutes for hydration to occurs.

(b) If hydration does not occur, repeat the spraying of warm water mist at least 3 times. Wait a minimum of 15 minutes between each warm water application for hydration to occur.

B. Inspect Aircraft Primary Flight Controls

(1) Visually inspect the following primary flight controls for fluid residue.

(a) Examine the aileron/spoiler lateral controls as follow:

1) Open the applicable access panels:

Number	Name/Location
1505A	Aileron Mechanism, Aileron Hinge Bearing, Control Quadrant and Aft Spar
1506A	Aileron Mechanism, Aft Spar and Control Cables, Left Aileron Position Sensor
1507A	Aileron Hinge Bearing and Aft Spar
1508A	Aileron Mechanism, Aft Spar and Control Cables
1567A	Control Tab Mechanism
1605A	Aileron Mechanism, Aileron Hinge Bearing, Control Quadrant and Aft Spar
1606A	Aileron Mechanism, Aft Spar, and Aileron Control Cables
1607A	Aileron Hinge Bearing and Aft Spar
1608A	Aileron Mechanism, Aft Spar, and Aileron Control Cables
1665A	Control Tab Mechanism

2) Make sure there is proper clearance between aileron leading edges and wing trailing edges. (Figure 601)

3) Examine aileron control tab leading edges and aileron rear spars are open and clean of residue. (Figure 601)

4) Make sure the aileron control tab pushrods, end attachments, and sections passing through ailerons are open and clean of residue. (Figure 602)

5) Aileron control tab and bus sector assemblies are clean of residue. (Figure 603)

6) Make sure the aileron control and bus cable runs on wing rear spars and through wheel wells are clean of residue. (Figure 603)

7) Examine flight spoiler control system on wing rear spars and through wheel wells are clean of residue. (Figure 604)

8) Make sure the lateral control mixer assemblies are clean of residue. (Figure 605)

(b) Examine the rudder controls as follow:

1) Open the applicable access panels:

Number	Name/Location
6101A	Tail Cone and Aft Fuselage Interior
6504A	Rudder Removal, Torque Bearing, and Lower Hinge
6508A	Tab Bearing and Mechanism
6508G	Tab Bearing and Mechanism (Composite Rudder)
6513G	Rudder Bellcrank Fitting Barrel Nuts (Composite Rudder)

2) Make sure that all gaps between rudder leading edge and vertical stabilizer rear spar, including damper links are clean of residue. (Figure 606 or Figure 607)

3) Make sure that all gaps between rudder control tab leading edge and rudder rear spar are clean of residue. (Figure 608)

4) Make sure that rudder control tab pushrods and end attachments and sections passing through rudder are clean of residue. (Figure 609)

5) Make sure that rudder power package, load feel spring, and control cable runs in tail compartment are clean of residue. (Figure 610)

(c) Examine the elevator controls as follow:

1) Open the applicable access panels:

Number	Name/Location
3325C	Elevator Hydraulic Control Valve, Elevator Position Sensor
3426C	Elevator Hydraulic Control Valve, Elevator Position Sensor
3511A	Elevator Gear Tab Mechanism
3515A	Elevator Gear Tab Mechanism
3523A	Flight Tab Mechanism
3612A	Elevator Gear Tab Mechanism, Inboard
3616A	Elevator Gear Tab Mechanism
3624A	Flight Tab Mechanism
6101A	Tail Cone and Aft Fuselage Interior
6310A	Elevator Bellcrank and Upper Fairing
6314E	Elevator Bellcrank and Upper Fairing Structure
6404A	Control Cables
6406A	Control Cables

2) Make sure that all gaps between elevator leading edges and horizontal stabilizer rear spars are clean of residue. (ELEVATOR AND TAB CLEARANCES- CHECK, PAGEBLOCK 27-30-02/601)

3) Make sure that all gaps between elevator control tab leading edge and elevator rear spar are clean of residue. (ELEVATOR AND TAB CLEARANCES- CHECK, PAGEBLOCK 27-30-02/601)

4) Make sure that elevator control tab pushrods and end attachments and sections passing through elevator surfaces are clean of residue. (Figure 611)

5) Make sure that elevator geared tab pushrods and end attachments and sections passing through elevator surfaces are clean of residue. (Figure 611)

6) Make sure that elevator control tab sectors are clean of residue. (Figure 612)

7) Make sure that elevator control cable runs and fairleads on vertical stabilizer rear spar and fuselage upper skin are clean of residue. (Figure 613)

8) Make sure that elevator control cable runs in tail compartment are clean of residue. (Figure 612)

C. Removal of Deicing Fluid Residue Buildup

(1) If residue is found, identify the area and proceed to the cleaning procedure to remove the residue. (DEICING FLUID RESIDUE - CLEANING, PAGEBLOCK 27-00-00/701)

D. Close the applicable access panels:

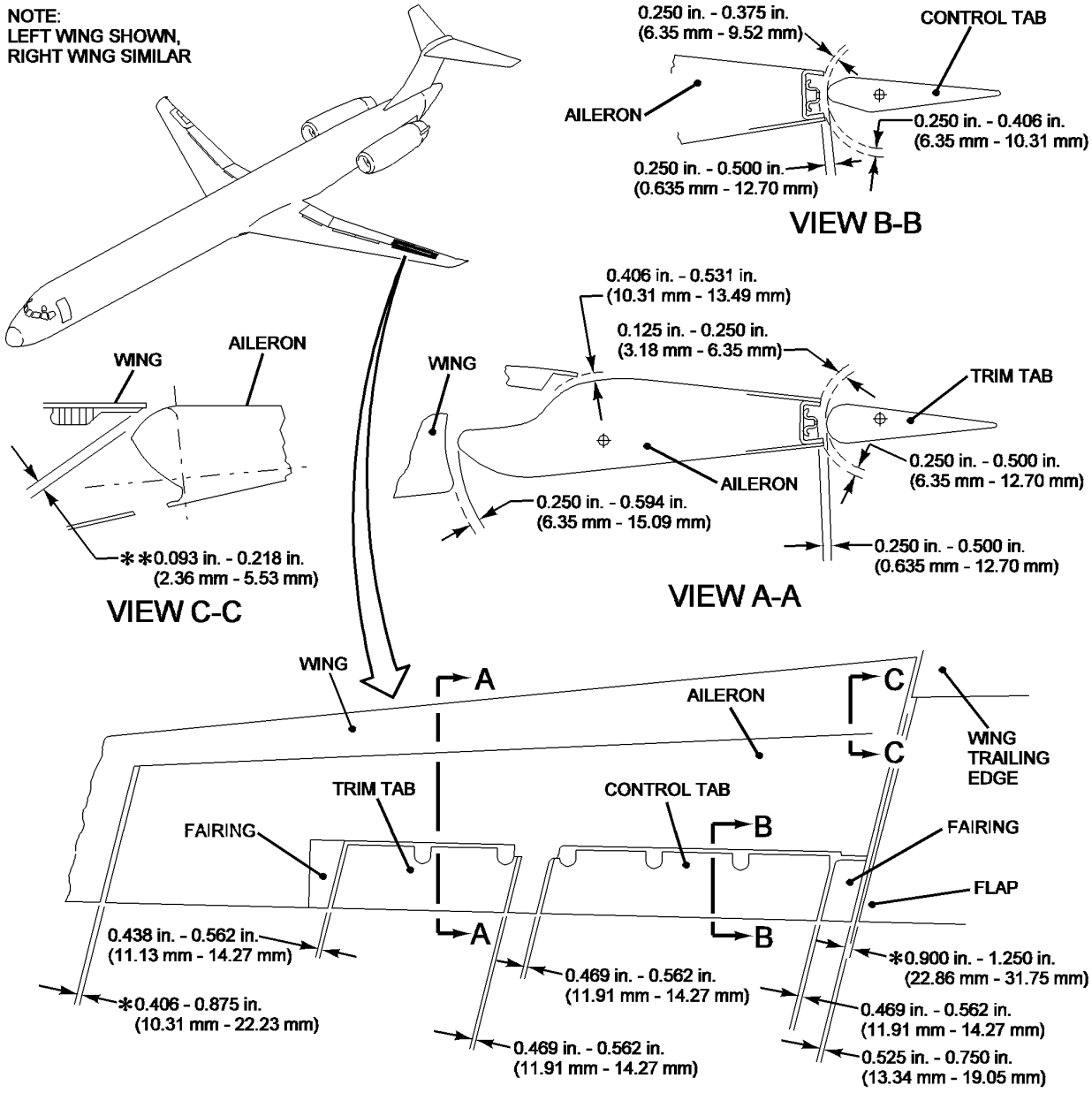
Number	Name/Location
1505A	Aileron Mechanism, Aileron Hinge Bearing, Control Quadrant and Aft Spar
1506A	Aileron Mechanism, Aft Spar and Control Cables, Left Aileron Position Sensor
1507A	Aileron Hinge Bearing and Aft Spar
1508A	Aileron Mechanism, Aft Spar and Control Cables
1567A	Control Tab Mechanism
1605A	Aileron Mechanism, Aileron Hinge Bearing, Control Quadrant and Aft Spar
1606A	Aileron Mechanism, Aft Spar, and Aileron Control Cables
1607A	Aileron Hinge Bearing and Aft Spar
1608A	Aileron Mechanism, Aft Spar, and Aileron Control Cables
1665A	Control Tab Mechanism
3325C	Elevator Hydraulic Control Valve, Elevator Position Sensor
3426C	Elevator Hydraulic Control Valve, Elevator Position Sensor
3511A	Elevator Gear Tab Mechanism
3515A	Elevator Gear Tab Mechanism
3523A	Flight Tab Mechanism
3612A	Elevator Gear Tab Mechanism, Inboard
3616A	Elevator Gear Tab Mechanism
3624A	Flight Tab Mechanism
5903A	Auxiliary Power Unit Service Access LH
5904A	Auxiliary Power Unit Service Access RH
6101A	Tail Cone and Aft Fuselage Interior
6310A	Elevator Bellcrank and Upper Fairing
6314E	Elevator Bellcrank and Upper Fairing Structure
6404A	Control Cables
6406A	Control Cables
6504A	Rudder Removal, Torque Bearing, and Lower Hinge
6508A	Tab Bearing and Mechanism
6508G	Tab Bearing and Mechanism (Composite Rudder)
6513G	Rudder Bellcrank Fitting Barrel Nuts (Composite Rudder)

E. Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position.

F. Remove the DO NOT OPERATE tags from the controls that follow:

- flap/slat handle
- flight spoiler handle
- aileron/elevator control column
- rudder pedals
- hydraulic system control panel.

G. Remove all the tools and equipment from the work area. Make sure the area is clean.



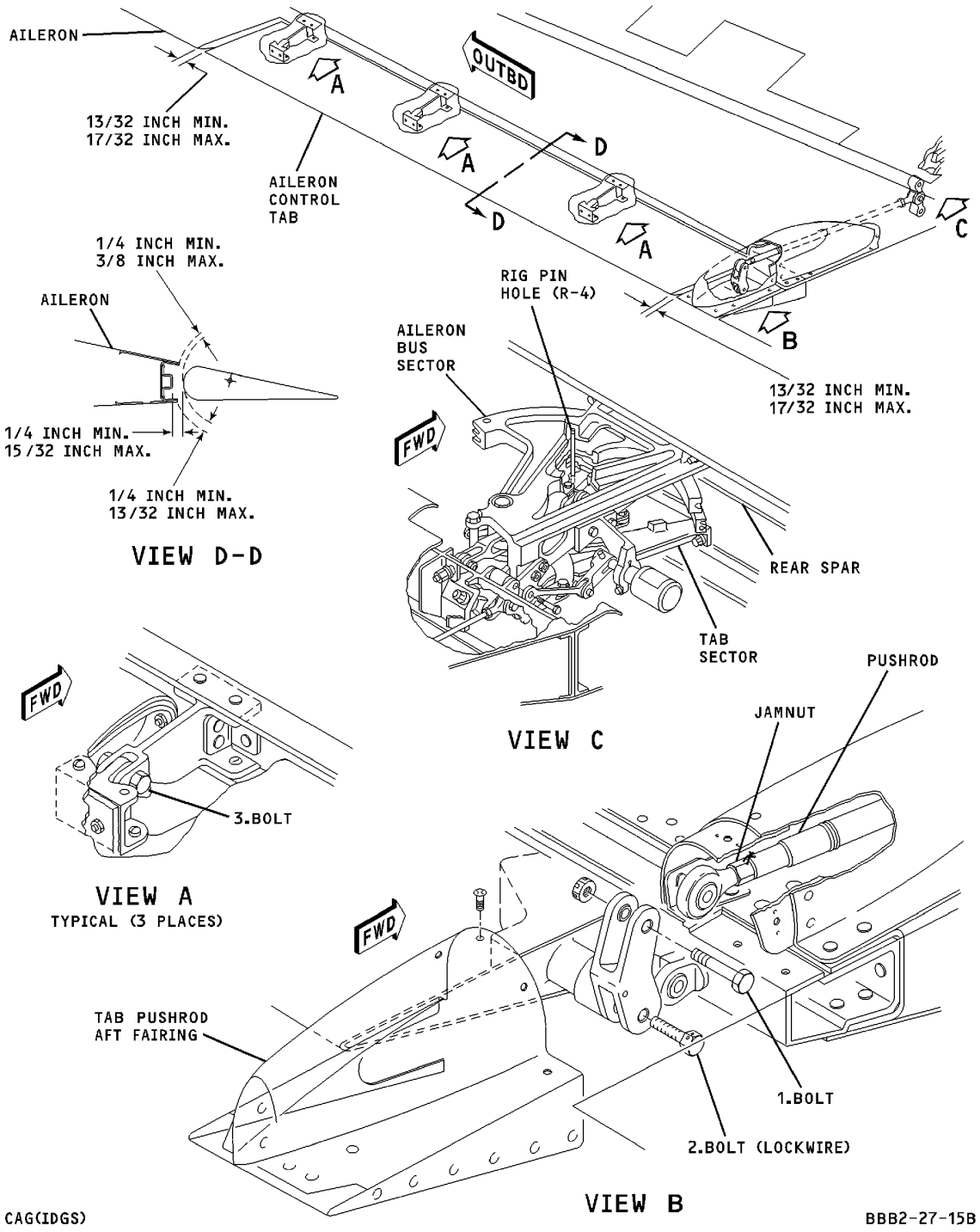
* NOTE: (1) GAP DIMENSIONS FOR ITEMS 2 AND 3, TABLES I AND II, INBOARD AND OUTBOARD ENDS RESPECTIVELY, OF THE AILERON, ARE STRUCTURAL CLEARANCES TO BE MAINTAINED BETWEEN MINIMUM AND MAXIMUM LIMITS WITHOUT REGARD TO SEALS INSTALLLED HERE.

(2) CHECK AILERON OPERATION THAT SEALS ON INBOARD AND OUTBOARD ENDS DO NOT DRAG AND BIND ON ADJACENT STRUCTURE.

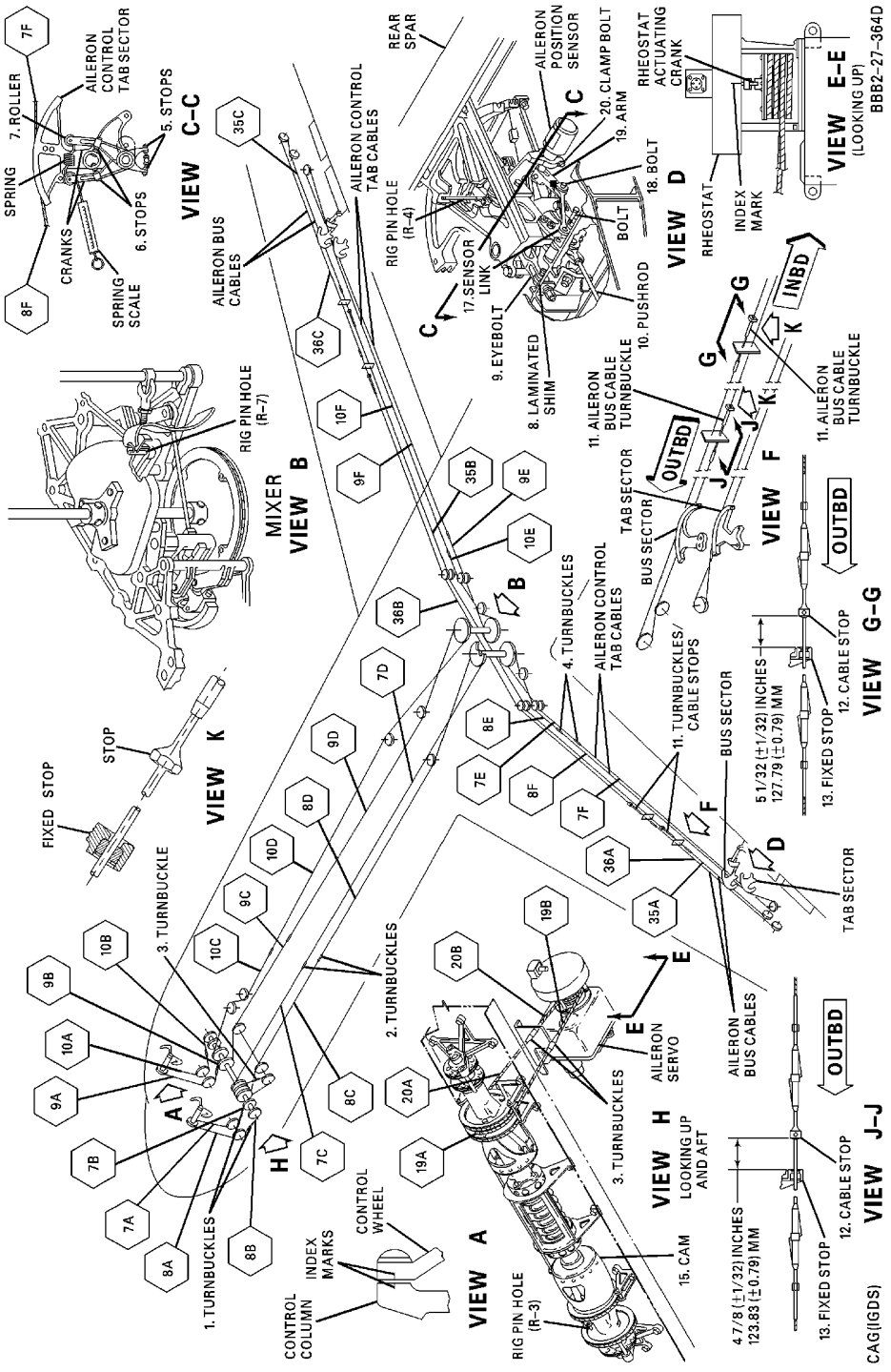
** NOTE: CLEARANCE TO BE MEASURED FROM LEADING EDGE SURFACE OF THE AILERON, SKIN ONLY.

BBB2-27-12G
S0006534715V3

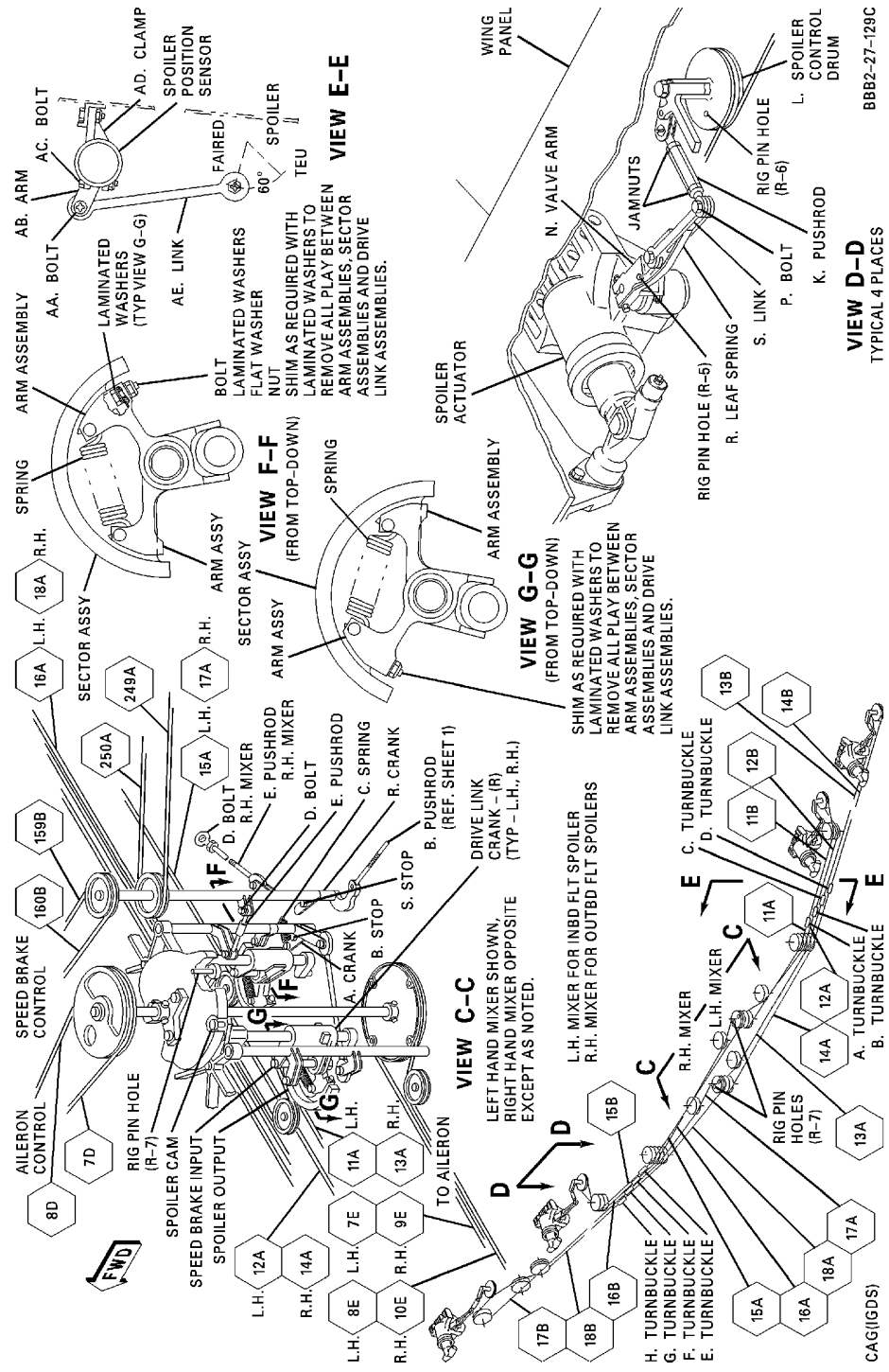
Aileron Leading Edge - Wing Trailing Edge Gaps
Figure 601/27-00-00-990-807



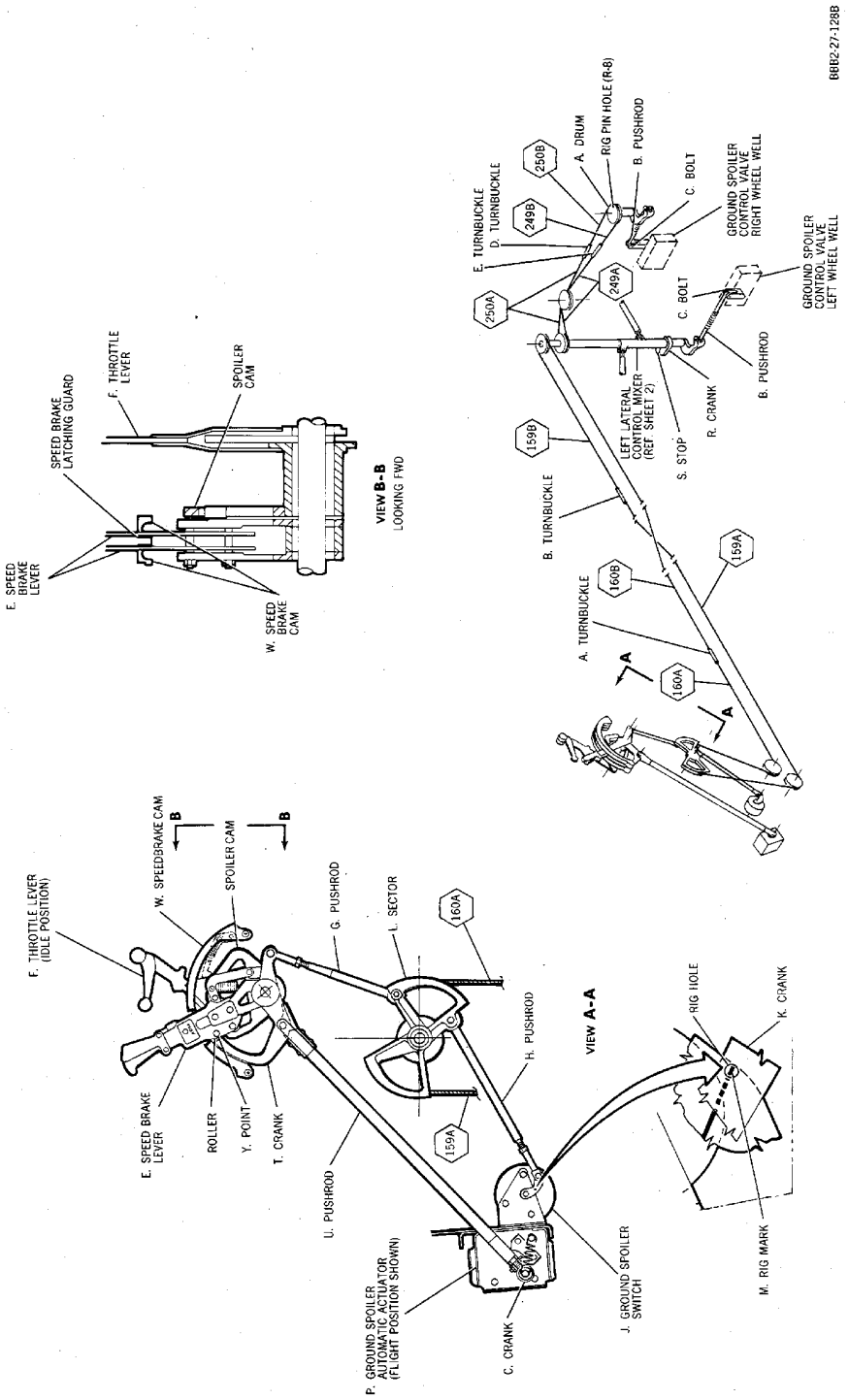
Aileron Control Tab Pushrods
Figure 602/27-00-00-990-808



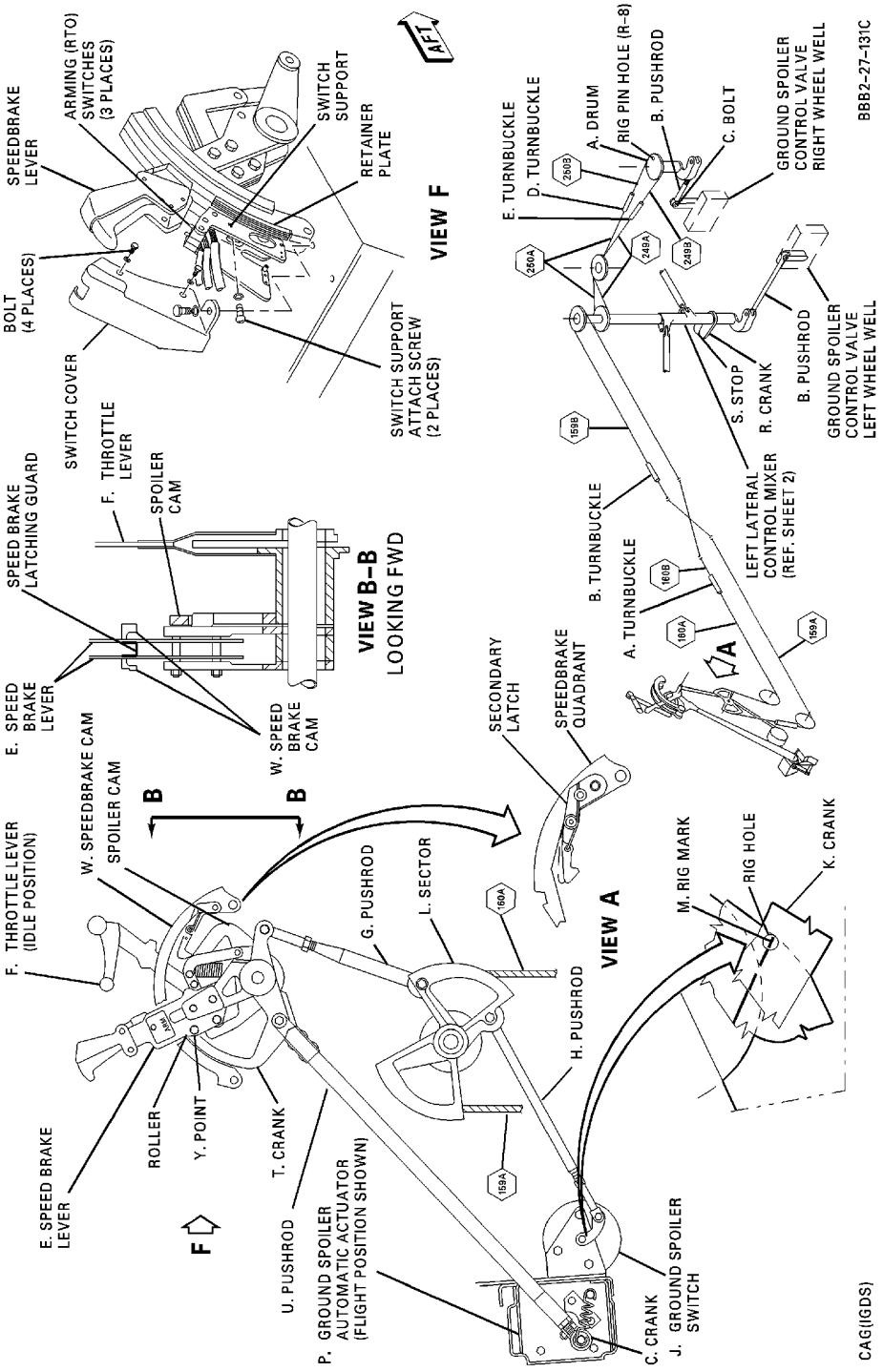
Aileron Control Tab System
Figure 603/27-00-00-990-809



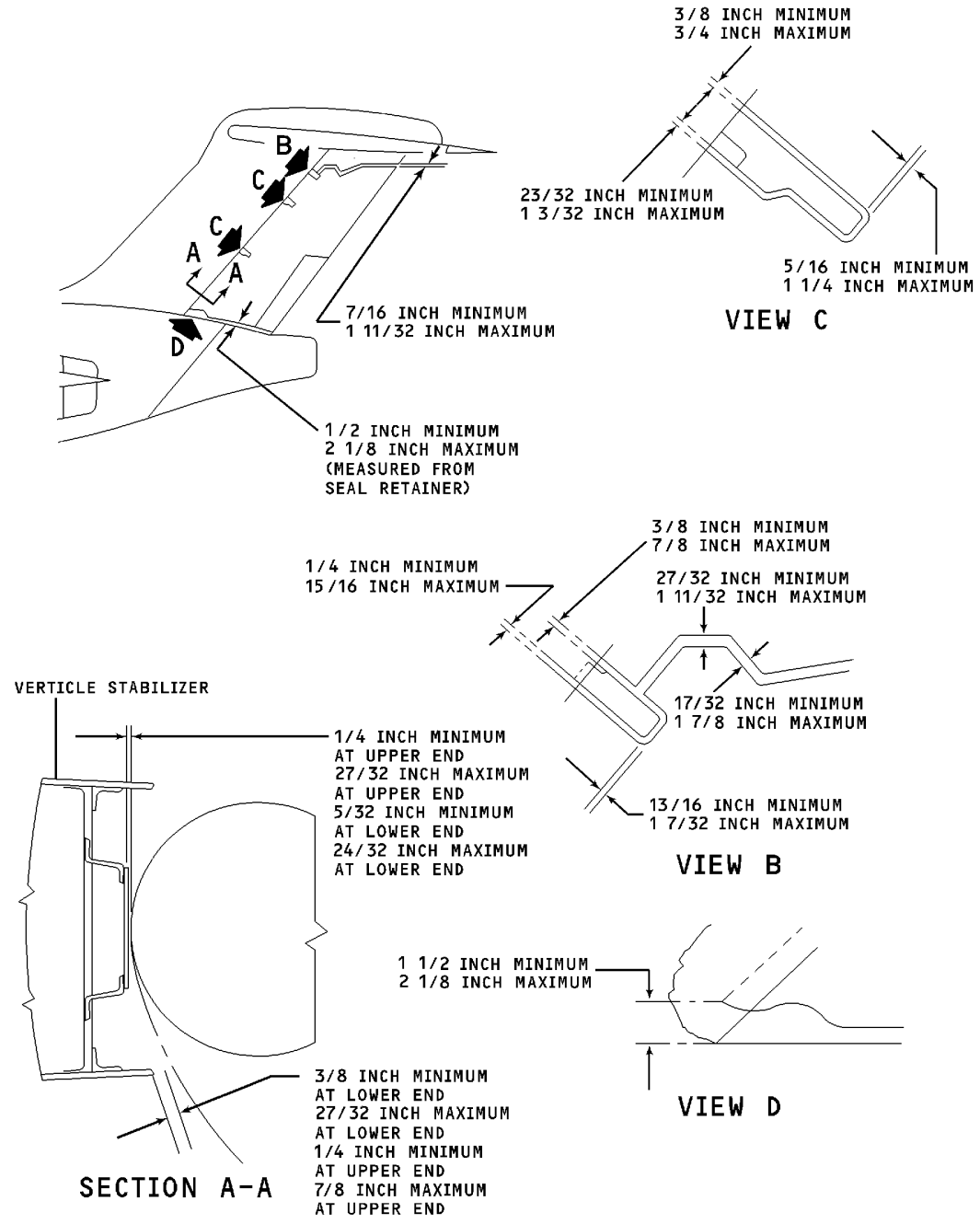
Flight Spoiler Control System
Figure 604/27-00-00-990-810



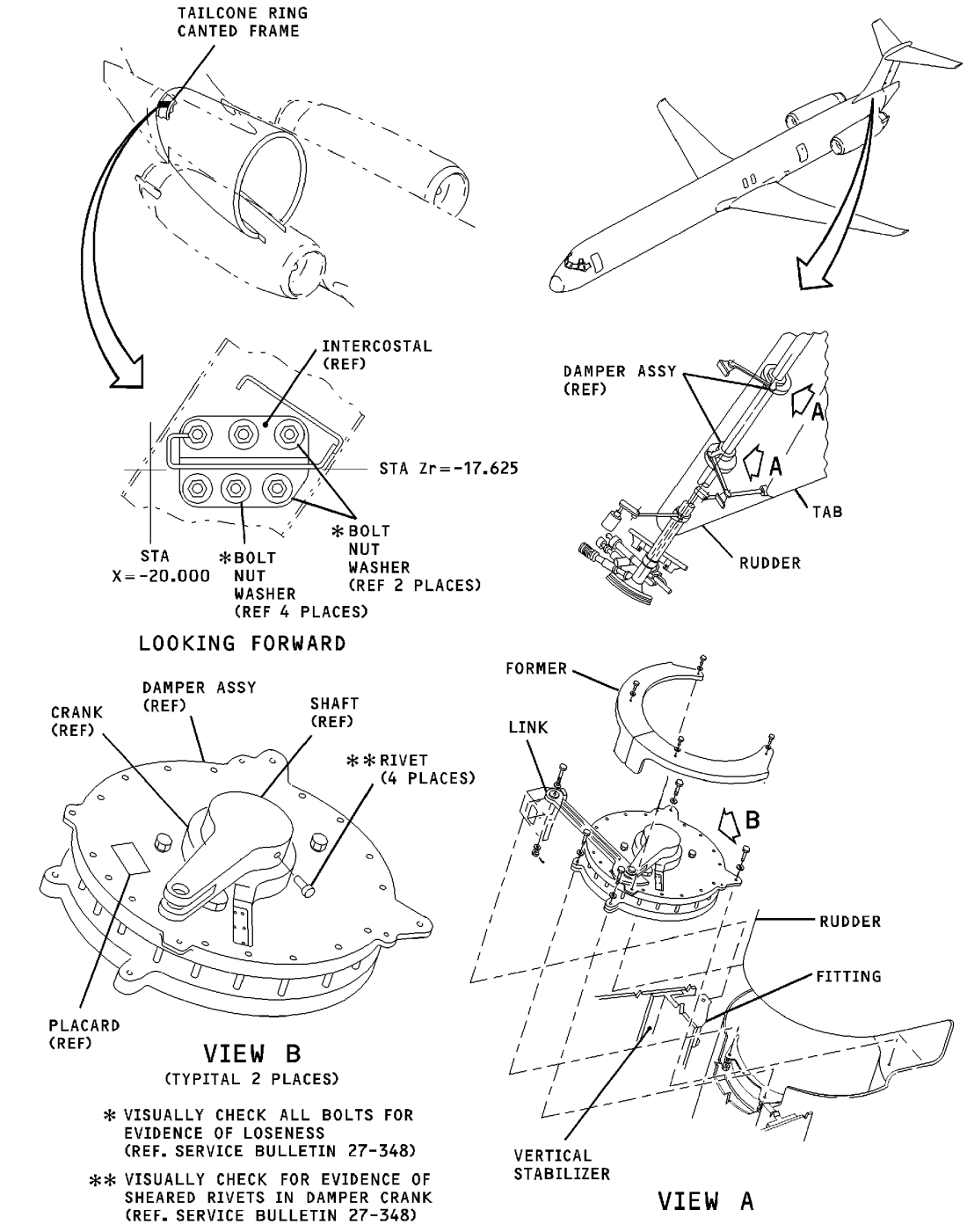
Lateral Control Mixer System
Figure 605/27-00-00-990-811 (Sheet 1 of 2)



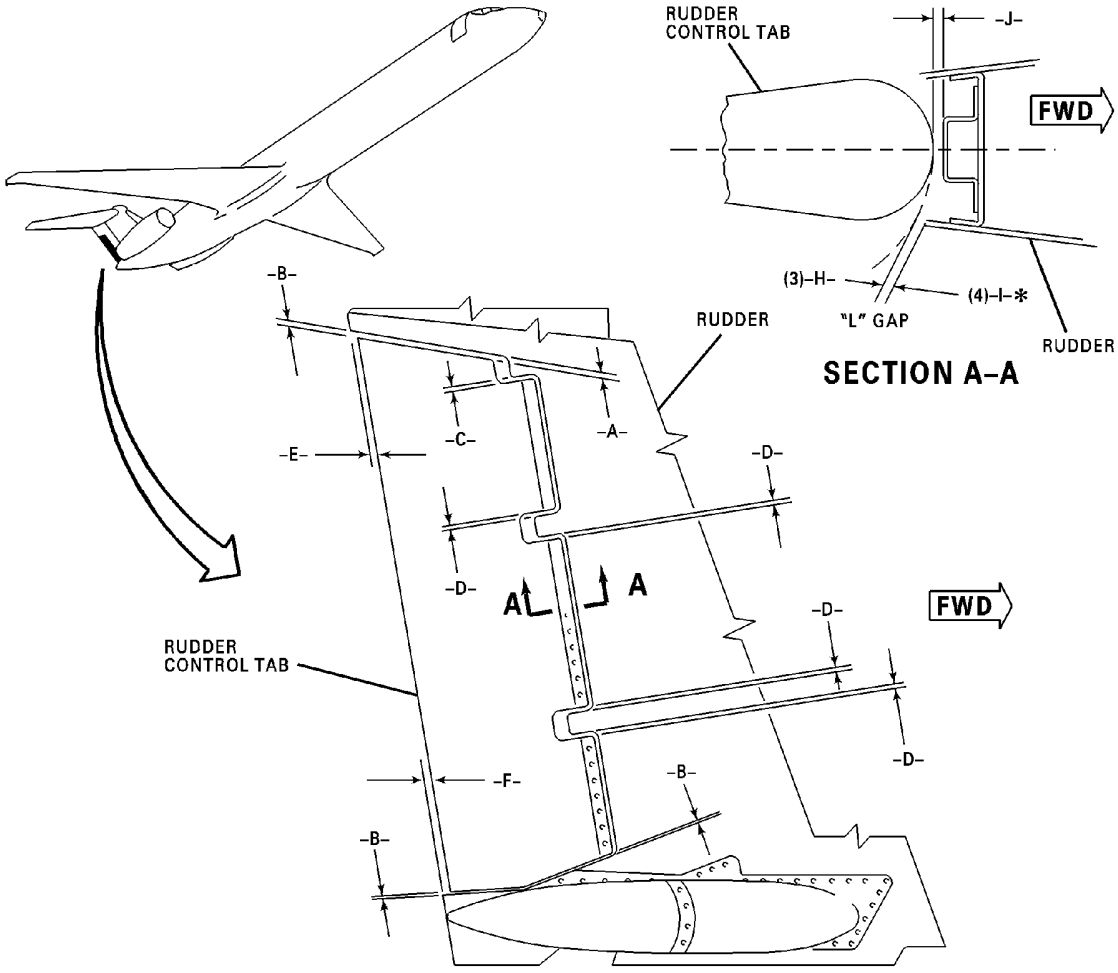
Lateral Control Mixer System
Figure 605/27-00-00-990-811 (Sheet 2 of 2)



Rudder Leading Edge - Vertical Stabilizer Rear Spar Gaps
Figure 606/27-00-00-990-812



Rudder Damper Gaps
Figure 607/27-00-00-990-813



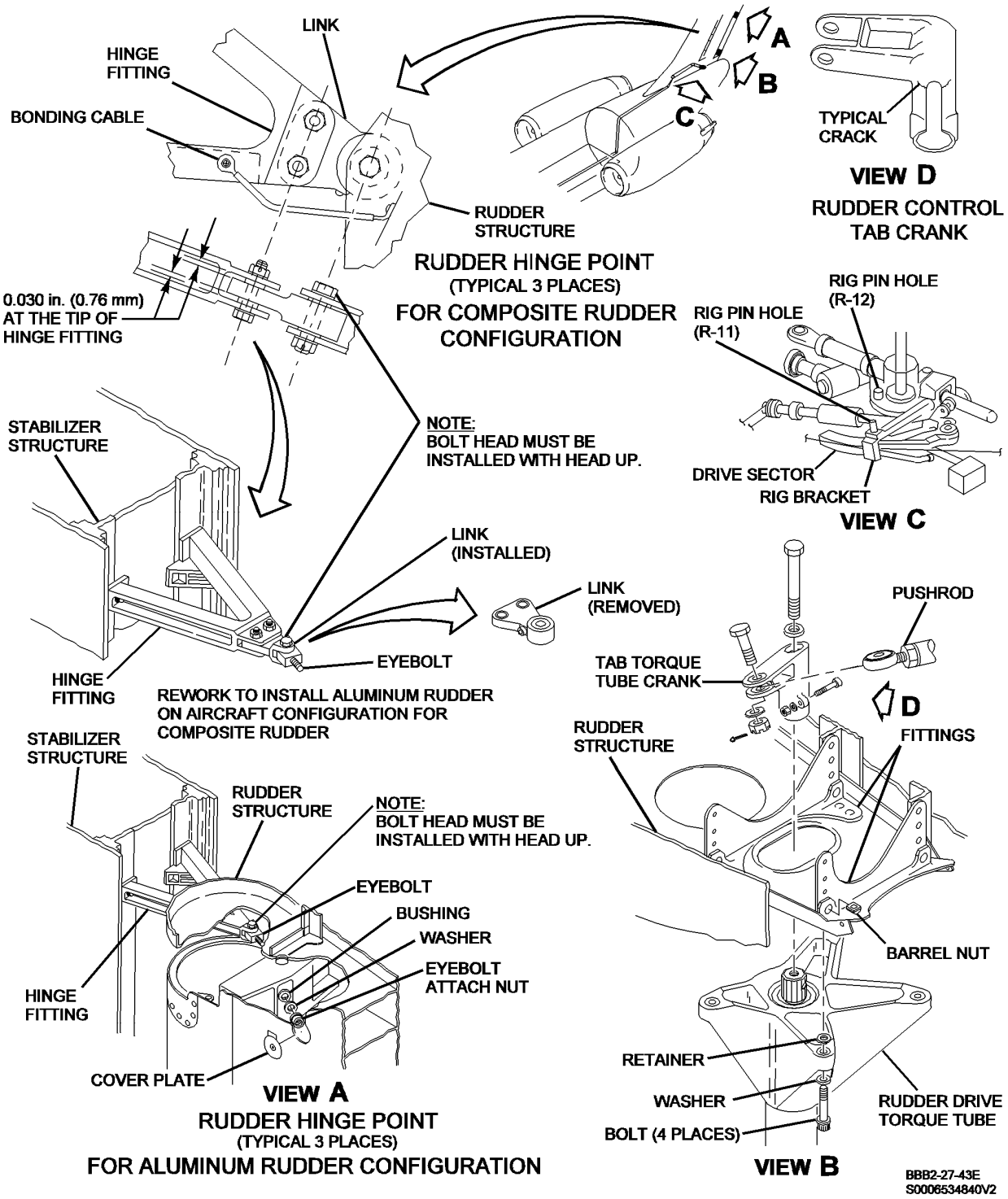
NOTES:
(1) TAB TO RUDDER TRAILING EDGE VARIANCE, UPPER.
(2) TAB TO RUDDER TRAILING EDGE VARIANCE, LOWER.
(3) CONTROL TAB LEADING EDGE "L" GAP, NOMINAL CLEARANCE, TAB BASE TO TOP.
(4) CONTROL TAB LEADING EDGE "L" GAP, * VARIANCE CLEARANCE, TAB BASE TO TOP (CLOSER MINIMUM ALLOWED FOR REPLACEMENT CONTROL TAB).
(5) ALL SURFACE GAP DIMENSIONS GIVEN ARE COMMON FOR BOTH ALUMINUM AND COMPOSITE ASSEMBLIES.

RUDDER CONTROL TAB TO RUDDER CLEARANCE GAPS

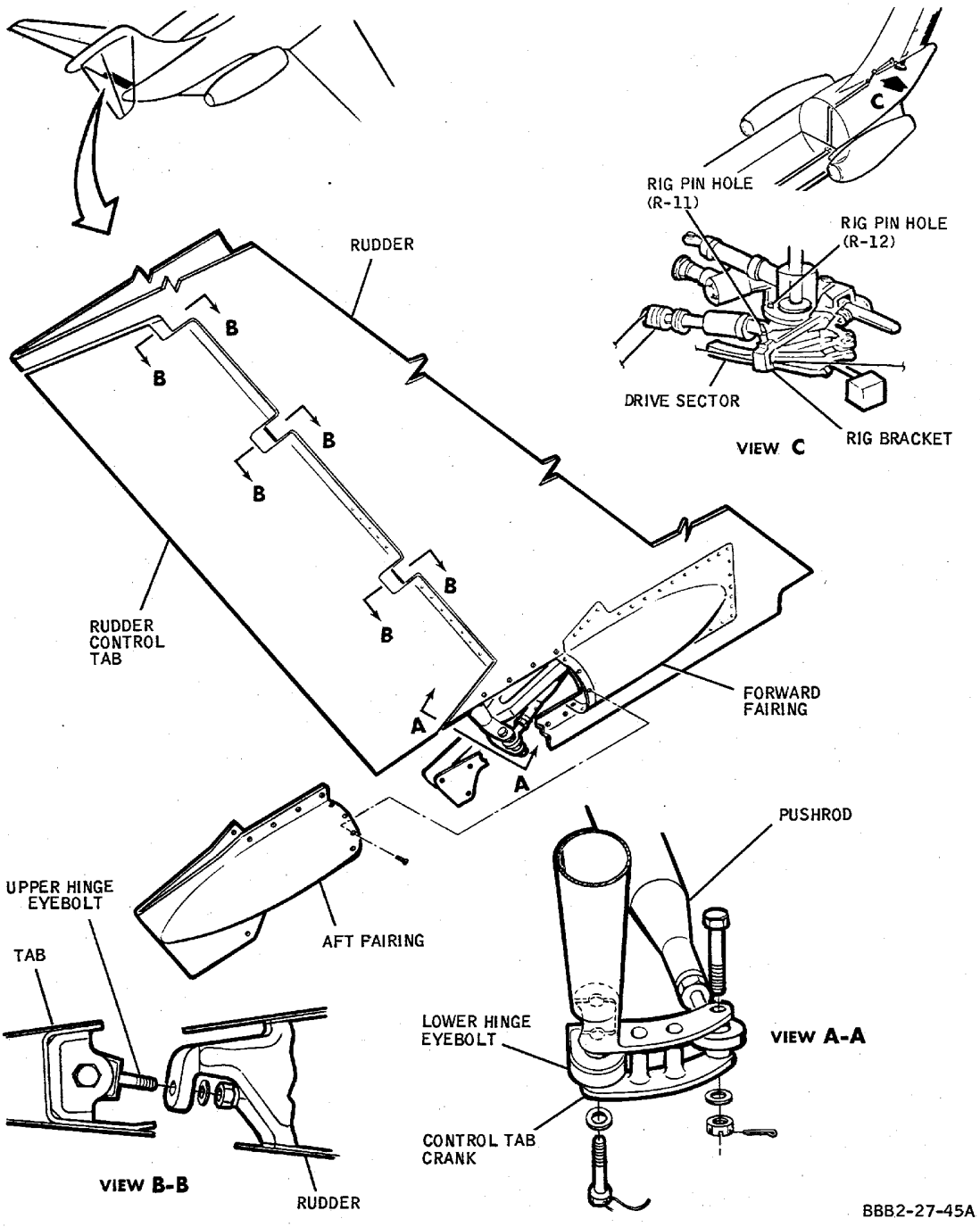
		–A–	–B–	–C–	–D–	(1)–E	(2)–F	(3)–H	(4)–I*	–J–
INCHES:	MIN.:	0.406	0.156	0.094	0.094	0.486	0.518	0.125	0.090*	0.136
	MAX.:	0.531	0.281	0.312	0.250	0.686	0.718	0.375	0.375	0.406
		– – –	– – –	– – –	– – –	– – –	– – –	– – –	– – –	– – –
MILLI–METERS:	MIN.:	10.31	3.96	02.39	02.39	12.34	13.16	03.18	02.29	03.45
	MAX.:	13.49	07.14	07.92	06.35	17.42	18.24	09.53	09.53	10.31
								L GAP	L GAP	

CAG(IGDS) TABLE 1 BBB2–27–46F

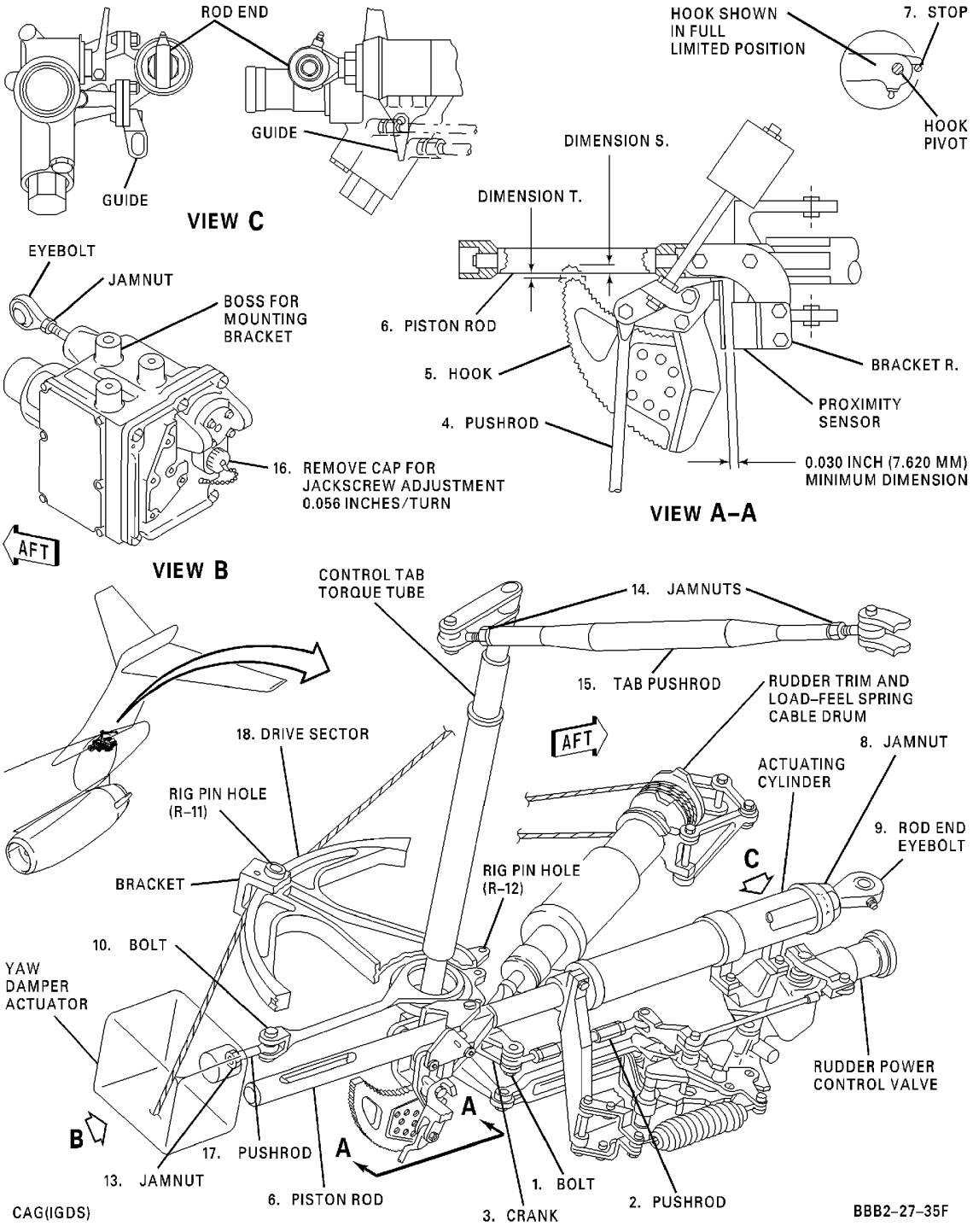
Rudder Control Tab Leading Edge - Rudder Rear Spar Gaps
Figure 608/27-00-00-990-814



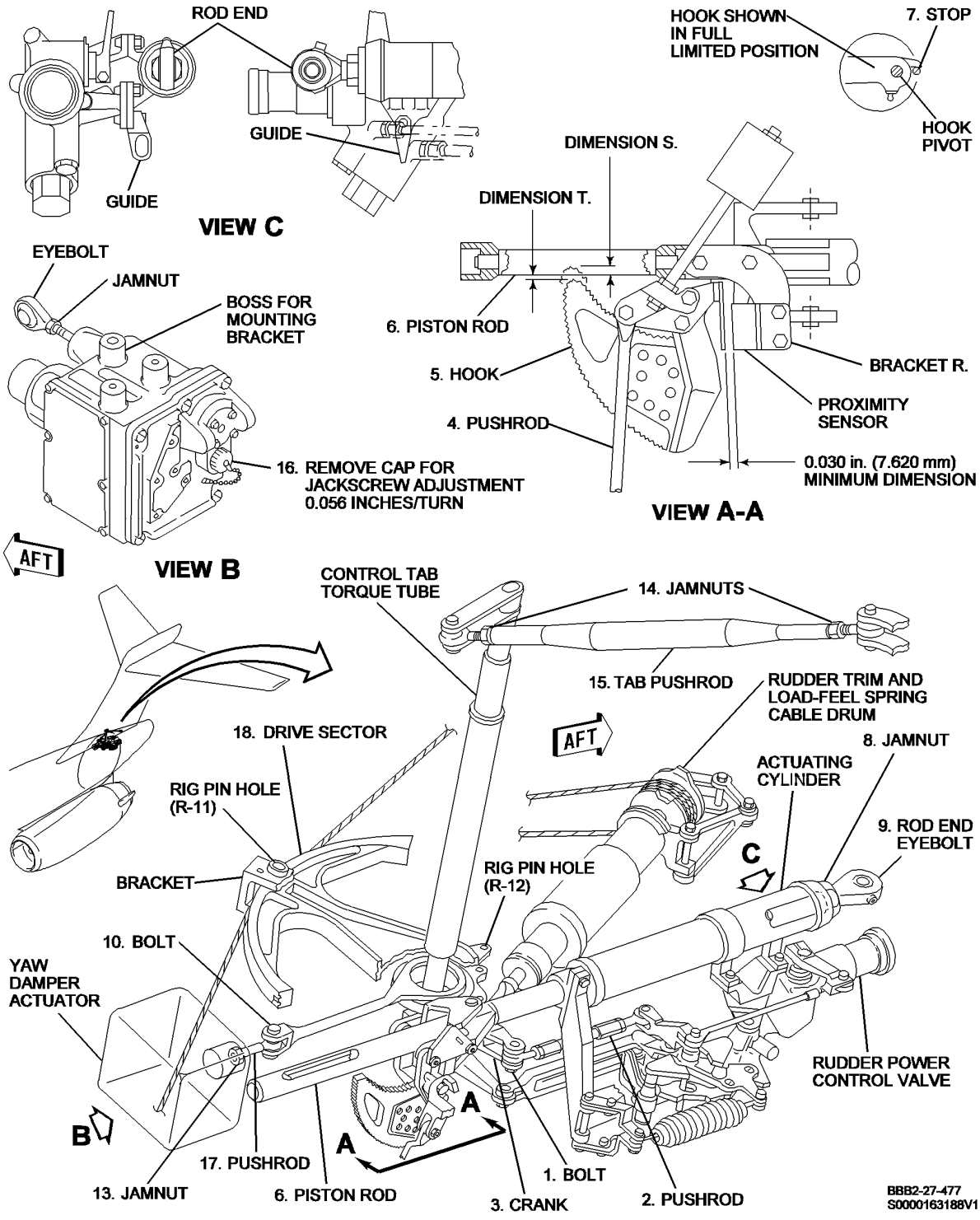
Rudder Control Tab Pushrods
Figure 609/27-00-00-990-815 (Sheet 1 of 2)



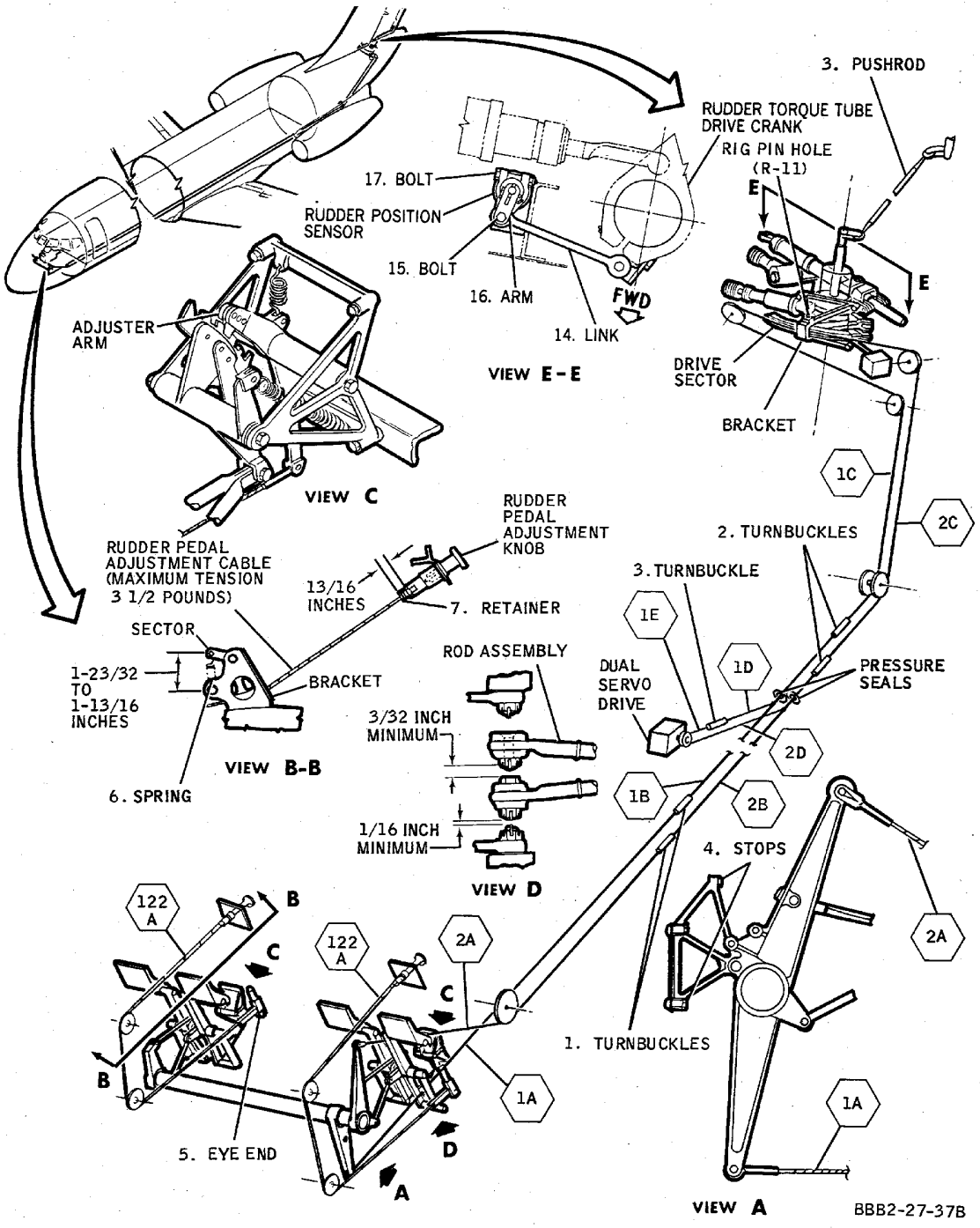
Rudder Control Tab Pushrods
Figure 609/27-00-00-990-815 (Sheet 2 of 2)



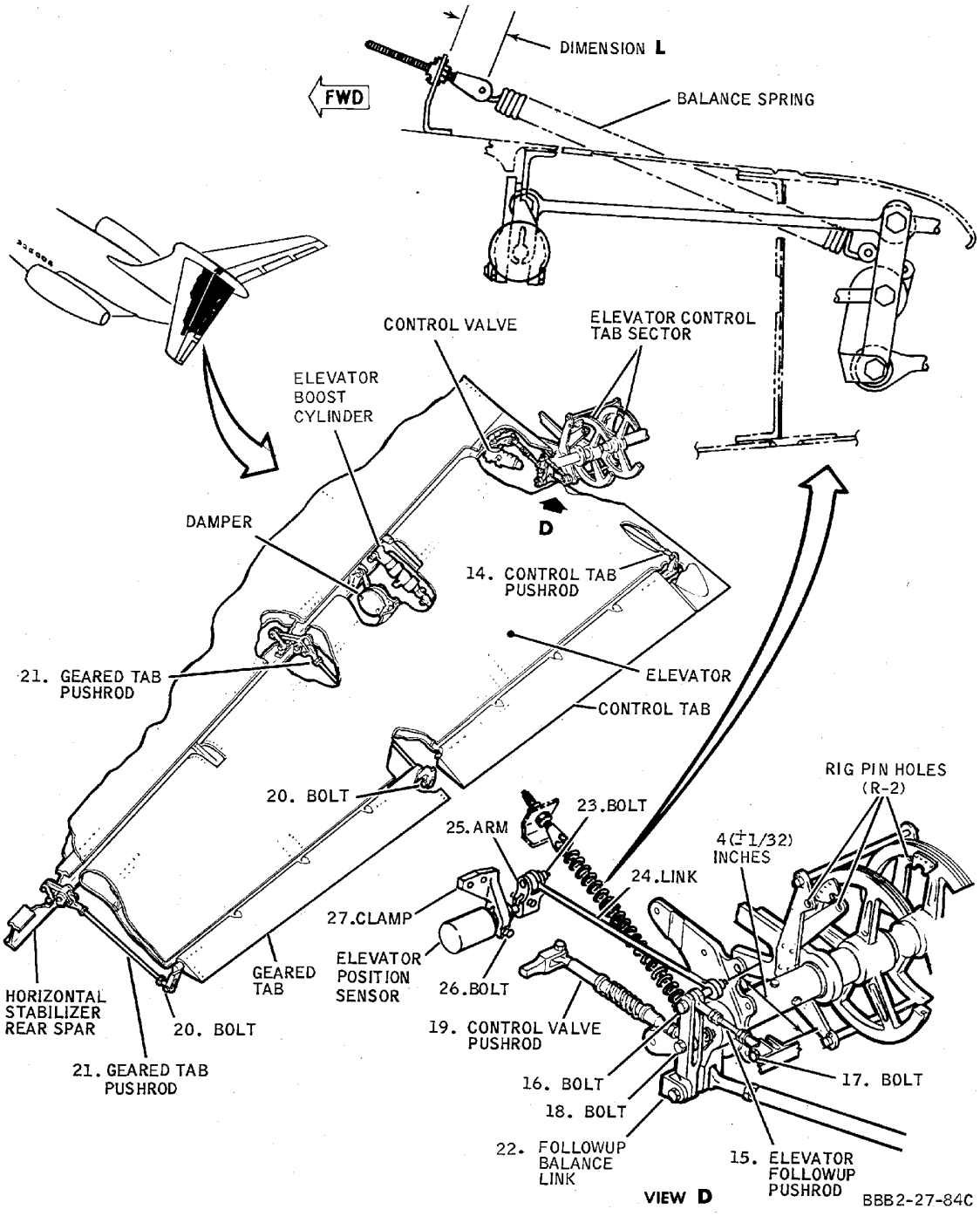
Rudder Control System
Figure 610/27-00-00-990-816 (Sheet 1 of 3)



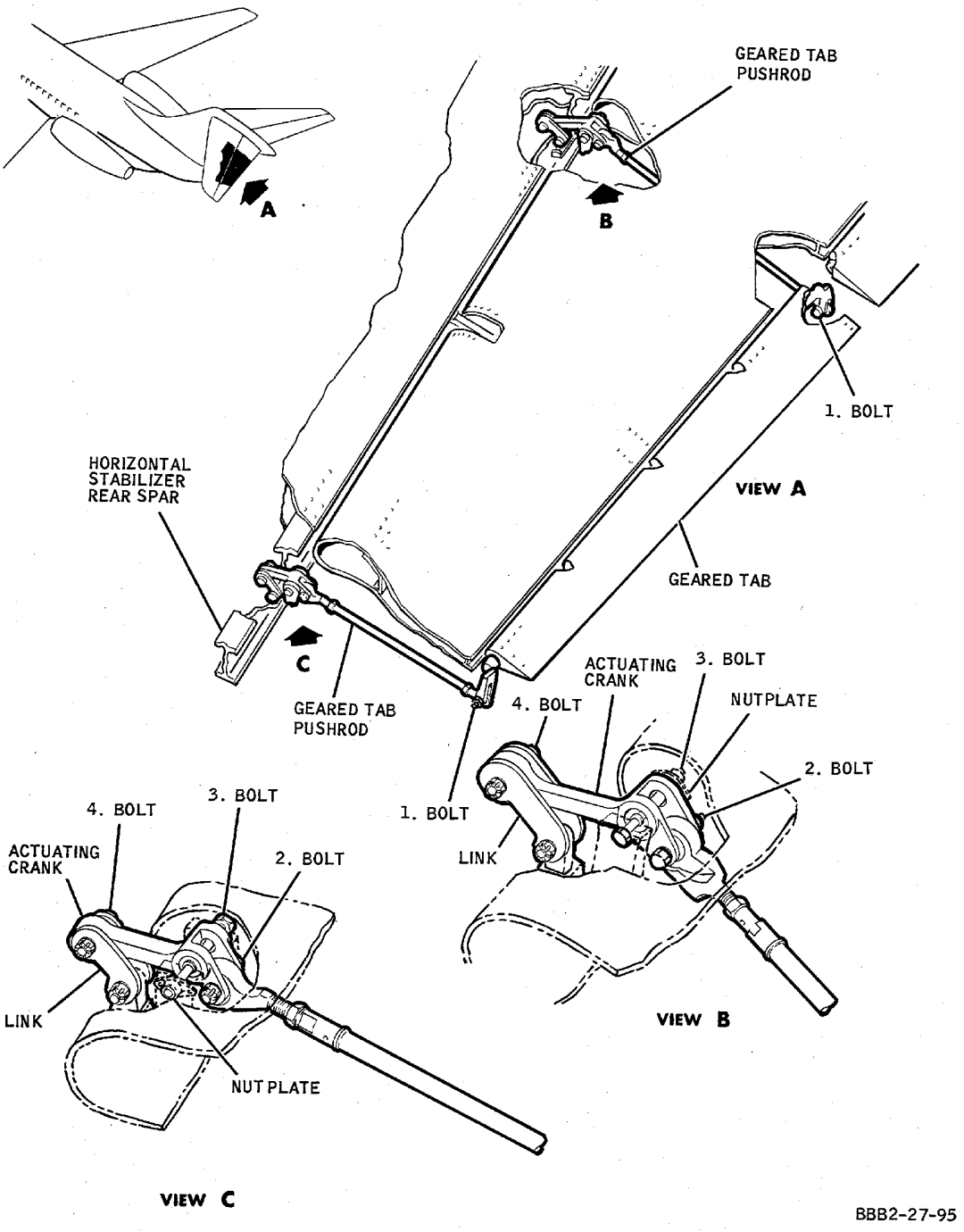
Rudder Control System
Figure 610/27-00-00-990-816 (Sheet 2 of 3)



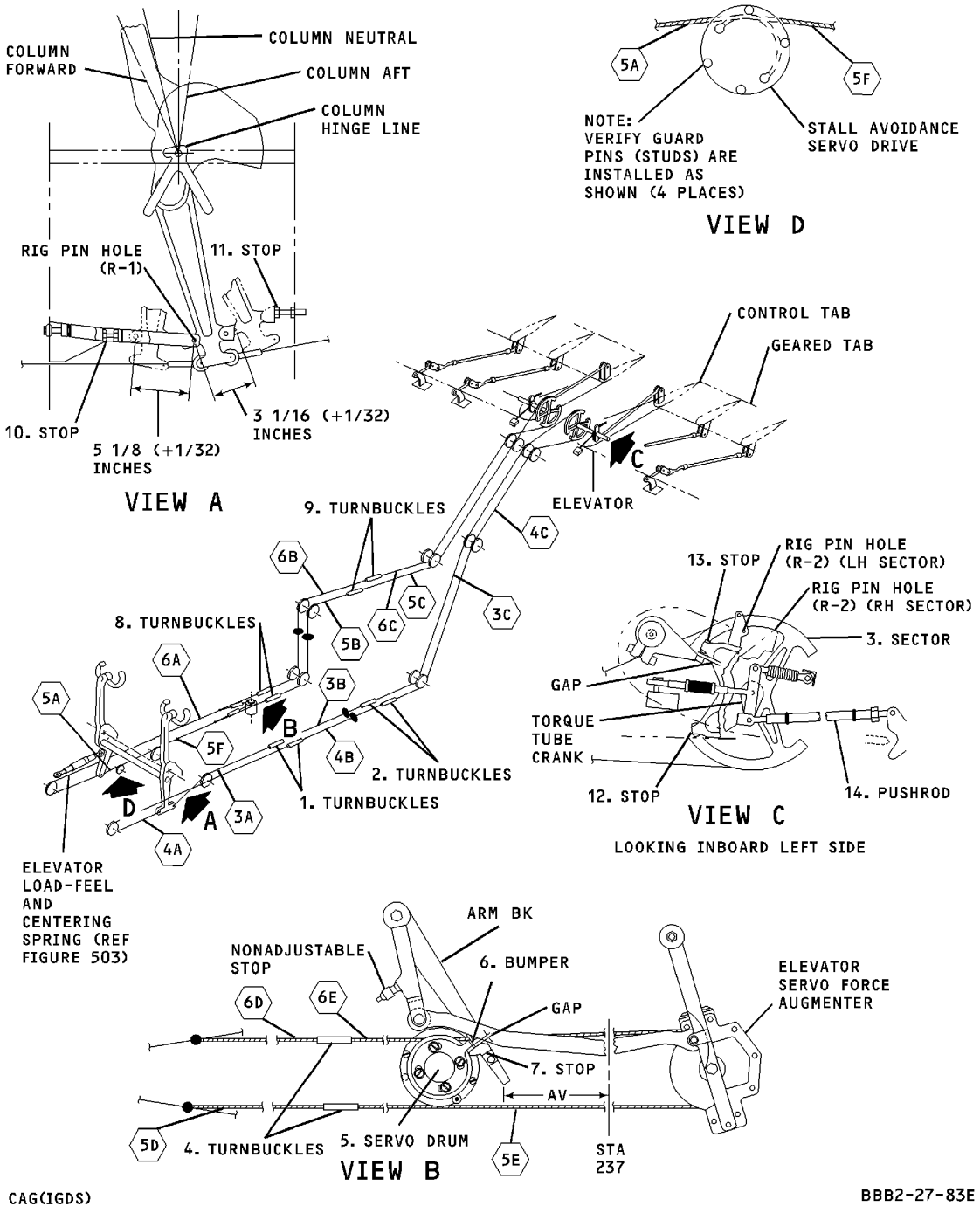
Rudder Control System
Figure 610/27-00-00-990-816 (Sheet 3 of 3)



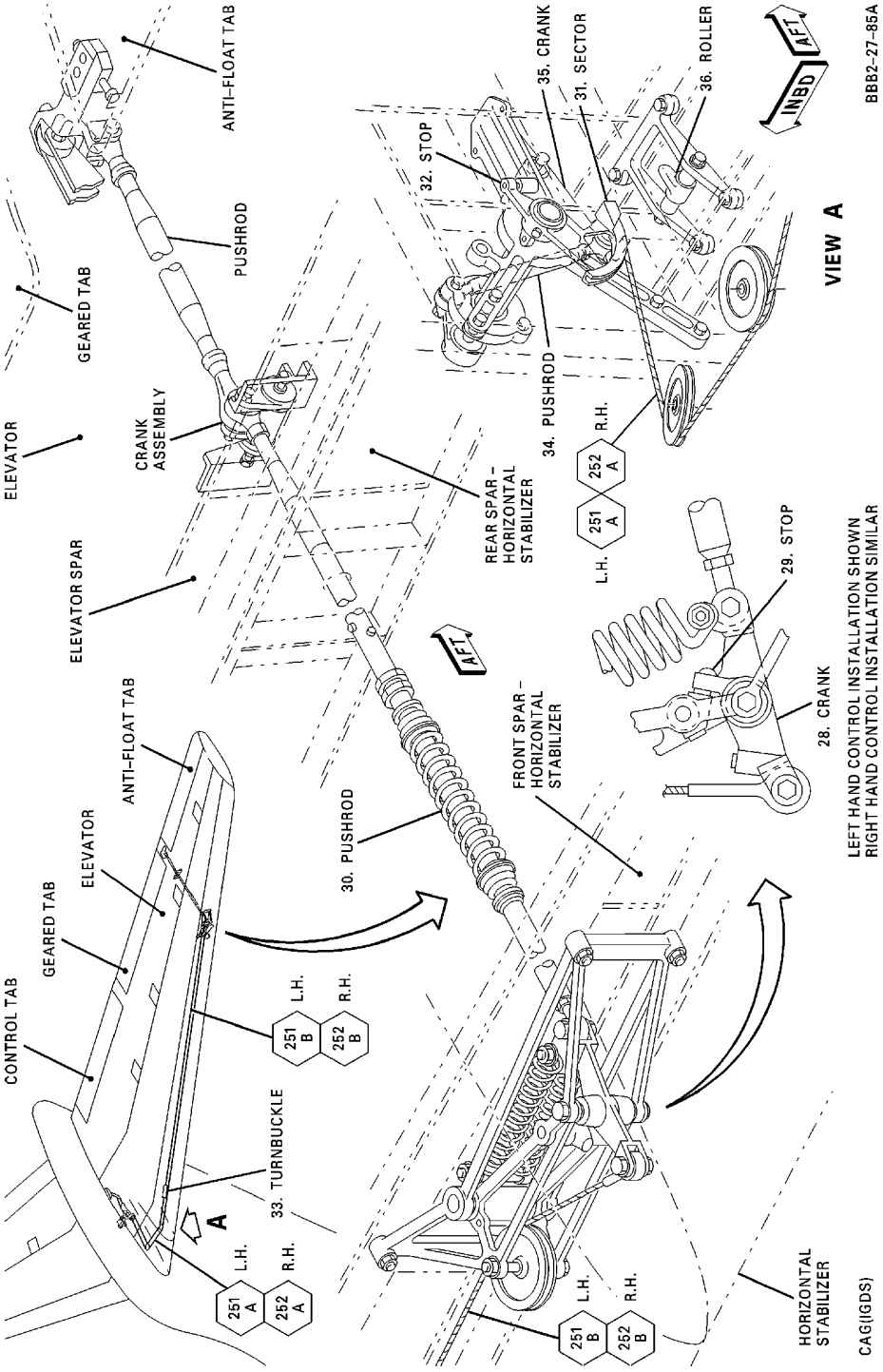
Elevator Control Tab Pushrods
Figure 611/27-00-00-990-818 (Sheet 1 of 2)



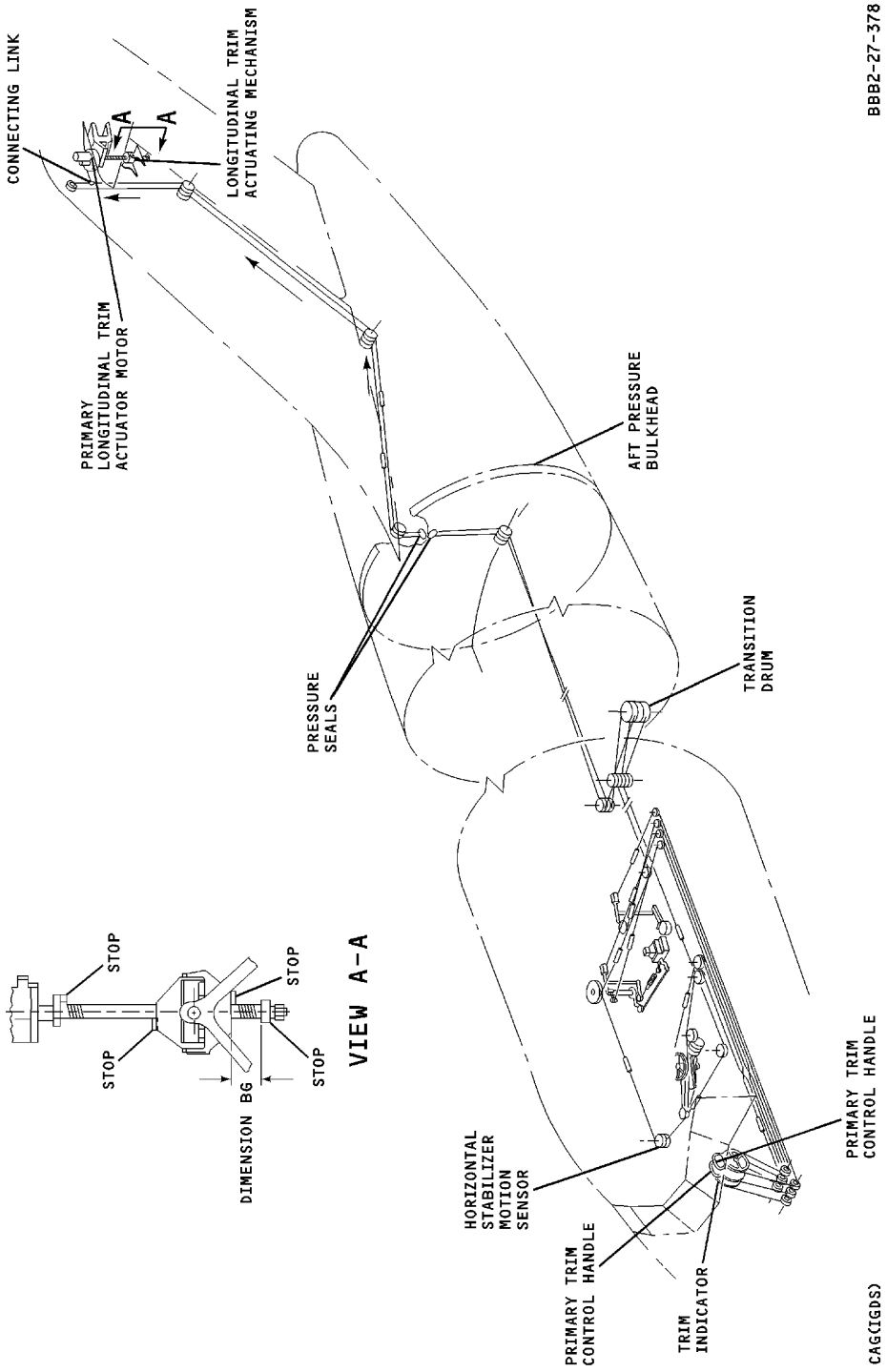
Elevator Control Tab Pushrods
Figure 611/27-00-00-990-818 (Sheet 2 of 2)



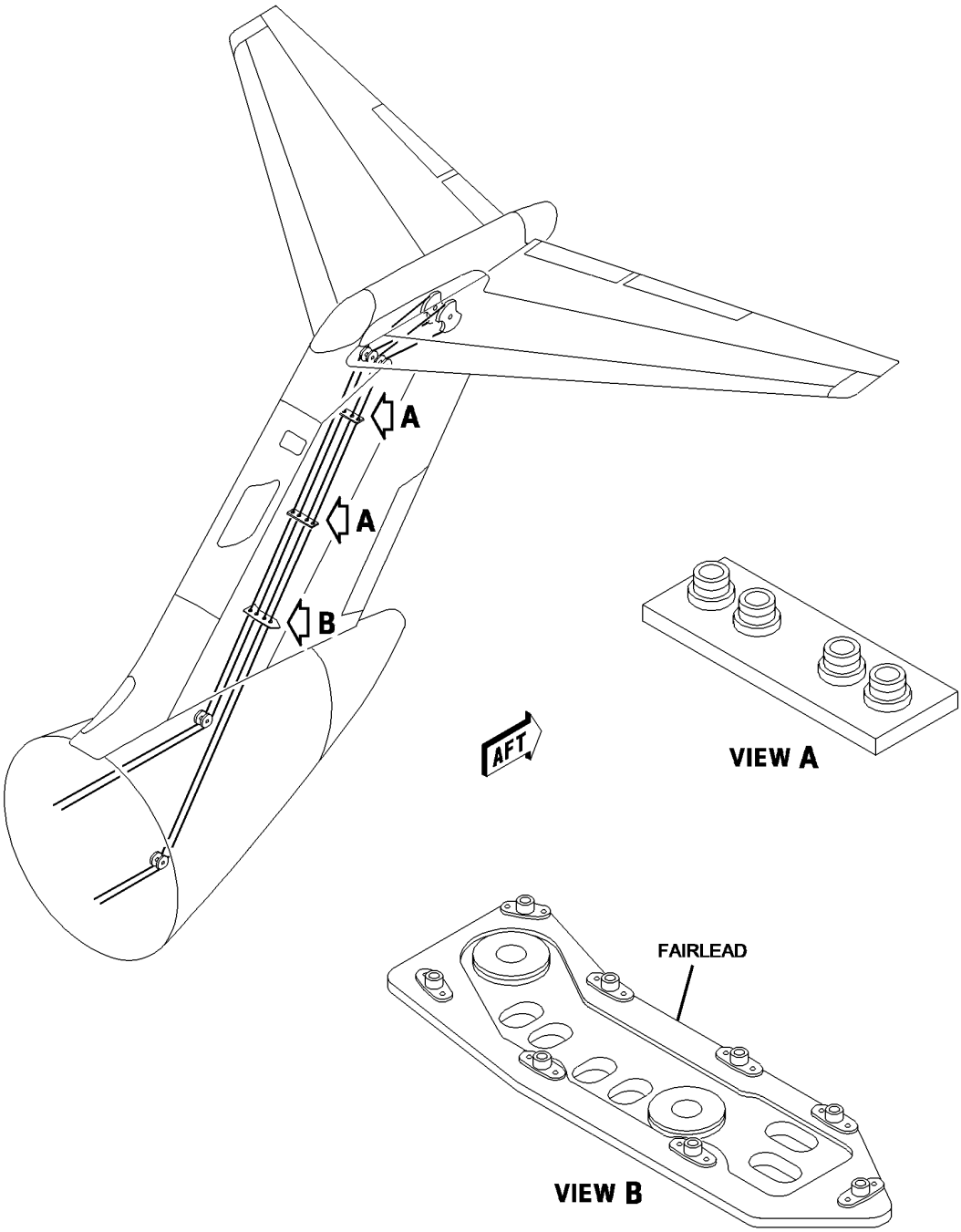
Elevator Control Tab System
Figure 612/27-00-00-990-819 (Sheet 1 of 3)



Elevator Control Tab System
Figure 612/27-00-00-990-819 (Sheet 2 of 3)



Elevator Control Tab System
Figure 612/27-00-00-990-819 (Sheet 3 of 3)



BBB2-27-496
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Elevator Control Cables and Fairleads
Figure 613/27-00-00-990-820

DEICING FLUID RESIDUE - CLEANING

1. General

A. This procedure has the cleaning of the deicing fluid residue from the aircraft surfaces.

B. Once the presence of residue from deicing/anti-icing fluid has been identified and the locations recorded, the residue should be removed.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used in place of the following listed items.

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 701

Name and Number	Manufacturer
Anti-Freeze Fluid Ethylene Glycol, Inhibited, Unthickened AMS 1424 Type I	Commercially available

3. Procedure - Deicing Fluid Residue Cleaning

A. Remove Deicing Fluid Residue

WARNING: GLYCOL FLUID IS AN AGENT THAT IS AN IRRITANT AND POISONOUS. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN GLYCOL FLUID IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET GLYCOL FLUID IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS MSDS FOR:

- MORE PRECAUTIONARY DATA.
- APPROVED SAFETY EQUIPMENT.
- EMERGENCY MEDICAL AID.
- TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(WARNING PRECEDES)

CAUTION: THIS CLEANING PROCESS HAS THE POTENTIAL OF REMOVING GREASE FROM CONTROL SYSTEM BEARINGS AND FITTINGS, AND REMOVING CORROSION INHIBITORS FROM CONTROL CABLES. TO THE GREATEST EXTENT PRACTICAL, CARE SHOULD BE TAKEN TO AVOID SPRAYING HIGH VELOCITY CLEANING FLUIDS INTO BEARINGS AND FITTINGS, AND ONTO CONTROL CABLES.

CAUTION: THIS CLEANING PROCESS HAS THE POTENTIAL TO WASH THE RESIDUE INTO OTHER AREAS WHERE IT MAY DEPOSIT AND CREATE A FUTURE PROBLEM. ATTENTION SHOULD BE PAID TO THE RUNOFF FROM THE CLEANING PROCESS INTO OTHER AREAS OF THE AIRCRAFT, AND THESE AREAS SHOULD ALSO BE FLUSHED UNTIL THE OPERATOR IS CONFIDENT THAT ANY DEICING/ANTI-ICING FLUID RESIDUE HAS COMPLETELY LEFT THE AIRCRAFT.

CAUTION: DO NOT APPLY WATER AT TEMPERATURES BELOW FREEZING. IF THE WATER TURNS TO ICE, THE FLIGHT CONTROLS CAN BE IMPAIRED, POSSIBLY AFFECTING THE AIRWORTHINESS OF THE AIRCRAFT.

(1) Apply warm water or Type I fluid, or a mixture of warm water and Type I fluid through a low pressure hose to areas identified.

NOTE: Use the lowest possible velocity that appears sufficient to remove the residue.

NOTE: Use of detergent additives reduces cleaning effectiveness. In addition, use of Type II or Type IV fluid actually adds to residue.

(2) Continue to apply warm water and/or Type I fluid until no visible traces of residue remain.

B. Lubrication

(1) In the areas identified and cleaned, lubricate all bearings and fittings in that area. (FLIGHT CONTROLS - LUBRICATION, PAGEBLOCK 12-21-02/301) (FUSELAGE COMPARTMENT - LUBRICATION, PAGEBLOCK 12-21-03/301)

(2) Apply corrosion inhibitors to all control cables exposed to water and Type I fluid. (CONTROL CABLES, SEALS, PULLEYS, AND PULLEY GUARD PINS - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-17/201)

C. Boeing recommends that within three days, examine the areas from which residue was removed.

NOTE: It is almost impossible to remove all residue with a single cleaning. Residue may slowly migrate out of crevices after it is first removed from open areas by cleaning.

(1) If residue is found, do cleaning process again.

(a) Continue the inspection and cleaning procedures until no additional residue is found.

D. Remove all the tools and equipment from the work area. Make sure the work area is clean.

AILERON AND TAB - DESCRIPTION AND OPERATION

1. General

A. The aileron and tab control system is actuated mechanically and provides lateral control of the airplane. The system consists of two subsystems: an aileron control system and an aileron trim control system.

B. Aileron Control System

(1) The aileron control system controls the movement of the aileron control tab and consists of the following major components.

Table 1

Component	Location
Two ailerons	One on trailing edge of each wing
Two control tabs	One on trailing edge of each aileron
Two aileron control wheels	In flight compartment
Aileron torque tube override mechanism	In electrical/electronics compartment
Sector and load-feel cranks	Wing rear spar, forward of aileron
Four dampers	Two at leading edge of each aileron

(2) The aileron control tabs are controlled by the aileron control wheels so that as one tab moves up, the opposite tab moves down. The ailerons are operated aerodynamically. When the control tabs are deflected, aerodynamic forces on the tabs move the ailerons in the opposite direction.

(3) A two-way cable system from the left aileron control wheel is connected to two drums on the aileron torque tube. Two other drums on the torque tube are connected, by a second cable system, to the aileron input drum on a shaft in the left lateral control mixer, located in the left wheelwell. The output drum on the shaft is connected, by a third cable system, to the control tab sector on the rear spar on the left wing. The sector is connected by pushrod to the control tab on the left aileron. The right aileron control wheel is connected by similar cable systems to the right control tab.

(4) The ailerons are connected by the aileron bus cable system, routed from a sector on the rear spar of one wing to another sector on the opposite wing. The sectors are connected by mechanical linkage to the ailerons. The aileron bus maintains correct phasing of the ailerons. Stops on the bus cable system prevent overtravel of the ailerons.

C. Aileron Trim Control System

(1) The aileron trim control system controls the movement of the aileron trim tabs to provide lateral trim. The system is controlled mechanically by a control knob on the control pedestal in the flight compartment.

(2) The aileron trim control system consists of two aileron trim tabs, one on the trailing edge of each aileron; the aileron trim control knob and mechanism on the control pedestal; and two actuators, one attached to the rear spar of each wing, forward of the trim tab.

(3) The control knob is mounted on the end of a shaft in the trim control mechanism. A drum on the opposite end of the shaft is connected by a two-way cable system to a drum on a shaft located in the right wheelwell. Another drum at the base of the same shaft is connected by a second cable system routed along the rear spar of each wing to the trim tab actuators. The actuators are connected to the trim tabs by a pushrod. A trim position indicator is connected mechanically to the trim control knob.

2. Component Description

A. Ailerons and Tabs

(1) An aileron is hinged to the rear spar of each wing, outboard of the flaps. Full range of aileron travel is 15(±1/2) degrees trailing edge up and 15(±1/2) degrees trailing edge down from faired position.

(2) Two tabs are hinged to the trailing edge of each aileron. The inboard tab is the control tab and travels through a range of 32(±3) degrees trailing edge up or down from the faired position. The outboard tab is the trim tab. Full range of trim tab travel is 21(±1.5) degrees up or down from the faired position.

B. Aileron Control Wheels

(1) Two aileron control wheels are located in the flight compartment, one on each control column. The control wheels are W-shaped and each has a hub cap and hub cap adapter. A microphone switch, autopilot release switch, and dual longitudinal trim control switches are installed in the outboard horn of each wheel.

(2) The wheel is attached to a cable drum in the top end of the control column. The hub cap and adapter cover the attaching bolts at the hub of the wheel. Electrical wiring from the switches is threaded through a hole in the hub and routed internally down through the control column.

(3) Index marks are provided on the wheel and control column to establish neutral position of the wheel. Stops on the drum in the top of the control column limit the rotation of the control wheel to approximately 135 degrees from the neutral position.

C. Aileron Torque Tube and Override Mechanism

(1) The aileron torque tube and override mechanism is located below the flight compartment floor in the electrical/ electronics compartment. The torque tube interconnects the two aileron cable systems so that either control wheel can operate both systems. The override mechanism allows either control wheel to operate one control tab if the other tab becomes inoperative.

(2) The override mechanism, mounted on the torque tube, consists of two springs, two cams, two bearings, and two bearing-mounted cable drums. The bearings slide on a splined portion of the torque tube and a cam is attached to each bearing. The cable drums are positioned on the tube so that cam followers, which are integral parts of the drums, are seated in the detents of the cams. The springs are located on the torque tube, between the two bearings, and exert a force to keep the cam followers seated in the cams.

D. Sectors and Load-Feel Cranks

(1) The aileron sectors and load-feel cranks are located on the rear spar of each wing at the inboard end of the aileron. The sectors transmit movement of the cable systems through mechanical linkage to the control tabs and ailerons. The load-feel cranks provide a simulated feel of aileron flight load at the aileron control wheels and also act as a centering device to return the aileron control system to neutral.

(2) The two sectors and two load-feel cranks are mounted on a common bolt in the inboard aileron hinge support bracket. The upper sector is the aileron bus sector, connected by cable to the bus sector on the opposite wing, and by mechanical linkage to the aileron. The lower sector is the control tab sector, connected to the aileron cable system and to the control tab.

(3) The load-feel cranks are installed between the two sectors and are connected to each other by a spring at one end. Adjustable stopbolts at the other end of each crank are in contact with a stop on the wing structure. Adjustable stop-bolts, midway along each crank, are in contact with stopbolts on a boss on the control tab sector.

E. Aileron Dampers

(1) There are two aileron dampers attached to the leading edge of each aileron. The dampers prevent aileron flutter during flight, and damp rapid movement of the ailerons caused by wind gusts when the airplane is on the ground.

(2) Each damper consists of a housing, six rotors, two spacers, three stators, a drive shaft, and bearings. The rotors are attached to the drive shaft which is installed in bearings in the housing. The stators are positioned between the rotors and secured to the housing with pins. The spacers separate the center and outer sets of rotors and stators. The housing is filled with a thick silicone fluid, through a port and filler plug on one side. An arm on the drive shaft is connected by a link to a bracket on the wing rear spar. The aileron dampers are identical to the elevator dampers except for the attachment point to the connecting link.

F. Aileron Trim Control Mechanism

(1) The aileron trim control mechanism, located in the aft section of the control pedestal, provides a means of adjusting and indicating the amount of aileron trim. The aileron and rudder trim control mechanism is installed as one unit.

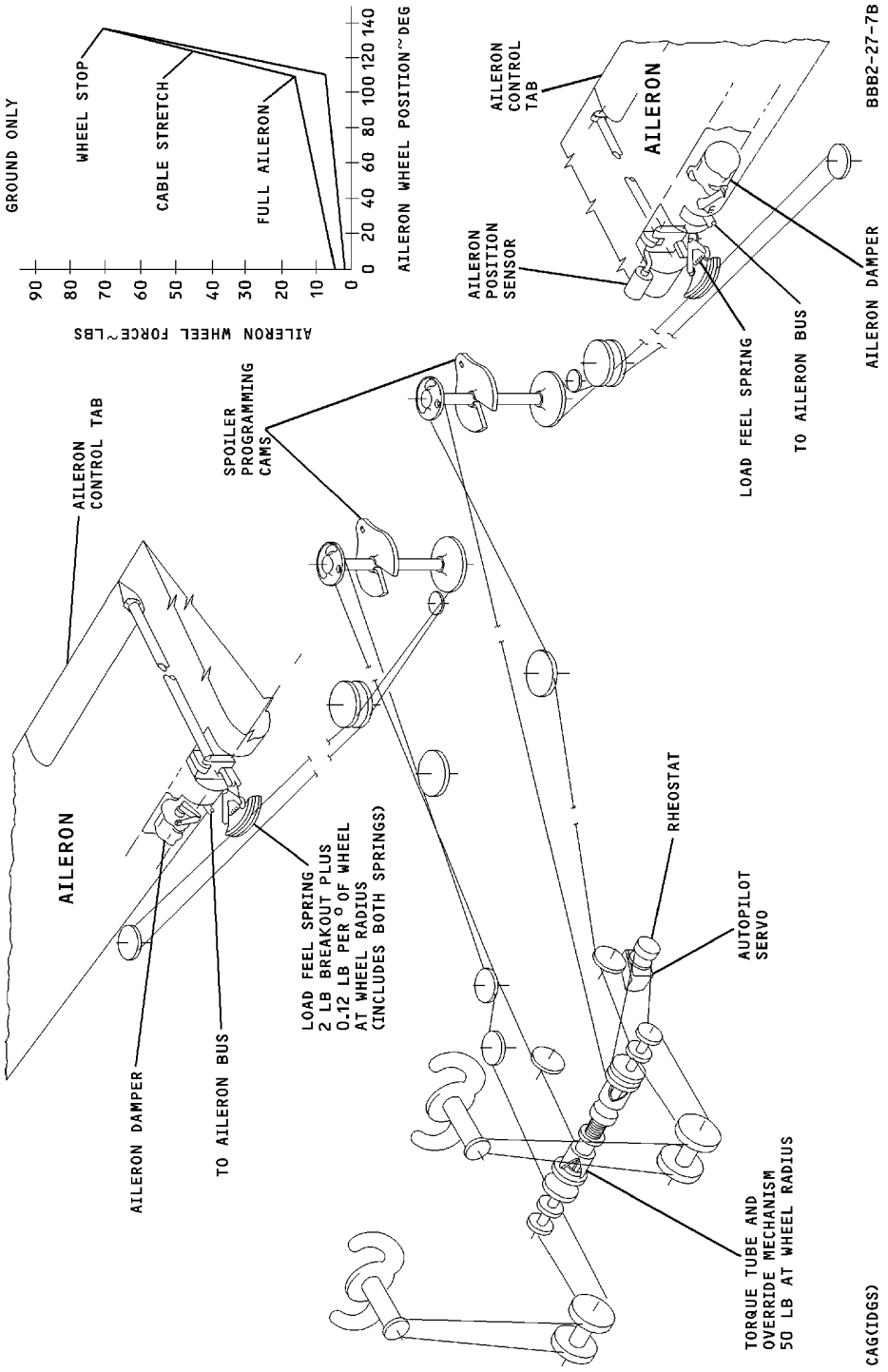
(2) The aileron portion of the mechanism consists of a control knob, trim drive shaft, cable drum, and trim position indicator. The control knob is mounted on the end of the drive shaft, which is located inside the hollow rudder trim drive shaft. The cable drum is installed between two supports on the forward end of the drive shaft. The trim cable system is routed around the drum and through the flight compartment floor below the pedestal. Guard pins attached to the two supports prevent the cables from leaving the drum.

(3) The trim position indicator consists of a spiral drive plate, slide washer (on aircraft with SB 27-311, a spiral plate follower), follower, spacer, pointer, cover plate, and placard. The drive plate fits directly on the square end of the drive shaft, forward of the control knob. The spacer is located on the drive shaft on top of the drive plate. The slide washer, follower, and pointer are installed on the spacer. The placard is attached to the cover plate which is installed on the pedestal frame between the pointer and the control knob. A rig neutral notch on the cover plate provides a neutral position for rigging purposes. Since there may be a difference between the rigged neutral position and the flight neutral position, the placard is adjustable so that it may be aligned with the pointer for the flight neutral position.

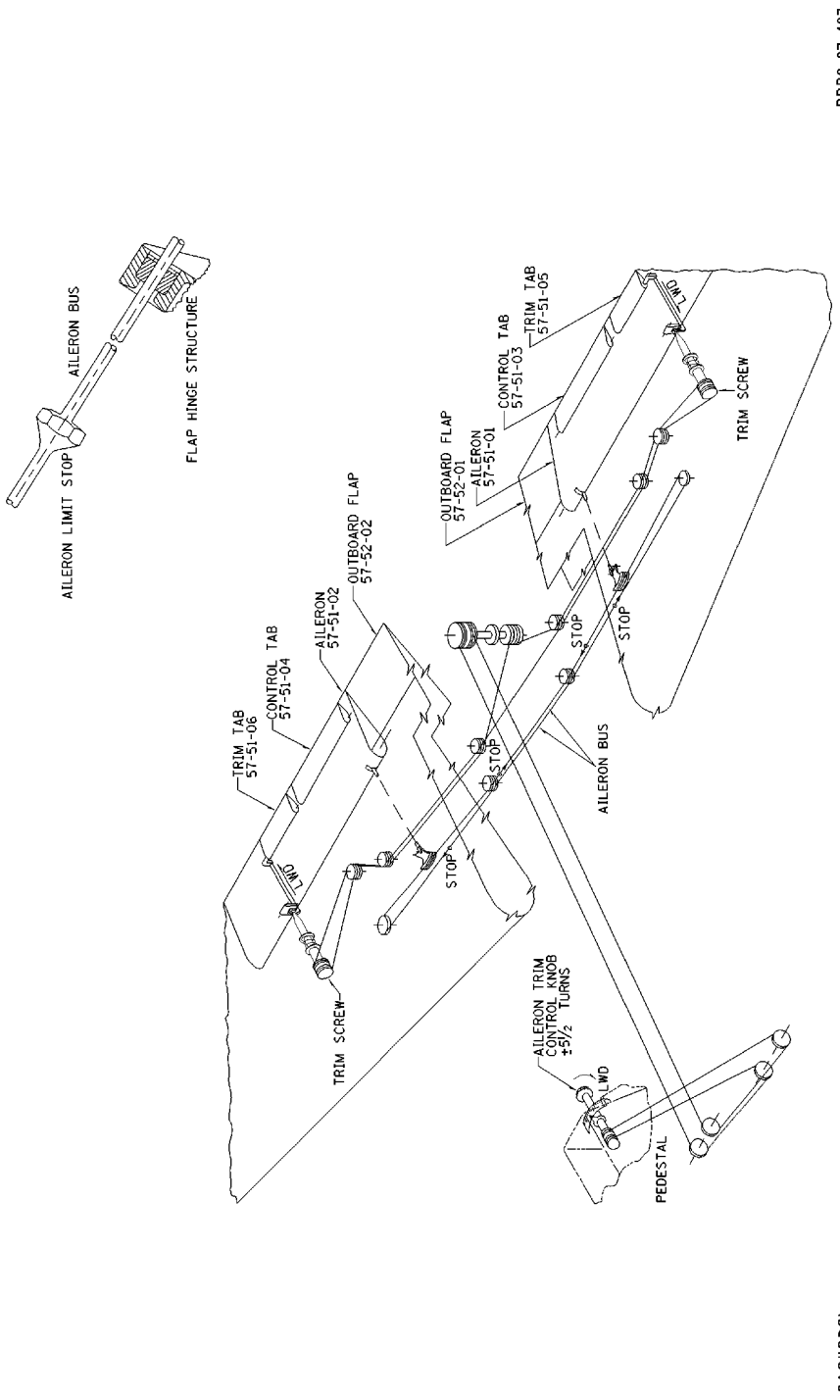
G. Aileron Trim Tab Actuator

(1) An aileron trim tab actuator is located on the rear spar of each wing, forward of the outboard end of the aileron trim tab. Each actuator consists of a cable drum, bearing, bracket, housing actuator nut, actuator screw, and eyebolt.

(2) The cable drum is installed on the bearing which rotates on the actuator mounting bolt. The housing is attached to the drum by three screws, and the actuator nut is secured in the housing by a pin. One end of the actuator screw is threaded into the actuator nut, and the eyebolt is installed in the opposite end of the screw. The eyebolt is connected by pushrod to the aileron trim tab. The bracket is attached to the wing rear spar by three bolts.



Aileron Control System -- Schematic
Figure 1/27-10-00-990-801



Aileron Trim and Bus -- Schematic
Figure 2/27-10-00-990-802

3. Operation

A. Aileron Control System

(1) When either aileron control wheel is rotated, the cable system from the wheel rotates the drums on the end of the torque tube. These drums move the second cable system to rotate the input drums in the lateral control mixers. Output drums on each mixer move the third cable system to rotate the control tab sectors. These sectors move the control tab on one aileron up and the tab on the opposite aileron down. Aerodynamic forces on the tabs cause the ailerons to move in the opposite direction. While the airplane is on the ground, the ailerons may be moved by manually moving the trailing edge of one aileron up or down. The aileron bus cable system will move the other aileron in the opposite direction.

B. Aileron Torque Tube and Override Mechanism

(1) In normal operation, when either aileron control wheel is rotated, the torque tube is also rotated. The bearings and cams rotate with the torque tube. The springs maintain pressure against the cams to keep the cam followers in the detents and allow the bearing-mounted cable drums to rotate and drive the cable systems to the control tabs.

(2) If one control tab becomes jammed, the corresponding cable system prevents the torque tube from rotating when normal force is exerted on the control wheels. The override mecha-ism is adjusted so that a force of 385(±45) inch-pounds (43.50(±5.04) N·m) on the control wheels is required to overcome the force exerted by the springs. When this extra force is applied to the control wheel, the cam follower moves out of the detents of the cam allowing the torque tube and the opposite cable drum to rotate and operate the other control tab. The aileron with the inoperative tab is moved by the aileron bus cable system.

C. Load-Feel Cranks

(1) When the aileron control tabs are in faired position, the stopbolts on the hub of the control tab sector are centered between the load-feel cranks, and the stopbolts at the end of the cranks are in contact with the structural stops.

(2) When the control tab sector is moved, the stopbolt on the boss moves one of the cranks, while the other crank is held in position by the structural stop. This movement causes the spring to extend and provide simulated load-feel at the control wheel. The stopbolts are adjusted so that a force of 4.5(+0.0,-0.5) pounds (2.041 (+0.0 -0.226) kg) is required to extend the spring. When force is removed from the control wheel, the spring returns the crank and the control tab sector to the neutral position.

D. Aileron Dampers

(1) When the aileron is moved, the damper drive shaft is rotated moving the rotors in the silicone fluid. The stators and the fluid resist the movement of the rotors.

(2) The force necessary to rotate the drive shaft is equal to the internal resistance of the damper and is proportional to the speed of the motion: The more rapid the motion, the greater the resistance that is applied to the rotors. Normal movement of the aileron is slow and is met with little resistance from the dampers. Rapid movement such as that caused by flutter or gusts of wind is met with greater resistance from the dampers.

E. Aileron Trim Control System

(1) When the aileron trim control knob is rotated, the cable system from the drum in the trim control mechanism rotates the drum and shaft in the right lateral control mixer. The drum at the base of the shaft drives the second cable system to rotate the trim tab actuator cable drum on each wing. The actuator housing and actuator nuts rotate with the drums, driving the actuator screws to push one trim tab up and the other tab down. Aerodynamic forces on the tabs move the ailerons, and equalizes the force required at the control wheel to keep the airplane level laterally.

(2) When the trim control knob is rotated, the spiral drive plate in the trim position indicator is rotated and the follower is moved sideways. A pin on the follower moves the indicator pointer to indicate the amount of trim. Stops on the drive plate prevent overtravel of the trim control system.

F. Aileron System Cable Pulleys

(1) Cable pulleys are located in many locations throughout the aileron control system. Because of their operating environment in extremes of temperature, moisture, dust, sand and other adverse conditions, the center pivot bearings are subject to loss of lubrication, corrosion and ultimate failure. These bearing failures induce higher than design ("normal") control operating forces in the pilot's control wheels. The autopilot system also is affected by this increased pulley friction, leading to possible additional operational problems within the autopilot system components.

(2) When the aileron control system is reported with rough operation or higher than usual forces or autopilot malfunctions related to aileron system operation, special attention must be given to the condition of all aileron system pulleys for general condition and operational condition within the system. PAGEBLOCK 20-10-17/201 DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201 PAGEBLOCK 27-10-00/101 PAGEBLOCK 27-10-00/501 AILERON AND TAB - CHECK, PAGEBLOCK 27-10-00/601

AILERON AND TAB - TROUBLE SHOOTING

1. General

A. Trouble shooting the aileron and tab systems is accomplished initially by determining whether the trouble exists in the aileron control system or the aileron trim control system.

B. If trouble shooting the systems indicates that cable tensions require adjustment, that segment of the system containing the cable must be completely adjusted.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 101

Name and Number	Manufacturer
Tensiometer	Pacific Scientific Co.
Protractor (5916715)	Douglas Aircraft Co.
Spring scale (60-pound capacity) (27.2 kg)	John Chatilon & Sons

3. Trouble Shooting Aileron Control System

WARNING: BEFORE MOVING AILERONS, MAKE CERTAIN THAT AREAS AROUND LEFT AND RIGHT AILERONS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

A. Use the following to trouble shoot the aileron control system:

Table 102

Possible Causes		Isolation Procedure	Correction
B.	EXCESSIVE PLAY OR LOST MOTION IN CONTROL WHEEL, POOR CENTERING OF SYSTEM		
(1)	Excessive friction in system	Check aileron control system for excessive friction. (PAGEBLOCK 27-10-00/601)	Adjust or replace components as necessary.
(2)	Load-feel spring out of adjustment for preload of 6.5	Check load-feel spring (+0.0,-0.5) pounds (2.948 (+0.0,-0.226) kg).	Adjust load-feel spring. (PAGEBLOCK 27-10-00/501)
(3)	Binding control surfaces	Move ailerons manually through full travel. Check aileron and tabs for binding against adjacent structures.	Replace or adjust control surfaces as necessary.
(4)	Excessive loose- ness on control surfaces	Check control surfaces for looseness. Maximum play allowed at trailing edge of aileron is 1/8 inch; (3.175 mm) control tab, 3/32 inch, (2.382 mm). Check cable systems for improper adjustment.	Replace worn bearing, bolts, or other parts as necessary. Adjust cables as necessary. (PAGEBLOCK 27-10-00/501)
C,	AILERON SYSTEM JAMMED: ONE CONTROL TAB INOPERATIVE - OPPOSITE TAB NORMAL		
(1)	Binding control surfaces	Move ailerons manually through full travel. Check aileron and tabs for binding against adjacent structures.	Replace of adjust control surfaces as necessary.
(2)	Excessive friction in system	Check aileron control system for excessive friction. (PAGEBLOCK 27-10-00/601)	Adjust or replace components as necessary.
(3)	Torque tube and override mechanism breakout force too low	Check breakout force required to operate override mechanism. (PAGEBLOCK 27-10-09/401)	Replace torque tube and over ride mechanism. (PAGEBLOCK 27-10-09/401)

AILERON AND TAB - ADJUSTMENT/TEST

1. General

A. The procedures in this section are for the adjustment of the entire aileron and aileron trim control systems. Specific segments of the systems may be adjusted by following the procedures outlined in the applicable paragraphs. Adjustment procedures are identical for left and right systems except as noted. Access to components is given in text as required.

B. Numbers in parentheses in the following text correspond to callouts in Figure 501 and Figure 503.

C. The numbers and letters encircled in hexagon-shaped symbol shown in the adjustment diagrams correspond to cable run numbers and segments listed at the end of this section. Each cable run number is posted adjacent to the corresponding cable in the airplane.

D. All rig pins are assigned individual numbers in the following paragraphs; corresponding rig pin numbers and sizes are listed in the general maintenance practices (PAGEBLOCK 27-00-00/201).

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 501

Name and Number	Manufacturer
Protractor (5916715)	Douglas Aircraft Co.
Tensiometer	Pacific Scientific Co.
Spring scale (60-pound capacity) (27.2 kg)	John Chatilon & Sons
MLG Door safety locks 3936851-1, or -501 as applicable. PAGEBLOCK 27-00-00/201	Douglas Aircraft Co.
Lockwire, NASM20995N32, DPM 684*[1]	Not specified
Rig pin (4-4) 1/4 by 4 5/8 (6.35 x 117.475 mm)	
Rig pin (8-7) 1/2 by 7 5/8 (12.7 x 193.675 mm)	
Rig pin (4-10) 1/4 by 10 5/8 (6.35 x 269.875 mm)	
Tensioner Control Cable (1/16 to 3/8) inch (1.587 to 9.525 mm) (5954644-1, -503, -505)	Douglas Aircraft Co.
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch) (15.875 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. **Adjustment/Test Aileron and Tab**

A. Adjust System from Aileron Control Wheel to Torque Tube

(1) Insert rig pin (4-4) in rig hole (R-3) in aileron bus torque tube (AA). (Figure 501)

NOTE: Torque tube and turnbuckles, located below flight compartment floor, are accessible through electrical/electronics compartment.

(2) Adjust turnbuckles (1) until tension is between minimum and maximum load per cable tension table for 1/8-inch (3.175 mm) cables. (Figure 502)

(3) Differentially adjust turnbuckles (1) to align index marks on control column and control wheel within 1/32 inch (.7924 mm).

(4) Safety all turnbuckles with clips.

(5) Remove rig pin (4-4) from torque tube.

(6) Check aileron and control tab travel. (AILERON AND TAB - CHECK, PAGEBLOCK 27-10-00/601)

B. Adjust System from Torque Tube to Lateral Control Mixer

NOTE: Lateral control mixers are located in left and right main gear wheel wells. Turnbuckles (2) are accessible through forward lower cargo compartment ceiling panels 5151C for cables 7C, D; 5154C for cables 10C, D; 5156C for cables 8C, D, 9C, D.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Insert rig pin (4-4) in rig hole (R-3) in torque tube (AA).

(3) Adjust turnbuckles (2) until tension is between minimum and maximum load per cable tension table for 1/8-inch (3.175 mm) cables. (Figure 502, Figure 502)

(4) Differentially adjust turnbuckles (2) until rig pin (4-10) can be easily inserted in rig hole (R-7) in applicable lateral control mixer.

(5) Safety turnbuckles with clips.

(6) Remove rig pins (4-4) and (4-10).

(7) Check aileron and control tab travel. (AILERON AND TAB - CHECK, PAGEBLOCK 27-10-00/601)

(8) Securely fasten lateral mixer protective shield after completing all maintenance.

(9) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

C. Adjust System from Aileron Servo to Aileron Torque Tube

NOTE: Aileron torque tube, aileron servo, and turnbuckles, located below flight compartment floor, are accessible through electrical/electronics compartment.

(1) Insert rig pin (4-4) in rig hole (R-3) in aileron torque tube (AA).

(2) Adjust turnbuckles (3) until tension is between minimum and maximum load per cable tension table for 1/8-inch (3.175 mm) cables. (Figure 502)

NOTE: To check cable tension, remove rig pin (4-4) and rotate control wheel fully clockwise. Check tension at approximate midspan of cables 19B and 20A. Return control wheel to neutral and reinstall rig pin (4-4).

(3) Differentially adjust turnbuckles (3) until index mark on rheostat case is aligned within width of rheostat actuating crank tip.

(4) Remove rig pin (4-4) from aileron torque tube.

(5) Safety turnbuckles (3) with clips.

D. Adjust System from Lateral Control Mixer to Control Tab Sector

NOTE: Tab sectors are located at each aileron inboard hinge and are accessible through wing rear spar access doors. Lateral control mixers are located in left and right main gear wheel wells. Turnbuckles are accessible along wing rear spar with flaps extended.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(4) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Insert rig pin (4-10) in rig hole (R-7) in applicable lateral control mixer.

(6) Adjust turnbuckles (4) until tension is between minimum and maximum load per cable tension table for 1/8-inch (3.175 mm) cables. (Figure 502, Figure 502)

(7) Differentially adjust turnbuckles (4) until rig pin (8-7) can be easily inserted in rig hole (R-4) through bracket, tab sector, and bus sector.

(8) Safety turnbuckles with clips.

(9) Remove rig pins (8-7) and (4-10).

(10) Check aileron and control tab travel. (AILERON AND TAB - CHECK, PAGEBLOCK 27-10-00/601)

WJE 405-412, 414, 880, 881, 883, 884; Before incorporation of SB 27-247

(11) On airplanes before incorp. of SB 27-247, securely fasten lateral mixer protective shield after completing all maintenance.

WJE ALL

(12) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

E. Adjust Load-feel Spring

NOTE: Load-feel springs, located forward of each aileron inboard hinge, are accessible through wing trailing edge access doors.

(1) Insert rig pin (8-7) in rig hole (R-4) through bracket, tab sector, and sector.

(2) Loosen jamnuts and turn stops (6) away from structural stop.

(3) Symmetrically adjust stops (5) as necessary to require a force of 6.5 (+0.0,-0.5) pounds (2.948 (+0.0 -0.226) kg) to start crank moving.

NOTE: Force is measured by connecting spring scale to roller (7) bolt and pulling scale outward directly in line with centerline of spring.

(4) Adjust stops (6) sufficiently to eliminate play between sector and cranks.

(5) Tighten jamnuts on all stop bolts.

(6) Remove rig pin (8-7) from bracket and sectors.

F. Adjust Aileron

NOTE: Access is through wing trailing edge access doors and aileron upper access door at inboard hinge.

(1) Insert rig pin (8-7) in rig hole (R-4) through bracket, tab sector, and bus sector.

(2) Add or remove shims (8) as required under eyebolt (9) to move aileron to neutral position.

NOTE: Aileron is in neutral position when center of aft outboard corner of aileron is 1/8(±1/8) inch (3.175 (±3.175) mm) below adjacent wing trailing edge. Each 0.003-inch (0.0762 mm) shim moves aileron trailing edge approximately 1/64 inch (.3962 mm).

(3) On aircraft with aluminum ailerons, tighten nut on eyebolt (9) to torque of 400 to 450 inch-pounds, (44.8 to 50.4 N·m). Hold eyebolt aligned with clevis while tightening nut.

(4) On aircraft with composite ailerons, tighten nut on eyebolt (9) to torque of 260 to 300 inch-pounds (24.4 to 33.9 N·m). Hold eyebolt aligned with clevis while tightening nut.

(5) Remove rig pins (8-7) from brackets and sectors, left and right.

G. Adjust Control Tab

NOTE: Access is through control tab pushrod aft fairing and wing rear spar access doors.

(1) Insert rig pin (8-7) in rig hole (R-4) through bracket, tab sector, and bus sector.

(2) Make certain that aileron is in neutral position. If necessary, perform adjustment as outlined in step F.

(3) Loosen jamnuts and adjust pushrod (10) to fair control tab with aileron within one-quarter degree. Tighten jamnuts and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(4) Remove rig pins (8-7) from brackets and sectors, left and right.

H. Adjust Aileron Bus Cable System

NOTE: Access to bus sectors is through wing rear spar access doors. Turnbuckles are accessible along wing rear spar with flaps extended.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(4) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Insert rig pin (8-7) in rig hole (R-4) through bracket, tab sector, and bus sector at one wing.

(6) Adjust turnbuckles (11) until tension is between minimum and maximum load per cable tension table for aileron bus cables. (Figure 502)

(7) Differentially adjust turnbuckles (11) until rig pin (8-7) can be inserted easily in rig hole (R-4) through bracket and sectors on opposite wing.

(8) Adjust inboard bus cable stops (12) to obtain dimension of 5 1/32(±1/32) inches (127.79(±0.79) mm) between stop (12) and fixed stop (13). Hold turnbuckles and rotate stop (12) to obtain adjustment. (Figure 501)

NOTE: Turnbuckles (11) may be held by installing safety clips in portion of turnbuckle attached to cable.

NOTE: Aileron bus cable stops shank may be worn to a minimum diameter (or thickness) of 0.150, provided that it is free of sharp edges and has no tendency to catch or bind in the fairlead.

(9) Adjust outboard bus cable stops (12) to obtain dimension of 4 7/8(±1/32) inches (123.83(±0.79) mm) between stop (12) and fixed stop (13). Hold turnbuckles and rotate stop (12) to obtain adjustment. (Figure 501)

(10) Remove rig pins (8-7) from brackets and sectors on both wings.

(11) Manually move left hand aileron full trailing edge down. Outboard cable stop (12) should contact its corresponding fixed stop (13) on left hand wing.

(12) Manually move right hand aileron full trailing edge down. Outboard cable stop (12) should contact its corresponding fixed stop (13) on right hand wing.

(13) Manually move ailerons full travel in either direction. Inboard wing fixed stop (13) and cable stop (12) should not contact.

(14) Safety all turnbuckles with clips.

(15) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

(16) Check aileron travel. AILERON AND TAB - CHECK, PAGEBLOCK 27-10-00/601

I. Check Torque Tube and Override Mechanism - Breakout Force

NOTE: Torque tube and override mechanism is accessible through electrical/electronics compartment. Lateral control mixers are located in left and right main gear wheel wells.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inbound doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Insert rig pin (4-10) in rig hole (R-7) in left lateral control mixer.

WARNING: BEFORE MOVING AILERON CONTROL TABS, MAKE CERTAIN THAT AREA AROUND LEFT AND RIGHT AILERONS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Attach spring scale to right horn of either aileron control wheel.

(4) Pull scale to rotate wheel clockwise and note breakout force required to start cam follower (14) moving up cam (15). Breakout force should be 54(±6) pounds (24.49(±2.7) kg).

(5) Move spring scale to left horn of wheel.

(6) Pull scale to rotate wheel counterclockwise and check that breakout force is within limits specified in Paragraph 3.I.(4).

(7) If breakout force is not within specified limits, adjust screws (8) to obtain correct breakout force.

NOTE: When adjusting aileron override mechanism breakout force with adjusting screws (8), tighten adjusting screws in opposing sequence such that inner and outer springs do not flex, bow and contact each other, torque shaft phenolic tubing or housing. With proper breakout force set, spring seat (11) may be asymmetrical relative to torque shaft rather than perpendicular. Asymmetric adjustment is an acceptable condition. (Figure 27-10-09-990-804)

(8) Safety adjustment screws (8) with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(9) Remove rig pin (4-10) from left mixer.

(10) Insert rig pin (4-10) in rig hole (R-7) in right mixer.

(11) Repeat Paragraph 3.I.(3) through Paragraph 3.I.(6).

(12) Remove rig pin (4-10) from right mixer.

(13) Return control wheel to neutral position.

WJE 405-412, 414, 880, 881, 883, 884

(14) On airplanes before incorp. of SB 27-247, securely fasten lateral mixer protective shields after completing all maintenance.

WJE ALL

(15) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

J. Adjust Aileron Trim Cable System - Fuselage (Figure 503)

NOTE: Turnbuckles (C and N) are accessible through forward lower cargo compartment ceiling panel 5154C for cable 28A, B; and 5156C for cable 27A, B. Drum (1) is accessible through pedestal side covers. Drum (2) is accessible by removing passenger compartment floor panel.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(4) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Rotate aileron trim control knob on pedestal to align pointer with rig neutral notch on pedestal cover.

NOTE: There may be a difference between rigged neutral and flight neutral positions, therefore pointer may or may not align with flight neutral position on indicator placard.

(6) Check that cable sockets in drum (1) are down and that cables have an equal number of wraps on drum. If necessary, rotate drum to position noted and align pointer as outlined in AILERON AND RUDDER TRIM CONTROL MECHANISM - REMOVAL/INSTALLATION, PAGEBLOCK 27-10-07/401.

(7) Adjust turnbuckles (C and N) until tension is between minimum and maximum load per cable tension table for 3/32-inch (2.382 mm) cables. (Figure 502)

(8) Rotate trim control knob to extreme left and right several times and adjust turnbuckles as required to maintain tensions specified in Paragraph 3.J.(7).

(9) With pointer aligned with rig neutral notch, differentially adjust turnbuckles (C and N) to position drum (2) so that cable sockets are centered forward.

NOTE: If passenger compartment floors are installed and drums (2) are not accessible, drum (4) in right lateral control mixer may be positioned so that cable sockets are centered on the outboard side.

(10) Safety turnbuckles with clips.

(11) Check aileron trim tab travel. AILERON AND TAB - CHECK, PAGEBLOCK 27-10-00/601

(12) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

K. Adjust Aileron Trim Cable System - Left and Right Wings

NOTE: Access to actuators and tab pushrod is through wing access door and tab pushrod aft fairing. Turnbuckles are accessible along wing rear spar with flaps extended.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(4) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Rotate aileron trim control knob on pedestal to align pointer with rig neutral notch on pedestal cover.

NOTE: There may be a difference between rigged neutral and flight neutral positions, therefore pointer may or may not align with flight netural position on indicator placard.

(6) Adjust turnbuckles (G and H) and (L and M) until tension is between minimum and maximum load per cable tension table for 1/16-inch (1.587 mm) cables. (Figure 502)

(7) Rotate trim knob to contact left and right stops several times and adjust turnbuckles as required to maintain cable tensions as specified in Paragraph 3.K.(6).

(8) Rotate trim knob to align pointer with rig neutral notch.

(9) Secure drum (4) with cable sockets centered on outboard side.

(10) Differentially adjust turnbuckles (G and H) to position left actuator drum (7) so that cable sockets are centered on inboard side.

(11) Differentially adjust turnbuckles (L and M) to position right actuator drum (8) so that cable sockets are centered on inboard side. Make certain that position of drum (7) is not altered during adjustment.

(12) Safety all turnbuckles with clips.

(13) Remove restraint from drum (4) as installed in Paragraph 3.K.(9).

(14) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position.

(15) Check aileron trim tab travel. AILERON AND TAB - CHECK, PAGEBLOCK 27-10-00/601

L. Adjust Aileron Trim Tab Actuator

NOTE: This procedure will position aileron trim tab to neutral with actuator. Aileron trim cable systems must be properly rigged (Paragraph 3.J.) (Paragraph 3.K.) before adjusting actuator. Actuator is located on each wing forward of outboard end of trim tab. Access is through wing rear spar access doors.

(1) Rotate aileron trim control knob to align pointer with rig neutral notch.

NOTE: There may be a difference between rigged neutral position and flight neutral position, therefore pointer may or may not align with flight netural position on indicator placard.

(2) Loosen jamnut (9) and rotate actuator screw (10) to obtain dimension of 1 ±1/32 in (25.4 ±.792 mm) between end of housing and end of actuator screw.

NOTE: This is a preliminary dimension which may be changed later.

(3) Remove bolt (11), hold trim tab faired with aileron, and aileron in neutral position, and rotate eyebolt, (12) to align crank and pushrod within one full turn of eyebolt, making certain that actuator screw does not rotate when adjusting eyebolt.

(4) Install bolt (11) to connect actuator to pushrod and crank.

(5) Check position of trim tab and if necessary, rotate actuator screw to fair tab with aileron within one-quarter degree, making certain that actuator drum and eyebolt (12) do not rotate.

NOTE: Length of pushrod is preset and must not be adjusted.

(6) Tighten jamnut (9) and safety nut to tab washer with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(7) Check aileron trim tab travel. (AILERON AND TAB - CHECK, PAGEBLOCK 27-10-00/601)

M. Adjust Aileron Position Sensor

NOTE: Aileron controls must be adjusted prior to adjusting aileron position sensor. The position sensor is located on the left wing only.

(1) With the left aileron held and/or clamped in the faired position with adjacent wing surface, remove bolt (18) from link (17) and arm (19). (Figure 501, View E)

CAUTION: SENSOR WILL BE DAMAGED IF ROTATED BEYOND INTERNAL STOPS.

(2) Rotate arm (19) until sensor detent is located or index marks are aligned, whichever applies.

(3) Loosen clamp bolt (20) and rotate sensor body until bolt (18) can be freely inserted through arm (19) and link (17).

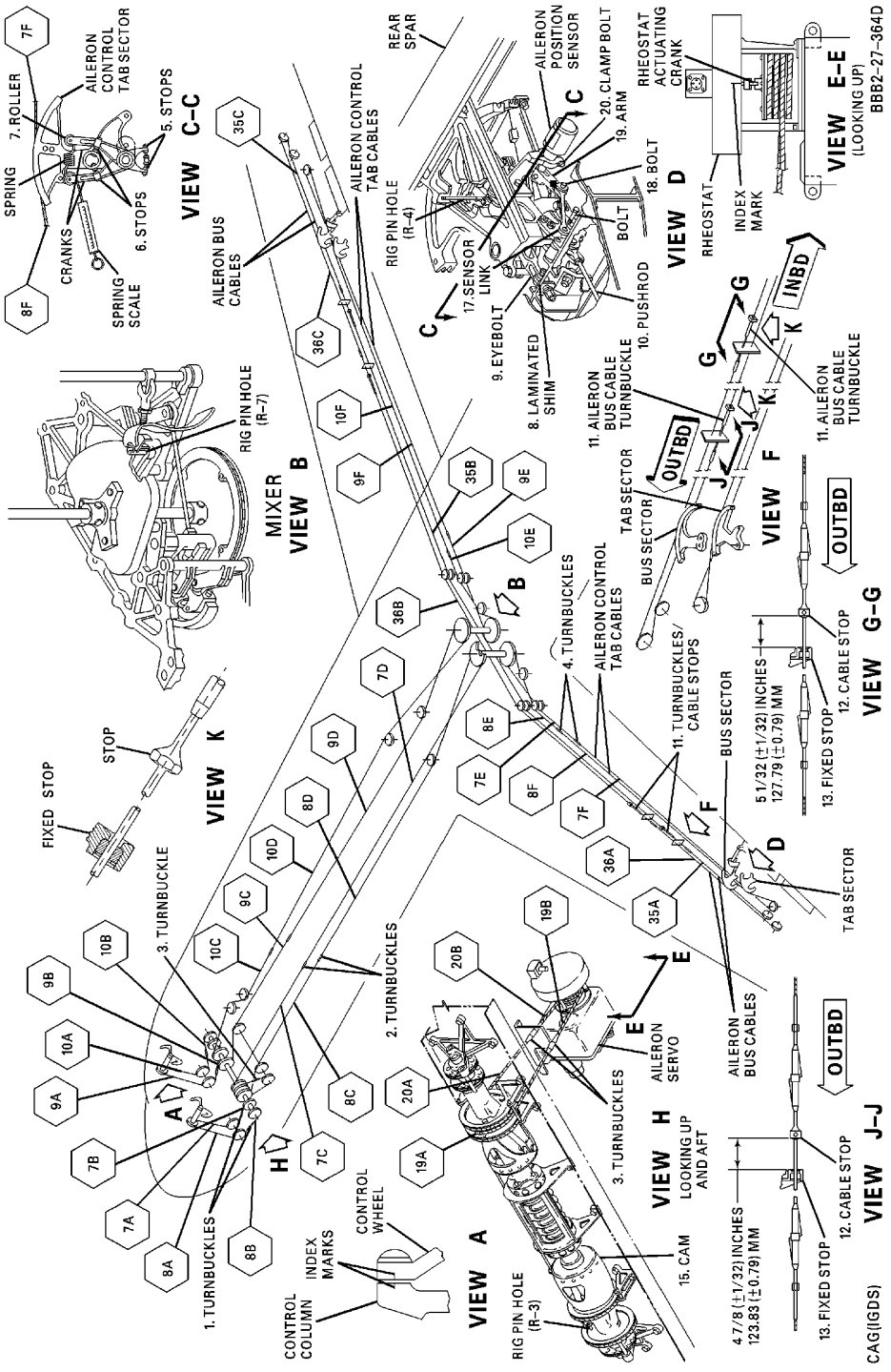
(4) Tighten clamp bolt (20).

(5) Check bolt (18) for free insertion, install bolt (18). Safety nut with cotter pin.

(6) If aileron was clamped in faired position, remove clamp.

(7) Check sensor. (PAGEBLOCK 22-01-03/201)

(8) Perform return to service (RTS) test. (DFGS STATUS/TEST, SUBJECT 22-01-05)



Aileron and Tab Control System - Adjustment
Figure 501/27-10-00-990-803

CABLE TENSION TABLE – 1/8 DIAMETER

TEMP deg F	MAX. PROD. RIG LOAD	MIN. PROD. RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. PROD. RIG LOAD	MIN. PROD. RIG LOAD	MIN. ALLOW. SERV. LOAD
–60	10	9	6	42	55	51	35
–58	11	10	7	44	56	52	36
–56	12	11	7	46	57	53	36
–54	12	12	8	48	58	54	37
–52	13	12	9	50	59	54	38
–50	14	13	9	52	60	55	38
–48	15	14	10	54	61	56	39
–46	16	15	10	56	61	57	40
–44	17	16	11	58	62	58	40
–42	18	16	11	60	63	59	41
–40	19	17	12	62	64	60	41
–38	20	18	13	64	65	61	42
–36	20	19	13	66	66	62	43
–34	21	20	14	68	67	63	43
–32	22	21	14	70	68	64	44
–30	23	21	15	72	69	64	45
–28	24	22	15	74	70	65	45
–26	25	23	16	76	71	66	46
–24	26	24	16	78	72	67	47
–22	26	25	17	80	74	68	47
–20	27	25	18	82	75	69	48
–18	28	26	18	84	76	70	49
–16	29	27	19	86	77	71	49
–14	30	28	19	88	78	72	50
–12	31	29	20	90	79	73	51
–10	32	29	20	92	80	74	51
–8	33	30	21	94	81	75	52
–6	33	31	21	96	82	76	53
–4	34	32	22	98	83	77	53
–2	35	33	23	100	84	78	54
0	36	33	23	102	85	79	55
2	37	34	24	104	87	80	56
4	38	35	24	106	88	81	56
6	39	36	25	108	89	83	57
8	40	37	25	110	90	84	58
10	40	38	26	112	91	85	59
12	41	38	27	114	92	86	59
14	42	39	27	116	94	87	60
16	43	40	28	118	95	88	61
18	44	41	28	120	96	89	62
20	45	42	29	122	97	90	62
22	46	42	29	124	98	91	63
24	47	43	30	126	100	93	64
26	48	44	31	128	101	94	65
28	48	45	31	130	102	95	66
30	49	46	32	132	103	96	67
32	50	47	32	134	105	97	67
34	51	48	33	136	106	98	68
36	52	48	33	138	107	100	69
38	53	49	34	140	109	101	70
40	54	50	35				

CAG(IGDS)

BBB2–27–51A

Aileron Cable Tension Table
Figure 502/27-10-00-990-805 (Sheet 1 of 4)

CABLE TENSION TABLE – AILERON BUS

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
-60	77	71	54	40	117	108	81
-58	78	72	54	42	119	109	82
-56	78	72	54	44	120	110	83
-54	79	73	55	46	121	112	84
-52	79	73	55	48	122	113	85
-50	80	74	55	50	123	114	85
-48	81	74	56	52	125	115	86
-46	81	75	56	54	126	116	87
-44	82	75	57	56	127	117	88
-42	82	76	57	58	128	118	89
-40	83	77	57	60	130	120	90
-38	84	77	58	62	131	121	91
-36	84	78	58	64	132	122	92
-34	85	78	59	66	134	123	93
-32	86	79	59	68	135	125	94
-30	86	80	60	70	136	126	94
-28	87	80	60	72	138	127	95
-26	88	81	61	74	139	129	96
-24	88	81	61	76	141	130	97
-22	89	82	62	78	142	131	99
-20	90	83	62	80	144	133	100
-18	90	83	63	82	145	134	101
-16	91	84	63	84	147	136	102
-14	92	85	64	86	148	137	103
-12	93	86	64	88	150	138	104
-10	93	86	65	90	152	140	105
-8	94	87	65	92	153	141	106
-6	95	88	66	94	155	143	107
-4	96	88	66	96	156	144	108
-2	97	89	67	98	158	146	109
0	97	90	67	100	160	148	111
2	98	91	68	102	162	149	112
4	99	92	69	104	163	151	113
6	100	92	69	106	165	152	114
8	101	93	70	108	167	154	115
10	102	94	71	110	169	156	117
12	103	95	71	112	170	157	118
14	104	96	72	114	172	159	119
16	105	97	73	116	174	161	121
18	106	98	73	118	176	162	122
20	107	98	74	120	178	164	123
22	108	99	75	122	180	166	125
24	109	100	75	124	182	168	126
26	110	101	76	126	184	170	127
28	111	102	77	128	186	171	129
30	112	103	77	130	188	173	130
32	113	104	78	132	190	175	131
34	114	105	79	134	192	177	133
36	115	106	80	136	194	179	134
38	116	107	80	138	196	181	136
				140	198	183	137

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-277A

Aileron Cable Tension Table
Figure 502/27-10-00-990-805 (Sheet 2 of 4)

CABLE TENSION TABLE – 3/32 DIAMETER

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD
–60	7	1	0	40	30	24	18
–58	8	2	1	42	31	25	18
–56	8	2	1	44	31	25	19
–54	8	2	1	46	32	26	19
–52	9	3	1	48	33	27	20
–50	9	3	2	50	33	27	20
–48	9	3	2	52	34	28	21
–46	10	4	2	54	34	28	21
–44	10	4	2	56	35	29	22
–42	11	5	3	58	36	30	22
–40	11	5	3	60	36	30	23
–38	11	5	3	62	37	31	23
–36	12	6	4	64	38	32	24
–34	12	6	4	66	38	32	24
–32	12	6	4	68	39	33	25
–30	13	7	5	70	39	33	25
–28	13	7	5	72	40	34	26
–26	14	8	5	74	41	35	26
–24	14	8	6	76	41	35	27
–22	15	9	6	78	42	36	27
–20	15	9	6	80	43	37	28
–18	15	9	7	82	44	38	28
–16	16	10	7	84	44	38	29
–14	16	10	7	86	45	39	29
–12	17	11	8	88	46	40	30
–10	17	11	8	90	46	40	30
–8	18	12	8	92	47	41	31
–6	18	12	9	94	48	42	31
–4	19	13	9	96	48	42	32
–2	19	13	9	98	49	43	33
0	20	14	10	100	50	44	33
2	20	14	10	102	51	45	34
4	21	15	10	104	51	45	34
6	21	15	11	106	52	46	35
8	22	16	11	108	53	47	35
10	22	16	12	110	54	48	36
12	23	17	12	112	54	48	37
14	23	17	12	114	55	49	37
16	24	18	13	116	56	50	38
18	24	18	13	118	57	51	38
20	25	19	14	120	58	52	39
22	25	19	14	122	58	52	40
24	26	20	14	124	59	53	40
26	26	20	15	126	60	54	41
28	27	21	15	128	61	55	41
30	27	21	16	130	62	56	42
32	28	22	16	132	62	56	43
34	28	22	17	134	63	57	43
36	29	23	17	136	64	58	44
38	30	24	17	138	65	59	45
				140	66	60	45

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-278A

Aileron Cable Tension Table
Figure 502/27-10-00-990-805 (Sheet 3 of 4)

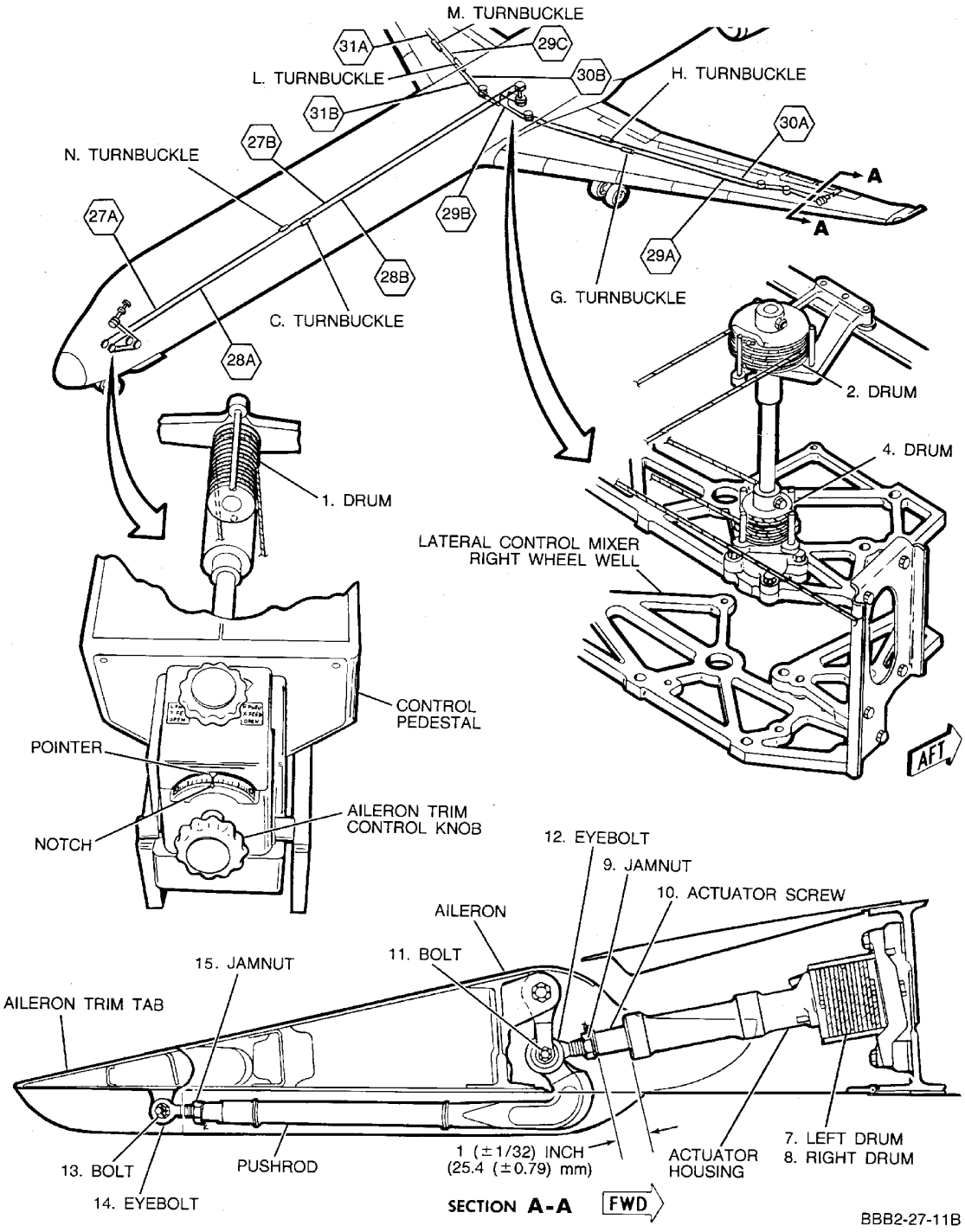
CABLE TENSION TABLE – 1/16 DIAMETER

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
–60	5	0	0	40	18	12	8
–58	5	0	0	42	18	12	9
–56	5	0	0	44	18	12	9
–54	6	0	0	46	19	13	9
–52	6	0	0	48	19	13	9
–50	6	0	0	50	19	13	9
–48	7	1	0	52	20	14	10
–46	7	1	0	54	20	14	10
–44	7	1	0	56	20	14	10
–42	7	1	0	58	20	14	10
–40	8	2	1	60	21	15	11
–38	8	2	1	62	21	15	11
–36	8	2	1	64	21	15	11
–34	8	2	1	66	22	16	11
–32	9	3	1	68	22	16	12
–30	9	3	2	70	22	16	12
–28	9	3	2	72	23	17	12
–26	9	3	2	74	23	17	12
–24	10	4	2	76	23	17	13
–22	10	4	2	78	24	18	13
–20	10	4	2	80	24	18	13
–18	10	4	3	82	24	18	13
–16	11	5	3	84	25	19	14
–14	11	5	3	86	25	19	14
–12	11	5	3	88	25	19	14
–10	11	5	3	90	26	20	15
–8	12	6	4	92	26	20	15
–6	12	6	4	94	27	21	15
–4	12	6	4	96	27	21	16
–2	12	6	4	98	27	21	16
0	13	7	4	100	28	22	16
2	13	7	5	102	28	22	16
4	13	7	5	104	28	22	17
6	13	7	5	106	29	23	17
8	14	8	5	108	29	23	17
10	14	8	5	110	30	24	18
12	14	8	6	112	30	24	18
14	14	8	6	114	31	25	18
16	15	9	6	116	31	25	19
18	15	9	6	118	31	25	19
20	15	9	6	120	32	26	19
22	15	9	7	122	32	26	20
24	16	10	7	124	33	27	20
26	16	10	7	126	33	27	20
28	16	10	7	128	34	28	21
30	16	10	7	130	34	28	21
32	17	11	8	132	35	29	21
34	17	11	8	134	35	29	22
36	17	11	8	136	36	30	22
38	18	12	8	138	36	30	23
				140	37	31	23

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-279A

Aileron Cable Tension Table
Figure 502/27-10-00-990-805 (Sheet 4 of 4)



Aileron Trim Tab Control System -- Adjustment
Figure 503/27-10-00-990-806

4. Cable Assemblies

NOTE: The cable run numbers and segment letters listed below correspond to callouts in hexagonal symbols in Figure 501 through Figure 503.

Table 502

Function	Cable Run Number	Segment Letter
Left aileron - up	7 7 7 7 7 7	A B C D E F
Left aileron - down	8 8 8 8 8 8	A B C D E F
Right aileron - up	9 9 9 9 9 9	A B C D E F
Right aileron - down	10 10 10 10 10 10	A B C D E F
Left aileron servo - up	19 19	A B
Right aileron servo - up	20	A
Aileron trim - Left wing down	27 27	A B
Aileron trim - Right wing down	28 28	A B
Aileron trim bus	29 29 29	A B C
Aileron trim - Left wing up, right wing down	30 30	A B
Aileron trim - Right wing up, left wing down	31 31	A B

Table 502 (Continued)

Function	Cable Run Number	Segment Letter
Aileron bus - Left aileron up	35 35 35	A B C
Aileron bus - Left aileron down	36 36 36	A B C

AILERON AND TAB - CHECK

1. General

A. Linear dimensions for checking aileron are measured from outboard end of aileron trailing edge to adjacent trailing edge of wing. Angular dimensions for checking control and trim tabs are measured by placing protractor on rigging reference lines on lower surface of tabs as shown in PAGEBLOCK 27-00-00/201. Aileron is in neutral position when center of aft outboard corner of aileron is 1/8(±1/8) inch (3.175(±3.175) mm) below adjacent wing trailing edge.

B. Control surfaces are adjusted to neutral position only. If surface throw limits are not obtained, check system for obstruction, excessive wear, or damage.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 601

Name and Number	Manufacturer
MLG Door safety locks 3936851-1, or -501 as applicable. (PAGEBLOCK 27-00-00/201)	Douglas Aircraft
Protractor (5916715)	Douglas Aircraft Co.
Spring Scale (40 pound capacity) (18.144 kg)	John Chantilon & Sons

3. Check Aileron and Tab

A. Check Aileron and Control Tab Travel

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(2) Depressurize spoiler hydraulic systems by moving spoiler shutoff and system depressurization levers, located in left and right wheelwells, to off position. Secure levers with safety pins.

WARNING: BEFORE MOVING AILERONS, MAKE CERTAIN THAT AREAS AROUND LEFT AND RIGHT AILERONS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Manually move right aileron trailing edge up until aileron bus cable stops contact, and rotate aileron control wheel clockwise approximately 100 degrees. Hold right aileron in full trailing edge up position and make the following checks.

NOTE: Aileron is in neutral position when center of aft outboard corner of aileron is 1/8(±1/8) inch (3.18(±3.18)mm) below adjacent wing trailing edge.

(a) Check that right aileron is 3 13/16(±1/8) inches (96.84(±3.18) mm), or 15(±0.5) degrees (0.26(±0.001) rad trailing edge up above neutral position.

(b) Check that right control tab is 32(±3) degrees below neutral position.

(c) Check that left aileron is 3 13/16(±1/8) inches (96.84(±3.18 mm), or 15(±0.5) degrees (0.26(±0.001) rad trailing edge down below neutral position.

(d) Check that left control tab is 32(±3) degrees (0.56(±0.05) rad above neutral position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(4) Manually move left aileron trailing edge up until aileron bus cable stops contact, and rotate aileron control wheel counterclockwise until wing sector control tab stops contact. Hold aileron in this position and make following checks:

WJE ALL

(a) Check that left aileron is 3 13/16(±1/8) inches (96.84(±3.18) mm), or 15(±0.5) degrees (0.26(±0.001) rad trailing edge up above neutral position.

(b) Check that left control tab is 32(±3) degrees (0.56(±0.05) rad below neutral position.

(c) Check that right aileron is 3 13/16(±1/8) inches (96.84(±3.18 mm), or 15(±0.5) degrees (0.26(±0.001) rad trailing edge down below neutral position.

(d) Check that right control tab is 32(±3) degrees (0.56(±0.05) rad above neutral position.

(5) Place ailerons and control tabs to neutral position.

(6) Place spoiler shutoff and system depressurization valve, located in left and right wheelwell, levers to ON position. Secure levers with safety pins.

B. Check Aileron Trim Tab Travel

(1) Rotate aileron trim control knob clockwise until stops contact and make following checks.

NOTE: When operating aileron trim control knob, intermovement of 1/32 inch (.792 mm) between aileron and rudder trim control knobs is acceptable.

(a) Check that left trim tab is 21(±1 1/2) degrees above faired position.

(b) Check that right trim tab is 21(±1 1/2) degrees below faired position.

(2) Rotate aileron trim control knob counterclockwise until stops contact and make following checks.

(a) Check that left trim tab is 21(±1 1/2) degrees below faired position.

(b) Check that right trim tab is 21(±1 1/2) degrees above faired position.

(3) Return trim tabs to faired position.

C. Check Lateral Control System for Excessive Friction

NOTE: Throughout the range of aileron system travel (total hysteresis loop), if the difference between input forces required to rotate control wheel from 10 to 60 degrees and the restraining forces required from 60 to 10 degrees exceeds 8 pounds (3.627 kg). Friction may be considered too high. Forces tend to stabilize between 10 and 60 degrees of control wheel rotation; therefore, this range is used to determine system friction in the following check. Aileron and tab control system (PAGEBLOCK 27-00-00/501) must be properly adjusted, aileron and tab throws (Paragraph 3.A.) and clearances must be within limits and that lateral control system must be properly lubricated prior to performing excessive friction check. (Figure 601 or Figure 602)

(1) Clamp aileron surfaces in neutral position.

NOTE: Aileron is in neutral position when center of aft outboard edge of aileron is 1/8(±1/8) inch (3.175(±3.175) mm) below adjacent wing trailing edge.

(2) Locate an index mark on hub of control wheel at 10 and 60 degrees in each direction from neutral mark. One degree of control wheel rotation equals .026 inch.

(3) Place speedbrake/spoiler control lever in unarmed retract position.

(4) Rotate aileron trim knob to zero position.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(5) Pressurize both hydraulic systems. (PAGEBLOCK 27-00-00/201)

(6) Assure neutral index marks on control wheels align.

(7) Check neutral position of aileron control tabs. If trailing edges do not align with ailerons, measure and record differences at outboard trailing edges of tabs.

(8) Attach spring scale to pilot's aileron control wheel.

(9) Utilizing spring scale, rotate control wheel from neutral to 70 degrees in each direction and return to neutral.

(a) Measure input forces required to rotate control wheel from 10 to 60 degrees.

(b) Measure force required to restrain control wheel from 60 to 10 degrees.

(10) If difference between forces measure above 8 pounds, (3.627 kg) excessive friction is indicated.

NOTE: In straight cable runs, guard pins may be removed, cables raised and pulleys rotated to detect noisy and/or seized bearings.

NOTE: Subsequent to accomplishment of each following item, if corrective action is necessary, depressurize hydraulic system, replace, repair defective parts or lubricate parts as required. Repeat Paragraph 3.C.(9) and Paragraph 3.C.(10)to determine that friction loads are acceptable.

(a) Check both control wheel assemblies for seized or worn bearings, proper installation of spacers and other hardware, and that installation bolts are tightened evenly. Rotate control wheel, observe and listen to detect noisy bearing or defective parts. Disconnect cable turnbuckles in either column to isolate control wheels.

(b) Check aileron override mechanism. Rotate control wheels and observe cable drums for evidence of guard pin or structural interference and seized bearings.

(c) Examine aileron cable runs, right and left hand sides throughout fuselage, right and left hand wings for broken pulleys, fairlead alignment, contaminated pressure seals, cable pull off, seized or frozen bearings in pulleys, sectors, and pushrod ends. Disconnect cable turnbuckles as necessary to isolate right side from left side.

(d) Check aileron servodrum for cable pull off and for free rotation, when disengaged.

(e) Check right and left hand lateral control mixers for obstruction or damage, cams and rollers for proper clearance, cleanliness, bearings in sectors and rod end for free rotation. Disconnect cables and/or linkages to isolate mixers from system.

(f) Disconnect pushrods, check control tab sectors and linkages for condition of bearings, check tab surfaces for tight hinges.

(g) Check right and left hand load feel spring installations for serviceability.

(h) Check spoiler cable runs in right and left hand wings for broken pulleys, fairlead alignment, cable pull off, seized bearings in control drums (four places) and linkages. Disconnect cable turnbuckles to isolate actuating mechanisms.

(11) After corrective action has been accomplished, slowly rotate control wheel counterclockwise until stops contact, then clockwise until neutral index marks align. Control tab should return to within 1/4 inch (6.35 mm) of dimension recorded in step (7). Repeat in opposite direction. Difference between input and return forces required to rotate control wheel should not exceed 8 pounds (3.63 kg).

(12) Shut off hydraulic pressure source.

(13) Remove aileron surface clamps.

WJE 405-411, 880, 881, 883, 884

(14) On aircraft without SB 27-247, securely fasten lateral mixer protective shields after completing all maintenance.

WJE ALL

(15) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

D. Check Aileron and Tab Clearances

(1) Check aileron and tab clearances as shown in Figure 601.

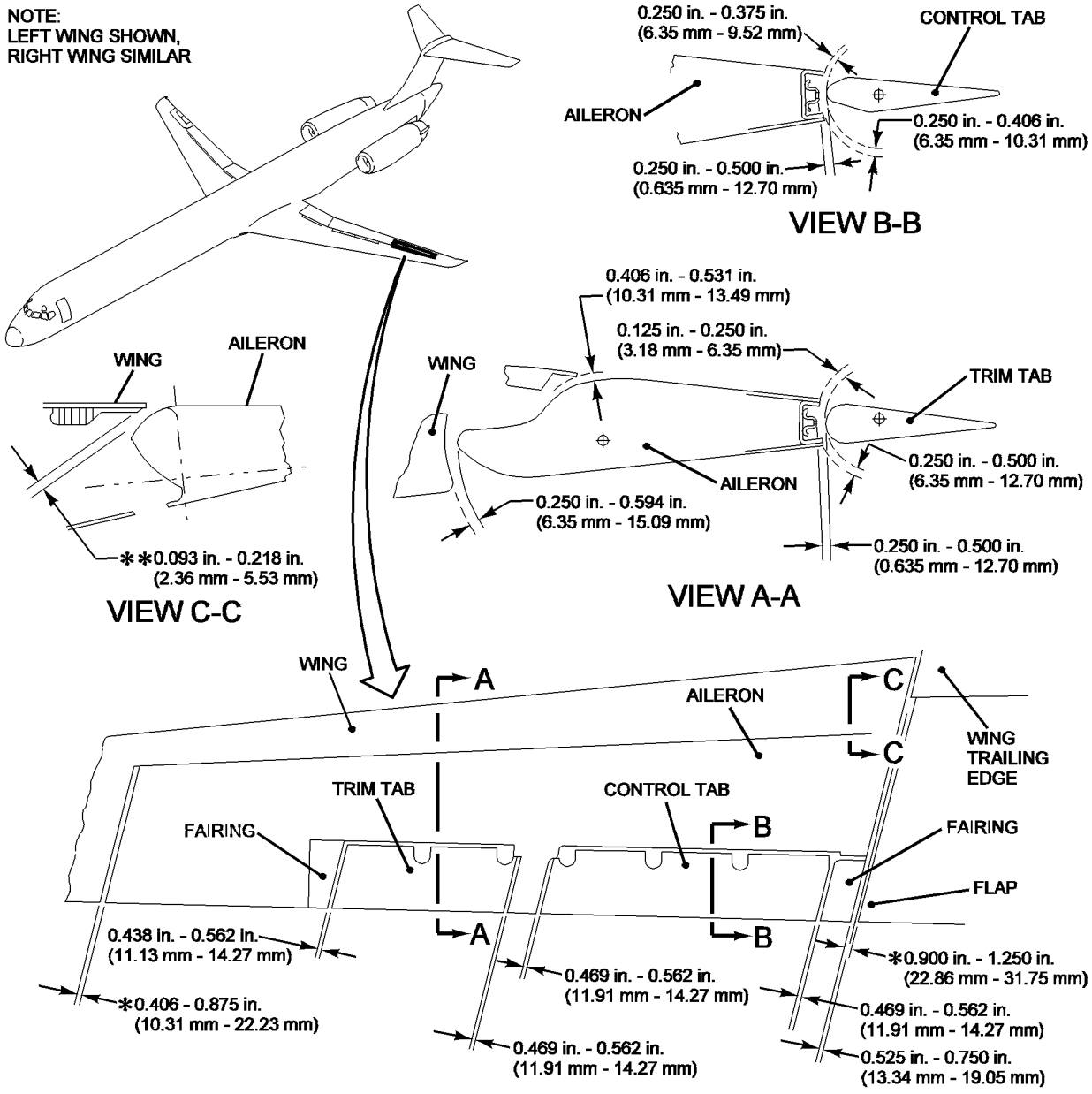
E. Check Aileron and Aileron Control Tab Looseness

(1) With aileron in neutral position, check that looseness at outboard end of aileron trailing edge does not exceed 1/8 inch, (3.175 mm).

NOTE: Aileron is in neutral position when center of aft outboard edge of aileron is 1/8(±1/8) inch (3.175(±3.175) mm) below wing trailing edge.

(2) Check that looseness at outboard end of aileron control tab trailing edge does not exceed 3/32 inch, (2.382 mm).

NOTE: Maximum allowable looseness on aileron and tab is checked by moving surface up and down from faired position.



∗ NOTE: (1) GAP DIMENSIONS FOR ITEMS 2 AND 3, TABLES I AND II, INBOARD AND OUTBOARD ENDS RESPECTIVELY, OF THE AILERON, ARE STRUCTURAL CLEARANCES TO BE MAINTAINED BETWEEN MINIMUM AND MAXIMUM LIMITS WITHOUT REGARD TO SEALS INSTALLLED HERE.

(2) CHECK AILERON OPERATION THAT SEALS ON INBOARD AND OUTBOARD ENDS DO NOT DRAG AND BIND ON ADJACENT STRUCTURE.

∗∗ NOTE: CLEARANCE TO BE MEASURED FROM LEADING EDGE SURFACE OF THE AILERON, SKIN ONLY.

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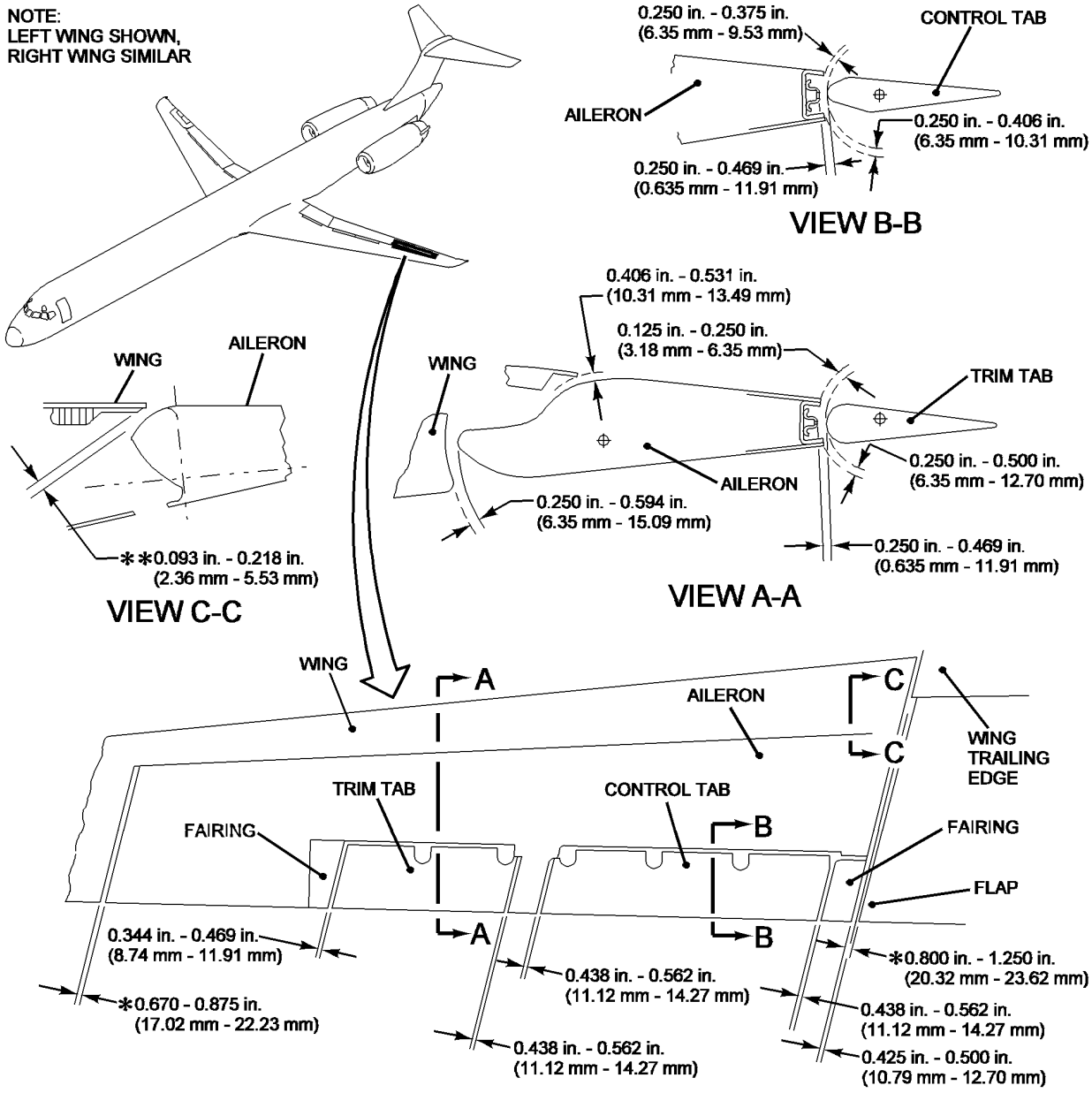
S0006534715V3

Aluminum Aileron -- Clearances
Figure 601/27-10-00-990-807



* NOTE: (1) GAP DIMENSIONS FOR ITEMS 2 AND 3, TABLES I AND II, INBOARD AND OUTBOARD ENDS RESPECTIVELY, OF THE AILERON, ARE STRUCTURAL CLEARANCES TO BE MAINTAINED BETWEEN MINIMUM AND MAXIMUM LIMITS WITHOUT REGARD TO SEALS INSTALLLED HERE.

(2) CHECK AILERON OPERATION THAT SEALS ON INBOARD AND OUTBOARD ENDS DO NOT DRAG AND BIND ON ADJACENT STRUCTURE.

** NOTE: CLEARANCE TO BE MEASURED FROM LEADING EDGE SURFACE OF THE AILERON, SKIN ONLY.

BBB2-27-511
S0000274752V1

Composite Aileron -- Clearances
Figure 602/27-10-00-990-808

AILERON - REMOVAL/INSTALLATION

1. General

A. An aileron is located at the trailing edge of each wing, outboard of the flaps. Each aluminum aileron weighs approximately 168 lb (76.20 kg). Each composite aileron weighs approximately 137 lb (62.14 kg).

NOTE: Aluminum ailerons can be installed on aircraft configured originally for composite ailerons with minimal rework (replacement of hinge link assemblies at hinge 2, 3, and 4). However, composite ailerons cannot readily be installed on aircraft configured originally for aluminum ailerons without extensive rework.

NOTE: When substituting a composite aileron for an aluminum aileron (and vice versa), both Left Hand (LH) and Right Hand (RH) ailerons should be replaced at the same time.

B. Removal and installation procedures are identical for left and right aluminum ailerons. (Paragraph 3.)

C. Removal and installation procedures are identical for left and right composite ailerons. (Paragraph 4.)

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 401

Name and Number	Manufacturer
Protractor (5916715)	Douglas Aircraft Co.
Sling (5916712-1)	Douglas Aircraft Co.
Torque Wrench 0 in-lb (0 N·m)-1500 in-lb (169 N·m)	
Lockwire, NASM20995N32, DPM 684*[1]	Not specified
Rig pin (8-7) ½ in. (13 mm) by 7⅝ in. (194 mm)	Douglas Aircraft Co.
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Aluminum Aileron

A. Remove the applicable aileron as follows: (Figure 401, Figure 403)

(1) Rotate aileron trim control knob on pedestal to align pointer with rig notch.

NOTE: There may be a difference between rigged neutral position and flight neutral position, therefore pointer may or may not align with flight neutral position on indicator placard.

(2) Install cable clamps on aileron trim cables adjacent to trim actuator or wing rib to prevent movement of cable system.

(3) Open the applicable access panels:

Access Panels

Access panel No.	Location
1554A	Upper surface of left aileron
1560A	Upper surface of left aileron

Access Panels (Continued)

Access panel No.	Location
1562A	Upper surface of left aileron
1573A	Upper surface of left aileron
1654A	Upper surface of right aileron
1660A	Upper surface of right aileron
1662A	Upper surface of right aileron
1671A	Upper surface of right aileron

(4) Remove bolts (1) to disconnect damper links from rear spar fittings.

NOTE: There are two aileron dampers for each aileron.

(5) Remove bolt (2) to disconnect aileron bus sector link (3) from eyebolt (4).

(6) Remove bolt (5) to disconnect control tab sector link (6) from aileron control tab idler crank.

(7) Remove bolt (19) to disconnect autopilot aileron position sensor link (10) from aileron control tab idler crank (20).

NOTE: The above step is for the left aileron only.

(8) Secure trim tab actuator with tape or equivalent to prevent rotation of actuator screw in housing.

(9) Remove bolt (7) to disconnect trim tab pushrod from actuator, making certain that actuator screw does not rotate and disturb trim adjustment.

(10) Arrange damper links and cranks so they will not obstruct removal of aileron.

(11) Remove plugs from sling attach holes in upper surface of aileron.

(12) Install sling on aileron and raise hoist to support weight of aileron, making certain that aileron is not lifted at this time. (Figure 402).

(13) Remove attaching hardware as follows:

(a) Remove nut (8) from eyebolt at hinges 1,2, 3, and 4 (Figure 401).

CAUTION: ALUMINUM AILERON WEIGHS APPROXIMATELY 168 POUNDS (76.20 KG). HANDLE CAREFULLY TO PREVENT DAMAGE TO AILERON OR ADJACENT STRUCTURES.

(14) Lift aileron up and aft with hoist, to disengage it from eyebolts. Remove aileron.

(15) Remove sling from aileron and install plugs in attach holes in aileron upper surface. (Figure 402)

B. Install the applicable aileron as follows

NOTE: Aluminum ailerons can be installed on aircraft configured originally for composite ailerons with minimal rework (see aircraft effectivity). However, composite ailerons cannot readily be installed on aircraft configured originally for aluminum ailerons without extensive rework.

NOTE: When substituting a composite aileron for an aluminum aileron (and vice versa), both left and right ailerons should be replaced at the same time.

(1) If installing aluminum aileron on aircraft configured for composite aileron, do the steps that follow:

(a) Remove link (14) at hinge number 2 and link (15) at hinge numbers 3 and 4. Retain bearings (Figure 403).

(b) Install link (16) at hinge number 2 and link (17) at hinge numbers 3 and 4 on hinge brackets. Torque nuts (18) to290 in-lb (33 N·m) to 415 in-lb (47 N·m).

(c) Install retained bearings on each link and torque nuts to 95 in-lb (11 N·m) to 115 in-lb (13 N·m).

(2) Prepare the area between base of eyebolt and aileron fitting at each hinge for electrical bond. (ELECTRICAL BONDING - MAINTENANCE PRACTICES, SWPM 20-50-01)

(3) Remove plugs from sling attach holes and install sling on upper surface of aileron. (Figure 402)

(4) Move aileron with sling and hoist to a position above and slightly aft of installed position.

(5) Position damper links so they will align with damper cranks on aileron when aileron is moved into place.

CAUTION: ALUMINUM AILERON WEIGHS APPROXIMATELY 168 POUNDS (76.20 KG). HANDLE CAREFULLY TO PREVENT DAMAGE TO AILERON OR ADJACENT STRUCTURES.

(6) Align eyebolts with hinge fittings, and lower aileron to engage eyebolts with fittings.

(7) Install washer and nut (8) on eyebolt at hinge 1. Torque nut to 1200 in-lb (136 N·m) to 1440 in-lb (163 N·m). Maintain alignment of eyebolt in fitting when tightening nut.

(8) Install nut (8) on eyebolts at hinges 2, 3, and 4. Torque nuts to 400 in-lb (45 N·m) - 450 in-lb (51 N·m). Maintain alignment of eyebolts in fittings when tightening nuts. (Figure 401).

(9) Remove sling from aileron.

(10) Install plugs in sling attach holes on upper surface of aileron.

(11) Insert rig pin (8-7) in rig hole (R-4) through aileron sector and bracket.

(12) Install bolt (2) to connect link (3) to eyebolt (4).

(13) Check the neutral position of aileron, neutral position when center of aft outboard corner of aileron is 0.125 ±0.125 in. (3.1750 ±3.1750 mm) below adjacent wing trailing edge.

(a) Add or remove shims under eyebolt (4) as required to adjust aileron neutral position

NOTE: Each 0.003 in. (0.0762 mm) shim moves aileron trailing edge approximately 0.01562 in. (0.39675 mm).

(b) Torque eyebolt (4) to 400 in-lb (45 N·m) - 450 in-lb (51 N·m).

(14) Install bolt (5) to connect control tab sector link (6) to idler crank (20) as follows:

(a) Install bolt head (5) facing outboard side. Orient idler crank (20) such that lockwire hole is located outboard with subject bolt head to allow for safetying. (Figure 401)(LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

CAUTION: SENSOR WILL BE DAMAGED IF ROTATED BEYOND INTERNAL STOPS.

(15) Install bolt (19) to connect autopilot aileron position sensor link (10) to aileron control tab idler crank (20).

NOTE: The above step is for the left aileron only.

(16) Adjust pushrod (9) as required to move control tab to faired position with aileron within one-quarter degree. Tighten jamnut on pushrod and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(17) Install bolt (7) to connect actuator to pushrod and crank.

(a) Install the bolt (7) with the bolt head outboard.

(18) Remove tape or equivalent, installed on trim tab actuator in Paragraph 3.A.(8).

(19) Loosen jamnut on eyebolt and rotate actuator screw as required to move trim tab to faired position with aileron within one-quarter degree. Tighten jamnut against serrated washer and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: The length of trim tab pushrod is shop preset. Do not adjust it.

(20) Remove cable clamps from aileron trim cables.

(21) Remove rig pin (8-7) from aileron sectors.

(22) Install bolt (1) to attach damper link to fittings on rear spar.

NOTE: There are two aileron dampers for each aileron.

(23) With the left aileron held and/or clamped in the faired position with adjacent wing surface, remove bolt (11) from link (10) and arm (12). (Figure 401) and (Figure 404)

CAUTION: SENSOR WILL BE DAMAGED IF ROTATED BEYOND INTERNAL STOPS.

(24) Rotate arm (12) until sensor detent is located or index marks are aligned, whichever applies.

(25) Loosen clamp bolt (13) and rotate sensor body until bolt (11) can be freely inserted through arm (12) and link (10).

(26) Tighten clamp bolt (13).

(27) Check bolt (11) for free insertion, install bolt (11). Safety nut with new cotter pin.

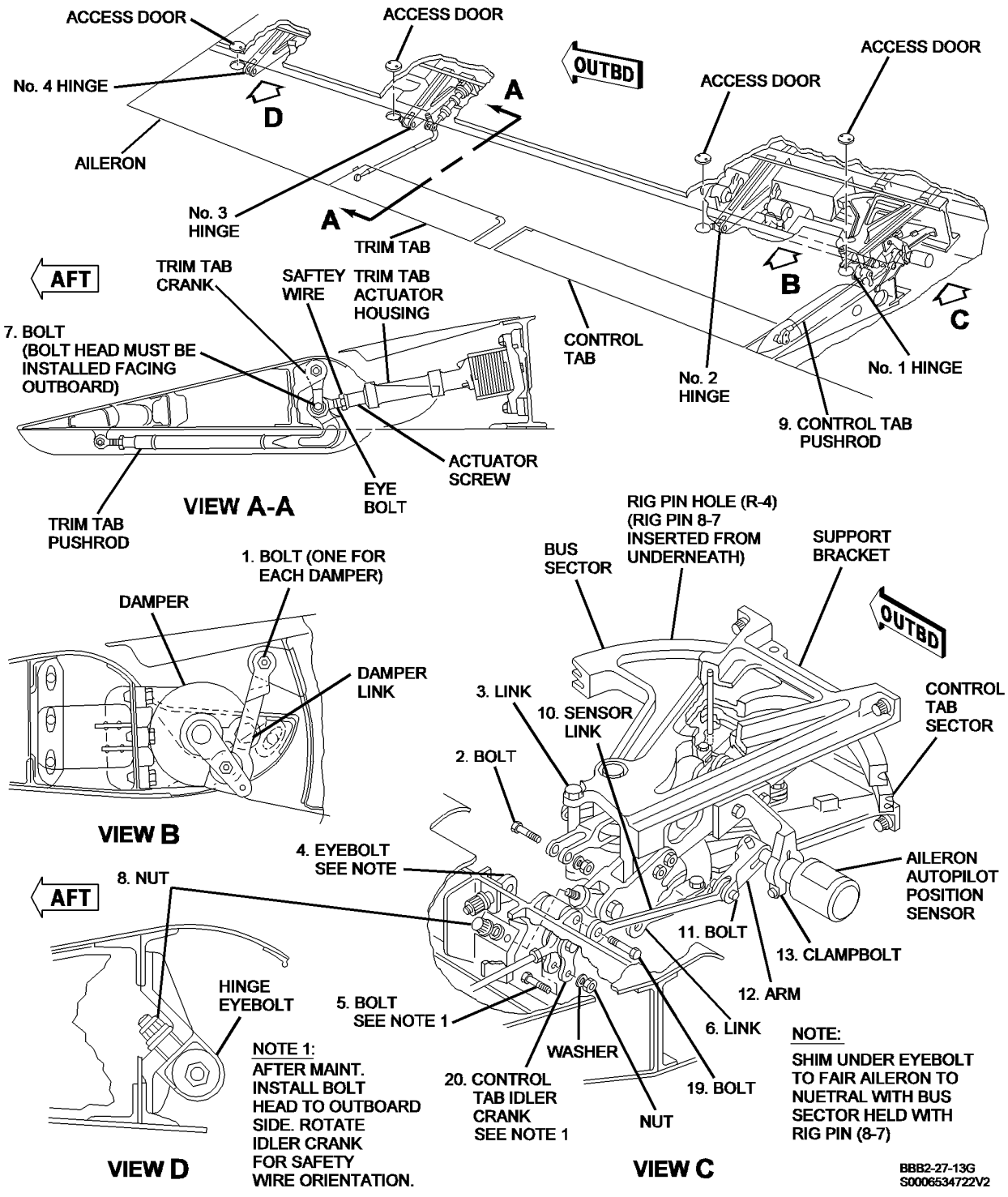
(28) If aileron was clamped in faired position, remove clamp.

(29) Lubricate aileron and tab fittings as applicable. (PAGEBLOCK 12-21-02/301)

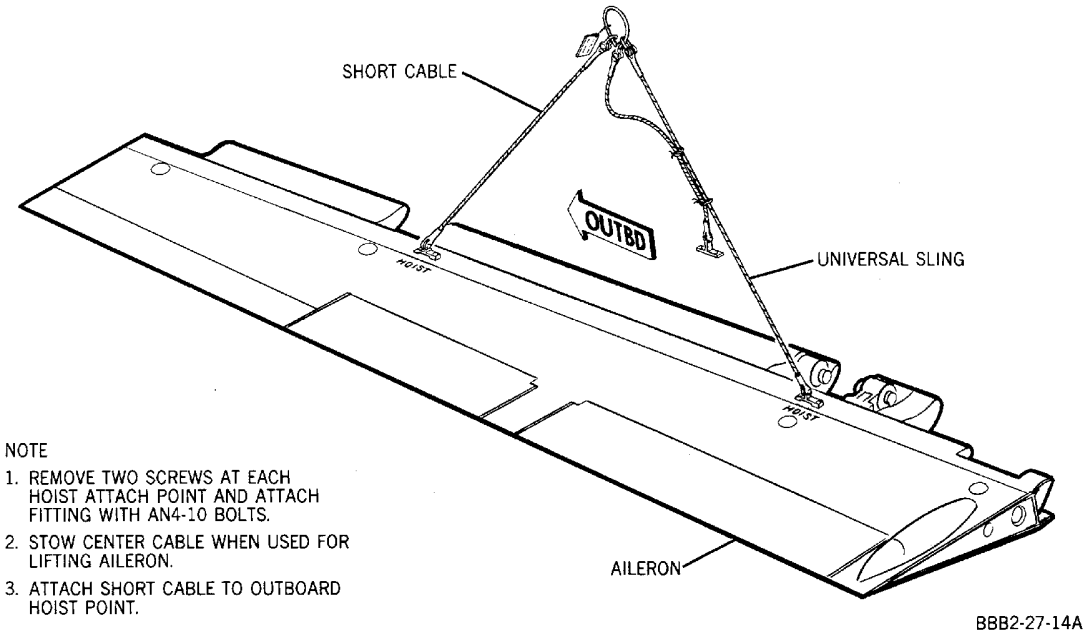
(30) Check aileron and tabs. (PAGEBLOCK 27-10-00/601)

(31) Check aileron position sensor. (PAGEBLOCK 22-01-03/201)

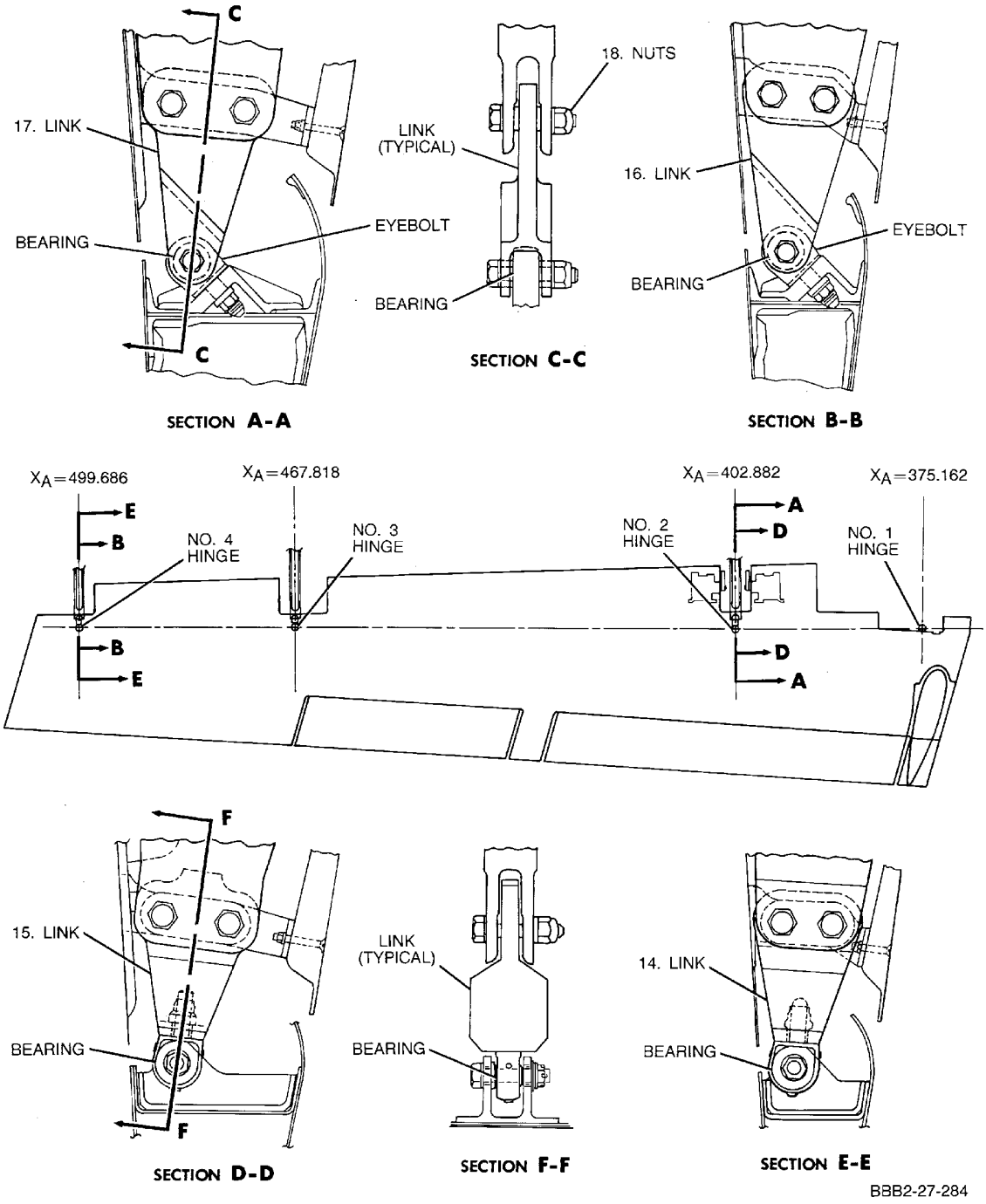
(32) Perform Return-to-Service (RTS) test. (DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201)



Aileron (Aluminum) -- Removal/Installation
Figure 401/27-10-01-990-801



Aileron -- Sling Installation
Figure 402/27-10-01-990-805



Aileron (Aluminum) -- Removal/Installation
Figure 403/27-10-01-990-806

4. Removal/Installation Composite Aileron

A. Remove the applicable composite aileron (1) as follows:(Figure 404)

(1) Rotate aileron trim control knob on pedestal to align pointer with rig notch.

NOTE: There may be a difference between rigged neutral position and flight neutral position, therefore pointer may or may not align with flight neutral position on indicator placard.

(2) Put the captain's or first officer's aileron control wheel to the neutral position.

(3) Attach a "DO NOT OPERATE" tag to the aileron trim control knob, the captain's and the first officer's aileron control wheel.

(4) Install cable clamps on aileron trim cables adjacent to trim actuator or wing rib to prevent movement of cable system.

(5) Remove bolt (2) and disconnect damper link (3) from rear spar fittings.

NOTE: There are two aileron dampers for each aileron.

(a) Secure the damper links out of the way.

(6) Remove bolt (4) and disconnect aileron sector link (5) from eyebolt (6).

(7) Remove bolt (7) and disconnect aileron tab sector link (8) from control tab idler crank (9).

(8) Remove bolt (10) and disconnect autopilot aileron position sensor link (11).

NOTE: The above step is for the left aileron only.

(9) Remove bolt (12) and disconnect trim tab actuator rod end (13) form the trim tab crank (14).

(a) Secure trim tab actuator with tape or equivalent to prevent rotation of actuator screw in housing.

(10) Arrange damper links and cranks so they will not obstruct removal of aileron.

(11) Install the universal sling to the applicable aileron assembly as follows:

(a) Remove two screws at each hoist attach point on the aileron and attach the fittings with AN 4–10 bolts.(Figure 402)

(b) Stow the center cable when lifting the aileron.

(c) Attach the short cable to the outboard hoist point.

(d) Raise hoist to support weight of aileron, making certain that aileron is not lifted at this time.

(12) Remove the aileron attaching hardware as follows:(Figure 404)

(a) Remove bolt (15) to disconnect aileron sector (17) from eyebolt (16) at hinge No.1.

(b) Remove bolt (18) from eyebolt at hinge No.2 and No.3.

(c) Remove bolt (19) from eyebolt at hinge No.4.

CAUTION: COMPOSITE AILERON WEIGHS APPROXIMATELY 137 POUNDS (62.14 KG). HANDLE CAREFULLY TO PREVENT DAMAGE TO AILERON OR ADJACENT STRUCTURES.

(13) Lift aileron up and aft with hoist, to disengage it from eyebolts. Remove aileron.

(a) Put the aileron (1) in a storage container or a stand.

(14) Remove sling from aileron and install plugs in attach holes in aileron upper surface.

B. Install the applicable composite aileron (1) as follows: Figure 404

NOTE: Aluminum ailerons can be installed on aircraft configured originally for composite ailerons with minimal rework (see aircraft effectivity). However, composite ailerons cannot readily be installed on aircraft configured originally for aluminum ailerons without extensive rework.

NOTE: When you replace a composite aileron for an aluminum aileron (and vice versa), both left and right ailerons must be replaced at the same time.

(1) Install the sling on the applicable aileron. (Paragraph 4.A.(11))

(2) Move aileron with sling and hoist to a position above and slightly aft of installed position.

(3) Put damper links so they will align with damper cranks on aileron (1) when it is moved into position.

CAUTION: COMPOSITE AILERON WEIGHS APPROXIMATELY 137 POUNDS (62.14 KG). HANDLE CAREFULLY TO PREVENT DAMAGE TO AILERON OR ADJACENT STRUCTURES.

(4) Align eyebolts with hinge fittings, and lower aileron to engage eyebolts with fittings.

(5) Install the aileron sector (17) on eyebolt (16) with bolt (15) at hinge No.1.

(a) Torque nut to 160 in-lb (18 N·m) to 190 in-lb (21 N·m). Keep eyebolt aligned in fitting when you tighten nut.

(b) Safety nuts with new cotter pins. (Figure 404)

(6) Install the attaching hardware as follows:(Figure 404)

NOTE: Bolt heads must face outboard.

(a) Install bolt (18), washer, and nut through eyebolt at hinges 2, 3.

(b) Install bolt (19), washer and nut through eyebolt at hinge 4

(c) Torque nuts at hinges 2, 3, and 4 to 95 in-lb (11 N·m) to 115 in-lb (13 N·m).

(d) Safety nuts with new cotter pins.

(7) Remove sling from aileron.

(a) Install plugs in sling attach holes on upper surface of aileron.

(8) Put rig pin (8-7) in rig hole (R-4) through aileron sector (16) and bracket.

(9) Connect link (5) to eyebolt (6) and install bolt (4).

(10) Check neutral position of aileron, neutral position when center of aft outboard corner of aileron is 0.125 ±0.125 in. (3.1750 ±3.1750 mm) below adjacent wing trailing edge.

(a) Add or remove shims under eyebolt (6) as required to adjust aileron neutral position.

NOTE: Each 0.003 in. (0.0762 mm) shim moves aileron trailing edge approximately 0.01562 in. (0.39675 mm).

(b) Torque nut on eyebolt (6) to 260 in-lb (29 N·m) to 300 in-lb (34 N·m).

(11) Connect control tab sector link (8) to the aileron control tab idler crank (9) as follows: (Figure 404)

(a) Install bolt (7) so the head points inboard. Orient aileron control tab idler crank (9) such that lockwire hole is located inboard with head of bolt (7) to allow for safetying. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

CAUTION: SENSOR WILL BE DAMAGED IF ROTATED BEYOND INTERNAL STOPS.

(12) Connect autopilot aileron position sensor link (11) to aileron control tab idler crank (9) with bolt (10).

NOTE: The above step is for the left aileron only.

(13) If necessary, adjust control tab pushrod (20) as follows

(a) Loosen jamnut, adjust the control tab to within ¼° faired position with aileron

(b) Tighten jamnut on pushrod and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(14) Connect trim tab actuator rod end (13) to trim tab crank (14) with bolt (12).

NOTE: Bolt must be installed with head facing inboard.

(a) Safety head of bolt with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(b) Put a new cotter through the nut and bolt (12).

(15) Remove tape or equivalent, used to secure the trim tab actuator .

(16) Adjust the trim tab actuator as follows:

NOTE: Do not adjust the length of trim tab pushrod, it is preset.

(a) Loosen jamnut on eyebolt, adjust the rotate actuator screw to move the control tab to within ¼° faired position with aileron

(b) . Tighten jamnut against serrated washer and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(17) Remove cable clamps from aileron trim cables.

(18) Remove rig pin (8-7) from aileron sector (16).

(19) Install bolt (2) to attach damper link (3) to fittings on rear spar.

NOTE: There are two aileron dampers for each aileron.

(20) Adjust the aileron position sensor (21) as follows:(Figure 404)

With the left aileron held and/or clamped in the faired position with adjacent wing surface, remove bolt (22) from link (10) and arm (12).

(a) Secure the left aileron in a faired position with adjacent wing surface.

(b) Remove bolt (22) from link (11) and arm (23).

CAUTION: SENSOR WILL BE DAMAGED IF ROTATED BEYOND INTERNAL STOPS.

(c) Rotate arm (23) until aileron position sensor (21) detent is located.

(d) Loosen clamp bolt (24) and rotate aileron position sensor (21) until bolt (22) can be freely inserted through arm (23) and link (11).

(e) Tighten clamp bolt (24).

(f) Make sure that bolt (22) can be freely inserted,

(g) Install bolt (22) and safety nut with new cotter pin.

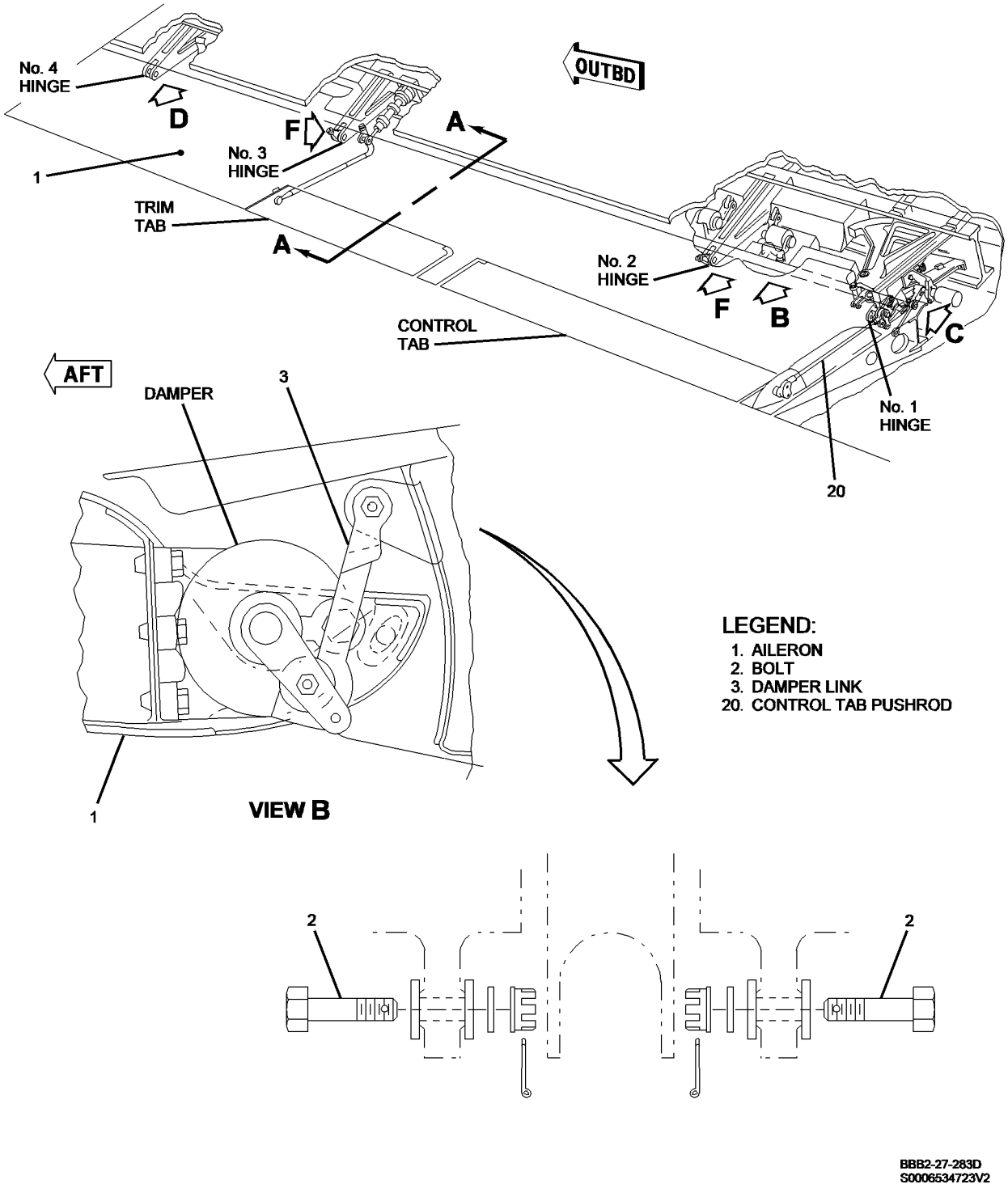
(21) Remove the device that is holding the left aileron in the faired position.

(22) Lubricate aileron and control tab and trim tab fittings. (PAGEBLOCK 12-21-02/301)

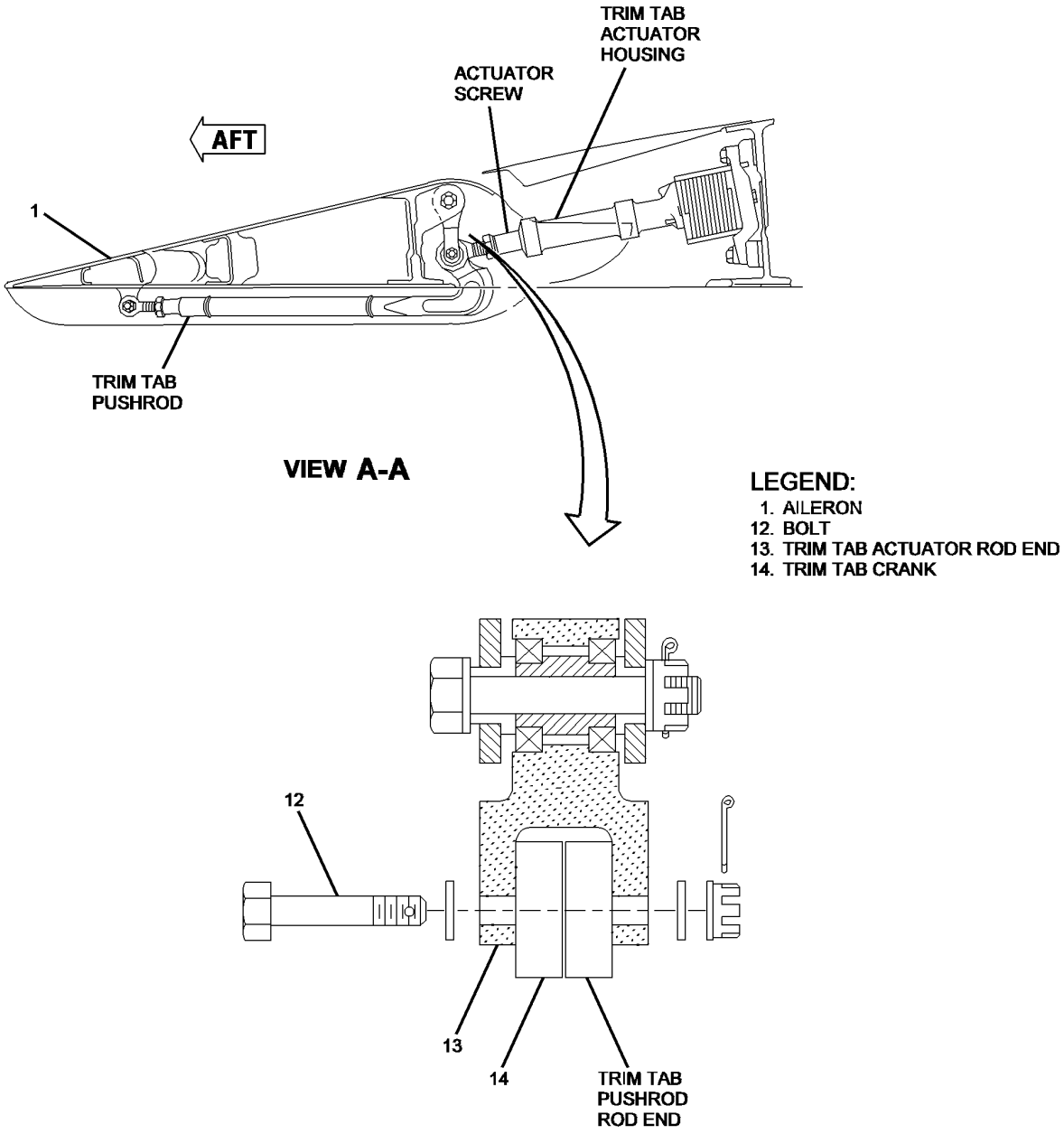
(23) Check aileron and tabs. (PAGEBLOCK 27-10-00/601)

(24) Check aileron position sensor. (PAGEBLOCK 22-01-03/201)

(25) Perform RTS test. (DFGS STATUS/TEST, SUBJECT 22-01-05)



Aileron (Composite) -- Removal/Installation
Figure 404/27-10-01-990-803 (Sheet 1 of 6)



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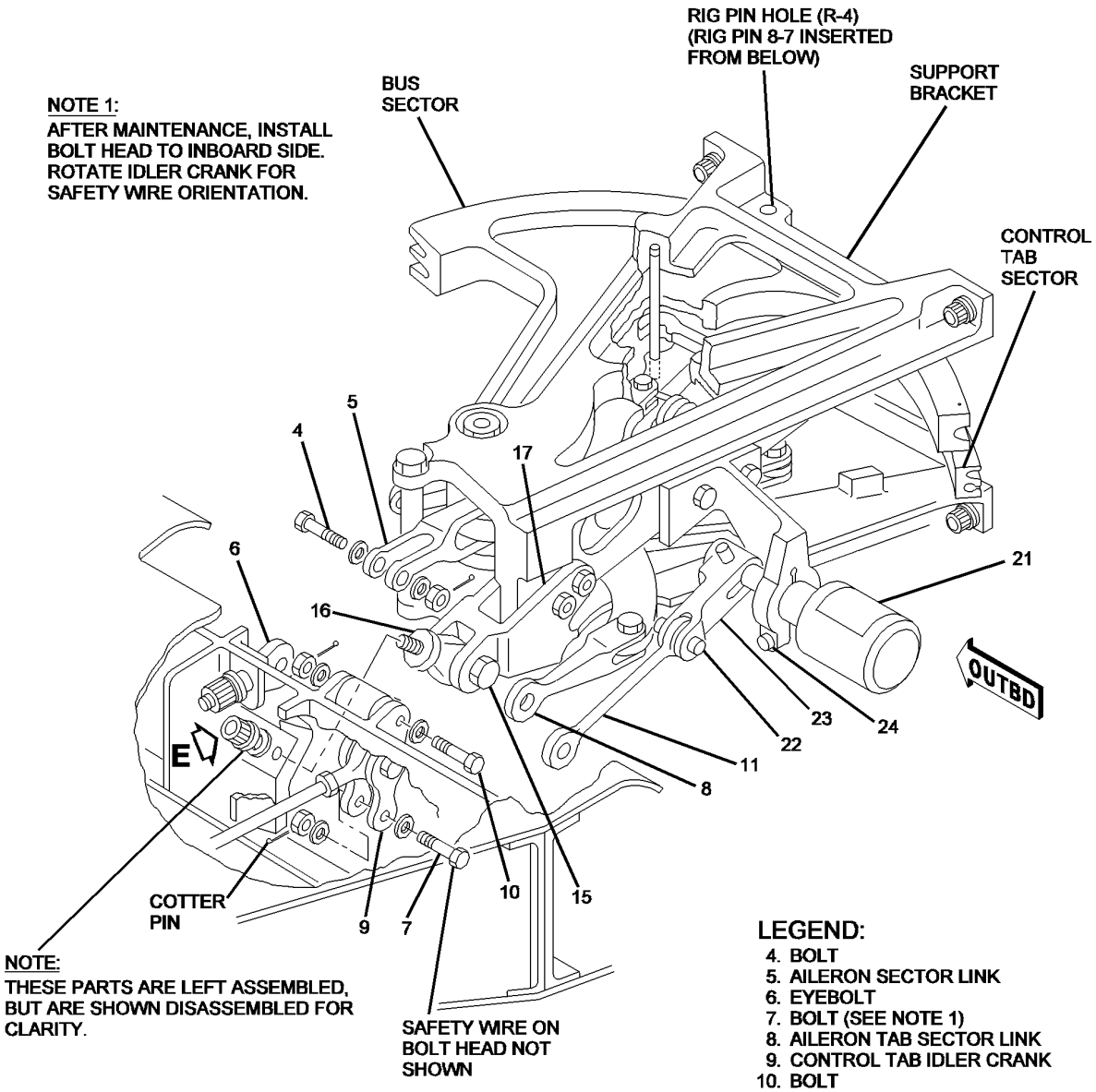
Aileron (Composite) -- Removal/Installation
Figure 404/27-10-01-990-803 (Sheet 2 of 6)



LEGEND:

4. BOLT
5. AILERON SECTOR LINK
6. EYEBOLT
7. BOLT (SEE NOTE 1)
8. AILERON TAB SECTOR LINK
9. CONTROL TAB IDLER CRANK
10. BOLT
11. AILERON POSITION SENSOR LINK
15. BOLT
16. EYEBOLT
17. AILERON SECTOR
21. AILERON POSITION SENSOR
22. BOLT
23. ARM
24. CLAMP BOLT

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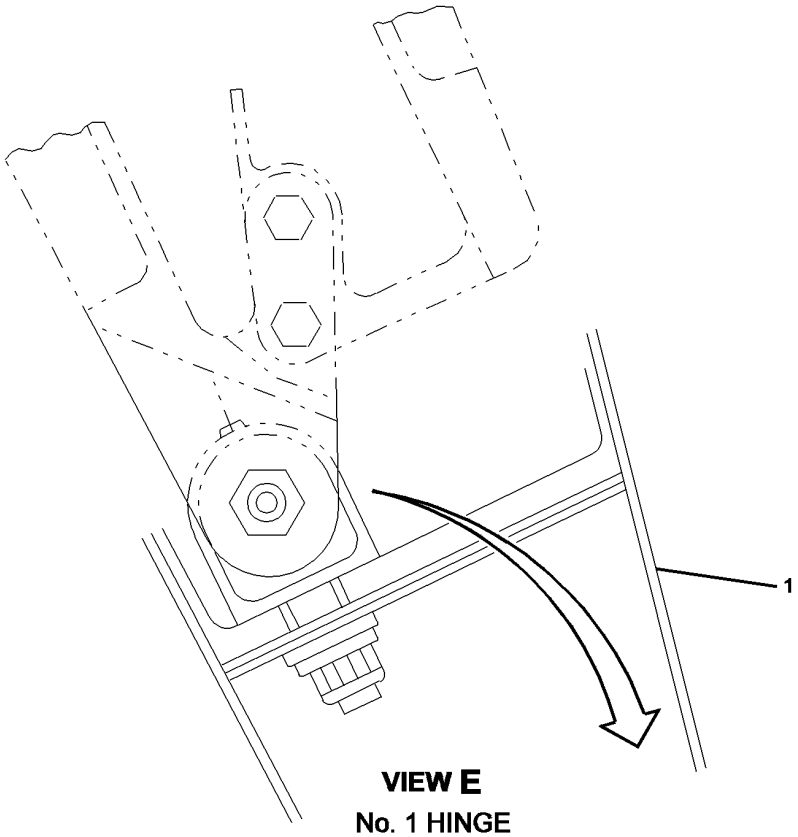
Aileron (Composite) -- Removal/Installation
Figure 404/27-10-01-990-803 (Sheet 3 of 6)



LEGEND:
1. AILERON
15. BOLT
16. EYEBOLT

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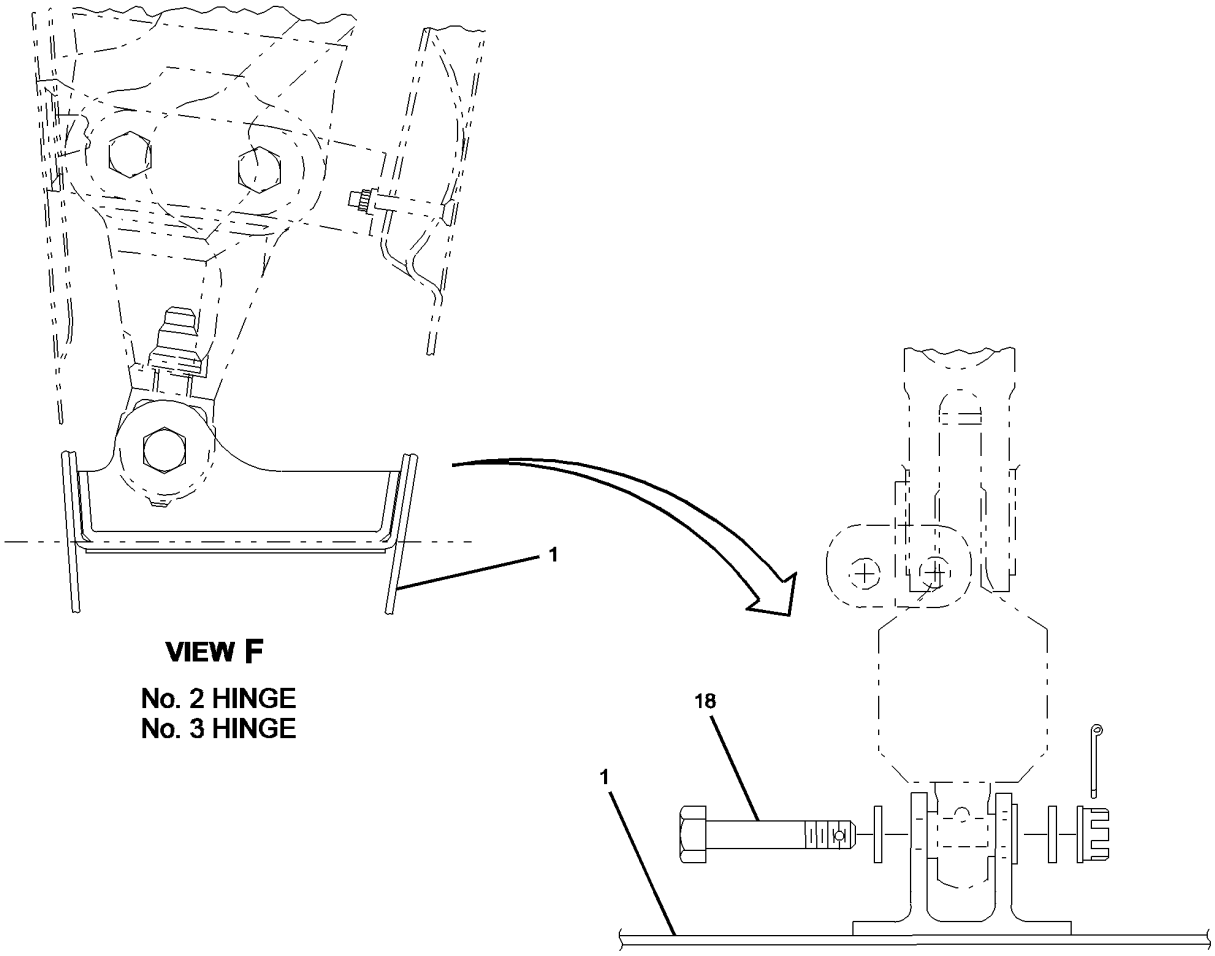
S0000285000V1

Aileron (Composite) -- Removal/Installation
Figure 404/27-10-01-990-803 (Sheet 4 of 6)



VIEW F

No. 2 HINGE
No. 3 HINGE

LEGEND:

1. AILERON
18. BOLT

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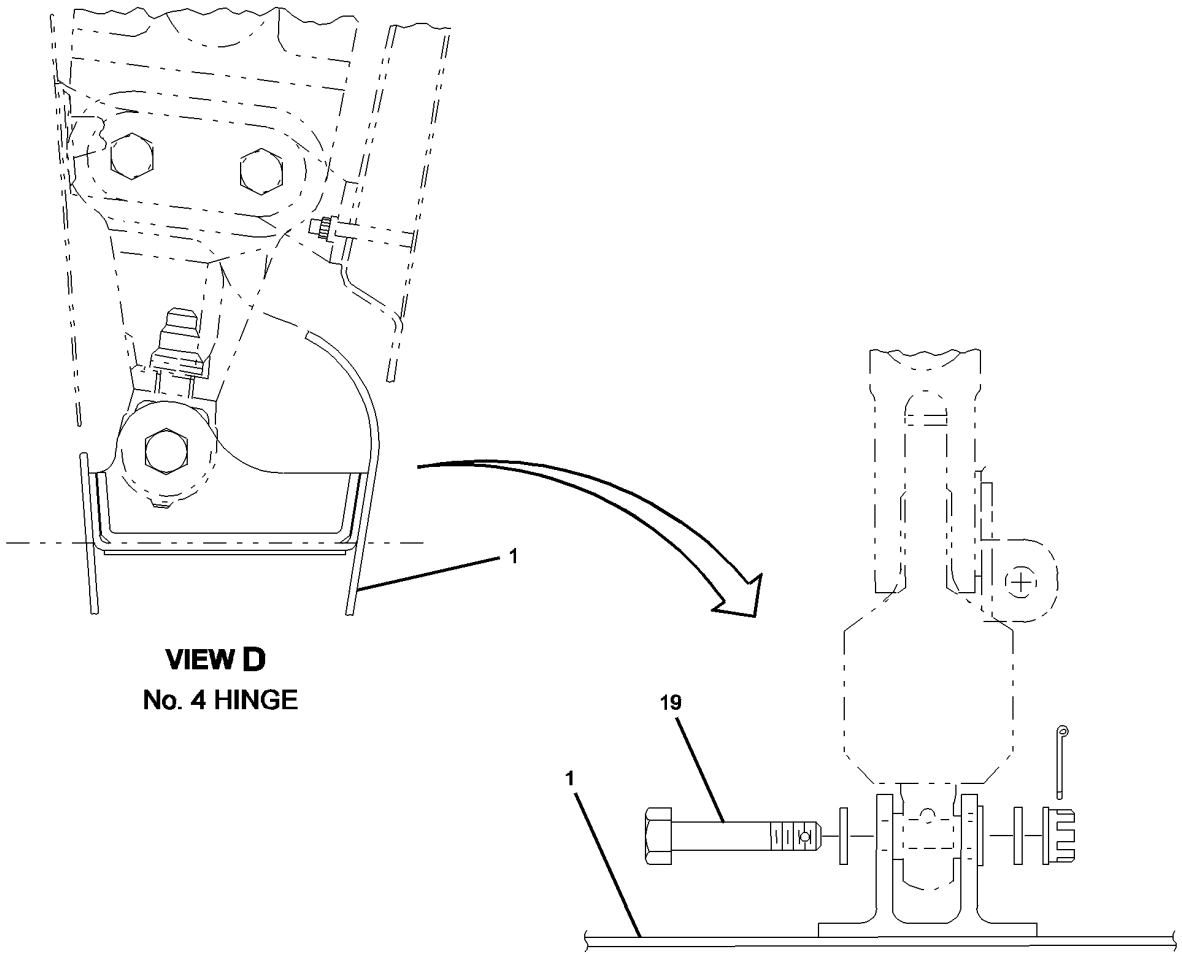
S0000285003V1

Aileron (Composite) -- Removal/Installation
Figure 404/27-10-01-990-803 (Sheet 5 of 6)



LEGEND:
1. AILERON
19. BOLT

BBB2-27-517
S0000285004V1

Aileron (Composite) -- Removal/Installation
Figure 404/27-10-01-990-803 (Sheet 6 of 6)

AILERON CONTROL TAB - MAINTENANCE PRACTICES

1. General

A. The aileron control tabs are located at the inboard trailing edge of each aileron. Each control tab weighs approximately 10 pounds (4.54 kg).

B. Access to the control tab pushrod and inboard hinge is gained by removal of the tab pushrod aft fairing and wing lower access doors.

C. Removal and installation procedures are identical for left and right aileron control tabs. Numbers in parentheses in the following text correspond to callouts in Figure 201.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
Protractor (5916715)	Douglas Aircraft Co.
Torque Wrench (0-300 inch-pounds) (0-33.9 N·m)	
Rig pin (8-7) 1/2 by 7 5/8 (12.7 x 193.675 mm)	Douglas Aircraft Co.
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch), (15.875 mm).	

3. Removal/Installation Aileron Control Tab

A. Remove Control Tab

(1) Remove bolt (1) to disconnect pushrod from tab.

(2) Remove bolt (2) at tab inboard hinge.

(3) Remove hinge bolts (3) and remove tab from aileron.

B. Install Control Tab

(1) Place control tab in position and install hinge bolts (3); tighten nuts to torque of 30 to 40 inch-pounds (3.39 to 4.52 N·m) and safety with cotter pin.

(2) Install bolt (2) at tab inboard hinge; tighten bolt to torque of 145 to 200 inch-pounds (16.39 to 22.6 N·m) and safety with lcockwire.

(3) Install bolt (1) with head facing inboard to connect pushrod to tab.

(4) Insert rig pin (8-7) in rig hole (R-4) through aileron tab and bus sectors.

(5) Loosen jamnut and adjust pushrod to align control tab trailing edge with aileron trailing edge within one-quarter degree.

(6) Remove rig pin (8-7) from sectors.

(7) Lubricate control tab fittings as applicable. (PAGEBLOCK 12-21-01/301)

(8) Check control tab. (Paragraph 4.)

4. Check Aileron Control Tab

A. Check control tab clearances as shown in Figure 201.

B. Check Control Tab Travel

NOTE: Angular dimensions for checking control tab travel are measured by using protractor as described in PAGEBLOCK 27-00-00/201. Control surfaces are adjusted to neutral position only. If surface throw limits are not obtained, check system for obstruction, excessive wear, or damage.

(1) Make certain left and right hydraulic systems are depressurized.

WARNING: BEFORE MOVING AILERONS, MAKE CERTAIN THAT AREAS AROUND LEFT AND RIGHT AILERONS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) With left aileron held manually in full down position, rotate aileron control wheel clockwise until stops contact and check left or right control tab as follows:

(a) Check that left control tab is 32(±3) degrees above faired position.

(b) Check that right control tab is 32(±3) degrees below faired position.

(3) With right aileron manually held in full down position, rotate aileron control wheel counterclockwise until stops contact. Check left or right control tab as follows:

(a) Check that right control tab is 32(±3) degrees above faired position.

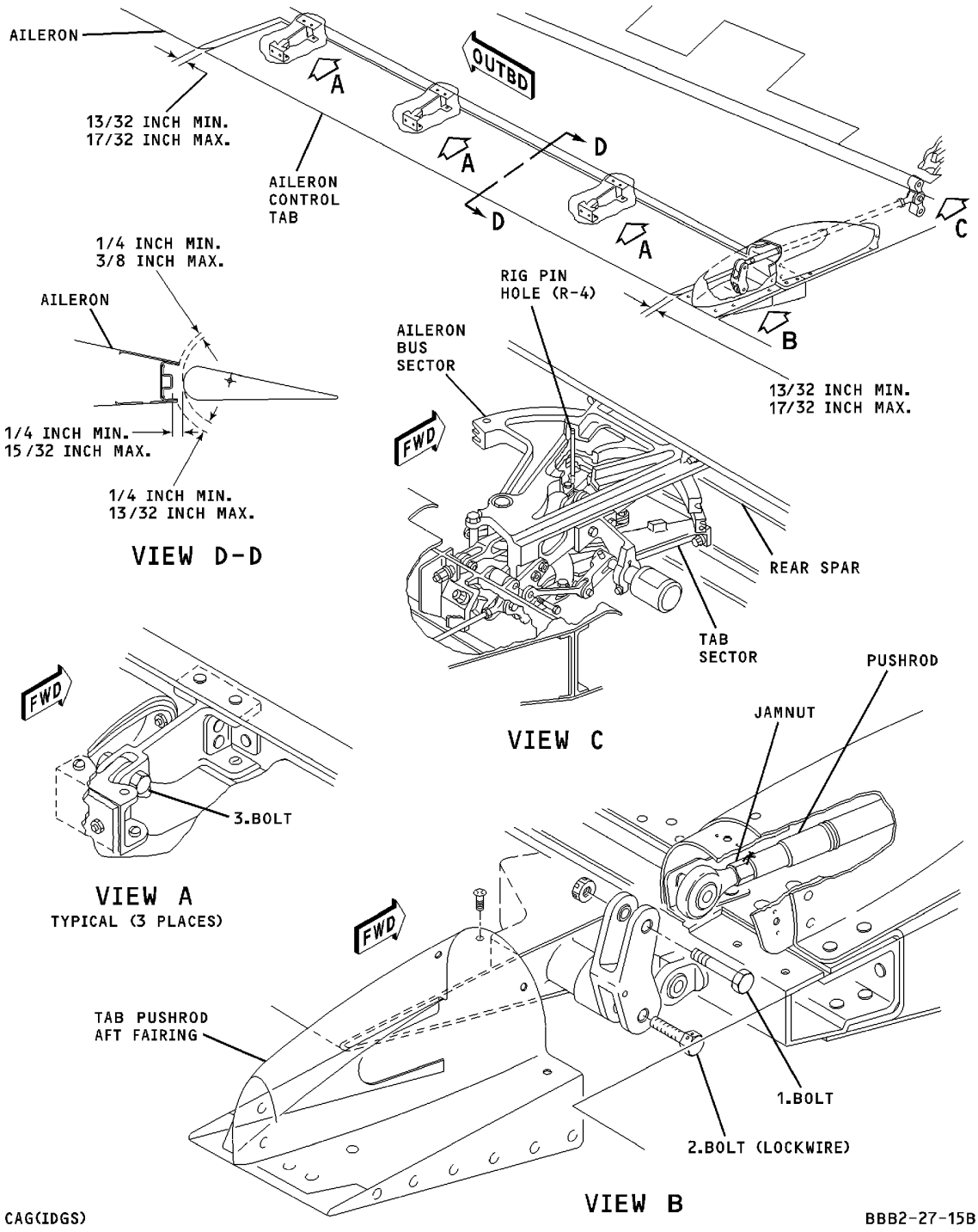
(b) Check that left control tab is 32(±3) degrees below faired position.

(4) Return ailerons and tabs to neutral position.

(5) Check that looseness at outboard end of aileron control tab trailing edge does not exceed 3/32 inch, (2.382 mm).

NOTE: Maximum allowable looseness on aileron and tabs is checked by moving surface up and down from faired position.

NOTE: Aileron is in neutral position when center of aft outboard edge of aileron is 1/8(±1/8) inch (3.175(±3.175) mm) below wing trailing edge.



Aileron Control Tab -- Removal/Installation
Figure 201/27-10-02-990-801

AILERON SECTORS AND LOAD FEEL CRANKS - REMOVAL/INSTALLATION

1. General

A. The aileron bus sector, control tab sector, and load-feel cranks are hinged on a common bolt in the inboard hinge support bracket of each aileron. Access to sectors is through the wing upper and lower surface access doors at the aileron inboard hinge. The turnbuckles are accessible with the flaps extended.

B. The sectors and cranks can be removed and installed with the bracket and aileron installed as described in Paragraph 3.A. and Paragraph 3.C.. If bracket is to be removed with sectors, follow procedures described in Paragraph 3.B. and Paragraph 3.D..

C. Removal and installation procedures are identical for left and right sectors, cranks, and brackets, except as noted. Numbers in parentheses in the following text correspond to callouts in Figure 401.

D. The linear dimensions for checking aileron travel are measured from outboard trailing edge of aileron to trailing edge of adjacent wing tip. Angular dimensions for checking tab travel are measured by placing protractor on rigging reference lines on lower surface of tabs as shown in PAGEBLOCK 27-00-00/201. Aileron is in neutral position when center of aft outboard corner of aileron is 1/8(±1/8) inch (3.175(±3.175) mm) below adjacent wing trailing edge.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 401

Name and Number	Manufacturer
Tensiometer	Pacific Scientific Co.
Spring scale (40-pound capacity) (18.143 kg)	John Chatilon & Sons
Protractor (5916715)	The Boeing Company
MLG door safety locks 3936851-1, or -501 as applicable. (PAGEBLOCK 27-00-00/201)	The Boeing Company
Lockwire, NASM20995N32, DPM 684*[1]	Not specified
Rig pin (8-7) 1/2 by 7 5/8 (.5000 x 193.675 mm)	
Rig pin (4-10) 1/4 by 10 5/8 (.2500 x 269.875 mm)	
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch) (15.875 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Aileron Sectors and Load-Feel Cranks

A. Remove Sectors and Load-Feel Cranks

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS. MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE. MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(4) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Loosen turnbuckles (1) outboard of aileron bus cable stops to relieve cable tension.

(6) Loosen turnbuckles (2) to relieve tension from control tab cables.

(7) Disconnect cables from sectors.

(8) Remove bolt (3) to disconnect tab sector link (4) and autopilot aileron position sensor link (21) (left aileron only) from idler crank.

(9) Remove bolt (25) to disconnect autopilot aileron position sensor link (21) (left aileron only) from aileron control tab idler crank.

(10) Remove bolt (5) to disconnect bus sector link (6) from eyebolt (7).

CAUTION: USE CARE DURING REMOVAL OF SPRING TO PREVENT NICKS OR ABRASIONS ON COILS OR HOOK ENDS OF SPRING.

(11) Remove spring (8) from cranks.

(12) Remove bolt (9) and remove sectors and cranks from bracket.

(13) Disconnect tab sector link (4) from tab sector and bus sector link (6) from bus sector.

B. Remove Sectors, Load-Feel Cranks, and Bracket

(1) Remove aileron. (PAGEBLOCK 27-10-01/401)

(2) If removing load-feel bracket from left wing perform following:

(a) On flight guidance control panel, place AP switch to 1 position.

(b) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2
C	12	B10-339	DIGITAL FLIGHT GUIDANCE SYSTEM ALPHA-1
C	13	B10-337	DIGITAL FLIGHT GUIDANCE SYSTEM FLAP POSITION-1

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2
C	3	B10-340	DIGITAL FLIGHT GUIDANCE SYSTEM ALPHA-2
C	4	B10-338	DIGITAL FLIGHT GUIDANCE SYSTEM FLAP POSITION-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1

(c) Disconnect electrical connector from autopilot aileron position sensor.

(3) Loosen turnbuckles (1) outboard of bus cable stops to relieve cable tension.

(4) Loosen turnbuckles (2) to relieve tension from control tab cables.

(5) Disconnect cables from sectors.

(6) Remove nuts (10) and shims (11), and remove bracket with sectors and cranks; note position of shims and retain for installation.

(7) Remove hinge eyebolt from bracket.

C. Install Sectors and Load-Feel Cranks

(1) Connect bus sector link (6) to bus sector and tab sector link (4) to control tab sector.

(2) Place sectors and cranks in position and install bolt (9).

(3) Install washer and nut on bolt (9) and tighten nut until vertical play in sector assembly has been removed. Loosen nut on castellation and install cotter pin.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(a) Make certain that vertical play in sector assembly does not exceed 0.156 inch (3.96 mm) maximum. Vertical play is measured along circumference of sector.

WJE ALL

CAUTION: USE CARE DURING INSTALLATION OF SPRING TO PREVENT NICKS OR ABRASIONS ON COILS ON HOOK ENDS OF SPRING.

(4) Install spring (8) on cranks.

(5) Install cables in sectors, making certain that cables are properly routed through wing trailing edge; safety cable ball ends with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(6) Adjust turnbuckles (2) to obtain tension of 64 pounds (28.8 kg) at 70°F (21.1°C) for 1/8-inch (3.175 mm) cables. Compensate for temperature. (Figure 402)

(7) Adjust turnbuckles (1) until tension is between minimum and maximum load per cable tension table for aileron bus cables. Compensate for temperature. (Figure 403)

(8) Move aileron control wheel several times to stabilize cable tension and adjust turnbuckles as required to obtain tensions specified in Paragraph 3.C.(6) and Paragraph 3.C.(7).

(9) Insert rig pin (4-10) in rig hole (R-7) in lateral control mixer in wheelwell nearest cranks being installed.

(10) Insert rig pin (8-7) in rig hole (R-4) through aileron sectors and bracket on opposite side of sectors being installed.

(11) Differentially adjust turnbuckles (2) to align rig pin hole (R-4) in aileron control tab sector (12) with rig pin hole in bracket.

(12) Differentially adjust turnbuckles (1) to align rig pin hole (R-4) in sector (15) with rig pin hole in bracket.

(13) Insert rig pin (8-7) in rig pin hole (R-4) through sectors and bracket.

(14) Adjust load-feel spring as follows:

(a) Loosen jamnuts and turn stops (14) away from stop.

(b) Connect spring scale to roller (16) bolt and pull scale outboard directly in line with centerline of spring and measure force required to start cranks moving.

(c) Symmetrically adjust stop (13) as necessary to require a force of 6.5(+0.0, -0.5) pounds (2.946(+0.0, -0.226) kg) on spring scale.

(d) Adjust stops (14) sufficiently to eliminate play between sector and cranks.

(e) Tighten jamnuts on four stopbolts.

(15) Install bolt (5) to connect bus sector link (6) to eyebolt (7).

(16) Check position of aileron and add or remove laminated shims (17) as required to place aileron in neutral position. Tighten nut on eyebolt to torque of 400 to 450 inch-pounds (44.8 to 50.4 N·m) for aluminum ailerons and 260 to 300 inch-pounds (29.4 to 33.9 N·m) for composite ailerons.

(17) Aileron is in neutral position when center of aft outboard corner of aileron is 1/8(±1/8) inch (3.175(±3.175) mm) below adjacent wing trailing edge. Each 0.003-inch shim moves aileron trailing edge approximately 1/64 inch (1.587 mm).

(18) Install bolt (3) to connect aileron control tab sector link (4) to idler crank.

(19) Install bolt (25) to connect autopilot aileron position sensor link (21) (left aileron only) to aileron control tab idler crank.

(20) Adjust pushrod (18) as required to move control tab to faired position with aileron within one-quarter degree. Tighten jamnut and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(21) Adjust inboard aileron bus cable stop (19) to obtain dimension of 5 1/32(±1/32) inches (127.792(±.792) mm) between cable stop (19) and fixed stop (20); hold turnbuckles (1) and rotate cable stop (19) to obtain dimension. (Figure 401 View D-D)

(22) Turnbuckle (1) may be held by installing safety clips in portion of turnbuckle attached to cable.

(23) Adjust outboard cable stops (19) to obtain dimension of 4 7/8(±1/32) inches (123.825(±0.792) mm) between cable stop (19) and fixed stop (20). Hold turnbuckles and rotate cable stop (19) to obtain dimension. (Figure 401 View C-C)

(24) Safety all turnbuckles with clips.

(25) Remove rig pins (8-7) from left and right sectors and brackets.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

(26) Remove rig pin (4-10) from lateral control mixer.

WJE 405-411, 880, 881, 883, 884

(27) Remove rig pin (4-10) from lateral control mixer, and on airplanes before incorp. of SB 27-247 securely fasten mixer protective shield.

WJE ALL

(28) Manually move aileron through full travel, outboard cable stop (19) should contact fixed stop (20). Inboard cable stop (19) should not contact fixed stop (20), both wings.

(29) Check aileron and control tab travel. (Paragraph 4.).

(30) If left wing sectors and load-feel cranks were installed, adjust aileron position sensor. (Paragraph 3.E.)

D. Install Sectors, Load-Feel Cranks, and Brackets

(1) If installing load-feel bracket on left wing, perform following:

(a) Make certain that AP switch, on flight guidance control panel, is in 1 position.

(b) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2
C	12	B10-339	DIGITAL FLIGHT GUIDANCE SYSTEM ALPHA-1
C	13	B10-337	DIGITAL FLIGHT GUIDANCE SYSTEM FLAP POSITION-1

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2
C	3	B10-340	DIGITAL FLIGHT GUIDANCE SYSTEM ALPHA-2

(Continued)

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	4	B10-338	DIGITAL FLIGHT GUIDANCE SYSTEM FLAP POSITION-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1

(2) Install sectors and cranks with original bracket as follows:

(a) Install hinge eyebolt on bracket.

(b) Place original shims (11) on bracket mounting studs in positions noted in Paragraph 3.B.(5).

(c) Install bracket with sectors and cranks; tighten attach nuts (10) to torque of 260 to 320 inch-pounds (29.12 to 35.84 N·m).

(d) Proceed to step (4) to complete installation.

(3) Install new bracket as follows:

(a) Remove hinge eyebolts from other three aileron hinges.

(b) Draw string or wire through center of each hinge bracket eyebolt attach hole to establish hinge centerline.

(c) Place bracket with sectors and cranks in position and install shims (11) as required between bracket and rear spar to align bracket hinge eyebolt attach hole with hinge centerline; remove string or wire from hinge brackets.

(d) Install nuts (10) and tighten to torque of 260 to 320 inch-pounds (29.12 to 35.84 N·m).

(e) Install hinge eyebolt on each hinge bracket.

(4) Install aileron. (PAGEBLOCK 27-10-01/401)

(5) Install cables in sectors, making certain that cables are properly routed through wing trailing edge. Safety cable ball ends with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(6) Adjust turnbuckles (2) until tension is between minimum and maximum load per cable tension table for 1/8-inch (3.175 mm) cables. Compensate for temperature. (Figure 402)

(7) Adjust turnbuckles (1) until tension is between minimum and maximum load per cable tension table for aileron bus cables. Compensate for temperature. (Figure 403)

(8) Move aileron control wheel several times to stabilizer cable tension and readjust turnbuckles as necessary to obtain tensions specified in Paragraph 3.D.(6) and Paragraph 3.D.(7).

(9) Insert rig pin (4-10) in rig pin hole (R-7) in lateral control mixer in wheelwell nearest sectors being installed.

(10) Insert rig pin (8-7) in rig pin hole (R-4) through aileron sectors and bracket on side opposite of sectors being installed.

(11) Differentially adjust turnbuckles (2) to align rig pin hole (R-4) in sector (12) with hole in bracket.

(12) Differentially adjust turnbuckles (1) to align rig pin hole (R-4) in sector (15) with hole in bracket.

(13) Insert rig pin (8-7) in rig pin hole (R-4) through sectors and bracket.

(14) Adjust load-feel spring as follows:

(a) Loosen jamnuts and turn stops (14) away from stop.

(b) Connect spring scale to roller (16) bolt and pull scale outboard directly in line with centerline of spring and measure force required to start crank moving.

(c) Symmetrically adjust stops (13), as necessary, to require a force of 6.5(+0.0,-0.5) pounds (2.95(+0.0,-0.23) kg) of spring scale.

(d) Adjust stops (14) sufficiently to eliminate play between sector and cranks.

(e) Tighten jamnuts on four stop bolts.

(15) Adjust inboard aileron bus cable stop (19) to obtain dimension of 5 1/32(±1/32) inches (127.79(±.79) mm) between cable stop (19) and fixed stop (20); hold turnbuckles (1) and rotate cable stops (19) to obtain dimension. (Figure 401 View D-D)

(16) Turnbuckles (1) may be held by installing safety clips in portion of turnbuckle attached to cable.

(17) Adjust outboard cable stop (19) to obtain dimension of 4 7/8(±1/32) inches (123.83(±.79) mm) between cable stop (19) and fixed stop (20). Hold turnbuckles and rotate cable stop (19) to obtain dimension. (Figure 401 View C-C)

(18) Safety turnbuckles (1) and (2) with clips.

(19) Remove rig pin (8-7) from left and right aileron sectors.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

(20) Remove rig pin (4-10) from lateral control mixer.

WJE 405-411, 880, 881, 883, 884

(21) Remove rig pin (4-10) from lateral control mixer, and on airplanes before incorp. of SB 27-247 securely fasten mixer protective shield.

WJE ALL

(22) Manually move left hand aileron full trailing edge down. Outboard cable stop (12) should contact its corresponding fixed stop (13) on left hand wing.

(23) Manually move right hand aileron full trailing edge down. Outboard cable stop (12) should contact its corresponding fixed stop (13) on right hand wing.

(24) Manually move ailerons full travel in either direction. Inboard wing fixed stop (13) and cable stop (12) should not contact.

(25) If left load feel bracket was installed, perform following:

(a) Connect electrical connector to autopilot aileron position sensor.

(b) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2
C	12	B10-339	DIGITAL FLIGHT GUIDANCE SYSTEM ALPHA-1
C	13	B10-337	DIGITAL FLIGHT GUIDANCE SYSTEM FLAP POSITION-1

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2
C	3	B10-340	DIGITAL FLIGHT GUIDANCE SYSTEM ALPHA-2
C	4	B10-338	DIGITAL FLIGHT GUIDANCE SYSTEM FLAP POSITION-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1

(26) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

(27) If left wing load-feel bracket was installed, adjust aileron position sensor. (Paragraph 4.)

E. Adjust Aileron Position Sensor

(1) Aileron controls must be adjusted prior to adjusting aileron position sensor. The position sensor is located on the left wing only.

(2) With the left aileron held and/or clamped in the faired position with adjacent wing surface, remove bolt (22) from sensor link (21) and arm (23). (Figure 401 View A)

CAUTION: SENSOR WILL BE DAMAGED IF ROTATED BEYOND INTERNAL STOPS.

(3) Rotate arm (23) until sensor detent is located.

(4) Loosen clamp bolt (24) and rotate sensor body until bolt (22) can be freely inserted through arm (23) and sensor link (21).

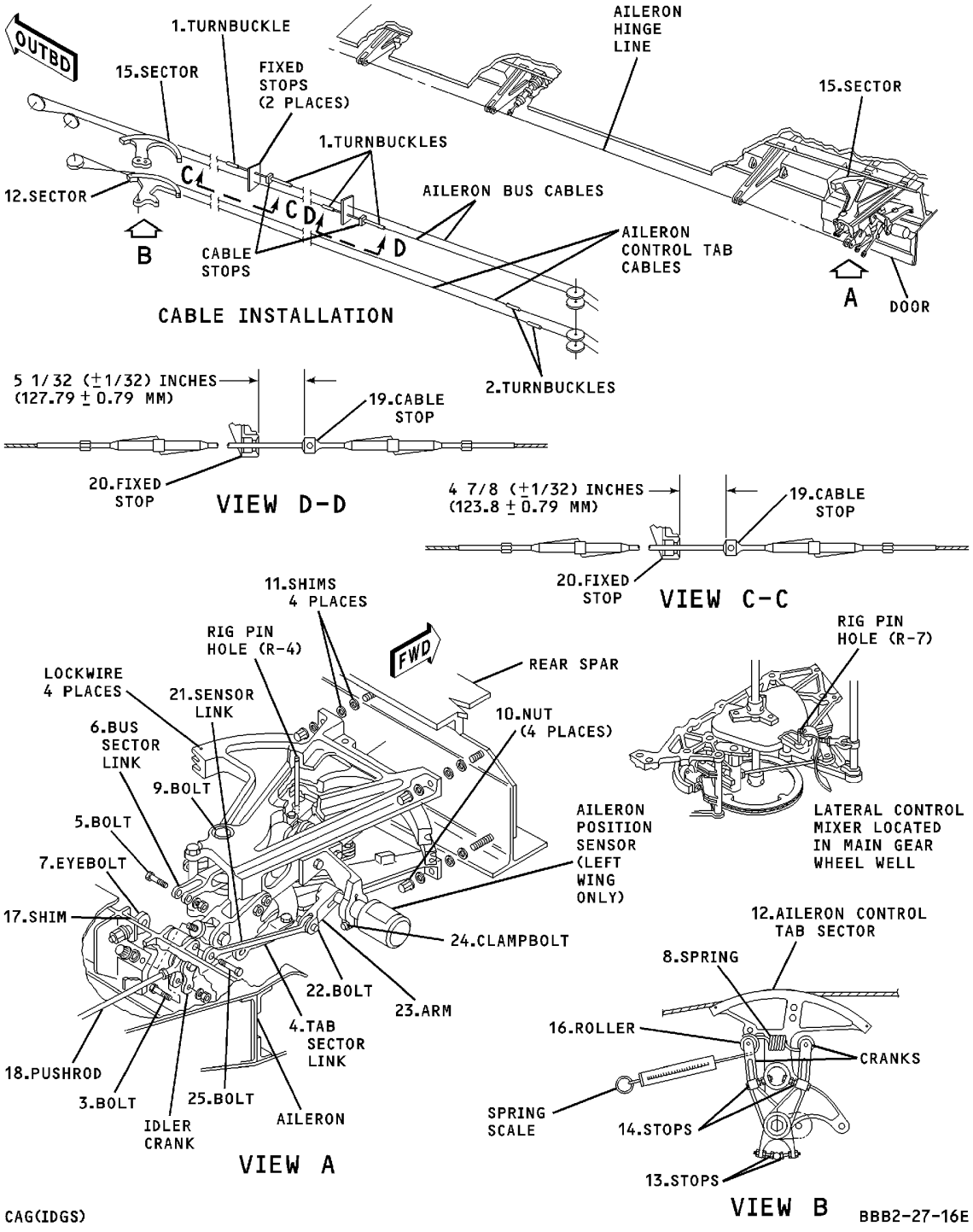
(5) Tighten clamp bolt (24).

(6) Check bolt (22) for free insertion, install bolt (22). Safety nut with cotter pin.

(7) If aileron was clamped in faired position, remove clamp.

(8) Check sensor. (PAGEBLOCK 22-01-03/201)

(9) Perform return to service (RTS) test. (DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201)



Aileron Sectors and Load-Feel Cranks -- Removal/Installation
Figure 401/27-10-03-990-801

CABLE TENSION TABLE – 1/8 DIAMETER

TEMP deg F	MAX. PROD. RIG LOAD	MIN. PROD. RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. PROD. RIG LOAD	MIN. PROD. RIG LOAD	MIN. ALLOW. SERV. LOAD
–60	10	9	6	42	55	51	35
–58	11	10	7	44	56	52	36
–56	12	11	7	46	57	53	36
–54	12	12	8	48	58	54	37
–52	13	12	9	50	59	54	38
–50	14	13	9	52	60	55	38
–48	15	14	10	54	61	56	39
–46	16	15	10	56	61	57	40
–44	17	16	11	58	62	58	40
–42	18	16	11	60	63	59	41
–40	19	17	12	62	64	60	41
–38	20	18	13	64	65	61	42
–36	20	19	13	66	66	62	43
–34	21	20	14	68	67	63	43
–32	22	21	14	70	68	64	44
–30	23	21	15	72	69	64	45
–28	24	22	15	74	70	65	45
–26	25	23	16	76	71	66	46
–24	26	24	16	78	72	67	47
–22	26	25	17	80	74	68	47
–20	27	25	18	82	75	69	48
–18	28	26	18	84	76	70	49
–16	29	27	19	86	77	71	49
–14	30	28	19	88	78	72	50
–12	31	29	20	90	79	73	51
–10	32	29	20	92	80	74	51
–8	33	30	21	94	81	75	52
–6	33	31	21	96	82	76	53
–4	34	32	22	98	83	77	53
–2	35	33	23	100	84	78	54
0	36	33	23	102	85	79	55
2	37	34	24	104	87	80	56
4	38	35	24	106	88	81	56
6	39	36	25	108	89	83	57
8	40	37	25	110	90	84	58
10	40	38	26	112	91	85	59
12	41	38	27	114	92	86	59
14	42	39	27	116	94	87	60
16	43	40	28	118	95	88	61
18	44	41	28	120	96	89	62
20	45	42	29	122	97	90	62
22	46	42	29	124	98	91	63
24	47	43	30	126	100	93	64
26	48	44	31	128	101	94	65
28	48	45	31	130	102	95	66
30	49	46	32	132	103	96	67
32	50	47	32	134	105	97	67
34	51	48	33	136	106	98	68
36	52	48	33	138	107	100	69
38	53	49	34	140	109	101	70
40	54	50	35				

CAG(IGDS)

BBB2–27–51A

1/8 Inch Cable Tension Table
Figure 402/27-10-03-990-802

CABLE TENSION TABLE – AILERON BUS

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
-60	77	71	54	40	117	108	81
-58	78	72	54	42	119	109	82
-56	78	72	54	44	120	110	83
-54	79	73	55	46	121	112	84
-52	79	73	55	48	122	113	85
-50	80	74	55	50	123	114	85
-48	81	74	56	52	125	115	86
-46	81	75	56	54	126	116	87
-44	82	75	57	56	127	117	88
-42	82	76	57	58	128	118	89
-40	83	77	57	60	130	120	90
-38	84	77	58	62	131	121	91
-36	84	78	58	64	132	122	92
-34	85	78	59	66	134	123	93
-32	86	79	59	68	135	125	94
-30	86	80	60	70	136	126	94
-28	87	80	60	72	138	127	95
-26	88	81	61	74	139	129	96
-24	88	81	61	76	141	130	97
-22	89	82	62	78	142	131	99
-20	90	83	62	80	144	133	100
-18	90	83	63	82	145	134	101
-16	91	84	63	84	147	136	102
-14	92	85	64	86	148	137	103
-12	93	86	64	88	150	138	104
-10	93	86	65	90	152	140	105
-8	94	87	65	92	153	141	106
-6	95	88	66	94	155	143	107
-4	96	88	66	96	156	144	108
-2	97	89	67	98	158	146	109
0	97	90	67	100	160	148	111
2	98	91	68	102	162	149	112
4	99	92	69	104	163	151	113
6	100	92	69	106	165	152	114
8	101	93	70	108	167	154	115
10	102	94	71	110	169	156	117
12	103	95	71	112	170	157	118
14	104	96	72	114	172	159	119
16	105	97	73	116	174	161	121
18	106	98	73	118	176	162	122
20	107	98	74	120	178	164	123
22	108	99	75	122	180	166	125
24	109	100	75	124	182	168	126
26	110	101	76	126	184	170	127
28	111	102	77	128	186	171	129
30	112	103	77	130	188	173	130
32	113	104	78	132	190	175	131
34	114	105	79	134	192	177	133
36	115	106	80	136	194	179	134
38	116	107	80	138	196	181	136
				140	198	183	137

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-277A

Aileron Bus Cable Tension Table
Figure 403/27-10-03-990-804

4. Check Aileron Sectors and Load-Feel Cranks

A. Check Aileron and Control Tab Travel

(1) Make certain left and right hydraulic systems are depressurized. (PAGEBLOCK 29-00-00/201)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(a) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(b) Depressurize spoiler hydraulic systems by securing spoiler shutoff and system depressurization valve levers, located in main gear wheelwells, in off position. Secure levers with safety pins.

WARNING: BEFORE MOVING AILERON, MAKE CERTAIN THAT AREAS AROUND RIGHT AND LEFT AILERONS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Manually move right aileron trailing edge up until aileron bus cable stops contact. Rotate aileron control wheel clockwise until stops contact. Hold aileron in this position and make following checks.

(a) Aileron is in neutral position when center of aft outboard cones of aileron is 1/8(±1/8) inch (3.17(±3.17)mm) below adjacent wing trailing edge.

(b) Check that right aileron is 3 13/16(±1/8) inches (96.84(±3.17) mm) above neutral position.

(c) Check that right control tab is 32(±3) degrees (0.55(±0.05) rad) below faired position.

(d) Check that left aileron is 3 13/16(±1/8) inches (96.84(±3.17) mm) below neutral position.

(e) Check that left control tab is 32(±3) degrees (0.55(±0.05) rad) above faired position.

(3) Manually move left aileron trailing edge up until aileron bus cable stops contact. Rotate aileron control wheel counterclockwise until stops contact. Hold aileron in this position and make following checks.

(a) Check that left aileron is 3 13/16(±1/8) inches (96.84(±3.17) mm) above neutral position.

(b) Check that left control tab is 32(±3) degrees (0.55(±0.05) rad) below faired position.

(c) Check that right aileron is 3 13/16(±1/8) inches (96.84(±3.17) mm) below neutral position.

(d) Check that right control tab is 32(±3) degrees (0.55(±0.05) rad) above faired position.

(4) Return ailerons and control tabs to neutral position.

B. Check Aileron Trim Tab Travel

(1) Rotate aileron trim control knob clockwise until stops contact. Make following checks.

(a) Check that left trim tab is 20 1/2(+2, -1) degrees (0.36(+0.03,1-0.02)rad) above faired position.

(b) Check that right trim tab is 20 1/2(+2, -1) (0.36(+0.03, -0.02)rad) degrees below faired position.

(2) Rotate aileron trim control knob counterclockwise until stops contact. Make following checks.

(a) Check that right trim tab is 20 1/2(+2, -1) degrees (0.36(+0.03, -0.02)rad) above faired position.

(b) Check that left trim tab is 20 1/2(+2, -1) degrees (0.036(+0.03, -0.02)rad) below faired position.

(3) Return trim tabs to faired position.

(4) Place spoiler shutoff and system depressurization valve levers to on position and secure valve levers with safety pins.

(5) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

AILERON DAMPERS - MAINTENANCE PRACTICES

1. General

A. There are two aileron dampers installed on each aileron. The dampers are accessible through the access doors adjacent to the second hinge from aileron inboard end. Removal and installation procedures are identical for all dampers.

2. Removal/Installation Aileron Damper

A. Remove Damper

(1) Disconnect damper arm from link.

(2) Remove damper from aileron.

B. Install Damper

(1) Place damper in position and install attach bolts.

(2) Connect damper arm to link, making certain that link is connected to hole midway along arm. Safety nut with cotter pin.

(3) Check damper. (Paragraph 3.)

3. Check Aileron Damper

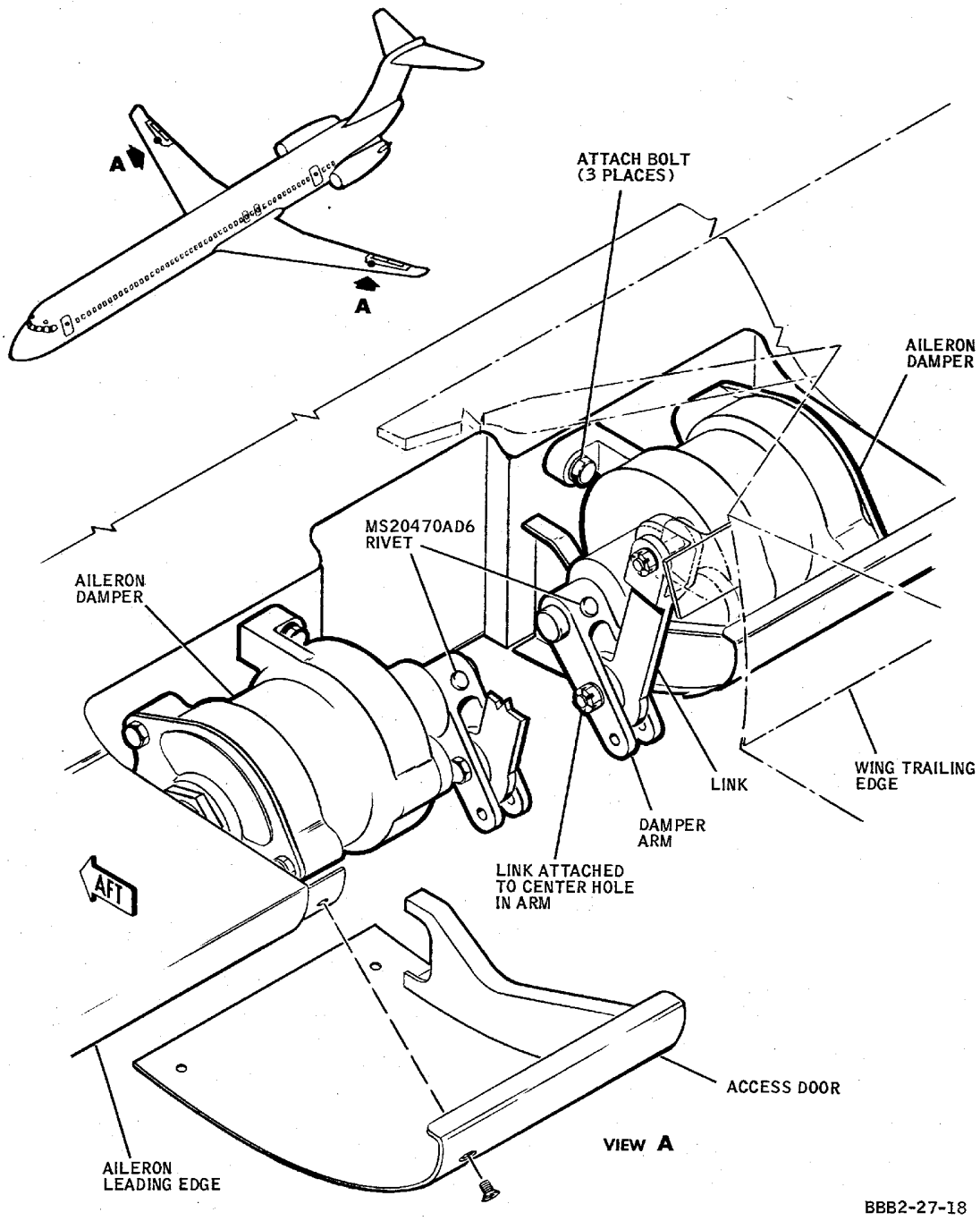
A. Check Damper

(1) Visually check damper housing and shaft seals for sign of leakage. If evidence of leakage exists, the following should be accomplished:

(a) Clean damper and adjacent area.

NOTE: Damper should be replaced when there is any evidence of leakage, and a pilot item has been written against the system. Leakage normally occurs from the weep holes near the arm of the damper. If no pilot item has been written against the system, and evidence of leakage (pooled silicone) is small, then clean the damper and adjacent area, and check for leakage signs after one hour. If leakage signs occur, replace the damper. If no leakage signs occur, damper may remain installed. (Leakage to be checked again at next scheduled visit.) Do not confuse silicone which is thick and sticky with hydraulic fluid.

(2) Move aileron to full up and down positions; check damper and linkage for freedom of operation, and that no binding, roughness, scraping, or interference exists.



Aileron Damper -- Removal/Installation
Figure 201/27-10-04-990-801

AILERON TRIM TAB - MAINTENANCE PRACTICES

1. General

A. The aileron trim tabs are located on the trailing edge of each aileron outboard of the control tab. Access to the trim tab pushrod and outboard hinge point is gained by removing the pushrod aft fairing. Each trim tab weighs approximately six pounds (2.7 kg).

B. Removal and installation procedures are identical for right and left aileron trim tabs. Numbers in parentheses in the following text correspond to callouts in Figure 201.

C. Angular dimensions for checking trim tab travel are measured by using protractor as shown in PAGEBLOCK 27-00-00/201. Control surfaces are adjusted to neutral position only. If surface throw limits are not obtained, check system for obstruction, excessive wear, or damage.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
Protractor (5916715)	Douglas Aircraft Co.
Torque Wrench (0-100 inch-pounds) (0.0-11.3 N·m)	
Lockwire, NASM20995N32, DPM 684*[1]	Not specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Aileron Trim Tab

A. Remove Trim Tab

(1) Rotate aileron trim control knob to align indicator pointer with rig neutral notch on control pedestal cover.

NOTE: There may be a difference between rigged neutral position and flight neutral position on trim position indicator, therefore pointer may or may not align with flight neutral position on indicator placard.

(2) Remove bolt (1) at aft end of trim tab pushrod.

(3) Remove nut (2) at outboard hinge point.

(4) Remove bolts (3) at two inboard hinge points and remove trim tab.

B. Install Trim Tab

(1) Place trim tab in position and install hinge bolts (3) at two inboard hinge points. Tighten nuts finger-tight only and safety nuts with cotter pins.

(2) Install nut (2) at outboard hinge point. Tighten to torque of 50 to 70 inch-pounds (5.6 to 7.84 N·m).

(3) Check that trim tab moves up and down freely with no binding at hinges.

(4) Install bolt (1) to connect pushrod to tab. Safety nut with cotter pin.

(5) Make certain that trim position indicator pointer is aligned with rig neutral notch on control pedestal cover.

(6) Check position of trim tab and if necessary adjust trim tab actuator to move tab to faired position as follows:

NOTE: Trim tab is in faired position when trailing edge of tab aligns with adjacent aileron trailing edge within one-quarter degree.

(a) Loosen jamnut (4) on actuator eyebolt.

(b) Rotate actuator screw (5), holding drum and eyebolt fixed, to move tab to faired position.

NOTE: Length of trim tab pushrod is preset and must not be adjusted.

(c) Tighten jamnut (4) against serrated washer and safety nut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(7) Lubricate trim tab fittings. (PAGEBLOCK 12-21-02/301)

(8) Check trim tab. Paragraph 4.

4. Check Aileron Trim Tab

A. Check Trim Tab

(1) Check that clearances are as shown on Figure 201.

(2) Rotate aileron trim control knob slowly to extreme left and right positions. Check that tab moves up and down freely with no binding at hinges.

(3) Return trim tabs to faired position.

(4) Check that looseness at outboard end of aileron trim tab trailing edge does not exceed 1/16 inch, (1.587 mm).

NOTE: Maximum allowable looseness on aileron trim tabs is checked by moving surface up and down from faired position.

(5) Rotate aileron trim control knob clockwise until stops contact and check left or right trim tab as follows:

(a) Check that left trim tab is 21(±1 1/2) degrees above faired position.

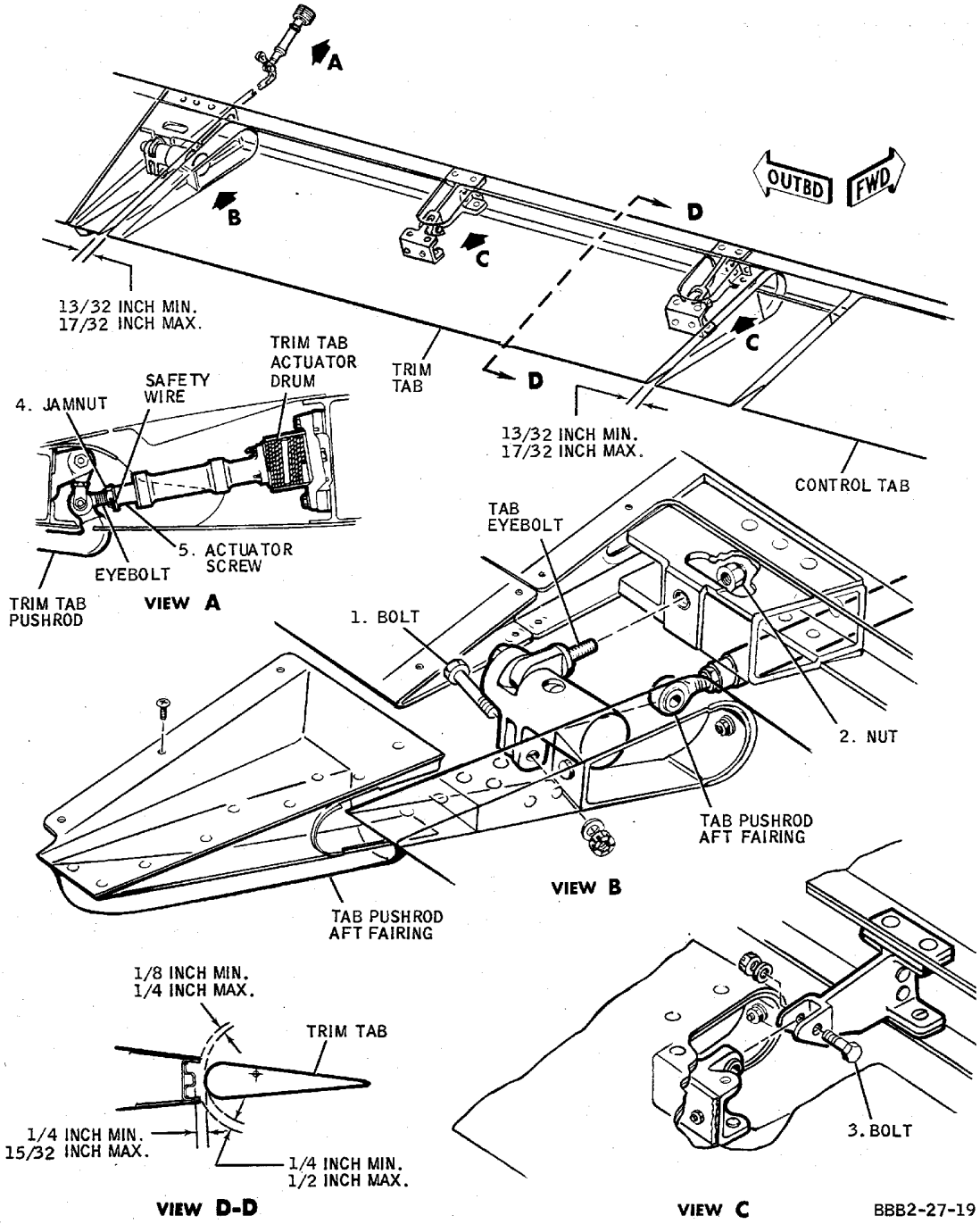
(b) Check that right trim tab is 21(±1 1/2) degrees below faired position.

(6) Rotate trim control knob counterclockwise until stops con-tact and check left or right trim tab as follows:

(a) Check that right trim tab is 21(±1 1/2) degrees above faired position.

(b) Check that left trim tab is 21(±1 1/2) degrees below faired position.

(7) Return trim tabs to faired position.



Aileron Trim Tab -- Removal/Installation
Figure 201/27-10-05-990-801

AILERON TRIM TAB ACTUATOR - MAINTENANCE PRACTICES

1. General

A. A trim tab actuator is located on each wing, forward of the outboard end of the aileron trim tab. Access is through the wing trailing edge lower access door and the tab pushrod forward fairing. The turnbuckles are accessible with the flaps extended.

B. Removal and installation procedures are identical for the left and right actuator. Numbers in parentheses in the following text correspond with callouts in Figure 201.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
Protractor (5916715)	The Boeing Company
Tensiometer	Pacific Scientific Co.
Lockwire, NASM20995N32, DPM 684*[1]	Not specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Aileron Trim Tab Actuator

A. Remove Actuator

(1) Rotate aileron trim control knob to align pointer with rig neutral notch on control pedestal cover.

NOTE: There may be a difference between rigged neutral position and flight neutral position, therefore pointer may or may not align with flight neutral position on indicator placard.

NOTE: When operating aileron trim control knob, intermovement of 1/32 inch (.792 mm) between aileron and rudder trim control knobs is acceptable.

(2) Install wood blocks on aileron trim cables adjacent to wing rib inboard of turnbuckles to maintain tension on cables inboard of clamps, as shown in Figure 201.

(3) Loosen turnbuckles (1) to relieve cable tension.

(4) Remove bolt (2) to disconnect actuator from pushrod and crank.

(5) Remove bolts (3) to disconnect actuator from rear spar.

(6) Remove cable guard pins (4).

(7) Disconnect cables from actuator cable drum and tag cables to prevent crossing during installation.

B. Install Actuator

(1) Position actuator on rear spar and install bolts (3).

(2) Position actuator cable drum so that cable ball sockets face inboard and rotate actuator screw (5) to obtain dimension of 1(±1/32) inch (25.4(±.0.8 mm) between end of screw and end of housing.

(3) Wrap cables on drum, making certain that each cable has an equal number of wraps. Safety cable ball ends with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(4) Install guard pins (4).

(5) Loosen jamnut (6) and rotate eyebolt (7) to align eyebolt with crank and pushrod within one full turn, making certain that drum and actuator screw does not rotate with eyebolt.

(6) Install bolt (2) to connect actuator to pushrod and crank. (Bolt head must be installed facing inboard for composite ailerons and outboard for aluminum ailerons.)

(7) Adjust turnbuckles (1) to obtain tension per cable table for 1/16-inch (1.59 mm) cables. (Figure 202)

(8) Remove wood blocks from cables.

(9) Rotate aileron trim control knob to contact left and right stops several times to stabilize cable tension. Adjust turnbuckles as required to maintain tension obtained in Paragraph 3.B.(7).

(10) Make certain that trim position indicator pointer is aligned with rig notch on control pedestal cover and differentially adjust turnbuckles (1) to position actuator cable drum with cable ball sockets facing inboard.

(11) Safety turnbuckles with clips.

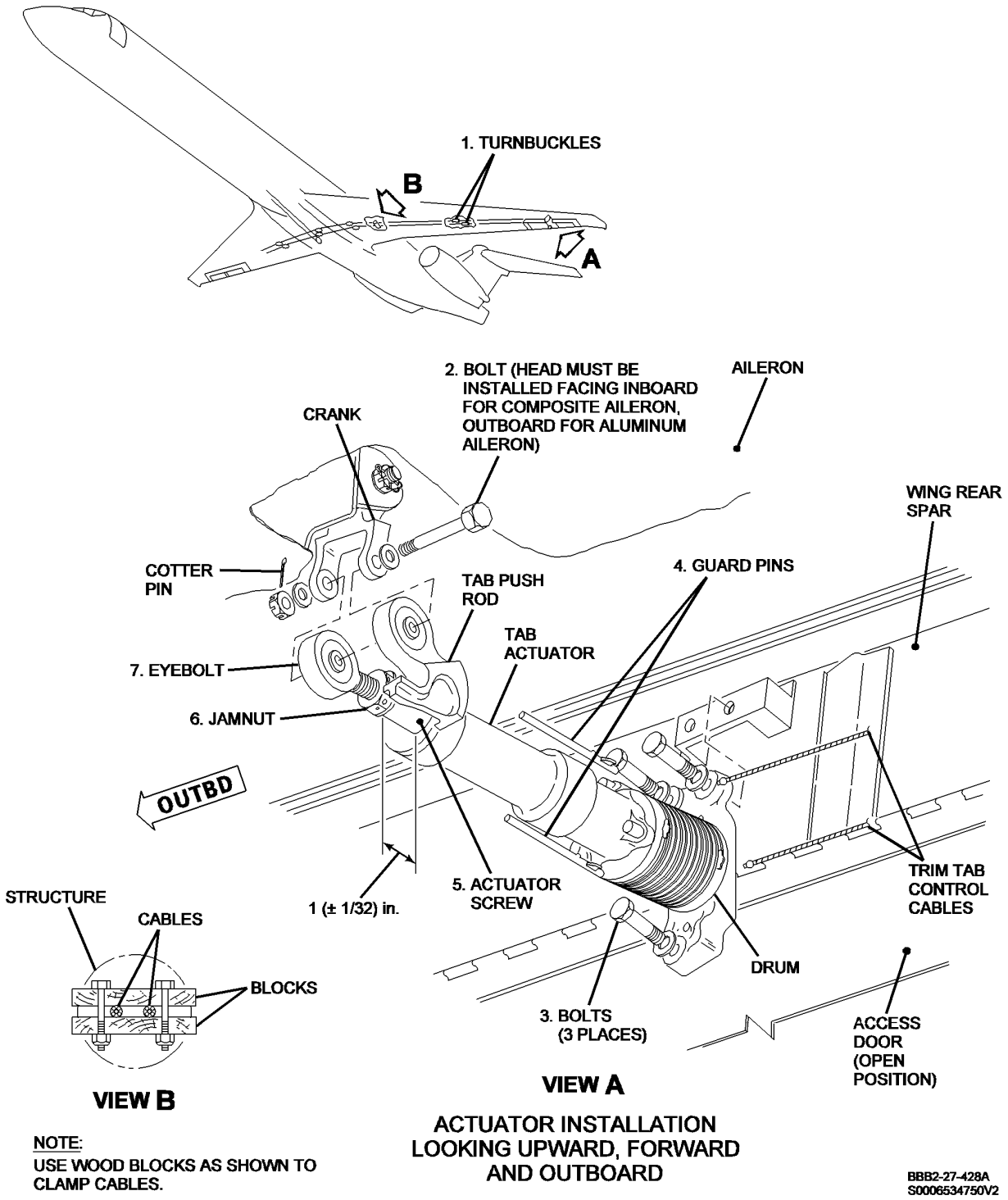
(12) Hold actuator cable drum and eyebolt (7) firmly and rotate actuator screw (5) to position trim tab in neutral within one-quarter degree. Length of tab pushrod is preadjusted and must not be disturbed.

NOTE: Trim tab is in neutral when tab trailing edge is aligned with adjacent aileron trailing edge. Angular dimension for checking tab is measured by placing protractor on rigging reference line on lower surface of tab. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)

(13) Check position of opposite trim tab; loosen jamnut (6) on opposite actuator and repeat Paragraph 3.B.(12) to adjust tab to neutral, if necessary.

(14) Tighten jamnuts (6) and safety nuts to tab washer with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(15) Check trim tab travel. Paragraph 4.



Aileron Trim Tab Actuator -- Removal/Installation
Figure 201/27-10-06-990-801

CABLE TENSION TABLE – 1/16 DIAMETER

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
–60	5	0	0	40	18	12	8
–58	5	0	0	42	18	12	9
–56	5	0	0	44	18	12	9
–54	6	0	0	46	19	13	9
–52	6	0	0	48	19	13	9
–50	6	0	0	50	19	13	9
–48	7	1	0	52	20	14	10
–46	7	1	0	54	20	14	10
–44	7	1	0	56	20	14	10
–42	7	1	0	58	20	14	10
–40	8	2	1	60	21	15	11
–38	8	2	1	62	21	15	11
–36	8	2	1	64	21	15	11
–34	8	2	1	66	22	16	11
–32	9	3	1	68	22	16	12
–30	9	3	2	70	22	16	12
–28	9	3	2	72	23	17	12
–26	9	3	2	74	23	17	12
–24	10	4	2	76	23	17	13
–22	10	4	2	78	24	18	13
–20	10	4	2	80	24	18	13
–18	10	4	3	82	24	18	13
–16	11	5	3	84	25	19	14
–14	11	5	3	86	25	19	14
–12	11	5	3	88	25	19	14
–10	11	5	3	90	26	20	15
–8	12	6	4	92	26	20	15
–6	12	6	4	94	27	21	15
–4	12	6	4	96	27	21	16
–2	12	6	4	98	27	21	16
0	13	7	4	100	28	22	16
2	13	7	5	102	28	22	16
4	13	7	5	104	28	22	17
6	13	7	5	106	29	23	17
8	14	8	5	108	29	23	17
10	14	8	5	110	30	24	18
12	14	8	6	112	30	24	18
14	14	8	6	114	31	25	18
16	15	9	6	116	31	25	19
18	15	9	6	118	31	25	19
20	15	9	6	120	32	26	19
22	15	9	7	122	32	26	20
24	16	10	7	124	33	27	20
26	16	10	7	126	33	27	20
28	16	10	7	128	34	28	21
30	16	10	7	130	34	28	21
32	17	11	8	132	35	29	21
34	17	11	8	134	35	29	22
36	17	11	8	136	36	30	22
38	18	12	8	138	36	30	23
				140	37	31	23

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

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Aileron Cable Tension Table
Figure 202/27-10-06-990-803

4. Check Aileron Trim Tab Actuator

A. Check Trim Tab Travel

NOTE: Angular dimensions for checking tab travel are measured by placing protractor on rigging reference lines on lower surface of tab as shown in PAGEBLOCK 27-00-00/201. Control surfaces are adjusted to neutral position only. If surface throw limits are not obtained, check system for obstruction, excessive wear, or damage.

(1) Rotate aileron trim control knob clockwise until stops contact and make following checks.

(a) Check that left trim tab is 21 (±1.5) degrees (0.37(±0.03 rad) above faired position.

(b) Check that right trim tab is 21 (±1.5) degrees (0.37(±0.03 rad) below faired position.

(2) Rotate aileron trim control knob counterclockwise until stops contact and make following checks.

(a) Check that right trim tab is 21 (±1.5) degrees (0.37(±0.03 rad) above faired position.

(b) Check that left trim tab is 21 (±1.5) degrees (0.37(±0.03 rad) below faired position.

(3) Return trim tabs to faired position.

AILERON AND RUDDER TRIM CONTROL MECHANISM - REMOVAL/INSTALLATION

1. General

A. The aileron and rudder trim control mechanism is located in the aft end of the control pedestal, from which it is removed as one unit. The trim position indicators can be removed and installed individually without disturbing the rigging of either control system. This procedures describe the removal and installation of the trim control mechanism.

B. Removal and installation procedures are identical for the aileron and rudder trim position indicators except that the rudder trim cover plate must be loosened and raised approximately one-eighth inch (25.4 mm) before the aileron trim cover plate can be removed.

C. Access to control mechanism is through the pedestal aft side covers. Access to turnbuckles is through the forward lower cargo compartment ceiling panels.

D. Numbers in parentheses in the following text correspond to call-outs in Figure 401 and Figure 402.

WJE 407, 408, 410, 411, 417, 419, 421, 423, 869, 871, 872, 875-879

E. The removal and installation procedures in this section refer only to those aircraft delivered from the factory with incorporation of Service Bulletin 27-311 "Modify Aileron/Rudder Trim Position Indicators" and those aircraft subsequently modified post-delivery.

WJE ALL

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 401

Name and Number	Manufacturer
Tensiometer	Pacific Scientific Co.
Lockwire, NASM20995N32, DPM 684*[1]	Not specified
WTR - Grease, Wide Temperature Range MIL-PRF-81322 DPM 5348	Exxon Mobil Corporation, Fairfax VA, Mobilgrease 28
Protractor (5916715)	Douglas Aircraft Co.
WJE 407, 408, 410, 411, 417, 419, 421, 423, 869, 871, 872, 875-879	
Spring scale (40 pound capacity) (18.34 kg)	John Chatilon & Sons
WJE ALL	
MLG door safety locks 5936851-1, or -501 as applicable. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co.
Rig pin (6-4) 3/8 by 4 5/8 (9.525 x 117.475 mm)	
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch), (15.875 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. **Removal/Installation**

A. Remove Trim Position Indicator

(1) Rotate trim control knob to align pointer with rig neutral notch on cover plate.

NOTE: There may be a difference between rigged neutral position and flight neutral position, therefore pointer may or may not align with flight neutral position on indicator placard.

(2) Remove button (1) from trim knob by prying out gently with knife blade.

(3) Remove trim knob (2) from shaft.

(4) Remove aileron cover plate (3) and/or rudder cover plate (10) and spacers, making certain that spacers do not drop into pedestal.

WJE 401-406, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 863-866, 868, 873, 874, 880, 881, 883, 884, 886, 887, 891-893

NOTE: Nuts and washers are replaced by Rivnuts on later aircraft.

WJE ALL

NOTE: To remove aileron trim cover plate, loosen screws securing rudder trim cover plate, and raise rudder trim cover plate approximately one-eighth inch (3.175 mm) to allow aileron trim cover plate to be removed.

WJE 401-406, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 863-866, 868, 873, 874, 880, 881, 883, 884, 886, 887, 891-893

(5) Remove pointer (4), follower (5), slide washer (6), spacer (7), spiral drive plate (8), and shims (9). Record number of shims and retain for installation.

WJE 407, 408, 410, 411, 417, 419, 421, 423, 869, 871, 872, 875-879

(6) Remove pointer (4), follower (5), spacer (7), spiral drive plate (8), and shims (9). Record number of shims and retain for installation.

WJE ALL

B. Remove Trim Control Mechanism

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Rotate aileron and rudder trim control knobs to align pointers with rig neutral notches on cover plates.

(3) Note position of aileron trim cable drum in lateral control mixer and note position of cable ball ends on this drum.

(4) Install cable clamps on aileron and rudder trim cables just forward of a floor beam and aft of turnbuckles (17) and (18) to maintain tension and prevent movement of cables aft of clamps. (Figure 402)

(5) Loosen turnbuckles (17) and (18) to relieve trim cable tension.

(6) Remove aileron and rudder trim position indicators. Paragraph 3.A.

(7) Remove support (19) from pedestal and mechanism shaft.

(8) Remove bolts (20) from forward end of mechanism.

(9) Remove guard pins (21) from mechanism.

(10) Move mechanism down and aft to clear shroud and disconnect cables from drums. Tag cables to prevent crossing during installation.

(11) Remove trim control mechanism from pedestal.

C. Install Trim Position Indicator

(1) Make certain that all contacting surfaces of pointer, follower, slide washer, and spiral drive plate are smooth, clean, and free of paint.

(2) Make certain that all contacting surfaces of pointer, follower, and spiral drive plate are smooth, clean, and free of paint, oil, grease or any other foreign substance.

(3) Make certain that aileron trim tab or rudder control tab, as applicable, are in faired position.

WJE 401-406, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 863-866, 868, 873, 874, 880, 881, 883, 884, 886, 887, 891-893

NOTE: Aileron trim tabs are in faired position when tab trailing edges are aligned with respective trailing edges of aileron control surface within 1/4 degree.

WJE 407, 408, 410, 411, 417, 419, 421, 423, 869, 871, 872, 875-879

NOTE: Aileron tabs are in faired position when tab trailing edges are aligned with trailing edge of main control surface within 1/4 degree.

WJE ALL

NOTE: Rudder control tab is in faired position when tab trailing edge is aligned with rudder trailing edge within 1/16 inch (1.57 mm).

WJE 401-406, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 863-866, 868, 873, 874, 880, 881, 883, 884, 886, 887, 891-893

(4) Check that follower (5) moves freely in guide on bottom of aileron cover plate (3) and/or rudder cover plate (10).

(5) Install shims (9) on shaft, adding one or more additional shims to those retained in Paragraph 3.A.(5)

WJE 407, 408, 410, 411, 417, 419, 421, 423, 869, 871, 872, 875-879

(6) Install shims (9) on shaft, adding one or more additional shims to those retained in Paragraph 3.A.(6)

WJE ALL

(7) Install spiral drive plate (8) on shaft so that stop is centered at top within 45 degrees.

(8) Apply a light coat of grease (DPM 5348), to drive plate grooves.

NOTE: Spiral drive plates fabricated of nylon require no lubrication.

WJE 407, 408, 410, 411, 417, 419, 421, 423, 869, 871, 872, 875-879

(9) Add shims under spiral drive plate, as required, to provide 0.020 inch (0.3 mm) minimum clearance between bottom edge of each spiral drive plate and it's respective support plate.

WJE ALL

(10) Install spacer (7) on shaft.

WJE 401-406, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 863-866, 868, 873, 874, 880, 881, 883, 884, 886, 887, 891-893

(11) Install slide washer (6) on spacer.

(12) Install follower (5) on spacer so that follower engages groove on drive plate halfway between inside and outside grooves.

WJE 401-406, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 863-866, 868, 873, 874, 880, 881, 883, 884, 886, 887, 891-893 (Continued)

(13) Install pointer (4) on spacer with slot over follower pin.

NOTE: Pointer may be bent to ensure alignment with rig neutral notch on pedestal cover.

(14) Check clearance of follower to drive plate as follows:

(a) Temporarily install trim knob (2) and rotate knob clockwise until spiral drive plate stops contact follower. Rotate knob counterclockwise one full turn and check that 0.010 to 0.050 inch clearance exists between follower and drive plate stop.

(b) Rotate knob counterclockwise until drive plate stops contact follower. Rotate knob clockwise one full turn and check that 0.010 to 0.050 inch clearance exists between follower and drive plate stop.

(c) Trim ends of follower and slide washer as required to obtain clearance specified in Paragraph 3.C.(14)(a) and Paragraph 3.C.(14)(b).

(d) Rotate trim knob to align pointer with rig neutral notch and remove knob.

WJE 407, 408, 410, 411, 417, 419, 421, 423, 869, 871, 872, 875-879

(15) Install follower (5) on grooves of spiral drive plate so that follower Pin "A" engages spiral groove on drive plate halfway between inner and outer groove in plate.

(16) Install pointer (4) on spacer with slotted arm over follower pivot pin. Install washer and retaining ring on follower pin to secure pointer.

NOTE: Pointer tip may be bent laterally, as required, to obtain correct alignment of pointer tip with rig neutral notch on pedestal cover.

(17) Install shim washers under spiral drive plate, as required, and between pointer arm and spiral drive plate, as required, to provide a minimum of 0.010 inch (0.3 mm) clearance between each pointer tip and it's respective light plate surface.

CAUTION: DO NOT CLAMP ASSEMBLIES. MAKE CERTAIN THAT RUDDER AND AILERON TRIM INDICATOR FOLLOWERS ROTATE FREELY ON EACH RESPECTIVE PIVOT BOLT.

(18) Install pivot bolt through follower into support assembly. Install shim washers under head of pivot bolt and between follower and support assembly, as required, to obtain 0.050-0.065 inch (1.3-1.7 mm) clearance between Pin "A" pad lower surface and upper surface of spiral drive plate. Install washer and nut on pivot bolt and safety with cotter pin or safety wire.

NOTE: Lockwire, NASM20995N32, DPM684 may be used in lieu of cotter pin.

NOTE: Measure clearance at Pin "A" and spiral drive plate only between lower surface of Pin "A" pad and upper surface of spiral drive plate. Do not measure between point (tip) of Pin "A" and upper surface of spiral drive plate.

NOTE: With pivot bolt tightened, check for 0.010-0.015 inch (0.25-0.38 mm) clearance between head of pivot bolt and follower.

(19) Perform deflection test of follower assembly on spiral plate to make certain that Pins "A" cannot be disengaged from spiral plate groove as follows:

(a) Temporarily install trim knob on respective shaft.

(b) Slowly rotate respective trim mechanism through full range of travel (stop to stop) both clockwise and counterclockwise. Observe to make certain that Pin "A" tracks fully and smoothly throughout full length of spiral drive plate groove without riding UP or undue oscillation of pin within groove during cycle range.

WJE 407, 408, 410, 411, 417, 419, 421, 423, 869, 871, 872, 875-879 (Continued)

(c) Position Pin "A" in outermost portion of spiral groove from center.

(d) Using an appropriate spring-scale, apply alternately, lateral-outboard and then vertical deflection loads of 2.0-2.5 pounds (0.9-1.13 kg) on outboard follower arm. Pin "A" should not disengage from groove of spiral drive plate.

WJE 401-406, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 863-866, 868, 873, 874, 880, 881, 883, 884, 886, 887, 891-893

(20) Remove trim control knob. Retain for reinstallation.

WJE 407, 408, 410, 411, 417, 419, 421, 423, 869, 871, 872, 875-879

(21) Check movement of trim knob. Trim knob and mechanism should move smoothly through full travel left and right with no binding action.

(22) Install aileron trim cover plate (3) and rudder trim cover plate (10) on pedestal.

WJE 401-406, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 863-866, 868, 873, 874, 880, 881, 883, 884, 886, 887, 891-893

(23) Install aileron trim cover plate (3) and/or rudder trim cover plate (10) on pedestal, as required.

WJE 407, 408, 410, 411, 417, 419, 421, 423, 869, 871, 872, 875-879

(24) Install trim control knob.

WJE 401-406, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 863-866, 868, 873, 874, 880, 881, 883, 884, 886, 887, 891-893

(25) Install trim knob (2).

(26) Check movement of trim knob. Due to extra shims (9) under drive plate trim knob should not move, or move only with binding action.

(27) Obtain clearance between drive plate and slide washer as follows:

(a) Remove knob (2), cover plate (3), or (10), pointer (4), slide washer (6), follower (5), spacer (7), and drive plate (8).

(b) Remove one shim (9).

(c) Install items removed in Paragraph 3.C.(27)(a).

(d) Repeat Paragraph 3.C.(27)(a) through Paragraph 3.C.(27)(c) until knob rotates freely through complete range of travel and 0.005 to 0.030 inch clearance between drive plate and slide washer is obtained.

NOTE: To maintain clearance of 0.005 to 0.030 inch, no more than two 0.010 inch (0.254 mm) thick shims may be removed after free movement is obtained. Exceeding this limit could move follower pin out of groove on drive plate and cause indicator to be out of phase with trim system. Last time indicator is assembled, make certain that procedures in steps Paragraph 3.C.(7) through Paragraph 3.C.(11) are followed.

NOTE: Remove aileron cover plate (3) to gain access for measurement of clearance between rudder drive plate (10) and slide washer (6). Rudder cover plate (10) must be removed when measuring for clearance between aileron drive plate (3) and slide washer (6). Measure clearance by inserting feeler gage between slide washer (6) and spiral drive plate (8).

WJE 407, 408, 410, 411, 417, 419, 421, 423, 869, 871, 872, 875-879

(28) Install trim control knob.

WJE ALL

(29) Install button (1) in trim knob.

(30) If previously removed, position aileron/rudder trim nameplates (13)/(15) and install screws (14)/(16).

(a) Torque screws (14)/(16) 1± 0.5 in-lb (0.11 ± 0.06 N·m).

(31) Check trim control mechanism. (Paragraph 4.)

D. Install Trim Control Mechanism

(1) Place trim control mechanism in pedestal. Hold mechanism below shroud and wrap cables on drums. Safety cable ball ends with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(2) Install guard pins and secure pins with cotter pins.

(3) Raise mechanism into position and install bolts (20). (Figure 402)

(4) Install support (19) over shafts and attach to pedestal.

(5) Install rudder spiral drive plate (8) on shaft, hold rudder cable drum from rotating and measure amount that plate will rotate. (Figure 401)

NOTE: This procedure measures free movement between rudder bevel gears. Maximum movement as measured at perimeter of drive plate should be 1/64 inch, (.396 mm). Gears may be just snug, but should not bind.

(6) Add or remove washers between gear and bearing in support (19) as required to obtain free movement of gears within limits specified in Paragraph 3.D.(5). (Figure 402)

(7) Install aileron and rudder trim position indicators. (Paragraph 3.C.)

(8) Rotate aileron and rudder trim control knobs so that cable ball ends are down when pointers align with rig neutral notches.

(9) Adjust turnbuckles (17) and (18) to obtain tension of 28 pounds (12.699 kg) at 70°F for 3/32 inch (2.382 mm) cables. Compensate for temperature. (Figure 403)

(10) Rotate aileron and rudder trim control knobs (2) in each direction several times to stabilize cable tensions. Adjust turnbuckles as necessary to maintain tension as specified in Paragraph 3.D.(9).

(11) Differentially adjust turnbuckles (17) so that aileron trim cable drum in lateral control mixer is in position noted in Paragraph 3.B.(3).

(12) Differentially adjust turnbuckles (18) so that rig pin (6-4) may be easily inserted in rig pin hole (R-11) in rudder drive sector and bracket in aft accessory compartment.

(13) Safety all turnbuckles with clips.

(14) Remove rig pin (6-4) from rudder drive sector.

WJE 401-406, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 863-866, 868, 873, 874, 880, 881, 883, 884, 886, 887, 891-893

(15) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position.

WJE 407, 408, 410, 411, 417, 419, 421, 423, 869, 871, 872, 875-879

(16) Remove door safety locks, close inboard doors and place main gear door ground maintenance bypass lever to normal (lever retracted) position.

WJE ALL

(17) Check aileron and rudder trim controls. Paragraph 4.

4. Check - Aileron and Rudder Trim Control Mechanism

A. Check Aileron Trim Control

NOTE: Angular dimensions for checking aileron trim tab travel are measured by holding protractor on rigging reference lines on lower surface of tab as described in GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201.

(1) Rotate aileron trim control knob to extreme right and left positions, then rotate knob to align pointer with rig neutral notch. Check that mechanism operates smoothly without binding and that aileron trim tabs are returned to faired position.

(2) Rotate trim control knob clockwise until stops contact and make following checks.

NOTE: The force to rotate the aileron trim knob must not be more than 25.00 in-lb (2.82 N·m). When you turn the aileron trim knob, 1/32 inch (0.0312 in. (0.7925 mm)) movement is permitted between the rudder and aileron trim knob

(a) Check that left trim tab is 20 1/2(+2,-1) degrees above faired position.

(b) Check that right trim tab is 20 1/2(+2,-1) degrees below faired position.

(3) Rotate trim control knob counterclockwise until stops contact and make following checks.

NOTE: The force to rotate the aileron trim knob must not be more than 25.00 in-lb (2.82 N·m). When you turn the aileron trim knob, 1/32 inch (0.0312 in. (0.7925 mm)) movement is permitted between the rudder and aileron trim knob

(a) Check that right trim tab is 20 1/2(+2,-1) degrees above faired position.

(b) Check that left trim tab is 20 1/2(+2,-1) degrees below faired position.

WJE 401-406, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 863-866, 868, 873, 874, 880, 881, 883, 884, 886, 887, 891-893

(4) Return trim tabs to faired position.

WJE 407, 408, 410, 411, 417, 419, 421, 423, 869, 871, 872, 875-879

(5) Place trim tabs to faired position.

WJE ALL

B. Check Rudder Trim Control

NOTE: Linear dimensions for checking rudder travel are measured from aft upper corner of rudder to center of adjacent vertical stabilizer trailing edge.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: MAKE CERTAIN THAT AREA AROUND RUDDER IS CLEAR OF PERSONNEL AND EQUIPMENT WHEN RUDDER REVERTS FROM MANUAL TO POWER OPERATION.

(2) Move rudder hydraulic power shutoff valve control lever to on position.

(3) Slowly rotate rudder trim control knob to extreme left and right positions and check that trim control mechanism operates smoothly without binding.

(4) Rotate trim control knob to align indicator pointer with rig neutral notch. Check that rudder returns to neutral position and that control tab is faired with rudder within one-quarter degree.

(5) Rotate trim control knob clockwise until stops contact and check that rudder is 8 15/16(±1) inches (227.012(±25.4) mm) to right of neutral.

(6) Rotate trim control knob counterclockwise until stops contact and check that rudder is 8 15/16(±1) inches (227.012(±25.4) mm) left of neutral.

WJE 401-406, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 863-866, 868, 873, 874, 880, 881, 883, 884, 886, 887, 891-893

(7) Return rudder to neutral position.

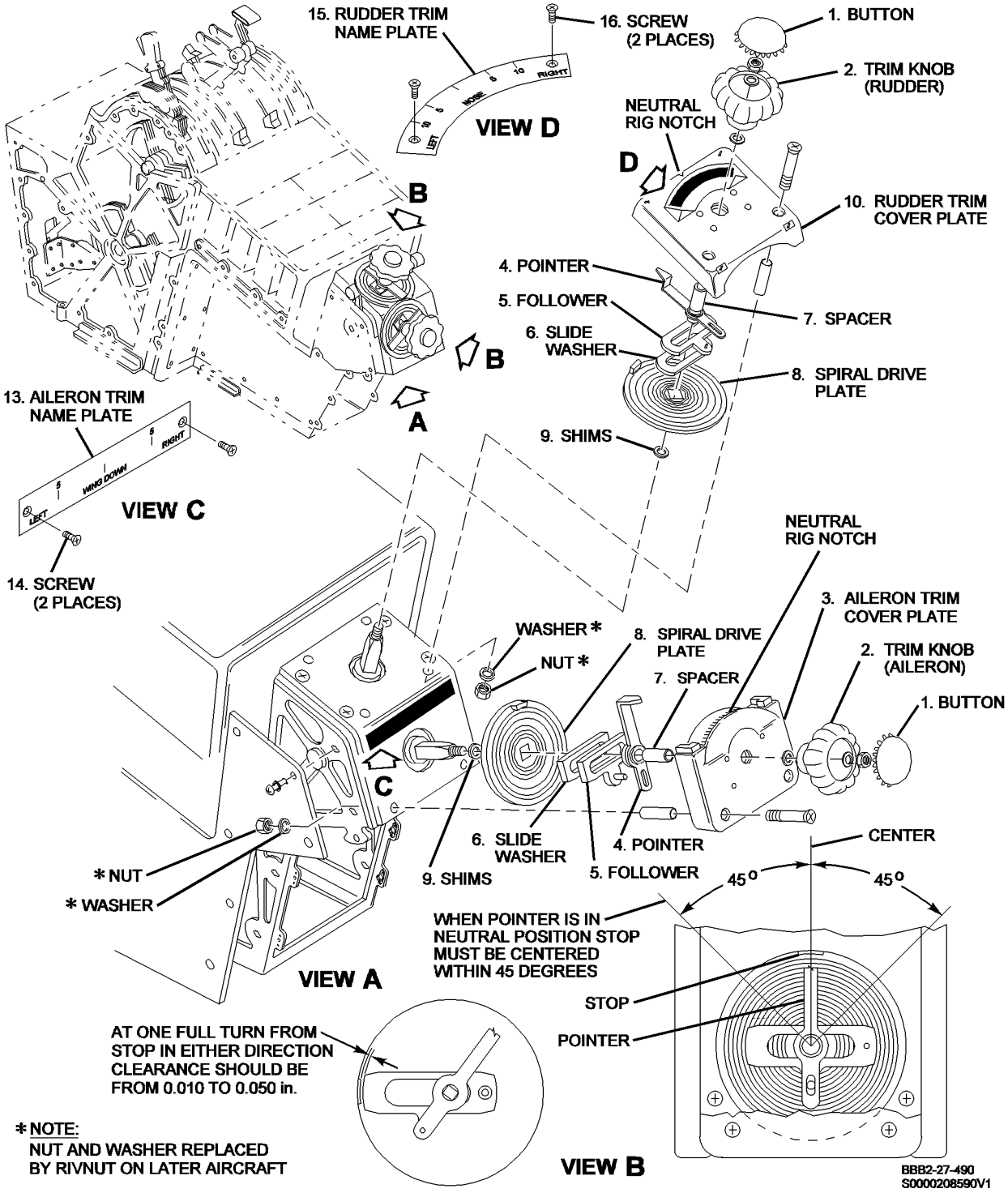
(8) Return rudder hydraulic power shutoff valve control lever to off position.

WJE 407, 408, 410, 411, 417, 419, 421, 423, 869, 871, 872, 875-879

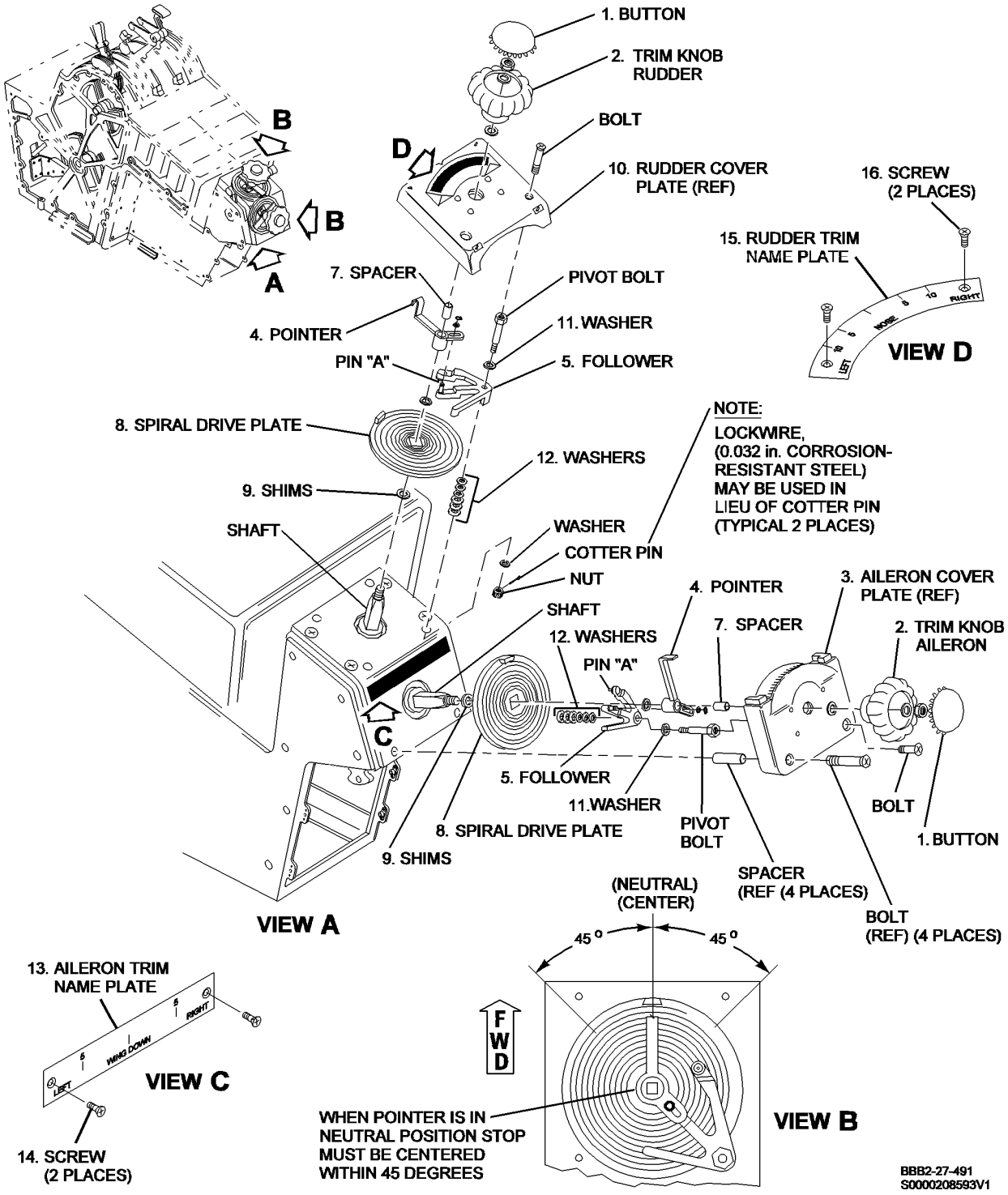
(9) Place rudder to neutral position.

(10) Place rudder hydraulic power shutoff valve control lever to off position.

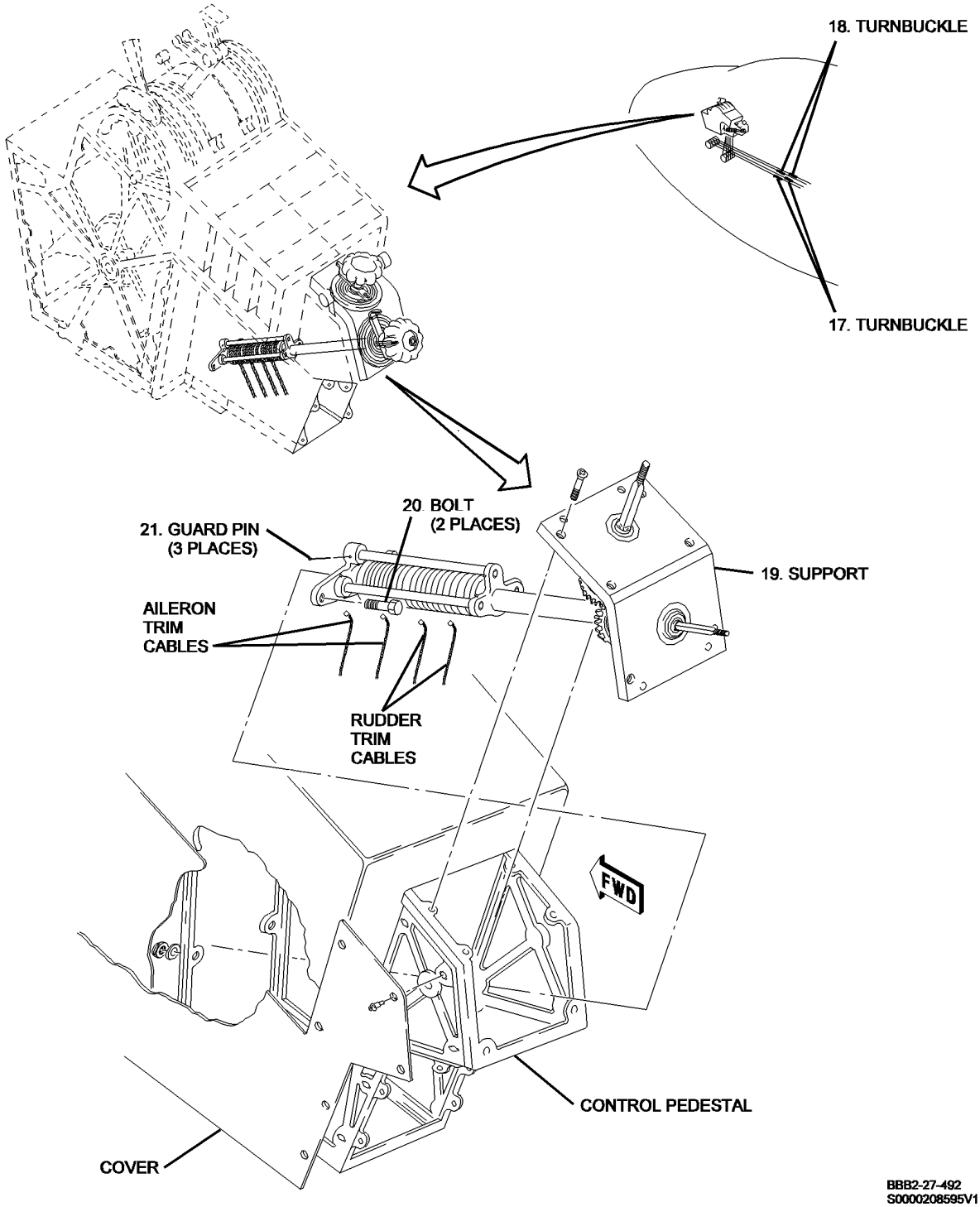
WJE ALL



Aileron and Rudder Trim Control Mechanism -- Removal/Installation
Figure 401/27-10-07-990-801 (Sheet 1 of 2)



Aileron and Rudder Trim Control Mechanism -- Removal/Installation
Figure 401/27-10-07-990-801 (Sheet 2 of 2)



Aileron and Rudder Trim Control Mechanism -- Removal/Installation
Figure 402/27-10-07-990-803

CABLE TENSION TABLE – 3/32 DIAMETER

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD
–60	7	1	0	40	30	24	18
–58	8	2	1	42	31	25	18
–56	8	2	1	44	31	25	19
–54	8	2	1	46	32	26	19
–52	9	3	1	48	33	27	20
–50	9	3	2	50	33	27	20
–48	9	3	2	52	34	28	21
–46	10	4	2	54	34	28	21
–44	10	4	2	56	35	29	22
–42	11	5	3	58	36	30	22
–40	11	5	3	60	36	30	23
–38	11	5	3	62	37	31	23
–36	12	6	4	64	38	32	24
–34	12	6	4	66	38	32	24
–32	12	6	4	68	39	33	25
–30	13	7	5	70	39	33	25
–28	13	7	5	72	40	34	26
–26	14	8	5	74	41	35	26
–24	14	8	6	76	41	35	27
–22	15	9	6	78	42	36	27
–20	15	9	6	80	43	37	28
–18	15	9	7	82	44	38	28
–16	16	10	7	84	44	38	29
–14	16	10	7	86	45	39	29
–12	17	11	8	88	46	40	30
–10	17	11	8	90	46	40	30
–8	18	12	8	92	47	41	31
–6	18	12	9	94	48	42	31
–4	19	13	9	96	48	42	32
–2	19	13	9	98	49	43	33
0	20	14	10	100	50	44	33
2	20	14	10	102	51	45	34
4	21	15	10	104	51	45	34
6	21	15	11	106	52	46	35
8	22	16	11	108	53	47	35
10	22	16	12	110	54	48	36
12	23	17	12	112	54	48	37
14	23	17	12	114	55	49	37
16	24	18	13	116	56	50	38
18	24	18	13	118	57	51	38
20	25	19	14	120	58	52	39
22	25	19	14	122	58	52	40
24	26	20	14	124	59	53	40
26	26	20	15	126	60	54	41
28	27	21	15	128	61	55	41
30	27	21	16	130	62	56	42
32	28	22	16	132	62	56	43
34	28	22	17	134	63	57	43
36	29	23	17	136	64	58	44
38	30	24	17	138	65	59	45
				140	66	60	45

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-278A

Cable Tension Table
Figure 403/27-10-07-990-804

AILERON CONTROL WHEEL - MAINTENANCE PRACTICES

1. General

A. Two aileron control wheels are located in the flight compartment, one on each control column.

B. Removal and installation procedures are identical for left and right aileron control wheels and control column heads.

2. Removal/Installation Aileron Control Wheel

A. Remove Control Wheel (Figure 201)

(1) On Flight Guidance Control Panel, place AP switch to 1 position.

(2) Verify AP ON switch is placed OFF.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(3) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B10-92	PRIMARY LONGITUDINAL TRIM PHASE A
		B10-93	PRIMARY LONGITUDINAL TRIM PHASE B
		B10-94	PRIMARY LONGITUDINAL TRIM PHASE C

OVERHEAD EMERGENCY DC BUS

Row	Col	Number	Name
WJE 401-409, 411, 412, 414-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893			
B	8	B10-7	VHF COMM-1
WJE 410			
B	9	B10-7	VHF COMM-1

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
WJE ALL			
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1
G	5	B10-44	VHF COMM-2

(4) Remove screws securing primary longitudinal trim control wheel switch bracket to control wheel.

(5) Remove bracket, and switches from control wheel and disconnect electrical leads from switches. Tag leads to provide identification for installation.

(6) Remove setscrew securing microphone switch to control wheel.

(7) Remove switch from control wheel and disconnect electrical leads from switch. Tag leads to provide identification for installation.

(8) Remove setscrew securing autopilot release switch to control wheel.

(9) Remove switch from control wheel and disconnect electrical leads from switch. Tag leads to provide identification for installation.

(10) Remove hub cap and hub cap adapter from control wheel.

(11) Pull electrical wire bundles from three holes in hub of wheel, taking care not to damage insulation.

(12) Tie three wire bundles tightly to make one bundle.

(13) Remove control head cap.

(14) Remove snap ring and screw retaining ring from end of cable drum.

(15) Remove control wheel retaining nuts and washers.

(16) Remove control wheel from drum in control column and pull wire bundle through hole in center of hub, taking care not to damage insulation.

(17) Tie wire bundle to control column.

B. Disassembly of Control Column Head (Figure 201)

(1) Remove control wheel but do not tie wire bundle to control column. Paragraph 2.A.

(2) Loosen conduit and pull wire bundle free of cable drum. Use care not to damage insulation.

(3) Loosen aileron control cable turnbuckles between control column and torque tube.

(4) Remove cotter pins and aileron control cable from cable drum.

(5) Remove aft bearing, cable drum, three control wheel screws, and spacer.

(6) Remove stop assembly retaining bolts, stop assembly, and forward bearing.

C. Assembly of Control Column Head

(1) Install forward bearing, stop assembly, and stop assembly retaining bolts in control column wheel.

(2) Install cable drum, spacer, and aft bearing.

(3) Insert three control wheel retaining screws in cable drum.

(4) Install aileron control cable on control drum and install cotter pins.

(5) Tighten aileron control cable turnbuckles between control column and torque tube.

(6) Insert wire bundle in cable drum and tighten conduit. Use care not to damage insulation.

(7) Install control wheel. (Paragraph 2.D.)

(8) Adjust aileron control system from control wheel to torque tube. (PAGEBLOCK 27-10-00/501)

(9) Check that control column cap is not interfering with aileron cable drum.

D. Install Control Wheel

(1) Make certain AP switch, on flight guidance panel, is in 1 position.

(2) Make certain AP ON switch is in OFF position.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(3) Make sure that these circuit breakers are open and have safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B10-92	PRIMARY LONGITUDINAL TRIM PHASE A
		B10-93	PRIMARY LONGITUDINAL TRIM PHASE B
		B10-94	PRIMARY LONGITUDINAL TRIM PHASE C

OVERHEAD EMERGENCY DC BUS

Row	Col	Number	Name
WJE 401-409, 411, 412, 414-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893			
B	8	B10-7	VHF COMM-1
WJE 410			
B	9	B10-7	VHF COMM-1

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
WJE ALL			
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1

(Continued)

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1
G	5	B10-44	VHF COMM-2

(4) Make certain that aileron control tab trailing edges are aligned with aileron trailing edges within one-quarter degree.

(5) Untie wire bundle from control column and thread bundle through center hole in control wheel hub, taking care not to damage insulation.

(6) Install control wheel on drum in control column so that index marks on column and wheel are aligned.

(7) Install control wheel retaining nuts and washers.

(8) Install screw retaining ring and snap ring in end of cable drum.

(9) Install control head cap.

(10) Separate three wire bundles and thread one bundle through each of three holes in control wheel hub and through out-board horn of wheel to switch position, taking care not to damage insulation.

(11) Connect electrical leads to microphone switch terminals, making certain that all wires are connected properly. (Ref. Wiring Diagram Manual)

(12) Position microphone switch in control wheel and secure with setscrew.

(13) Connect electrical leads to autopilot release switch terminals, making certain that all wires are connected properly. (Ref. Wiring Diagram Manual)

(14) Position autopilot release switch in control wheel and secure with setscrew.

(15) Connect electrical leads to primary longitudinal trim control wheel switch terminals, making certain that all wires are connected properly. (Ref. Wiring Diagram Manual)

(16) Install bracket and switches in control wheel.

(17) Install hub cap adapter and hub cap on control wheel.

(18) Remove the safety tags and close these circuit breakers:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B10-92	PRIMARY LONGITUDINAL TRIM PHASE A
		B10-93	PRIMARY LONGITUDINAL TRIM PHASE B
		B10-94	PRIMARY LONGITUDINAL TRIM PHASE C

OVERHEAD EMERGENCY DC BUS

Row	Col	Number	Name
WJE 401-409, 411, 412, 414-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893			
B	8	B10-7	VHF COMM-1
WJE 410			
B	9	B10-7	VHF COMM-1

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
WJE ALL			
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2

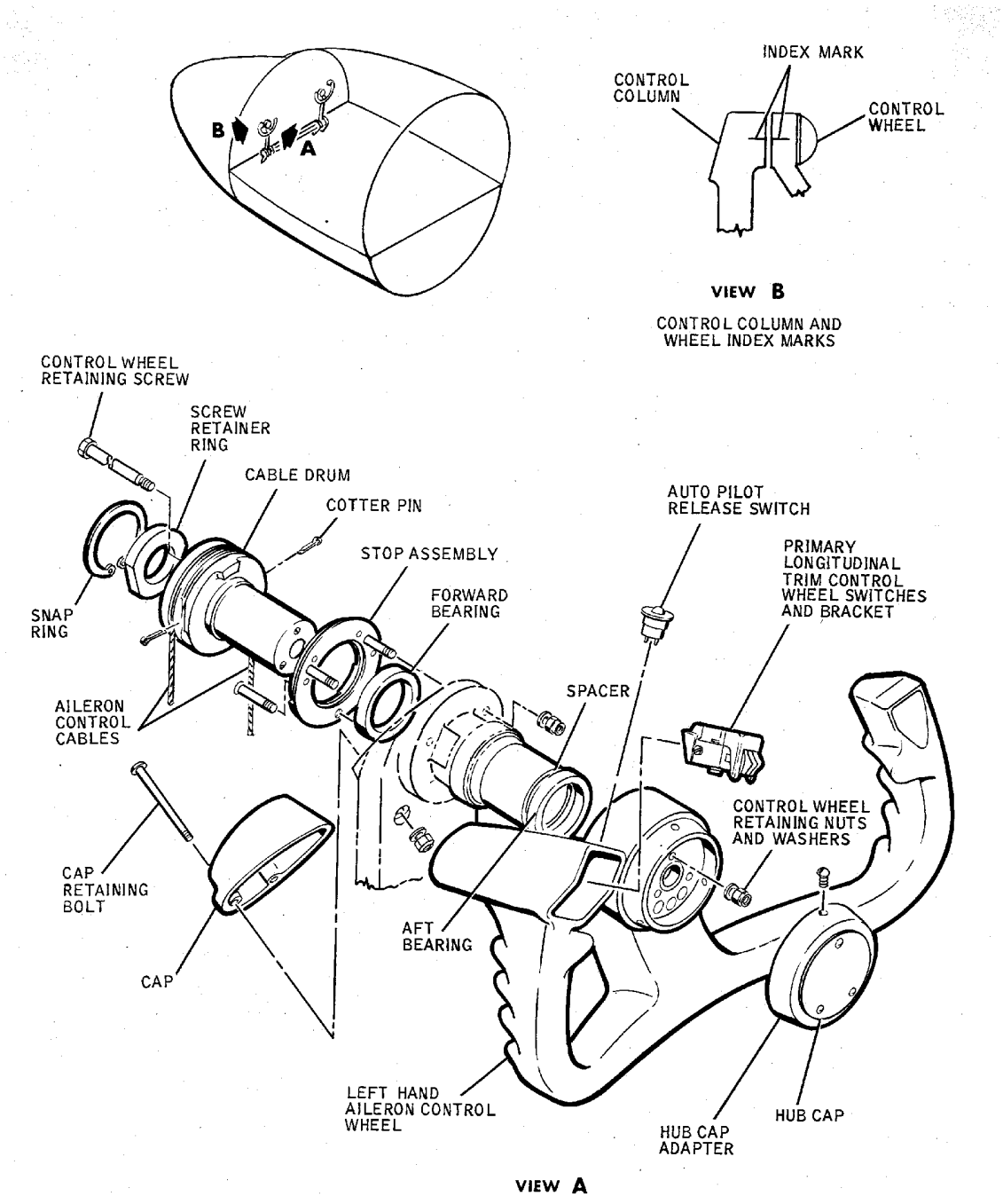
UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1
G	5	B10-44	VHF COMM-2

(19) Check operation of primary longitudinal trim control wheel switches. (Paragraph 3.)

(20) Check operation of microphone switch. (AUDIO INTEGRATING, SUBJECT 23-50-00, Page 201)

(21) Check operation of autopilot release switch. (AUTOPILOT, SUBJECT 22-10-00, Page 201)



Aileron Control Wheel -- Removal/Installation
Figure 201/27-10-08-990-801

3. Check Aileron Control Wheel

A. Check Primary Longitudinal Trim Control Wheel Switches

NOTE: Throughout this check, an intermittent warning horn should sound any time the horizontal stabilizer surface is in motion.

WARNING: BEFORE ACTUATING HORIZONTAL STABILIZER, MAKE CERTAIN THAT AREA AROUND STABILIZER IS CLEAR OF PERSONNEL OR EQUIPMENT.

(1) Move both trim switches in control wheel to airplane noseup position and make following check.

(a) Check that horizontal stabilizer leading edge moves down then stops as switches are released.

(2) Move both switches to airplane nosedown position and make following check.

(a) Check that stabilizer leading edge moves up then stops as switches are released.

(3) Move each switch separately in each direction and check that stabilizer remains stationary.

(4) Return stabilizer to neutral position.

AILERON TORQUE TUBE AND OVERRIDE MECHANISM - REMOVAL/INSTALLATION

1. General

A. The aileron torque tube and override mechanism is located below the flight compartment floor. Access to the mechanism and forward turnbuckles is through the electrical/electronics compartment. Lateral control mixers are located in main gear wheelwells. Access to the aft turnbuckles is through the forward cargo compartment ceiling panels.

B. Numbers in parentheses in the following text correspond to callouts in Figure 401.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 401

Name and Number	Manufacturer
MLG door safety locks 5936851-1, or -501 as applicable. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co.
Tensiometer	Pacific Scientific Co.
Rig pin (4-4) 1/4 by 4 5/8 (2500 x 117.475 mm)	
Rig pin (4-10) 1/2 by 7 5/8 (5000 x 193.675 mm)	
Rig pin (RP-7) 1/4 by 10 5/8 (2500 x 269.875 mm)	
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch), (15.875 mm).	
General purpose grease (MIL-G-81322) (DPM 5348)	Mobile Grease 28 Aeroshell Grease 22
Spring scale (60-pound capacity) (27.2 kg)	John Chatilon & Sons
NASM20995N32, DPM 684*[1]	Not specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Aileron Torque Tube and Override Mechanism

A. Remove Tube and Mechanism

(1) Loosen turnbuckles (1), (2), and (3) to relieve tension from cables.

(2) Disconnect cables from torque tube cable drums.

(3) Remove two guard pins (4) from bracket at bottom of cable drums.

(4) Remove bolts securing spring guard (5) to floor beam.

(5) Support torque tube and disconnect brackets (6) from floor beam. Retain shim washers, if any, noting number and position for installation.

(6) Remove torque tube and override mechanism from aircraft.

(7) Remove mounting brackets (6) from end of torque tube.

B. Install Tube and Mechanism

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Install mounting brackets (6) on ends of torque tube, making certain that washers (7), between bracket and torque tube, are installed with chamfer facing torque tube.

(3) Place torque tube in position and attach mounting brackets (6) to floor beam with two washers under upper and lower legs of each bracket.

(4) Connect cables to torque tube cable drums, making certain that cables are properly routed through fuselage and control column. Safety cable ball ends with cotter pin.

(5) Insert rig pin (4-4) in rig pin hole (R-3) in aileron torque tube cable drum.

(6) Adjust turnbuckles (1) (four places) to obtain tension of 64 pounds (28.8 kg) at 70°F for 1/8 inch (3.175 mm) cables. Compensate for temperature. (Figure 402)

(7) Differentially adjust turnbuckles (1) so that index marks on control columns align with index marks on control wheels within 1/32 inch (0.79 mm).

(8) Insert rig pins (4-10) in rig pin holes (R-7) in left and right lateral control mixers.

(9) Adjust turnbuckles (2) (four places) to obtain tension of 64 pounds (28.8 kg) at 70°F for 1/8 inch (3.18 mm) cables. Compensate for temperature. (Figure 402)

(10) Differentially adjust turnbuckles (2) so that rig pins (4-10) can be freely removed from rig pin holes (R-7)in left and right lateral control mixers.

(11) Remove rig pins (4-10) from left and right lateral control mixers.

(12) Adjust turnbuckles (3) to obtain tension of 64 pounds (28.8 kg) at 70°F for 1/8 inch (3.18 mm) cables. Compensate for temperature. (Figure 403) (Figure 402).

NOTE: To check cable tension, remove rig pin (4-4) and rotate control wheel fully clockwise. Check tension at approximate midspan of cables 19B and 20A. Return control wheel to neutral and reinstall rig pin (4-4) in rig pin hole (R-3).

(13) Differentially adjust turnbuckles (3) until index mark on rheostat case is aligned within width of rheostat actuating crank tip. (Figure 403)

(14) Position spring guard (5) and attach to floor beam. Shim with washers between guard bosses and floor beam, or trim guard bosses to obtain 1/8 inch to 3/16 inch (3.18 to 4.76 mm) clearance between guard and spring housing.

(15) Install guard pins (4) at bottom of cable drums. Add or remove washers under guard pin brackets (8) to obtain 1/32 to 1/16 inch (0.792 -1.59 mm) clearance between guard pins and cable drums.

WJE 405-411, 880, 881, 883, 884

(16) Remove rig pin (4-4). On airplanes without SB 27-247, securely fasten mixer protective shields.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

(17) Remove rig pin (4-4).

WJE ALL

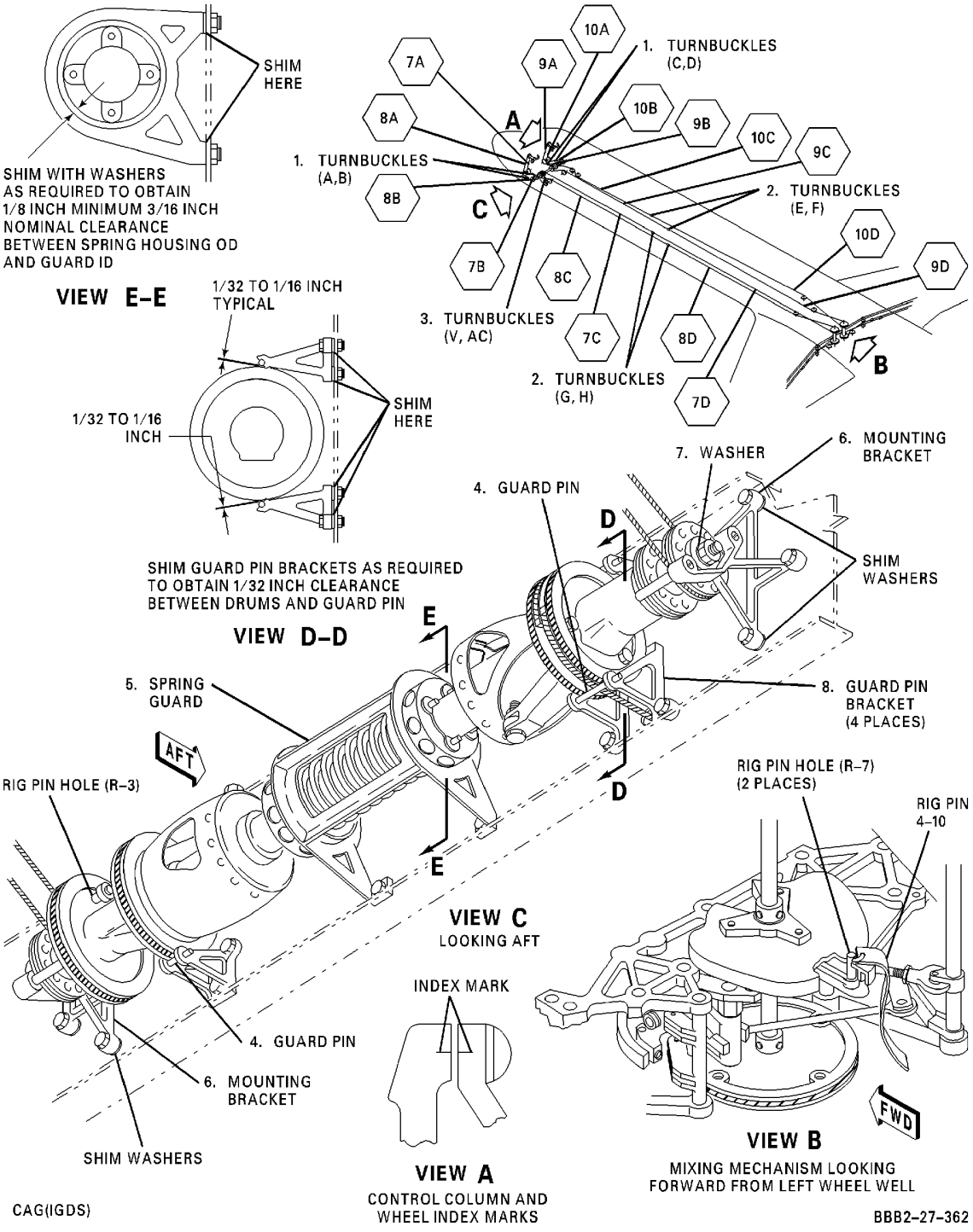
(18) Safety all turnbuckles with clips.

(19) Lubricate aileron torque tube and override mechanism as applicable. (PAGEBLOCK 12-21-02/301)

NOTE: After lubrication is applied, cycle the unit from neutral to full travel and wipe off excess.

(20) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

(21) Check aileron torque tube and override mechanism. (Paragraph 4.)



Aileron Torque Tube and Override Mechanism -- Removal/Installation
Figure 401/27-10-09-990-801

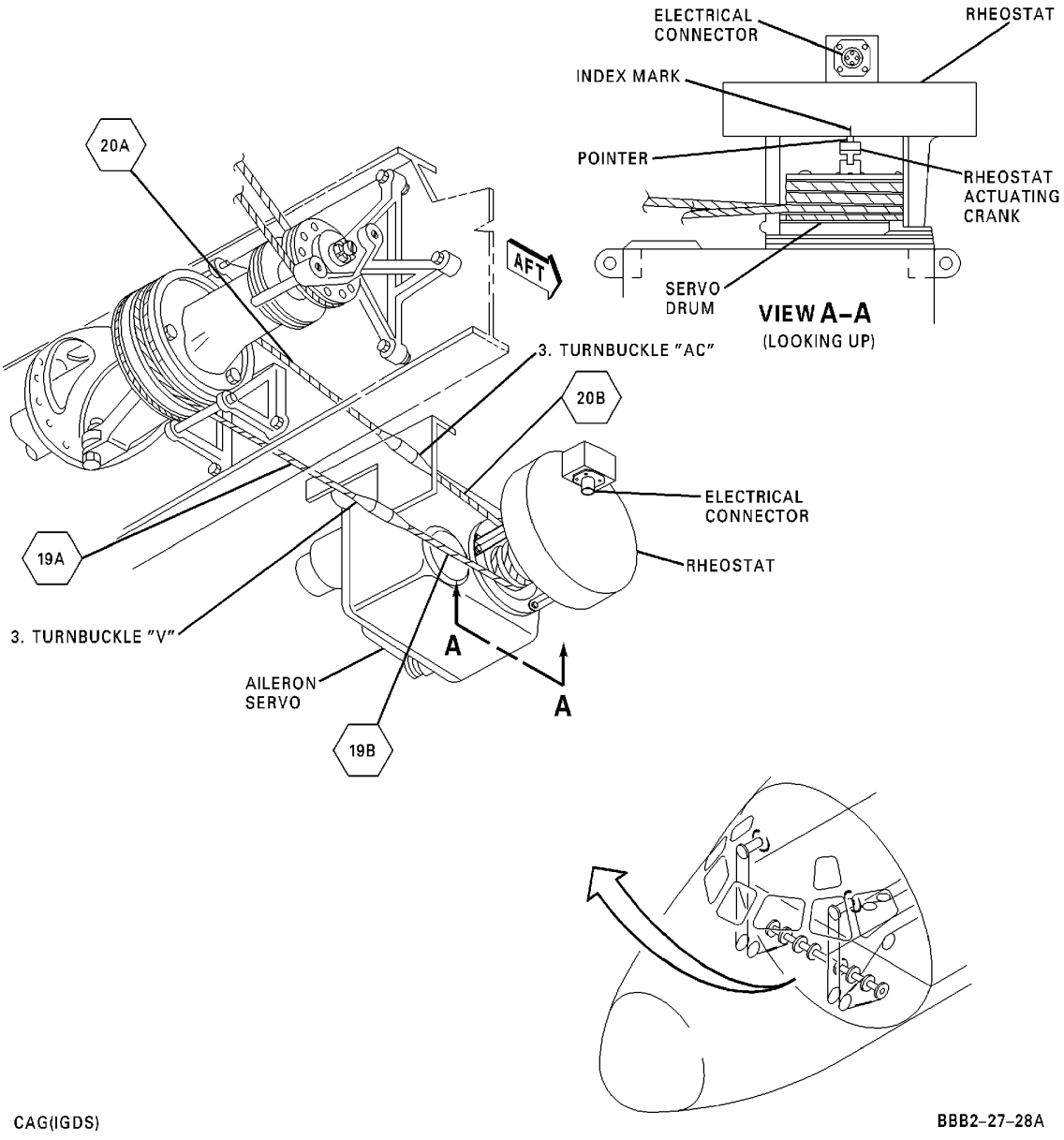
CABLE TENSION TABLE – 1/8 DIAMETER

TEMP deg F	MAX. PROD. RIG LOAD	MIN. PROD. RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. PROD. RIG LOAD	MIN. PROD. RIG LOAD	MIN. ALLOW. SERV. LOAD
–60	10	9	6	42	55	51	35
–58	11	10	7	44	56	52	36
–56	12	11	7	46	57	53	36
–54	12	12	8	48	58	54	37
–52	13	12	9	50	59	54	38
–50	14	13	9	52	60	55	38
–48	15	14	10	54	61	56	39
–46	16	15	10	56	61	57	40
–44	17	16	11	58	62	58	40
–42	18	16	11	60	63	59	41
–40	19	17	12	62	64	60	41
–38	20	18	13	64	65	61	42
–36	20	19	13	66	66	62	43
–34	21	20	14	68	67	63	43
–32	22	21	14	70	68	64	44
–30	23	21	15	72	69	64	45
–28	24	22	15	74	70	65	45
–26	25	23	16	76	71	66	46
–24	26	24	16	78	72	67	47
–22	26	25	17	80	74	68	47
–20	27	25	18	82	75	69	48
–18	28	26	18	84	76	70	49
–16	29	27	19	86	77	71	49
–14	30	28	19	88	78	72	50
–12	31	29	20	90	79	73	51
–10	32	29	20	92	80	74	51
–8	33	30	21	94	81	75	52
–6	33	31	21	96	82	76	53
–4	34	32	22	98	83	77	53
–2	35	33	23	100	84	78	54
0	36	33	23	102	85	79	55
2	37	34	24	104	87	80	56
4	38	35	24	106	88	81	56
6	39	36	25	108	89	83	57
8	40	37	25	110	90	84	58
10	40	38	26	112	91	85	59
12	41	38	27	114	92	86	59
14	42	39	27	116	94	87	60
16	43	40	28	118	95	88	61
18	44	41	28	120	96	89	62
20	45	42	29	122	97	90	62
22	46	42	29	124	98	91	63
24	47	43	30	126	100	93	64
26	48	44	31	128	101	94	65
28	48	45	31	130	102	95	66
30	49	46	32	132	103	96	67
32	50	47	32	134	105	97	67
34	51	48	33	136	106	98	68
36	52	48	33	138	107	100	69
38	53	49	34	140	109	101	70
40	54	50	35				

CAG(IGDS)

BBB2–27–51A

Aileron Cable Tension Table
Figure 402/27-10-09-990-802



Aileron Servo -- Adjustment
Figure 403/27-10-09-990-803

4. Check Aileron Torque Tube and Override Mechanism

A. Check Override Mechanism (Figure 404)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Insert rig pin (4-10) in pig pin hole (R-7) in left lateral control mixer.

(3) Attach spring scale to right horn of either aileron control wheel.

WARNING: BEFORE MOVING AILERON CONTROL TABS, MAKE CERTAIN THAT AREAS AROUND LEFT AND RIGHT AILERONS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(4) Pull scale to rotate wheel clockwise and note breakout force required to start cam follower (9) moving up cam (10). Breakout force should be 54(±6) pounds (24.3(±2.7) kg).

(5) Move spring scale to left horn of wheel.

(6) Pull scale to rotate wheel counterclockwise and check that breakout force is within limits specified in Paragraph 4.A.(4).

(7) If breakout force is not within specified limits, adjust screws (8) to obtain correct breakout force.

NOTE: When adjusting aileron override mechanism breakout force with adjusting screws (8), tighten adjusting screws in opposing sequence such that inner and outer springs do not flex, bow and contact each other, torque shaft phenolic tubing or housing. With proper breakout force set, spring seat (11) may be asymmetrical relative to torque shaft rather than perpendicular. Asymmetric adjustment is an acceptable condition. Figure 404

(8) Safety adjustment screws (8) with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(9) Remove rig pin (4-10) from left mixer.

(10) Insert rig pin (4-10) in rig pin hole (R-7) in right mixer.

(11) Repeat Paragraph 4.A.(3) through Paragraph 4.A.(11).

(12) Remove rig pin (4-10) from right mixer.

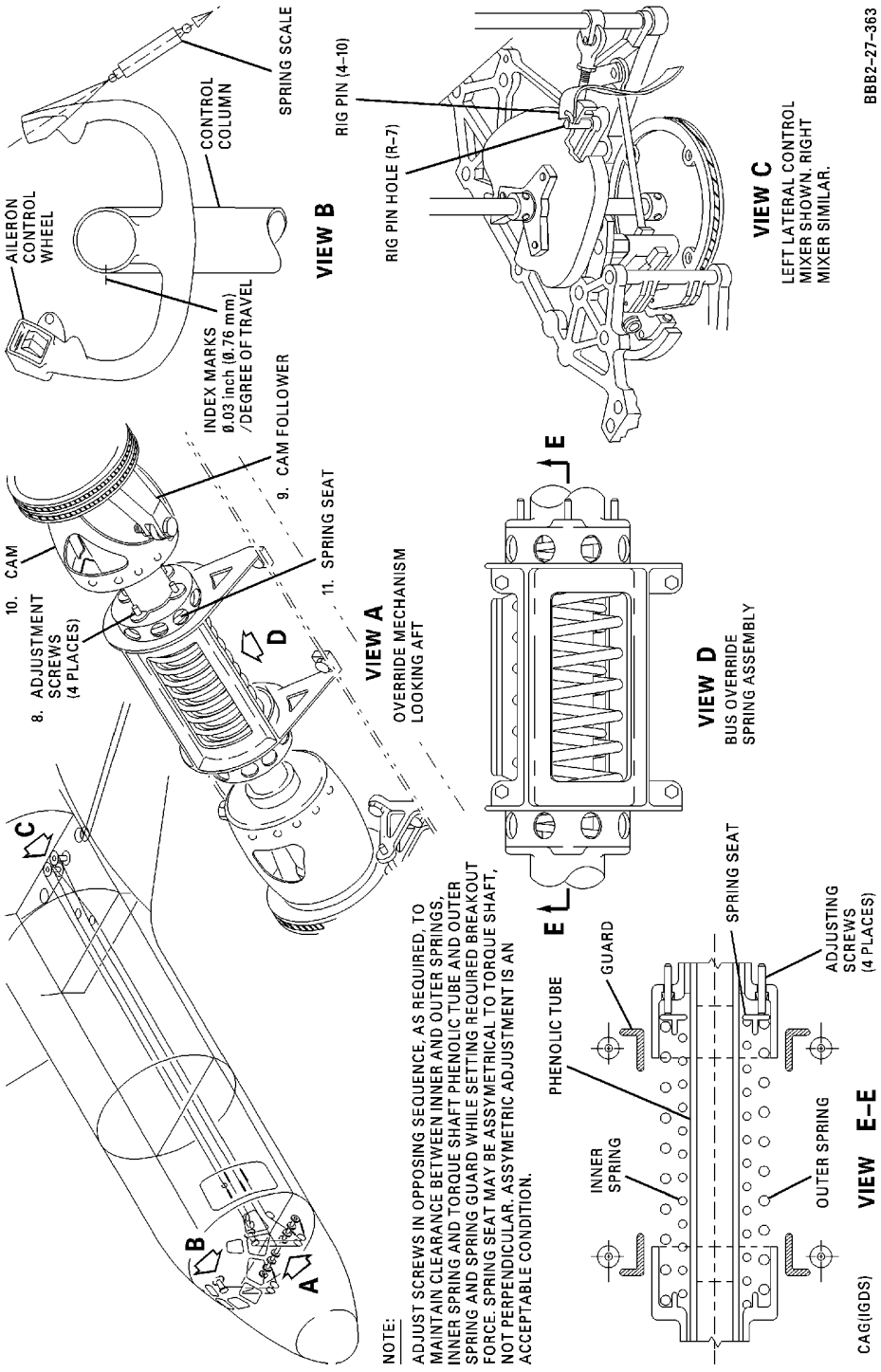
(13) Return control wheel to neutral position.

WJE 405-411, 880, 881, 883, 884

(14) On aircraft before incorp. of SB 27-247, securely fasten lateral mixer protective shields after completing all maintenance.

WJE ALL

(15) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).



Aileron Torque Tube and Override Mechanism
Figure 404/27-10-09-990-804

AILERON TORQUE TUBE AND OVERRIDE MECHANISM - ADJUSTMENT/TEST

1. General

A. This procedure contains MSG-3 task card data.

TASK 27-10-09-720-801

2. Functional Check of the Aileron Control Torque Tube and Override Mechanism

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
20-10-18 P/B 201	LOCKWIRE SAFETYING - MAINTENANCE PRACTICES
32-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES

B. Tools/Equipment

NOTE: When more than one tool part number is listed under the same "Reference" number, the tools shown are alternates to each other within the same airplane series. Tool part numbers that are replaced or non-procurable are preceded by "Opt:", which stands for Optional.

Reference	Description
SPL-578	Lock Assembly - MLG Door Safety (used when airplane is resting on the gear) **MD80-81, -82, -83, -88** Part #: 3936851-1 Supplier: 88277
SPL-4248	Pin - Rig
STD-5505	Spring Scale

C. Consumable Materials

NOTE: Equivalent replacements are permitted for the items that follow.

NOTE: It is possible that some materials in the Consumable Materials chart cannot be used for some or all of the necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Reference	Description	Specification
G60169	Lockwire - .032 Inconel	DPM 684 (NASM20995N)
G60803	Lockwire - Stainless Steel, 316 (0.032 in. diameter)	DPM 5865 (NASM20995C32)

D. Prepare for the Functional Check of the Aileron Control Torque Tube and Override Mechanism

SUBTASK 27-10-09-010-001

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install MLG door safety lock assembly, SPL-578. (PAGEBLOCK 32-00-00/201)

(2) Remove lateral mixer protective shields (if installed).

E. Functional Check of the Aileron Control Torque Tube and Override Mechanism

SUBTASK 27-10-09-720-001

WARNING: BEFORE YOU MOVE THE AILERONS AND AILERON CONTROL TABS, MAKE SURE THE AREAS AROUND THE LEFT AND RIGHT AILERONS ARE CLEAR OF ALL PERSONS AND EQUIPMENT. THIS WILL HELP PREVENT INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(1) Do a functional check of the aileron control torque tube and override mechanism (left lateral control mixer). (Figure 501)

(a) Insert rig pin, SPL-4248 in rig pin hole (R-7) in left lateral control mixer.

WARNING: BEFORE YOU MOVE THE AILERONS AND AILERON CONTROL TABS, MAKE SURE THE AREAS AROUND THE LEFT AND RIGHT AILERONS ARE CLEAR OF ALL PERSONS AND EQUIPMENT. THIS WILL HELP PREVENT INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(b) Attach spring scale, STD-5505 to right horn of either aileron control wheel.

(c) Pull scale to rotate wheel clockwise and note breakout force required to start cam follower (9) moving up cam (10). Breakout force should be 54 lb (24 kg) ± 6 lb (3 kg).

(d) Move spring scale, STD-5505 to left horn of wheel.

(e) Pull scale to rotate wheel counterclockwise and check that breakout force is within limits. Breakout force should be 54 lb (24 kg) ± 6 lb (3 kg).

(f) If breakout force is not within specified limits, adjust screws (8) to obtain correct breakout force.

NOTE: When adjusting aileron override mechanism breakout force with adjusting screws (8), tighten adjusting screws in opposing sequence such that inner and outer springs do not flex, bow and contact each other, torque shaft phenolic tubing or housing. With proper breakout force set, spring seat (11) may be asymmetrical relative to torque shaft rather than perpendicular. Asymmetric adjustment is an acceptable condition.(Figure 501)

(g) Safety adjustment screws (8) with .032 inconel lockwire, G60169. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: For the installation of control cables and associated hardware, lockwire, G60803 can be used.

(h) Remove rig pin from left mixer.

SUBTASK 27-10-09-720-002

WARNING: BEFORE YOU MOVE THE AILERONS AND AILERON CONTROL TABS, MAKE SURE THE AREAS AROUND THE LEFT AND RIGHT AILERONS ARE CLEAR OF ALL PERSONS AND EQUIPMENT. THIS WILL HELP PREVENT INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(2) Do a functional check of the aileron control torque tube and override mechanism (right lateral control mixer). (Figure 501)

(a) Insert rig pin, SPL-4248 in rig pin hole (R-7) in right lateral control mixer.

WARNING: BEFORE YOU MOVE THE AILERONS AND AILERON CONTROL TABS, MAKE SURE THE AREAS AROUND THE LEFT AND RIGHT AILERONS ARE CLEAR OF ALL PERSONS AND EQUIPMENT. THIS WILL HELP PREVENT INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(b) Attach spring scale, STD-5505 to right horn of either aileron control wheel.

(c) Pull scale to rotate wheel clockwise and note breakout force required to start cam follower (9) moving up cam (10). Breakout force should be 54 lb (24 kg) ± 6 lb (3 kg).

(d) Move spring scale, STD-5505 to left horn of wheel.

(e) Pull scale to rotate wheel counterclockwise and check that breakout force is within limits. Breakout force should be 54 lb (24 kg) ± 6 lb (3 kg).

(f) If breakout force is not within specified limits, adjust screws (8) to obtain correct breakout force.

NOTE: When adjusting aileron override mechanism breakout force with adjusting screws (8), tighten adjusting screws in opposing sequence such that inner and outer springs do not flex, bow and contact each other, torque shaft phenolic tubing or housing. With proper breakout force set, spring seat (11) may be asymmetrical relative to torque shaft rather than perpendicular. Asymmetric adjustment is an acceptable condition. (Figure 501)

(g) Safety adjustment screws (8) with .032 inconel lockwire, G60169. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(h) Remove rig pin, SPL-4248 from right mixer.

(i) Return control wheel to neutral position.

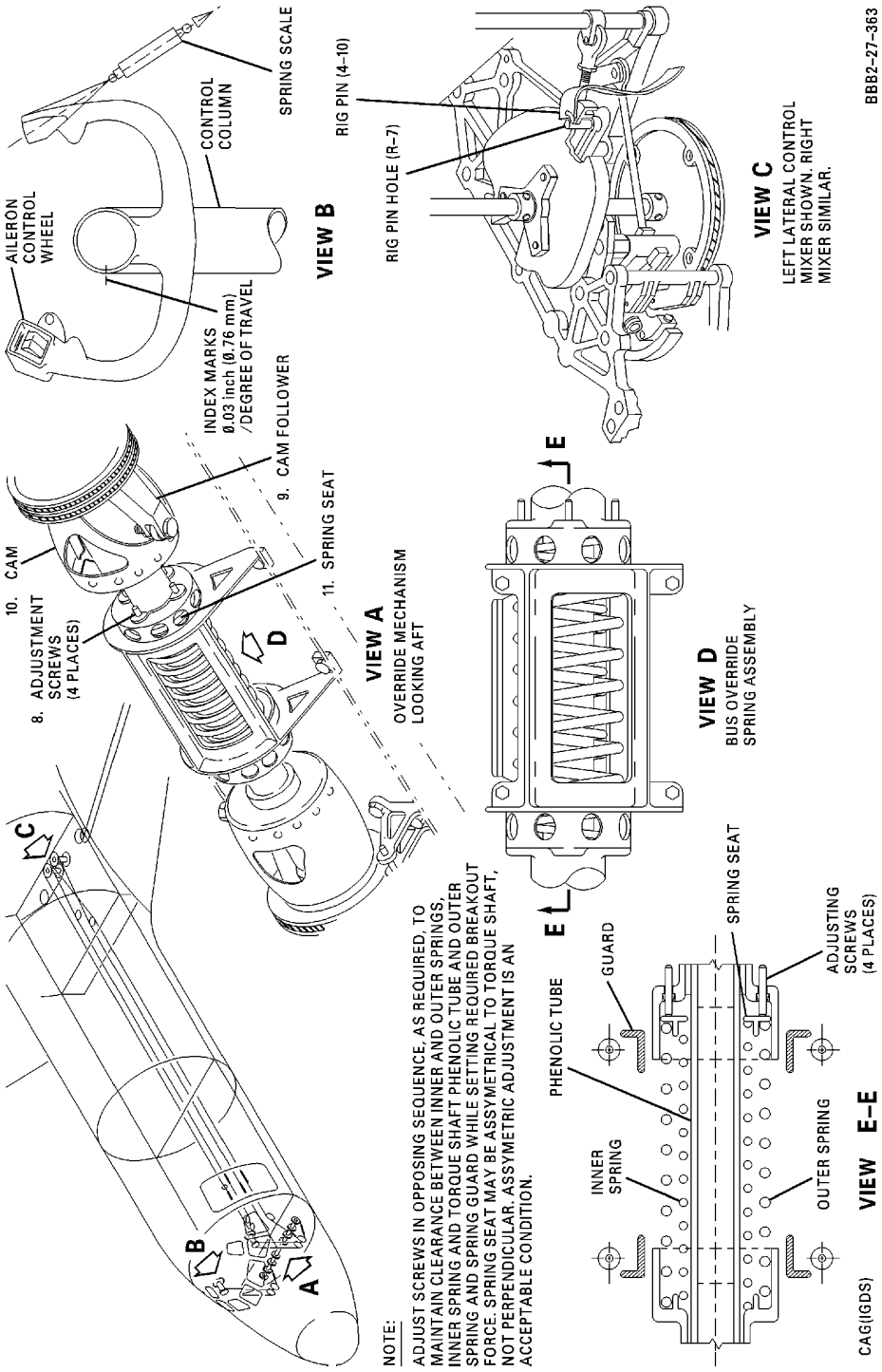
F. Job Close-up

SUBTASK 27-10-09-410-001

(1) Securely fasten lateral mixer protective shields (if installed) after completing all maintenance.

(2) Remove MLG door safety lock assembly, SPL-578, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

——— END OF TASK ———



Aileron Torque Tube and Override Mechanism
Figure 501/27-10-09-990-805

RUDDER AND TAB - DESCRIPTION AND OPERATION

1. General

A. The rudder and tab control system is a hydraulically actuated, mechanically controlled system that provides directional control of the airplane about the vertical axis. The system consists of three subsystems; the rudder control system, the rudder hydraulic power shutoff system, and the rudder trim control system.

B. Rudder Control System (Figure 1)

(1) The rudder control system controls the movement of the rudder and tab and consists of rudder drive torque tube, control tab torque tube, drive selector, hydraulic power package, a dual set of rudder pedals, rudder throw-limiter, and two rudder dampers.

(2) The rudder is hinged to the rear spar of the vertical stabilizer at three points. The drive torque tube is attached to the base of the rudder at the hinge line and extends down into the aft fuselage section. The tab torque tube is bearing-mounted within the drive torque tube and supported at the lower end by a bracket attached to the empennage structure. A crank on the upper end of the tab torque tube is connected by pushrod to the control tab which is hinged to the rear spar of the rudder at three points. The drive sector, mounted at the base of the torque tubes, is connected by mechanical linkage to the hydraulic power package which is located near the top of the aft fuselage canted bulkhead. A two-way cable system connects the drive sector to the rudder pedals in the flight compartment. The pedals are interconnected by a torque tube below the flight compartment floor so that both sets of pedals operate in unison. The throw-limiter actuator, on the forward side of the aft fuselage canted bulkhead, is connected by mechanical leakage to a hook which is positioned in a slot in the hydraulic power package actuating cylinder piston rod.

C. Rudder Trim Control System

(1) The rudder trim control system provides a means of adjusting the neutral position of the rudder drive sector to obtain rudder trim. The system is controlled mechanically by a knob on the flight compartment center control pedestal.

(2) The system consists of the rudder trim control mechanism in the center control pedestal and the rudder trim and load-feel spring, located in the aft fuselage section between the drive sector and the aft fuselage canted bulkhead. A two-way cable system connects the trim and load-feel spring to the trim control mechanism. A shaft on the trim and load-feel spring is connected to the drive sector.

D. Rudder Hydraulic Power Shutoff System

(1) The rudder hydraulic power shutoff system controls the supply of hydraulic pressure to the rudder hydraulic power package. The system is mechanically controlled by a lever in the flight compartment on the center control pedestal.

(2) The shutoff system consists of a hydraulic shutoff valve, located in the aft accessory compartment below the right air conditioning unit, connected by a two-way cable system to a control lever on the center control pedestal. The shutoff valve is connected, by hydraulic lines, to the right hydraulic power system and the hydraulic power package.

2. Component Description

A. Rudder Hydraulic Power Package (Figure 2 or Figure 3 or Figure 4)

(1) The rudder hydraulic power package consists of the hydraulic components that control the movement of the rudder during power operation, and the power-to-manual reversion mechanism.

(2) The hydraulic components consist of an actuating cylinder and a manifold and valve. The actuating cylinder housing is connected to a crank which is splined to the rudder drive torque tube. One end of the actuating cylinder piston rod is slotted to accommodate the rudder throw-limiter stop hook. The other end of the piston rod is attached to a fixed support on the structure. The manifold and valve consists of a tab lockout cylinder and a control valve in the same manifold housing. Internal passages in the manifold connect the control valve, tab lockout cylinder, and the actuating cylinder hydraulically. Hydraulic lines connect the manifold to the rudder hydraulic power shutoff valve. The tab lock-out cylinder piston rod is connected to the reversion mechanism gripper arm. The control valve is connected through the reversion mechanism to the rudder drive sector.

(3) The power-to-manual reversion mechanism consists of two gripper arms, two camshafts, a pivot lever, clevis, reversion spring, and connecting links. The camshafts are installed on a support attached to the power package. The gripper arms are installed on the camshafts and are connected together at one end of a connecting link. The pivot lever is mounted on the support between the gripper arms, and connected by pushrods to the drive sector and the control valve. The clevis is installed on the support below the pivot lever and is connected by pushrod to rudder control tab torque tube. The reversion spring is connected between one of the gripper arms and a bracket on the sup-port. The same gripper arm is connected to the tab lockout cylinder piston rod.

B. Rudder Hydraulic Power Shutoff Valve

(1) The rudder hydraulic power shutoff valve automatically shuts off hydraulic pressure to the rudder hydraulic power package when the pressure drops below 750(+350,-50) psi (1.175(+2415 -345) kPa). The valve can also be operated manually by a lever on the center control pedestal.

(2) The shutoff valve consists of a filter, a pressure-operated slide valve, manually operated slide valve, and bypass valve, all enclosed in a common housing. Internal passages connect the valves and filter hydraulically within the housing. Pressure inlet and outlet ports are connected by hydraulic lines to the right hydraulic system and to the rudder hydraulic power package. A yoke attached to the exposed end of the manual slide valve piston rod is connected by mechanical linkage to the rudder hydraulic power shutoff cable system.

C. Rudder Accumulator Cylinder

(1) The rudder accumulator cylinder, located in the pressure line to the shutoff valve, maintains a head of pressure to the valve in the event of a momentary drop of hydraulic pressure when operating a major component, such as the landing gear and doors, of the right hydraulic system. The accumulator is charged to 1000(±50) psi, (6900(±345) kPa) with dry nitrogen.

(2) The accumulator cylinder consists of a shell, a piston and two end caps with ports. One end cap port is connected to a hydraulic line and the opposite end is connected to an air line. A filler valve and a pressure gage is attached to the other end of the air line. Backup rings and packing on the free moving piston separate the air chamber of the accumulator from the hydraulic fluid chamber.

D. Rudder Dampers

(1) Two rudder dampers, located in the leading edge of the rudder at the lower and center hinges, prevent rudder flutter during flight and sudden movement of the rudder, such as that caused by gusts of wind, while the airplane is on the ground.

(2) Each damper consists of a housing, shaft, rotors, stators, and bearings. The housing is filled with thick silicone fluid. The rotors are attached to the shaft which is installed in bearings in the housing. The stators are positioned in the housing between the rotors. An arm on the shaft is attached to a fitting on the vertical stabilizer below the hinge mounting brackets. The housing is attached to the rudder leading edge structure at the hinge point.

(3) As the rudder is moved, the shaft of the damper is rotated, moving the rotors in the silicone fluid. The stators and the fluid resist rotor movement. Normal rudder movement is slow, and is opposed with little resistance from the dampers. Rapid movement of the rudder, such as that caused by flutter of gusts of wind, is met with greater resistance from the dampers.

E. Rudder Throw-Limiter Actuator

(1) The rudder throw-limiter actuator positions a progressive, hook-like stop in a slot in the rudder hydraulic power pack-age actuating cylinder piston rod to restrict rudder travel at high airspeeds.

(2) The actuator consists of a cover, support, piston, diaphragm, idler crank, drive crank, linear crank, and dual first-and second-stage limiting springs. The diaphragm is secured between the cover and the piston, creating an air chamber in the cylindrical support. A fitting in the cover admits air pressure from a pitot system into the chamber. The piston is attached to the drive crank which is connected to the linear crank. One end of the idler crank is attached to the piston between the drive crank and the air chamber. The other end of the idler crank is attached to the support. The first-stage limiting springs are installed between the lower end of the drive crank and the upper end of the linear crank. The second-stage limiting springs are attached to the lower end of the linear crank and to the support near the outside rim of the chamber. Mechanical linkage connects the drive crank to the throw-limiter hook on the rudder hydraulic power package.

(3) Pitot pressure to operate the rudder throw-limiter is supplied from the pitot tube located on the vertical stabilizer leading edge. A pitot sump and water drain for this system is provided in the fuselage tail section at base of rudder hinge line.

F. Rudder Trim and Load-Feel Spring

(1) The rudder trim and load-feel spring provides a simulated feel of aerodynamic rudder movement to the rudder pedals and also acts as a centering device to return the rudder drive sector and rudder pedals to an adjustable neutral position to obtain rudder trim.

(2) The trim and load-feel spring consist of an inner and outer housing, two springs, shaft, actuator screw, collar, cable drum, sliders, and internal stops. The shaft is installed in the inner housing and the small spring is held around the shaft by stops on the housing and on the shaft. The inner housing is centered within the outer housing by the sliders. The large spring is installed around the inner housing between the sliders. Stops on both ends of the shaft prevent over travel of the shaft. The cable drum is attached to the actuator screw which is threaded through the collar around one end of the outer housing. The exposed end of the shaft is connected to the rudder drive sector. Two-way cable systems connect the cable drum to the rudder trim control mechanism in the control pedestal.

G. Rudder Trim Control Mechanism (Figure 5)

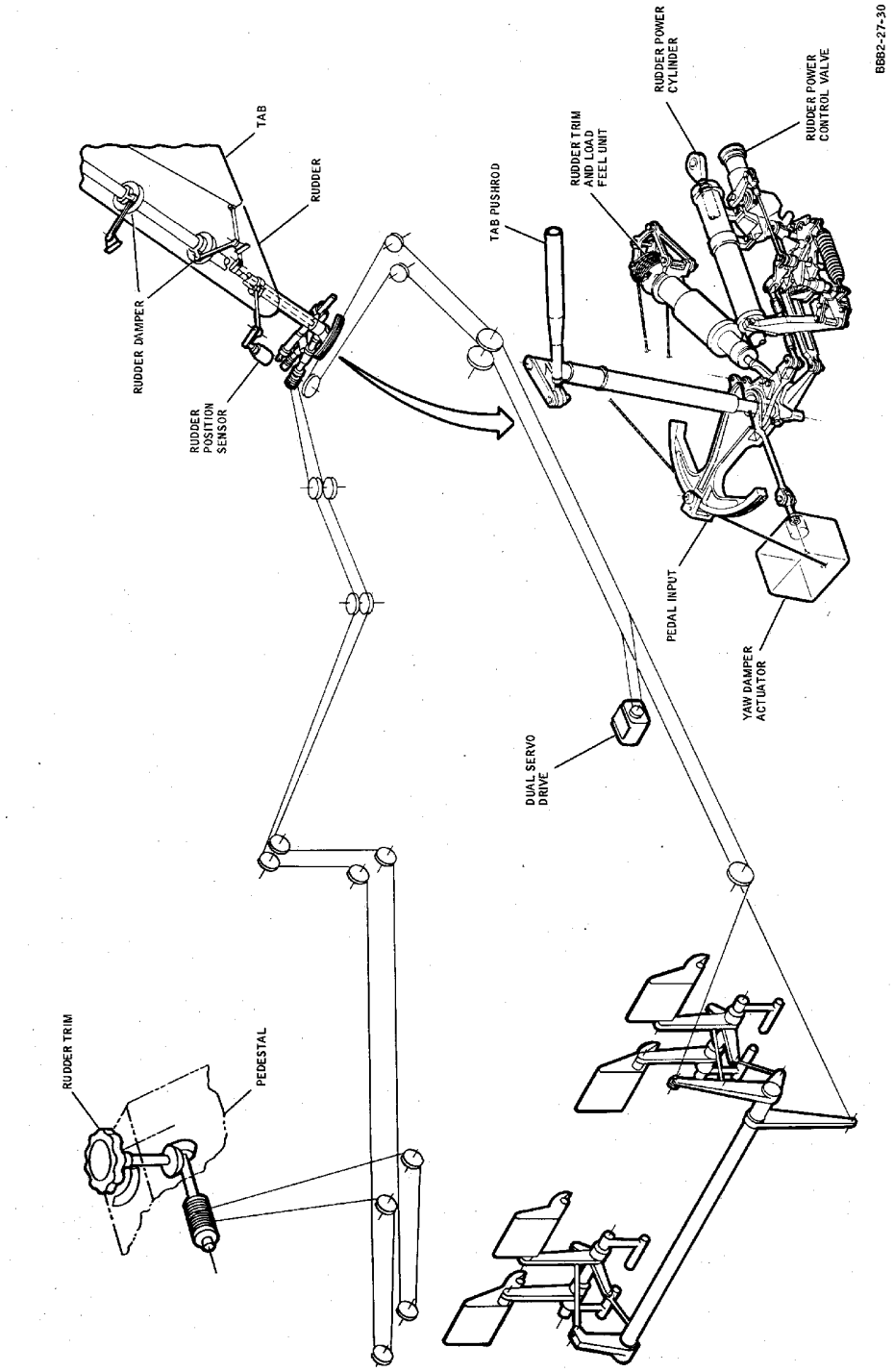
(1) The rudder trim control mechanism provides a means of adjusting and indicating the amount of rudder trim. The aileron and rudder trim control mechanism is installed as one unit in the control pedestal. (PAGEBLOCK 27-10-07/401)

(2) The rudder portion of the mechanism consists of a control knob, trim shaft, bevel gear drive shaft, cable drum, gears, and a trim position indicator. The cable drum is attached to one end of the trim shaft. The lower bevel gear, on the opposite end of the trim shaft, mesh with the upper bevel gear on the lower end of the drive shaft. The trim position indicator and the control knob are mounted on the upper end of the drive shaft.

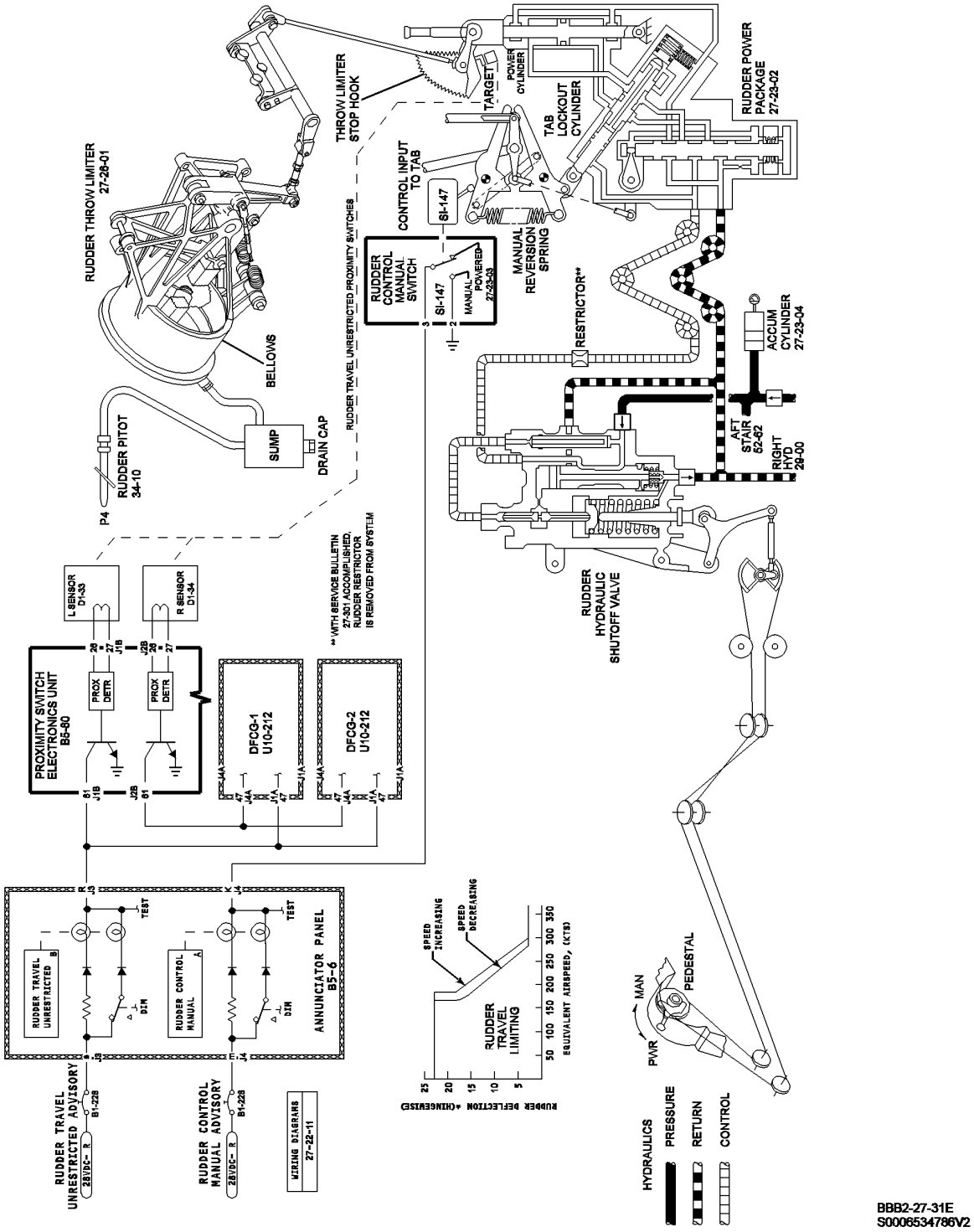
(3) The rudder trim position indicator and trim control mechanism is mounted on the upper aft face of the flight compartment center control pedestal.

(4) On aircraft without SB 27-311, the mechanism consists of a spiral drive plate, slide washer, follower, spacer, pointer, cover plate, placard and trim control knob. The drive plate fits directly on the square drive shaft. The spacer is located on the shaft on top of the drive plate. The slide washer, follower, and pointer are installed on the spacer. The placard is attached to the cover plate which is installed on the control pedestal. A rig neutral notch on the cover plate marks a neutral position for rigging purposes. Since there may be a difference between the rigged neutral position and the flight neutral position, the placard is adjustable so that it may be aligned with the pointer for the flight neutral position.

(5) On aircraft with SB 27-311, the spiral drive plate, follower, spacer and pointer are redesigned, the cover plate is modified, and the slide washer eliminated. The placard and trim control knob remain unchanged. The drive plate fits directly on the square drive shaft. The follower is mounted to the center control pedestal frame on a pivot bolt. The follower pivots on this axis as it is driven by the spiral plate through two follower pins tracking the plate groove. The pointer pivots on a bushing installed over the drive shaft and is driven by the follower through a slotted arm on the pointer riding a pin on the follower center arm. The placard is attached to the cover plate which is installed on the control pedestal. A rig neutral notch on the cover plate marks a neutral position for rigging purposes. Since there may be a difference between the rigged neutral position and the flight neutral position, the placard is adjustable so that it may be aligned with the pointer for the flight neutral position.

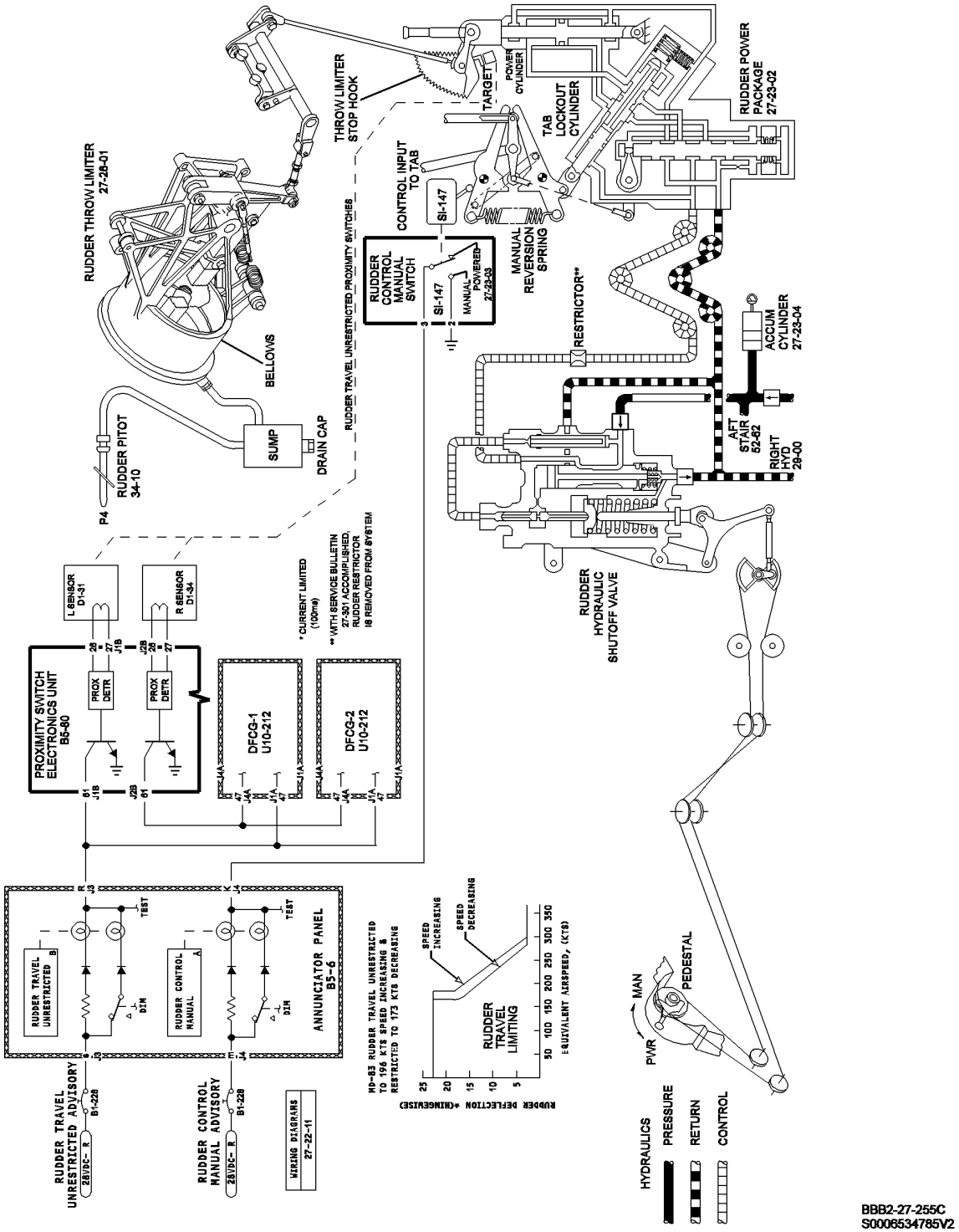


Rudder Control and Trim System -- Schematic
Figure 1/27-20-00-990-801

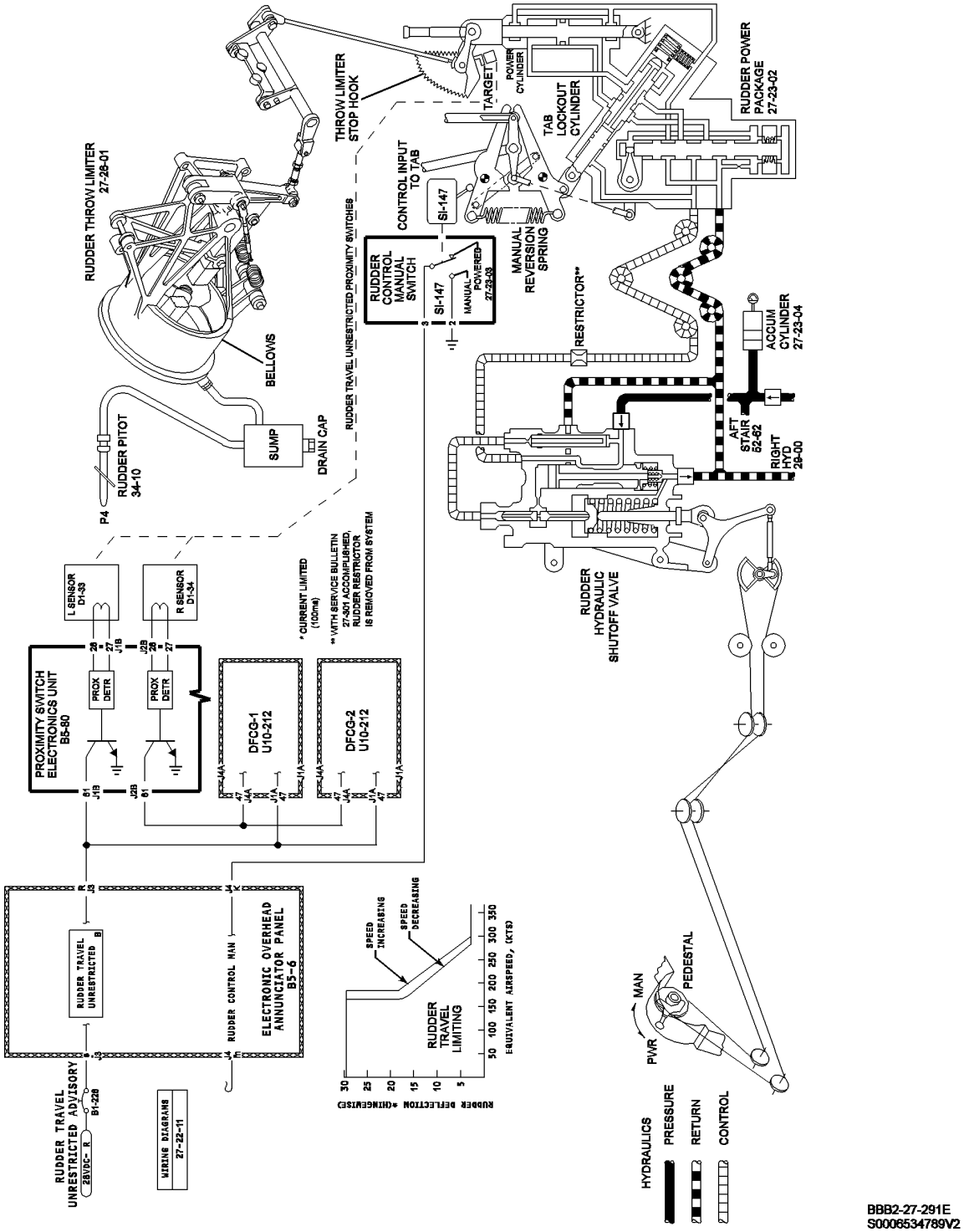


BBB2-27-31E
S0006534786V2

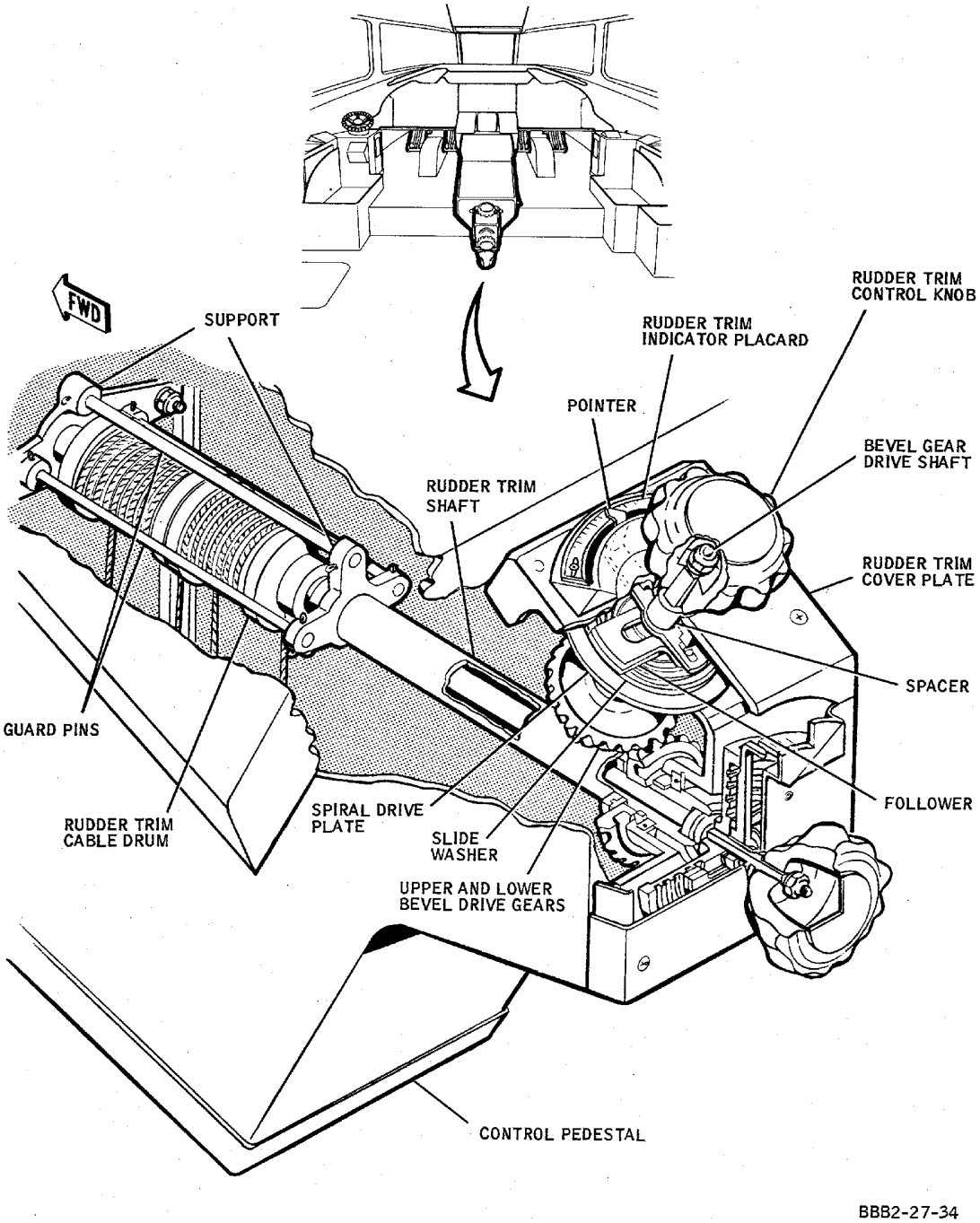
Rudder Hydraulics and Throw-Limiter -- Schematic
Figure 2/27-20-00-990-802



Rudder Hydraulics and Throw-Limiter -- Schematic
Figure 3/27-20-00-990-804



Rudder Hydraulics and Throw-Limiter -- Schematic
Figure 4/27-20-00-990-806



Rudder Trim Control Mechanism
Figure 5/27-20-00-990-809

3. Operation

A. Hydraulic Power Operation

(1) The rudder hydraulic power shutoff system controls the supply of hydraulic pressure to the hydraulic power package. When the shutoff valve control lever is in the off position, the rudder control system is in the manual mode of operation. Hydraulic pressure from the right hydraulic system is bypassed through the shutoff valve filter and manual slide valve to the system return port. When the control lever is moved to the on position, the two-way cable system and mechanical linkage pull the shutoff valve yoke, closing the manual slide valve. Hydraulic pressure is now directed to the pressure-operated slide valve. When pressure reaches 1300(±100) psi, (8970(±690) kPa) the pressure-operated slide valve opens, directing pressure from the shutoff valve to the hydraulic power package tab lockout cylinder and control valve.

(2) The tab lockout cylinder piston rod is maintained in the extended position during manual operation. When hydraulic pressure is directed to the lockout cylinder, the piston rod retracts, overcoming the reversion spring and closing the gripper arms on a roller in the end of the clevis. This locks the clevis, and through the linkage to the control tab torque tube, holds the control tab in faired position during power operation. At the same time, the reversion mechanism camshafts rotate and release a track roller in the end of the pivot lever, allowing the lever to pivot freely. When the rudder pedals are moved, the cable system rotates the rudder drive sector, causing the mechanical linkage from the sector to pivot the lever and actuate the control valve. The control valve directs hydraulic pressure to the actuating cylinder. The actuating cylinder moves along the piston rod to drive the rudder in the direction selected.

B. Manual Operation

(1) If hydraulic pressure from the right hydraulic system drops below 750(+350,-50) psi, (5175(+2415 -345) kPa) the pressure-operated slide valve in the rudder hydraulic power shutoff valve closes and pressure is bypassed through the manual slide valve to the system return line. Hydraulic pressure to the tab lockout cylinder is cut off, causing the spring-loaded piston rod to return to the extended position. The reversion spring opens the gripper arms to free the clevis and permit movement of the control tab. At the same time, the camshafts rotate to close the cams on the track roller in the end of the pivot lever, preventing movement of the control valve. The pivot lever now pivots about the track roller and moves the clevis. Rudder pedal movement is transmitted through the drive sector and clevis directly to the control tab. This moves the control tab only, and aerodynamic forces on the tab move the rudder.

(2) Manual operation can also be selected by moving the rudder hydraulic power shutoff valve control lever to the off position. A switch on the hydraulic power package is actuated whenever the rudder control system reverts to manual mode of operation and a rudder control manual light comes on in the flight compartment.

C. Rudder Throw-Limiter Operation

(1) Rudder travel is limited at normal cruising speeds by the rudder throw-limiter actuator. Maximum rudder travel is 22 degrees left or right of neutral position, and a light on the annunciator panel is on when the rudder travel is unrestricted.

(2) As airspeed increases, air pressure enters the chamber of the throw-limiter actuator and moves the actuator piston. The piston, through mechanical linkage, positions a hook in the slot in the hydraulic power package actuating cylinder piston rod to limit rudder travel. Rudder travel is decreased progressively as airspeed increases, until at high airspeeds, rudder travel is restricted to 2 1/2(±1/2) degrees (0.044(±0.009) rad) 1 5/8(±5/16) inch (41.28(±7.94) mm to left and right of neutral position.

(3) A switch on the rudder hydraulic power package is actuated on the first rudder travel restriction, causing the rudder travel unrestricted light to go off. The rudder travel unrestricted light on the annunciator panel will come on as hook withdraws from the actuating cylinder pushrod.

D. Rudder Trim Operation

(1) Rudder trim is accomplished by rotating the rudder trim control knob on the control pedestal. The drive shaft in the trim control mechanism drives the bevel gear, causing the trim shaft to rotate. The cable drum on the trim shaft drives the cable system to the trim and load-feel spring. The trim and load-feel spring cable drum rotates the actuator screw and the collar moves along the screw. The housing, springs, and shaft move with the collar, causing the rudder drive sector and rudder pedals to move to a new neutral position. During power operation, this causes the hydraulic power package to move the rudder to the left or right in proportion to the amount of trim selected. During manual operation, the rudder drive sector positions the rudder control tab so that aerodynamic forces on the tab move the rudder to the selected trim position.

(2) When the trim control knob is rotated, the spiral drive plate in the trim position indicator is rotated, moving the follower sideways. A pin on the follower moves the indicator pointer to indicate the amount of trim on the placard. Stops on the drive plate prevent over travel of the trim control knob.

(3) When the rudder pedals are moved, the drive sector moves the shaft in the trim and load-feel spring. The stop on the shaft compresses the small spring against the stop on the inner housing. The force required to compress the small spring increases until it is greater than the force required to compress the large spring. At this point, the small spring moves the inner housing against the slider, compressing the large spring. The resistance of the springs increases as the shaft is moved away from the neutral position, providing the simulated load-feel at the rudder pedals. When force is removed from the pedals, the springs return to the extended position, returning the drive sector and pedals to the neutral position.

RUDDER AND TAB - TROUBLE SHOOTING

1. Trouble Shooting

A. For rudder and tab trouble shooting, use the following table:

Table 101

Possible Causes		Isolation Procedure	Correction
A.	RUDDER PEDAL MOVEMENT ROUGH OR CHATTERING IN POWER OR MANUAL MODE		
(1)	Excessive friction in trim and load feel mechanism	Disconnect trim and load-feel spring from rudder control valve drive crank and recheck.	If condition is corrected, replace spring assembly with serviceable unit.
(2)	Excessive cable system friction	Perform system friction check. (RUDDER AND TAB - CHECK, PAGEBLOCK 27-20-00/601)	If excessive friction is found, check condition of pulleys, bearings, cables, seals. Repair, replace, adjust, and lubricate as required.
(3)	Gummed, sticking pressure seals	Check pressure seals for cleanness and freedom.	Clean and correct condition as required.
(4)	Misaligned cable fairleads, seized bearings, cable pulloff or fouling, binding linkage or guard pins	Check cable system for alignment, pulloff, seized bearings and condition of cable.	Replace faulty parts, align, adjust and lubricate as required.
(5)	Excessive cable tension	Check cable tension.	Adjust cable tension to standard rig chart values.
(6)	Rudder pedal linkage or torque tube bearings defective	Check pedal system for faulty pivots, bearings, etc.	Replace bearings, clean and lubricate as required.
(7)	Lost motion in load-feel mechanism	Check unit and attachments for looseness.	Replace faulty unit or parts as necessary.
B.	EXCESSIVE LOOSENESS OF SURFACES		
(1)	Loose tab hinges or pushrod ends	Check at tab trailing edge for 1/8 inch (3.175 mm) maximum looseness in manual or 1/16 inch (1.587 mm) in power mode.	Replace worn hinges, rod ends, bolts, etc. as necessary.
(2)	Loose rudder hinges or actuator pivots	Check at rudder trailing edge for maximum 1/4 inch (6.35 mm) looseness with power on.	Observe for lost motion at hinges and in power package. Replace any worn or loose parts.
(3)	Incorrect control cable tension	Check cable tension.	Adjust cables to standard rig chart.
C.	RUDDER POWER SHUTOFF CONTROL INOPERATIVE		
(1)	Broken, loose or displaced control cables	If rudder control manual light does not respond to control lever movement, check cables for attachment, routing over pulleys, and tension.	Repair, replace, reinstall or adjust cables as required.
(2)	Broken or displaced control valve linkage	If annunciator light responds to control lever movement, check for broken or disconnected valve pushrod or lever.	Repair, replace or reinstall, and adjust as necessary.

Table 101 (Continued)

Possible Causes		Isolation Procedure	Correction
D.	RUDDER OSCILLATES DURING FLIGHT		
(1)	Insufficient clearance between rudder drive torque tube and control tab torque tube	Measure clearance as described in RUDDER DRIVE TORQUE TUBE - MAINTENANCE PRACTICES, PAGEBLOCK 27-20-03/201.	Add or remove shim washers under control tab torque tube support bracket.
E.	MANUAL RUDDER TRIM EXCEEDS POWER RUDDER TRIM BY MORE THAN PLUS OR MINUS ONE UNIT (DURING FLIGHT)		
(1)	Improper ground adjustable tab (fixed tab) setting	Check fixed tab setting.	Move tab 1/16 inch (1.587 mm) at trailing edge for each unit of trim required. To trim airplane nose left adjust tab trailing edge left. To trim airplane nose right adjust tab trailing edge right. Maximum tab deflection should not exceed 1/2 inch (12.7 mm) at trailing edge of tab.
WJE 401-404, 412, 414, 863-866, 868, 869, 871, 872, 875-879, 891; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383			
F.	WHEN AIRSPEED IS DECREASING, RUDDER TRAVEL UNRESTRICTED WARNING LIGHT DOES NOT COME ON AT OR BEFORE 168 KNOTS (IAS)		
NOTE: A certain amount of lag exists in the rudder throw-limiter actuator and linkage, a rapid decrease in airspeed could delay actuation of the rudder unrestricted switch. Airspeed indication should not be below 168 KIAS when the rudder travel unrestricted light comes on.			
WJE 405-411, 415-424, 429, 861, 862, 873, 874, 880, 881, 883, 884, 892, 893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383			
F.	WHEN AIRSPEED IS DECREASING, RUDDER TRAVEL UNRESTRICTED WARNING LIGHT DOES NOT COME ON AT OR BEFORE 191 KNOTS (IAS)		
NOTE: A certain amount of lag exists in the rudder throw-limiter actuator and linkage, a rapid decrease in airspeed could delay actuation of the rudder unrestricted switch. Airspeed indication should not be below 191 KIAS when the rudder travel unrestricted light comes on.			
WJE ALL			
(1)	Rudder control system improperly rigged	Check rigging.	Rerig as necessary.
(2)	Rudder Limiter System, Excessive Friction	Disconnect pushrods/ linkages and check free rotation of bearings.	Lubricate and reinstall or replace as necessary.
(3)	Rudder limiter switch not secured properly	Check switch for proper security.	Repair or adjust as necessary.
(4)	Pitot tube sump clogged	Check.	Drain as necessary.
(5)	Throw-limiter actuator and linkage out of adjustment	Check RUDDER THROW-LIMITER - MAINTENANCE PRACTICES, PAGEBLOCK 27-20-06/201	Adjust as necessary.

RUDDER AND TAB - ADJUSTMENT/TEST

1. General

A. Procedures in the following paragraphs cover adjustment of the entire rudder and rudder trim control systems. Specific segments of the system may be adjusted by following the procedures in the applicable paragraphs.

B. Access to components is given in the text as required.

C. Numbers in parentheses in the following text correspond to callouts in Figure 501 or Figure 502 through Figure 509.

D. The numbers and letters enclosed by the hexagon-shaped symbol shown in the adjustment diagrams correspond to cable run numbers and segments listed at the end of this section. Each cable run number is posted adjacent to the corresponding cable in the aircraft.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 501

Name and Number	Manufacturer
Tensiometer	Pacific Scientific Co.
Tensioner control cable, (1/16 to 3/8) inch (1.587 to 9.525 mm) (5954644-1, -503, -505)	Douglas Aircraft Co.
Protractor (5916715)	Douglas Aircraft Co.
Rig pins (2) (6-4) 3/8 by 4 5/8 (9.525 X 117.475 mm).	
Rig pin (4-3) 1/4 by 3 5/8 (6.35 X 92.075 mm).	
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch), (15.875 mm).	
Cylinder low pressure compressed nitrogen	
Torque wrench (0-150 foot-pounds) (0 - 201.6 N·m).	
Lockwire, NASM20995N32, DPM 684*[1]	Not specified
Tester assembly, rudder throw limiter (5916789)	The Boeing Company
or	
Tester assembly, rudder throw- limiter (827)	Aerospace Support Equipment Co.
or	
Pressure gage, capable of measuring at least 3.5 psi (24.15 kPa) to within 0.01 psi, (0.069 kPa)	
or	
Airspeed indicator graduated in increments of one knot or less	
Linear servo actuator line test set (5916816)	The Boeing Company

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Adjustment/Test Rudder and Tab

A. Adjust Rudder Hydraulic Power Package (Figure 501 or Figure 502 and Figure 503)

NOTE: Access to rudder hydraulic power package is through access door in fuselage tailcone or aft pressure dome.

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT COULD RESULT.

(1) Move rudder hydraulic power shutoff valve control lever, located on control pedestal, to off position.

(2) Manually move rudder to neutral position.

NOTE: Rudder is in neutral position when center of upper aft corner of rudder aligns within 11/64-inch (4.4 mm) of center of adjacent vertical stabilizer trailing edge.

(3) Loosen jamnut (8).

(4) Disconnect pushrod (4) from hook (5).

(5) Move hook (5) into slot in piston rod (6) until hook stop contacts stop screw (7). Slope of serrated ends of hook must match sloped faces in slot of piston rod.

(6) Manually move rudder to extreme left, then to extreme right of neutral position. Measure rudder travel at both extremes to determine amount of adjustment required.

NOTE: Rudder travel is measured from center of upper aft corner of rudder to center of adjacent vertical stabilizer trailing edge. Travel should be 1 5/8 (±5/16) inches (41.28 (±7.94) mm), rudder trailing edge left and right, each side of neutral.

(7) On eye-bolts with two flush mounted lube fittings, move hook (5) out of slot in piston rod (6) and adjust eye-bolt (9) in half-turn increments to obtain dimensions noted in Paragraph 3.A.(6) (Figure 501 or Figure 502).

NOTE: Grease fitting on eyebolt should be on side away from support bracket.

(a) Remove cotter pin from end of rudder power control safety tube. Remove tube end from support fitting to allow eyebolt (9) to turn. (PAGEBLOCK 27-20-08/401)

(8) On eye-bolts with one lube fitting, move hook (5) out of slot in piston rod (6) and adjust eye-bolt (9) in increments of one full turn to obtain dimensions noted in Paragraph 3.A.(6) (Figure 501 or Figure 502).

NOTE: Grease fitting on eyebolt should be on side away from support bracket.

(a) Remove cotter pin from end of rudder power control safety tube. Remove tube end from support fitting to allow eyebolt (9) to turn. (PAGEBLOCK 27-20-08/401) (Figure 501 or Figure 502)

(9) Repeat Paragraph 3.A.(5) and Paragraph 3.A.(6) to check adjustment. Slope of serrated ends of hook must match sloped faces in slot of piston rod.

(10) Connect pushrod (4) to hook (5).

CAUTION: MAKE CERTAIN THAT TAB OF LOCKWASHER IS INSTALLED IN SLOT OF PISTON.

(11) Install cotter pin in end of rudder power control safety tube.

(12) Tighten jamnut (8) to torque of 100 foot-pounds. Safety nuts with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(13) Adjust rudder yaw damper actuator as described in Paragraph 3.B..

B. Adjust Rudder Yaw Damper Actuator (Figure 501 or Figure 502) (Figure 503)

NOTE: As an alternate procedure, use status test panel to check null of yaw damper. (PAGEBLOCK 22-13-01/201)

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT COULD RESULT.

(1) Move rudder hydraulic power shutoff valve control lever, located on control pedestal, to off position.

(2) Loosen jamnut (13) on linear servo (yaw damper) actuator rod (17).

(3) Remove bolt (10) from yaw damper actuator rod (17).

(4) Rotate trim and load-feel spring cable drum to position sector (18) so that rig pin (6-4) can be easily inserted in rig pin hole (R-11) through sector and bracket.

(5) Install rig pin (6-4) in rig pin hole (R-12) through sector (18) and crank (3). If necessary, crank (3) may be moved so that rig pin (6-4) can be inserted.

(6) Null yaw damper as follows using linear servo actuator test set.

(a) On Flight Guidance Control Panel, place AP switch to 1 position.

(b) Make certain that AP ON/OFF switch is placed to OFF position.

(c) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	27	B10-345	YAW DAMPER-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1
G	13	B10-346	YAW DAMPER-2

(d) Preset linear servo actuator test set by placing power switch SI to off position; speed control RI to slow position; and mode switch S2 to yaw damper position.

(e) Disconnect electrical plug from yaw damper actuator and attach to power input cable of test set.

(f) Connect test set control cable electrical plug to yaw damper actuator.

(g) Remove knurled cover from yaw damper actuator (16) to expose 3/16 (4.762 mm) hex-end gear shaft.

(h) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	27	B10-345	YAW DAMPER-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1
G	13	B10-346	YAW DAMPER-2

(i) Place test set power switch in on position. Allow one minute for test set to warm up.

(j) Hold extend-retract switch in either of its positions and slowly rotate speed control in fast direction until actuator gear train rotates very slowly. Gear train rotation may be verified by observing exposed 3/16 (4.762 mm) hex-end gear shaft or by extension or retraction of actuator jackscrew shaft.

(k) Place extend-retract switch in position that causes course indicator to move toward zero position. Hold until zero is reached.

(l) Rotate speed control to slow position.

(m) Use a 3/16 inch (4.762 mm) hex-nut driver and rotate gear train (16) to obtain NULL indication on Linear Servo Actuator Test Set FINE Indicator of 40, or less. Any Yaw Damper Actuator with NULL reading in excess of 40 should be rejected.

(n) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	27	B10-345	YAW DAMPER-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1
G	13	B10-346	YAW DAMPER-2

(o) Remove linear servo actuator test set from aircraft.

(p) Installed knurled cover on yaw damper actuator.

(q) Connect yaw damper input cable electrical plug to yaw damper actuator.

(7) With rig pins (6-4) installed in rig pin holes (R-11) and (R-12) and yaw damper actuator nulled, adjust yaw damper actuator rod (17) until bolt (10) can be freely installed. Safety nut with cotter pin.

(8) Tighten jamnut (13). Safety nut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Make certain yaw damper actuator rod does not contact drive sector.

(9) Remove rig pin (6-4) from rig pin holes (R-11) and (R-12).

(10) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	27	B10-345	YAW DAMPER-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1
G	13	B10-346	YAW DAMPER-2

(11) Test yaw damper actuator. (PAGEBLOCK 22-13-01/201)

(12) Test rudder control system. (Paragraph 3.J.)

C. Adjust Rudder Control Tab (Figure 501 or Figure 502)

NOTE: Before performing the following procedure make certain that rudder hydraulic power package has been adjusted and yaw damper actuator has been nulled. (Paragraph 3.B.(6)(m))

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT COULD RESULT.

(1) Move rudder hydraulic power shutoff valve control lever to off position.

(2) Manually move rudder to neutral position.

NOTE: Rudder is in neutral position when center of upper aft corner of rudder aligns within ±11/64 inch (4.37 mm) of center of adjacent vertical stabilizer trailing edge.

(3) Insert rig pin (6-4) in rig pin hole (R-11) through bracket and drive sector (18).

(4) Insert rig pin (6-4) in rig pin hole (R-12) through drive sector (18) and crank (3).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(5) Pressurize right hydraulic system. (PAGEBLOCK 27-00-00/201)

(6) Move rudder hydraulic power shutoff valve control lever to on position.

(7) Loosen jamnuts (14) on tab pushrod (15) and rotate body of pushrod (15) to fair control tab with rudder. Tighten jam-nuts and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(8) Move rudder hydraulic power shutoff valve control lever to off position.

(9) With rudder in neutral position (±11/64 inch) (4.37 mm), loosen jamnuts on pushrod (2) and rotate body of pushrod (2) to fair control tab with rudder. Tighten jamnuts and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(10) Remove rig pins (6-4) from rig pin holes (R-11) and (R-12).

(11) Shut off hydraulic pressure source.

D. Adjust Rudder Control Cable System (Figure 504)

NOTE: Access to turnbuckles (1) is through forward lower cargo compartment ceiling panel 5154C. Access to turnbuckles (2) and rudder drive sector is through access door in fuselage tailcone or aft pressure dome. Access to turnbuckle (3) and dual servo drive is aft cargo compartment ceiling panel 5726C.

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT COULD RESULT.

(1) Move rudder hydraulic power shutoff valve control lever to off position.

(2) Rotate trim and load-feel spring cable drum to position sector (18) so that rig pin (6-4) can be easily inserted in rig pin hole (R-11) through sector and bracket.

(3) Insert rig pin (6-4) in rig pin hole (R-11) through drive sector and bracket.

(4) Adjust turnbuckles (1), (2), and (3) until tension is between minimum and maximum load per cable tension table for 1/8 inch (3.18 mm) cables forward of servo drive cable bridle splices. (Figure 505 (Sheet 1))

(5) Differentially adjust turnbuckles (1) and (2) until rudder pedals are in line within 3/16 in. (4.762 mm).

NOTE: Measurement is taken at center of pedal hub with rudder control system in neutral position.

(6) Remove rig pin (6-4) from rig pin hole (R-11).

(7) Adjust rudder pedal stops (4) to allow cable in flight compartment area to travel 6 3/8(±1/8) inches (161.93(±3.18) mm) in either direction from neutral position.

(8) Adjust rudder pedals to each detent and move pedals full travel in both directions. Check for binding or obstruction.

NOTE: If pedals are binding, check for 3/32 inch (2.38 mm) minimum clearance between control arms and 1/16 inch (1.59 mm) minimum clearance between rudder control arm and bracket. (Figure 504)

(9) Safety all turnbuckles with clips.

(10) Test rudder control system. (Paragraph 3.J.)

E. Adjust Rudder Pedal Adjustment Cable (Figure 504)

NOTE: Adjustment procedures for right and left rudder pedal adjustment cables are identical.

(1) Make certain that adjuster arm is fully engaged in adjuster detent (bearing on both sides of detent).

(2) Adjust cable fitting in eye ends so that length of spring (6) is 1 23/32 to 1 13/16 inches (43.657 to 46.037 mm) from center of attach hole in sector, to center of attach hole in bracket.

(3) With rudder pedals adjusted to mid range, loosen locknut on retainer (7) and adjust retainer in knob to just remove slack from cable.

NOTE: Upper surface of wrenching head on retainer must not extend below knob by more than 13/16 inch, (20.637 mm)

(4) Tighten locknut on retainer.

(5) Safety eye end (5) to cable fitting with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

F. Adjust Rudder Throw-Limiter (Figure 506 or Figure 507)

NOTE: Access to rudder throw-limiter is through access door in fuselage tailcone or aft pressure bulkhead.

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT COULD RESULT.

(1) Move rudder hydraulic power shutoff valve control lever, located on control pedestal, to off position.

(2) Remove bolt (1) to disconnect pushrod (2) from crank (3).

(3) Insert rig pin (4-3) through bellcrank rig pin hole (R-22).

(4) Adjust pushrod (2) until bolt (1) can be freely installed through crank (3) and pushrod (2). Install bolt (1). Safety nut with cotter pin.

(5) Remove rig pin (4-3) from bellcrank.

(6) Disconnect pitot pressure line from pressure inlet (6).

(7) Connect a controlled source of clean, dry, low-pressure air to pressure inlet (6).

CAUTION: AIR PRESSURE APPLIED TO THROW-LIMITER PRESSURE INLET MUST NOT EXCEED 4 PSI (27.6 KPA). PRESSURE MUST BE APPLIED SLOWLY TO PREVENT DAMAGE TO THROW-LIMITER.

(8) Slowly (not more than 0.60 psi/minute (4.14 kPa) or 75 knots/minute) apply pressure until crank (3) first moves away from stop (7). Air pressure should be at or less than air pressure/speed that follows when crank (3) moves away from stop (7).

WJE 412, 414-416; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

- 0.70 psi, (4.83 kPa), (172 knots)

WJE 401-411, 417-424, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383

- 0.86 psi, (5.93 kPa), (191 knots)

WJE ALL

NOTE: This is a preliminary adjustment only.

(9) Slowly increase air pressure until pressure is:

WJE 412, 414-416; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

- 1.58 (±0.01) psi, (10.902 (±0.069) kPa), (255 (±1) knots).

WJE 401-411, 417-424, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383

- 1.66 (±0.01) psi, (11.45 (±0.069) kPa), (261 (±1) knots).

(10) Manually move rudder to extreme left, then to extreme right of neutral position. Measure rudder travel at both extremes of travel to determine amount of adjustment to pushrod (5) required to limit rudder travel to 5 1/16 (± 5/8) inches (128.59 (±15.88) mm) left and 4 5/16 (+15/16, -5/8) inches (109.54 (+23.81, -15.88) mm) right.

NOTE: Rudder travel is measured from center of upper aft corner of rudder to center of adjacent vertical stabilizer trailing edge.

WJE 412, 414-416; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

(11) Manually move rudder to extreme left, then to extreme right of neutral position. Measure rudder travel at both extremes of travel to determine amount of adjustment to pushrod (5) required to limit rudder travel to 5 1/16 (± 5/8) inches (128.58 (±15.88) mm) left and 4 5/16 (± 5/8) inches (109.53 (±15.88) mm) right.

NOTE: Rudder travel is measured from center of upper aft corner of rudder to center of adjacent vertical stabilizer trailing edge.

WJE ALL

(12) Decrease air pressure to throw-limiter bellows to zero psi (zero knots).

(13) Remove bolt (4) to disconnect pushrod (5) from bellcrank.

WJE 401-411, 417-424, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383

(14) Loosen jamnut at end of pushrod (5) and adjust rod end to obtain dimensions noted in Paragraph 3.F.(10).

NOTE: Lengthening pushrod reduces amount of rudder travel, shortening pushrod increases amount of rudder travel.

WJE 412, 414-416; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

(15) Loosen jamnut at end of pushrod (5) and adjust rod end to obtain dimensions noted in Paragraph 3.F.(11).

NOTE: Lengthening pushrod reduces amount of rudder travel, shortening pushrod increases amount of rudder travel.

WJE ALL

(16) Connect pushrod (5) to bellcrank with bolt (4).

(17) Slowly apply air pressure to throw-limiter bellows until pressure is as follows:

WJE 412, 414-416; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

- 1.58 (±0.1) psi, (10.90 (±0.69) kPa), (255 (±1) knots).

WJE 401-411, 417-424, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383

- 1.66 (±0.1) psi, (11.45 (±0.069) kPa), (261 (±1) knots).

WJE 412, 414-416; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

(18) Manually move rudder to extreme left, then to extreme right of neutral position. Check that travel is 5 1/16 (±5/8) inches (128.58 (±15.88) mm) left and 4 5/16 (±5/8) inches (109.53 (±15.88) mm) right. If necessary, repeat Paragraph 3.F.(12) through Paragraph 3.F.(18) until pushrod (5) is properly adjusted.

WJE 401-411, 417-424, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383

(19) Manually move rudder to extreme left, then to extreme right of neutral position. Check that travel is 5 1/16 (±5/8) inches (128.58 (±15.88) mm) left and 4 5/16 (+15/16, -5/8) inches (109.53 (+23.81, -15.88) mm) right. If necessary, repeat Paragraph 3.F.(12) through Paragraph 3.F.(19) until pushrod (5) is properly adjusted.

WJE ALL

(20) Reduce air pressure to throw-limiter bellows to zero psi, then slowly increase air pressure and check that hook (10) has engagement of 0.06 inch (1.52 mm) minimum per dimension (S) with piston rod (11) at an air pressure that follows: (Figure 506 or Figure 507, View A-A)

WJE 412, 414-416; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

- 0.78 psi, (5.38 kPa), (181 knots) or less.

WJE 401-411, 417-424, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383

- 0.96 psi, (6.62 kPa), (200 knots) or less.

WJE ALL

(21) Slowly decrease air pressure and check that hook (10) clears piston rod (11) by a minimum of 0.03 inch (0.76 mm) per dimension (T) at an air pressure that follows: (Figure 506 or Figure 507, View A-A)

WJE 412, 414-416; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

- 0.67 psi, (4.62 kPa), (168 knots) or more.

WJE 401-411, 417-424, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383

- 0.86 psi, (5.93 kPa), (191 knots) or more.

WJE ALL

CAUTION: LENGTH OF SPRINGS MUST BE MAINTAINED EQUAL WITHIN 0.06 INCH(1.5 MM) WHEN ADJUSTING TURNBUCKLES.

(22) If the air pressure noted in Paragraph 3.F.(8) through Paragraph 3.F.(22) goes higher than that specified, lengthen turnbuckles (8). If air pressure is lower than specified shorten turnbuckles (8). (Figure 506 or Figure 507)

(23) If necessary, repeat steps referenced above as required, until conditions above are satisfied.

(a) If conditions of steps above cannot be met, do a check for excessive friction exists in rudder throw limiter system as follows:

1) Disconnect pushrod (2) from crank (3). (Figure 506 or Figure 507)

2) Record adjusted position of weight (12) on rod (13) (Mark rod at bottom of weight with pencil). Remove weight (12) from rod (13).

3) Manually actuate linkage with weight rod (13). Check for any binding or excessive friction in system linkages from rod (13) to hook (10) to bellcrank (14) to pushrod (2). Replace any defective bearings, as required.

4) Install weight (12) on rod (13) and adjust to location/dimension noted in Paragraph 3.F.(23)(a)2)

a) If recorded adjustment is lost the nominal adjustment is 3.938 inch.

5) Connect pushrod (2) to crank (3) with bolt (1).

WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281

(24) Adjust movable proximity sensor bracket (R) to target gap (Minimum 0.030 inch (0.762 mm)) to provide the following: (Figure 506, View A-A)

(a) RUDDER TRAVEL UNRESTRICTED light goes out at an air pressure that follows or less when air pressure is increasing.

WJE 425-427 PRE MD80-27-382 AND PRE MD80-27-281

- 0.78 psi, (5.38 kPa), (181 knots).

WJE 405, 409, 416, 420, 422, 424, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281; WJE 425-427 POST MD80-27-382 AND PRE MD80-27-281

- 0.96 psi, (6.62 kPa), (200 knots).

WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281

(b) RUDDER TRAVEL UNRESTRICTED light comes on at an air pressure that follows or more when air pressure is decreasing.

WJE 425-427 PRE MD80-27-382 AND PRE MD80-27-281

- 0.67 psi, (4.623 kPa), (168 knots).

WJE 405, 409, 416, 420, 422, 424, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281; WJE 425-427 POST MD80-27-382 AND PRE MD80-27-281

- 0.86 psi, (5.93 kPa), (191 knots)

WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281

(c) Position rudder in full right position and verify dimension between target and sensor is greater than 0.030 inch (0.762 mm).

NOTE: Make sure hook assembly clears envelope of piston when rudder is moved through full travel.

WJE 401-404, 406-408, 410-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 886, 887, 892, 893; WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281

(25) Adjust proximity sensor bracket (R) to target gap (0.015 inch (0.38 mm) or more)) and stop bolt to provide following: (Figure 507)

(a) Remove stop bolt (15), spacer (16), and washers (17) from bracket of proximity sensor.

(b) Slowly apply air pressure to rudder throw-limiter so that RUDDER TRAVEL UNRESTRICTED light indications are as follows: (Figure 507, View A-A or B)

1) RUDDER TRAVEL UNRESTRICTED light goes out at an air pressure that follows or less when air pressure is increasing.

WJE 412, 414; WJE 425-427 PRE MD80-27-382 AND POST MD80-27-281; WJE 886, 887 PRE MD80-27-383

- 0.78 psi, (5.38 kPa), (181 knots).

WJE 401-404, 406-408, 410, 411, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 892, 893; WJE 405, 409, 416, 420, 422, 424, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281; WJE 425-427 POST MD80-27-382 AND POST MD80-27-281; WJE 886, 887 POST MD80-27-383

- 0.96 psi, (6.62 kPa), (200 knots).

WJE 401-404, 406-408, 410-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 886, 887, 892, 893; WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281

(c) RUDDER TRAVEL UNRESTRICTED light comes on at an air pressure that follows or more when air pressure is decreasing.

WJE 412, 414; WJE 425-427 PRE MD80-27-382 AND POST MD80-27-281; WJE 886, 887 PRE MD80-27-383

- 0.67 psi, (4.623 kPa), (168 knots).

WJE 401-404, 406-408, 410, 411, 415, 863-866, 869, 871, 872, 875-879, 881, 883, 892, 893; WJE 405, 409, 416, 420, 422, 424, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281; WJE 425-427 POST MD80-27-382 AND POST MD80-27-281; WJE 886, 887 POST MD80-27-383

- 0.86 psi, (5.93 kPa), (191 knots).

WJE 401-404, 406-408, 410-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 886, 887, 892, 893; WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281

(d) Position rudder in full right position and verify dimension between target and sensor is greater than 0.015 inch (0.38 mm).

NOTE: Make sure the hook assembly clears envelope of piston when rudder is moved through full travel.

(e) Install stop bolt (15) as follows:

1) Move hook assembly until target is position 0.015 inch (0.38 mm) minimum from face of sensors.

2) Install stop bolt (15), spacer (16), and washers (17) on bracket of proximity sensor. (Figure 507)

a) Use enough washers between spacer and bracket assembly to allow stop bolt (15) to contact target support assembly.

b) Extreme care should be taken not to disturb adjustment accomplished in Paragraph 3.F.(25)(d).

NOTE: Repetitive removal/installation of bolt in self-locking plate nut may destroy the self-locking feature of the plate nut, thereby, precluding any future revision to washer quantity. Make sure bolt break away torque does not fall below 7 inch-pounds. (PAGEBLOCK 20-30-01/201)

WJE ALL

(26) Reduce air pressure to zero psi, manually move rudder through full travel and check that hook (10) clears piston rod (11). Do not change adjustment of turnbuckles (8) or pushrod (5) without rechecking Paragraph 3.F.(22).

(27) Tighten nut on bolt (4) and safety with cotter pin.

(28) Tighten jamnut at end of pushrod (5) and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(29) Safety turnbuckles (8) with clips.

(30) Disconnect air pressure source from pressure inlet (6).

(31) Connect pitot pressure line to pressure inlet (6).

(32) Test rudder throw-limiter. (Paragraph 3.K.)

G. Adjust Rudder Trim Control System (Figure 508)

NOTE: Rudder control system must be properly adjusted before adjusting rudder trim control system. Access to turnbuckles (1) is through forward lower cargo compartment ceiling panel 5154C. Access to turnbuckles (2) is through aft accessory compartment.

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT COULD RESULT.

(1) Move rudder hydraulic power shutoff valve control lever, located on control pedestal, to off position.

(2) Remove rudder trim position indicator placard from cover to expose rig neutral notch on cover. (Retain placard for installation.)

(3) Rotate rudder trim control knob to align pointer with rig neutral notch on control pedestal cover.

NOTE: There may be a difference between rigged neutral position and flight neutral position of trim position indicator, therefore pointer may or may not align with flight neutral position on indicator placard.

(4) Loosen turnbuckles (1) and (2) to provide slack in cables.

(5) Rotate drum (3) to position cable ball end sockets (4) at forward side of drum, 90 degrees (1.57 rad) from centerline of guard pin hole.

(6) Adjust turnbuckles (1) and (2) until tension is between minimum and maximum load per cable tension table for 3/32 inch (2.38 mm) cables. (Figure 505)

(7) Remove guard pins (5) so that load-feel spring housing may rotate.

(8) Adjust length of trim and load-feel spring by rotating housing in increments of 1/4 turn until rig pin holes in drive sector (6) and rig bracket are aligned within 1/16 inch, (1.6 mm).

NOTE: This is only a preliminary adjustment.

(9) Install guard pins (5).

(10) Differentially adjust turnbuckles (2) so that rig pin (6-4) can be inserted easily in rig pin hole (R-11) through drive sector (6) and bracket.

(11) Safety all turnbuckles with clips.

(12) Remove rig pin (6-4) from sector and bracket.

(13) Install rudder trim position indicator on cover. Align trim-neutral "0" on placard with point of trim indicator pointer with system in neutral rig condition.

(14) Test trim control system. (Paragraph 3.L.)

H. Adjust Rudder Hydraulic Power Shutoff Control System (Figure 509)

NOTE: Access to turnbuckles (1) is through forward lower cargo compartment ceiling panels 5151C and 5156C, access to turnbuckles (2) is through aft cargo compartment ceiling panels 5730C and 5732C. Access to rudder power shutoff valve is through aft accessory compartment panel 5911A.

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT COULD RESULT.

(1) Move rudder hydraulic power shutoff valve control lever to off position.

(2) Remove bolt (3) to disconnect pushrod (4).

(3) Move control lever (5) so that aft edge of pin (6) aligns with vertical edge of cam (7). Clamp control lever in this position.

(4) Adjust turnbuckles (1) and (2) to obtain tension per cable tension table for 1/16-inch (1.6 mm) cables. (Figure 505 (Sheet 3))

(5) Differentially adjust turnbuckles (2) until rig mark (8) on sector (9) is 0.12(±0.03) inch (3.05(±0.76) mm) aft of guard pin (10).

(6) Safety all turnbuckles with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(7) Rotate crank (11) until yoke (12) is firmly seated against forward internal stop.

(8) Loosen jamnut on pushrod (4) and adjust pushrod so that bolt (3) can be easily installed (bolt head outboard). Safety nut on bolt (3) with cotter pin.

(9) Tighten jamnut on pushrod (4) and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(10) Remove clamp from control lever (5).

(11) Test rudder hydraulic power shutoff system. (Paragraph 3.M.)

I. Adjust Rudder Position Sensor. (Figure 504)

NOTE: Rudder controls must be properly adjusted prior to adjusting rudder position sensor.

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT COULD RESULT.

(1) Move rudder hydraulic power shutoff valve control lever, located on control pedestal, to off position.

(2) Manually move rudder to neutral position.

NOTE: Rudder is in neutral position when center of upper aft corner of rudder aligns within 11/64-inch (4.4 mm) of center of adjacent vertical stabilizer trailing edge.

(3) Remove bolt (15) from link (14) and arm (16).

CAUTION: SENSOR WILL BE DAMAGED IF ROTATED BEYOND INTERNAL STOPS.

(4) Rotate arm (16) until sensor detent is located.

(5) Loosen clamp bolt (17) and rotate sensor body until bolt (15) can be freely inserted through arm (16) and link (14).

(6) Tighten clamp bolt (17).

(7) Check bolt (15) for free insertion, install bolt (15). Safety nut with cotter pin.

(8) Move rudder hydraulic power shutoff valve control lever to on position.

(9) Check sensor. (PAGEBLOCK 22-01-03/201)

(10) Perform return to service (RTS) test. (DFGS STATUS/TEST, SUBJECT 22-01-05)

J. Test Rudder Control System

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT COULD RESULT.

(1) Move rudder hydraulic power shutoff valve control lever, located on control pedestal, to off position.

NOTE: Linear dimensions for checking rudder travel are measured from center of upper aft corner of rudder to center of adjacent vertical stabilizer trailing edge. Angular dimensions for checking control tab travel are measured by placing protractor on rigging reference line on left side of rudder and tab. (PAGEBLOCK 27-00-00/201)

(2) Rotate rudder trim control knob to align pointer with rig neutral notch on control pedestal cover.

NOTE: There may be a difference between rigged neutral position and flight neutral position of trim position indicator, therefore pointer may or may not align with flight neutral position on indicator placard.

(3) Check rudder travel and range as follows:

(a) Move captain's right rudder pedal forward until stops contact.

(b) Manually move rudder trailing edge to 14 5/8(±1/2) inches (371.5(±12.7) mm) right of neutral position.

(c) Check that control tab trailing edge is 26(±2) degrees (0.454(±0.035) rad) left of rudder trailing edge.

(d) Check rudder drive and control tab torque tube mechanisms for binding or chafing.

(e) Return rudder and pedals to neutral.

(f) Move left rudder pedal forward until stops contact.

(g) Manually move rudder trailing edge to 14 5/8(±1/2) inches left (371.5(±12.7) mm) of neutral position.

(h) Check that control tab trailing edge is 26(±2) degrees (0.454(±0.035) rad) right of rudder trailing edge.

(i) Check rudder drive and control tab torque tube mechanism for binding or chafing.

(j) Return rudder and pedals to neutral position.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(4) Pressurize right hydraulic system. (PAGEBLOCK 27-00-00/201)

WARNING: MAKE CERTAIN THAT AREA AROUND RUDDER IS CLEAR OF PERSONNEL AND EQUIPMENT WHEN RUDDER REVERTS FROM MANUAL TO POWER OPERATION.

(5) Move rudder hydraulic power shutoff valve control lever to on position. Check that rudder control manual light in flight compartment goes off.

(6) Move right rudder pedal full forward. Check for following.

(a) Control tab remains faired with rudder within one degree.

(b) Rudder trailing edge is 14 5/8(±1/2) inches (371.5(±12.7) mm) right of neutral position.

(7) Move left rudder pedal full forward. Check for following.

(a) Control tab remains faired with rudder within one degree.

(b) Rudder trailing edge is 14 5/8(±1/2) inches (371.5(±12.7) mm) left of neutral position.

(8) Return rudder pedals to neutral position.

(9) Shut off hydraulic pressure source.

K. Test Rudder Throw-Limiter (Figure 506 or Figure 507)

NOTE: For periodic checks where no rigging adjustments are made, a tolerance of ±4 knots is acceptable.

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT COULD RESULT.

(1) Move rudder hydraulic power shutoff valve control lever, located on control pedestal, to off position.

(2) Place rudder pedals in neutral position.

(3) Check that rudder travel unrestricted light in flight compartment is on.

(4) Check that hook (10) is clear of piston rod (11).

(5) Disconnect pitot line from pitot pressure inlet (6).

(6) Connect a controlled source of clean, dry, low-pressure air to pressure inlet.

CAUTION: AIR PRESSURE APPLIED TO THROW-LIMITER PRESSURE INLET MUST NOT EXCEED 4 PSI (27.6 KPA). PRESSURE MUST BE APPLIED SLOWLY TO PREVENT DAMAGE TO THROW-LIMITER.

(7) Slowly (not more than 0.60 psi/minute, (4.14 kPa) or 75 knots/minute) apply air pressure to throw-limiter bellows and check that hook (10) has engagement of 0.06 inch (1.52 mm) minimum with piston rod (11) and RUDDER TRAVEL UNRESTRICTED light, on overhead panel in flight compartment, goes out at or less than a pressure/speed in the Table that follows:

Table 502

AIRCRAFT SERIES	RUDDER TRAVEL UNRESTRICTED LIGHT INDICATION					
	GOES OUT AT			COMES ON AT		
	*PSI	KPA	KNOTS	**PSI	KPA	KNOTS
WJE 401-404, 412, 414, 863-866, 868, 869, 871, 872, 875, 876, 891; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383						
MD-81, MD-82 AND MD-88	0.78	5.382	181	0.67	4.623	168
WJE 401-412, 414-424, 429, 861, 862, 873, 874, 877-881, 883, 884, 892, 893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383						
MD-83 AND MD-88	0.96	6.620	200	0.86	5.930	191
WJE ALL						
NOTE: * Or less when pressure is increasing.						
NOTE: ** Or more when pressure is decreasing.						

(8) Slowly increase air pressure and make certain that rudder travel is limited when measured at aft upper corner of rudder to center of adjacent vertical stabilizer trailing edge as follows:

AIRCRAFT SERIES	TRAVEL LIMT LEFT	TRAVEL LIMIT RIGHT	WHEN AIR PRESSURE/ SPEED IS
WJE 401-404, 412, 414, 863-866, 868, 869, 871, 872, 875, 876, 891; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383			
MD-81, MD-82 AND MD-88	5 1/16 (±5/8) inches (128.59 (±15.88) mm)	4 5/16 (±5/8) inches (109.54 (±15.88) mm)	1.58 ±0.01 psi (10.89 ±0.07 kPa), (255 (±1) knots).

WJE 401-404, 412, 414, 863-866, 868, 869, 871, 872, 875, 876, 891; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383 (Continued)

(Continued)

AIRCRAFT SERIES	TRAVEL LIMT LEFT	TRAVEL LIMIT RIGHT	WHEN AIR PRESSURE/ SPEED IS
WJE 401-412, 414-424, 429, 861, 862, 873, 874, 877-881, 883, 884, 892, 893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383			
MD-83 AND MD-88	5 1/16 (±5/8) inches (128.59 (±15.88) mm)	4 5/16 (+5/16, -5/8) inches (109.54 (+7.94, -15.88) mm)	1.66 ±0.01 psi (11.45 ±0.07 kPa)(261 (±1) knots).
WJE ALL			

(9) Slowly increase air pressure until hook is firmly against its stop.

(a) Air pressure/speed should be as follows:

WJE 401-404, 412, 414, 863-866, 868, 869, 871, 872, 875, 876, 891; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

- 2.30 psi (15.86 kPa), (304 knots) or less.

WJE 401-412, 414-424, 429, 861, 862, 873, 874, 877-881, 883, 884, 892, 893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383

- 2.39 psi (16.48 kPa), (310 knots) or less.

WJE ALL

(b) Rudder travel should be limited to 1 5/8 (±5/16) inches (41.27 (±7.94) mm) each way measured at aft upper corner of rudder.

(10) Slowly decrease air pressure and make certain that hook (10) clears piston rod (11) and RUDDER TRAVEL UNRESTRICTED light comes on at or more than air pressure/speed in Table 502.

(11) Slowly decrease air pressure to zero.

(12) Manually place rudder to full trailing edge right position and hold that position steady while performing the following measurements.

WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281

(a) Make certain that minimum gap between proximity sensor and target is always greater than 0.03 inch (0.76 mm) with rudder in full right position. (Figure 506)

WJE 401-404, 406-408, 410-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 886, 887, 892, 893; WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281

(b) Make certain that minimum gap between proximity sensor and target is always greater than 0.015 inch (0.38 mm) with rudder in full right position. (Figure 507)

WJE ALL

(13) Disconnect air pressure source from pressure inlet (6).

(14) Connect pitot line to pressure inlet.

WARNING: MAKE CERTAIN THAT AREA AROUND RUDDER IS CLEAR OF PERSONNEL AND EQUIPMENT WHEN RUDDER REVERTS FROM MANUAL TO POWER OPERATION.

(15) Move rudder hydraulic power shutoff valve control lever to on position and remove tag.

(16) Pressure test rudder throw-limiter pitot system. (PITOT STATIC - MAINTENANCE PRACTICES, PAGEBLOCK 34-11-00/201 Config 1)

L. Test Rudder Trim Control System (Figure 508)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize right hydraulic system. (PAGEBLOCK 27-00-00/201)

WARNING: MAKE CERTAIN THAT AREA AROUND RUDDER IS CLEAR OF PERSONNEL AND EQUIPMENT WHEN RUDDER REVERTS FROM MANUAL TO POWER OPERATION.

(2) Move rudder hydraulic power shutoff valve control lever, located on control pedestal, to on position.

(3) Rotate rudder trim control knob to align pointer with rig neutral notch on control pedestal cover. Check that rudder is faired with vertical stabilizer within 11/64 in. (4 mm) and that rudder control tab is faired with rudder within 1/16 inch, (1.587 mm)

NOTE: There may be a difference between rigged neutral position and flight neutral position of trim position indicator, therefore pointer may or may not align with flight neutral position on indicator placard.

NOTE: When operating rudder trim control knob, intermovement of 1/32 inch (.792 mm) between rudder and aileron trim control knobs is acceptable.

(4) Rotate rudder trim control knob clockwise until stops contact. Check that rudder trailing edge is 8 15/16(±1) inches, (227.012(±25.4) mm) right of neutral position, measured from upper aft corner of rudder to center of adjacent vertical stabilizer trailing edge.

(5) Rotate rudder trim control knob counterclockwise until stops contact. Check that rudder trailing edge is 8 15/16(±1) inches, (227.012(±25.4) mm) left of neutral position, measured from upper aft corner of rudder to corner of adjacent vertical stabilizer trailing edge.

(6) Rotate rudder trim control knob to neutral position.

(7) Shut off hydraulic pressure source.

M. Test Rudder Hydraulic Power Shutoff System (Figure 509)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROLS SYSTEMS.

(1) Pressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE SETTING RUDDER IN POWER MODE OF OPERATION, MAKE CERTAIN THAT AREA AROUND RUDDER IS CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Move rudder hydraulic power shutoff control lever to PWR position. Check that rudder control manual light on annunciator panel goes off within 7 seconds after handle reaches PWR.

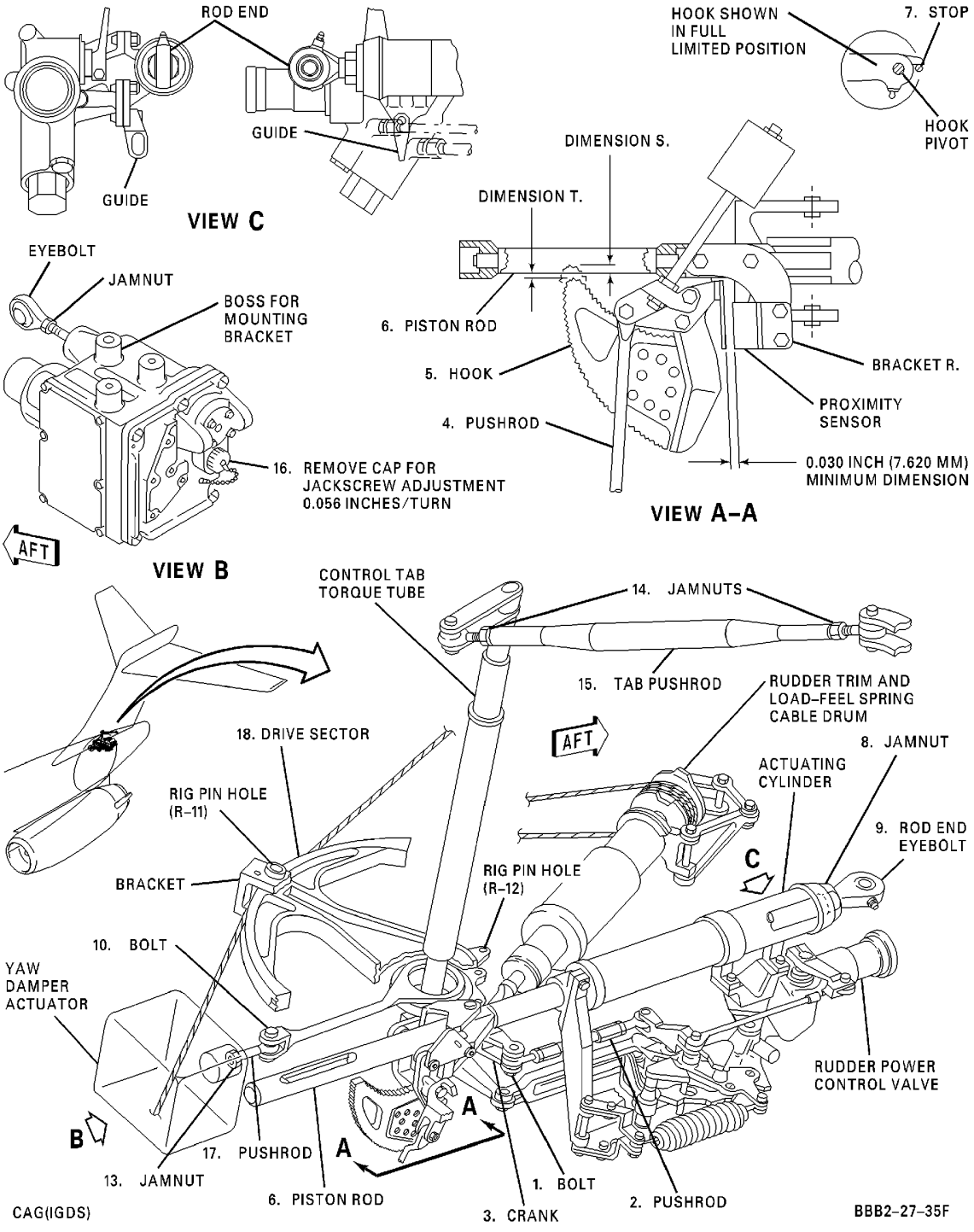
(3) Slowly reduce hydraulic pressure. Check that shutoff valve closes between 1150 psi, (7935 kPa) and 750 psi, (5175 kPa) (rudder reverts to manual control and rudder control manual lights comes on).

NOTE: If light does not illuminate by the time the pressure reaches 750 psi (5175 kPa), hold pressure at 750 psi (5175 kPa) while operating rudder pedals to release pressure from rudder accumulator.

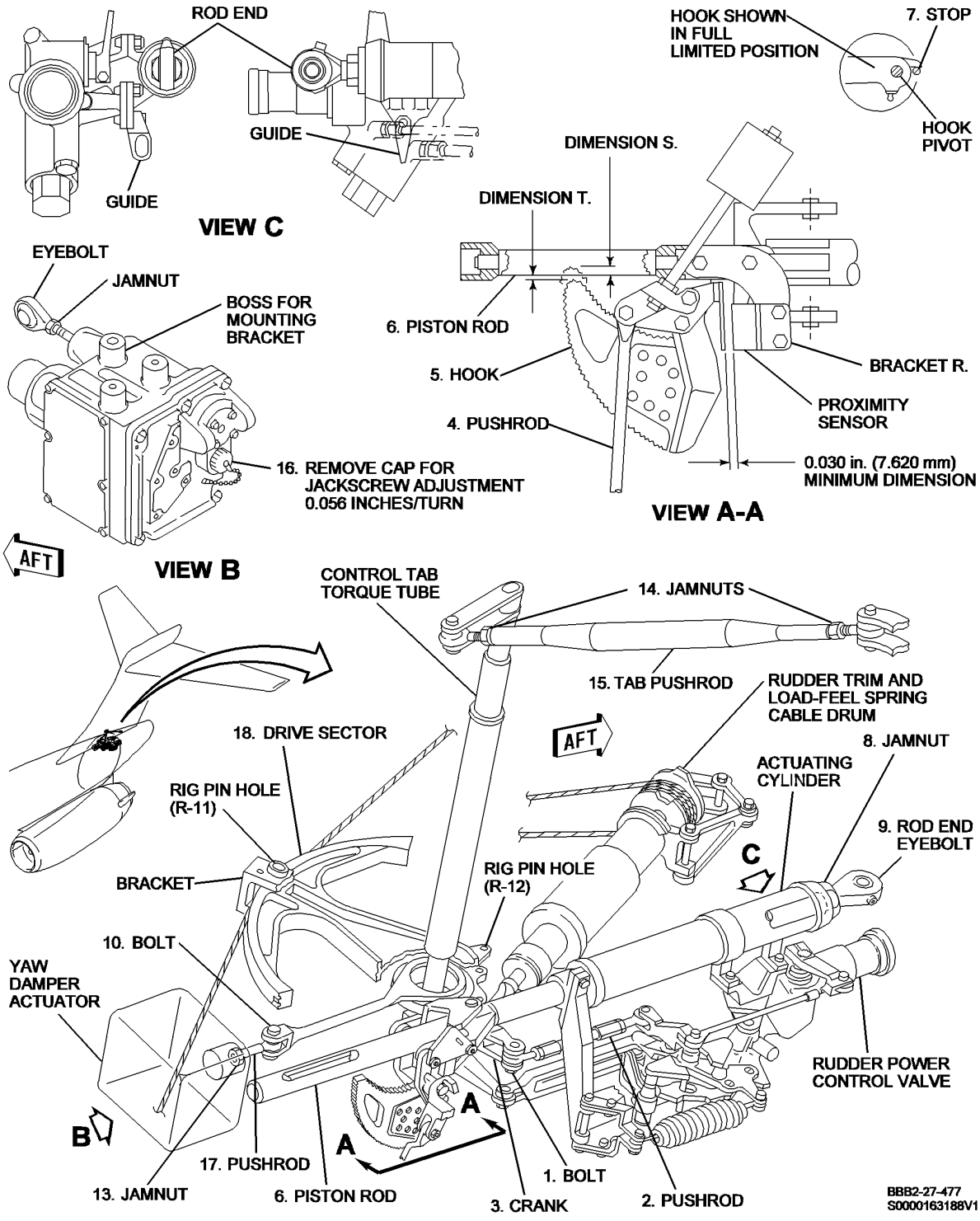
(4) Slowly increase hydraulic pressure. Check that shutoff valve opens between 1200 psi, (8280 kPa) and 1400 psi (9660 kPa) (rudder reverts to power operation and rudder control manual light goes off).

(5) Return rudder hydraulic power shutoff valve control lever to off position. Check that rudder control manual light comes on within 2 seconds after handle reaches man position.

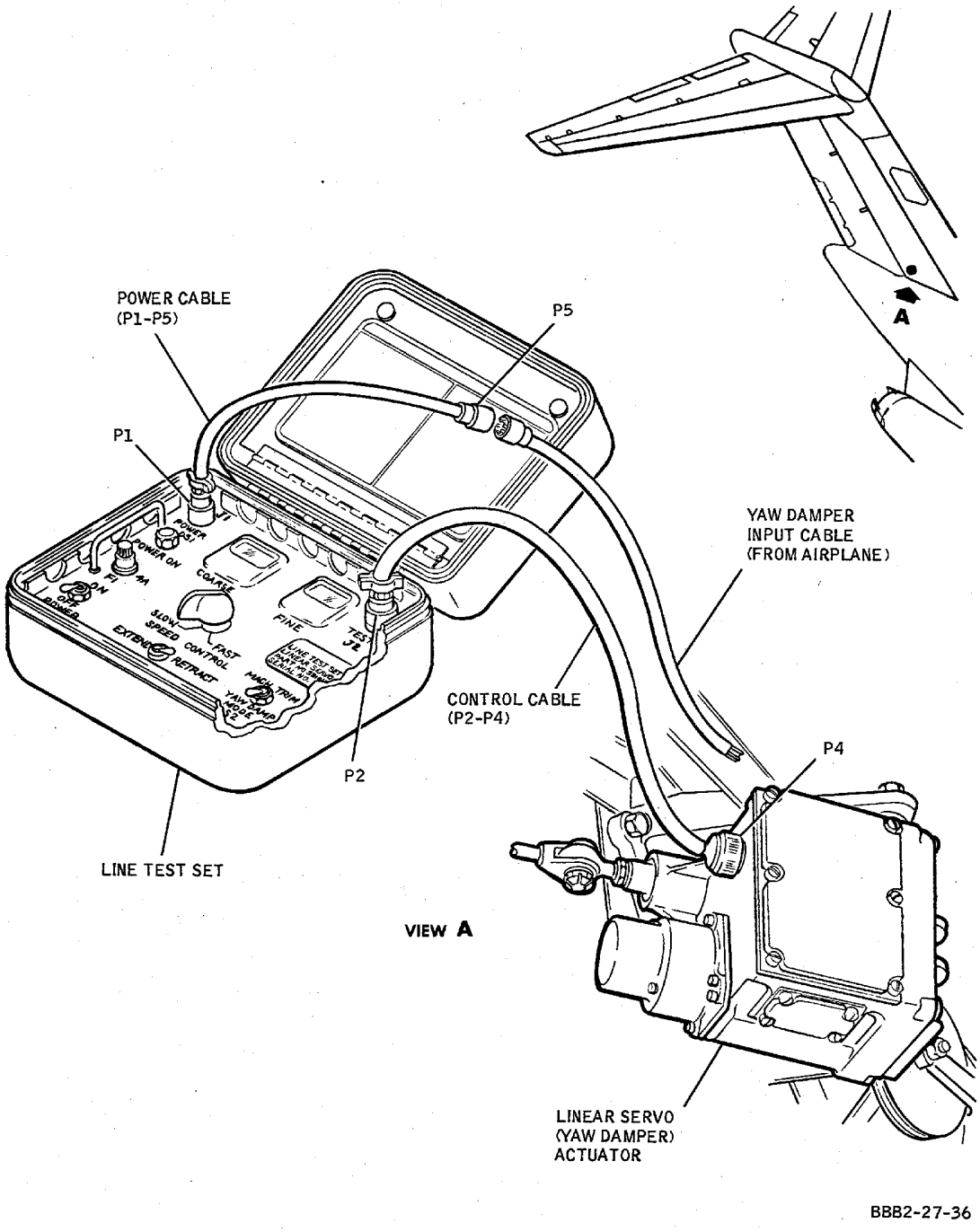
(6) Shut off hydraulic pressure source.



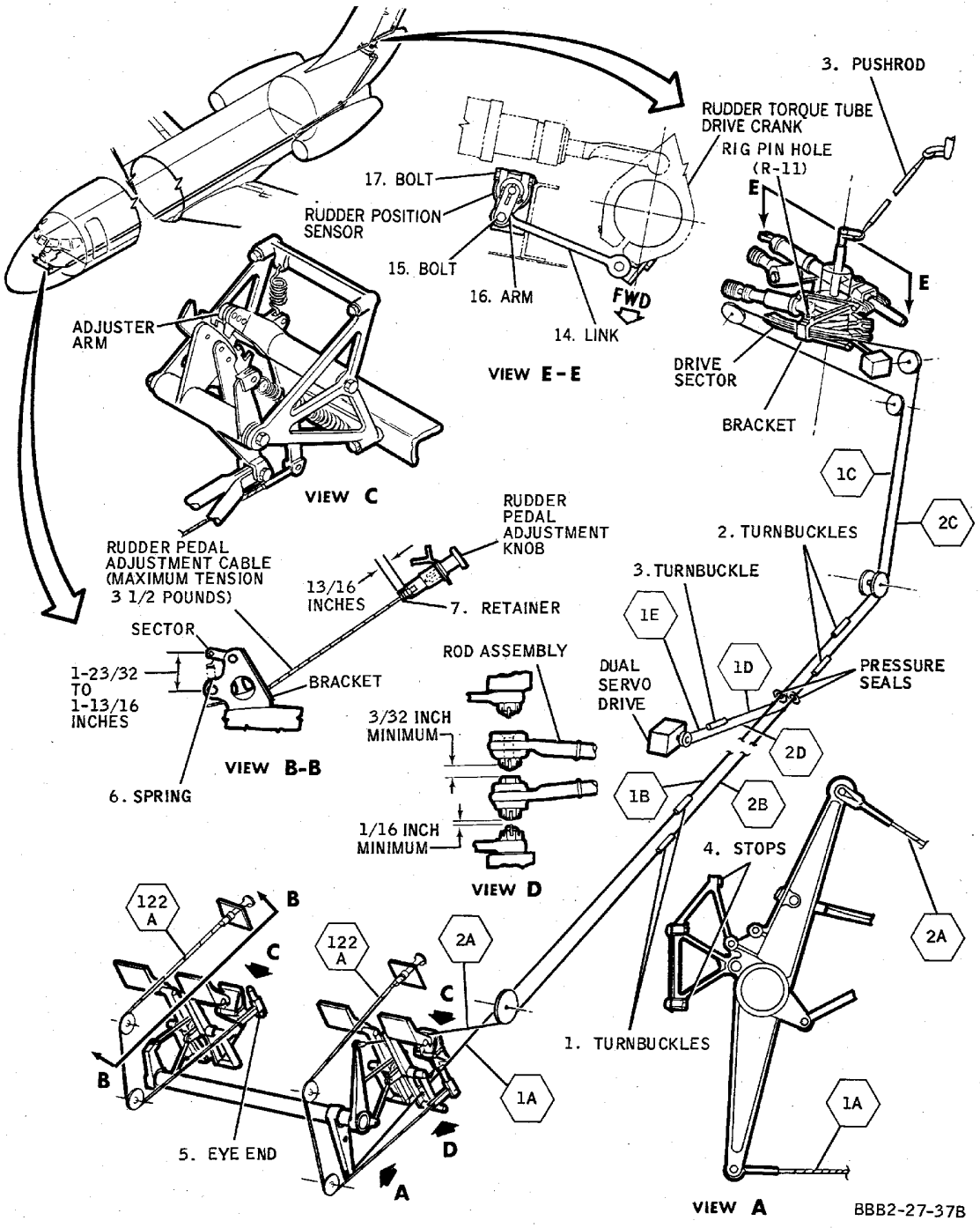
Rudder Hydraulic Power Package -- Adjustment
Figure 501/27-20-00-990-810



Rudder Hydraulic Power Package with flush fittings -- Adjustment
Figure 502/27-20-00-990-826



Linear Servo Yaw Damper Actuator Line Test Set
Figure 503/27-20-00-990-812



Rudder Control System -- Adjustment
Figure 504/27-20-00-990-813

CABLE TENSION TABLE – 1/8 DIAMETER

TEMP deg F	MAX. PROD. RIG LOAD	MIN. PROD. RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. PROD. RIG LOAD	MIN. PROD. RIG LOAD	MIN. ALLOW. SERV. LOAD
–60	10	9	6	42	55	51	35
–58	11	10	7	44	56	52	36
–56	12	11	7	46	57	53	36
–54	12	12	8	48	58	54	37
–52	13	12	9	50	59	54	38
–50	14	13	9	52	60	55	38
–48	15	14	10	54	61	56	39
–46	16	15	10	56	61	57	40
–44	17	16	11	58	62	58	40
–42	18	16	11	60	63	59	41
–40	19	17	12	62	64	60	41
–38	20	18	13	64	65	61	42
–36	20	19	13	66	66	62	43
–34	21	20	14	68	67	63	43
–32	22	21	14	70	68	64	44
–30	23	21	15	72	69	64	45
–28	24	22	15	74	70	65	45
–26	25	23	16	76	71	66	46
–24	26	24	16	78	72	67	47
–22	26	25	17	80	74	68	47
–20	27	25	18	82	75	69	48
–18	28	26	18	84	76	70	49
–16	29	27	19	86	77	71	49
–14	30	28	19	88	78	72	50
–12	31	29	20	90	79	73	51
–10	32	29	20	92	80	74	51
–8	33	30	21	94	81	75	52
–6	33	31	21	96	82	76	53
–4	34	32	22	98	83	77	53
–2	35	33	23	100	84	78	54
0	36	33	23	102	85	79	55
2	37	34	24	104	87	80	56
4	38	35	24	106	88	81	56
6	39	36	25	108	89	83	57
8	40	37	25	110	90	84	58
10	40	38	26	112	91	85	59
12	41	38	27	114	92	86	59
14	42	39	27	116	94	87	60
16	43	40	28	118	95	88	61
18	44	41	28	120	96	89	62
20	45	42	29	122	97	90	62
22	46	42	29	124	98	91	63
24	47	43	30	126	100	93	64
26	48	44	31	128	101	94	65
28	48	45	31	130	102	95	66
30	49	46	32	132	103	96	67
32	50	47	32	134	105	97	67
34	51	48	33	136	106	98	68
36	52	48	33	138	107	100	69
38	53	49	34	140	109	101	70
40	54	50	35				

CAG(IGDS)

BBB2–27–51A

Rudder Cable Tension Table
Figure 505/27-20-00-990-815 (Sheet 1 of 3)

CABLE TENSION TABLE – 3/32 DIAMETER

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD
–60	7	1	0	40	30	24	18
–58	8	2	1	42	31	25	18
–56	8	2	1	44	31	25	19
–54	8	2	1	46	32	26	19
–52	9	3	1	48	33	27	20
–50	9	3	2	50	33	27	20
–48	9	3	2	52	34	28	21
–46	10	4	2	54	34	28	21
–44	10	4	2	56	35	29	22
–42	11	5	3	58	36	30	22
–40	11	5	3	60	36	30	23
–38	11	5	3	62	37	31	23
–36	12	6	4	64	38	32	24
–34	12	6	4	66	38	32	24
–32	12	6	4	68	39	33	25
–30	13	7	5	70	39	33	25
–28	13	7	5	72	40	34	26
–26	14	8	5	74	41	35	26
–24	14	8	6	76	41	35	27
–22	15	9	6	78	42	36	27
–20	15	9	6	80	43	37	28
–18	15	9	7	82	44	38	28
–16	16	10	7	84	44	38	29
–14	16	10	7	86	45	39	29
–12	17	11	8	88	46	40	30
–10	17	11	8	90	46	40	30
–8	18	12	8	92	47	41	31
–6	18	12	9	94	48	42	31
–4	19	13	9	96	48	42	32
–2	19	13	9	98	49	43	33
0	20	14	10	100	50	44	33
2	20	14	10	102	51	45	34
4	21	15	10	104	51	45	34
6	21	15	11	106	52	46	35
8	22	16	11	108	53	47	35
10	22	16	12	110	54	48	36
12	23	17	12	112	54	48	37
14	23	17	12	114	55	49	37
16	24	18	13	116	56	50	38
18	24	18	13	118	57	51	38
20	25	19	14	120	58	52	39
22	25	19	14	122	58	52	40
24	26	20	14	124	59	53	40
26	26	20	15	126	60	54	41
28	27	21	15	128	61	55	41
30	27	21	16	130	62	56	42
32	28	22	16	132	62	56	43
34	28	22	17	134	63	57	43
36	29	23	17	136	64	58	44
38	30	24	17	138	65	59	45
				140	66	60	45

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-278A

Rudder Cable Tension Table
Figure 505/27-20-00-990-815 (Sheet 2 of 3)

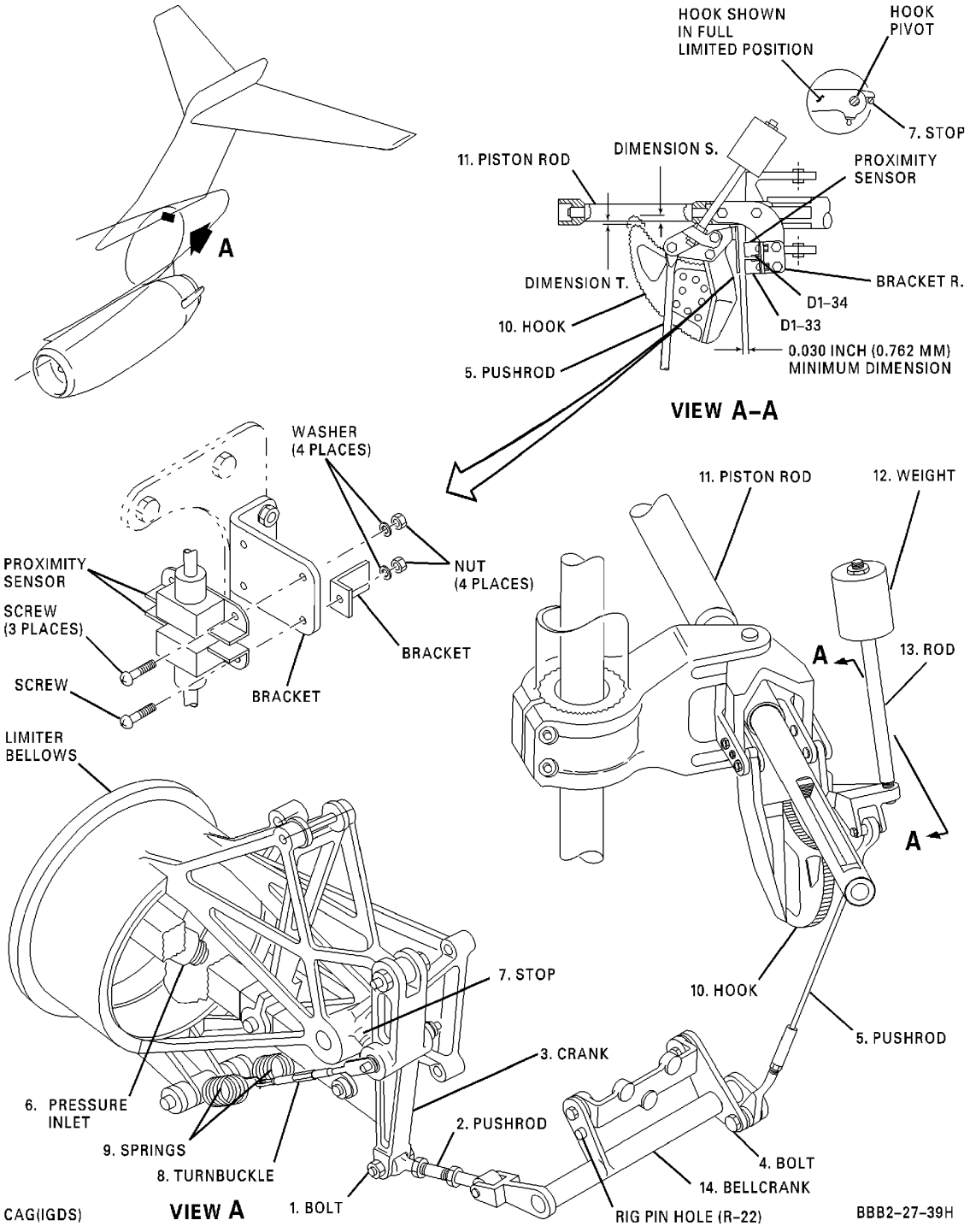
CABLE TENSION TABLE – 1/16 DIAMETER

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
–60	5	0	0	40	18	12	8
–58	5	0	0	42	18	12	9
–56	5	0	0	44	18	12	9
–54	6	0	0	46	19	13	9
–52	6	0	0	48	19	13	9
–50	6	0	0	50	19	13	9
–48	7	1	0	52	20	14	10
–46	7	1	0	54	20	14	10
–44	7	1	0	56	20	14	10
–42	7	1	0	58	20	14	10
–40	8	2	1	60	21	15	11
–38	8	2	1	62	21	15	11
–36	8	2	1	64	21	15	11
–34	8	2	1	66	22	16	11
–32	9	3	1	68	22	16	12
–30	9	3	2	70	22	16	12
–28	9	3	2	72	23	17	12
–26	9	3	2	74	23	17	12
–24	10	4	2	76	23	17	13
–22	10	4	2	78	24	18	13
–20	10	4	2	80	24	18	13
–18	10	4	3	82	24	18	13
–16	11	5	3	84	25	19	14
–14	11	5	3	86	25	19	14
–12	11	5	3	88	25	19	14
–10	11	5	3	90	26	20	15
–8	12	6	4	92	26	20	15
–6	12	6	4	94	27	21	15
–4	12	6	4	96	27	21	16
–2	12	6	4	98	27	21	16
0	13	7	4	100	28	22	16
2	13	7	5	102	28	22	16
4	13	7	5	104	28	22	17
6	13	7	5	106	29	23	17
8	14	8	5	108	29	23	17
10	14	8	5	110	30	24	18
12	14	8	6	112	30	24	18
14	14	8	6	114	31	25	18
16	15	9	6	116	31	25	19
18	15	9	6	118	31	25	19
20	15	9	6	120	32	26	19
22	15	9	7	122	32	26	20
24	16	10	7	124	33	27	20
26	16	10	7	126	33	27	20
28	16	10	7	128	34	28	21
30	16	10	7	130	34	28	21
32	17	11	8	132	35	29	21
34	17	11	8	134	35	29	22
36	17	11	8	136	36	30	22
38	18	12	8	138	36	30	23
				140	37	31	23

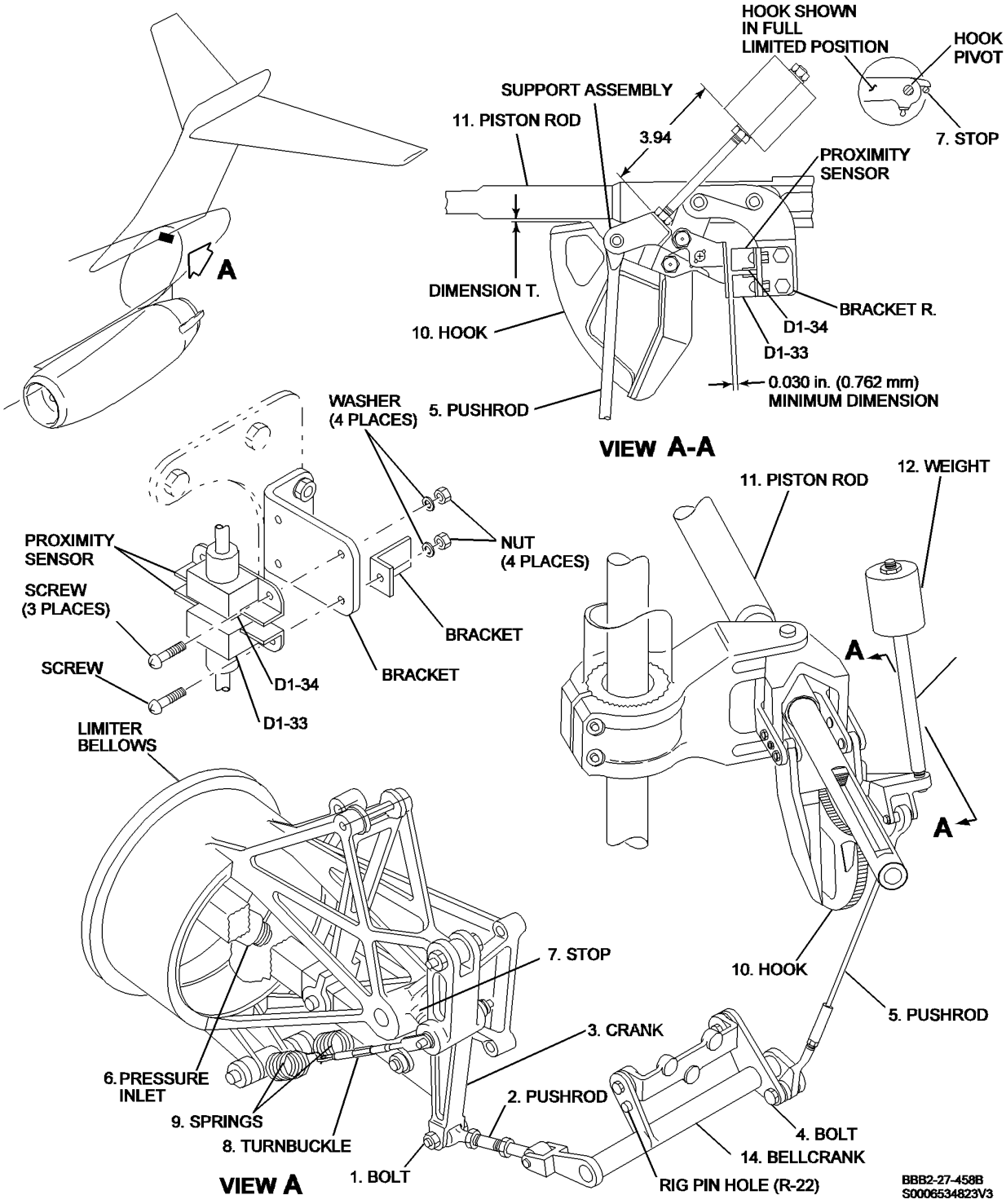
NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-279A

Rudder Cable Tension Table
Figure 505/27-20-00-990-815 (Sheet 3 of 3)

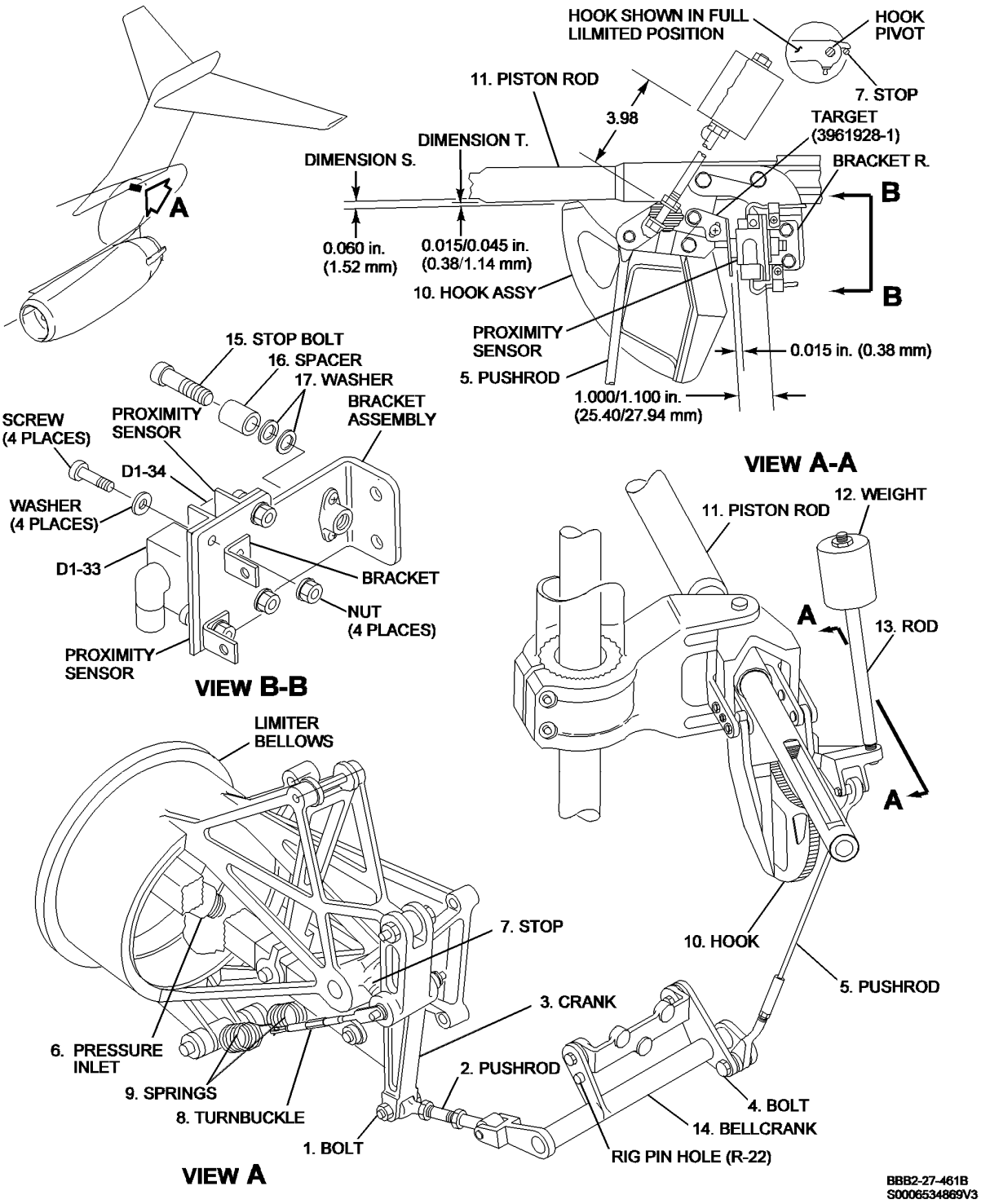


Rudder Throw-Limiter Actuator and Linkage -- Adjustment
Figure 506/27-20-00-990-816 (Sheet 1 of 2)

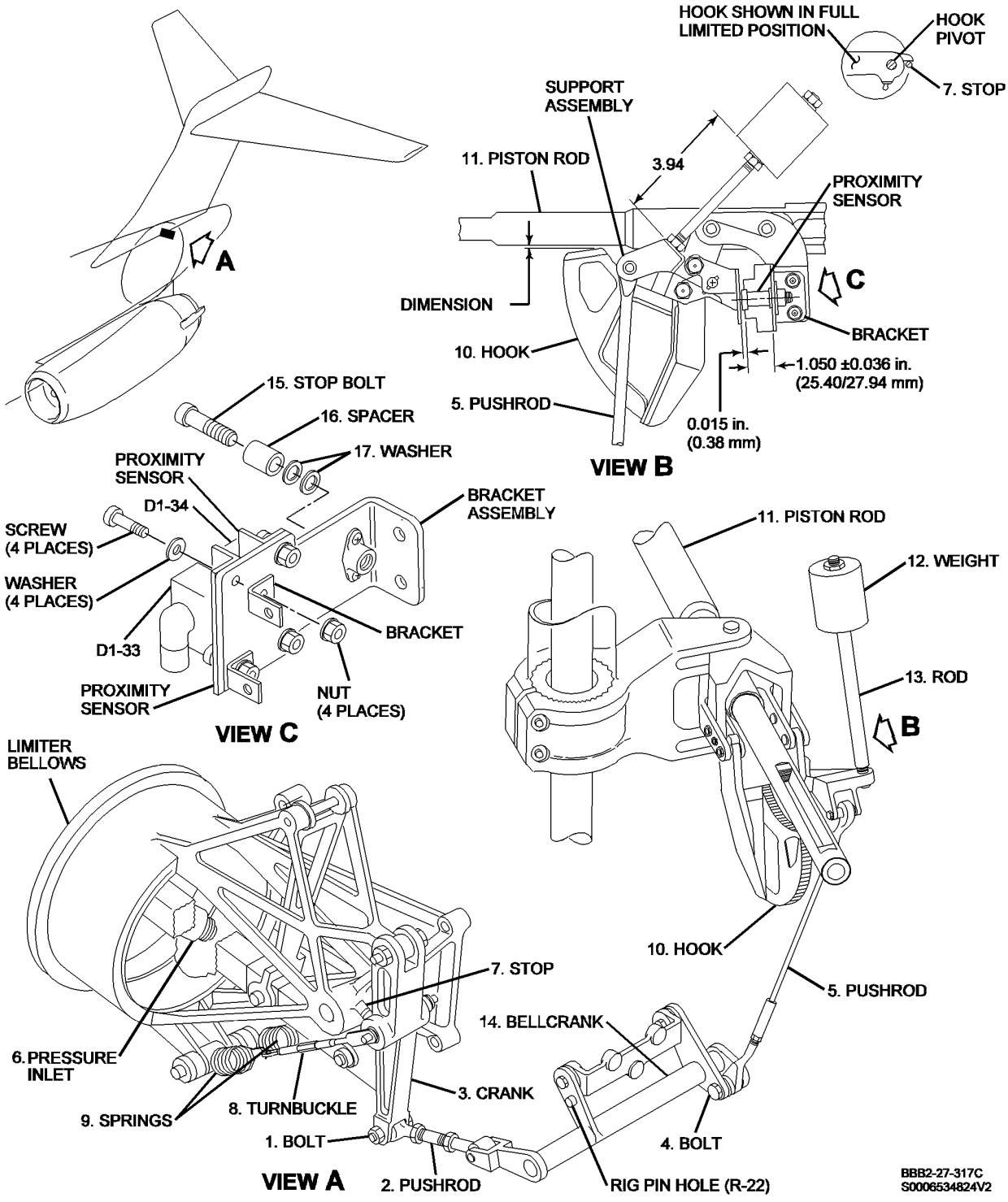


Rudder Throw-Limiter Actuator and Linkage -- Adjustment
Figure 506/27-20-00-990-816 (Sheet 2 of 2)

EFFECTIVITY
WJE 405, 409, 420, 422, 424, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281; WJE 425-427 POST MD80-27-382 AND PRE MD80-27-281

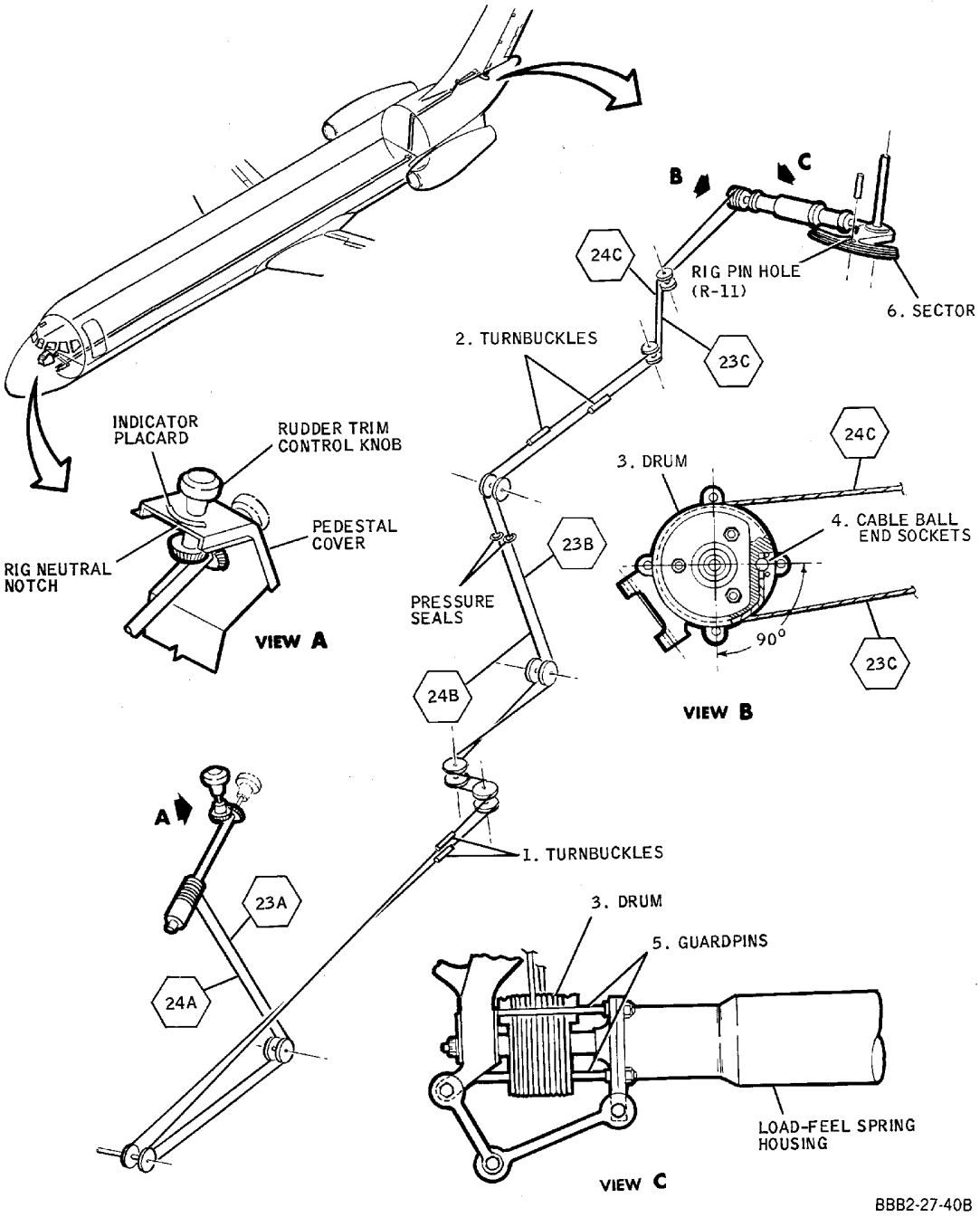


Rudder Throw-Limiter Actuator and Linkage -- Adjustment
Figure 507/27-20-00-990-829 (Sheet 1 of 2)

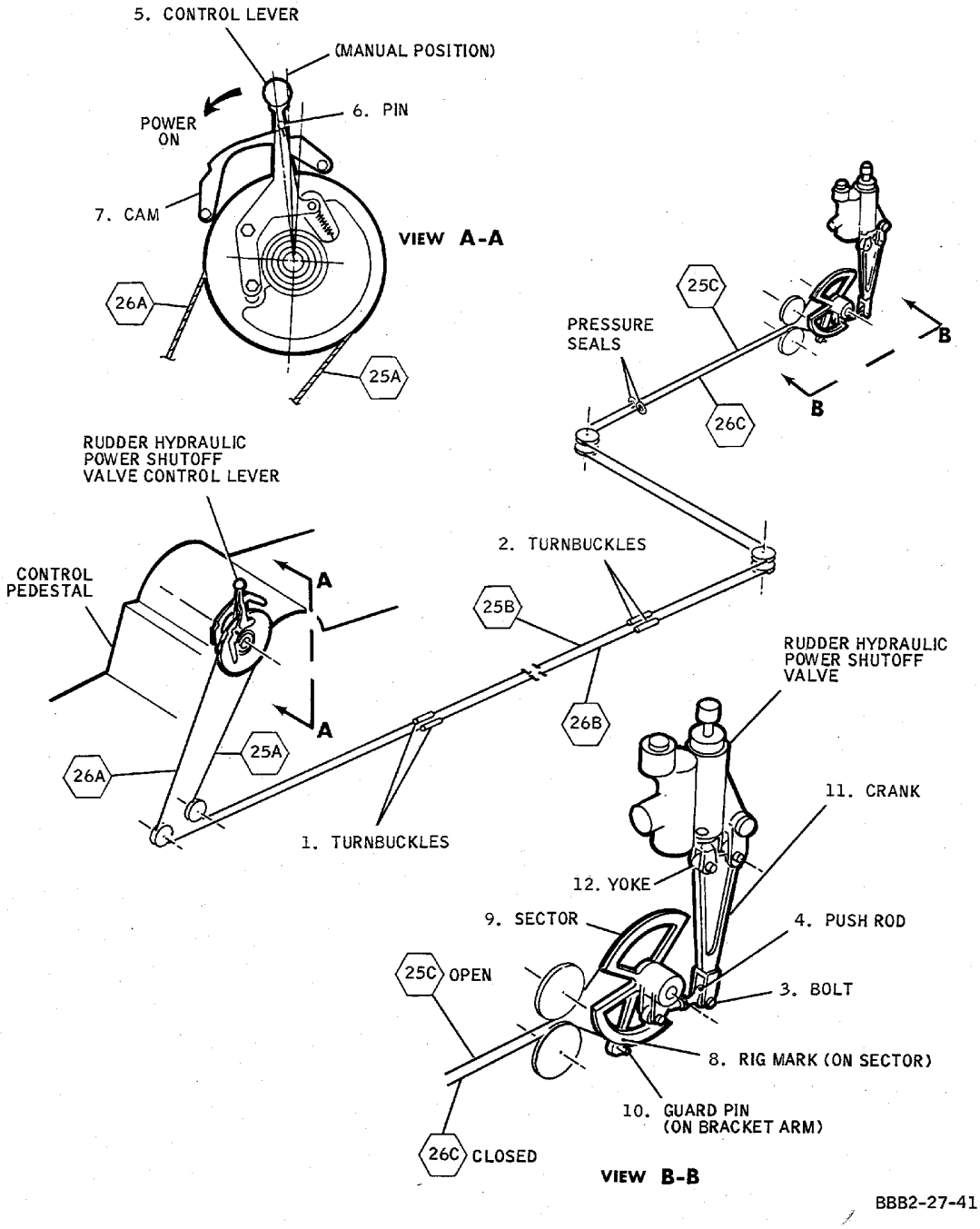


Rudder Throw-Limiter Actuator and Linkage -- Adjustment
Figure 507/27-20-00-990-829 (Sheet 2 of 2)

EFFECTIVITY
WJE 401-404, 406-408, 410, 411, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 892, 893; WJE 405, 409, 420, 422, 424, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281; WJE 425-427 POST MD80-27-382 AND POST MD80-27-281; WJE 886, 887 POST MD80-27-383



Rudder Trim Control System -- Adjustment
Figure 508/27-20-00-990-819



Rudder Hydraulic Power Shutoff Control System -- Adjustment
Figure 509/27-20-00-990-820

4. Cable Assemblies

NOTE: The cable run numbers and segment letters listed below correspond to callouts in hexagonal symbols in Figure 504 , Figure 508 and Figure 509

Table 503

Function	Cable Run Number	Segment Letter
Rudder left	1 1 1 1 1	A B C D E
Rudder right	2 2 2 2	A B C D
Rudder trim nose-left	23 23 23	A B C
Rudder trim nose-right	24 24 24	A B C
Rudder power shutoff on	25 25 25	A B C
Rudder power shutoff off	26 26 26	A B C
Rudder pedal adjustment	122	A

RUDDER AND TAB - CHECK

1. General

A. The following procedures require that the airplane be in still air-conditions to eliminate the effect of wind on the control surface.

2. Check Ruddder and Tab

A. Rudder System Friction Check

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize right hydraulic system. (PAGEBLOCK 27-00-00/201)

(2) Rotate rudder trim control knob to align pointer with rig neutral notch on control pedestal cover.

NOTE: There may be a difference between rigged neutral position and flight neutral position of trim position indicator; therefore, pointer may or may not align with flight neutral position on indicator placard.

(3) Rotate rudder trim control knob to full right position, then back to rig neutral notch.

WARNING: USE EXTREME CAUTION WHEN PERFORMING FOLLOWING PROCEDURES. PERSONNEL SHOULD REMAIN CLEAR OF POWERED RUDDER SURFACE TO PREVENT INJURY IF RUDDER IS MOVED FULL LEFT OR RIGHT.

(4) Mark position of rudder trailing edge accurately on tail-cone. Do not mar or scar tailcone when marking position.

(5) Rotate rudder trim control knob to full left position, then back to rig neutral notch.

(6) Mark position of rudder trailing edge accurately on tail-cone. Do not mar or scar tailcone when marking position.

(7) Measure distance between marks made in steps (4) and (6). If distance is greater than 1/2 inch, (12.7 mm), friction is excessive. Make following checks to determine cause.

(a) Check rudder control and ruddder trim cable systems for fairlead misalignment, excessive pulloff at pulleys, seized pulley bearings, binding guard pins, and rubbing at cutouts.

(b) Check that pressure seals at pressure bulkhead, in aft section of fuselage, are clean and free of oil and grease.

(c) Check that tab remains faired with rudder during power operation, when rudder is moved from full right to full left positions.

(d) Check rudder pedal linkage and reversion mechanism for binding or interference.

(e) Check rudder load-feel unit for binding.

(f) Shut off hydraulic pressure source.

B. Check Rudder and Control Tab Clearances

(1) Check that clearances between rudder and vertical stabilizer are as shown in Figure 601.

(2) Check that clearances between control tab and rudder are as shown in Figure 601.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(3) Pressurize right hydraulic system. (PAGEBLOCK 27-00-00/201)

WARNING: USE EXTREME CAUTION WHEN PERFORMING FOLLOWING PROCEDURES. PERSONNEL SHOULD REMAIN CLEAR OF POWERED RUDDER SURFACE TO PREVENT INJURY IF RUDDER IS MOVED FULL LEFT OR RIGHT.

(4) With rudder in neutral position, check that looseness at upper aft end of rudder trailing edge does not exceed 1/4 inch, (6.35 mm) with power on.

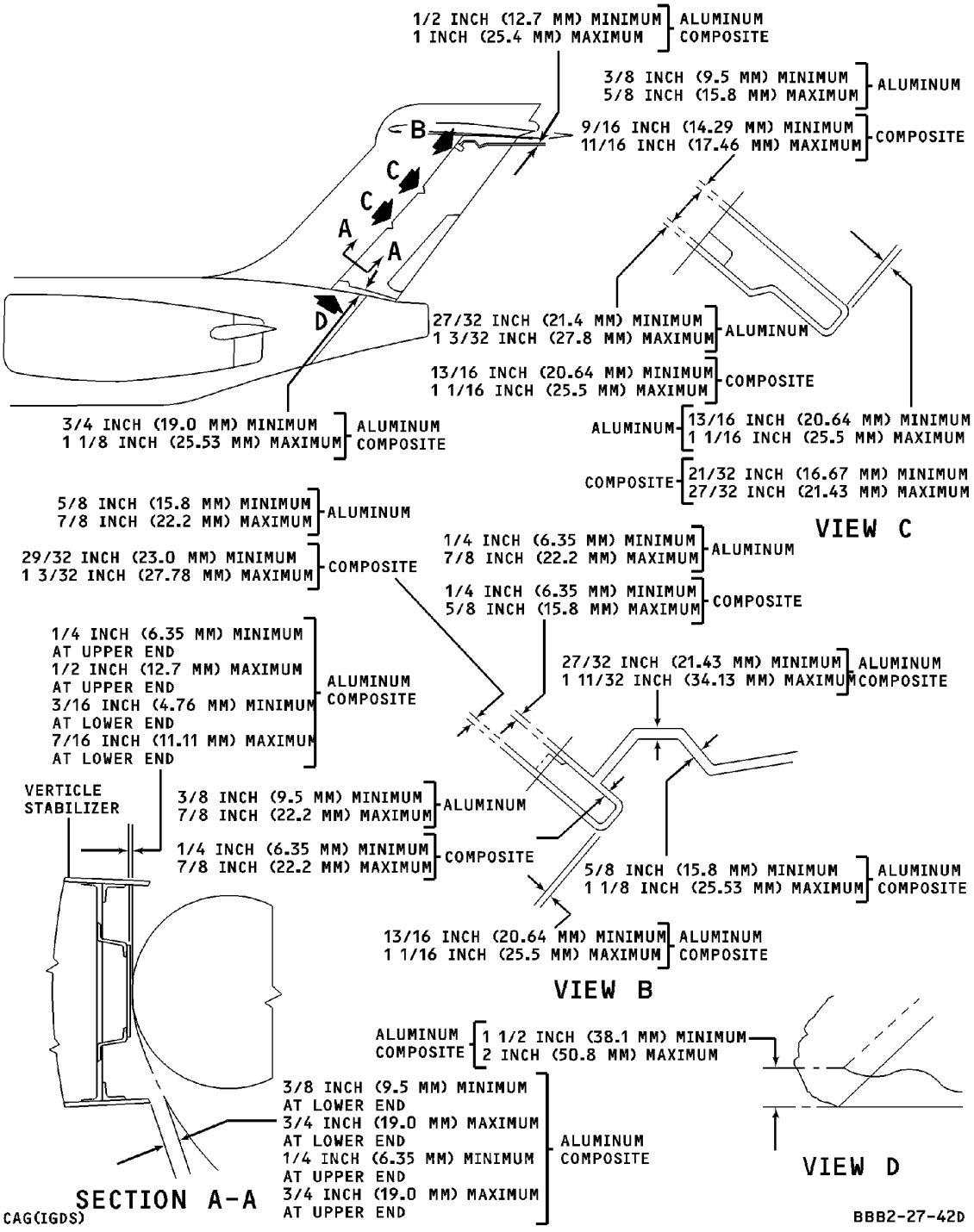
NOTE: Rudder is in neutral position when center of upper aft corner of rudder aligns within 11/64 inch (4.4 mm) of center of vertical stabilizer trailing edge.

(5) Check that looseness at upper aft end of rudder tab trailing edge does not exceed 1/16 inch, (1.59 mm) with power on.

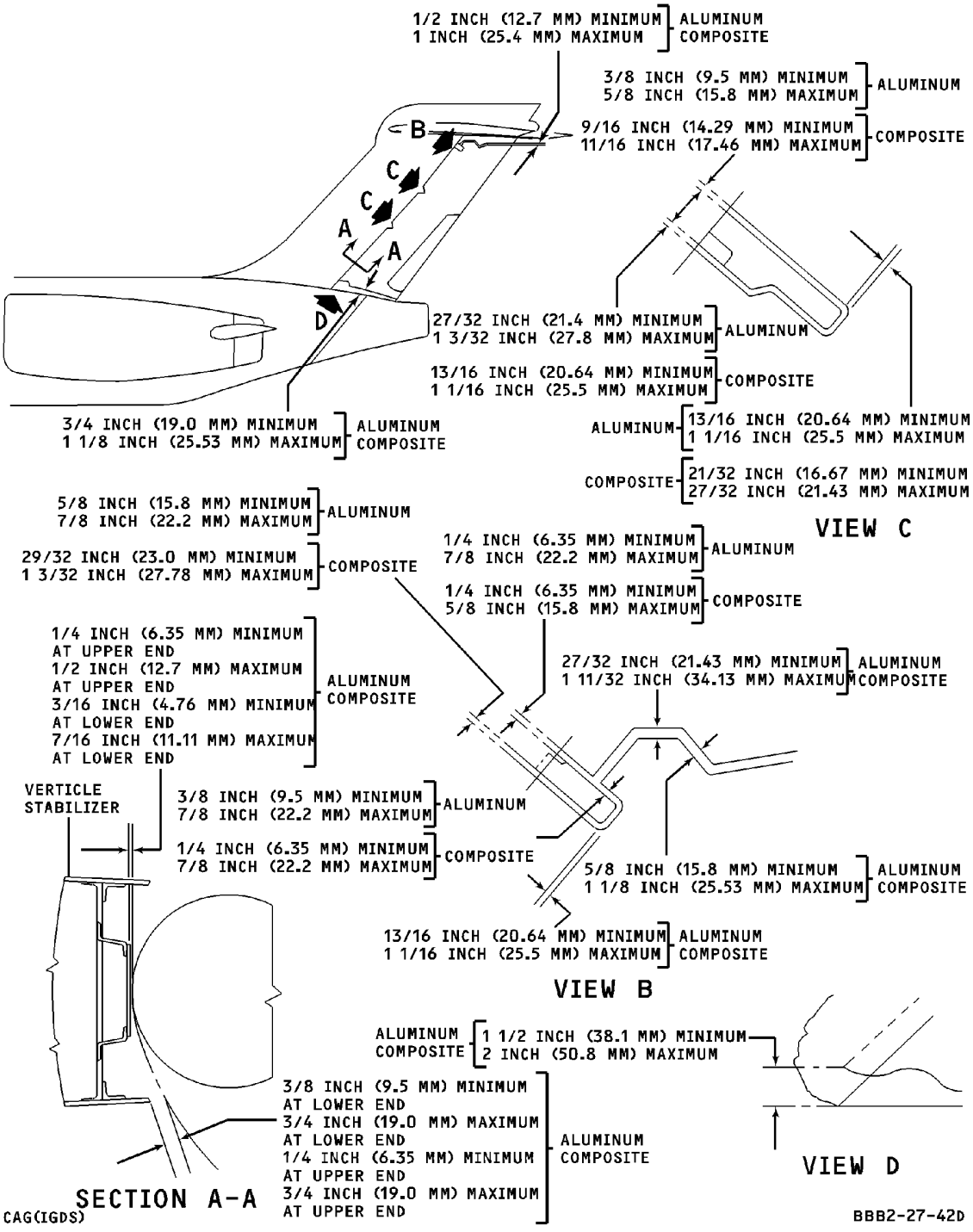
NOTE: Maximum allowable looseness on rudder and tab is checked by moving surface back and forth from faired position.

(6) Shut off hydraulic pressure source.

(7) Check that looseness at upper aft end of rudder tab trailing edge does not exceed 1/8 inch, (3.18 mm) with power off.



Rudder and Control Tab Clearances
Figure 601/27-20-00-990-822



Rudder and Control Tab Clearances
Figure 602/27-20-00-990-824

RUDDER - REMOVAL/INSTALLATION

1. General

A. The rudder is hinged to the vertical stabilizer rear spar. Access to the rudder attach fittings is through access doors on the left side of the rudder at each hinge, through hinge cutout fairings at the upper and lower dampers; and through doors, fairings, and support angles at the base of the rudder.

NOTE: An aluminum rudder can be installed on aircraft configured originally for composite rudder with minimal rework (replacement of hinge link assemblies at hinge 1, 2, and 3). However, a composite rudder cannot readily be installed on aircraft configured originally for aluminum rudder without extensive rework.

B. The fuselage tailcone must be removed to provide clearance for lowering and raising the rudder during removal and installation.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 401

Name and Number	Manufacturer
Rudder sling assembly (5952166)	Douglas Aircraft Co.
Protractor (5916715)	Douglas Aircraft Co.
Torque wrench (0-300 inch pounds) (0-33.9 N·m)	
Torque wrench (1600-1900 inch-pounds) (179.2-212.8 N·m)	
Parker-O-Lube (DPM 5367)	Parker Seal Co. Culver City, CA
Rig pins (2) (6-4) 3/8 by 4 5/8 (9.53 x 117.48 mm)	
NOTE: Rig pin sizes are in inches (diameter X length; length = grip plus 5/8 inch), (15.875 mm).	

3. Removal/Installation

A. Remove Rudder (Figure 401)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(1) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(2) On flight guidance control panel, place AP switch to 1 position.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(3) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	26	B10-343	MACH TRIM-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1

WARNING: TAG CONTROL LEVER.

(4) Place rudder hydraulic power shutoff valve control lever, located on control pedestal, in off position to prevent inadvertent operation of rudder hydraulic power system.

(5) Remove fuselage tailcone. (TAILCONE, SUBJECT 53-53-00, Page 401)

(6) Remove all fairings from lower leading edge and right side of rudder.

(7) Remove pushrod from control tab torque tube crank.

(8) Remove control tab torque tube crank.

(9) Perform visual check of torque tube crank for cracks. (Figure 401, View D)

(10) Attach rudder hoist bracket and boom to underside of left and right horizontal stabilizer as shown in Figure 402.

(11) Attach rudder hoist fixture to left and right side of rudder (Figure 402).

(a) Use pickup point “C” for aluminum rudder.

(b) Use pickup point “A” for composite rudder.

(12) Attach hoist to boom and hoist fixture, left and right side.

(13) Tension both hoist cables sufficiently to support rudder.

(14) Remove bolts attaching rudder torque fitting to rudder.

(15) Disconnect upper and lower rudder damper links from vertical stabilizer rear spar fittings.

(16) Hoist rudder sufficiently to remove weight of rudder from rudder hinges.

(17) Perform the following:

(a) On aluminum rudder, remove attach nut (2) from each rudder hinge eyebolt.

(b) On composite rudder, remove rudder attach bolt (1).

CAUTION: ALUMINUM RUDDER WEIGHS APPROXIMATELY 307 POUNDS (139 KG), COMPOSITE RUDDER WEIGHS APPROXIMATELY 272 POUNDS (123 KG). USE CARE WHEN HANDLING TO PREVENT DAMAGE TO RUDDER AND ADJACENT AIRCRAFT STRUCTURE.

(18) Position rudder aft and to left until clear of hinges and aircraft structure.

(19) Lower rudder to ground.

(20) Remove hoisting fixtures from rudder.

B. Install Rudder (Figure 401)

NOTE: An aluminum rudder can be installed on aircraft configured originally for composite rudder with minimal rework (replacement of hinge link assemblies at hinge 1, 2, and 3). However, a composite rudder cannot readily be installed on aircraft configured originally for aluminum rudder without extensive rework.

(1) Make certain left and right hydraulic systems are depressurized.

(2) Make certain rudder hydraulic power shutoff valve control lever is in off position and tagged.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(3) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	26	B10-343	MACH TRIM-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1

(4) Before installing rudder, make sure rudder damper links are installed correctly. (RUDDER DAMPERS - MAINTENANCE PRACTICES, PAGEBLOCK 27-20-05/201)

(5) If installing aluminum rudder on aircraft configured for composite rudder, perform following:

(a) Remove ground cable from all hinge brackets.

(b) Remove link assemblies (1) from hinge brackets at hinge 1, 2, and 3.

(c) Install link (2), hinge brackets 1, 2, and 3. Tighten nuts to torque of 270-300 inch-pounds (30.51 to 33.9 N·m).

(d) Install bearings (eyebolt) on each link (2). Tighten nuts to torque of 290 to 415 inch-pounds (32.8 to 46.9 N·m).

(6) If installing aluminum rudder, clean contact area between base of eyebolt and fitting at each rudder hinge to provide good electrical bond.

WARNING: LUBRICANT IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN LUBRICANT IS USED.

- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET LUBRICANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.

(WARNING PRECEDES)

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(7) Coat shank of hinge bearing, bolt or pin through bore of all bearings with Parker-O-Lube.

(8) Install hoisting fixtures on rudder. (Figure 402)

(9) Attach hoist to rudder fixtures.

(a) Use pickup point “C” for aluminum rudder.

(b) Use pickup point “A” for composite rudder.

CAUTION: ALUMINUM RUDDER WEIGHS APPROXIMATELY 307 POUNDS (139 KG), COMPOSITE RUDDER WEIGHS APPROXIMATELY 272 POUNDS (123 KG). USE CARE WHEN HANDLING TO PREVENT DAMAGE TO RUDDER AND ADJACENT AIRPLANE STRUCTURE.

(10) Using hoists lift rudder into approximate alignment with vertical stabilizer.

(11) Align rudder hinge fittings with eyebolts on vertical stabilizer hinge fittings.

(12) Position rudder slightly aft and left of installed position, with trailing edge to right.

(13) Move rudder forward and to right to engage eyebolts with hinge fittings. Make certain torque tube flange is properly aligned as rudder is moved into position and perform the following:

(a) If installing aluminum rudder, install nuts (head of bolt up) on eyebolts fingertight.

(b) If installing composite rudder, install hinge bolts (head of bolt up) and tighten nuts fingertight.

(14) Install rudder to torque tube attach bolts for alignment only (4 places).

(15) If installing aluminum rudder, tighten nuts on rudder hinge eyebolts to torque of 1620 to 1860 inch-pounds (183.06 to 210.18 N·m).

(16) If installing composite rudder, tighten nuts on rudder hinge bolts to torque of 290 to 415 inch-pounds (32.77 to 46.9 N·m).

(17) Install crank on tab torque tube. Safety upper attach bolt with lockwire.

(18) If installing aluminum rudder, perform following:

(a) Using hoist, support rudder to give a gap of 0.005 inch, (0.13 mm) minimum clearance between the rudder and torque tube at all attachment points (4 places).

(b) Measure gaps and install shim washers as required to get all gaps equal within 0.016 inch (0.41 mm) of each other. Hold original smallest gap to 0.005 inch, (0.13 mm) as in step (16).

(19) If installing composite rudder, perform following:

(a) Using hoist, support rudder to give gap of 0.030 inch (0.76 mm) minimum clearance between stabilizer support fitting at sta. Zr=43.043, and rudder hinge link tip. (Figure 401)

(b) Measure gaps between the rudder and torque tube at all attachment points (4 places) and install shim washers as required to smallest gap to maintain 0.030 inch (0.76 mm) at hinge link tip.

(c) Add shim washers as required to remaining torque tube attachment points to get all gaps equal within 0.016 inch (0.41 mm) of each other.

(20) Lower rudder and torque attach bolts to 255(±25) inch-pounds, (28.8(±2.8) N·m).

(21) If composite rudder was installed, verify that 0.030 inch (0.76 mm) is maintained between stabilizer support fitting and hinge link at sta. Zr=43.043; shim as required.

(22) Remove rudder hoist from booms and hoist fixture.

(23) Remove boom and brackets from underside of left and right horizontal stabilizer. Install screws at bracket attach points on stabilizer.

(24) Connect tab pushrod to crank. Safety nut with cotter pin.

(25) Remove hoisting fixture from left and right side of rudder. Install screws at fixture attach points on rudder.

(26) Connect upper and lower damper links to vertical stabilizer rear spar fittings.

(27) Manually move rudder to neutral position.

NOTE: Rudder is in neutral position when center of upper aft corner of rudder is in line within 11/64 inch, (4.4 mm) with center of adjacent vertical stabilizer trailing edge.

(28) Rotate rudder trim control knob to align indicator pointer in flight compartment, with rig neutral notch on control pedestal cover.

NOTE: There may be a difference between rigged neutral position and flight neutral position on trim indicator, therefore, pointer may or may not align with flight neutral position on indicator placard.

(29) Insert rig pin (6-4) in rig pin hole (R-11) through rig bracket and drive sector, insert rig pin (6-4) in rig pin hole (R-12) through drive sector and rudder power control valve actuating crank. (Figure 401, View C)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(30) Pressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: MAKE CERTAIN THAT AREA AROUND RUDDER IS CLEAR OF PERSONNEL AND EQUIPMENT BEFORE RUDDER REVERTS FROM MANUAL TO POWER OPERATION.

(31) Move rudder hydraulic power shutoff valve control lever to on position.

(32) Check that rudder is in neutral position. (Paragraph 3.B.(27))

(33) Loosen jamnuts on pushrod and rotate body of pushrod to align trailing edge of control tab with trailing edge of rudder within 1/4 degree.

(34) Tighten jamnuts on pushrod.

(35) Move rudder hydraulic power shutoff valve control lever to off position.

(36) Remove rig pins (6-4) from rig pin holes (R-11) and (R-12).

(37) Shut off hydraulic pressure source.

(38) Install fairing on lower right-hand side and leading edge of rudder.

(39) Lubricate rudder and control tab fittings as applicable (PAGEBLOCK 12-21-02/301).

(40) Install fuselage tailcone. (TAILCONE, SUBJECT 53-53-00, Page 401).

(41) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	26	B10-343	MACH TRIM-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1

(42) Check rudder clearances. (RUDDER - CHECK, PAGEBLOCK 27-20-01/601)

(43) Check rudder position sensor. (PAGEBLOCK 22-01-03/201)

(44) Perform return to service (RTS) test (DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201).

C. Check Rudder

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

NOTE: Linear dimensions for checking rudder travel are measured from center of upper aft corner of rudder to center of adjacent vertical stabilizer. Angular dimensions for checking control tab travel are made with rigging protractor held at rigging reference lines on left side of rudder and tab.

WJE ALL

WARNING: TAG CONTROL LEVER, IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT COULD RESULT.

(1) Make certain that rudder hydraulic power shutoff valve control lever, located on control pedestal, is in off position.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize hydraulic system. (PAGEBLOCK 29-00-00/201)

(3) Make certain that rudder trim position indicator pointer is aligned with rig neutral position notch on control pedestal cover.

NOTE: There may be a difference between rigged neutral position and flight neutral position on trim position indicator, therefore, pointer may or may not align with flight neutral position on indicator placard.

(4) Manually move rudder trailing edge 14 5/8(±1/2) inches (371.5(±12.7) mm) to right of neutral position, and move right rudder pedal full forward to contact stop.

(5) Check that control tab is 26(±2) degrees left of rudder trailing edge.

(6) Manually move rudder trailing edge 14 5/8(±1/2) inches (371.5(±12.7) mm) to left of neutral position, and move left rudder pedal full forward to contact stop.

(7) Check that control tab is 26(±2) degrees right of rudder trailing edge.

(8) Return rudder and rudder pedal to neutral position.

WARNING: MAKE CERTAIN THAT AREA AROUND RUDDER IS CLEAR OF PERSONNEL AND EQUIPMENT WHEN RUDDER REVERTS FROM MANUAL TO POWER OPERATION.

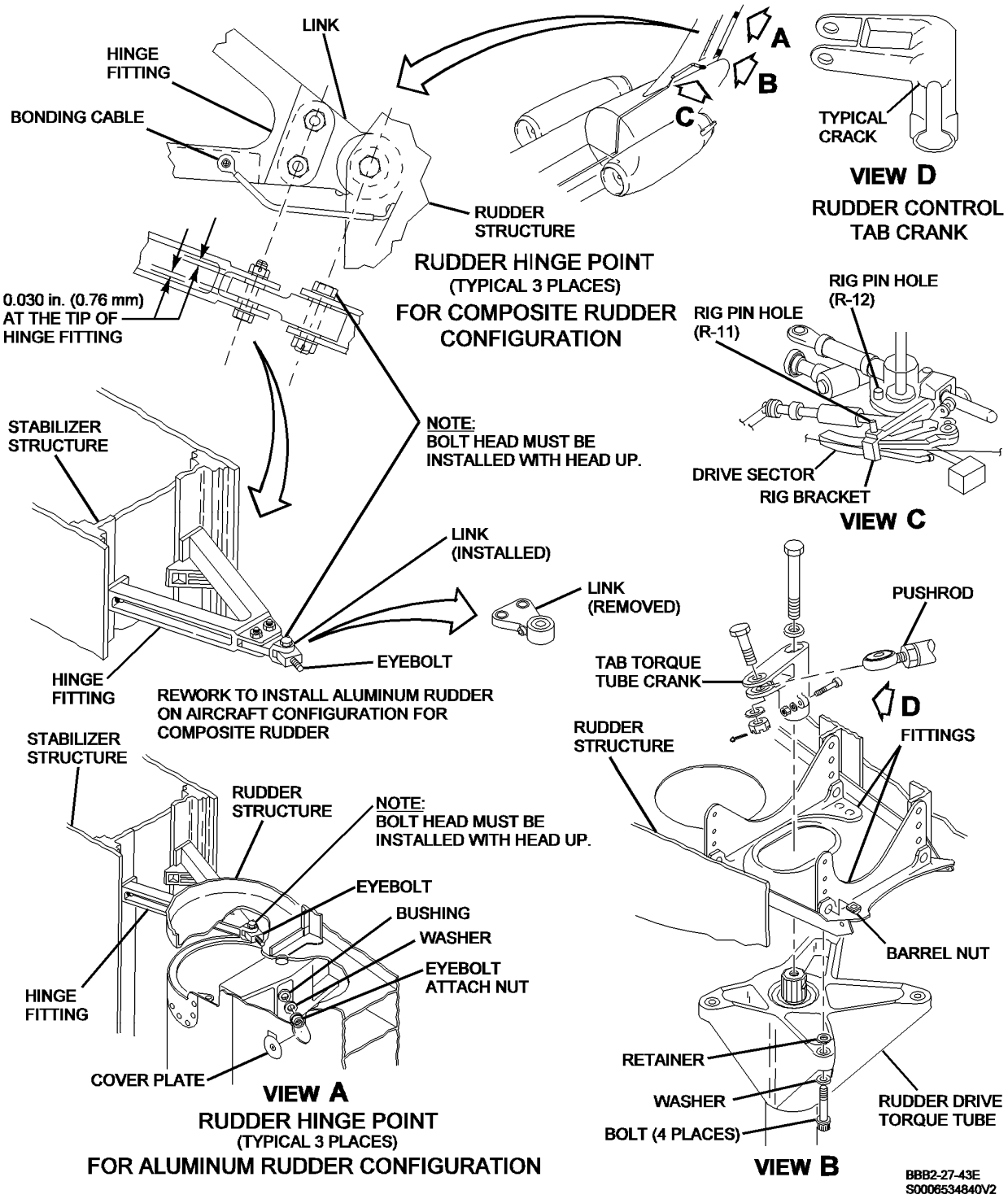
(9) Move hydraulic power shutoff valve control lever to on position.

(10) Move right rudder pedal full forward. Check that rudder trailing edge is 14 5/8(±1/2) inches (371.5(±12.7) mm) to right of neutral position.

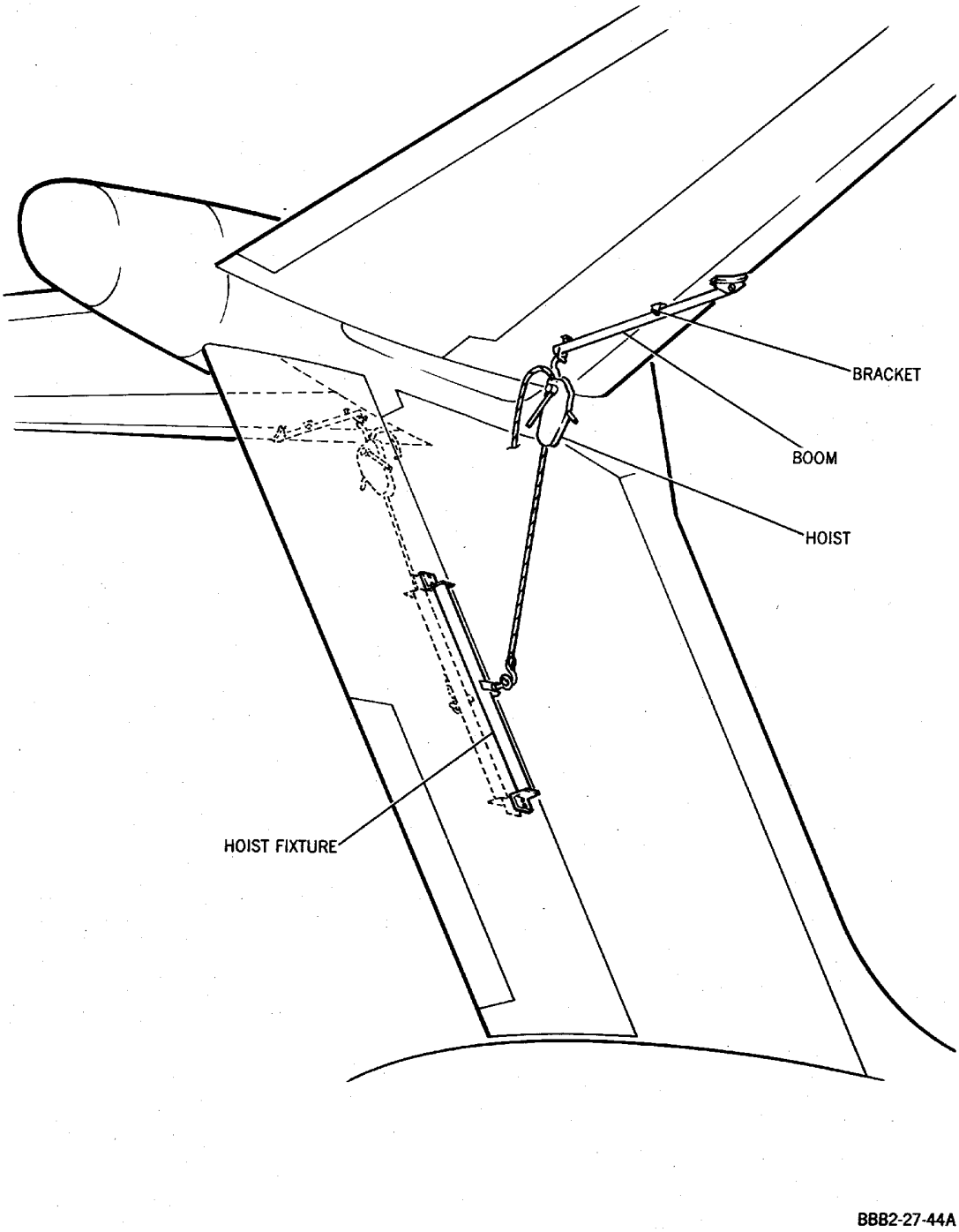
(11) Move left rudder pedal forward. Check that rudder trailing edge is 14 5/8(±1/2) inches (371.5(±12.7) mm) to left of neutral position.

(12) Place rudder pedal to neutral position.

(13) Shut off hydraulic system pressure source.



Rudder -- Installation
Figure 401/27-20-01-990-801



Rudder Sling Assembly
Figure 402/27-20-01-990-802

RUDDER - CHECK

1. General

A. The procedures in this section are for the check of the rudder and control tab clearances.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Consumable List

Name and Number	Manufacturer
Lockwire, NASM20995N32, DPM 684*[1]	Not specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Check Rudder

A. Check Rudder and Control Tab Clearances

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT CAN RESULT.

(1) Place rudder hydraulic power shutoff control lever, located on control pedestal, in off position.

(2) Check that clearances between rudder and vertical stabilizer are as shown in Figure 601

(3) Check clearances between control tab and rudder. (Figure 27-20-02-990-803)

(4) Check that looseness at upper aft end of rudder tab trailing edge does not exceed 1/8 inch (3.18 mm).

NOTE: Maximum allowable looseness on rudder and tab is checked by moving surface back and forth from neutral position.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT ALL CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF SYSTEMS OR EQUIPMENT.

(5) Pressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: MAKE CERTAIN THAT AREA AROUND RUDDER IS CLEAR OF PERSONNEL AND EQUIPMENT WHEN RUDDER REVERTS FROM MANUAL TO POWER OPERATION.

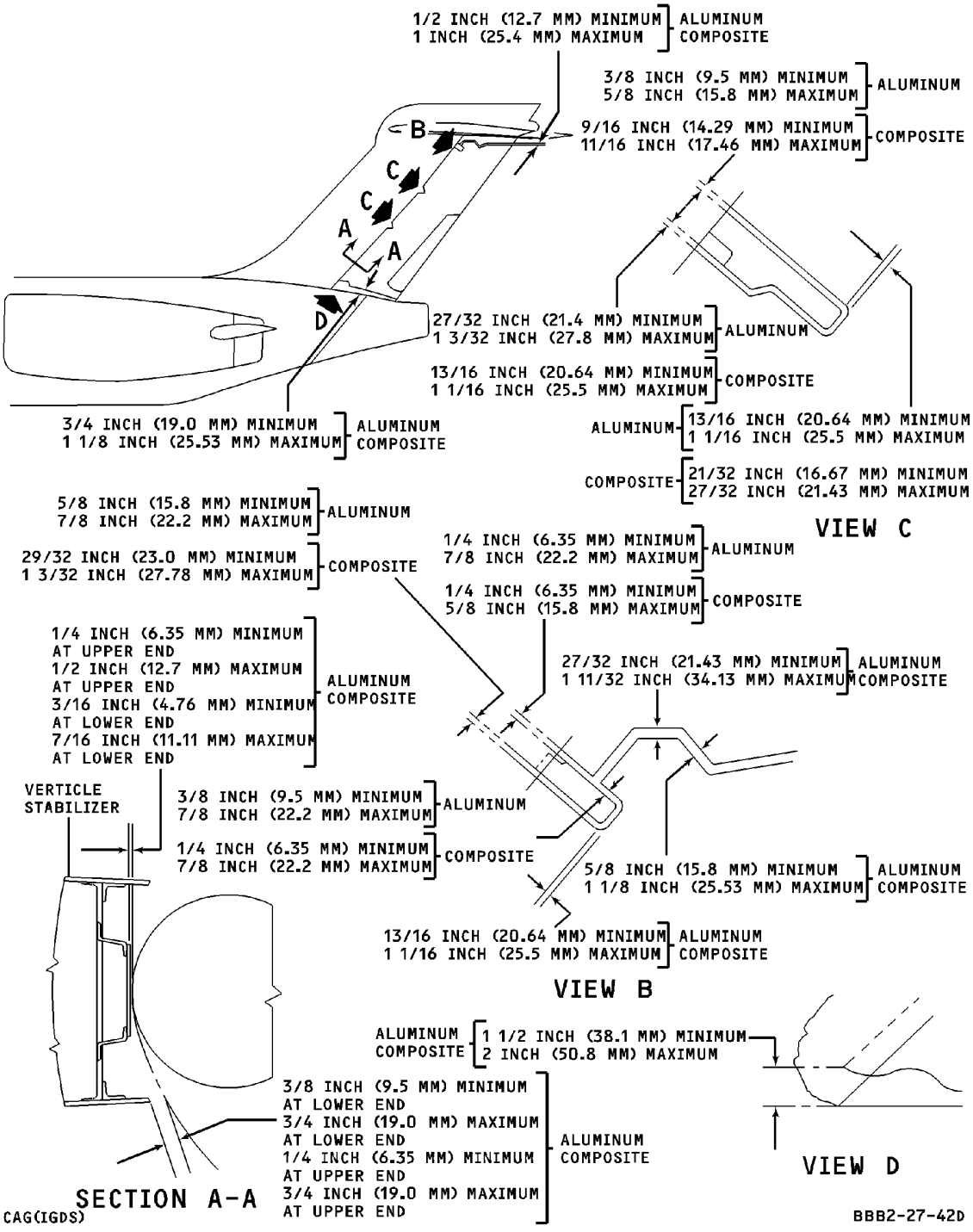
(6) Place rudder hydraulic power shutoff control lever in on position, remove tag.

(7) With rudder in neutral position check that looseness at upper aft end of rudder trailing edge does not exceed 1/4 inch (6.35 mm).

NOTE: Rudder is in neutral position when center of upper aft corner of rudder aligns within 11/64 inch (4.4 mm) of center of vertical stabilizer trailing edge.

(8) Check that looseness at upper aft end of rudder tab trailing edge does not exceed 1/16 inch (1.587 mm).

(9) Shut off hydraulic pressure source.



Rudder and Control Tab Clearances
Figure 601/27-20-01-990-804

RUDDER CONTROL TAB - REMOVAL/INSTALLATION

1. General

A. The rudder control tab is located near the lower end of the rudder trailing edge and is attached to the rudder by four hinge eyebolts fastened to support brackets on the rudder rear spar.

B. Access to the three upper eyebolts is through the hinge cover fairings. Access to the lower eyebolt is through the aft push-rod fairing.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 401

Name and Number	Manufacturer
Protractor (5916715)	Douglas Aircraft Co.
Torque wrench (0-300 inch pounds) (0-33 N·m)	
Lockwire, NASM20995N32, DPM 684*[1]	Not specified
Rig pins (2)(6-4) 3/8 by 4 5/8 (9.525 x 117.475 mm)	
NOTE: Rig pin sizes are in inches (diameter X length; length = grip plus 5/8 inch) (15.875 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Rudder Control Tab

A. Remove Rudder Control Tab (Figure 401)

(1) Make certain right hydraulic system is depressurized.

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT COULD RESULT.

(2) Move rudder hydraulic power shutoff valve control lever located on control pedestal to off position.

(3) Remove bolt and disconnect pushrod from control tab.

(4) Remove bolt from lower hinge eyebolt.

(5) Remove nuts from three upper hinge eyebolts and remove tab from rudder.

(6) If control tab is to be replaced, adjust the fixed tab of the replacement control tab according to the position of the fixed tab on the removed control tab.

B. Install Rudder Control Tab

(1) Make certain right hydraulic system is depressurized.

(2) Make certain that hydraulic power shutoff valve control lever is in off position.

(3) Clean contact area between eyebolt and fitting at each tab hinge to provide good electrical bond.

(4) Place control tab in position on rudder and install washer and nut on each of three upper hinge eyebolts. Tighten nuts to torque of 173(±27) inch-pounds (19.5(±3.1) N·m).

(5) Install bolt at lower hinge eyebolt. Tighten bolt to torque of 255(±25) inch-pounds, (28.8(±2.8) N·m). Safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(6) Connect pushrod to control tab and safety with cotter pin.

(7) Lubricate control tab fittings as applicable. (PAGEBLOCK 12-21-02/301)

(8) Manually move rudder to neutral position.

NOTE: Rudder is in neutral position when center of upper aft corner of rudder is in line with center of adjacent vertical stabilizer trailing edge within 11/64 inch (4.4 mm).

(9) Rotate rudder trim control knob to align indicator pointer in flight compartment with rig neutral notch on control pedestal cover.

NOTE: There may be a difference between rigged neutral position and flight neutral position on trim indicator, therefore, pointer may or may not align with flight neutral position on indicator placard.

(10) Check that trailing edge of control tab is aligned with rudder trailing edge within 1/4 degree (11/64 inch (4.4 mm)). If necessary, adjust control tab. (RUDDER AND TAB - ADJUSTMENT/TEST, PAGEBLOCK 27-20-00/501)

(11) Check rudder control tab clearances. (Figure 402)

(a) Shim, as required, with corrosion-resistant steel shims under rudder side of control tab hinge fittings to achieve required tab leading edge to rudder clearance gaps.

(b) If/as tab hinge eye bolts are removed for shimming per Paragraph 3.B.(11)(a) above, the following torque values apply:

CAUTION: IF A THIN CROSS SECTION NUT (MS21042L5) MUST BE USED TO ACHIEVE MINIMUM THREAD PROTRUSION THRU NUT AFTER TORQUING IS COMPLETE, EXERCISE SPECIAL CARE TO AVOID STRIPPING THREADS IN NUT.

1) From top of tab, at hinge points 1, 2, and 3:

a) Torque to 145-200 inch pounds (16.38-22.6 N·m). (Figure 401)

2) Bottom hinge point (tab actuating crank):

a) Torque to 450-500 inch pounds (50.85-56.5 N·m). (Figure 401)

NOTE: After all shimming requirements are met and installation is secure, make certain that all hinge clevis stud threads have minimum (1 1/2) thread protrusion thru attaching nut.

(12) Check rudder control tab throws. (Paragraph 3.C.)

C. Check Rudder Control Tab Throws

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

NOTE: Linear dimensions for checking rudder travel are measured from center of upper aft corner of rudder to center of adjacent vertical stabilizer. Angular dimensions for checking control tab travel are made with rigging protractor held at rigging reference lines on left side of rudder and tab.

WJE ALL

(1) Make certain right hydraulic system is depressurized.

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT COULD RESULT.

(2) Move rudder hydraulic power shutoff valve control lever located on control pedestal to off position.

(3) Make certain that rudder trim position indicator pointer is aligned with rig neutral notch on control pedestal cover.

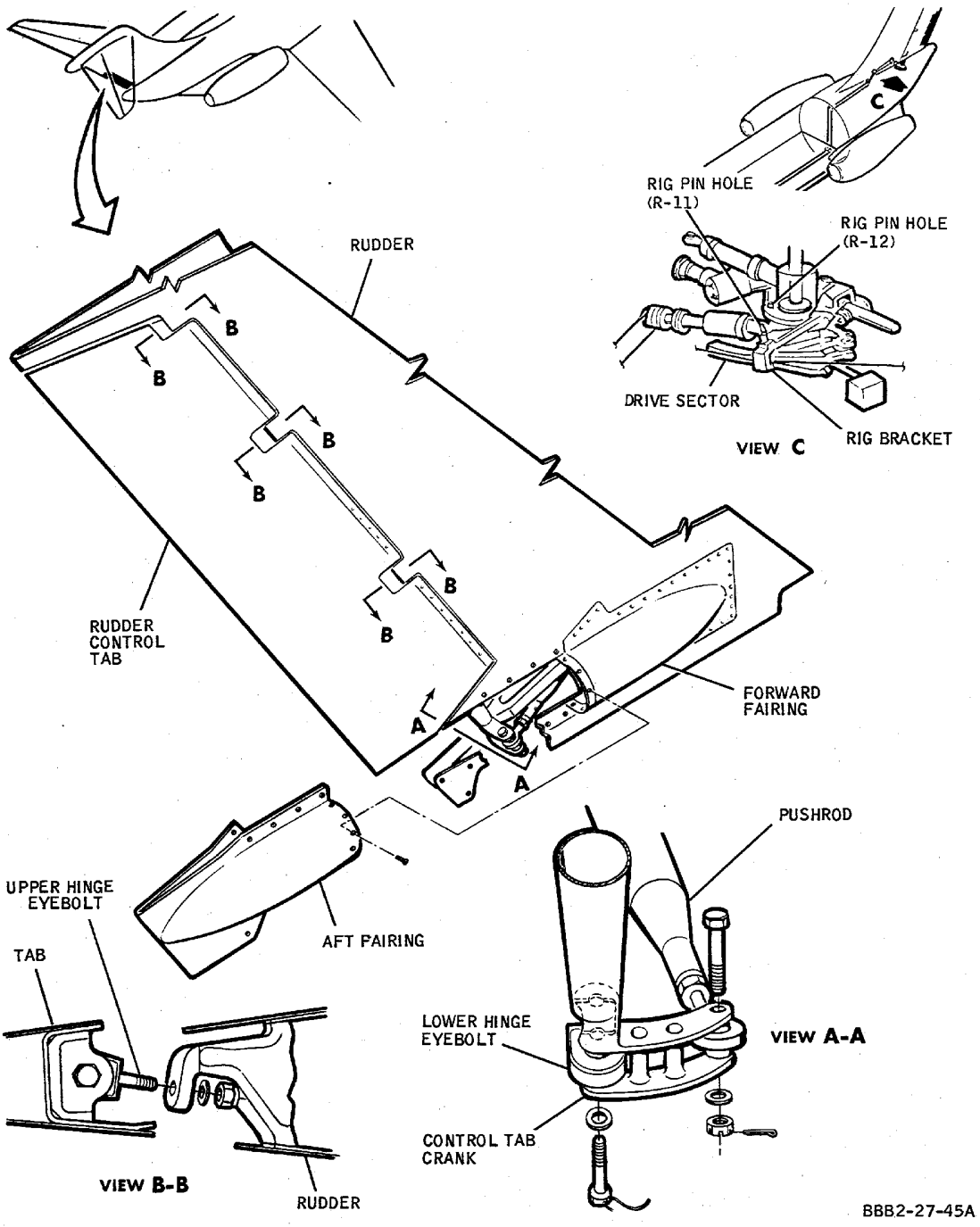
(4) Manually move rudder trailing edge 14 5/8(±1/2) inches, (371.5(±12.7) mm) to right of neutral position, and move right rudder pedal full forward to contact stop.

(5) Check that control tab is 26(±2) degrees (0.45(±0.03) radians) or 4 1/8(±5/16) inches (104.9(±7.9) mm) left of rudder trailing edge.

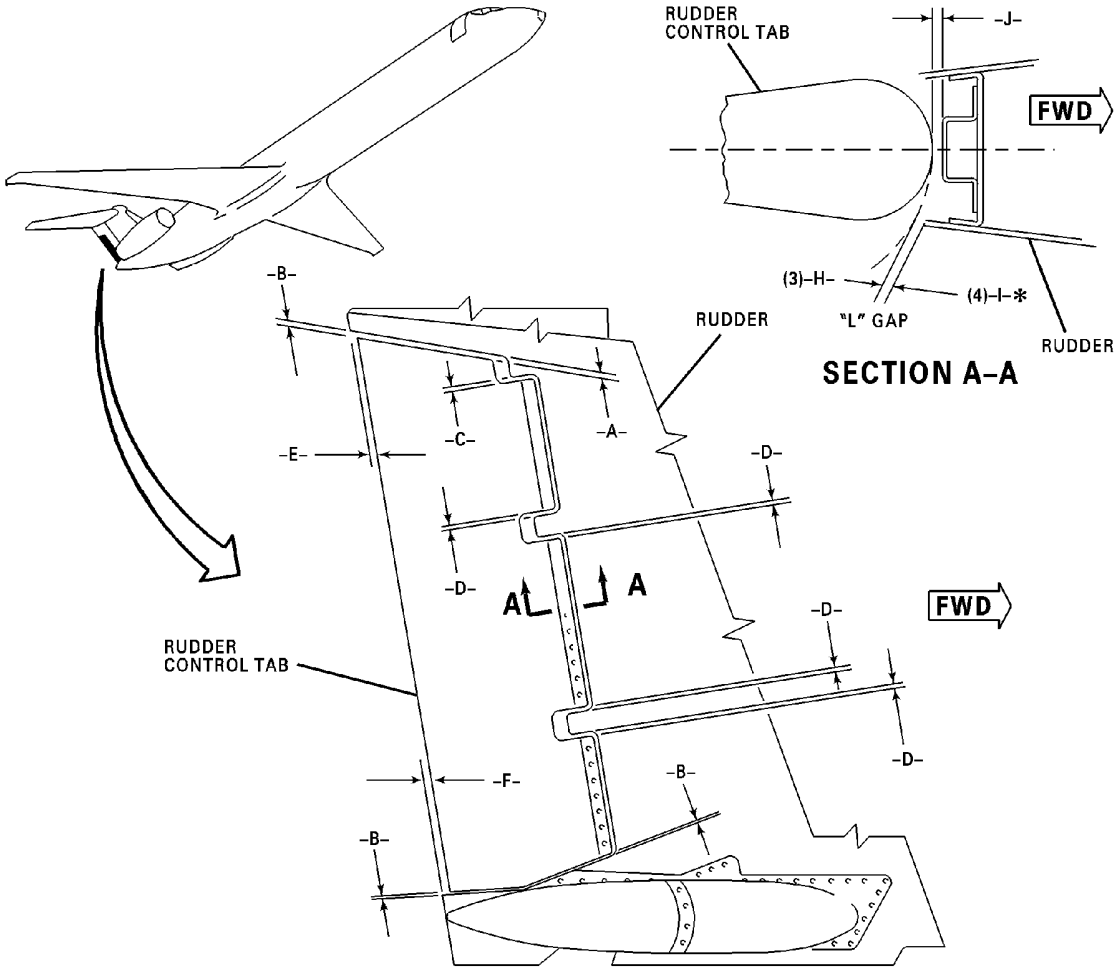
(6) Manually move rudder trailing edge 14 5/8(±1/2) inches, (371.5(±12.7) mm) to left of neutral position, and move left rudder pedal full forward to contact stop.

(7) Check that control tab is 26(±2) degrees (0.45(±0.03) radians) or 4 1/8(±5/16) inches (104.9(±7.9) mm) right of rudder trailing edge.

(8) Return rudder and rudder pedal to neutral position.



Rudder Control Tab -- Installation
Figure 401/27-20-02-990-801



NOTES:
(1) TAB TO RUDDER TRAILING EDGE VARIANCE, UPPER.
(2) TAB TO RUDDER TRAILING EDGE VARIANCE, LOWER.
(3) CONTROL TAB LEADING EDGE "L" GAP, NOMINAL CLEARANCE, TAB BASE TO TOP.
(4) CONTROL TAB LEADING EDGE "L" GAP, * VARIANCE CLEARANCE, TAB BASE TO TOP (CLOSER MINIMUM ALLOWED FOR REPLACEMENT CONTROL TAB).
(5) ALL SURFACE GAP DIMENSIONS GIVEN ARE COMMON FOR BOTH ALUMINUM AND COMPOSITE ASSEMBLIES.

RUDDER CONTROL TAB TO RUDDER CLEARANCE GAPS

		–A–	–B–	–C–	–D–	(1)–E	(2)–F	(3)–H	(4)–I*	–J–
INCHES:	MIN.:	0.406	0.156	0.094	0.094	0.486	0.518	0.125	0.090*	0.136
	MAX.:	0.531	0.281	0.312	0.250	0.686	0.718	0.375	0.375	0.406
		– – –	– – –	– – –	– – –	– – –	– – –	– – –	– – –	– – –
MILLI–METERS:	MIN.:	10.31	3.96	02.39	02.39	12.34	13.16	03.18	02.29	03.45
	MAX.:	13.49	07.14	07.92	06.35	17.42	18.24	09.53	09.53	10.31
								L GAP	L GAP	

CAG(IGDS) TABLE 1 BBB2–27–46F

Rudder Control Tab -- Clearances
Figure 402/27-20-02-990-803

RUDDER DRIVE TORQUE TUBE - MAINTENANCE PRACTICES

1. General

A. The rudder drive torque tube is located in the aft section of the fuselage at the base of the rudder hinge line. Access to the rudder drive torque tube is through access door in tail-cone, and requires that the rudder be removed.

B. Numbers in parentheses in the following text correspond to callouts in Figure 201.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

Name and Number	Manufacturer
Measuring tool	Local Fabrication (Figure 202)
Rig pin (2) (6-4) 3/8 by 4 5/8 (9.525 x 117.475 mm)	
NOTE: Rig pin sizes are in inches (diameter X length; length = grip plus 5/8 inch), (15.875 mm).	
Grease, wide temperature range (MIL-G-81322) (DPM 5348)	Shell Oil Co. Mobil Oil Co.
Sealant (RTV-88) Catalyst (RTV-9910) (DMS QPL 1799, Rev. C)	General Electric Co.
Lockwire, NASM20995N20, DPM 684*[1]	Not specified
Parker-O-Lube (DPM 5367)	Parker Seal Co. Culver City, CA

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Rudder Drive Torque Tube

A. Remove Rudder Drive Torque Tube

NOTE: To aid in installation, put the rudder in its neutral position and index the rudder torque tube drive crank (4) to the rudder drive torque tube (10).

(1) Remove rudder. (PAGEBLOCK 27-20-01/401)

(2) Insert rig pin (6-4) in rig pin hole (R-11) through rudder drive sector (1) and bracket (2).

(3) Insert rig pin (6-4) in rig pin hole (R-12) through rudder drive sector (1) and rudder control valve drive crank (3).

(4) Disconnect rudder actuating cylinder from rudder torque tube drive crank (4).

(5) Disconnect rudder position sensor link (9) from rudder torque tube drive crank (4).

(6) Loosen two bolts (5) holding rudder torque tube drive crank (4) to rudder drive torque tube.

(7) Remove nut (6) from bottom end of rudder drive torque tube. Lift torque tube as nut is turned off to disengage nut from tube.

(8) Support rudder torque tube drive crank (4) and lift rudder drive torque tube through support bracket. Record sequence and position of all washers and spacers during torque tube removal process.

(9) Install suitable packing around control tab torque tube (7) at support bracket to keep torque tube centered in bracket, to prevent damage to bearing in bracket, and to prevent dam-age to lower support bracket.

B. Install Rudder Drive Torque Tube

(1) Check condition of bearing seal retainer assemblies. If necessary, replace retainer assemblies as follows: (Figure 201, View A)

(a) Remove retainer assemblies.

(b) Using non-metallic scraper carefully remove sealant from surface of bearing ring.

NOTE: Protect bearing from debris while removing sealant.

WARNING: SILICONE SEALANT IS AN AGENT THAT IS POISONOUS, CARGINOGENIC, CORROSIVE, AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN SILICONE SEALANT IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET SILICONE SEALANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE DUST OR GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(c) Apply sealant compound (RTV-88 mixed with catalyst RTV-9910 per manufacturer instructions) to faying surfaces of seal retainer assemblies and bearing ring.

(d) Install seal retainer assemblies. Safety boltheads and nuts with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

WARNING: GREASE LUBRICANT IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN GREASE LUBRICANT IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET GREASE LUBRICANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

(WARNING PRECEDES)

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(e) Pack space between seal retainer assemblies and bearing with grease.

(2) Place washers and spacers, as recorded during removal, on rudder drive torque tube shaft. Install upper washer with chamfer seated against radius of torque tube.

(3) Remove packing from around control tab torque tube (7) at support bracket.

(4) Before installing torque tube, apply light coating of grease to torque tube in area of bearing seals.

WARNING: SILICONE SEALANT IS AN AGENT THAT IS POISONOUS, CARGINOGENIC, CORROSIVE, AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN SILICONE SEALANT IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET SILICONE SEALANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE DUST OR GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(5) Fill serrations on lower end of torque tube and inside of spacers with Parker-O-Lube.

(6) Slide rudder drive torque tube through bearing in support bracket. Guide control tab torque tube through bearing in upper end of rudder drive torque tube, align and guide spacers and washers into position as drive torque tube is lowered.

NOTE: Make certain all washers and spacers are installed in sequence recorded in step (8) of removal instructions.

(7) Install rudder torque tube drive crank (4) on rudder drive torque tube (10). Make certain that index marks (Paragraph 3.A.) on crank (4) and torque tube (10) are aligned. The rudder torque tube drive crank (4) centerline will be pointing aft and 27 degrees left of aircraft centerline see (Figure 201). Do not tighten bolts (5) at this time.

(8) Install lockwasher and nut (6) on lower end of rudder drive torque tube. Do not tighten nut at this time.

(9) Check position of rudder drive torque tube as follows: If original torque tube and spacers are being installed, this step may be omitted.

NOTE: Distance between rudder drive torque tube and rudder hinge bracket cannot be measured when rudder is installed. The following steps describe procedure for determining rudder drive torque tube position, in relation to lower rudder hinge support bracket on vertical stabilizer, to provide proper distance.

(a) Install measuring tool plate on rudder drive torque tube flange for aircraft with aluminum rudder and Sheet 2 for aircraft with composite rudder. Figure 202 (Sheet 1)

(b) Insert measuring tool rod through rudder hinge support fitting bushings and into index hole in measuring plate.

(c) For aircraft with aluminum rudder, measure distance between top of bushings in rudder drive torque tube flange and top of lower bushing in lower hinge support fitting. Distance should be 44.480(±0.030) inches, (1129.792(±0.762) mm).

(d) For aircraft with composite rudder, measure distance between top of bushings in rudder drive torque tube flange and LOWER SIDE OF LOWER HINGE SUPPORT FITTING LINK. Distance should be 44.480(±0.030) inches, (1129.792(±0.762) mm).

(e) If distance between top of bushing in rudder drive torque tube and top of lower bushing in lower hinge support fit-ting is not within limits, remove rudder drive torque tube and shim as required.

(10) Tighten nut (6) on lower end of rudder drive torque tube as tight as possible, using fingers only. All parts must fit tight, one against the other, with no vertical movement of torque tube. Continue to tighten nut to align slot in nut with washer tab. Bend tab into slot.

NOTE: Maximum permissible vertical movement of 0.018 inches, (0.46 mm) may be present on torque tube bearing due to wear.

(11) Tighten two rudder torque tube drive crank clamp bolts (5) to secure rudder torque tube drive crank (4) to rudder drive torque tube (10) in alternating, opposing sequence at 15 in-lb (1.7 N·m) increments to final torque of 50-70 in-lbs (5.65-7.9 N·m). Torque stripe nuts (11) as ready visual reference aid against nut/bolt rotation/loosening.

(12) Install two actuating cylinder attach bolts (8) with heads of bolts away from actuating cylinder, to rudder drive crank (4). Safety the nuts with cotter pins, and safety lower attach bolt head with lockwire to anti-rotation lug. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(13) Connect rudder position sensor link (9) to rudder torque tube crank (4). Safety nut with cotterpin.

(14) Move torque tube full throw right and left and check for a minimum of .070 inch (1.78 mm) clearance between base of rudder torque tube and control tab torque tube. (Figure 203) Insufficient clearance may cause rudder oscillation. Adjust clearance as required by adding or removing shim washers from under base of control tab torque tube support bracket.

(15) Remove rig pins (6-4) from rig pin holes (R-11) and (R-12).

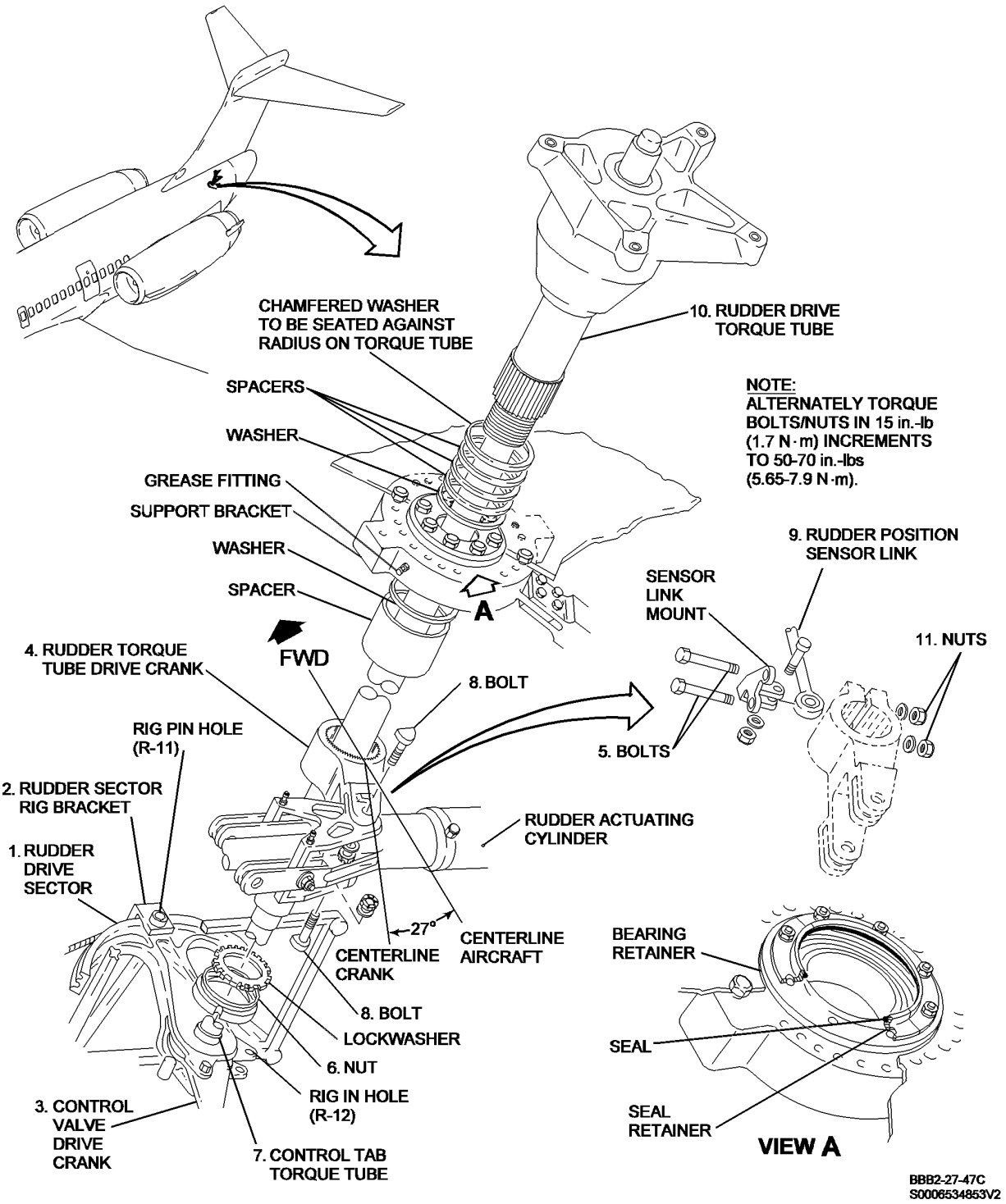
(16) Remove measuring tool plate from rudder drive torque tube flange.

(17) Install rudder and check rudder. (PAGEBLOCK 27-20-01/401)

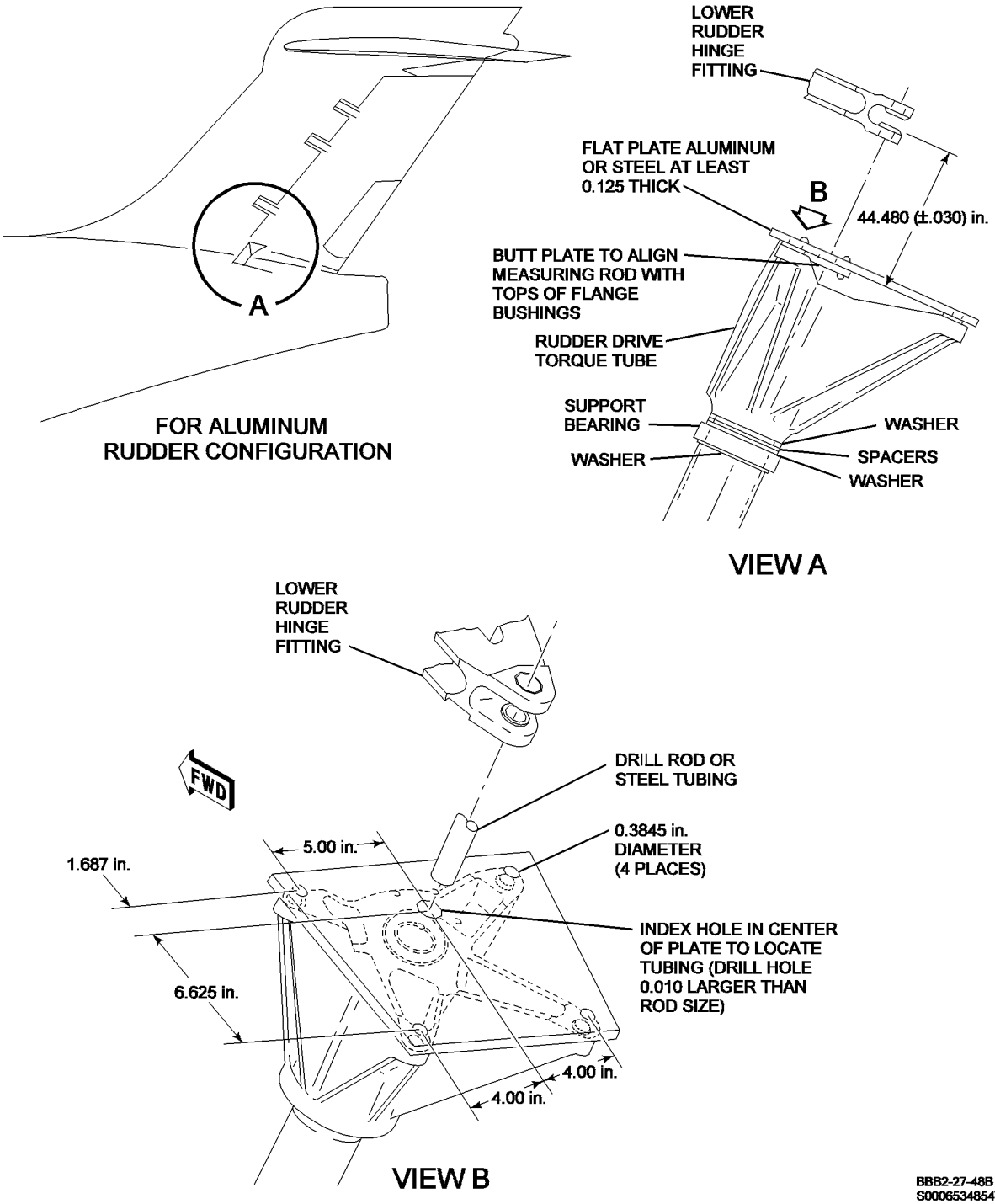
(18) Adjust rudder position sensor. RUDDER AND TAB - ADJUSTMENT/TEST, PAGEBLOCK 27-20-00/501

(19) Check rudder position sensor. (PAGEBLOCK 22-01-03/201)

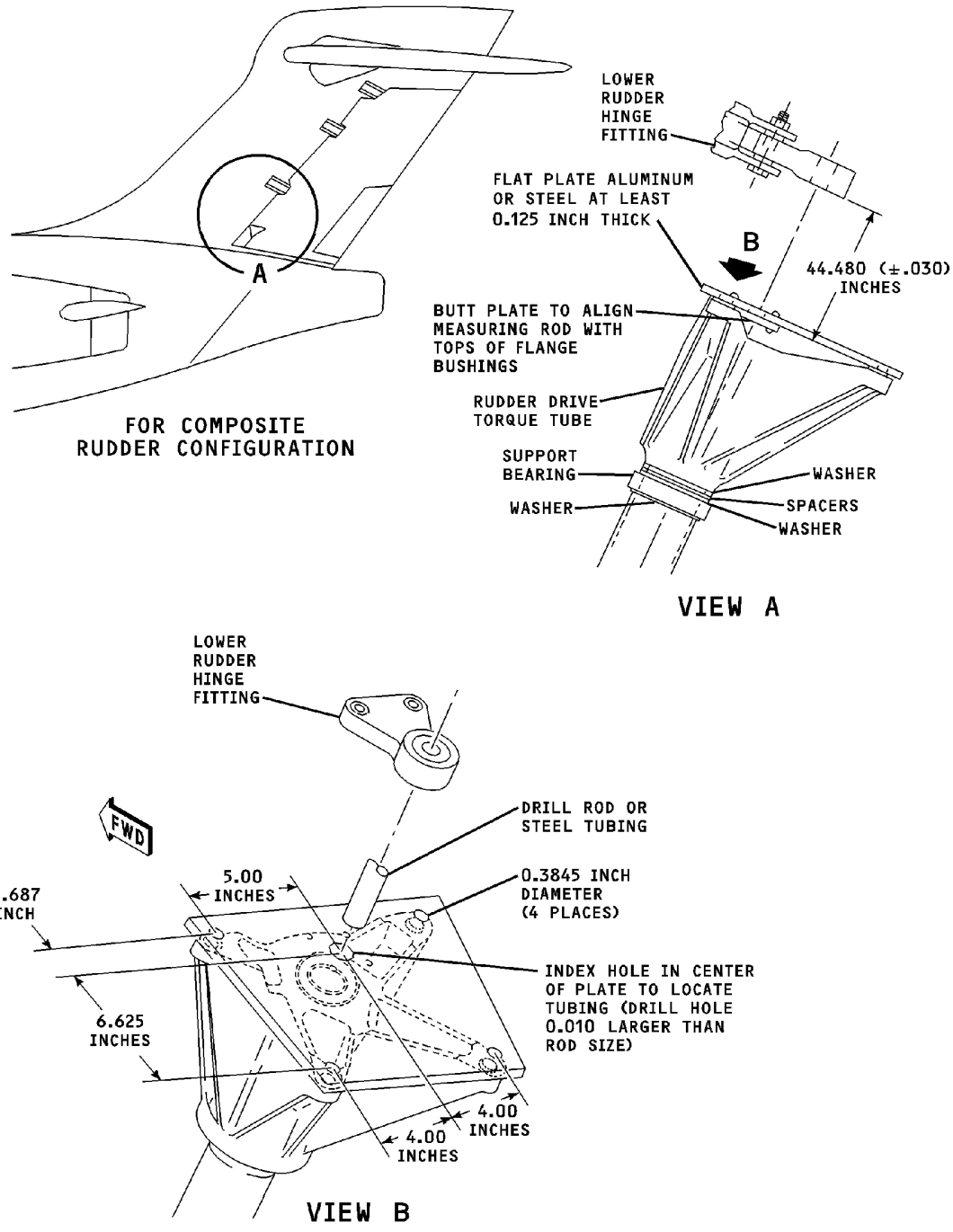
(20) Perform return to service (RTS) test. (DFGS STATUS/TEST, SUBJECT 22-01-05)



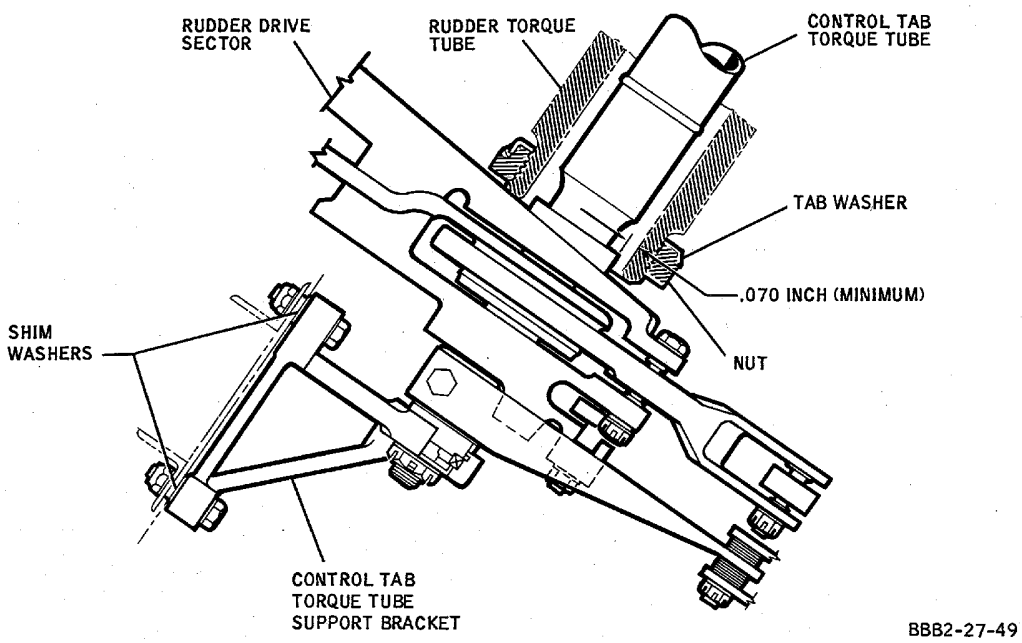
Rudder Drive Torque Tube -- Installation
Figure 201/27-20-03-990-801



Measuring Tool - Rudder Drive Torque Tube -- Installation
Figure 202/27-20-03-990-802 (Sheet 1 of 2)



Measuring Tool - Rudder Drive Torque Tube -- Installation
Figure 202/27-20-03-990-802 (Sheet 2 of 2)



Rudder Torque Tube Clearance - Adjustment
Figure 203/27-20-03-990-803

RUDDER CONTROL TAB TORQUE TUBE - MAINTENANCE PRACTICES

1. General

A. The rudder control tab torque tube is coaxially mounted within the rudder drive torque tube in the aft section of the fuselage at the base of the rudder hinge line. Access to the tab torque tube is through door in fuselage tailcone and at the lower end of the rudder aft of the leading edge.

B. Numbers in parentheses in the following text correspond to callouts in Figure 201. Cable run numbers and segment letters referred to in following text correspond to callouts in hexagonal symbols. Each cable run number is posted adjacent to the corresponding cable in the airplane.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
Tensiometer	Pacific Scientific Co.
Protractor (5916715)	Douglas Aircraft Co.
Rig pins (2) (6-4) 3/8 by 4 5/8 (9.525 x 117.475 mm)	
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Rudder Control Tab Torque Tube

A. Remove Control Tab Torque Tube

(1) Make certain right hydraulic system is depressurized.

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT COULD RESULT.

(2) Move rudder hydraulic power shutoff valve control lever, located on control pedestal, to off position.

(3) Loosen turnbuckles to relieve tension on rudder cables 1C and 2C.

(4) Remove cables from rudder drive sector.

(5) Remove rudder sector rig bracket.

(6) Remove bolt (1) to disconnect pushrod (3) from rudder control valve drive crank.

(7) Remove bolt (2) to disconnect pushrod (4) from control tab lower drive crank (5).

(8) Secure pushrods (3) and (4) clear of drive sector to prevent interference.

(9) Remove bolt (6) to disconnect rudder trim and load-feel spring from rudder drive sector.

(10) Remove bolt (7) to disconnect pushrod (8) from yaw damper drive shaft.

NOTE: Do not rotate end of pushrod (8). If pushrod is rotated, yaw damper adjustment will be disturbed.

(11) Loosen bolt that attaches control tab lower drive crank (5) to control tab torque tube.

(12) Remove control tab torque tube support bracket. Record presence and sequence of installation of all washers, cups, shims, and spacers for reference at time of reinstallation.

(13) Remove control tab lower drive crank (5).

(14) Disconnect control tab pushrod (9) from control tab upper drive crank (10).

(15) Support control tab torque tube and remove bolts (11), (12), and (13) to disconnect control tab upper crank (10) from control tab torque tube.

(16) Perform visual check of upper crank for cracks. (Figure 201)

(17) Support rudder drive sector, rudder control valve drive crank, and yaw damper drive crank. Move control tab torque tube upward until rudder drive sector is free.

(18) Remove rudder drive sector, rudder control valve drive crank, and yaw damper drive crank simultaneously.

(19) Lower control tab torque tube through rudder drive torque tub and remove.

B. Install Control Tab Torque Tube

(1) Make certain right hydraulic system is depressurized.

WARNING: IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT COULD RESULT.

(2) Make certain that rudder hydraulic power shutoff valve control lever, located on control pedestal, is in off position, and that control lever is tagged.

(3) Slide control tab torque tube upward through rudder drive torque tube.

(4) Support control tab torque tube and install control tab upper drive crank (10). Install washer and bolt (12). Tighten crank lockbolt (11). Safety bolt (12) with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Make certain that index mark on crank and torque tube are aligned.

(5) Connect control tab pushrod (9) to control tab upper drive crank (10). Install nut, washer, and bolt (13). Install nut fingertight, then rotate nut as necessary to clear cotter pin hole and install cotter pin.

(6) Raise control tab torque tube and install rudder drive sector, rudder control valve drive crank, and yaw damper drive crank.

(7) Install control tab lower drive crank (5). Tighten crank lockbolt.

NOTE: Make certain that index marks on crank and tube are aligned.

(8) Install control tab torque tube support bracket as follows. (To insure proper sequence of installation of all washers, cups, shims, and spacers, refer to record created during step (11) of removal procedures.)

(a) Install spacer on control tab torque tube.

(b) Install control tab torque tube support and bracket attach bolts.

(9) Install cup, washer and nut, at lower end of control tab torque tube. Install nut fingertight, then rotate as necessary to align cotter pin holes and install cotter pin.

(10) Install drive sector rig bracket.

(11) Install bolt (6) to connect rudder trim and load-free spring to drive sector. Safety with cotter pin.

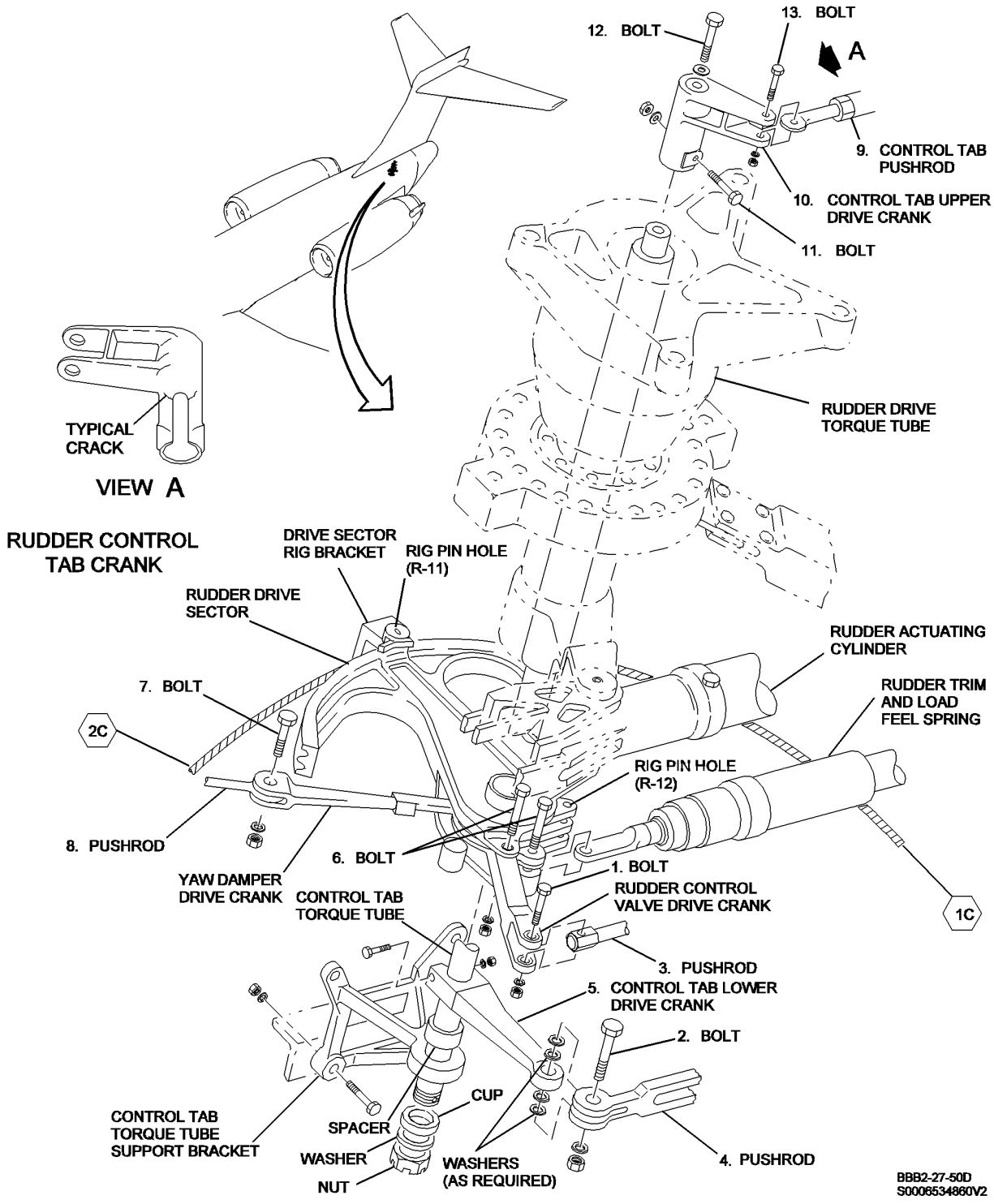
(12) Install bolt (2) to connect pushrod (4) to control tab lower drive crank (5). Install washers as necessary between push-rod and control tab lower drive crank to prevent preloading of crank or pushrod clevis. Install nut and safety with cotter pin.

(13) Install bolt (1) to connect pushrod (3) to rudder control valve drive crank. Safety with cotter pin.

(14) Install bolt (7) to connect pushrod (8) to yaw damper drive crank. Safety with cotter pin.

(15) Connect rudder control cables to rudder drive sector. Safety cables in sector with cotter pins.

(16) Adjust rudder control cable system per reference (RUDDER AND TAB, SUBJECT 27-20-00).



Rudder Control Tab Torque Tube - Installation
Figure 201/27-20-04-990-801

RUDDER DAMPERS - MAINTENANCE PRACTICES

1. General

A. Two rudder dampers are located at the leading edge of the rudder, one at the center hinge bracket and one at the lower hinge bracket. Access to the dampers is through the rudder leading edge access doors and fairings.

B. Removal and installation procedures for both dampers are identical.

2. Removal/Installation Rudder Dampers

A. Remove Damper (Figure 201)

(1) Make certain right hydraulic system is depressurized.

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT CAN RESULT.

(2) Move rudder hydraulic power shutoff valve control lever, located on control pedestal, to off position.

(3) Disconnect link on damper from fitting on vertical stabilizer.

(4) Remove damper from rudder.

B. Install Damper (Figure 201)

(1) Make certain right hydraulic system is depressurized.

(2) Make certain that rudder hydraulic power shutoff valve control lever is in the off position.

(3) Install damper on rudder.

(4) Connect link on damper to fitting on vertical stabilizer. Safety with cotter pin.

(5) Check damper. (Paragraph 3.)

3. Check Rudder Dampers

A. Check Dampers

(1) Make certain right hydraulic system is depressurized.

(2) Make certain that rudder hydraulic power shutoff valve control lever is in off position.

(3) Visually inspect damper housing and shaft seals for sign of leakage. If evidence of leakage exists, the following should be accomplished:

(a) Clean damper and adjacent area.

(b) Monitor damper for evidence of continued or increased fluid leakage for 100 flight hours. Verify that the other damper is not leaking.

NOTE: Two leaking dampers is acceptable for a limited number of flights. One of the two leaking dampers must be repaired or replaced at first capable station. If any event, repair or replacement must be accomplished at the terminating station.

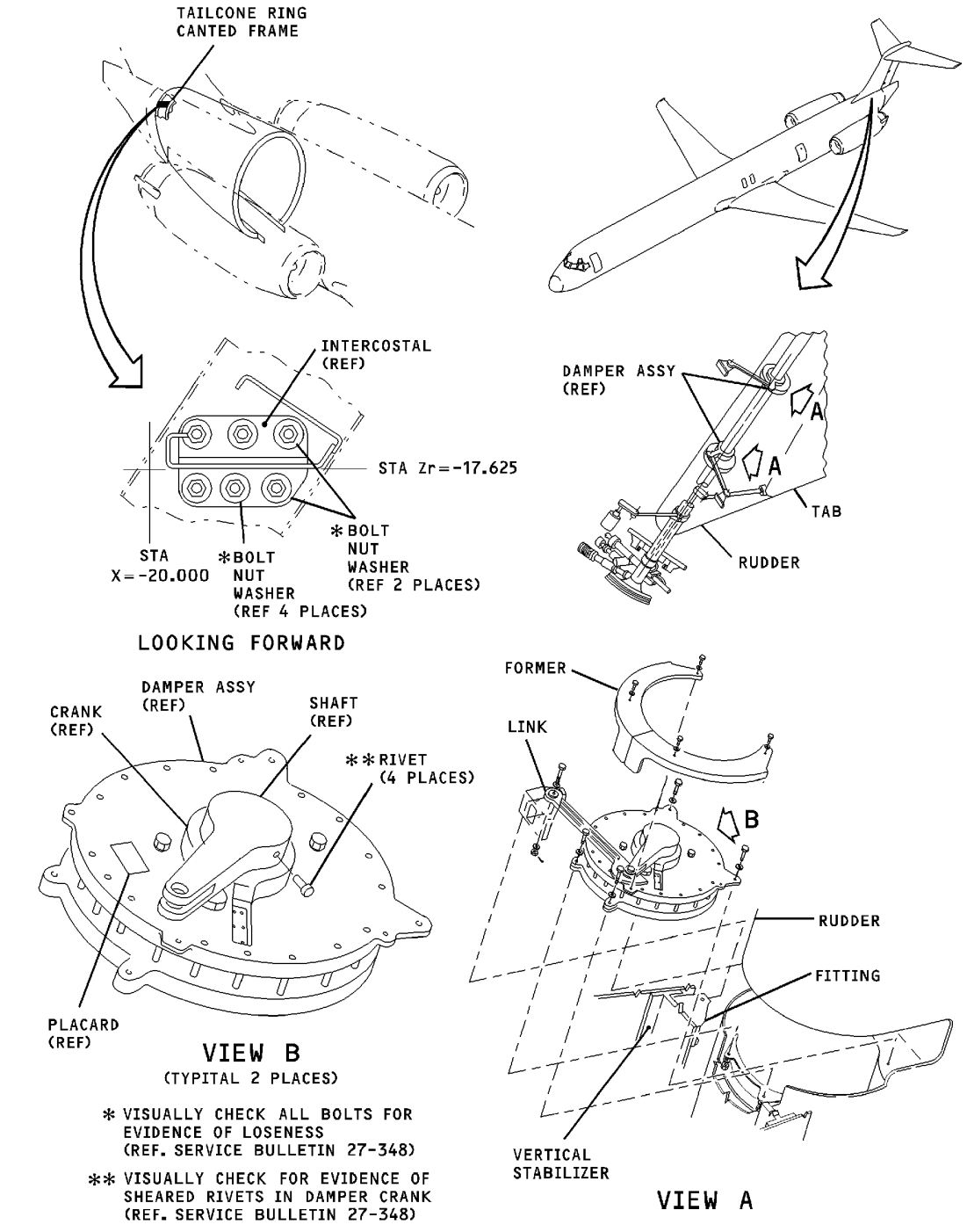
(c) Check the non-leaking damper for conditions at intervals not to exceed 225 flight hours.

(d) Replace the leaking damper at the earliest maintenance period not to exceed 600 flight hours after leak is detected.

(4) Move rudder trailing edge to full right and left positions. Check damper and linkage for freedom-of-operation, and that no binding, roughness, scraping, or interference exists.

WARNING: MAKE CERTAIN THAT AREA AROUND RUDDER IS CLEAR OF PERSONNEL AND EQUIPMENT WHEN RUDDER REVERTS FROM MANUAL TO POWER OPERATION.

(5) Move rudder hydraulic power shutoff valve control lever to on position and remove tag.



Rudder Damper -- Removal/Installation
Figure 201/27-20-05-990-801

RUDDER THROW-LIMITER - MAINTENANCE PRACTICES

1. General

A. The rudder throw-limiter actuator and linkage are located in aft section of fuselage at base of rudder hinge line. Access to the actuator and linkage is through a door in the fuselage tail section.

B. The rudder throw-limiter actuator and linkage is removed and installed as a unit.

C. The rudder throw-limiter sensors are mounted on lower aft portion of the rudder hydraulic power package. Sensors may be removed and installed individually.

D. A BITE test of the proximity sensor system can be performed at any time to determine if Proximity Switch Electronic Unit (PSEU) and proximity sensors are functioning properly. (PAGEBLOCK 32-60-00/101)

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
Rig pin (4-3) 1/4 by 3 5/8 (6.35 x 92.075 mm)	
NOTE: Rig pin sizes are in inches (diameter X length; length = grip plus 5/8 inch), (15.875 mm).	
Tester rudder throw-limiter (5916789)	Douglas Aircraft Co.
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Rudder Throw-Limiter

A. Remove Rudder Throw-Limiter (Figure 201 or Figure 202)

(1) Make certain right hydraulic system is depressurized.

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT COULD RESULT.

(2) Move rudder hydraulic power shutoff valve control lever, located on control pedestal, to off position.

(3) Remove bolt (1) to disconnect pushrod (2) from crank (3).

(4) Disconnect pitot line from fitting (6) on rudder throw-limiter actuator cover.

(5) Remove four attach bolts and remove rudder throw-limiter actuator.

B. Install Rudder Throw-Limiter (Figure 201 or Figure 202)

(1) Make certain right hydraulic system is depressurized.

(2) Make certain that rudder hydraulic power shutoff valve control lever is in off position and tagged.

(3) Place rudder throw-limiter actuator in position and install four attach bolts.

(4) Insert rig pin (4-3) in rig hole (R-22) through bellcrank.

(5) Adjust pushrod (2) until bolt (1) can be freely installed through crank (3) and pushrod (2). Install bolt (1). Safety nut with cotter pin.

(6) Remove rig pin (4-3) from bellcrank.

(7) Connect controlled source of clean, dry, low-pressure air or nitrogen to pressure inlet (6) of throw-limiter.

CAUTION: AIR PRESSURE APPLIED TO THROW-LIMITER PRESSURE INLET MUST NOT EXCEED 4 PSI (27.6 KPA). PRESSURE MUST BE APPLIED SLOWLY TO PREVENT DAMAGE TO THROW-LIMITER.

(8) Slowly (not more than 0.60 psi/minute, (4.14 kPa) or 75 knots/minute) apply pressure until crank (3) first moves away from stop (7). Air pressure should be at or less than air pressure/speed that follows when crank (3) moves away from stop (7).

WJE 412, 414-416; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

- 0.70 psi, (4.83 kPa), (172 knots)

WJE 401-411, 417-424, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383

- 0.86 psi, (5.93 kPa), (191 knots)

WJE ALL

NOTE: This is a preliminary adjustment only.

(9) Slowly increase air pressure until pressure is:

WJE 412, 414-416; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

- 1.58 (±0.01) psi, (10.902 (±0.069) kPa), (255 (±1) knots).

WJE 401-411, 417-424, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383

- 1.66 (±0.01) psi, (11.45 (±0.069) kPa), (261 (±1) knots).

WJE 412, 414-416; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

(10) Manually move rudder to extreme left, then to extreme right of neutral position. Measure rudder travel at both extremes of travel to determine amount of adjustment to pushrod (5) required to limit rudder travel to 5 1/16 (±5/8) inches (128.58 ±15.88 mm) left and 4 5/16 (±5/8) inches (109.53 ±15.88 mm) right.

NOTE: Rudder travel is measured from center of upper aft corner of rudder to center of adjacent vertical stabilizer trailing edge.

WJE 401-411, 417-424, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383

(11) Manually move rudder to extreme left, then to extreme right of neutral position. Measure rudder travel at both extremes of travel to determine amount of adjustment to pushrod (5) required to limit rudder travel to 5 1/16 (±5/8) inches (128.59 ±15.88 mm) left and 4 5/16 (+15/16, -5/8) inches (109.54 +23.81 -15.88) mm) right.

NOTE: Rudder travel is measured from center of upper aft corner of rudder to center of adjacent vertical stabilizer trailing edge.

WJE ALL

(12) If rudder travel does not meet above limits, it may be necessary to adjust rudder hydraulic power package per RUDDER AND TAB - ADJUSTMENT/TEST, PAGEBLOCK 27-20-00/501.

(13) Decrease air pressure to throw-limiter bellows to zero psi (zero knots).

(14) Remove bolt (4) to disconnect pushrod (5) from bellcrank.

WJE 401-411, 417-424, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383

(15) Loosen jamnut at end of pushrod (5) and adjust rod end to obtain dimensions noted in Paragraph 3.B.(11).

NOTE: Lengthening pushrod reduces amount of rudder travel, shortening pushrod increases amount of rudder travel.

WJE 412, 414-416; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

(16) Loosen jamnut at end of pushrod (5) and adjust rod end to obtain dimensions noted in Paragraph 3.B.(10).

NOTE: Lengthening pushrod reduces amount of rudder travel, shortening pushrod increases amount of rudder travel.

WJE ALL

(17) Connect pushrod (5) to bellcrank with bolt (4).

(18) Slowly apply air pressure to throw-limiter bellows until pressure is as follows:

WJE 412, 414-416; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

- 1.58 (±0.1) psi, (10.90 (±0.69) kPa), (255 (±1) knots).

WJE 401-411, 417-424, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383

- 1.66 (±0.1) psi, (11.45 (±0.069) kPa), (261 (±1) knots).

WJE 412, 414-416; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

(19) Manually move rudder to extreme left, then to extreme right of neutral position. Check that travel is 5 1/16 (±5/8) inches (128.58 ±15.88 mm) left and 4 5/16 (± 5/8) inches (109.53 ±15.88 mm) right. If necessary, repeat Paragraph 3.B.(13) through Paragraph 3.B.(19) until pushrod (5) is properly adjusted.

WJE 401-411, 417-424, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383

(20) Manually move rudder to extreme left, then to extreme right of neutral position. Check that travel is 5 1/16 (±5/8) inches, 128.58 (±15.88 mm) left and 4 5/16 (+15/16 -5/8) inches, (109.53 (+ 23.81 -15.88 mm) right. If necessary, repeat Paragraph 3.B.(13) through Paragraph 3.B.(20) until pushrod (5) is properly adjusted.

WJE ALL

(21) Reduce air pressure to throw-limiter bellows to zero psi, then slowly increase air pressure and check that hook (10) has engagement of 0.06 inch (1.52 mm) minimum per dimension (S) with piston rod (11) at an air pressure that follows: (Figure 201 or Figure 202)

WJE 412, 414-416; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

- 0.78 psi, (5.38 kPa), (181 knots) or less.

WJE 401-411, 417-424, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383

- 0.96 psi, (6.62 kPa), (200 knots) or less.

WJE ALL

(22) Slowly decrease air pressure and check that hook (10) clears piston rod (11) by minimum of 0.03 inch (0.76 mm) per dimension (T) at an air pressure that follows: (Figure 201 or Figure 202)

WJE 412, 414-416; WJE 425-427 PRE MD80-27-382; WJE 886, 887 PRE MD80-27-383

- 0.67 psi, (4.62 kPa), (168 knots) or more.

WJE 401-411, 417-424, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893; WJE 425-427 POST MD80-27-382; WJE 886, 887 POST MD80-27-383

- 0.86 psi, (5.93 kPa), (191 knots) or more.

WJE ALL

CAUTION: LENGTH OF SPRINGS MUST BE MAINTAINED EQUAL WITHIN 0.06 INCH(1.5 MM) WHEN ADJUSTING TURNBUCKLES.

(23) If the air pressure noted in Paragraph 3.B.(8) through Paragraph 3.B.(22) goes higher than that specified, lengthen turnbuckles (8). If air pressure is lower than specified shorten turnbuckles (8). (Figure 201 or Figure 202)

(24) If necessary, repeat steps referenced above as required, until conditions above are satisfied.

(a) If conditions of steps above cannot be met, do a check for excessive friction in rudder throw limiter system as follows:

1) Disconnect pushrod (2) from crank (3). (Figure 201 or Figure 202)

2) Record adjusted position of weight (12) on rod (13) (mark rod at bottom of weight with pencil). Remove weight (12) from rod (13).

3) Manually actuate linkage with weight rod (13). Check for any binding or excessive friction in system linkages from rod (13) to hook (10) to bellcrank (14) to pushrod (2). Replace any defective bearings, as required.

4) Install weight (12) on rod (13) and adjust to location/dimension as recorded earlier in Paragraph 3.B.(24)(a)2).

a) If recorded adjustment is lost the nominal adjustment is 3.938 inch.

5) Connect pushrod (2) to crank (3) with bolt (1).

WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281

(25) Adjust movable proximity sensor bracket (R) to target gap minimum 0.030 inch (0.762 mm) to provide following: (Figure 201)

(a) RUDDER TRAVEL UNRESTRICTED light goes out at an air pressure that follows or less when air pressure is increasing.

WJE 425-427 PRE MD80-27-382 AND PRE MD80-27-281

- 0.78 psi, (5.38 kPa), (181 knots).

WJE 405, 409, 416, 420, 422, 424, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281; WJE 425-427 POST MD80-27-382 AND PRE MD80-27-281

- 0.96 psi, (6.62 kPa), (200 knots).

WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281

(b) RUDDER TRAVEL UNRESTRICTED light comes on at an air pressure that follows or more when air pressure is decreasing.

WJE 425-427 PRE MD80-27-382 AND PRE MD80-27-281

- 0.67 psi, (4.623 kPa), (168 knots).

WJE 405, 409, 416, 420, 422, 424, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281; WJE 425-427 POST MD80-27-382 AND PRE MD80-27-281

- 0.86 psi, (5.93 kPa), (191 knots).

WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281

(c) Position rudder in full right position and verify dimension between target and sensor is greater than 0.030 inch (0.762 mm).

NOTE: Make sure hook assembly clears envelope of piston when rudder is moved through full travel.

WJE 401-404, 406-408, 410-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 886, 887, 892, 893; WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281

(26) Adjust proximity sensor bracket (R) to target gap 0.015 inch (0.38 mm) or more and stop bolt to provide following: (Figure 202)

(a) Remove stop bolt (15), spacer (16), and washers (17) from bracket of proximity sensor.

(b) Slowly apply air pressure to rudder throw-limiter so that RUDDER TRAVEL UNRESTRICTED light indications are as follows: (Figure 202, View A-A or B)

1) RUDDER TRAVEL UNRESTRICTED light goes out at an air pressure that follows or less when air pressure is increasing.

WJE 412, 414; WJE 425-427 PRE MD80-27-382 AND POST MD80-27-281; WJE 886, 887 PRE MD80-27-383

- 0.78 psi, (5.38 kPa), (181 knots).

WJE 401-404, 406-408, 410, 411, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 892, 893; WJE 405, 409, 416, 420, 422, 424, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281; WJE 425-427 POST MD80-27-382 AND POST MD80-27-281; WJE 886, 887 POST MD80-27-383

- 0.96 psi, (6.62 kPa), (200 knots).

WJE 401-404, 406-408, 410-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 886, 887, 892, 893; WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281

(c) RUDDER TRAVEL UNRESTRICTED light comes on at an air pressure that follows or more when air pressure is decreasing.

WJE 412, 414; WJE 425-427 PRE MD80-27-382 AND POST MD80-27-281; WJE 886, 887 PRE MD80-27-383

- 0.67 psi, (4.623 kPa), (168 knots).

WJE 401-404, 406-408, 410, 411, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 892, 893; WJE 405, 409, 416, 420, 422, 424, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281; WJE 425-427 POST MD80-27-382 AND POST MD80-27-281; WJE 886, 887 POST MD80-27-383

- 0.86 psi, (5.93 kPa), (191 knots).

WJE 401-404, 406-408, 410-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 886, 887, 892, 893; WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281

(d) Position rudder in full right position and verify dimension between target and sensor is greater than 0.015 inch (0.38 mm).

NOTE: Make sure hook assembly clears envelope of piston when rudder is moved through full travel.

(e) Install stop bolt (15) as follows:

1) Move hook assembly until target is position 0.015 inch (0.38 mm) minimum from face of sensors.

2) Install stop bolt (15), spacer (16), and washers (17) on bracket of proximity sensor. (Figure 202)

a) Use enough washers between spacer and bracket assembly to allow stop bolt (15) to contact target support assembly.

b) Extreme care should be taken not to disturb adjustment accomplished in Paragraph 3.B.(26)(d).

NOTE: Repetitive removal/installation of bolt in self-locking plate nut may destroy the self-locking feature of the plate nut, thereby, precluding any future revision to washer quantity. Make sure bolt break away torque does not fall below 7 inch-pounds. (PAGEBLOCK 20-30-01/201)

WJE ALL

(27) Reduce air pressure to zero psi, manually move rudder through full travel and check that hook (10) clears piston rod (11). Do not change adjustment of turnbuckles (8) or pushrod (5) without rechecking Paragraph 3.B.(23).

(28) Tighten nut on bolt (4) and safety with cotter pin.

(29) Tighten jamnut at end of pushrod (5) and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

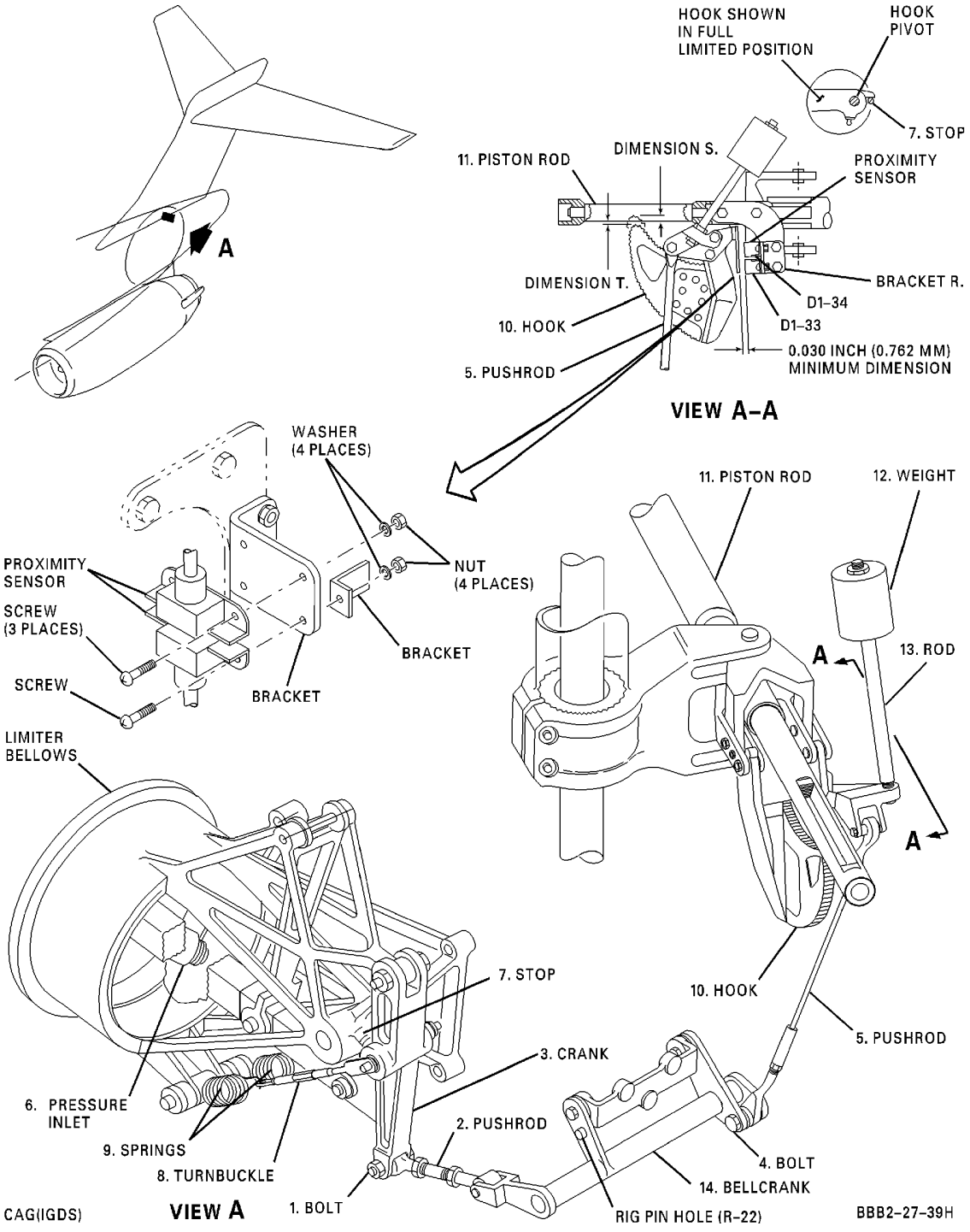
(30) Safety turnbuckles (8) with clips.

(31) Disconnect air pressure source from pressure inlet (6).

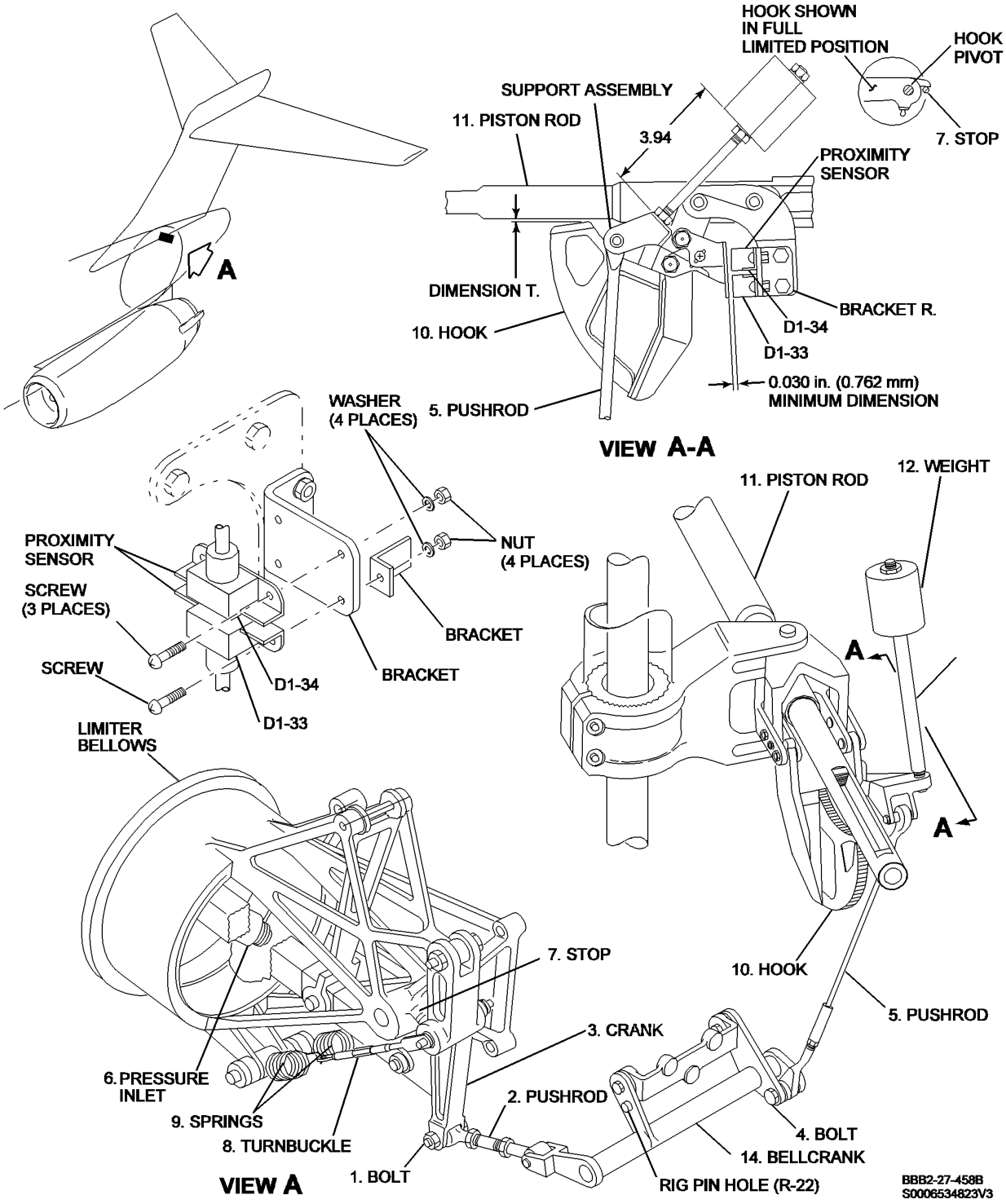
(32) Connect pitot line to pressure inlet (6).

(33) Move rudder hydraulic power shutoff valve control lever to on position.

(34) Pressure test rudder throw-limiter pitot system. (PITOT STATIC - MAINTENANCE PRACTICES, PAGEBLOCK 34-11-00/201 Config 1)

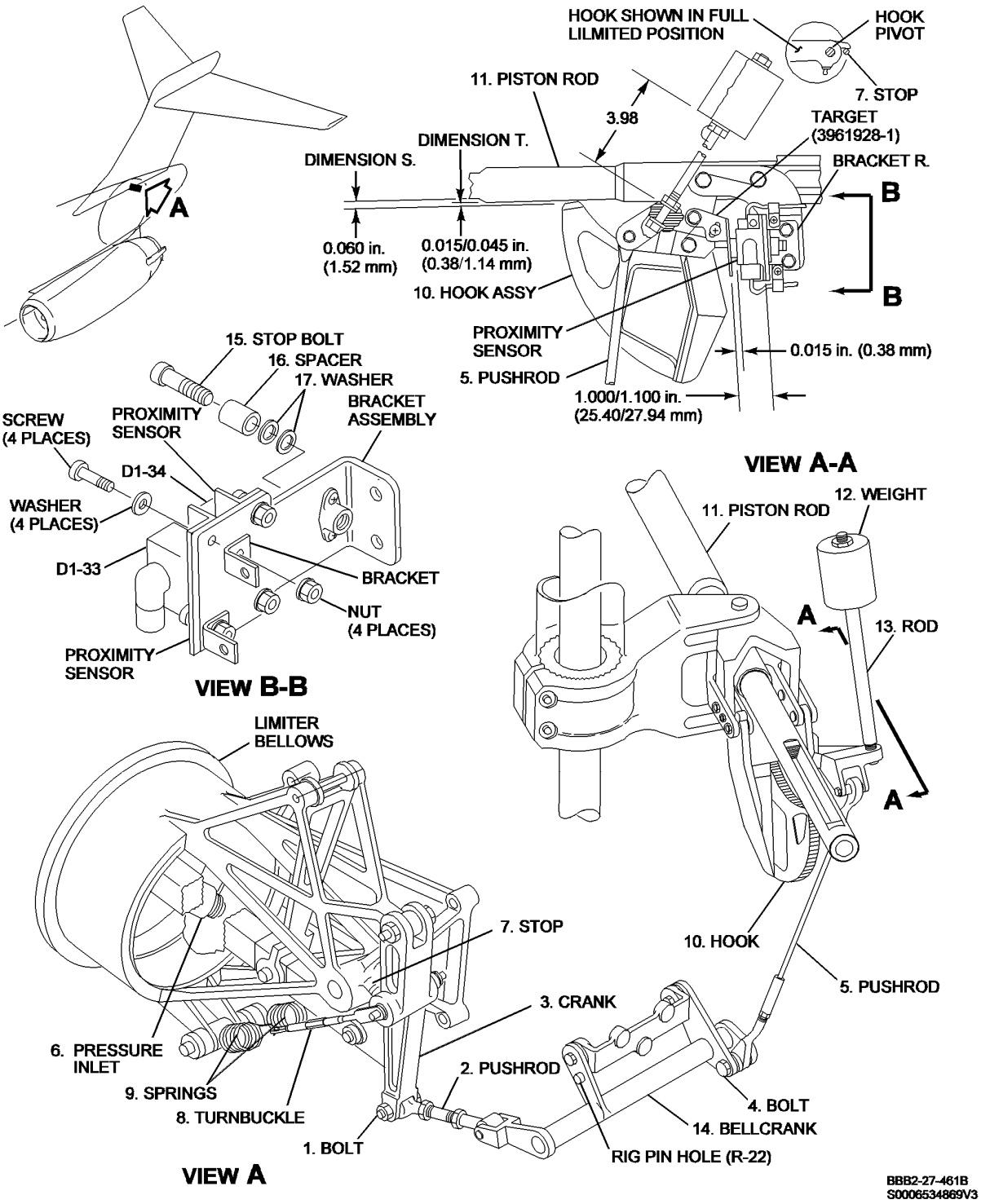


Rudder Throw-Limiter -- Adjustment
Figure 201/27-20-06-990-801 (Sheet 1 of 2)



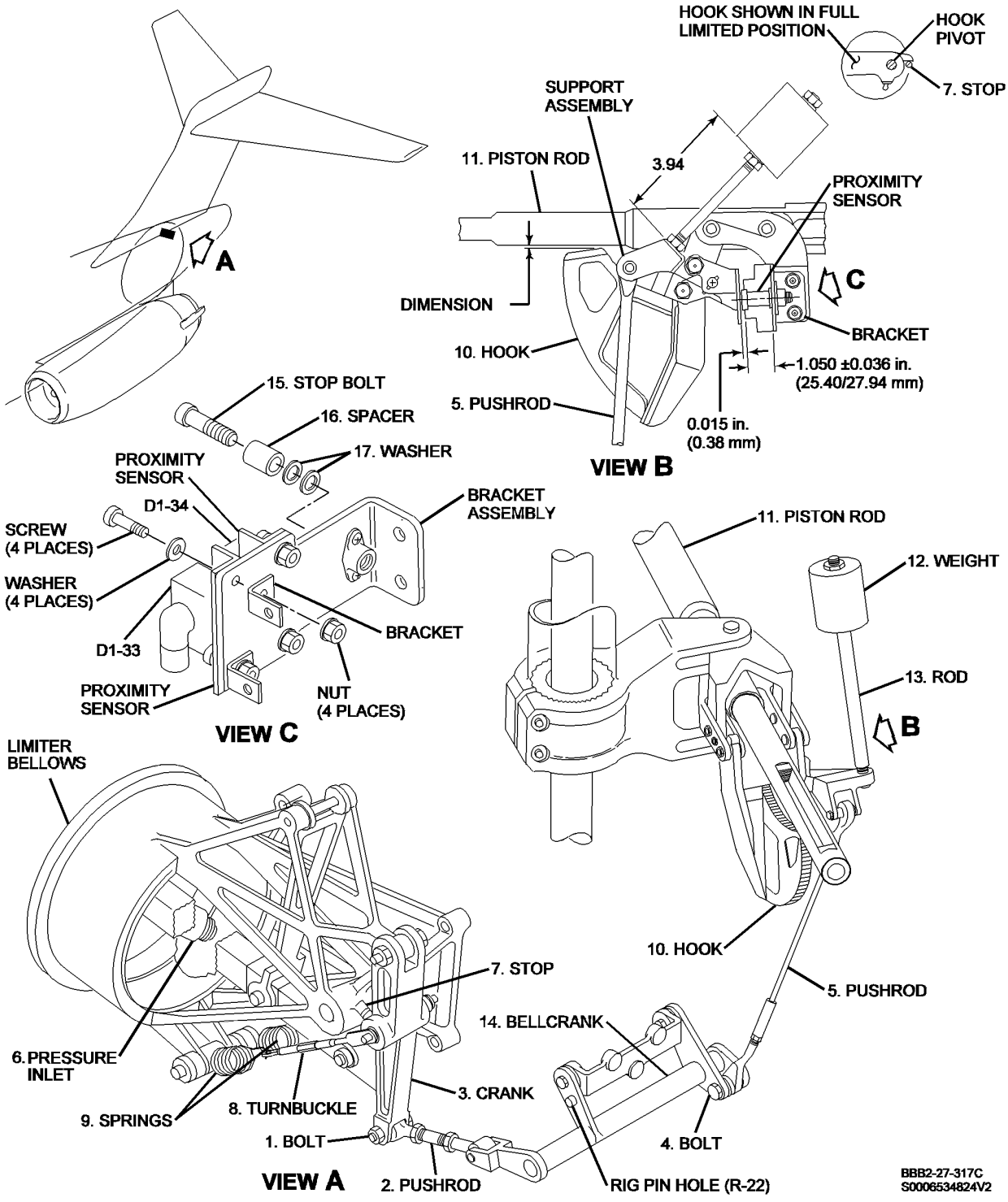
Rudder Throw-Limiter -- Adjustment
Figure 201/27-20-06-990-801 (Sheet 2 of 2)

EFFECTIVITY
WJE 405, 409, 420, 422, 424, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281; WJE 425-427 POST MD80-27-382 AND PRE MD80-27-281



Rudder Throw-Limiter -- Adjustment
Figure 202/27-20-06-990-802 (Sheet 1 of 2)

EFFECTIVITY
WJE 412, 414, 415; WJE 416 POST MD80-27-281; WJE 425-427 PRE MD80-27-382 AND POST MD80-27-281; WJE 886, 887 PRE MD80-27-383



Rudder Throw-Limiter -- Adjustment
Figure 202/27-20-06-990-802 (Sheet 2 of 2)

4. Removal/Installation Rudder Throw-Limiter Sensor

A. Remove Sensor

(1) Make certain left and right hydraulic systems are depressurized. (PAGEBLOCK 29-00-00/201)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open this circuit breaker and install safety tag:

LOWER EPC, DC AIR CONDITIONING & MISCELLANEOUS

Row	Col	Number	Name
W	25	B1-228	RUDDER TRAVEL UNRESTRICT ADVISORY

(3) Remove sensor from mounting bracket for sensor being removed. (Figure 201 or Figure 202)

(4) Disconnect wires at splice and remove sensor.

B. Install Sensor

(1) Make certain left and right hydraulic systems are depressurized. (PAGEBLOCK 29-00-00/201)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Make sure that this circuit breaker is open and has safety tag:

LOWER EPC, DC AIR CONDITIONING & MISCELLANEOUS

Row	Col	Number	Name
W	25	B1-228	RUDDER TRAVEL UNRESTRICT ADVISORY

(3) Connect sensor wires at splice. (Ref. Wiring Diagram Manual, 20-10-03, Page 201)

(4) Install sensor on mounting bracket. (Figure 201 or Figure 202)

(5) Remove the safety tag and close this circuit breaker:

LOWER EPC, DC AIR CONDITIONING & MISCELLANEOUS

Row	Col	Number	Name
W	25	B1-228	RUDDER TRAVEL UNRESTRICT ADVISORY

(6) Using Proximity Switch Electronics Unit Test Panel, perform BITE test on rudder throw-limiter sensor. (PAGEBLOCK 32-60-00/101)

(7) If necessary, adjust gap between target and sensors as follows:

(a) Make certain that rudder hydraulic power shutoff valve control lever is in off position and tagged.

CAUTION: AIR PRESSURE APPLIED TO THROW-LIMITER PRESSURE INLET MUST NOT EXCEED 4 PSI (27.6 KPA). PRESSURE MUST BE APPLIED SLOWLY TO PREVENT DAMAGE TO THROW-LIMITER.

(b) Connect controlled source of clean, dry, low-pressure air or nitrogen to pressure inlet (6) of throw-limiter.

WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281

WARNING: CIRCUIT BREAKERS ARE ENERGIZED, POTENTIAL HAZARDS EXIST.

(c) Adjust movable proximity sensor bracket (R) to target gap minimum 0.030 inch (0.762 mm), and slow apply air pressure to throw-limiter to provide following: (Figure 201)

WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281 (Continued)

1) RUDDER TRAVEL UNRESTRICTED light goes out at an air pressure that follows or less when air pressure is increasing:

WJE 425-427 PRE MD80-27-382 AND PRE MD80-27-281

- 0.78 psi, (5.382 kPa), (181 knots).

WJE 405, 409, 416, 420, 422, 424, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281; WJE 425-427 POST MD80-27-382 AND PRE MD80-27-281

- 0.96 psi, (6.62 kPa), (200 knots).

WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281

2) RUDDER TRAVEL UNRESTRICTED light comes on at an air pressure that follows or more when air pressure is decreasing:

WJE 425-427 PRE MD80-27-382 AND PRE MD80-27-281

- 0.67 psi, (4.623 kPa), (168 knots).

WJE 405, 409, 416, 420, 422, 424, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281; WJE 425-427 POST MD80-27-382 AND PRE MD80-27-281

- 0.86 psi, (5.93 kPa), (191 knots).

WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 PRE MD80-27-281

3) Position rudder in full right position and verify dimension between target and sensor is greater than 0.030 inch (0.762 mm).

NOTE: Make sure hook assembly clears envelope of piston when rudder is moved through full travel.

WJE 401-404, 406-408, 410-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 886, 887, 892, 893; WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281

WARNING: CIRCUIT BREAKERS ARE ENERGIZED, POTENTIAL HAZARDS EXIST.

(d) Adjust proximity sensor bracket (R) to target gap 0.015 inch (0.38 mm) or more and stop bolt to provide following: (Figure 202)

1) Remove stop bolt (15), spacer (16), and washers (17) from bracket of proximity sensor.

2) RUDDER TRAVEL UNRESTRICTED light goes out at an air pressure that follows or less when air pressure is increasing:

WJE 412, 414; WJE 425-427 PRE MD80-27-382 AND POST MD80-27-281; WJE 886, 887 PRE MD80-27-383

- 0.78 psi, (5.382 kPa), (181 knots).

WJE 401-404, 406-408, 410, 411, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 892, 893; WJE 405, 409, 416, 420, 422, 424, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281; WJE 425-427 POST MD80-27-382 AND POST MD80-27-281; WJE 886, 887 POST MD80-27-383

- 0.96 psi, (6.62 kPa), (200 knots).

WJE 401-404, 406-408, 410-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 886, 887, 892, 893; WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281

3) RUDDER TRAVEL UNRESTRICTED light comes on at an air pressure that follows or more when air pressure is decreasing:

WJE 412, 414; WJE 425-427 PRE MD80-27-382 AND POST MD80-27-281; WJE 886, 887 PRE MD80-27-383

- 0.67 psi, (4.623 kPa), (168 knots).

WJE 401-404, 406-408, 410, 411, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 892, 893; WJE 405, 409, 416, 420, 422, 424, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281; WJE 425-427 POST MD80-27-382 AND POST MD80-27-281; WJE 886, 887 POST MD80-27-383

- 0.86 psi, (5.93 kPa), (191 knots).

WJE 401-404, 406-408, 410-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 886, 887, 892, 893; WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-281

4) Position rudder in full right position and verify dimension between target and sensor is greater than 0.015 inch (0.38 mm).

   NOTE: Make sure hook assembly clears envelope of piston when rudder is moved through full travel.

5) Install stop bolt (15) as follows:

   a) Move hook assembly until target is positioned 0.015 inch (0.38 mm) minimum from face of sensors.

   b) Install bolt (15), spacer (16), and washers (17) on bracket of proximity sensor. (Figure 202)

      <1> Use enough washers between spacer and bracket assembly to allow bolt to contact target support assembly.

      <2> Extreme care should be taken not to disturb adjustment accomplished in Paragraph 4.B.(7)(d)4).

      NOTE: Repetitive removal/installation of bolt in self-locking plate nut may destroy the self-locking feature of the plate nut, thereby, precluding any future revision to washer quantity. Make sure bolt break away torque does not fall below 7 inch-pounds. (PAGEBLOCK 20-30-01/201)

WJE ALL

(e) Reduce air pressure to zero psi, manually move rudder through full travel and check that hook (10) clears piston rod (11). Do not change adjustment of turnbuckles (8) or pushrod (5) without rechecking Paragraph 3.B.(23).

(f) Disconnect air pressure source from pressure inlet (6).

(g) Connect pitot line to pressure inlet (6).

(h) Move rudder hydraulic power shutoff valve control lever to on position.

RUDDER TRIM AND LOAD-FEEL SPRING - MAINTENANCE PRACTICES

1. General

A. The rudder trim and load-feel spring is located in the aft fuselage section immediately forward of the tailcone and adjacent to the rudder drive mechanism. Access to the trim and load-feel spring is through the aft passenger compartment door in the aft pressure bulkhead, and with tail compartment cat-walk lowered; or through the access door in the fuselage tailcone.

B. Numbers in parentheses in the following text correspond to callouts in Figure 201. Cable run numbers and segment letters referred to in the following text correspond to callouts in hexagonal symbols in Figure 201. Each cable run number is posted adjacent to the corresponding cable in the airplane.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
Tensiometer	Pacific Scientific Co.
Lockwire, NASM20995N32, DPM 684*[1]	Not specified
Rig pin (6-4) 3/8 by 4 5/8 (9.525 x 117.475 mm)	Not Specified
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch), (15.875 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Rudder Trim and Load-Feel Spring

A. Remove Rudder Trim and Load-Feel Spring

(1) Make certain right hydraulic system is depressurized.

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT CAN RESULT.

(2) Move rudder hydraulic power shutoff valve control lever, located on control pedestal, to off position.

(3) Loosen turnbuckles on cables 23C and 24C, located in aft fuselage section forward of air-conditioning unit, to provide slack in cables.

(4) Remove cable guard pins from collar.

(5) Remove cables from drum.

(6) Remove bolt (1) to disconnect link from collar.

(7) Remove nut and washer from drum support bolt.

(8) Remove bolt (2) to disconnect rudder trim and load-feel shaft from control valve drive crank.

(9) Withdraw rudder trim and load-feel spring from serrated spacer, leaving spacer in position in mounting bracket.

(10) Note and record number of spacer washers on drum support bolt, between cable pulley and serrated spacer. Retain washers for installation.

B. Install Rudder Trim and Load-feel Spring

(1) Make certain right hydraulic system is depressurized.

(2) Make certain that rudder hydraulic shutoff valve control lever is in off position.

(3) Rotate rudder trim control knob to align pointer with rig neutral notch on control pedestal cover.

NOTE: There may be a difference between rigged neutral position and flight neutral position of trim position indicator; therefore, pointer may or may not align with flight neutral position on indicator placard.

(4) Place spacer washers, removed in step A.(9), on drum support bolt and insert rudder trim and load-feel spring in serrated washer and mounting bracket. Rotate spacer as required to eliminate vertical misalignment between rudder trim and load-feel shaft and rudder control valve crank.

(5) Install bolt (2) to connect rudder trim and load-feel shaft to control valve drive crank. Safety nut with cotter pin.

(6) Install nut on drum support bolt and safety with cotter pin.

(7) Install bolt (1) to connect link to collar. Safety nut with cotter pin.

(8) Wrap cable 23C (lower cable) counterclockwise, looking out-board, around drum. Start at center of drum, so that cable ball end fits in ball socket at outboard end of drum.

(9) Wrap cable 24C (upper cable) clockwise, looking outboard, around drum. Start at center of drum, so that cable ball end fits in ball socket at inboard end of drum.

(10) Safety cable ball ends in place with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(11) Rotate drum to position cable ball end sockets at forward side of drum, 90 degrees from centerline of guard pin hole.

(12) Adjust turnbuckles to obtain tension of 28 pounds (12.700 kg) at 70°F for 3/32-inch, (2.382 mm) cable. Compensate for temperature. (Figure 202)

(13) Adjust length of rudder trim and load-feel spring by rotating housing in increments of 1/4 turn until rig pin holes in drive sector and drive sector rig bracket are aligned within 1/16 inch (1.587 mm).

(14) Install cable guard pins on collar.

(15) Differentially adjust turnbuckles until rig pin (6-4) can be easily inserted in rig pin hole (R-11) through drive sector and drive sector rig bracket. Make certain that rudder trim indicator remains aligned with rig neutral notch on pedestal cover; and that cable ball end sockets remain positioned on forward side of drum, 90 degrees to center of cable guard pin hole.

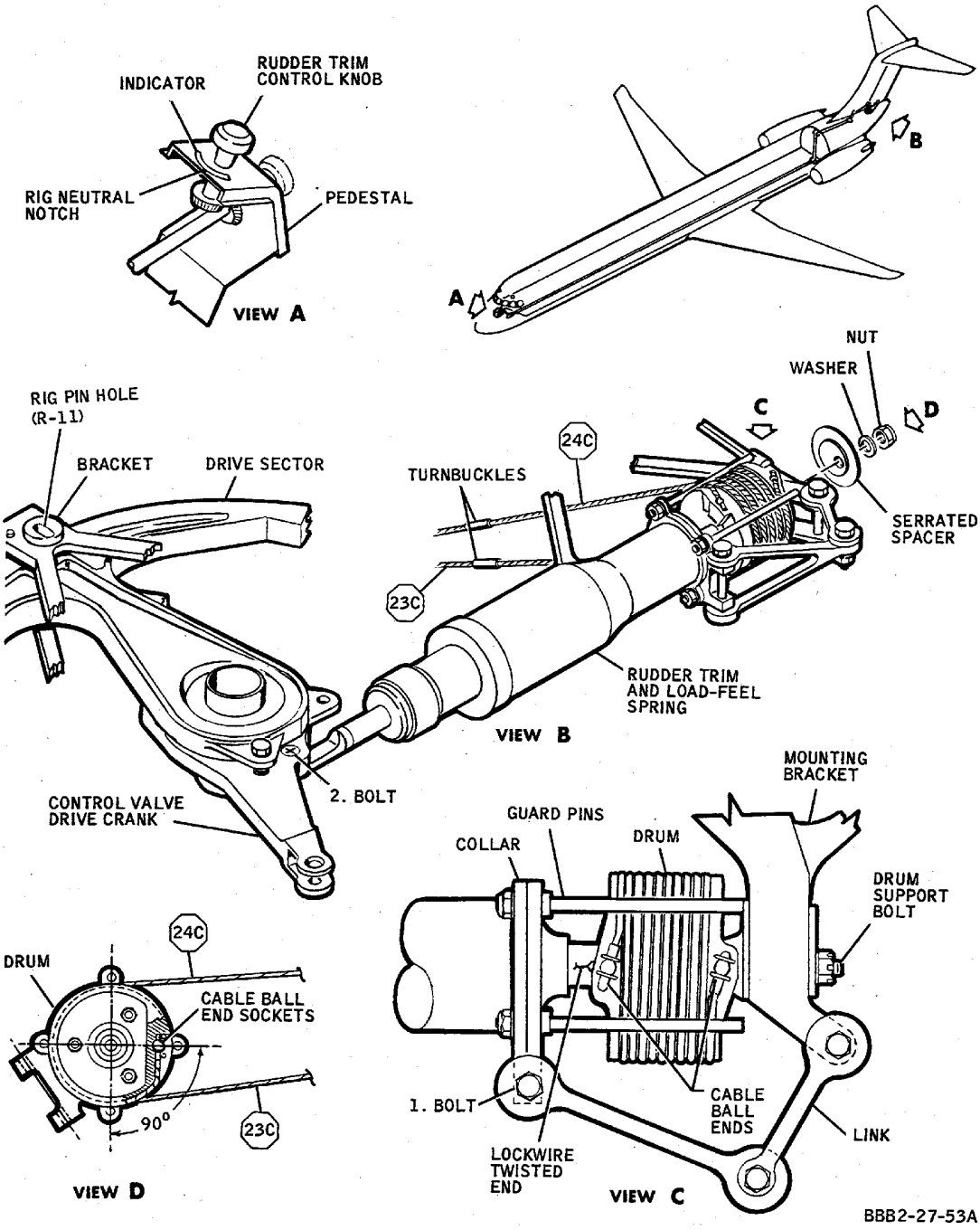
(16) Remove rig pin (6-4).

(17) Safety turnbuckles with clips.

WARNING: MAKE CERTAIN THAT AREA AROUND RUDDER IS CLEAR OF PERSONNEL AND EQUIPMENT WHEN RUDDER REVERTS FROM MANUAL TO POWER OPERATION.

(18) Move rudder hydraulic shutoff valve control lever to on position. Remove tag.

(19) Perform adjustment/test. Paragraph 4.



Rudder Trim and Load-Feel Spring -- Removal/Installation
Figure 201/27-20-07-990-801

CABLE TENSION TABLE – 3/32 DIAMETER

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD
–60	7	1	0	40	30	24	18
–58	8	2	1	42	31	25	18
–56	8	2	1	44	31	25	19
–54	8	2	1	46	32	26	19
–52	9	3	1	48	33	27	20
–50	9	3	2	50	33	27	20
–48	9	3	2	52	34	28	21
–46	10	4	2	54	34	28	21
–44	10	4	2	56	35	29	22
–42	11	5	3	58	36	30	22
–40	11	5	3	60	36	30	23
–38	11	5	3	62	37	31	23
–36	12	6	4	64	38	32	24
–34	12	6	4	66	38	32	24
–32	12	6	4	68	39	33	25
–30	13	7	5	70	39	33	25
–28	13	7	5	72	40	34	26
–26	14	8	5	74	41	35	26
–24	14	8	6	76	41	35	27
–22	15	9	6	78	42	36	27
–20	15	9	6	80	43	37	28
–18	15	9	7	82	44	38	28
–16	16	10	7	84	44	38	29
–14	16	10	7	86	45	39	29
–12	17	11	8	88	46	40	30
–10	17	11	8	90	46	40	30
–8	18	12	8	92	47	41	31
–6	18	12	9	94	48	42	31
–4	19	13	9	96	48	42	32
–2	19	13	9	98	49	43	33
0	20	14	10	100	50	44	33
2	20	14	10	102	51	45	34
4	21	15	10	104	51	45	34
6	21	15	11	106	52	46	35
8	22	16	11	108	53	47	35
10	22	16	12	110	54	48	36
12	23	17	12	112	54	48	37
14	23	17	12	114	55	49	37
16	24	18	13	116	56	50	38
18	24	18	13	118	57	51	38
20	25	19	14	120	58	52	39
22	25	19	14	122	58	52	40
24	26	20	14	124	59	53	40
26	26	20	15	126	60	54	41
28	27	21	15	128	61	55	41
30	27	21	16	130	62	56	42
32	28	22	16	132	62	56	43
34	28	22	17	134	63	57	43
36	29	23	17	136	64	58	44
38	30	24	17	138	65	59	45
				140	66	60	45

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-278A

Cable Tension Table
Figure 202/27-20-07-990-802

4. Adjustment/Test Rudder Trim and Load-Feel Spring

A. Test Rudder Trim and Load-Feel Spring

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Make certain that rudder hydraulic shutoff valve control lever is in on position.

WARNING: BEFORE MOVING RUDDER TRIM CONTROL KNOB, MAKE CERTAIN AREA AROUND RUDDER IS CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Rotate rudder trim control knob clockwise until stops contact. Check that rudder trailing edge is 8 15/16 (±1), (227.012(±25.4) mm) inches right of neutral position, measured from upper aft corner of rudder to center of adjacent vertical stabilizer trailing edge; and that rudder trim position indicator points to 13 1/2 degrees right. Force required to rotate control knob must not exceed 20 inch-pounds, (2.24 N·m).

(4) Rotate rudder trim control knob counterclockwise until stops contact. Check that rudder trailing edge is 8 15/16 (±1) inches, (227.012(±25.4) mm) left of neutral position, measured from upper aft corner of rudder to center of adjacent vertical stabilizer trailing edge; and that rudder trim position indicator points to 13 1/2 degrees left. Force required to rotate control knob must not exceed 20 inch-pounds, (2.24 N·m).

(5) Rotate rudder trim control knob to align pointer with rig neutral notch on control pedestal cover. Check that rudder is neutral with vertical stabilizer within 11/64 inch (4.4 mm).

(6) Return rudder trim control knob to neutral position.

(7) Shut off hydraulic system pressure source.

RUDDER HYDRAULIC POWER PACKAGE - REMOVAL/INSTALLATION

1. General

A. The rudder hydraulic power package is located in the aft fuselage section at the lower end of the rudder hinge line. Access to the hydraulic power package is through the aft passenger compartment door in the aft pressure bulkhead with cat-walk down or through the access door in the tailcone.

B. Numbers in parentheses in the following text correspond to callouts in Figure 401 and Figure 402 or Figure 403.

C. In addition to the Adjustment/Test procedures contained in this chapter, Inspection Test Correct as Necessary (ITCAN) test procedures for the entire hydraulic system and related components are contained in MAIN - ADJUSTMENT/TEST, PAGEBLOCK 29-10-00/501.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 401

Name and Number	Manufacturer
Protractor (5916715)	The Boeing Company
Torque Wrench (0-150 foot-pounds) (0-1800 inch pounds) (0.0-203.4 N·m)	
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified
Rig pins (2) (6-4) 3/8 by 4 5/8 (9.525 x 117.475 mm)	
NOTE: Rig pin sizes are in inches (diameter X length; length = grip plus 5/8 inch), (15.875 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Rudder Hydraulic Power Package

A. Remove Rudder Hydraulic Power Package (Figure 401)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

LOWER EPC, DC AIR CONDITIONING & MISCELLANEOUS

Row	Col	Number	Name
W	25	B1-228	RUDDER TRAVEL UNRESTRICT ADVISORY

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
R	33	B1-229	RUDDER CONTROL MANUAL ADVISORY

WJE ALL

(2) Make certain right hydraulic system is depressurized. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT CAN RESULT.

(3) Move rudder hydraulic power shutoff valve control lever, on pedestal, to off position.

(4) Disconnect electrical connector from power-to-manual indicating light switch (1).

(5) Remove throw-limiter indicating proximity sensors (2) from support on power package.

(6) Disconnect hydraulic lines from rudder power control valve (3). Cap or plug open lines and ports.

(7) Remove cotter pin from end of rudder power control safety tube (5) and remove tube from support.

(8) Disconnect drive sector pushrod (6) from lever (19).

(9) Disconnect rudder control tab actuating rod (8) from cam arm (9). Rotate cam if necessary to obtain clearance for bolt removal.

NOTE: Camshaft is provided with wrench flats for manually rotating cam.

(10) Secure pushrods clear of power package to prevent interference.

(11) Disconnect rudder throw-limiter pushrod (10) from hook support (11).

(12) Support power package and remove two actuating cylinder attach bolts (12) (upper and lower) to disconnect actuating cylinder (4) from rudder drive crank (13).

(13) Continue to support power package and disconnect piston rod end (14) from support brace (15). Remove piston rod attach bolt (17) and remove power package from aircraft.

(14) If applicable, remove union from return port, filter union from pressure inlet port, and O-rings from control valve. Discard O-rings. Plug and cap open port lines. Secure all disconnected rods, cranks, levers, etc. to minimize damage.

B. Install Rudder Hydraulic Power Package

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, DC AIR CONDITIONING & MISCELLANEOUS

Row	Col	Number	Name
W	25	B1-228	RUDDER TRAVEL UNRESTRICT ADVISORY

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
R	33	B1-229	RUDDER CONTROL MANUAL ADVISORY

WJE ALL

(2) Make certain that right hydraulic system is depressurized. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

(3) Make certain that rudder hydraulic power shutoff valve control lever is in off position.

(4) If applicable, install filter union and new O-ring in control valve pressure inlet port. Install union and new O-ring in return port. (Figure 401)

(5) If new power package is to be installed, adjust extended length of actuating cylinder to match length of removed cylinder as follows. (This is a preliminary adjustment. Additional adjustment will be required during subsequent steps.)

(a) Loosen jamnut (20) on piston rod end (14).

(b) Adjust piston rod end (14) in increments of one full turn to obtain dimension, so that zerk (21) (grease fitting) in piston rod end (14) is on side away from support bracket.

If the piston rod end (14) is P/N VTA11170, which has two grease fitting, adjust the piston rod end (14) in increments of one half turn to obtain dimension, so that one zerk (21) (grease fitting) in piston rod end (14) is on side away from support bracket.

NOTE: Rod end jam nut will not be torqued and safetied at this point.

(6) Support power package in position and connect actuating cylinder (4) to support brace (15). Secure nut with cotter-pin, and safety bolt head with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(7) Install piston rod attach bolt (17).

(8) Install two actuating cylinder attach bolts (12) with heads of the bolts away from the actuating cylinder (4) to rudder drive crank (13). Safety nuts with cotter pins and safety lower attach bolt head with lockwire to the anti-rotation lug. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(9) Connect drive sector pushrod (6) to lever (19) (bolt is installed inverted). Safety nut with cotter pin and safety bolt head with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(10) Connect rudder control tab actuating rod (8) to cam arm (9). Rotate cam if necessary to obtain clearance to install bolt.

NOTE: Camshaft is provided with wrench flats for manually rotating cam.

(11) Slide safety tube (29) through guide on rudder power control valve (3), and install on support. Secure tube with cotter pin.

NOTE: Shim with washers as required between tube supports and tube support brackets to maintain 1/16-inch, (1.59 mm) clearance between tube and guide throughout full travel of cylinder.

(12) Connect hydraulic lines to rudder power control valve (3). Use new O-ring seals.

(13) Install throw-limiter indicating proximity sensors (2) on power package support.

(14) Connect electrical connector to power-to-manual indicating light switch (1).

(15) Lubricate rudder hydraulic power package as applicable. (PAGEBLOCK 12-21-02/301)

(16) Remove the safety tags and close these circuit breakers:

LOWER EPC, DC AIR CONDITIONING & MISCELLANEOUS

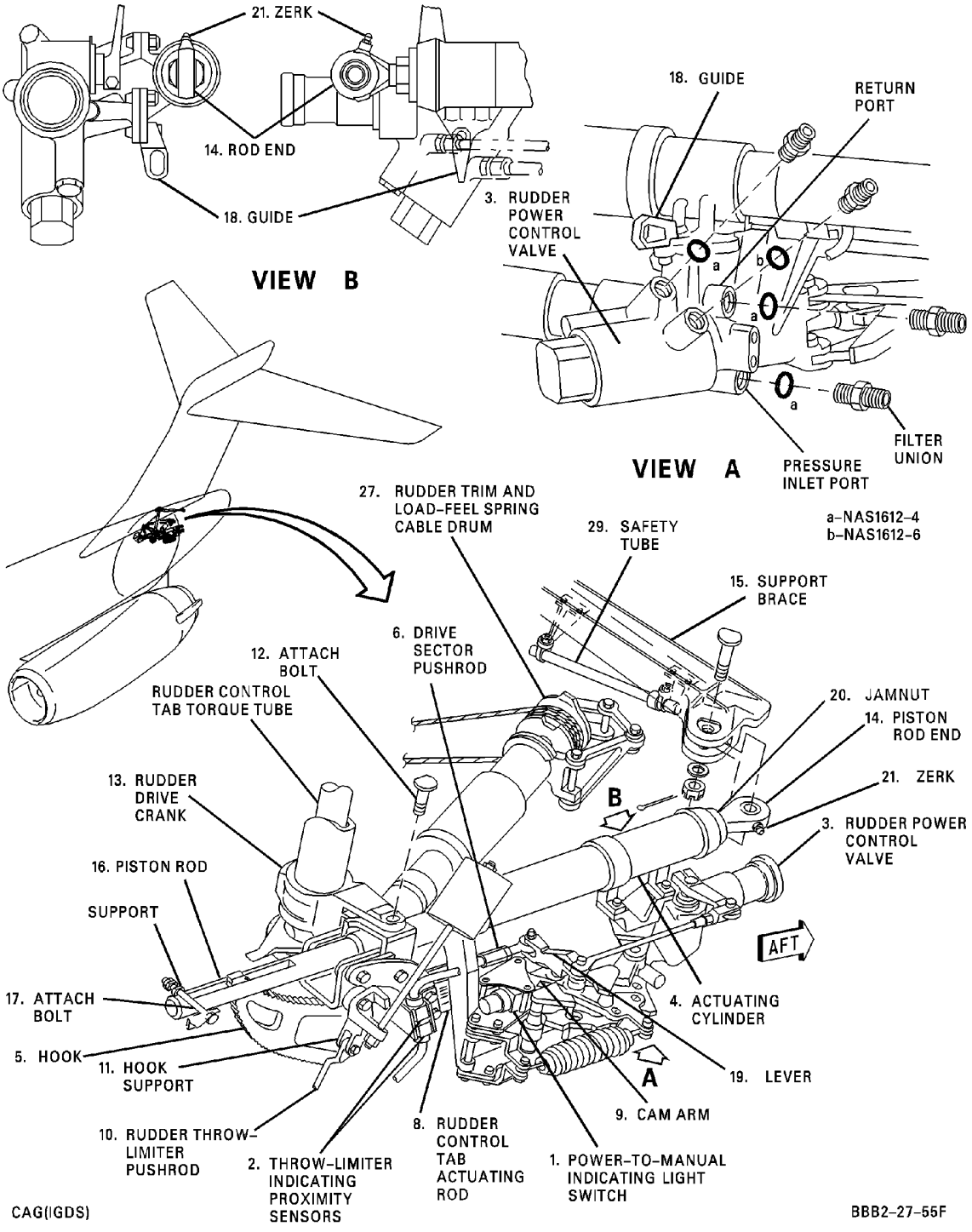
Row	Col	Number	Name
W	25	B1-228	RUDDER TRAVEL UNRESTRICT ADVISORY

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
R	33	B1-229	RUDDER CONTROL MANUAL ADVISORY

WJE ALL

(17) Adjust and test hydraulic power package. (Paragraph 4.)



Rudder Hydraulic Power Package -- Removal/Installation
Figure 401/27-20-08-990-801

4. **Adjustment/Test Rudder Hydraulic Power Package**

A. Adjust Rudder Hydraulic Power Package (Figure 402 or Figure 403)

WARNING: TAG CONTROL LEVER. IF HYDRAULIC POWER IS INADVERTENTLY TURNED ON, INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT CAN RESULT.

(1) Move rudder hydraulic power shutoff valve control lever, located in control pedestal, to off position.

(2) Make certain right hydraulic system is depressurized.

(3) Manually move rudder to neutral position.

NOTE: Rudder is in neutral position when center of upper aft corner of rudder aligns within 11/64-inch, (4.4 mm) of center of adjacent vertical stabilizer trailing edge.

(4) Disconnect pushrod (10) from hook (5).

(5) Move hook (5) into slot in piston rod (6) until hook stop contacts stop (7). Slope of serrated ends of hook must match sloped faces in slot of piston rod.

(6) Manually move rudder to extreme left, and then to extreme right of neutral position. Measure rudder travel to both extremes to determine amount of adjustment required.

NOTE: Rudder travel is measured from center of upper aft corner of rudder to center of adjacent vertical stabilizer trailing edge. Travel should be 1 5/8 (±5/16) inches, (41.28(±7.94) mm) rudder trailing edge left and right, each side of neutral.

(7) Move hook (5) out of slot in piston rod (6), loosen jamnut (20), and adjust piston rod end (14) in increments of one full turn, one half turn if the rod end (14) has two grease fitting, to obtain dimensions noted in Paragraph 4.A.(6). Repeat Paragraph 4.A.(5) and Paragraph 4.A.(6) to check adjustment. Slope of serrated ends of hook must match sloped faces in slot of piston rod.

NOTE: At least one Zerk (21) (grease fitting) on piston rod end should be on side away from support bracket.

(8) Connect pushrod (10) to hook (5).

CAUTION: MAKE CERTAIN THAT TAB OF LOCKWASHER IS INSTALLED IN SLOT OF PISTON.

(9) Tighten jamnut (20) to torque of 100 foot-pounds, (1200 inch-pounds) (135.6 N·m). Safety nut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(10) Remove bolt (22) from pushrod (23).

(11) Rotate rudder trim and load-feel spring cable drum (27) to position sector (24) so that rig pin (6-4) can be easily inserted in rig pin hole (R-11) through sector and bracket (28).

(12) Loosen jamnut on drive sector pushrod (16) and rotate body of pushrod until rig pin (6-4) can be easily inserted in rig pin hole (R-12) through drive sector (24) and crank (25).

(13) Tighten jamnut on drive sector pushrod (16). Safety nut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(14) With yaw damper actuator in neutral and nulled position, loosen jamnut (26) and adjust yaw damper actuator pushrod (23) until bolt (22) can be easily installed. Safety nut with cotter pin.

NOTE: Complete yaw damper nulling. (RUDDER AND TAB - ADJUSTMENT/TEST, PAGEBLOCK 27-20-00/501)

(15) Tighten jamnut (26). Safety nut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Make certain yaw damper actuator rod does not contact drive sector.

(16) Remove rig pins (6-4) from rig pin holes (R-11) and (R-12).

(17) Test rudder throw-limiter actuator and linkage. (PAGEBLOCK 27-20-00/501)

(18) Test rudder control system. (Paragraph 4.B.)

(19) Perform return to service (RTS) test.

WJE 412, 414

(DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 1 or DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 4)

WJE 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891-893

(DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 3)

WJE 401-404, 412, 414, 875-877

(DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 4)

WJE 415, 417-419, 421, 423, 863-866, 869, 871, 872, 878, 879

(DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 5)

WJE 886, 887

(DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 6)

WJE 405-411, 880, 881, 883, 884

(DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 10)

(DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 11)

WJE ALL

B. Test Rudder Hydraulic Power Package.

NOTE: Linear dimensions for checking rudder travel are measured from center of upper aft corner of rudder to center of adjacent vertical stabilizer trailing edge. Angular dimensions for checking control tab travel are measured by placing protractor on rigging reference lines on left side of rudder and tab.

(1) Make certain that rudder hydraulic power shutoff valve control lever, located on control pedestal, is in off position.

(2) Make certain right hydraulic system is depressurized. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

(3) Rotate rudder trim control knob to align pointer with rig neutral notch on control pedestal cover.

NOTE: There may be a difference between rigged neutral position and flight neutral position of trim position indicator; therefore, pointer may or may not align with flight neutral position on indicator placard.

(4) Manually move rudder trailing edge to 14 5/8 (±1/2) inches (371.5(±12.7) mm) right of neutral position, and move right rudder pedal forward until stops contact. Check that control tab trailing edge is 26(±2) degrees left of rudder trailing edge.

(5) Manually move rudder trailing edge to 14 5/8 (±1/2) inches (371.5(±12.7) mm) left of neutral position, and move left rudder pedal forward until stops contact. Check that control tab trailing edge is 26(±2) degrees right of rudder trailing edge.

(6) Return rudder to neutral position.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(7) Pressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

(8) Check that rudder control manual light in flight compartment is on.

WARNING: BEFORE MOVING HYDRAULIC POWER SHUTOFF VALVE CONTROL LEVER, MAKE CERTAIN THAT AREA AROUND RUDDER IS CLEAR OF PERSONNEL AND EQUIPMENT WHEN RUDDER REVERTS FROM MANUAL TO POWER OPERATION.

(9) Move hydraulic power shutoff valve control lever to on position. Check that rudder control manual light in flight compartment goes off.

(10) Move right rudder pedal full forward. Check for following.

(a) Control tab remains faired with rudder within one degree.

(b) Rudder trailing edge is 14 5/8(±1/2) inches (371.5(±12.7) mm) right of neutral position.

(c) End play at trailing edge of rudder does not exceed 1/4-inch, (6.35 mm).

(11) Move left rudder pedal full forward. Check for following.

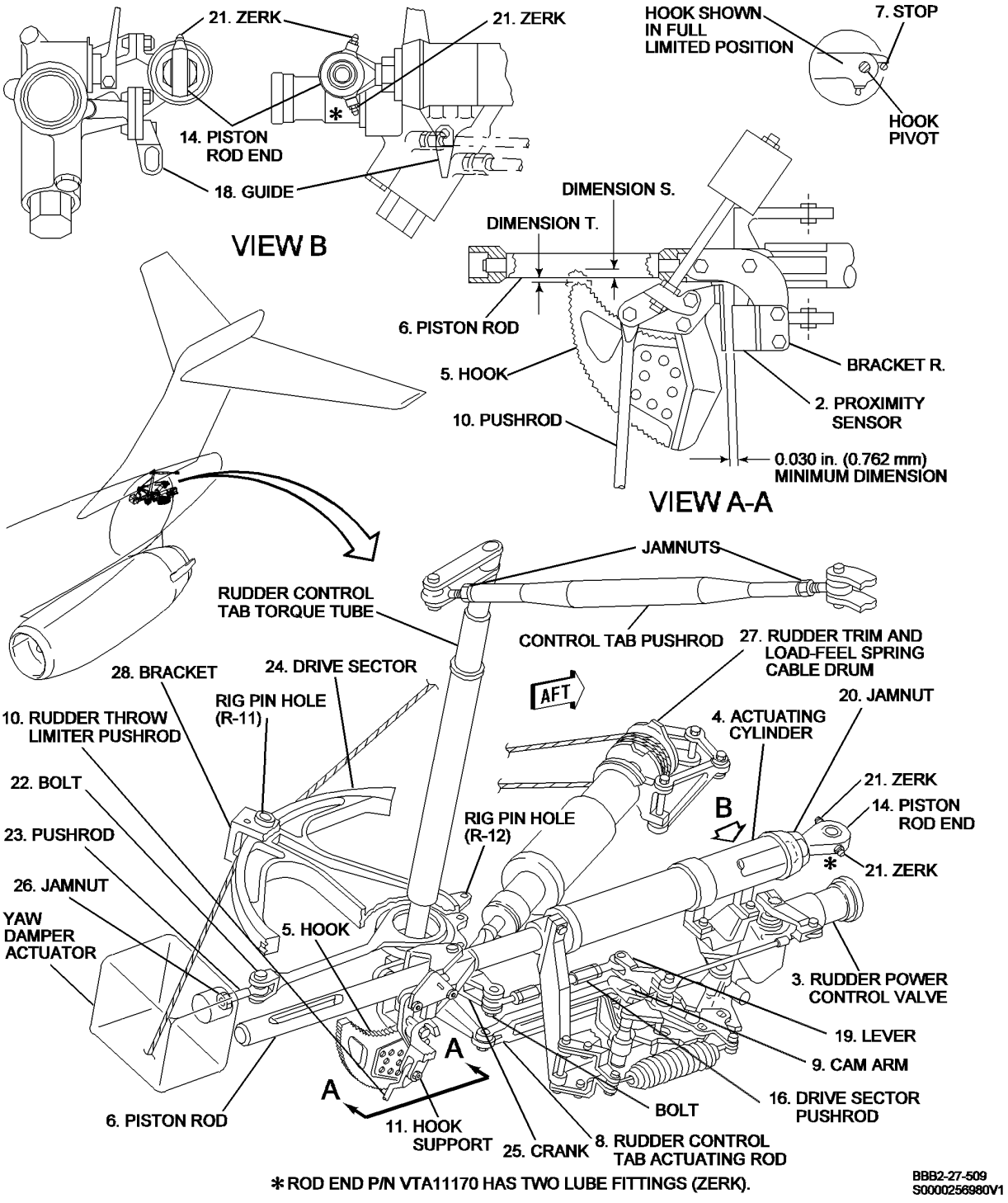
(a) Control tab remains faired with rudder within one degree.

(b) Rudder trailing edge is 14 5/8(±1/2) inches (371.5(±12.7) mm) left of neutral position.

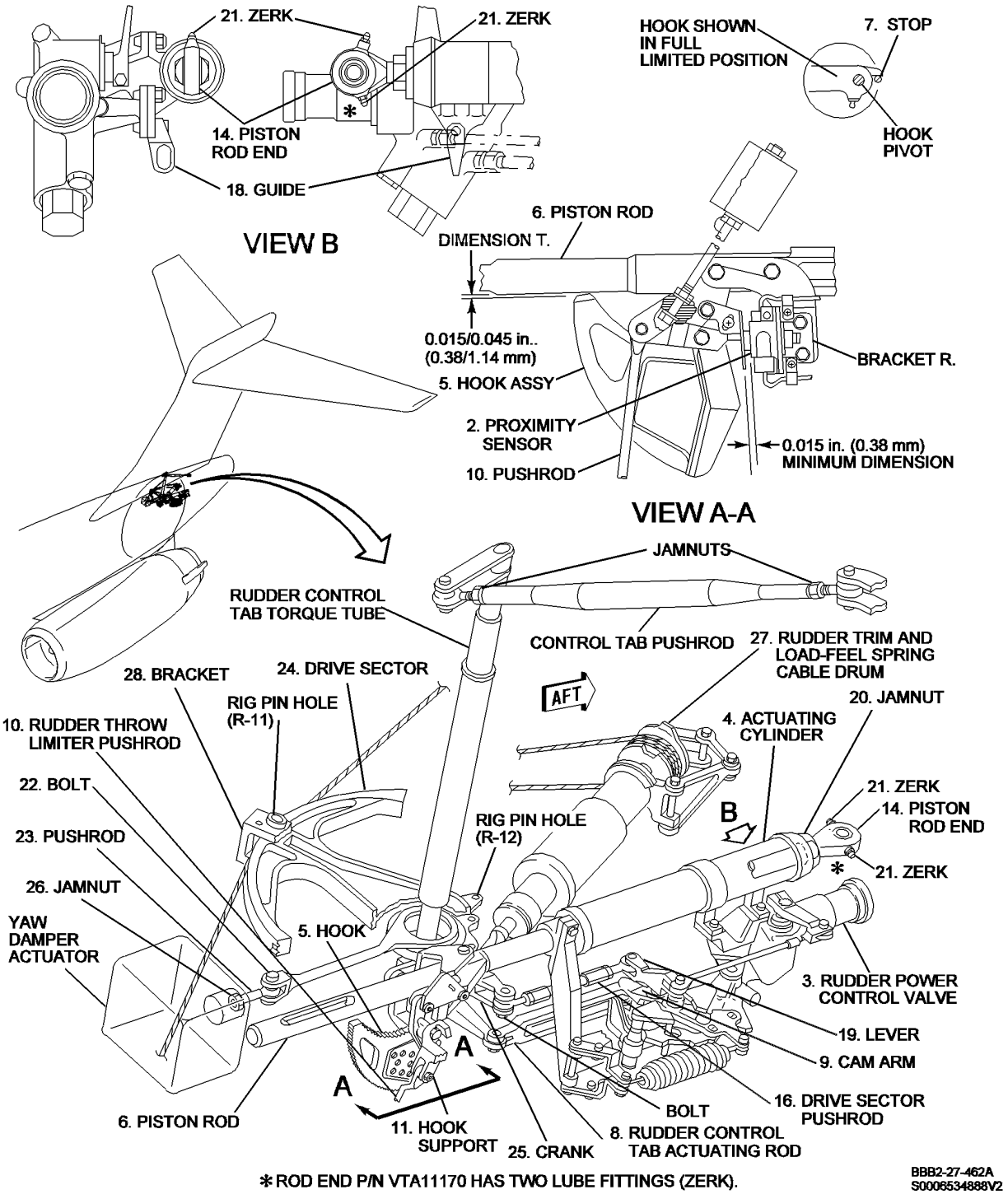
(c) End play at trailing edge of rudder does not exceed 1/4-inch (6.35 mm).

(12) Return rudder pedals to neutral position. Check that rudder is faired with vertical stabilizer within 11/64 inch (4.4 mm).

(13) Shut off hydraulic system pressure source. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)



Rudder Hydraulic Power Package -- Adjustment (Before Service Bulletin 27-281)
Figure 402/27-20-08-990-802



Rudder Hydraulic Power Package -- Adjustment (With Service Bulletin 27-281)
Figure 403/27-20-08-990-803

RUDDER HYDRAULIC POWER SHUTOFF VALVE - MAINTENANCE PRACTICES

1. General

A. The rudder hydraulic power shutoff valve is located in the right forward area of the aft accessory compartment, outboard of the APU shroud and below the right air-conditioning unit. Access is through the aft accessory compartment access door 5911A or the aft passenger compartment door in aft pressure bulkhead, with the aft accessory compartment catwalk down. (INTERNAL ACCESS DOORS, SUBJECT 06-31-00, Figure 3)

2. Removal/Installation Rudder Hydraulic Power Shutoff Valve

A. Remove Valve

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(1) Depressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Disconnect hydraulic lines from fittings in valve ports. Cap open hydraulic lines.

(3) Remove, cotter pins (15), nuts (14), washers (13), and bolts (12) from shutoff valve (1) and mounting bracket (3). (Figure 201)

(4) Remove nuts (18), washers (17), and bolts (16) from shutoff valve (1) and mounting bracket (3).

(5) Remove rudder hydraulic power shutoff valve (1) from mounting bracket (3).

(6) Remove check valves (4) and (7) from shutoff valve (1). Discard packings (10) and (11).

(7) Remove reducer (6) and union (5). Discard packings (9) and (8).

(8) Retain check valves (4) and (7), reducer (6) and union (5) for later installation.

(9) Remove pipe assembly (19) from shutoff valve (1). (Figure 202)

(10) Remove unions (20) and discard packings (21).

(11) Remove plug (22) and discard packing (23).

(12) Remove bushing (24) and discard packing (25).

(13) Retain unions (20), plug (22), bushing (24), and pipe assembly (19) for later installation.

(14) Plug open valve ports on shutoff valve (1) and pressure lines.

B. Install Valve (Figure 201) (Figure 202)

(1) Make certain right hydraulic system is depressurized.

CAUTION: DO NOT APPLY MORE THAN THE MAXIMUM SPECIFIED TORQUE WHEN YOU TIGHTEN THE PARTS. DAMAGE TO THE PARTS CAN OCCUR IF YOU APPLY TOO MUCH TORQUE.

(2) Install check valves (4) and (7), reducer (6), and union (5) with new packings (10), (11), (9), and (8) in shutoff valve (1) ports. (Figure 201)

NOTE: Torque the fittings, unions, bolts and nuts in accordance with standard practices. (PAGEBLOCK 20-10-13/201)

(3) Install unions (20) with new packings (21) on shutoff valve (1) and install pipe assembly (19). (Figure 202)

(4) Install plug (22) with new packing (23).

(5) Install bushing (24) with new packing (25).

(6) Place shutoff valve (1) on mounting bracket (3). (Figure 201)

(7) Install bolts (16), washers (17), and nuts (18) to attach shutoff valve to mounting bracket (3).

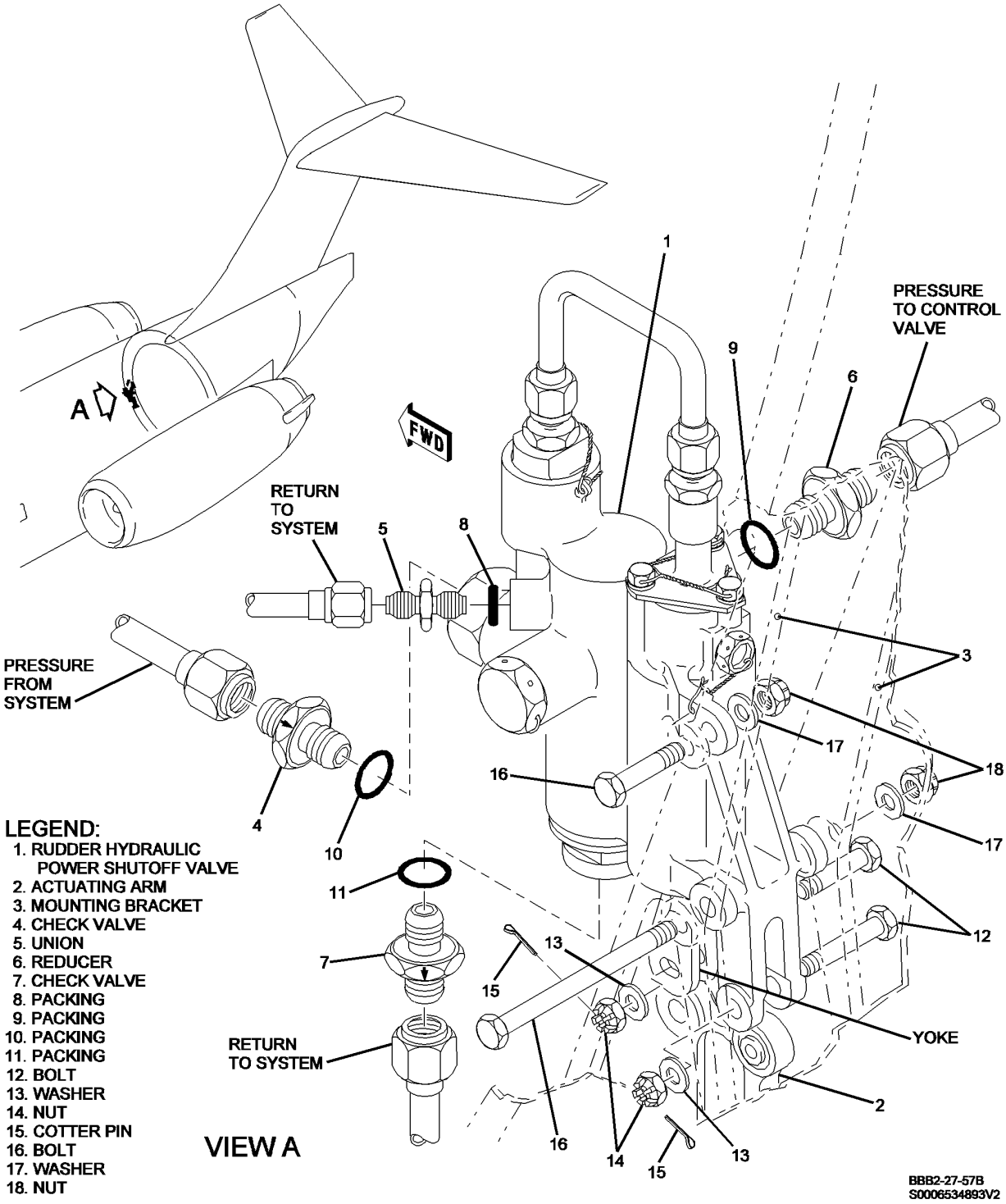
(8) Connect hydraulic lines to shutoff valve (1).

(9) Align actuating arm (2) with holes for bolts (12).

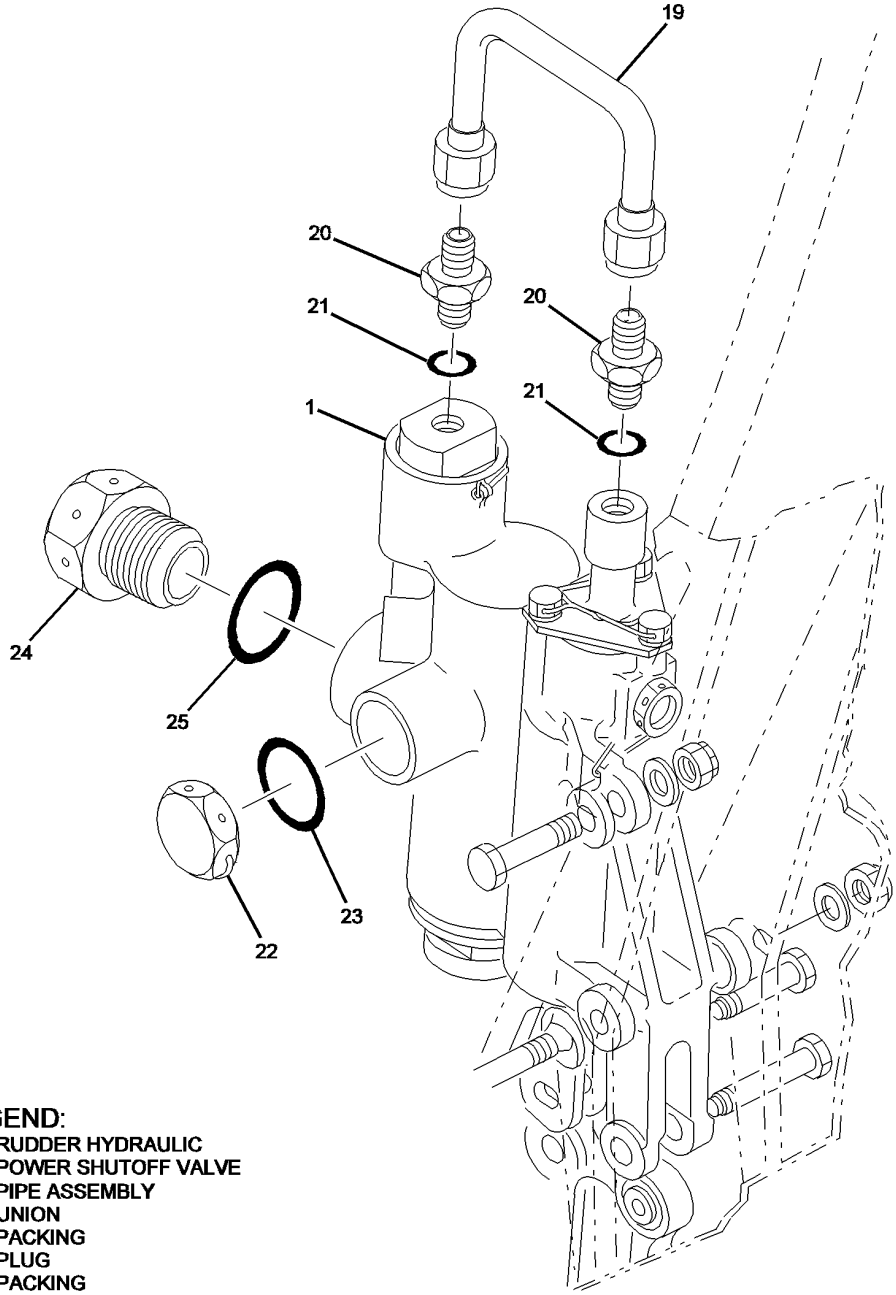
(10) Install bolts (12), washers (13) and nuts (14) to attach actuating arm (2) to shutoff valve (1).

(11) Install cotter pins (15).

(12) Test operation of shutoff valve. (Paragraph 3.)



Rudder Hydraulic Power Shutoff Valve -- Removal/Installation
Figure 201/27-20-09-990-801



LEGEND:

1. RUDDER HYDRAULIC POWER SHUTOFF VALVE
19. PIPE ASSEMBLY
20. UNION
21. PACKING
22. PLUG
23. PACKING
24. BUSHING
25. PACKING

BBB2-27-463B
S0006534894V2

Shutoff Valve Pipe Assembly and Plug -- Removal/Installation
Figure 202/27-20-09-990-802

3. **Test Rudder Hydraulic Power Shutoff Valve and Rudder Reversion Function**

A. Test Rudder Power Shutoff Valve and Rudder Reversion Function

(1) Test Automatic Reversion

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(a) Pressurize right hydraulic system (1500 (+100 -50) psi, (10,350 (+690, -345) kPa). (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING RUDDER HYDRAULIC POWER SHUTOFF VALVE CONTROL LEVER, MAKE CERTAIN THAT AREA AROUND RUDDER IS CLEAR OF PERSONNEL AND EQUIPMENT.

(b) Place rudder hydraulic power shutoff valve control lever in "PWR" position.

(c) Slowly reduce right hydraulic system pressure. Check that "Rudder Control Manual" light on overhead annunciator panel (on aircraft with EOAP, "Rudder Control Manual" legend) illuminates between 1150 and 750 psi (7935 and 5175 kPa).

NOTE: If light (or legend) does not illuminate at or above 750 psi (5175 kPa), maintain system pressure at 750 psi (5175 kPa) and operate rudder pedals to cycle rudder and consume stored energy in rudder system accumulator. Light (or legend) should then illuminate.

(d) Slowly increase right hydraulic system pressure. Check that "Rudder Control Manual" light on overhead annunciator panel (on aircraft with EOAP, "Rudder Control Manual" legend) extinguishes between 1200 and 1400 psi (8280 and 9660 kPa).

(2) Test Manual Reversion

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(a) Pressurize right hydraulic system (3000 (±200) psi (20,700 (±1380) kPa). (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING RUDDER HYDRAULIC POWER SHUTOFF VALVE CONTROL LEVER, MAKE CERTAIN THAT AREA AROUND RUDDER IS CLEAR OF PERSONNEL AND EQUIPMENT.

(b) Place rudder hydraulic control valve lever in "MAN" position. Check that rudder reverts to manual control and "Rudder Control Manual" light on overhead annunciator panel (on aircraft with EOAP, "Rudder Control Manual" legend) illuminates within 2 seconds after control lever is placed in "MAN" position.

(c) Place rudder hydraulic control valve lever in "PWR" position. Check that rudder reverts to power operation and "Rudder Control Manual" light on overhead annunciator panel (on aircraft with EOAP, "Rudder Control Manual" legend) extinguishes within 7 seconds after control lever is placed in "PWR" position.

(3) Visually check control valve and connections for hydraulic leakage. Check valve and linkage for security of mounting and all safeties.

(4) shutoff hydraulic system pressure source.

RUDDER HYDRAULIC POWER SHUTOFF VALVE - ADJUSTMENT/TEST

1. General

A. This procedure contains MSG-3 task card data.

TASK 27-20-09-710-801

2. Operational Check of the Rudder Hydraulic Shutoff System and Manual Reversion Mode

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
29-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES

B. Operational Check of the Rudder Hydraulic Shutoff System and Manual Reversion Mode

SUBTASK 27-20-09-710-001

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS. ENSURE ALL FLIGHT CONTROL SURFACES ARE FREE AND CLEAR OF PERSONNEL AND EQUIPMENT.

(1) Do the operational check of the rudder hydraulic shutoff system and manual reversion mode (test automatic reversion).

(a) Pressurize right hydraulic system to 1500 +100 / -50 psi (10,342 +690 / -345 kPa). (PAGEBLOCK 29-00-00/201)

(b) Place rudder hydraulic power shutoff valve control lever in "PWR" position.

(c) Slowly reduce right hydraulic system pressure. Check that "Rudder Control Manual" light on overhead annunciator panel (on aircraft with EOAP, "Rudder Control Manual" legend) illuminates between 1150 psi (7929 kPa) and 750 psi (5171 kPa).

NOTE: If light (or legend) does not illuminate at or above 750 psi (5171 kPa), maintain system pressure at 750 psi (5171 kPa) and operate rudder pedals to cycle rudder and consume stored energy in rudder system accumulator. Light (or legend) should then illuminate.

(d) Slowly increase right hydraulic system pressure. Check that "Rudder Control Manual" light on overhead annunciator panel (on aircraft with EOAP, "Rudder Control Manual" legend) extinguishes between 1200 psi (8274 kPa) and 1400 psi (9653 kPa).

SUBTASK 27-20-09-710-003

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS. ENSURE ALL FLIGHT CONTROL SURFACES ARE FREE AND CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Do the operational check of the rudder hydraulic shutoff system and manual reversion mode (test manual revision).

(a) Pressurize right hydraulic system 3000 ±200 psi (20,684 ±1379 kPa), (PAGEBLOCK 29-00-00/201)

(b) Place rudder hydraulic control valve lever in "MAN" position. Check that rudder reverts to manual control and "Rudder Control Manual" light on overhead annunciator panel (on aircraft with EOAP, "Rudder Control Manual" legend) illuminates within 2 seconds after control lever is placed in "MAN" position.

(c) Place rudder hydraulic control valve lever in "PWR" position. Check that rudder reverts to power operation and "Rudder Control Manual" light on overhead annunciator panel (on aircraft with EOAP, "Rudder Control Manual" legend) extinguishes within 7 seconds after control lever is placed in "PWR" position.

1) Visually check control valve and connections for hydraulic leakage. Check valve and linkage for security of mounting and all safeties.

C. Job Close-up

SUBTASK 27-20-09-942-001

(1) Depressurize hydraulics. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

(2) Remove all the tools and equipment from the work area. Make sure the area is clean.

——— END OF TASK ———

RUDDER PEDAL MECHANISM - MAINTENANCE PRACTICES

1. General

A. The rudder pedal mechanism is located in the flight compartment with parts of the mechanism below the compartment floor. Access to the pedal mechanism and attaching points is gained by removal of pilots seats and floor panels on each side of the left and right control columns.

B. The removal/installation procedures are identical for the left and right rudder pedal mechanism. All parts should be tagged during removal to ensure correct assembly during installation.

2. Removal/Installation Rudder Pedal Mechanism

A. Remove Pedal Mechanism

(1) Make certain right hydraulic system is depressurized.

(2) Move rudder hydraulic power shutoff valve control lever to off position.

(3) Remove both pilots seats. (PAGEBLOCK 25-13-01/201)

(4) Disconnect rudder pedal adjustment brackets from instrument panel. Clamp pedal adjustment cable 122A.

(5) Remove floor panels from below rudder pedals and around control columns.

(6) Remove brake pushrods from rudder pedals and torque tubes.

(7) Remove rudder pedals from control arms.

(8) Remove link assemblies from torque tube.

(9) Remove pushrods that connect rudder control arms to rudder control crank.

(10) Remove control arms from brackets.

(11) Visually check left and right rudder pedal bracket assemblies for cracks at structure mount pads. (Figure 201, View C)

(12) Visually check left and right rudder pedals assembly adjuster arm detent lug on rudder pedals adjuster hub assembly for cracks or other evidence of failure. (Figure 202, View C)

B. Install Pedal Mechanism

(1) Make certain right hydraulic system is depressurized.

(2) Make certain rudder hydraulic power shutoff valve control lever is in off position.

(3) Install control arms on brackets.

(4) Install pushrods from rudder control arms to rudder control crank. Safety nuts with cotter pins.

(5) Install link assemblies on torque tube. Safety nuts with cotter pins.

(6) Install brake pushrods on torque tube. Safety nuts with cotter pins.

(7) Install rudder pedals on control arms.

(8) Connect brake pushrods on rudder pedals. Safety nuts with cotter pins.

(9) Install rudder pedal adjustment brackets to instrument panels. Remove clamp from pedal adjustment cable 122A.

(10) Install floor panels.

(11) Check rudder pedal arms for alignment.

NOTE: Rudder pedal arms to be aligned within 3/16 in. (4.762 mm) at center of pedal hub with rudder control system in neutral position.

CAUTION: MAXIMUM PERMISSIBLE TENSION ON CABLE 122A IS 3-1/2 POUNDS.

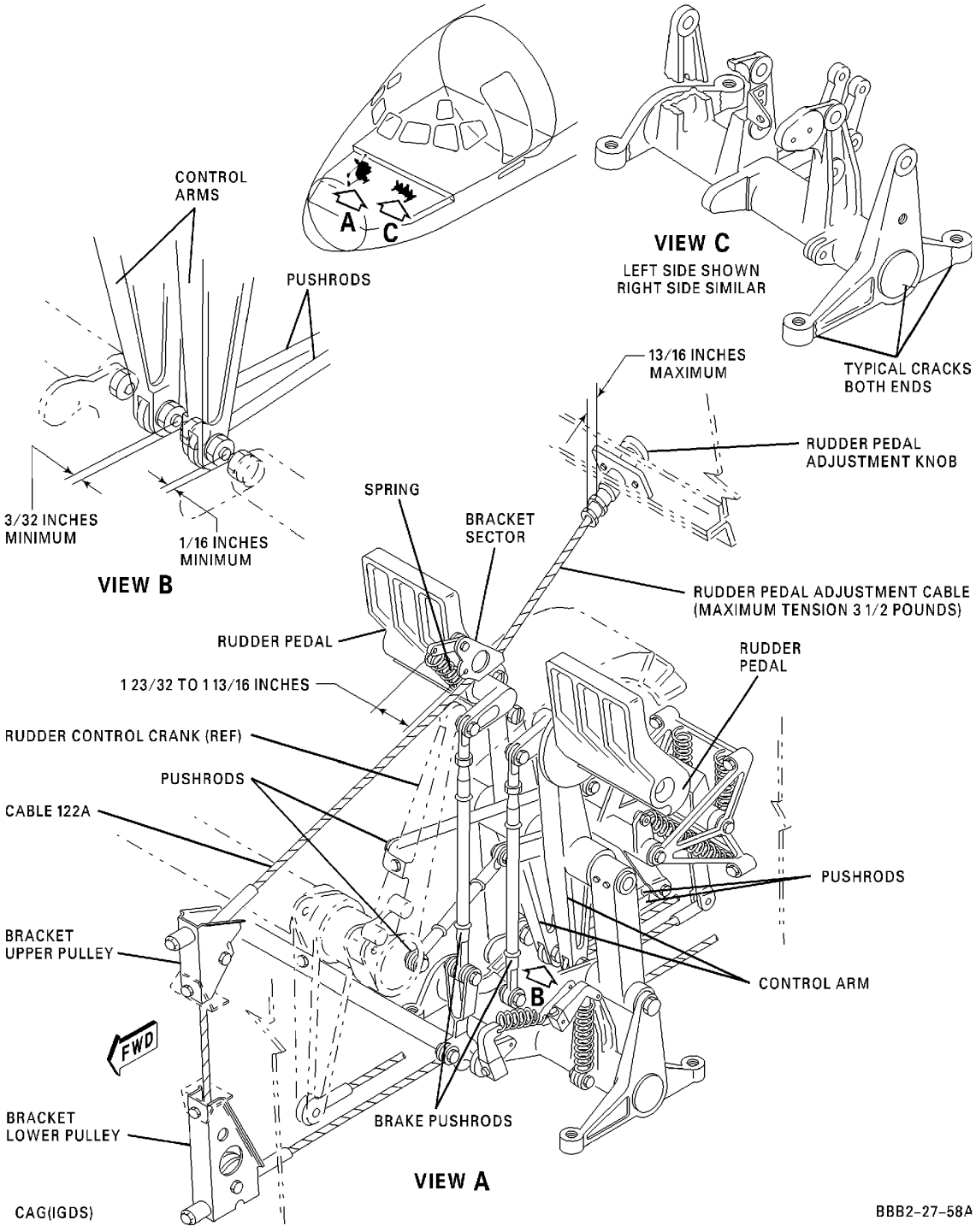
(12) If necessary adjust rudder pedal adjustment cable tension. (PAGEBLOCK 27-20-00/501)

(13) Check rudder pedal travel for full throw.

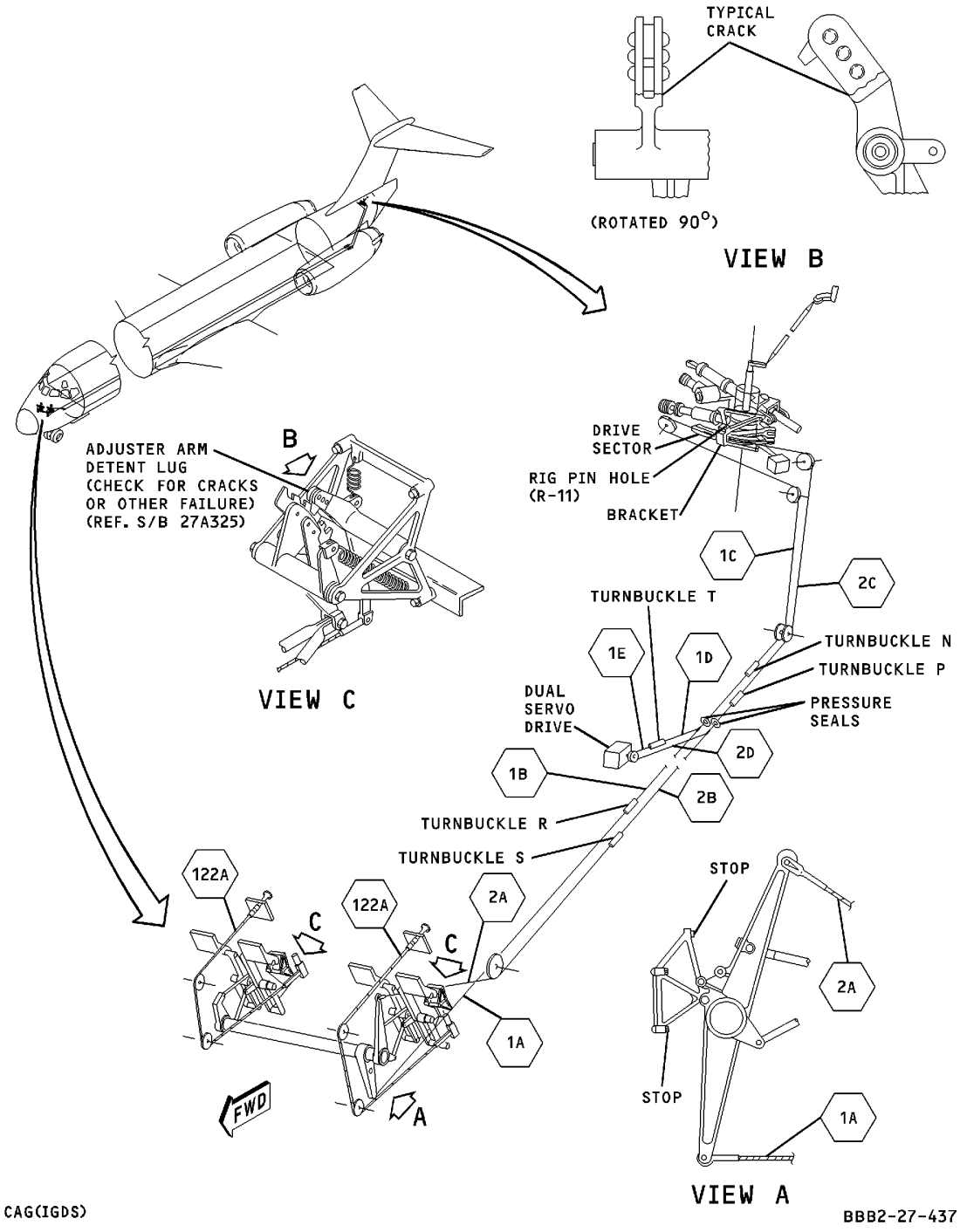
NOTE: Check for 3/32-inch, (2.382 mm) minimum clearance between control arms and 1/16-inch, (1.587 mm) minimum clearance between rudder control arm and bracket . (PAGEBLOCK 27-20-00/501)

(14) Install floor panels.

(15) Install pilot seats. (PAGEBLOCK 25-13-01/201)



Rudder Pedal Mechanism
Figure 201/27-20-12-990-801



Rudder Pedal Mechanism -- Adjuster Assembly
Figure 202/27-20-12-990-802

RUDDER PEDAL MECHANISM - INSPECTION/CHECK

1. General

A. This procedure contains task card data.

B. This procedure is a requirement of FAA AD 2001–24–27 (DC9–27A325R2).

TASK 27-20-12-250-801

2. Eddy Current Inspection of the Captain's and First Officer's Rudder Pedals Adjuster Hub

A. General

(1) This procedure is a requirement of FAA AD 2001–24–27 (DC9–27A325R2).

(2) Refer to FAA AD 2001–24–27 for terminating action.

B. Prepare for the Captain's and First Officer's Rudder Pedals Adjuster Hub Eddy Current Inspection

SUBTASK 27-20-12-020-001

(1) Remove captain's seat.

(2) Remove first officer's seat.

SUBTASK 27-20-12-010-001

(3) Remove access panels.

C. Captain's and First Officer's Rudder Pedals Adjuster Hub Eddy Current Inspection

SUBTASK 27-20-12-212-001

(1) Perform a visual inspection of the captain's rudder pedal adjuster hub. Refer to DC9-27A325 revision 2.

(2) Perform a visual inspection of the first officer's rudder pedal adjuster hub. Refer to DC9-27A325 revision 2.

SUBTASK 27-20-12-250-001

(3) Perform an eddy current inspection of the captain's rudder pedal adjuster hub. Refer to DC9-27A325 revision 2.

(4) Perform an eddy current inspection of the first officer's rudder pedal adjuster hub. Refer to DC9-27A325 revision 2.

D. Job Close-up

SUBTASK 27-20-12-410-001

(1) Install access panels.

SUBTASK 27-20-12-420-001

(2) Install captain's seat.

(3) Install first officer's seat.

SUBTASK 27-20-12-942-001

(4) Remove all the tools and equipment from the work area. Make sure the area is clean.

END OF TASK

RUDDER ACCUMULATOR CYLINDER - MAINTENANCE PRACTICES

1. General

A. The rudder accumulator cylinder (identified as transfer cylinder) is attached to a mounting plate on fuselage formers located in aft section of fuselage at lower right side of aircraft. Access to the accumulator is through an access door in fuselage pressure dome or through access door in the tailcone.

B. Access to rudder accumulator cylinder pressure gage and filler valve is through access door 5902C on right side of aft fuselage.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed item:

Table 201

Name and Number	Manufacturer
Pressure cylinder (compressed nitrogen)	

3. Servicing Accumulator

A. Checking Rudder Accumulator Cylinder for Service

(1) Depressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

(a) Move rudder hydraulic control lever on pedestal to MAN position.

(b) Place AUX hydraulic pump switch to OFF position.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(c) Make sure that this circuit breaker is open and has safety tag:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

(d) Relieve accumulator pressure by operating ventral stairway until there is no movement.

(2) Check accumulator pressure gage for proper service. Gage should read 1000(±50) psi, (6900(±345) kPa).

(3) Move rudder hydraulic control lever on pedestal to PWR position.

B. Recharging Accumulator Cylinder

(1) Remove cap from filler valve.

(a) If hydraulic fluid is seen to drip from the filler valve, ensure the drip rate is in limits for a dynamic seal under static conditions. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

(b) If the drip rate is out of limits, replace the accumulator. (Paragraph 4.)

(2) Attach nitrogen service hose chuck to filler valve.

(3) Loosen valve swivel nut a maximum of three-quarter turn.

(4) Charge accumulator with dry nitrogen to 1000(±50) psi, (6900(±345) kPa).

(5) Tighten swivel nut to torque of 50(±10) inch-pounds, (5.6(±1.12) N·m).

(6) Remove service hose.

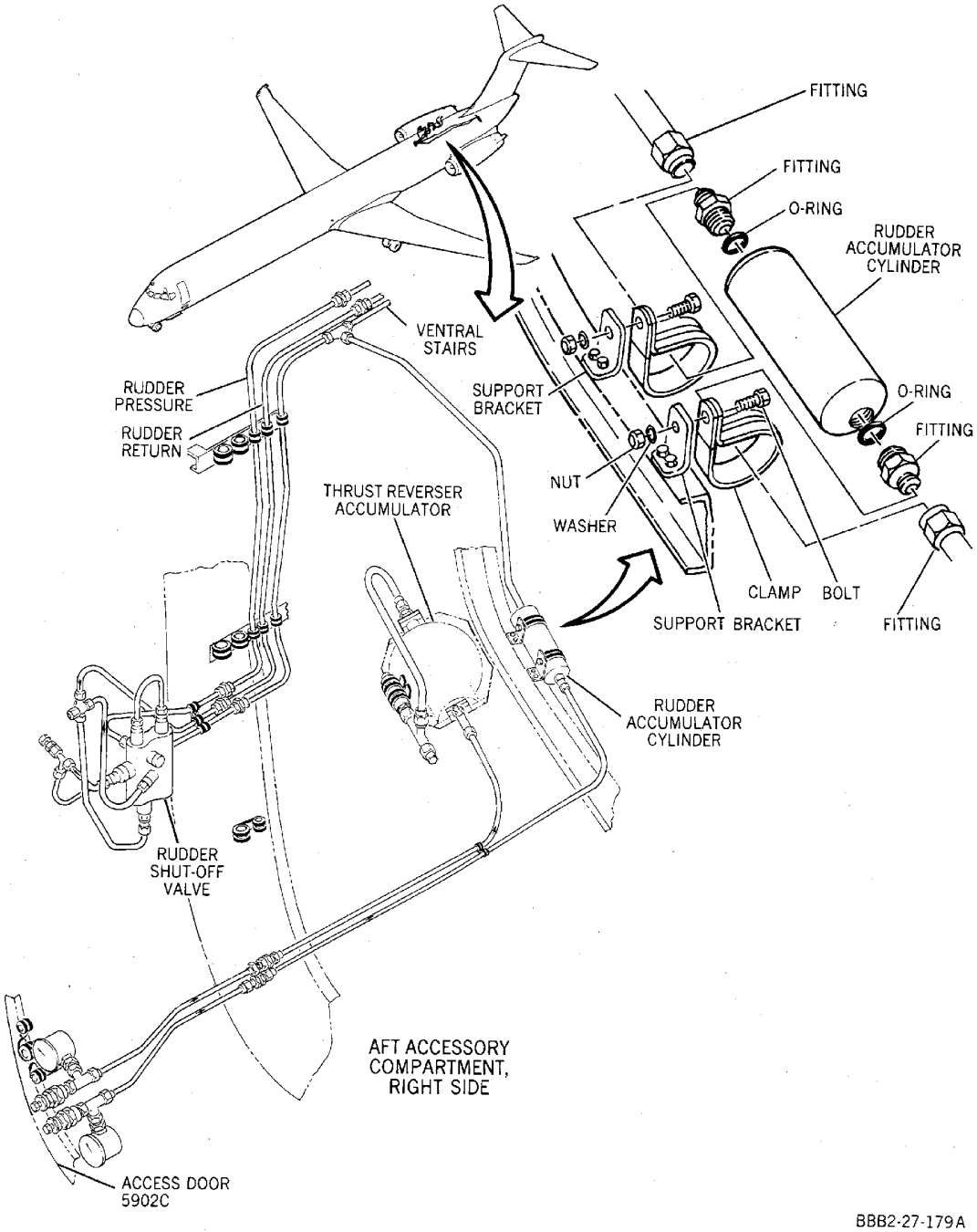
(7) Install valve cap; tighten cap to maximum fingertightness.

(8) Check for external nitrogen leakage after servicing.

(9) Remove the safety tag and close this circuit breaker:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C



Rudder Accumulator Cylinder -- Removal/Installation
Figure 201/27-20-15-990-801

4. Removal/Installation Rudder Accumulator Cylinder

A. Remove Accumulator Cylinder

(1) Depressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Remove filler valve cap.

WARNING: DO NOT PERMIT ANY PART OF BODY TO COME IN CONTACT WITH ESCAPING NITROGEN.

(3) Loosen valve swivel nut slightly until nitrogen can be heard escaping to relieve pressure charge from accumulator.

(4) Disconnect air line from accumulator. Cap or plug open air line.

(5) Disconnect hydraulic line from accumulator. Cap or plug open hydraulic line.

(6) Loosen or remove accumulator clamp bolts and remove accumulator.

NOTE: Maintain accumulator in upright position until fluid in upper chamber is drained.

(7) If required, remove fittings from ports of accumulator. Discard O-rings.

(8) Plug open ports on accumulator cylinder.

B. Install Accumulator Cylinder

(1) Make certain right hydraulic system is depressurized.

(2) If required, install fittings in ports of accumulator. Use new O-rings.

(3) Position accumulator in mounting clamps.

(4) Connect hydraulic line to accumulator.

NOTE: Both ends of accumulator are marked HYD. However, either end may be connected to the air line.

(5) Connect air line to accumulator.

(6) Tighten accumulator clamp bolts.

(7) Charge accumulator with dry nitrogen. (Paragraph 3.B.)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT ALL CONTROLS ARE IN THE CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR EQUIPMENT.

(8) Pressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING RUDDER PEDALS, MAKE CERTAIN THAT AREA AROUND RUDDER SURFACE IS CLEAR OF PERSONNEL AND EQUIPMENT.

(9) Move rudder pedals through full range of travel several times.

(10) Check accumulator, fittings and line connections for leakage.

(11) Shut off hydraulic pressure source.

RUDDER ACCUMULATOR CYLINDER - SERVICING

1. General

A. This procedure contains MSG-3 task card data.

TASK 27-20-15-614-801

2. Service the Rudder Accumulator to Proper Charge

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
29-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES

B. Tools/Equipment

Reference	Description
STD-3918	Pressure Source - Dry Nitrogen, 0 to 5000 psi (0 to 3447 kPa)

C. Prepare to Service the Rudder Accumulator to Proper Charge

SUBTASK 27-20-15-010-001

(1) Open access door.

SUBTASK 27-20-15-864-001

(2) Depressurize right hydraulic system. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

(a) Move rudder hydraulic control lever on pedestal to MAN position.

(b) Place auxiliary hydraulic pump switch to OFF position.

SUBTASK 27-20-15-865-001

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(3) Open this circuit breaker and install safety tag:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

SUBTASK 27-20-15-840-001

(4) Relieve accumulator pressure by operating ventral stairway until there is no movement.

SUBTASK 27-20-15-212-001

(5) Check accumulator pressure gage for proper service. Gage should read 1000 ±50 psi (6895 ±345 kPa).

SUBTASK 27-20-15-840-002

(6) Move rudder hydraulic control lever on pedestal to PWR position.

D. Service the Rudder Accumulator to Proper Charge

SUBTASK 27-20-15-030-001

(1) Remove cap from filler valve.

(a) If hydraulic fluid is seen to drip from the filler valve, ensure the drip rate is in limits for a dynamic seal under static conditions (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

(b) If the drip is out of limits, replace the accumulator.

SUBTASK 27-20-15-490-001

(2) Attach nitrogen service hose chuck to filler valve.

SUBTASK 27-20-15-030-002

(3) Loosen valve swivel nut a maximum of three-quarter turn.

SUBTASK 27-20-15-614-001

(4) Charge accumulator with 0 to 5000 psi (0 to 3447 kPa) dry nitrogen pressure source, STD-3918 to 1000 ±50 psi (6895 ±345 kPa).

SUBTASK 27-20-15-220-001

(5) Tighten swivel nut to torque of 50 ±10 in-lb (5.65 ±1.13 N·m).

SUBTASK 27-20-15-090-001

(6) Remove service hose.

SUBTASK 27-20-15-430-001

(7) Install valve cap; tighten cap to maximum finger tightness.

SUBTASK 27-20-15-790-001

(8) Check for external nitrogen leakage after servicing.

Remove the safety tag and close this circuit breaker:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

E. Job Close-up

SUBTASK 27-20-15-942-001

(1) Remove all the tools and equipment from the work area. Make sure the area is clean.

SUBTASK 27-20-15-410-001

(2) Close access door.

END OF TASK

ELEVATOR AND TAB - DESCRIPTION AND OPERATION

1. General

A. Longitudinal control is provided by the elevator, elevator control tab, and elevator control system. Elevator positioning is accomplished by a combination of mechanical and hydraulic systems. The mechanical system positions the control tab through its full range of travel and aerodynamic force acting on the control tab moves the elevator. The hydraulic system supplements the mechanical system to drive the elevator in a down direction only when 10 degrees or more of control tab movement is required to move the elevator downward.

B. The system consists of an elevator, control tab, geared tab, anti-float tab, two-way cable system, control column, and damper for each side of the airplane; a variable load-feel and centering spring mechanism connected to the right control column; and an elevator power control mechanism in the horizontal stabilizer center section. The elevator power control mechanism consists of a control valve, follow up linkage and boost cylinder for each elevator; pressure switch and indicating light, an accumulator in the pressure line; a return relief valve, and a pressure bypass valve.

C. The elevator control system is operated by the control columns in the flight compartment. The control columns are inter-connected so that the left and right side of the system work in unison. Control column movement is transmitted through the two-way cable systems to the control tab drive sectors and torque tubes in the horizontal stabilizer center section. Rotation of the drive sectors and torque tubes moves mechanical linkage to the control tabs. Movement of the linkage changes the position of the tab and affects aerodynamic force acting on the tab which moves the elevator. Left and right elevator surfaces are not interconnected.

D. The elevator power control mechanism is connected to the control tab drive sector torque tube by the following mechanism. Movement of the sector and control tab linkage is transmitted to the power control valve and positions the valve to apply pressure to the elevator boost cylinders. Hydraulic pressure is supplied to the power control mechanism by the left hydraulic system. Return pressure is maintained at 90-120 psi, (621 to 828 kPa) by the return relief valve. Power operation of the elevator is indicated in the flight compartment by the indicating light located on the overhead panel. The light is actuated by the pressure switch installed in the control pressure line to the boost cylinder.

E. A variable load-feel mechanism in conjunction with the load-feel and centering spring mechanism provides a simulated feel for the control system and returns the control column to neutral when released from an off neutral position. The mechanism is attached to the lower end of the right control and to the adjacent structure.

F. Dampers in the leading edge of the elevator, combined with the elevator power control boost cylinders, prevent elevator flutter during flight and resist rapid movement of the elevators caused by gusty winds while on the ground. One damper is installed on each side.

2. Component Description

A. Elevator (Figure 1)

(1) The elevators are movable airfoil shaped panels that control the airplane about the pitch axis. The elevators are mounted independently on truss-type brackets which are attached to the horizontal stabilizer rear spar. The hinges incorporate roller-type bearings which may be replaced without removing the elevator. Each elevator has a control tab, geared tab, and anti-float tab located in the trailing edge.

(2) Full range of travel of the elevator is from 27 degrees up to 16 1/2 degrees down from a position faired with the horizontal stabilizer. Adjustable stops are provided at the inboard end of the elevator, and the horizontal stabilizer center section, for setting elevator throw limits. Elevator travel may be measured linearly when the horizontal stabilizer is in the neutral position, by measuring the distance between the center of the elevator inboard trailing edge and the center of a protruding rivet head in the vertical fin.

B. Control Tab

(1) The control tabs are movable airfoil panels, located in the inboard trailing edge section of the elevator and are used to control the position of the elevator. The tabs control air pressure distribution on the elevator surface which causes the elevator to deflect. Each tab is mass balanced to prevent flutter. Control tabs can be interchanged without rebalancing the elevator.

(2) Tab movement is opposite to direction of elevator movement. Travel range of the control tabs, with the elevator in the neutral position, is 20 degrees (0.349 rad) up to 26 degrees (0.454 rad) down from the faired positions; minimum of 15 degrees (0.262 rad) up from faired position when the elevator is 16 1/2 degrees (0.288 rad) trailing edge down; and minimum of 24 degrees down from the faired position when the elevator is 27 degrees (0.471 rad) trailing edge up. Nonadjustable stops are provided on the control tab actuating crank to prevent over travel in either direction. Tabs are adjusted to the faired position. Angular displacement is measured with a protractor held at rigging reference lines on the surfaces. Refer to GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201.

C. Geared Tab

(1) The geared tabs are airfoil-shaped panels located in the elevator trailing edge, outboard of the control tabs. Their purpose is to assist in movement of the elevator. The geared tabs are directly linked to the stabilizer rear spar so that when the elevator moves, tabs are driven in the opposite direction. Geared tabs can be replaced without rebalancing the elevator.

(2) Travel range of the geared tabs is from 4 3/4 degrees (0.083 rad) up from faired position when the elevator is 16 1/2 degrees (0.288 rad) trailing edge down, to 27 3/4 degrees (0.484 rad) from faired position when the elevator is 27 degrees (0.471 rad) trailing edge up. The tab is adjusted to the faired position. Angular displacement is measured with a protractor held at rigging reference lines on the surfaces.

D. Anti-Float Tab

(1) The anti-float tabs are located in the elevator trailing edge, outboard of the geared tabs. Their purpose is to prevent down-float of the elevators when the horizontal stabilizer position is greater than 10 degrees (0.175 rad) aircraft noseup. The anti-float tabs are linked directly to the horizontal stabilizer and movement is programmed to stabilizer position.

(2) The anti-float tabs remain faired with the elevators until the horizontal stabilizer reaches 10 degrees (0.175 rad) aircraft noseup, the stabilizer linkage will then drive the anti-float tabs from the faired position to 26.25 degrees (0.458 rad) trailing edge down during the last 2.2 degrees (0.038 rad) of stabilizer travel.

E. Elevator Load-Feel and Centering Spring Mechanism

(1) The load-feel and centering mechanism is a spring-loaded cylinder device used to provide a synthetic feel in the control system, and to return the control columns to neutral position when released from an off neutral position. The unit consists of an inner and outer housing a large and small spring and an adjustable eyebolt.

(2) The unit is located at the lower end of the right control column. The aft end is attached to a crank on the variable load-feel mechanism. The forward end is attached to the adjacent structure by the fixed end fitting on the outer housing.

F. Variable Load-Feel Mechanism

(1) The variable load-feel mechanism provides the means for varying the synthetic load-feel in the elevator control system by increasing or decreasing the spring force of the elevator load-feel and centering spring. The mechanism consists of three cranks and a screwjack actuator, all mounted in a support bracket. The actuator is operated by two cables connected to the horizontal stabilizer trim cable system. Movement of the horizontal stabilizer, in either the airplane noseup or nosedown direction, will extend or retract the actuator screwjack repositioning a crank in the mechanism the crank, in turn, will reposition a crank connecting the load-feel and centering spring to the mechanism, thus increasing or decreasing the spring force of the load-feel spring. A pushrod connected to a crank in the mechanism and to the elevator control column transmits the load-feel to the control column.

(2) The variable load-feel mechanism is located at the lower end of the right elevator control column.

G. Elevator Power Control Followup Mechanism

(1) The elevator power control followup mechanism provides the means for opening and closing the hydraulic control valves. The mechanism opens the valves to apply pressure to the elevator boost cylinders when 10 degrees or more of tab is required to drive the elevators in a down direction only, and closes the valves when the desired degree of elevator movement is reached. The mechanism consists of the torque tube crank, a followup balance link, control valve pushrod, and an elevator followup pushrod, located in the aft inboard section of the left and right side of the horizontal stabilizer.

(2) The torque tube crank is connected to the end of the elevator control tab sector torque tube. The followup balance link is connected to the torque tube crank, the control tab pushrod, the control valve pushrod, and the elevator followup pushrod. The followup balance link is the prime link between the mechanical control and the hydraulic control of the elevator. The link determines the amount of initial travel of the control valve pushrod to open the control valve, and coupled with the elevator followup push-rod, produces the followup action to shut off the control valves when the selected degree of elevator throw is reached.

H. Elevator Power Control Valve (Figure 2 or Figure 3)

(1) The elevator power control valves are spring-loaded slide and body assemblies used to apply pressure to the elevator boost cylinders. The body of each valve has a system pressure inlet port, a pressure outlet port, and a return pressure inlet port. The slides are spring-loaded to the neutral position and are designed to provide open paths between the return pressure inlet port and the pressure outlet port except when the valve is in the tab up position.

(2) The valves are located in the aft inboard section of the horizontal stabilizer, on the left and right sides of the airplane. Each valve is controlled mechanically through its respective followup mechanism. The valves are connected in series to prevent an erroneous demand, of a single control valve, from actuating the cylinders and elevators, and protects the elevator system against malfunction caused by a single control valve sticking in the open position.

I. Elevator Power Control Boost Cylinder

(1) The elevator power control boost cylinders provide the means for driving the elevators in a downward direction when the elevator power control mechanism is actuated. The cylinders are located at the No. 2 elevator hinges, on each side of the airplane, and are attached to the horizontal stabilizer rear spar at one end and to a fitting in the elevator leading edge at the other end.

(2) Each boost cylinder consists of a body, a double rod piston, and an internal relief valve. The body of the cylinder has two ports which are located at opposite sides of the piston.

(3) The internal bleed relief valve is built into the piston rod and set at 2300 psi, (15870 kPa). The valve protects the system from excessive pressure and, provides a means for bleeding air from the elevator power control mechanism components and lines.

J. Elevator Return Relief Valve

(1) The elevator return relief valve is a spring-loaded hydraulic valve set to retain 90-120 psi, (621 to 828 kPa) in the elevator power control mechanism return lines. The valve allows return fluid to be directed to the left hydraulic system reservoir.

(2) The relief valve consists of a body, coupler, slide, spring, cam, handle, and tubular plug. The coupler is located at the inlet end of the valve and connects the valve to the power mechanism return line. The slide and body are lapped to allow fluid to flow through the valve when the slide is displaced, and to retain pressure in the return lines when the slide is seated. The slide is positioned in the body at one end by hydraulic pressure entering the inlet port, and at the opposite end by the force exerted by the spring. The spring is held in the body by the tubular plug. The plug serves as a spring guide and also directs fluid through the valve to the outlet port. The cam and handle are provided to displace the slide manually when depressurization of the return lines is required.

K. Elevator Power Control Pressure Accumulator

(1) The hydraulic pressure accumulator is installed in the lower right side of the fuselage aft section. The accumulator provides a reserve supply of hydraulic pressure for use in the elevator power control mechanism after power shutoff or main system failure. The accumulator also dampen surges in the system caused by pressure fluctuations. The accumulator is isolated from the rest of the system by check valves to prevent bleedoff. The accumulator is installed in the pressure line and stores pressure for actuating the elevator power control mechanism.

(2) The accumulator is a spherical-shaped container which is composed of two chambers separated by a synthetic diaphragm. The accumulator is equipped with a filler valve and direct-reading pressure gage. The lower chamber of the accumulator is inflated with dry nitrogen through the filler valve. The upper chamber stores hydraulic fluid under pressure. The gage is connected to the lower chamber and indicates accumulator pressure.

L. Elevator Dampers

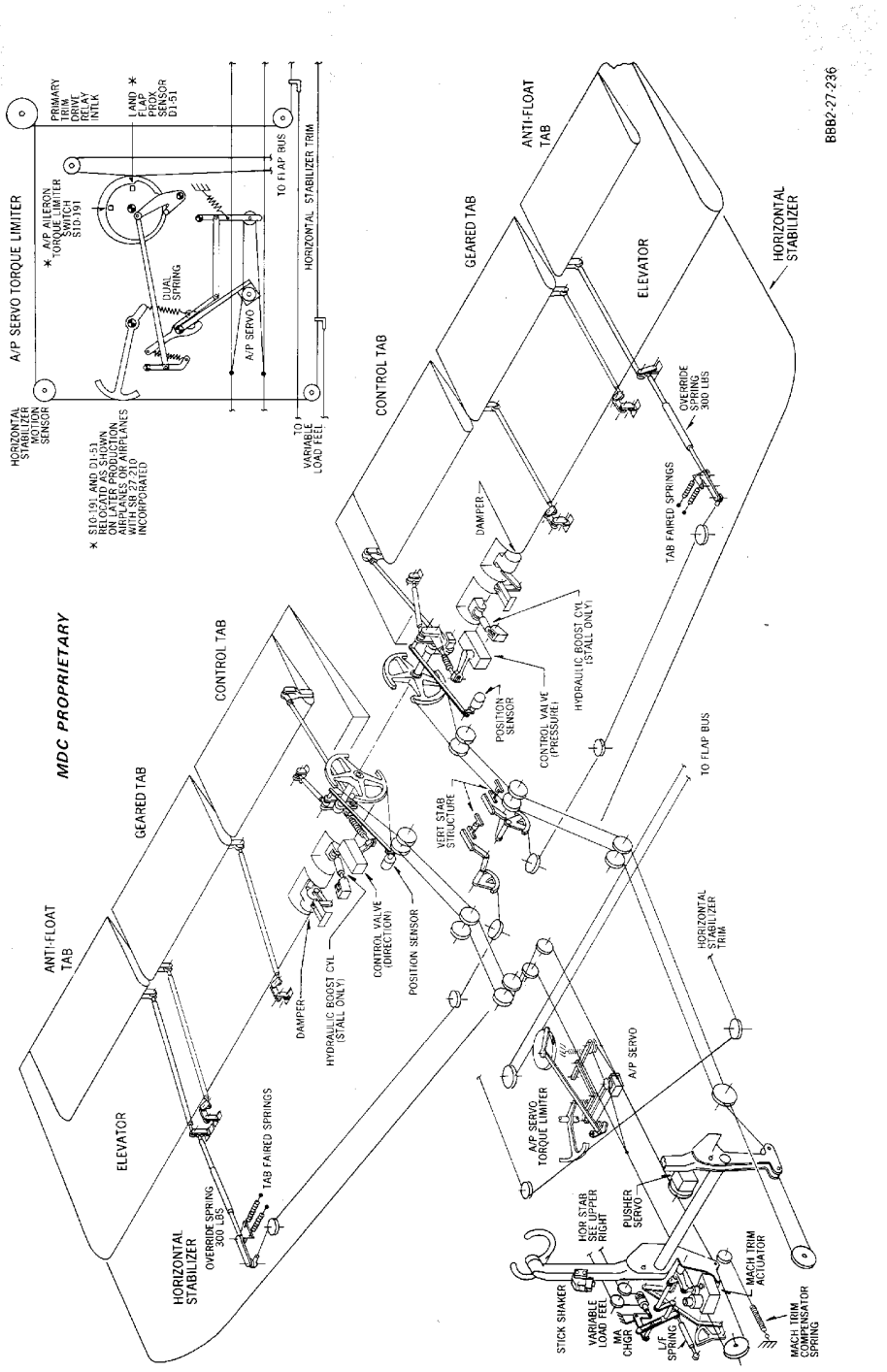
(1) A viscous damper is installed in each elevator leading edge section outboard of the No. 2 hinge. The purpose of the damper is to prevent elevator flutter during flight and also dampen rapid movement of the elevator caused by gusty winds, when the airplane is on the ground. The elevator and aileron dampers are interchangeable, the only difference being the method of installation.

(2) Each damper consists of a housing, six bimetal rotors, three stators, two spacers, a drive shaft, and bearings. The rotors are attached to the drive shaft which is installed in bearings in the housing. Stators are positioned between rotors and secured to the housing with pins. Spacers separate the center and outer sets of rotors and stators. The housing has a filler port on the side and is filled with thick silicone fluid. An arm on the drive shaft has two holes for attaching the connecting linkage. When the damper is used as an elevator damper, a link from a bracket on the horizontal stabilizer rear is connected to the hole at the end of the arm.

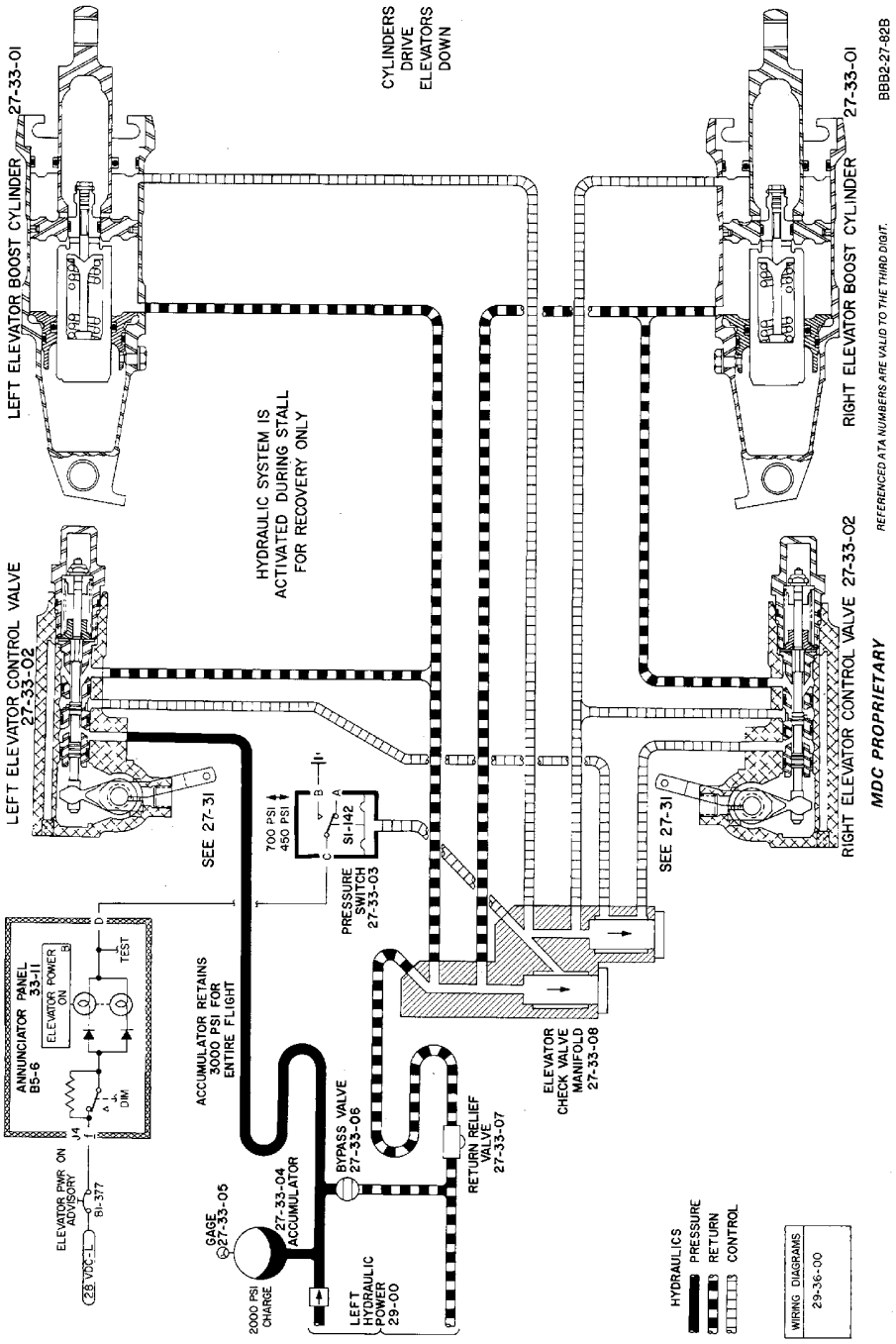
M. Elevator Power Control Pressure Bypass Valve

(1) The elevator power control pressure bypass valve, located in lower right side of the aft section of the fuselage, is installed in the system downstream of the pressure accumulator.

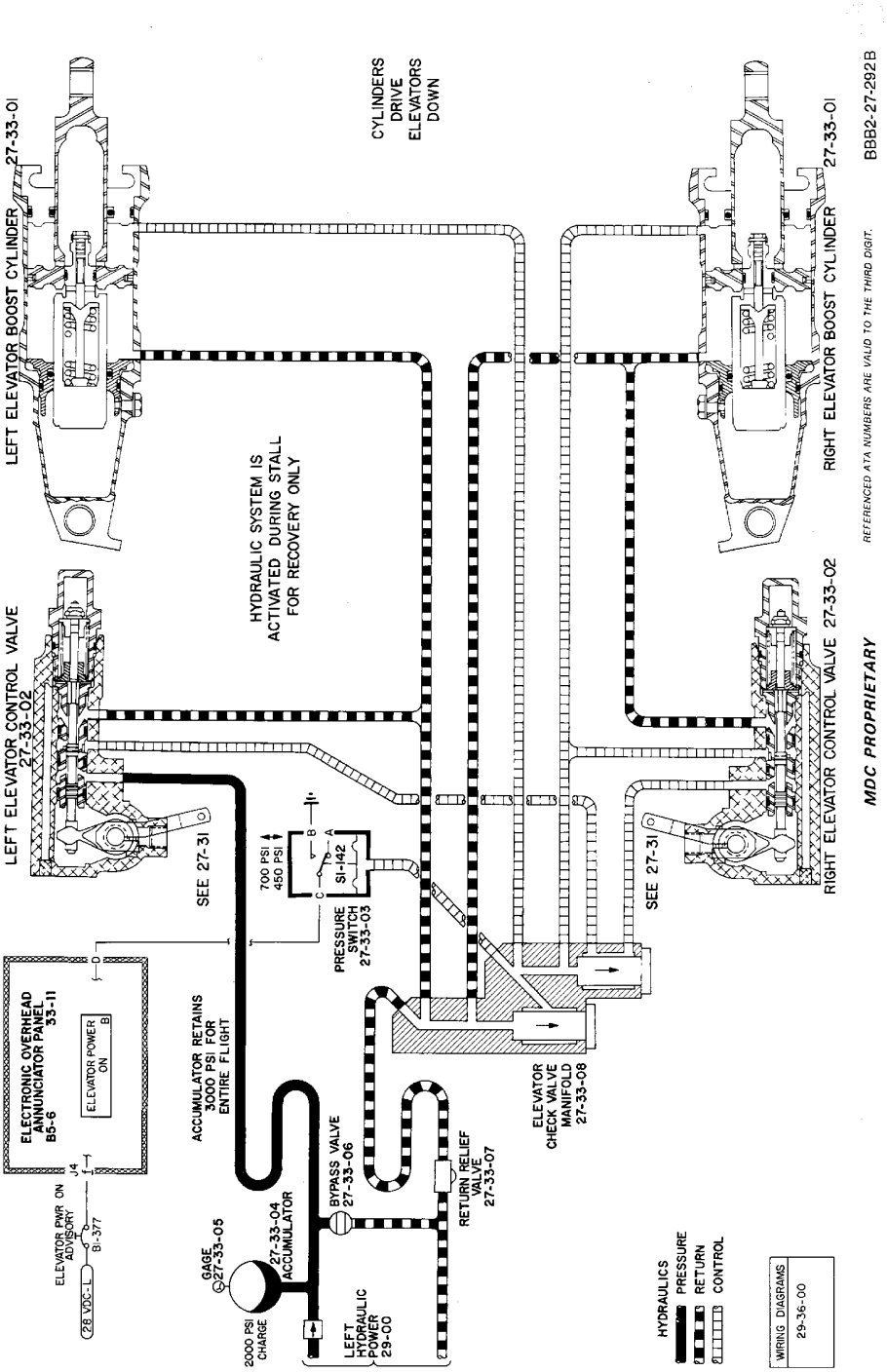
(2) The valve is used to depressurize the hydraulic components of the elevator power control mechanism during maintenance. Turning the valve handle to the open position allows system pressure to be bypassed back to the reservoir.



Elevator and Tab Control System -- Schematic
Figure 1/27-30-00-990-801



Elevator Power Control Hydraulic System -- Schematic
Figure 2/27-30-00-990-803



Elevator Power Control Hydraulic System -- Schematic
Figure 3/27-30-00-990-804

3. Operation

A. Elevator Control System (Figure 1 and Figure 2 or Figure 3)

(1) Forward and aft movements of the control column are transmitted through cable systems to the elevator control tab drive sectors and torque tubes, which in turn move control tab pushrods and elevator power control followup mechanism linkage. Movement of the tab pushrods changes the position of tabs. Aerodynamic force acting on the tabs move the elevators. Changes of elevator position relative to the horizontal stabilizer causes the geared tab linkage to move the geared tab in the same direction as the control tab. This action provides additional aerodynamic assistance to move the elevator in controlling the airplane about its pitch axis. When the horizontal stabilizer is positioned greater than 10 degrees (0.175 rad) aircraft noseup, linkage from the horizontal stabilizer to the elevator anti-float tabs drives the tabs, trailing edge, down thus preventing elevator down-float.

(2) Forward movement of the control column of sufficient travel to move the control tabs 10 degrees (0.175 rad) or more, will cause the elevator power control mechanism linkage to actuate the hydraulic control valves to the tab up position. Pressure is applied to the boost cylinders, driving the elevators downward. Movement of the elevator is transmitted through the followup linkage which returns the control valve to neutral position, when the elevator reaches the desired position.

(3) Since left and right elevator surfaces are not interconnected, an asymmetric condition of the surfaces is possible during airplane ground operations. Opposite deflection of elevator surfaces is sometimes caused by gusting tail or cross winds. This condition may result in blocked operation of the elevator control column. Elevator surfaces can be freed by: (1) Heading aircraft into wind or taxiing aircraft and simultaneously applying force to the control column; or (2) manually moving elevator control surfaces to the faired position.

B. Elevator Power Control Valves

(1) The control valves are spring-loaded in the neutral position. When both control valves are in the tab up position, system pressure enters the pressure inlet port in the left control valve, passes through the outlet port, the valve interconnect piping and right control valve, to the down side of the boost cylinders causing differential pressure in the cylinder.

C. Elevator Power Control Boost Cylinders

(1) When both sides of the boost cylinders are pressurized equally, the piston and rod in the cylinder follow the movement of the elevator. Pressure in the cylinders resists rapid movement of the piston causing the boost cylinders to serve as dampers to assist the viscous dampers in suppressing flutter during flight and rapid movement of the elevator, caused by gusty winds on the ground. When the control valves direct pressure to the down side of the boost cylinders, the increased pressure on one side of the piston moves the piston and rod to drive the elevator. Fluid in the opposite side of the cylinder is directed to the return line.

(2) Pressure in excess of 2400 psi, (16560 kPa) in the down side of the cylinders unseats the internal bleed relief valve in the actuating rod, and allows the pressure to pass through the rod into the opposite side of the cylinder and to the return line.

D. Elevator Power Control Pressure Switch and Indicating Light

(1) Pressure to the down side of the elevator boost cylinders enters the inlet port of the pressure switch and forces the piston against the actuating spring mounting plate. When the spring force is overcome, the piston moves the actuating pin against the electrical switch, closing the contacts in the switch to complete a circuit to the indicator light on the overhead panel in the flight compartment. Tension of the actuator spring is bench-adjusted so that not more than 700 psi, (4850 kPa) is required to operate the switch and hold the circuit closed until pressure drops to 450 (+100, -50) psi, (3105 (+690, -345 kPa)).

E. Load-Feel and Centering Spring Mechanism

(1) Movement of the control column through the variable load-feel mechanism moves the load-feel and centering spring shaft, and compresses the small spring in the mechanism until the force overcomes the large spring. The point at which the small spring force overcomes the large spring is dependent upon horizontal stabilizer positioning of the variable load-feel mechanism. At this point, the inner housing moves and causes the retainers and sliders to compress the large spring. The resistance of the springs increases as the mechanism is moved away from the neutral position. However, the rate of resistance decreases as the control column moves further from neutral position and prevents excessive column loads. This provides the simulated feel in the control system. When the deflecting forces are relieved from the control column, the springs extend to the stops and return the mechanism and control column to neutral.

F. Variable Load-Feel Mechanism

(1) The variable load-feel mechanism receives its input from horizontal stabilizer positioning. Two cables on the jack-screw actuator cable drum are connected to the horizontal stabilizer trim cables. Movement of the horizontal stabilizer is transmitted, through the cable system, to the actuator extending or retracting the jackscrew to position the cranks connected to the load-feel spring shaft so that the point at which the small spring, in the load-feel spring unit, overcomes the large spring varies.

G. Dampers

(1) When the elevator is moved, the drive shaft of the damper is rotated, moving the rotors in the silicone fluid. The stators and fluid resist movement of the rotors. The force necessary to rotate the drive shaft is equal to the internal resistance of the damper and is proportional to the speed of the motion. The more rapid the motion, the greater the resistance that is applied to the rotors. Normal movement of the elevator is slow and is opposed with little resistance. Rapid movement caused by gusty winds or flutter is met with greater resistance.

H. Servo Force Limiter

(1) The servo force limiter is a double spring assembly connecting the elevator servo, horizontal stabilizer followup system, and flap bus system. It provides a method of limiting the torque applied by the servo to the elevator system with reference to horizontal stabilizer and flap position. When spring breakout force is greater than force required to move the elevator control cables, an input to the servo will be transmitted without hesitation to the control tabs. When spring breakout force is less than force required to move the control cables, an input to the servo will cause a walking effect between the servo drum and the cables. This will have a damping effect on a hardover input to the servo. The damping will prevent abrupt movement of the elevator tabs. As the horizontal stabilizer is moved in the aircraft noseup direction, spring breakout force will increase. As the horizontal stabilizer is moved from aircraft noseup to aircraft nosedown position, spring breakout force will decrease. This decrease will continue until stop bolt contacts stop pad. Continued movement of horizontal stabilizer in this direction will have no effect on spring breakout force. As the flaps are extended, spring breakout force will increase and be fully implemented as the flaps pass 35 degrees. As the flaps retract, spring breakout force will decrease as the flaps pass 35 degrees and continue to decrease until stops contact, then further retraction offlaps will have no effect on spring breakout force. In addition an augmentor is installed in conjunction with the elevator servo force limiter. The augmentor allows a bridle cable to be routed from the same side of the elevator servo drum. This routing acts to equalize the breakout force of the bridle cables. It also acts to prevent slack in the bridle cables when the servo has reached a hardover condition.

ELEVATOR AND TAB - TROUBLE SHOOTING

1. General

A. Trouble shooting the elevators and tabs is accomplished initially by determining whether the trouble exists in the cable system, mechanical control system, the tab control system, load feel mechanism system, or mach trim compensator system.

B. If trouble shooting a system indicates that adjustment or replacement of components is required, or that cable tensions require adjustment, that segment of the system containing the components or cable must be completely adjusted. (ELEVATOR AND TAB - ADJUSTMENT/TEST, PAGEBLOCK 27-30-00/501)

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 101

Name and Number	Manufacturer
Oil, aerosol (MIL-VV-L-800) DPM 5481-1	Zip-Chemical Products A Division of ANDPAK San Jose, CA

3. Trouble Shooting

A. Use the following table to trouble shoot the elevator and tab.

Table 102

Possible Causes		Isolation Procedure	Correction
A.	AUTOPILOT WILL NOT MAINTAIN PITCH CONTROL; EXCESSIVE PLAY OR LOST MOTION IN CONTROL COLUMN; POOR CENTERING OF CONTROL COLUMN		
(1)	Excessive friction in mechanical control system	Check for defective bearings on tab control sector torque tube. Check elevator control system for excessive friction (Ref. Page 601).	Adjust or replace parts as necessary.
(2)	Binding control surfaces	Rotate elevator slowly by hand from stop to stop and check for binding or interference or torque shafts in stabilizer stubs. Check tabs for structural binding or interference. Check tab pushrods and linkage for binding or interference.	Correct and replace parts as necessary.
(3)	Neutral surfaces out of rig	Check that control tab is faired with elevator within 0(±1/4) degree, when control column and elevator are in neutral position.	Rig elevator system.

Table 102 (Continued)

Possible Causes		Isolation Procedure	Correction
(4)	Excessive looseness of surfaces	Check all surfaces for looseness. Maximum allowable looseness at trailing edge of geared tab is 1/32 inch, (.792 mm). Maximum allowable looseness of control tab is 3/64 inch (1.188mm) and antifloat tab is 1/16 inch, (1.587mm). Maximum allowable looseness of elevator is 3/16 inch, (4.762mm).	Replace worn bearings, bolts, or parts as necessary.
		Check system cables for proper tension. Check rigging position of elevator autopilot servo.	Rig cables for standard load. Position auto pilot servo correctly.
B.	CONTROL COLUMN CHATTER		
WARNING: LUBRICANT IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN LUBRICANT IS USED. • CLOSE THE CONTAINER WHEN NOT USED. • DO NOT GET THE LUBRICANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.			
WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR: • MORE PRECAUTIONARY DATA • APPROVED SAFETY EQUIPMENT • EMERGENCY MEDICAL AID. TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.			
(1)	Load-feel spring cartridge lacks lubricant	Disconnect load feel spring cartridge from variable load feel mechanism and determine if chatter stops	If chatter stops, spray lubricant (MIL-VV-L-800) into load feel spring cartridge through 1/4 inch hole in cart ridge housing. Reconnect cartridge. If lubrication fails to eliminate chatter, replace load feel spring cartridge.
C.	LOW COLUMN FORCES AROUND NEUTRAL POSITION; INADEQUATE MACH TRIM COMPENSATOR		
(1)	Load-feel mechanism improperly adjusted with respect to control column	Move right control column forward, then allow column to move aft slowly until it stops. Check that control column is in neutral position.	Adjust load feel mechanism shaft.
(2)	Control tabs improperly adjusted	Check that tabs are in neutral position when control column and elevator are in neutral position.	Adjust tabs.

Table 102 (Continued)

Possible Causes		Isolation Procedure	Correction
(3)	Mach trim system improperly adjusted	With actuator in operational extend position and control column at neutral, measure horizontal forward force at centerline of control wheel. Force should be approximately 18 pounds, (8.164 kg. With actuator in operational retract position, control column should reposition at neutral (so that rig pin can be freely inserted) with no measurable force at centerline of control wheel.	Adjust Mach trim system.
D.	CONTROL COLUMN FORWARD AND AFT MOTION BLOCKED		
(1)	Asymmetric condition of elevator surfaces	Visually check elevator surfaces for opposite deflection.	Head airplane into wind or taxi airplane while applying force to control column or manually move elevator control surfaces to faired position.

ELEVATOR AND TAB - ADJUSTMENT/TEST

1. General

A. If only part of this system has been disturbed, perform the applicable procedures described in the succeeding paragraphs. Adjustment/test procedures must be made with the horizontal stabilizer in the neutral position. The horizontal stabilizer is in the neutral position when the centers of two protruding rivet heads on the left hand inboard leading edge of the horizontal stabilizer line up with the center of the protruding rivet head on the vertical fin. Rivets are identified by a circle and crossline target.

B. The elevators are in neutral position when, with the horizontal stabilizer in neutral position, the center of the aft inboard edge of each elevator lines up with the center of a protruding head rivet in the vertical fin. Alignment rivet is identified by a circle and crossline target.

C. A rig pin hole in the lower end of the left control column is used to establish control column neutral position. Rig pin holes in the left and right elevator control tab sectors and sector guard pin brackets are used to adjust control cable tension and control tab neutral position. The elevator control tab sectors and sector guard pin brackets are located in the horizontal stabilizer center section. Rig pins should always be installed and removed without force.

D. Tab angular deflections are measured with a rigging protractor held at rigging reference lines as described in GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201.

E. Numbers in parentheses in the following text correspond to callouts in Figure 501, Figure 503 and Figure 506.

F. The numbers and letters encircled by the hexagonal shaped symbol shown in the adjustment diagram correspond to cable run numbers in the segments listed at the end of this section. Each cable run number is posted adjacent to the corresponding cable in the airplane.

WARNING: THE SAFETY BELT LUG DOES NOT MEET CURRENT FALL PROTECTION REQUIREMENTS. DO NOT USE THE SAFETY BELT LUG FOR FALL PROTECTION. OTHER METHODS MUST BE USED TO ENSURE ADEQUATE FALL PROTECTION.

G. A safety belt attachment lug is located on top of vertical stabilizer for use by personnel performing maintenance on elevator power control and actuating mechanisms.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 501

Name and Number	Manufacturer
Rigging protractor (5916715)	Douglas Aircraft Co.
Linear servo actuator line test set (5916816)	Douglas Aircraft Co
Special tool (Figure 503)	
Push-pull scale	John Chatillon & Son
Tensiometer	Pacific Scientific Co.

Table 501 (Continued)

Name and Number	Manufacturer
Door safety locks 3936851-1 or -501 as applicable. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co
Protractor	
Elevator servo- actuator tester	Local fabrication (Figure 508)
Elevator Servo Force Limiter Drum Fixture (5961707)	Local fabrication (Figure 509)
Rig pins (2) (R-2) 3/8 by 10 1/2 (9.525 x 266.7 mm)	Douglas Aircraft Co.
Tensioner Control Cable (1/16 to 3/8) inch (1.587 to 9.525 mm) (5954644-1, -503, -505)	Douglas Aircraft Co.
Rig pin (6-5) 3/8 by 5 5/8 (9.525 x 142.875 mm)	Douglas Aircraft Co.
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch), (15.875 mm).	
Lockwire, NASM20995N32, DPM684*[1]	Not specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Adjustment/Test Elevator and Tab

NOTE: If adjustment of mach trim compensator and linkage Paragraph 3.J. is required, it must be accomplished prior to adjusting elevator controls, (Paragraph 3.A.) through (Paragraph 3.I.).

A. Adjust Control Column (Figure 501)

(1) Make certain horizontal stabilizer and elevators are in neutral position. (Paragraph 1.A.) (Paragraph 1.B.)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A

(Continued)

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED.

(3) Each system must be depressurized separately.

(4) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(5) Move control column aft until dimensions between rig pin hole (R-1) in control column and rig pin hole (R-1) in structure is 5 1/8(±1/32) inches, (130.175(±.793) mm). Adjust stop (10) to contact stop pad on control column crank.

NOTE: Stops are located on left control column only. Access to control column stops and rig pin holes is through electrical/electronics compartment.

(6) Move control column forward until dimension between rig pin hole (R-1) in control column and rig pin hole (R-1) is 3 1/16(±1/32) inches, (77.787(±.792) mm). Adjust stop (11) to contact stop pad on control column crank.

NOTE: This is a preliminary adjustment of stop (11). Further adjustment may be necessary to meet requirements of elevator and tab system test. (Paragraph 3.M.)

B. Adjust Left Cable System

NOTE: Access to lower end of left control column for rig pin installation is through the electrical/electronics compartment. Access to elevator control tab sector and sector guard pin bracket for rig pin installation is through top of vertical fin.

(1) Place control column in neutral position and install rig pin (6-5) in rig pin hole (R-1) in lower end of left control column.

(2) Adjust turnbuckles (1) and (2) until tension is between minimum and maximum load per cable tension table for 1/8-inch (3.175 mm) cable. (Figure 502 (Sheet 1))

(3) Differentially adjust turnbuckles (1) or (2) to permit easy removal and installation of rig pins (R-2) in rig pin holes (R-2) through elevator control tab sectors (3).

NOTE: The left sector is to be adjusted to align the sector with the forward rig pin bracket.

(4) Remove rig pins (R-2) and (6-5).

(5) Safety turnbuckles with clips.

C. Adjust Right Cable System

NOTE: Access to lower end of left control column for rig pin installation is through the electrical/electronics compartment. Access to elevator control tab sector and sector guard pin bracket for rig pin installation is through top of vertical fin.

(1) Place control column in neutral position and install rig pin (6-5) in rig pin hole (R-1) in lower end of left control column.

(2) Place elevator control tab sector (3) in neutral position and install rig pins (R-2) in rig pin holes (R-2).

NOTE: The right sector is to be adjusted to align the sector with the aft rig pin bracket.

(3) With cables 5D, 5E, 6D, and 6E connected, adjust turnbuckles (8) and (9) so that cable 5B/6B tension aft of cable 5D/6D splice is between minimum and maximum load per cable tension table for 1/8 inch (3.18 mm) cable. (Figure 502 (Sheet 1))

NOTE: Access to turnbuckles (8) is through forward cargo compartment ceiling panel 5154C; and turnbuckles (9) is through ceiling panel 5910A in ventral stairway compartment.

NOTE: Tension in cables 5A, 5D, 5E, 6A, 6D, and 6E is determined by servo override springs attached to servoactuator bracket and elevator servo force augmenter. No adjustment of elevator servo force augmenter is required. This unit is provided to increase elevator servo authority and to eliminate slack cable condition during servo actuation.

(4) Adjust turnbuckles (4) to position servo drum (5) lower inboard mounting surface (ARM BK) 1 13/16(±1/8) inches (46.04(±3.18) mm) (measurement AV) from station Y237.

NOTE: Access to turnbuckles (4) is through the electrical/electronics compartment.

(5) Differentially adjust turnbuckles (8) and (9) to permit rig pin (R-2) to be removed freely.

(6) Remove rig pins (6-5) and (R-2).

(7) Manually hold elevators against elevator trailing edge up stops, pull right elevator control column aft until right elevator control tab trailing edge down stops are contacted.

(8) Differentially adjust turnbuckles (4) to position servo drum (5) so that gap between bumper (6) and stop (7) is 3/32(±1/32) inch (2.382(±.792) mm).

(9) Release elevators and return control column to neutral position.

(10) Install safety clips on turnbuckles.

D. Adjust Elevator Control Column Balance Spring

NOTE: The following instructions apply to both sides of the airplane. Left and right elevator cable systems Paragraph 3.B. and Paragraph 3.C.and Mach trim compensator and linkage Paragraph 3.J. must be properly adjusted prior to making following adjustments.

(1) Remove bolt (6) to disconnect pushrod (20). (Figure 503)

(2) Adjust length (L) of left and right balance springs at clevis, in equal increments until force to push control column forward from rig position equals force to pull control column aft within 3 pounds. (Figure 501 (Sheet 2), View D)

NOTE: Increasing length (L) moves column forward, decreasing length (L) moves column aft. Add washers to raise pivot at torque tube spring attach point if there is not enough adjustment at clevis.

(3) Connect pushrod (20) to crank, install bolt (6) with head inboard.

E. Adjust Elevator Stops

NOTE: Access to elevator stops is through upper and lower surfaces aft of leading edge in inboard end of elevator. Adjustment procedures are identical for left and right elevators.

(1) Move elevator trailing edge up 17 11/32(±5/16) inches, (440.53(±7.937) mm) measured from center of protruding rivet head on vertical fin to center of aft inboard edge of elevator (27 (±1/2) degrees). Adjust gap at stop (12) by shimming stop (12) with washers until a gap of 0.005 to 0.015 inch (0.127 to 0.381 mm) exists.

(2) Move elevator trailing edge down 10 21/32(±5/16) inches, (270.67(±7.937) mm) measured from center of protruding rivet head on vertical fin to center of aft inboard edge of elevator (16 1/2 (±1/2) degrees). Adjust gap at stop (13) by shimming stop (13) with washers until a gap of 0.005 to 0.015 inch (0.127 to 0.381 mm) exists.

F. Adjust Elevator Control Tab

NOTE: Access for adjustment to control tab pushrod is through removable fairing on upper surface at inboard end of elevator. Access for rig pin installation to elevator control tab sector and sector guard pin bracket, is through top of vertical fin. Adjustment procedures are identical for left and right control tab.

(1) Place elevator control tab sector (3) in neutral position and install rig pins (R-2) in rig pin holes (R-2).

NOTE: The left sector is to be aligned with the forward rig pin bracket and the right sector is to be aligned with the aft rig pin bracket.

(2) Place elevator in neutral position, loosen jamnuts, and adjust pushrod (14) to fair control tab with elevator within one-quarter degree. Tighten jamnuts and safety as follows:

NOTE: Elevator is in neutral position when center of aft inboard edge of elevator lines up with center of protruding rivet head in vertical fin. Rivet is identified by a circle and crossline target.

(a) Check forward and aft rod end for proper thread engagement through witness holes.

(b) Tighten aft jamnut snug, plus an additional 1/2 nut flat rotation and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(c) Tighten forward jamnut snug, plus an additional 1/2 nut flat rotation.

(3) Remove rig pins (R-2).

G. Adjust Elevator Geared Tabs

NOTE: Access for adjustment of geared tab pushrods is through removable fairings on lower surface of elevator at inboard and outboard end of geared tab. Adjustment procedures are identical for left and right geared tab.

(1) Remove bolts (20) to disconnect pushrod (21) from crank fittings at each end of geared tab.

(2) Place elevator in neutral position.

NOTE: Elevator in neutral position when center of aft inboard edge of elevator aligns with center of protruding rivet head in vertical fin. Rivet is identified by a circle and cross line target.

(3) Loosen jamnuts and adjust rod ends until bolt (20) can be inserted through crank fitting and rod end, when geared tab is faired with elevator within one-quarter degree.

(4) Secure bolt (20). Safety with cotter pin.

(5) Tighten jamnuts and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

H. Adjust Elevator Anti-Float Tabs (Figure 501 (Sheet 3)) (Figure 501 (Sheet 4))

NOTE: Adjustment procedures are identical for left and right anti-float tabs. Access for adjustment of tabs is through horizontal stabilizer lower access panels 3114 and 3115 (left side), and 3214 and 3215 (right side).

(1) Make certain horizontal stabilizer and elevators are in neutral position. (Paragraph 1.A.) (Paragraph 1.B.)

(2) With crank (28) against stop (29) adjust pushrod (30) to fair anti-float tab to elevator within 1/4 degree.

(3) With sector (31) against stop (32) adjust turnbuckle (33) to obtain tension of 50(±5) pounds (22.679(±2.267) kg). Crank (28) should be against stop (29).

NOTE: No cable tension table provided for this cable. Only tension value given is 50(±5) pounds.

NOTE: Access to turnbuckle (33) is through horizontal stabilizer leading edge access panels 3103C (left) and 3204C (right).

(4) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893

WARNING: BEFORE MOVING PRIMARY LONGITUDINAL TRIM CONTROL WHEEL SWITCHES, MAKE CERTAIN AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(5) Using primary longitudinal trim switches, on control wheel, position horizontal stabilizer to 9.5 (+0.5, -0.0) degrees (0.166 (+0.008, -0.00) rad) aircraft noseup position. Dimension (BG) on Figure 501 (Sheet 4) should be 10 33/64 - 11 13/64 inches (267.2 - 284.48 mm).

WJE 886, 887

WARNING: BEFORE MOVING PRIMARY LONGITUDINAL TRIM CONTROL WHEEL SWITCHES, MAKE CERTAIN AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(6) Using primary longitudinal trim switches, on control wheel, position horizontal stabilizer to 11.8 (+0.5, -0.0) degrees (0.206 (+0.008, -0.00) rad) aircraft noseup position. Dimension (BG) on Figure 501 (Sheet 4) should be 12 9/32 - 13 1/64 inches (311.91 - 330.45 mm).

WJE ALL

(7) Adjust pushrod (34) until crank (35) just makes contact with roller (36).

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 891-893

(8) Move stabilizer to 12.2 degrees (0.213 rad) ANU, dimension (BG) on Figure 501 (Sheet 4) should be 12 13/16(±5/32) inches (325.44(±3.97) mm). Anti-float tabs should move to 26 1/4(±3) degrees (0.458(±0.052) rad) trailing edge down (2 9/64(±1/4) inches (54.37(±6.35) mm) measured at inboard end of anti-float tab.

NOTE: Elevator must be faired with the horizontal stabilizer when measuring anti-float tab deflection.

WJE 405-411, 880, 881, 883, 884

(9) Move stabilizer to 12.2(±0.5) degrees (0.213(±0.008) rad) ANU, dimension (BG) on Figure 501 (Sheet 4) should be 12 13/16(±5/32) inches (325.44(±3.97) mm). Anti-float tabs should move to 26 1/4(±3) degrees (0.458(±0.052) rad) trailing edge down (2 9/64(±1/4) inches (54.37(±6.35) mm) measured at inboard end of anti-float tab.

NOTE: Elevator must be faired with the horizontal stabilizer when measuring anti-float tab deflection.

WJE 886, 887

(10) Move stabilizer to 14.5 degrees (0.253 rad) ANU, dimension (BG) on Figure 501 (Sheet 4) should be 14 5/8(±5/64) inches (371.47(±1.98) mm). Anti-float tabs should move to 26 1/4(±3) degrees (0.458(±0.052) rad) trailing edge down (2 9/64(±1/4) inches (54.37(±6.35) mm) measured at inboard end of anti-float tab.

NOTE: Elevator must be faired with the horizontal stabilizer when measuring anti-float tab deflection.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893

(11) Repeat Paragraph 3.G.(1) through Paragraph 3.H.(5), if required.

WJE 886, 887

(12) Repeat Paragraph 3.G.(1) through Paragraph 3.H.(6), if required.

WJE ALL

(13) Return horizontal stabilizer to neutral position.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(14) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(15) Safety turnbuckle (33) with clip.

I. Adjust Elevator Power Control Mechanism

NOTE: Access to elevator power control mechanism is through upper and lower surfaces of inboard trailing edge of horizontal stabilizer, and inboard section of elevator aft of hinge. Access for rig pin installation to elevator control tab sector and sector guard pin bracket, is through top of vertical fin.

(1) Place elevator control tab sector (3) in neutral position and install rig pins (R-2) in rig pin holes (R-2).

NOTE: The left sector is to be aligned with the forward rig pin bracket and the right sector is to be aligned with the aft rig pin bracket.

(2) Place elevator in neutral position. If necessary, adjust pushrod (14) to fair control tab with elevator within one-quarter degree. (Paragraph 3.F.)

NOTE: Elevator is in neutral position when center of aft inboard edge of elevator lines up with center of protruding rivet head in vertical fin. Rivet is identified by a circle and cross line target.

(3) Remove bolt (18) to disconnect control valve pushrod (19) from follow-up balance link (22).

(4) Check that length of pushrod (15) is 4(±3/32) inches, (101.6(±2.38) mm) measured center to center of bolts (16) and (17). If necessary, loosen pushrod (15) jamnuts and adjust pushrod to noted length. Tighten pushrod jamnuts.

(5) Place control valve in neutral detent and adjust rod (19) until bolt (18) can be freely inserted through follow-up balance link and pushrod. Tighten rod (19) jamnut.

(6) Tighten bolt (18). Safety with cotter pin.

(7) Remove rig pins (R-2).

J. Adjust/Test Mach Trim Compensator and Linkage (Figure 503 (Sheet 1)) (Figure 503 (Sheet 2))

NOTE: Access to Mach trim compensator, located at the lower end of right control column, is through forward accessory and electrical/electronics compartments.

(1) Loosen elevator and servo cable turnbuckles. (Figure 501).

(2) Disconnect cables from lower end of both control columns.

(3) Remove bolt (6) and disconnect pushrod (20) from crank.

(4) Move control column aft until gap V is 5 1/8 (±1/32) inch (130.175 (±0.794) mm), measured between rig pin hole R-1 in structure and rig pin hole R-1 in crank. If necessary, adjust stop bolt (F) to contact stop pad on left control column. (Figure 503 (Sheet 2))

(5) Move left control column forward until gap W is 3 1/16(±1/32) inch (77.787(±0.794) mm), measured between rig pin hole R-1 in structure and rig pin hole R-1 in crank. If necessary, adjust stop bolt (G) to contact stop pad on left control column. (Figure 503 (Sheet 2))

(6) Move control column forward until stop is contacted, and check clearance between column and instrument panel is 1/2 inch (12.70 mm) minimum.

(7) Adjust stop bolt (G) as required to obtain 1/2 inch (12.70 mm) minimum clearance.

(8) Disconnect pushrod (7) from cable drive sector (8) as follows:

(a) Install special tool (9) between spring (10) and bracket (11). (Figure 503 (Sheet 1))

(b) Adjust special tool (9) turnbuckle until spring (10) tension is relieved.

(c) Remove bolt (12).

(9) Adjust special tool (9) turnbuckle to allow cable drive sector (8) to bottom against stop on support bracket (13).

CAUTION: TO PREVENT ROTATION OF CABLE WHILE OBTAINING DIMENSION, ROTATE NUT (15), NOT EYEBOLT (14).

(10) Adjust eyebolt (14) by turning nut (15) until dimension AE is 1/2 inch (12.70 mm).

NOTE: This is an initial adjustment that can be changed when adjusting control column force in step (16).

NOTE: Before performing following steps, make certain that Mach trim compensator has been bench adjusted to establish correct operational retract position.

(11) Preset linear servoactuator tester as follows:

(a) Power switch S1 - Off

(b) Speed control R1 - Slow

(c) Mode switch S2 - Mach Trim.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(12) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	26	B10-343	MACH TRIM-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1

(13) Connect linear servoactuator line test set to Mach trim actuator as follows:

(a) Disconnect electrical plug from trim actuator (18) and attach to power input cable of linear servoactuator line test set.

(b) Connect test set actuator control cable to trim actuator (18).

(14) Move actuator to fully extended position as follows:

(a) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	26	B10-343	MACH TRIM-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1

(b) Place test set power switch in on position. Allow one minute for test set to warm up.

(c) Hold test set extended-retract switch in extend position until actuator stops running (fully extended).

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(15) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	26	B10-343	MACH TRIM-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1

(16) Move control column full aft against stop.

(17) Adjust special tool (9) to position cable drive sector (8) to gap dimension (19) 0.218(±0.030) inch, (5.537(±0.762) mm).

(18) Adjust length of pushrod (7) until pushrod can be connected to cable sector (8); install bolt (12).

NOTE: Install bolt (12) with head inboard.

(19) Remove special tool (9).

(20) With actuator fully extended, place push-pull scale at center of control wheel hub. Apply forward pressure on scale to position control column in neutral (rig pin hole RP-1 in lower end of left control column aligned with rig pin hole RP-1 in structure). Horizontal force at centerline of control wheel shall be 5 1/2(±1/2) pounds (2.49(±0.23) kg) indicated on spring scale. If force is not 5 1/2(±1/2) pounds, (2.49(±0.23) kg) adjust length of spring (10) with nut (15) as necessary.

(21) Move control column full aft (against stop). Make certain that gap (19) dimension 0.218(±0.030) inch (5.54(±0.76) mm) is maintained. If necessary, adjust pushrod (7).

(22) Return control column to neutral position.

(23) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	26	B10-343	MACH TRIM-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1

(24) Operate Mach trim actuator to retract position by placing extend-retract switch on tester to retract position until actuator stops running.

(25) Install rig pin (6-5) in rig pin hole (R-1).

(26) Remove bolt (21) from rod end (3).

(27) Connect pushrod (20) to crank and install bolt (6) with bolthead inboard.

(28) Adjust shaft (2) on rod end (3) until bolt (21) can be freely inserted.

(29) Remove rig pin (6-5).

(30) Operate actuator (18) to extend and retract positions several times using extend-retract switch on line test set.

(31) Check that gap (19) dimension 0.218 (±0.030) inch (5.537 (±0.762) mm) between cable drive sector (8) and stop on bracket (13) is maintained, when actuator (18) is fully extended and control column is fully aft against the stop. If necessary, adjust pushrod (7) and install bolt (12).

NOTE: Bolt (12) must be installed with head inboard.

(32) Move actuator (18) to retract position.

(33) Tighten jamnut (1) and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(34) Check that end of actuator indicator is flush with end of indicator tube when actuator is fully retracted. If necessary, loosen upper tube clamp and adjust tube vertically. Tighten clamp. (Figure 504)

(35) Tighten bolt (12) and bolt at eyebolt (6). Safety with cotter pin.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(36) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	26	B10-343	MACH TRIM-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1

(37) Disconnect line test set from actuator (18) and remove test set from airplane.

(38) Connect electrical connector to actuator (18).

(39) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	26	B10-343	MACH TRIM-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1

(40) Connect elevator control system cables to lower end of both control columns.

(41) Install rig pin (6-5) in rig pin hole (R-1) in lower end of left control column and install rig pins (R-2) in rig pin holes (R-2) in sector (3).

(42) Adjust left and right elevator control system cables as described in Paragraph 3.B. and Paragraph 3.C..

(43) Remove rig pins (6-5) and (R-2).

(44) Check that all rig pins are removed.

(45) mnuts.

K. Adjust Elevator Position Sensor (Figure 501 (Sheet 2))

NOTE: Elevator control system must be adjusted before adjusting elevator position sensor. (Paragraph 3.A. through Paragraph 3.I.)

NOTE: Removal/installation procedures for elevator position sensors are provided in SURFACE POSITION SENSORS - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-03/201.

(1) Make certain horizontal stabilizer and elevators are in neutral position. (Paragraph 1.A. and Paragraph 1.B.)

(2) Place control column in neutral and install rig pin (6-5) in rig pin hole (R-1).

NOTE: Rig pin may be omitted if elevator control system is complete and adjusted, and neutral position can be maintained during sensor adjustment.

(3) Install rig pins (R-2) in rig pin holes (R-2) in sector (3).

NOTE: Rig pin may be omitted if elevator control system is complete and adjusted, and neutral position can be maintained during sensor adjustment.

(4) Remove bolt (23) from arm (25) to disconnect link (24).

CAUTION: SENSOR WILL BE DAMAGED IF ROTATED BEYOND INTERNAL STOPS.

(5) Rotate arm (25) until sensor detent is located.

(6) Loosen bolt (26) from clamp (27) and rotate sensor body until bolt (23) can be freely inserted through arm (25) and link (24).

(7) Tighten bolt (26).

(8) Tighten bolt (23). Safety nut with cotter pin.

(9) Remove rig pins (R-2) and (6-5), if installed.

(10) Check sensor. (PAGEBLOCK 22-01-03/201)

(11) Perform return to service (RTS) test. (DFGS STATUS/TEST, SUBJECT 22-01-05)

L. Adjust Flap Bus to Elevator Servo Force Limiter Cable System

(Figure 506)

NOTE: Elevator and tab control system Paragraph 3.A. through Paragraph 3.I. , flap mechanical control and flap bus cable systems must be properly adjusted prior to adjusting flap bus to elevator servo force limiter cable system. (PAGEBLOCK 27-50-00/501)

NOTE: The lower wing trailing edge BUTE doors must be restrained in the faired position or down throughout the following procedure. Each wing main fuel tank should contain no more than 1000 pounds (450 kg) of fuel.

(1) Make certain horizontal stabilizer indicator is at 0°.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(2) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

WARNING: BEFORE PRESSURING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(3) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

WARNING: WHEN THE AIRCRAFT IS ON GROUND, WITH WEIGHT ON WHEELS, THE BITE TEST OF AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH THE TIME FLAP/SLAT HANDLE IS MOVED FROM RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. THE SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

(4) Place flap/slat handle 28°/LAND EXT detent.

(5) With roller (E) on upper surface of cam (F), adjust pushrod (C) so that dimension (A) equals 10 9/32(±1/16) inches. Figure 506 (Sheet 1)

NOTE: With Service Bulletin 27-210 incorporated and for fuselages 1078 and subsequent, the Paragraph 3.L.(5) through Paragraph 3.L.(8) apply.

(6) Place flap/slat handle 11°/LAND EXT detent.

(7) Rotate drum (D) until scribe line on drum (D) aligns with guard pin (F) within ±0.06 inch. Adjust stop bolt (B) until dimension (A) equals 7.31(±0.06) inches.

(8) With horizontal stabilizer at 0° neutral position (see Table that follows), place flap/slat handle in 11/T.O. EXT detent.

Table 502

SERIES AIRCRAFT	BG AT NEUTRAL
MD-87	2.93 ± 0.04 INCH
MD-80	3.01 ± 0.04 INCH

(9) Adjust cables 207A, 207B and 208A, 208B with turnbuckles (D) and (E); and cables 247A, 247B and 248A, 248B with turnbuckles (J) and (K) so that tension on cables 207A and 208A is between minimum and maximum load per cable tension table for 3/32 inch cables; (Figure 507 (Sheet 1)) and tension on cables 247A, 247B and 248A, 248B is between minimum and maximum load per cable tension table for 1/16 inch cables. (Figure 507 (Sheet 2))

NOTE: Access to turnbuckles (D) and (E) is through forward cargo compartment ceiling panels 5151C and 5156C; access to turnbuckles (J) and (K) is through cabin floor panel above center wing.

(10) Differentially adjust turnbuckles (D) and (E) until scribe line on drum (D) aligns just aft of center of guard pin (F) within 0.30(±0.06) inch (7.62(±1.52) mm). This is preliminary adjustment only.

NOTE: With Service Bulletin 27-210 incorporated and for fuselages 1078 and subsequent, the Paragraph 3.L.(10) through Paragraph 3.L.(18) apply.

(11) Differentially adjust turnbuckles (J) and (K) until rig mark on drum (B) in slat sequence mechanism is 0.19(±0.06) inch (4.83(±1.52) mm) outboard of rig mark (E).

(12) Without using excessive force against stop, increase Dial-A-Flap thumbwheel setting until it reaches mechanical stop approximately 24°. Place flap/slat handle in DAF detent.

(13) Note position of fixed slat scribe on leading flap track. (Figure 506 (Sheet 3))

(14) Extend flaps until leading flap track has moved additional 1.02(±0.25) inches (25.91(±6.35) mm) in extend direction as measured on leading flap track.

(15) Differentially adjust turnbuckles (D) and (E) until green LAND light just illuminates on system display panel in cockpit.

NOTE: If aircraft electrical power is not available, use 26° flap land tool in lieu of the green LAND light to verify rigging of the 26° flap land sensor.

(16) Adjust turnbuckle (G) so that 26° flap switch actuates. (Figure 506 (Sheet 1))

NOTE: The intent is to rig the 26° land sensor and the 26° flap switch to actuate when the flaps are extended 2°(±0.5°) beyond the maximum Dial-A-Flap position.

(17) Place flap slat handle in 28/LAND EXT detent and run horizontal stabilizer to 0° neutral position per Table 502.

(18) With servo bracket in normal position, measure dimension (AV). (Figure 506 (Sheet 2))

(19) If using weights to test elevator servoactuator, perform following:

(a) Securely attach elevator servoactuator tester to underside of aft floor beam webs between fuselage stations 218 and 237 as shown in Figure 508. Attach tester cable hook to servoactuator and route cable over tester pulley. Check tester for proper alignment and freedom of operation.

(b) Apply 39 pound (17.690 kg) weight on tester cable. Dimension (AV) should not move more than 3/8 inch (9.525 mm) from recorded dimension.

(c) Apply 52 pound (23.586 kg) weight (13 additional pounds), servo should move through its whole travel (a minimum of 5 inches), (127 mm). If necessary, remove weight and adjust crank (T) stop until the above requirements are met. Tighten jamnuts and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201) (Figure 506 (Sheet 2), View E-E)

(20) If using rigging tool with force gauge to test elevator servoactuator, perform following:

(a) Remove eyebolt (AW) from arm (BK) and attach rigging tool to aft side of servoactuator. Install rigging tool bolt through hole for eyebolt (AW).

(b) Position force gauge against free end of rigging tool and apply force of 13 (+1,-0) lbs (5.896 (+0.453,-0) kg) against end of rigging tool in direction of servo actuator travel. Dimension (AV) should not move more than 0.375 inch (9.525 mm) from recorded dimension.

(c) Increase force to 17 1/3 pounds (7.862 kg) maximum, servoactuator should move through full travel a minimum of 5 inches (127 mm). If necessary, adjust crank (T) stop until above requirements are met. Tighten jamnuts and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201) (Figure 506 (Sheet 2), View E-E)

(d) Install eyebolt (AW).

(21) Using flap/slat handle, in flaps UP direction, position flaps until scribe line, on structure, is 1.020(±0.250) inches (26°(±1/2°) flap position) from 28° flap position indicator on leading inboard flap track.

NOTE: With Service Bulletin 27-210 incorporated and for fuselages 1078 and subsequent, the Paragraph 3.L.(21) through Paragraph 3.L.(22) apply.

NOTE: Leading flap is the flap which has rotated farthest up from the 28°/LAND EXT detent position. Either flap may be the leading flap. Example: Left flap track 28° indicator is 1.020(±0.250) inches from scribe line. Right flap track 28° indicator is 1.020(±0.250) inches from scribe line. The left flap is the leading flap and the right flap is the trailing flap.

(22) Adjust turnbuckle (G) until 26° flap switch just actuates (audible click).

(23) Verify that not more than 8 threads are visible at each end of turnbuckle.

(24) Remove servoactuator tester and cable from aircraft.

(25) Place flap/slat handle in UP/RET detent.

(26) Check flap land proximity sensor for proper operation. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201, Takeoff Warning System)

(27) Perform return to service (RTS) test for aileron torque limiter switch (26° flap switch). (DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201)

(28) Shut off hydraulic pressure source.

(29) Safety all turnbuckles with clips.

(30) Remove door safety locks and place main gear door maintenance bypass lever in normal position (lever retracted).

M. Test Elevator and Tab System

(1) Make certain horizontal stabilizer in neutral position. (Paragraph 1.A.)

(2) Depressurize left hydraulic power system. (PAGEBLOCK 29-00-00/201)

(3) Move control column full forward against stop; check that clearance between forward side of control column and instrument panel is not less than 5/8 inch, (15.875 mm). If necessary, stop (11) shown in Figure 501 may be adjusted to meet the above requirement.

(4) Place control column in neutral position and install rig pin (6-5) in rig pin hole (R-1) in lower end of left control column.

(5) Place elevator control tab sector (3) in neutral position and install rig pins (R-2) in rig pin holes (R-2) as shown in Figure 501.

(6) Place left and right elevators in neutral position. Left and right control tabs, left and right geared tabs, and left and right anti-float tabs should be in neutral position and faired with elevator within 0(±1/4) degree.

NOTE: 1/4 degree is .04 inches per control tab and .03 inches per the geared and anti-float tab.

(7) Check that looseness at inboard end of elevator trailing edge does not exceed 3/16 inch, (4.762 mm).

NOTE: Maximum allowable looseness on elevator and tabs is checked by moving surface up and down from faired position.

(8) Check that looseness at inboard end of control tab trailing edge does not exceed 1/16 inch, (1.587 mm).

(9) Check that looseness at inboard end of geared tab trailing edge does not exceed 1/32 inch, (.792 mm)

(10) Check that looseness at inboard end of anti-float tab trailing edge does not exceed 1/16 inch, (1.587 mm).

(11) Remove rig pins (6-5) and (R-2).

(12) Hold elevator in neutral position and move right control column forward until upper stop on elevator control tab crank contacts stop on elevator control tab inboard hinge fitting. Check that trailing edge of left and right control tabs rotate up 20(±2) degrees (0.349(±0.035) rad) from neutral position.

(13) Hold elevator in neutral position and move right control column aft until lower stop on elevator control tab crank contacts stop on elevator control tab inboard hinge fitting. Check that trailing edge of left and right control tabs rotate down 26(±2) degrees (0.454(±0.035) rad) from neutral position.

(14) Move right control column full forward, and elevator trailing edge full down. Check the following:

(a) Trailing edge of left and right elevators are down 10 21/32(±5/16) inches, (270.67(±7.937) mm) measured from protruding rivet head in vertical fin to inboard end of trailing edge of elevator.

(b) Left and right control tabs are up 18.5(±3.5) degrees (0.323(±0.061) rad) from faired position.

(c) Left and right geared tabs are up 4.75(+2, -1) degrees (0.083(+0.035,-0.0175) rad) from faired position.

(d) Left and right anti-float tabs are faired with elevator.

(15) Move right control column full aft, and elevator trailing edge full up. Check for following:

(a) Trailing edge of left and right elevators are up 17 11/32(±5/16) inches, (440.53(±7.937) mm) measured from protruding rivet head on vertical stabilizer to inboard end of elevator trailing edge.

(b) Left and right control tabs are down 26.5(±2.5) degrees (0.462(±0.044) rad) from faired position.

(c) Left and right geared tabs are down 27.75(+1, -2) degrees (0.484(+0.0175, -0.035) rad) from faired position.

(d) Left and right anti-float tabs are faired with elevator.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893

WARNING: BEFORE MOVING PRIMARY LONGITUDINAL TRIM CONTROL WHEEL SWITCHES, MAKE CERTAIN AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(16) Using primary longitudinal trim control wheel switches move horizontal stabilizer to approximately 2 degrees aircraft nosedown. Move stabilizer from this position to 10 (+0, -0.5) (0.175(+0.0, -0.008) rad) degrees airplane noseup. Anti-float tabs should remain faired with elevator.

WJE 886, 887

WARNING: BEFORE MOVING PRIMARY LONGITUDINAL TRIM CONTROL WHEEL SWITCHES, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(17) Using primary longitudinal trim control wheel switches move horizontal stabilizer to approximately 2 degrees (0.035 rad) aircraft nosedown. Move stabilizer from this position to 12.3 (+0, -0.5) degrees (0.215(+0, -0.009) rad) aircraft noseup. Dimension (BG) should be 12 27/32(+0, -13/32) inches (326.23(+0, -10.32) mm). Anti-float tabs should remain faired with elevator.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893

(18) Move stabilizer to 12.2 degrees (0.213 rad) ANU dimension (BG) should be 12 13/16(±5/32) inches, (325.437(±3.967) mm). Anti-float tabs should move to 26 1/4(±3) degrees (0.458(±0.052) rad) trailing edge down (2 9/64(±1/4) inches, (54.37(±6.35) mm) measured at inboard end of anti-float tab).

WJE 886, 887

(19) Move stabilizer to 14.5 degrees (0.253 rad) ANU dimension (BG) should be 14 5/8(±5/64) inches, (371.602(±2.032) mm). Anti-float tabs should move to 26 1/4(±3) degrees (0.458(±0.052) rad) trailing edge down (2 9/64(±1/4) inches, (54.37(±6.35) mm) measured at inboard end of anti-float tab).

WJE ALL

(20) Return stabilizer to neutral position. Anti-float tabs should fair with elevators when stabilizer passes 10 degrees (0.175 rad) ANU and remain faired at stabilizer positions below 10 degrees (0.175 rad) ANU.

CAUTION: TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT RESULTING FROM ELEVATOR POWER CONTROL MECHANISM OPERATION, MAKE CERTAIN THAT MOVEMENT OF ELEVATOR IS UNOBSTRUCTED.

N. Test Elevator Power Control Mechanism

(1) Place elevator in neutral position.

(2) Place control tab in neutral position (faired with elevator within one-fourth degree).

(3) Measure length of control valve pushrod (19) and note dimension. This is normal length of pushrod to be used for comparison in steps (4) through (7). (Figure 501)

(4) Move control column full forward. Control valve pushrod should not be compressed from normal length.

(5) Move control column full aft. Control valve pushrod should not be compressed from normal length.

(6) Move elevator trailing edge full up. Control valve push-rod should not be compressed from normal length.

(7) Move elevator trailing edge full down. Control valve pushrod should not be compressed from normal length.

WARNING: BEFORE PRESSURIZING LEFT HYDRAULIC SYSTEM, MAKE CERTAIN THAT ALL CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR EQUIPMENT.

(8) Pressurize left hydraulic power system. (PAGEBLOCK 29-00-00/201)

(9) With control column in neutral position (held only by load-feel spring), manually position both elevators to neutral.

(10) Lift right elevator and hold against elevator up stop.

(11) Slowly lift left elevator until right boost cylinder just begins to move right elevator down.

(12) Check that left elevator control tab trailing edge is 10(±2) degrees up.

(13) Return both elevators to neutral position.

(14) Lift left elevator and hold against elevator up stop.

(15) Slowly lift right elevator until left boost cylinder just begins to move left elevator down.

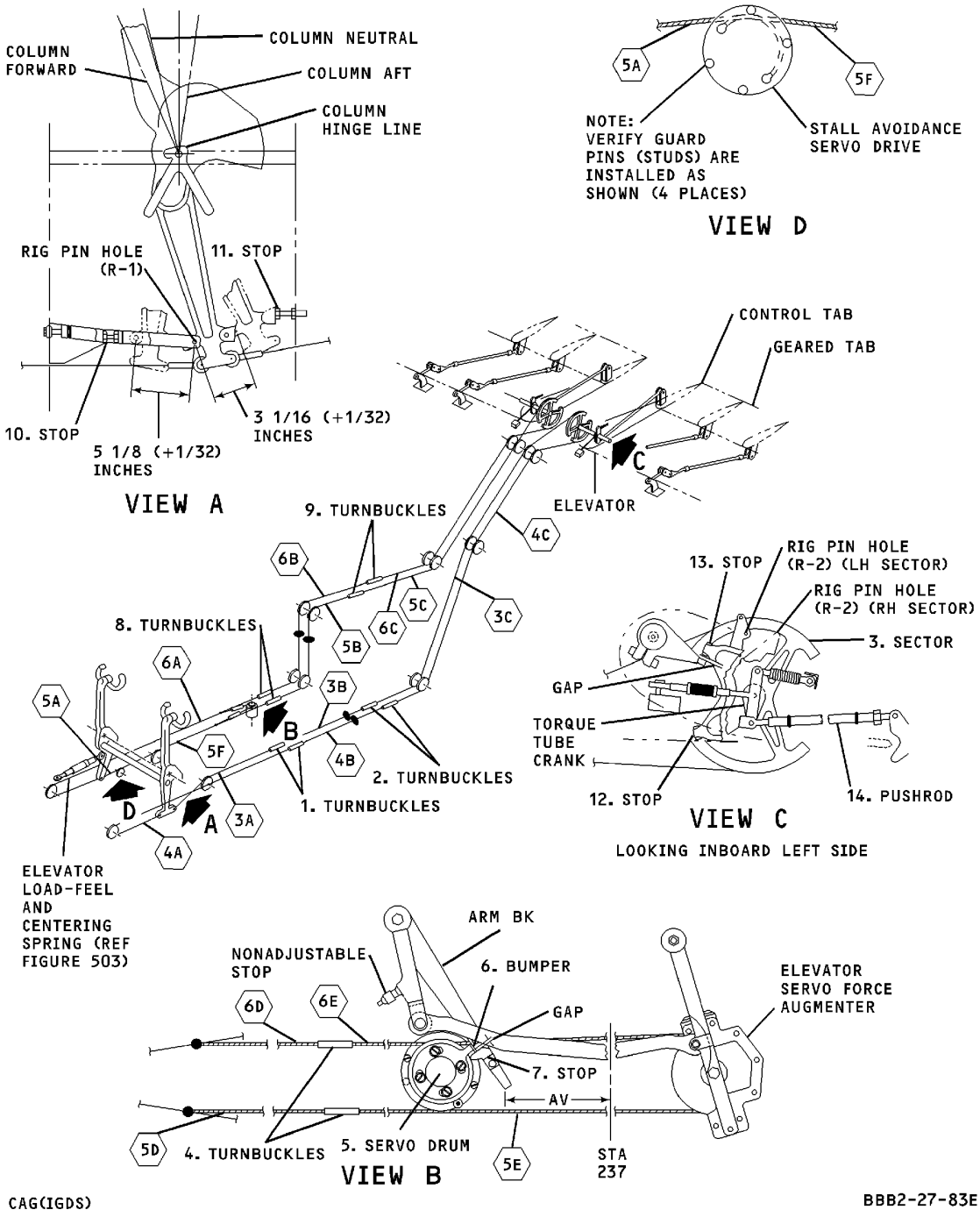
(16) Check that right elevator control tab trailing edge is 10(±2) degrees up.

(17) Return both elevators to neutral position.

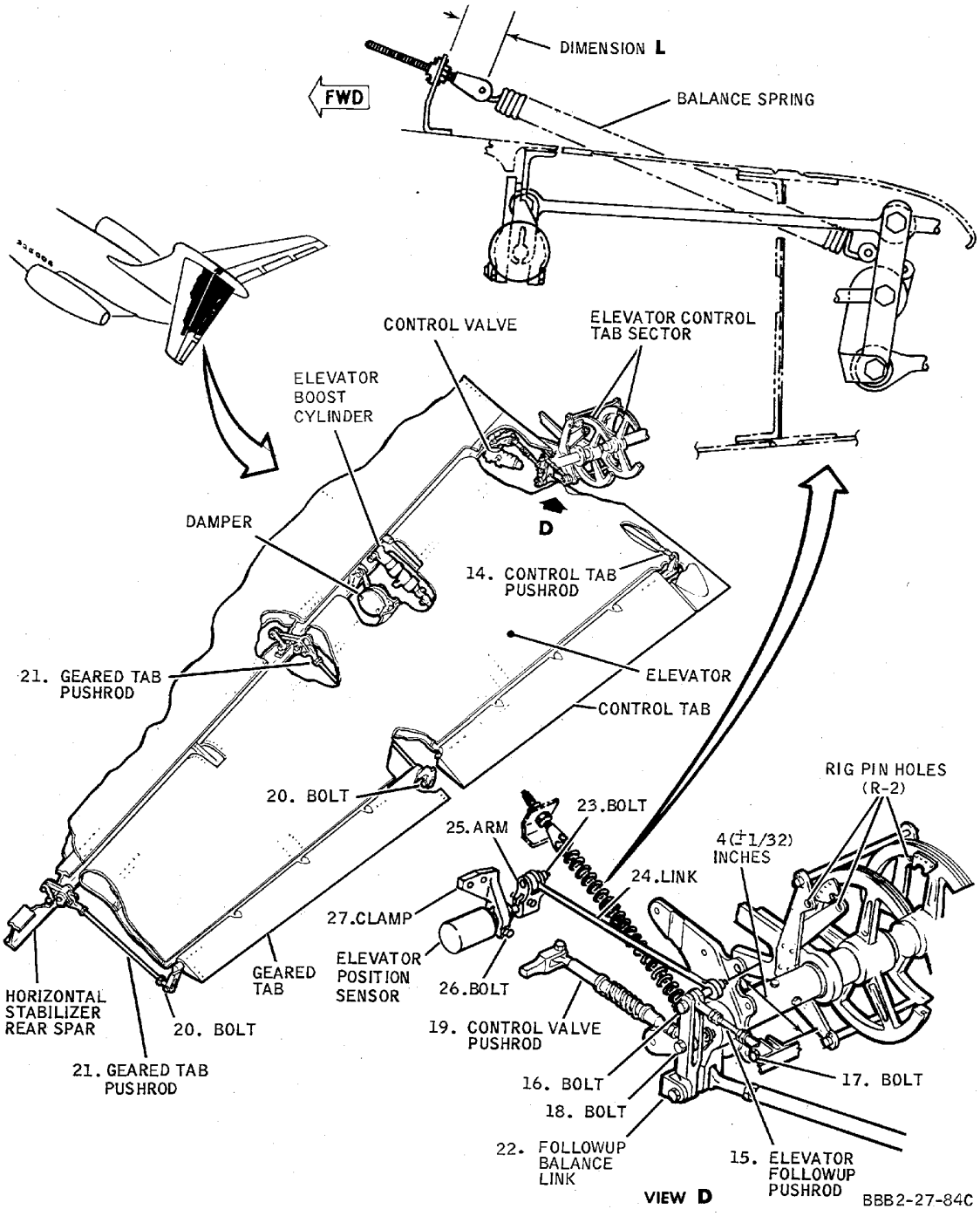
(18) Manually move both elevators down against elevator stops.

(19) Slowly move control column forward.

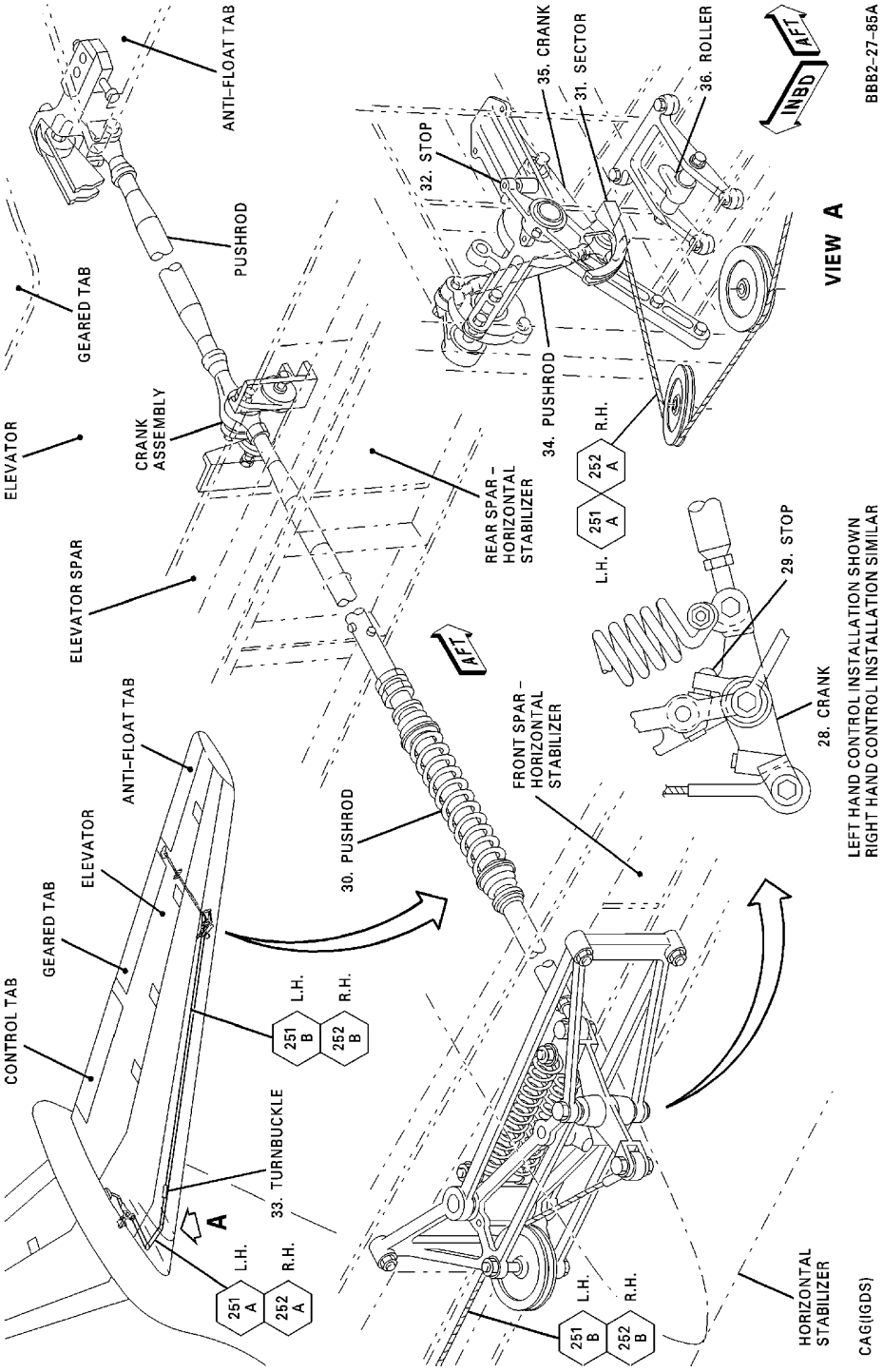
(20) Check that elevator power on light (located on flight compartment overhead panel), is on by time control column stop is contacted.



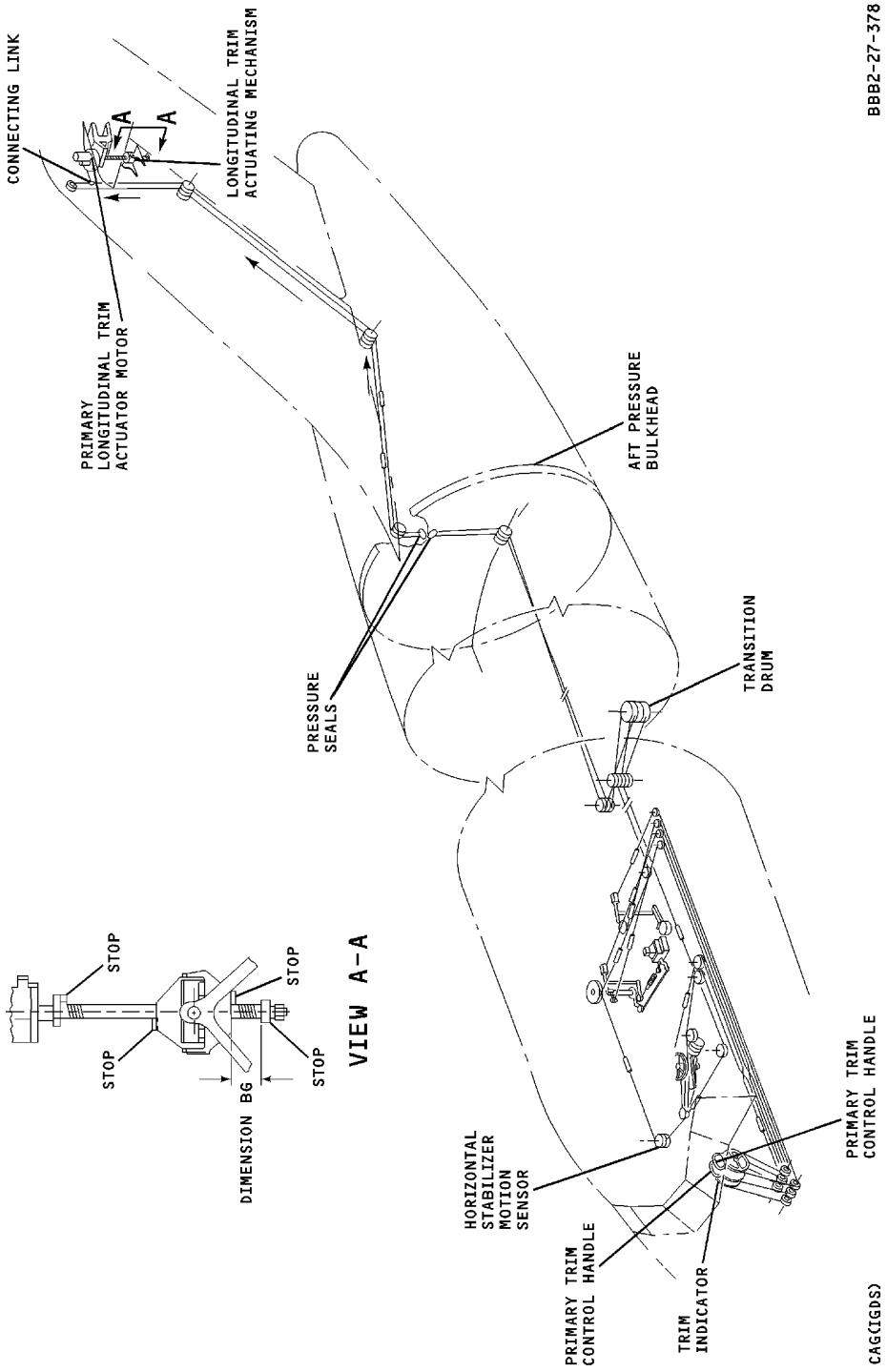
Elevator and Tab Control System -- Adjustment
Figure 501/27-30-00-990-807 (Sheet 1 of 4)



Elevator and Tab Control System -- Adjustment
Figure 501/27-30-00-990-807 (Sheet 2 of 4)



Elevator and Tab Control System -- Adjustment
Figure 501/27-30-00-990-807 (Sheet 3 of 4)



Elevator and Tab Control System -- Adjustment
Figure 501/27-30-00-990-807 (Sheet 4 of 4)

CABLE TENSION TABLE – 1/8 DIAMETER

TEMP deg F	MAX. PROD. RIG LOAD	MIN. PROD. RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. PROD. RIG LOAD	MIN. PROD. RIG LOAD	MIN. ALLOW. SERV. LOAD
–60	10	9	6	42	55	51	35
–58	11	10	7	44	56	52	36
–56	12	11	7	46	57	53	36
–54	12	12	8	48	58	54	37
–52	13	12	9	50	59	54	38
–50	14	13	9	52	60	55	38
–48	15	14	10	54	61	56	39
–46	16	15	10	56	61	57	40
–44	17	16	11	58	62	58	40
–42	18	16	11	60	63	59	41
–40	19	17	12	62	64	60	41
–38	20	18	13	64	65	61	42
–36	20	19	13	66	66	62	43
–34	21	20	14	68	67	63	43
–32	22	21	14	70	68	64	44
–30	23	21	15	72	69	64	45
–28	24	22	15	74	70	65	45
–26	25	23	16	76	71	66	46
–24	26	24	16	78	72	67	47
–22	26	25	17	80	74	68	47
–20	27	25	18	82	75	69	48
–18	28	26	18	84	76	70	49
–16	29	27	19	86	77	71	49
–14	30	28	19	88	78	72	50
–12	31	29	20	90	79	73	51
–10	32	29	20	92	80	74	51
–8	33	30	21	94	81	75	52
–6	33	31	21	96	82	76	53
–4	34	32	22	98	83	77	53
–2	35	33	23	100	84	78	54
0	36	33	23	102	85	79	55
2	37	34	24	104	87	80	56
4	38	35	24	106	88	81	56
6	39	36	25	108	89	83	57
8	40	37	25	110	90	84	58
10	40	38	26	112	91	85	59
12	41	38	27	114	92	86	59
14	42	39	27	116	94	87	60
16	43	40	28	118	95	88	61
18	44	41	28	120	96	89	62
20	45	42	29	122	97	90	62
22	46	42	29	124	98	91	63
24	47	43	30	126	100	93	64
26	48	44	31	128	101	94	65
28	48	45	31	130	102	95	66
30	49	46	32	132	103	96	67
32	50	47	32	134	105	97	67
34	51	48	33	136	106	98	68
36	52	48	33	138	107	100	69
38	53	49	34	140	109	101	70
40	54	50	35				

CAG(IGDS)

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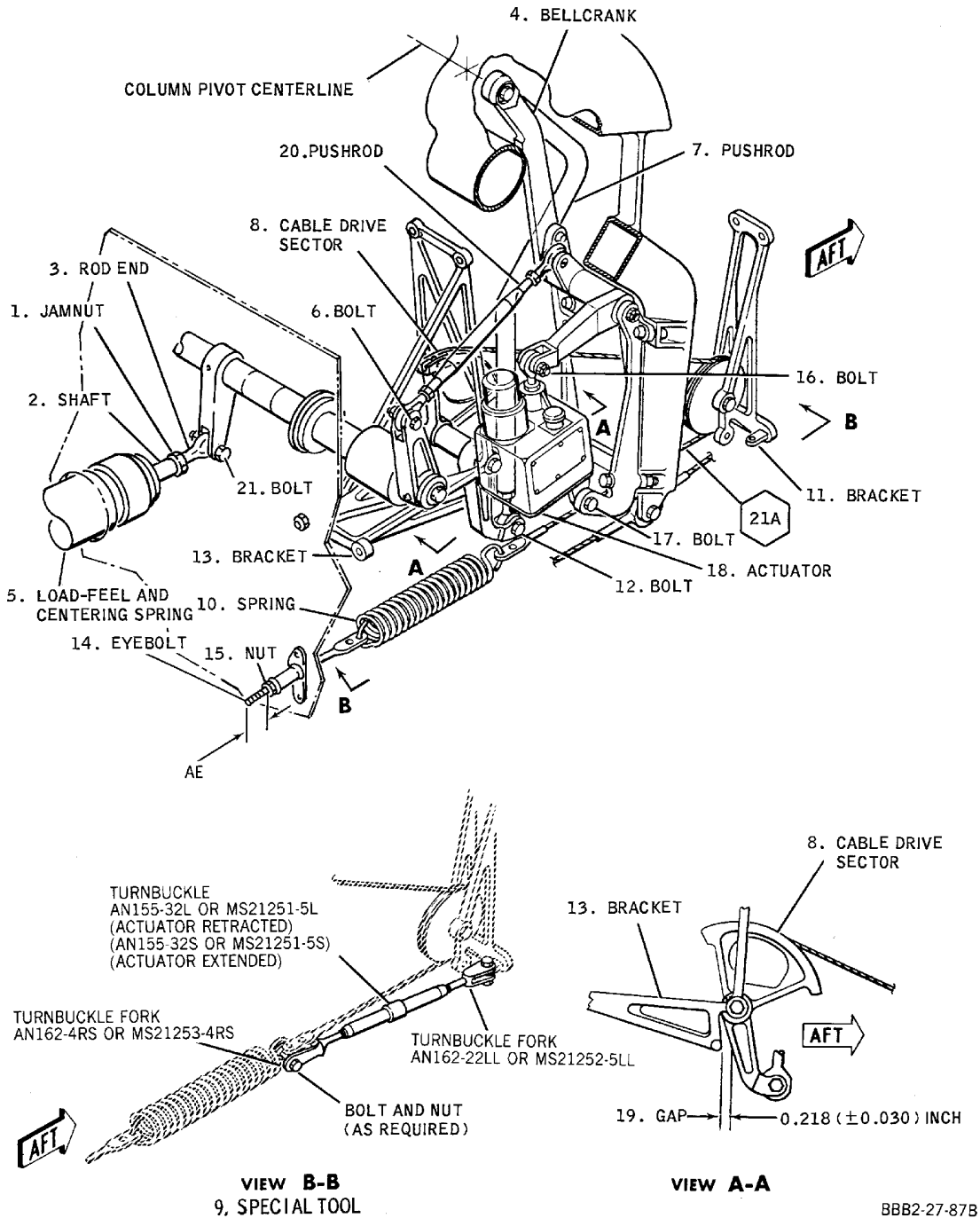
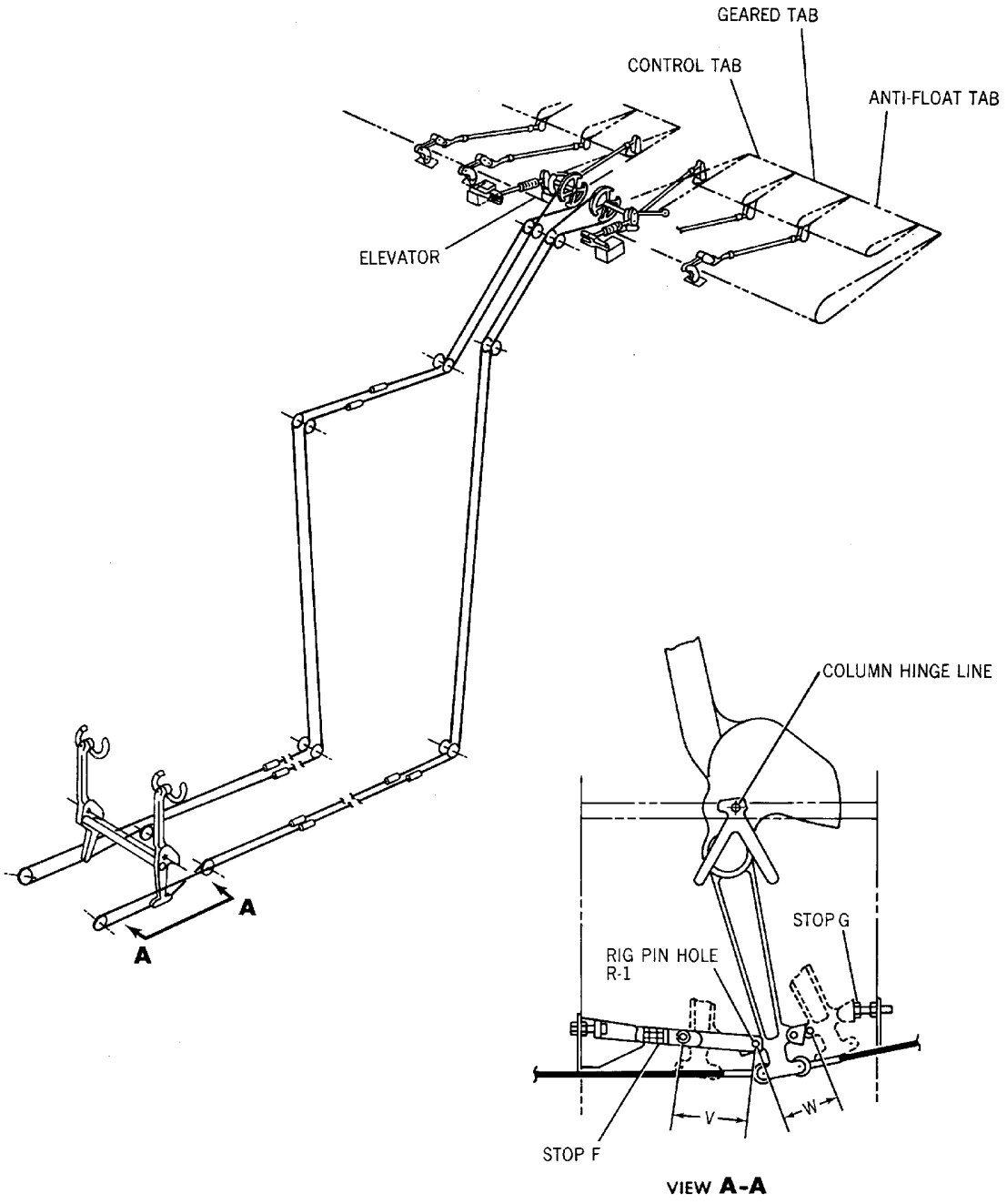
Cable Tension Table
Figure 502/27-30-00-990-808



Mach Trim Compensator -- Adjustment
Figure 503/27-30-00-990-809 (Sheet 1 of 2)



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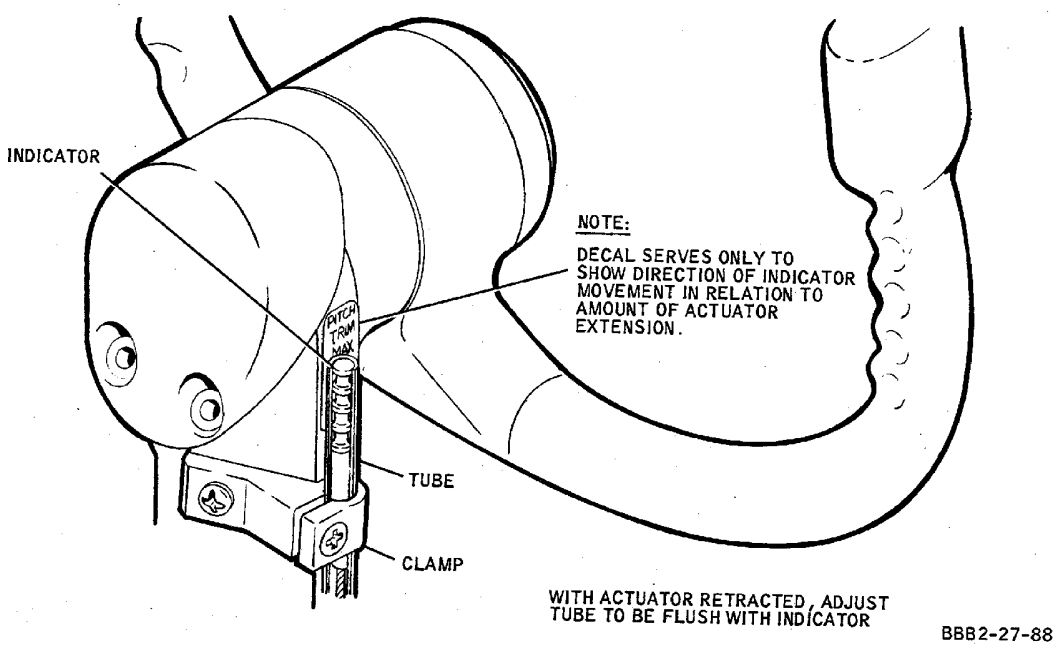
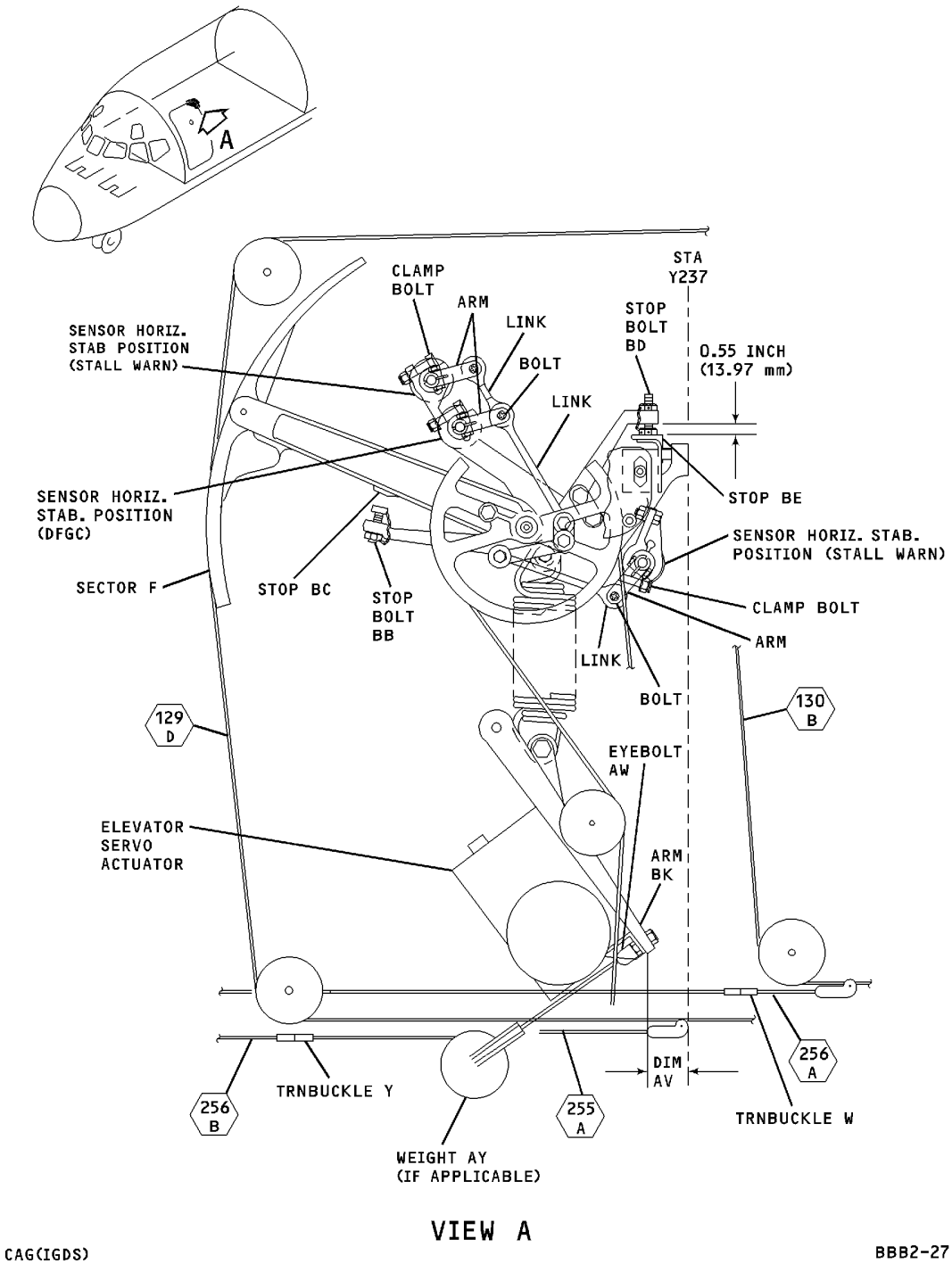
Mach Trim Compensator -- Adjustment
Figure 503/27-30-00-990-809 (Sheet 2 of 2)



Mach Trim Compensator Position Indicator -- Adjustment
Figure 504/27-30-00-990-810

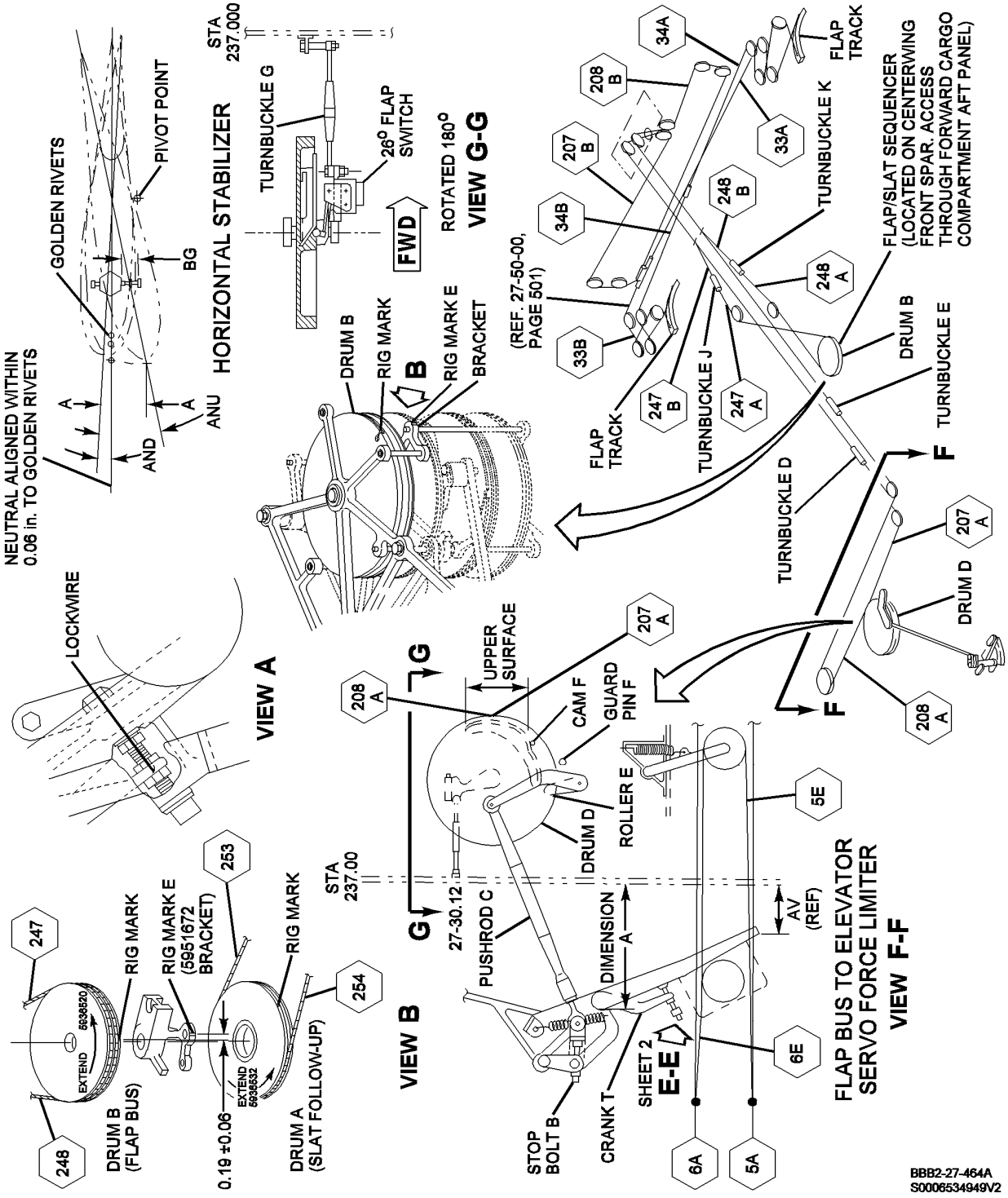


VIEW A

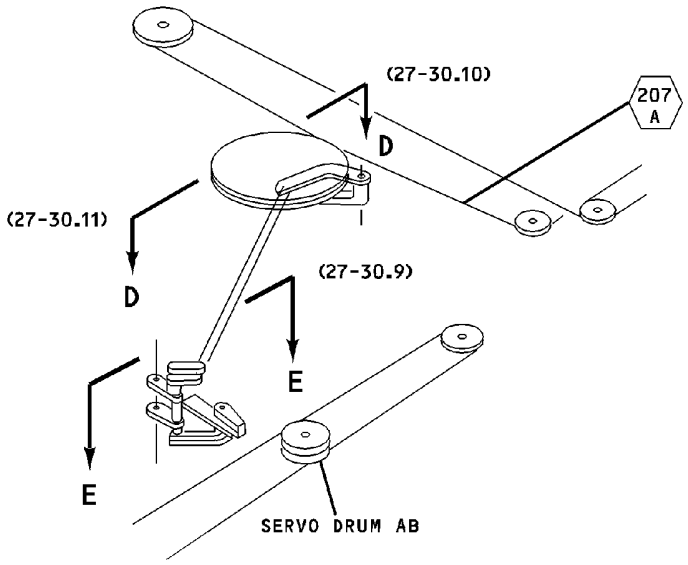
CAG(IGDS)

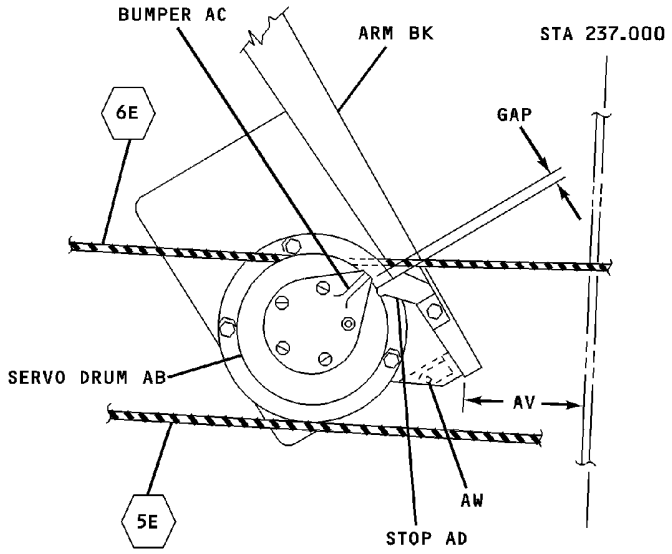
BBB2-27-447

Longitudinal Trim Control System -- Adjustment/Test
Figure 505/27-30-00-990-811

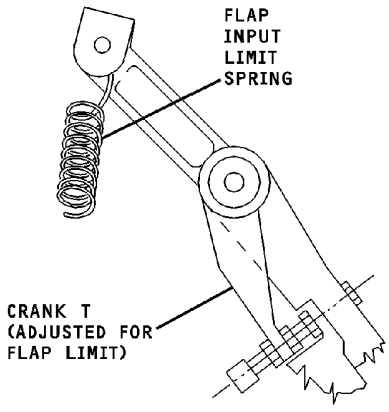


Flap Bus To Elevator Servo Force Limiter -- Adjustment/Test
Figure 506/27-30-00-990-812 (Sheet 1 of 3)





VIEW D-D



VIEW E-E

CAG(IGDS)

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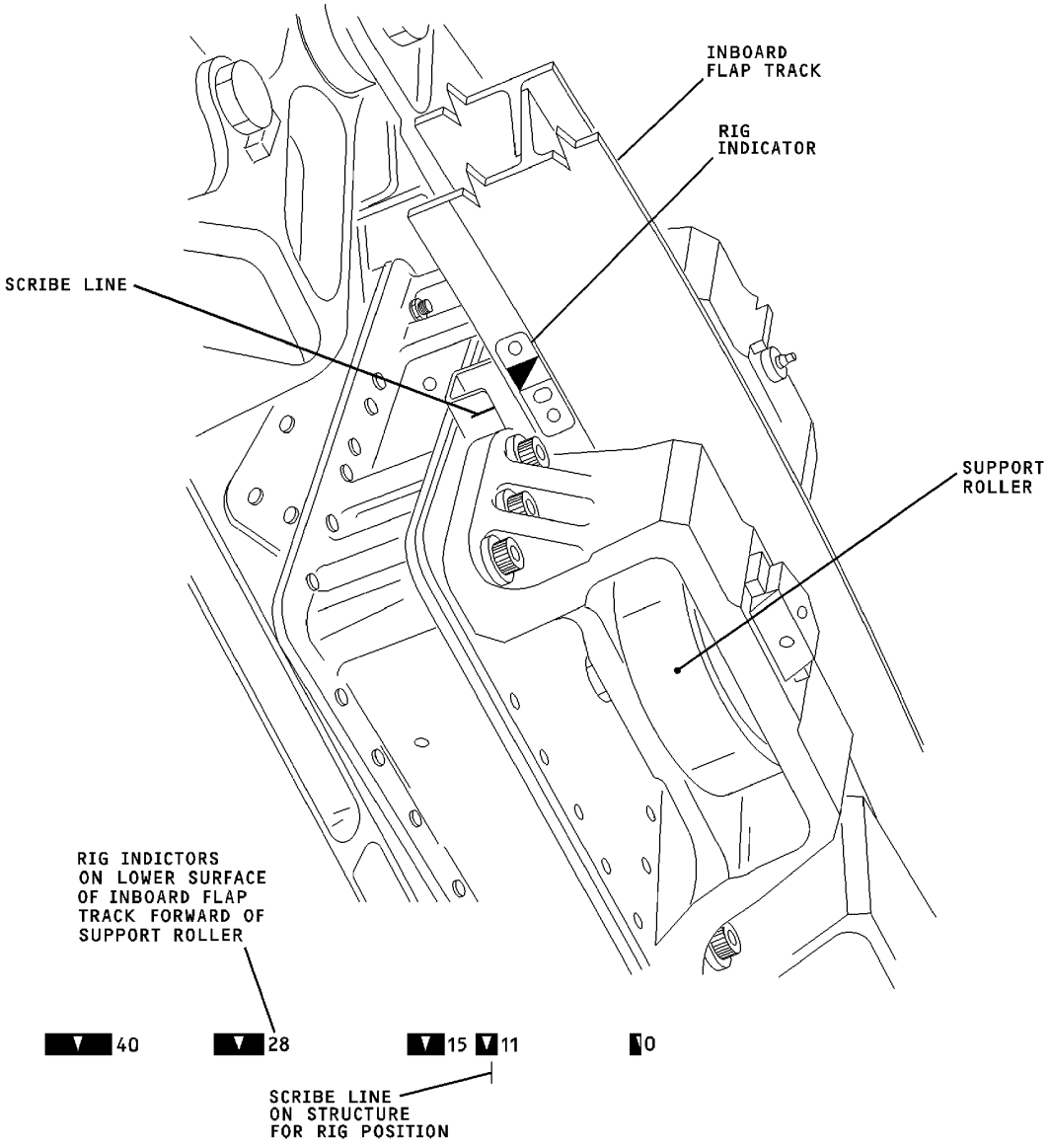
Flap Bus To Elevator Servo Force Limiter -- Adjustment/Test
Figure 506/27-30-00-990-812 (Sheet 2 of 3)



Flap Bus To Elevator Servo Force Limiter -- Adjustment/Test
Figure 506/27-30-00-990-812 (Sheet 3 of 3)

CABLE TENSION TABLE – SPEED BRAKE/FLAP INPUT TO ELEVATOR SERVO

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD
–60	19	13	9	40	67	61	46
–58	20	14	10	42	68	62	47
–56	21	15	11	44	69	63	48
–54	22	16	12	46	70	64	48
–52	23	17	12	48	71	65	49
–50	24	18	13	50	72	66	50
–48	25	19	14	52	73	67	51
–46	26	20	15	54	74	68	51
–44	27	21	15	56	75	69	52
–42	28	22	16	58	76	70	53
–40	29	23	17	60	77	71	54
–38	30	24	18	62	78	72	55
–36	31	25	18	64	79	73	55
–34	32	26	19	66	80	74	56
–32	33	27	20	68	81	75	57
–30	34	28	21	70	82	76	58
–28	35	29	21	72	83	77	58
–26	36	30	22	74	84	78	59
–24	37	31	23	76	85	79	60
–22	38	32	24	78	86	80	61
–20	39	33	24	80	87	81	62
–18	40	34	25	82	88	82	62
–16	41	35	26	84	89	83	63
–14	41	35	27	86	90	84	64
–12	42	36	27	88	91	85	65
–10	43	37	28	90	92	86	66
–8	44	38	29	92	93	87	67
–6	45	39	30	94	95	89	67
–4	46	40	30	96	96	90	68
–2	47	41	31	98	97	91	69
0	48	42	32	100	98	92	70
2	49	43	32	102	99	93	71
4	50	44	33	104	100	94	72
6	51	45	34	106	101	95	73
8	52	46	35	108	102	96	73
10	53	47	35	110	104	98	74
12	54	48	36	112	105	99	75
14	55	49	37	114	106	100	76
16	56	50	37	116	107	101	77
18	57	51	38	118	108	102	78
20	57	51	39	120	109	103	79
22	58	52	40	122	111	105	80
24	59	53	40	124	112	106	81
26	60	54	41	126	113	107	82
28	61	55	42	128	114	108	83
30	62	56	43	130	116	110	84
32	63	57	43	132	117	111	85
34	64	58	44	134	118	112	86
36	65	59	45	136	119	113	87
38	66	60	45	138	121	115	88
				140	122	116	89

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

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Cable Tension Table
Figure 507/27-30-00-990-813 (Sheet 1 of 2)

CABLE TENSION TABLE – 1/16 DIAMETER

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
–60	5	0	0	40	18	12	8
–58	5	0	0	42	18	12	9
–56	5	0	0	44	18	12	9
–54	6	0	0	46	19	13	9
–52	6	0	0	48	19	13	9
–50	6	0	0	50	19	13	9
–48	7	1	0	52	20	14	10
–46	7	1	0	54	20	14	10
–44	7	1	0	56	20	14	10
–42	7	1	0	58	20	14	10
–40	8	2	1	60	21	15	11
–38	8	2	1	62	21	15	11
–36	8	2	1	64	21	15	11
–34	8	2	1	66	22	16	11
–32	9	3	1	68	22	16	12
–30	9	3	2	70	22	16	12
–28	9	3	2	72	23	17	12
–26	9	3	2	74	23	17	12
–24	10	4	2	76	23	17	13
–22	10	4	2	78	24	18	13
–20	10	4	2	80	24	18	13
–18	10	4	3	82	24	18	13
–16	11	5	3	84	25	19	14
–14	11	5	3	86	25	19	14
–12	11	5	3	88	25	19	14
–10	11	5	3	90	26	20	15
–8	12	6	4	92	26	20	15
–6	12	6	4	94	27	21	15
–4	12	6	4	96	27	21	16
–2	12	6	4	98	27	21	16
0	13	7	4	100	28	22	16
2	13	7	5	102	28	22	16
4	13	7	5	104	28	22	17
6	13	7	5	106	29	23	17
8	14	8	5	108	29	23	17
10	14	8	5	110	30	24	18
12	14	8	6	112	30	24	18
14	14	8	6	114	31	25	18
16	15	9	6	116	31	25	19
18	15	9	6	118	31	25	19
20	15	9	6	120	32	26	19
22	15	9	7	122	32	26	20
24	16	10	7	124	33	27	20
26	16	10	7	126	33	27	20
28	16	10	7	128	34	28	21
30	16	10	7	130	34	28	21
32	17	11	8	132	35	29	21
34	17	11	8	134	35	29	22
36	17	11	8	136	36	30	22
38	18	12	8	138	36	30	23
				140	37	31	23

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

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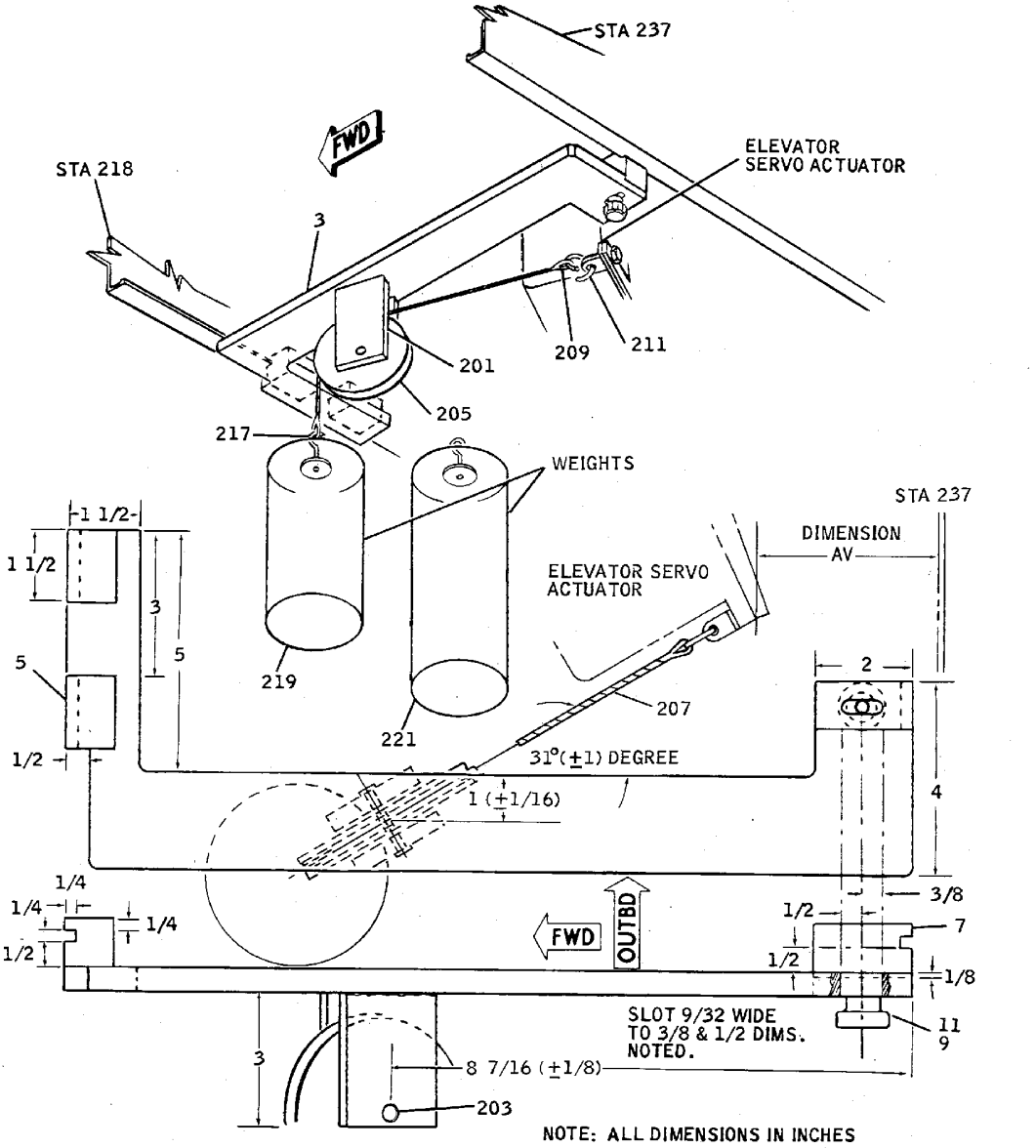
Cable Tension Table
Figure 507/27-30-00-990-813 (Sheet 2 of 2)



11	1	THD BAR STOCK
9	1	KNOB OR EQUIV.
7	1	1 X 1 1/2 X 2 1/4 6061-T6 ALUM.
5	2	1 X 1 1/4 X 1 3/4 6061-T6 ALUM.
3	1	1/2 X 7 1/4 X 18 6061-T6 ALUM.
221	1	4 1/2 DIA X 9 C.R.S.
219	1	4 1/2 DIA X 6 C.R.S.

217	2	T-53013-5 EYEBOLT OR EQUIV.
211	1	1/8 DIA. X 3 DR. ROD
209	2	CLAMPS FOR 207
207	18	1/16 (7 X 7) MIL-C-1511 CABLE
205	1	MS20220-3 PULLEY
203	1	5/16 DIA. X 1 1/2 DWL.
201	2	3/8 X 2 1/4 X 3 1/4 6061-T6 ALUM.

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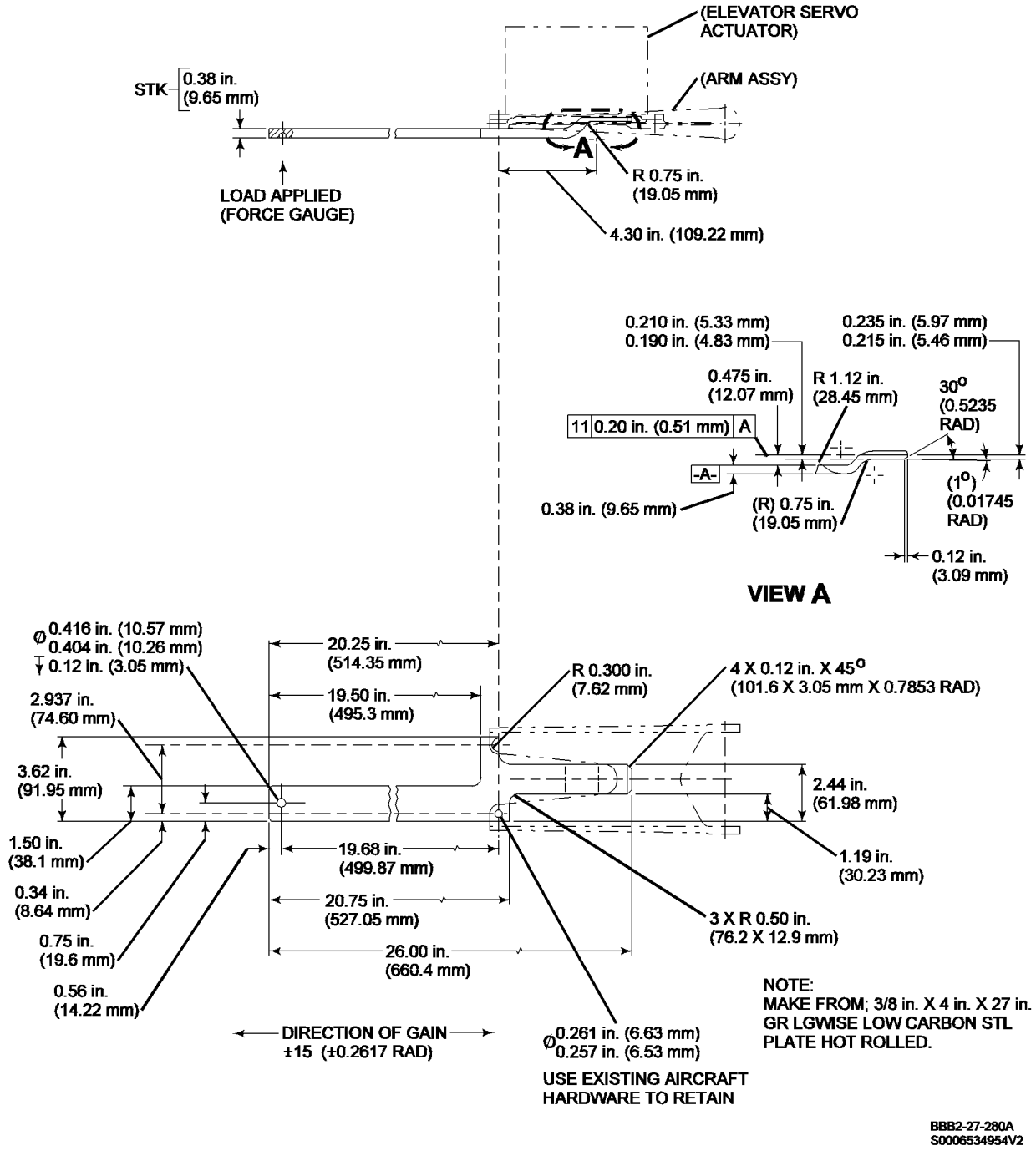
Elevator Servoactuator -- Tester
Figure 508/27-30-00-990-814



Elevator Servo Force Limiter Drum -- Fixture
Figure 509/27-30-00-990-815

4. Cable Assemblies

NOTE: Cable run numbers and segment letters listed below correspond to callouts in hexagonal symbols in Figure 501 and Figure 503.

Table 503

Function	Cable Run	Segment Letter
Left elevator up	3	A
	3	B
	3	C
Left elevator down	4	A
	4	B
	4	C
Right elevator up	5	A
	5	B
	5	C
	5	D
	5	E
Right elevator down	6	A
	6	B
	6	C
	6	D
	6	E
Mach pitch trim	21	A
Left elevator anti-float tab	251	A
	251	B
Right elevator anti-float tab	252	A
	252	B
Flap bus input to elevator servo force limiter - extend	207	A
	207	B
Flap bus input to elevator servo force limiter - retract	208	A
	208	B
Slat limiter extend - flap bus	247	A
	247	B
Slat limiter retract - flap bus	248	A
	248	B

ELEVATOR AND TAB - CHECK

1. General

A. When checking elevator control system for control column force, the flaps/slats must be in the up/retracted position and the horizontal stabilizer and elevators in the neutral position.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed item.

Table 601

Name and Number	Manufacturer
Push-pull Hunter force gauge (0-100 lbs) (0 to 45.359 kg)	John Chatillon and Son

3. Check Elevator and Tab

A. Check Elevator and Tab Clearances: (ELEVATOR AND TAB CLEARANCES- CHECK, PAGEBLOCK 27-30-02/601)

B. Check Elevator Control System for Excessive Friction

(1) Make certain left and right hydraulic systems are depressurized.

(2) Make certain flap/slat handle is in UP/RET position.

(3) Make certain horizontal stabilizer is in neutral position.

NOTE: Horizontal stabilizer is in neutral position when the centers of two protruding head rivets on left hand inboard leading edge of horizontal stabilizer line up with the center of a protruding head rivet in the vertical fin. Alignment rivets are identified by a circle and crossline target.

(4) Move control column through full travel, fore and aft, several times to bleed off hydraulic pressure.

(5) Clamp left and right elevators in neutral position.

NOTE: The elevators are in neutral position when, with the horizontal stabilizer in neutral position, the center of the aft inboard edge of each elevator lines up with the center of a protruding head rivet in the vertical fin. Alignment rivets are identified by a circle and crossline target.

(6) Attach push-pull force gauge to control wheel hub.

(7) Manually seek the control column neutral position by a fore and aft movement, allow control column to stabilize in neutral position.

(8) Measure and record distance from a point on control wheel hub, in line with center, to a point on instrument panel.

(9) Pull column aft 2(±0.03) inches, (50.8(±0.762) mm) from recorded distance in Paragraph 3.B.(8). Record column force.

(10) Pull column aft until force equals 40 pounds, (18.143 kg).

(11) Slowly relax column to 2(±0.03) inches, (50.8(±0.762) mm) position. Record column force.

(12) Subtract force recorded in Paragraph 3.B.(11) from force recorded in Paragraph 3.B.(9). Force should be 11(+2,-4) pounds, (4.989(+.907 -1.814) kg).

NOTE: This verifies acceptable friction level of all cables, bearings and load feel assembly.

(13) Slowly relax column to free position.

(14) Push column 2(±0.03) inches, (50.8(±0.762) mm) forward of recorded distance in Paragraph 3.B.(8). Record column force.

(15) Push column forward until force equals 40 pounds, (18.143 kg).

(16) Slowly relax column to 2(±0.03) inch, (50.8(±0.762) mm) position. Record column force.

(17) Subtract force recorded in Paragraph 3.B.(16) from force recorded in Paragraph 3.B.(14). Force should be 11(+2, -4) pounds, (4.989(+.907 -1.814) kg).

NOTE: This verifies acceptable friction level of all cables, bearings and load feel assembly.

(18) Slowly relax column to free position.

(19) Remove clamps from left and right elevators.

(20) Elevator surface friction check.

NOTE: The following procedure is to be performed on complete elevator surfaces, including installation of control tabs, geared tabs, anti-float tabs, dampers and power boost control valves and cylinders. Friction force level measurements are to be made normal (90°) to the elevator surface at the trailing edge between the geared tab and control tab and during still air (no wind) conditions. The horizontal stabilizer should be positioned at the approximate neutral position and elevator power boost hydraulic pressure should be bled off.

(21) Manually move left elevator surface to full trailing edge down (TED) position.

(22) Using force gauge, at position in above NOTE, slowly move left elevator to a trailing edge up (TEU) position, 13 inches, (330.2 mm) minimum from protruding head rivet. Force required should be 0 to 1 pound, (0.0 to 0.453 kg).

(23) Using force gauge, slowly move elevator to full TED position, 6 inches, (152.4 mm) minimum from protruding head rivet. Force required should be 9.75 pounds (4.39 kg) maximum. If elevator floats up at Paragraph 3.B.(22) with 0 pounds, maximum force allowed is 8.5 pounds.

(24) Repeat Paragraph 3.B.(21) through Paragraph 3.B.(23) for right elevator surface, while holding left elevator at neutral position.

NOTE: If friction levels are out of tolerance, check for causes of excessive friction at elevator hinges, geared tab hinges and pushrods, control tab hinges, dampers and power boost valves and cylinders. Verify proper lubrication at all lube fittings.

ELEVATOR LOAD-FEEL AND CENTERING SPRING MECHANISM - MAINTENANCE PRACTICES

1. General

A. The elevator load-feel and centering spring mechanism is installed at the lower end of the right control column beneath the flight compartment floor. Rig pin holes are provided in the lower end of the left control column for establishing control column neutral position. Access to the rig pin holes is through the electrical/electronics compartment. Access to load-feel and centering spring is through control cabin floor panel No. 4434C.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
Lockwire, NASM20995N32, DPM 684*[1]	Not specified
Rig pin (6-5) 3/8 by 5 5/8 (9.525 x 142.875 mm)	Douglas Aircraft Co.
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch), (15.875 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Elevator Load-feel and Centering Spring Mechanism

A. Remove Spring Mechanism

(1) Place control column in neutral position. Install rig pin (6-5) in rig pin hole (R-1) in lower end of left control column.

(2) Remove attach bolts from forward and aft ends of load-feel spring and carefully remove load-feel spring.

B. Install Spring Mechanism

(1) Make certain rig pin (6-5) is installed in rig pin hole (R-1).

(2) Carefully place forward end of load-feel and centering spring through hole provided in structure and install attach bolt. Safety nut with cotter pin.

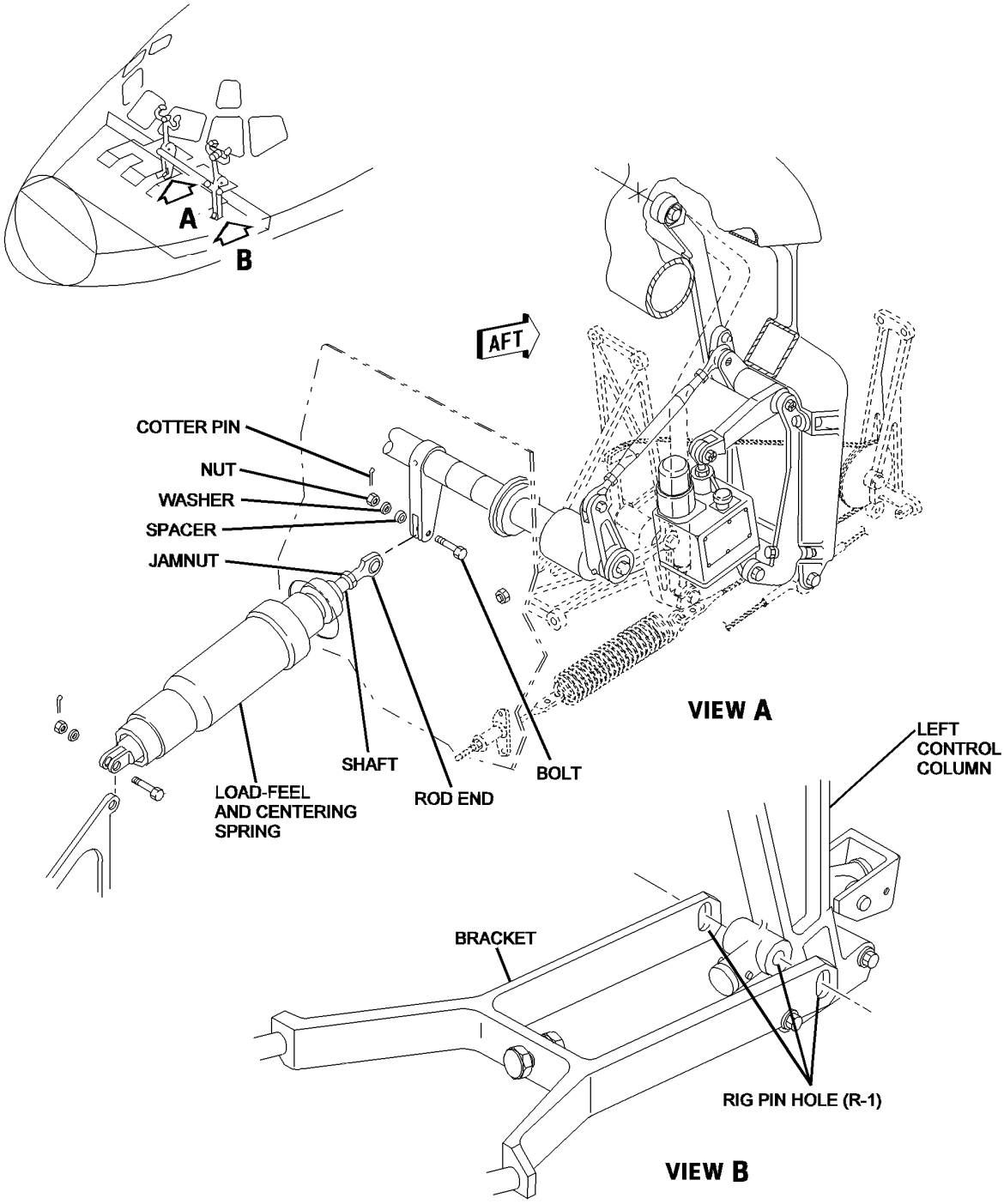
(3) Loosen jamnut and adjust shaft until attach bolt can be freely installed through rod end and crank. Install bolt and safety nut with cotter pin.

(4) Tighten jamnut and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(5) Remove rig pin (6-5).

(6) Move control column full forward and full aft several times, check that control column returns to neutral position smoothly and without binding.

(7) Check that rig pin (6-5) can be freely inserted and removed from rig pin hole (R-1). If necessary, readjust load-spring shaft until rig pin (6-5) can be freely inserted and removed.



Elevator Load-Feel and Centering Spring Mechanism -- Removal/Installation
Figure 201/27-30-01-990-801

ELEVATOR LOAD-FEEL MECHANISM - REMOVAL/INSTALLATION

1. General

A. The elevator load-feel mechanism is installed at the lower end of the right control column beneath the flight compartment floor. Rig pin holes are provided in the lower end of the left control column for establishing control column neutral position. Access of the rig pin holes is through the electrical/electronics compartment. Access to the load-feel and centering spring is through control cabin floor panel No. 4434C. Access to the elevator load-feel mechanism is through floor panel No. 4414A.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 401

Name and Number	Manufacturer
Lockwire, NAMS20995N32, DPM 684*[1]	Not Specified
Rig pin (6-5) 3/8 by 5/8 in. (9.525 X 142.875 mm)	The Boeing Company

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation of Elevator Load-Feel Mechanism

A. Removal of Elevator Load-Feel Mechanism (Figure 403)

(1) Place control column in neutral position. Install rig pin 6-5 in rig pin hole (R-1) in lower end of left control column. (Figure 401)

(2) Disconnect cables 256A and 256B by detaching turnbuckles W and Y. (Figure 402).

(3) Remove bolt (1), two washers (2), nut (3), and cotter pin (4) from load-feel and centering spring and elevator load-feel mechanism.

(4) Disconnect torque tube from the diaphragm as follows:

(a) Remove bolt (5), washer (6), nut (7), and cotter pin (8) from torque tube and diaphragm.

(b) Remove bolt (9), washer (10), nut (11), and cotter pin (12) from torque tube and diaphragm.

(5) Detach diaphragm from elevator load-feel mechanism as follows:

(a) Remove bolt (13), washer (14) from elevator load-feel mechanism.

(b) Remove bolt (17), washer (18), nut (19), and cotter pin (20) from elevator load-feel mechanism.

(c) Keep diaphragm with torque tube for later installation.

(6) Remove the crank assembly as follows:

(a) Remove bolt (31), washer (30), and nut (29) from crank assembly.

(b) Remove nut (32) and the washer (33) from crank assembly.

(c) Disengage crank assembly from torque tube.

(7) Remove two bolts (21), two washers (22), and spacer (23) from support.

(8) Remove two bolts (25), washers (26), nuts (27), and bushings (28) from support base.

(9) Remove elevator load-feel mechanism and cables 256A and 256B.

(10) Remove torque tube from elevator load-feel mechanism.

B. Installation of Elevator Load-Feel Mechanism (Figure 403)

(1) Make certain that control column is in neutral position and rig pin 6-5 is in rig pin hole (R-1) in lower end of left control column. (Figure 401)

(2) Place elevator load-feel mechanism with cables 256A and 256B in position so that support bases can be attached. (Figure 402)

(3) Install two bolts (21), washers (22), and one spacer (23).

NOTE: Do not tighten bolts and nuts until all bolts and nuts are installed and there are no misaligned holes.

(4) Install two bolts (25), washers (26), bushings (28), and nuts (27).

(5) Align and install torque tube with elevator load-feel mechanism.

(6) Insert diaphragm between torque tube and elevator load-feel mechanism with diaphragm holes aligned to torque tube and elevator load-feel mechanism.

(7) Attach diaphragm as follows:

(a) Install bolt (13), and washer (14), to elevator load-feel mechanism.

(b) Install bolt (17), washer (18), and nut (19) to elevator load-feel mechanism.

NOTE: Do not tighten bolts and nuts until all bolts and nuts are installed and there are no misaligned holes.

(8) Connect torque tube as follows:

(a) Install bolt (5), washer (6), and nut (7).

(b) Install bolt (9), washer (10), and nut (11).

NOTE: Do not tighten bolts and nuts until all bolts and nuts are installed and there are no misaligned holes.

(9) Torque bolts and nuts to required standard.

(10) Install crank assembly as follows:

(a) Engage the crank assembly into torque tube. Make sure to align index mark on end of spline with index mark on torque tube.

(b) Install washer (33) and nut (32) to crank assembly.

(c) Torque nut (32) to 30 in-lb (3 N·m). Permissible to back nut off just enough to install lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(d) Install bolt (31), washer (30), and nut (29) to attach pushrod to crank assembly.

(e) Install cotter pin (34) and lockwire (35). (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(11) Install bolt (1), two washers (2), spacer (36), and nut (3) to attach centering spring mechanism to elevator load-feel mechanism.

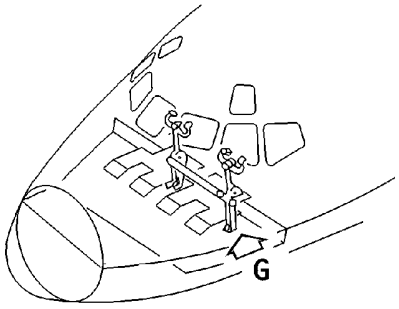
(12) Install cotter pins (4), (8), (12), (20), and lockwire (16). (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

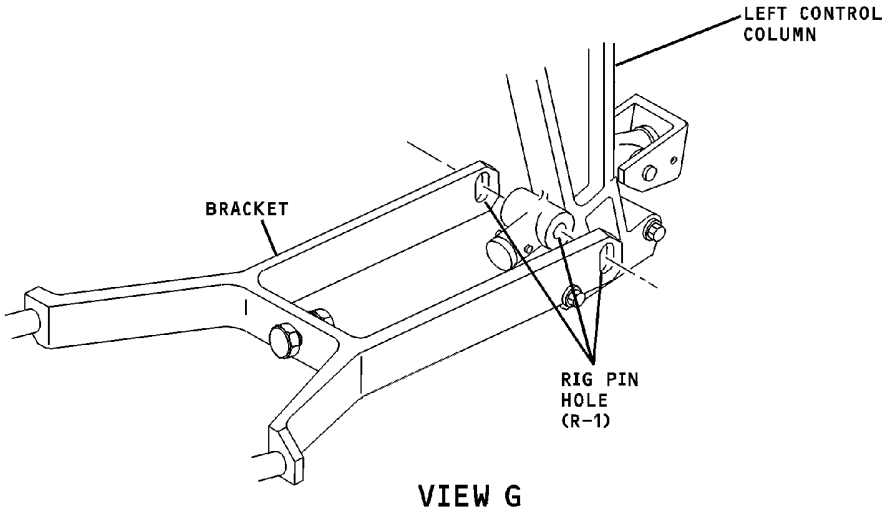
(13) Install cables 256A and 256B. Run cables as routed before.

(14) Attach turnbuckles W and Y.

(15) Perform adjustment/test of the Horizontal Stabilizer to adjust cables 256A and 256B as required. (PAGEBLOCK 27-40-00/501)

(16) Remove tools and equipment. Clean area.





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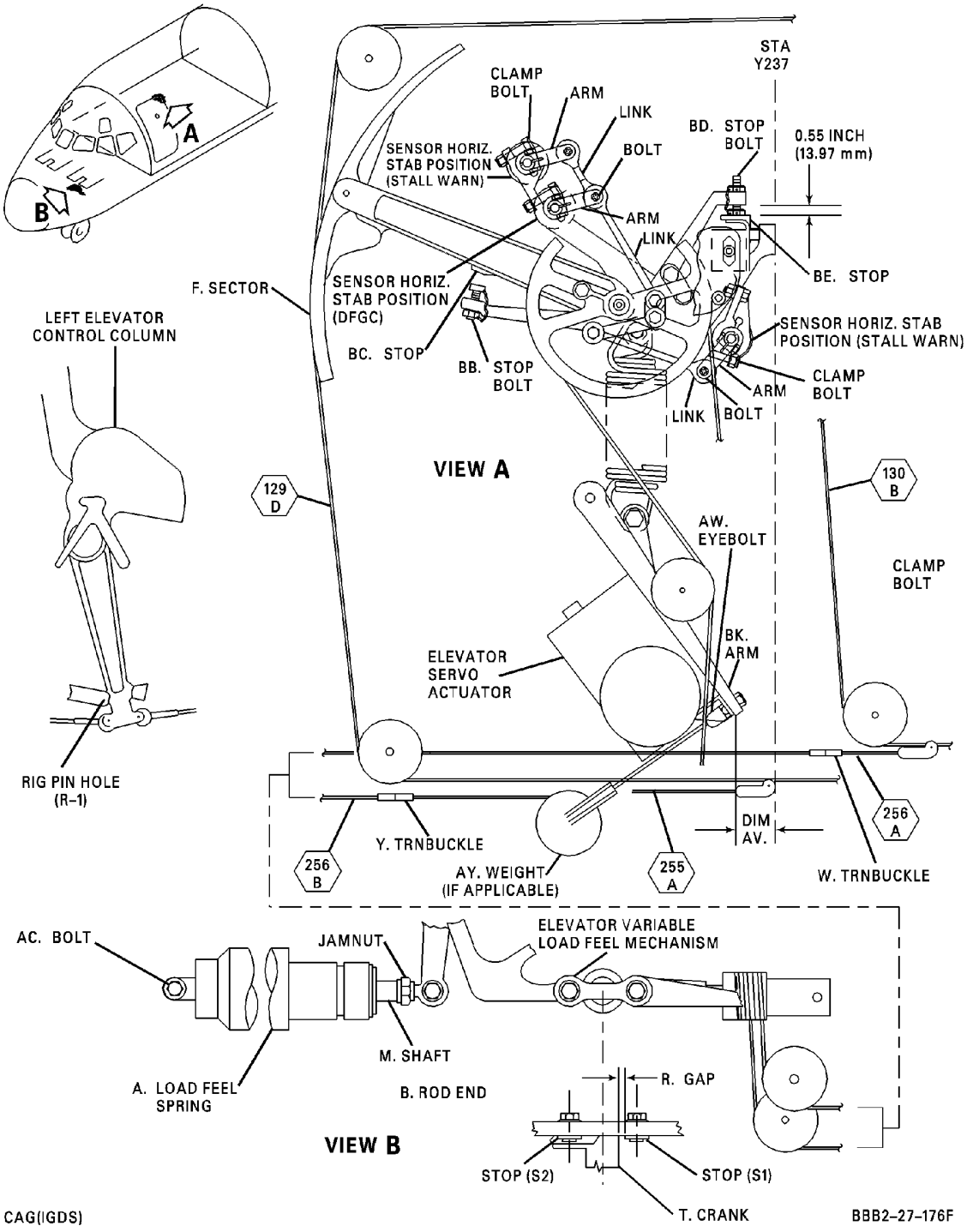
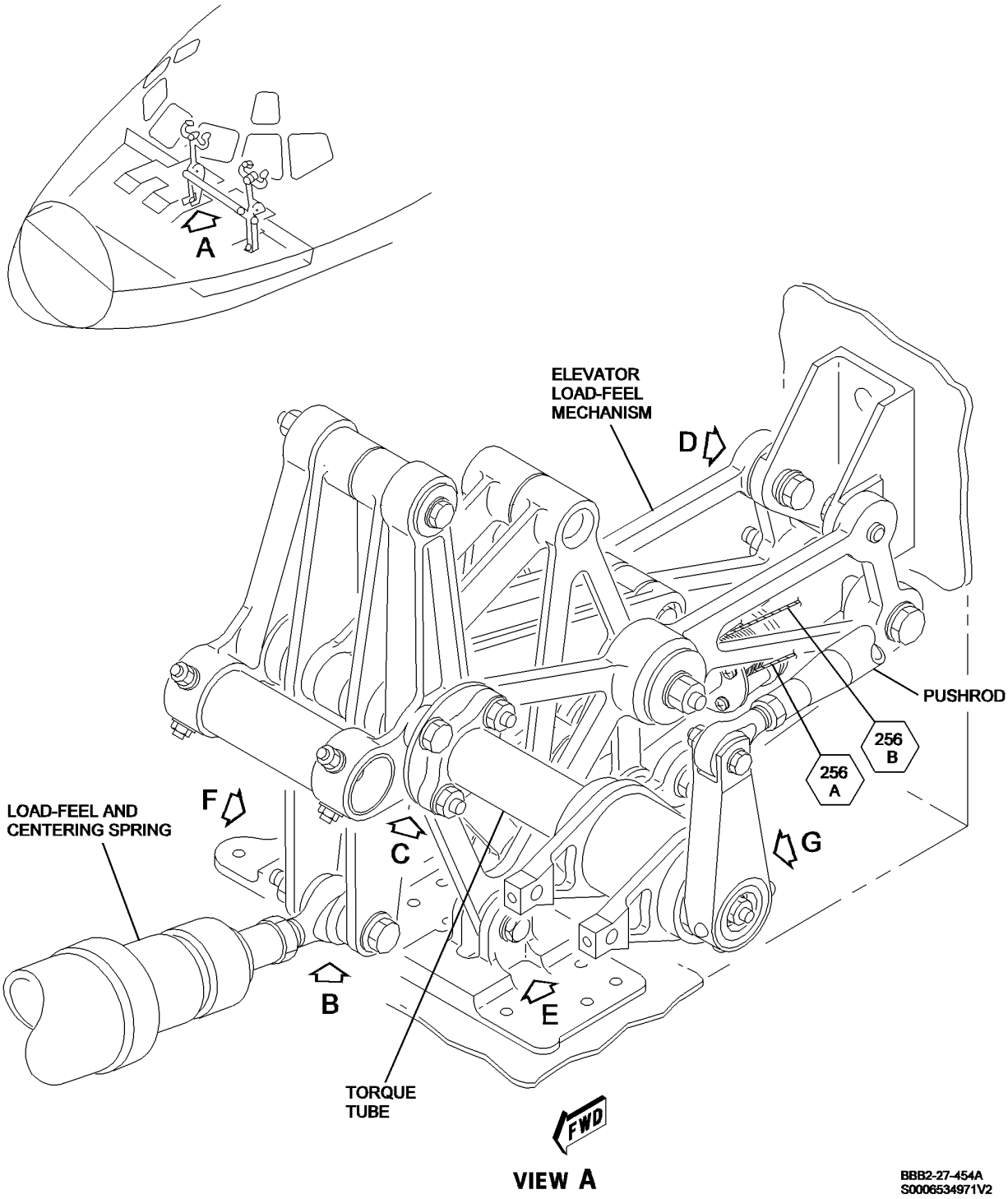
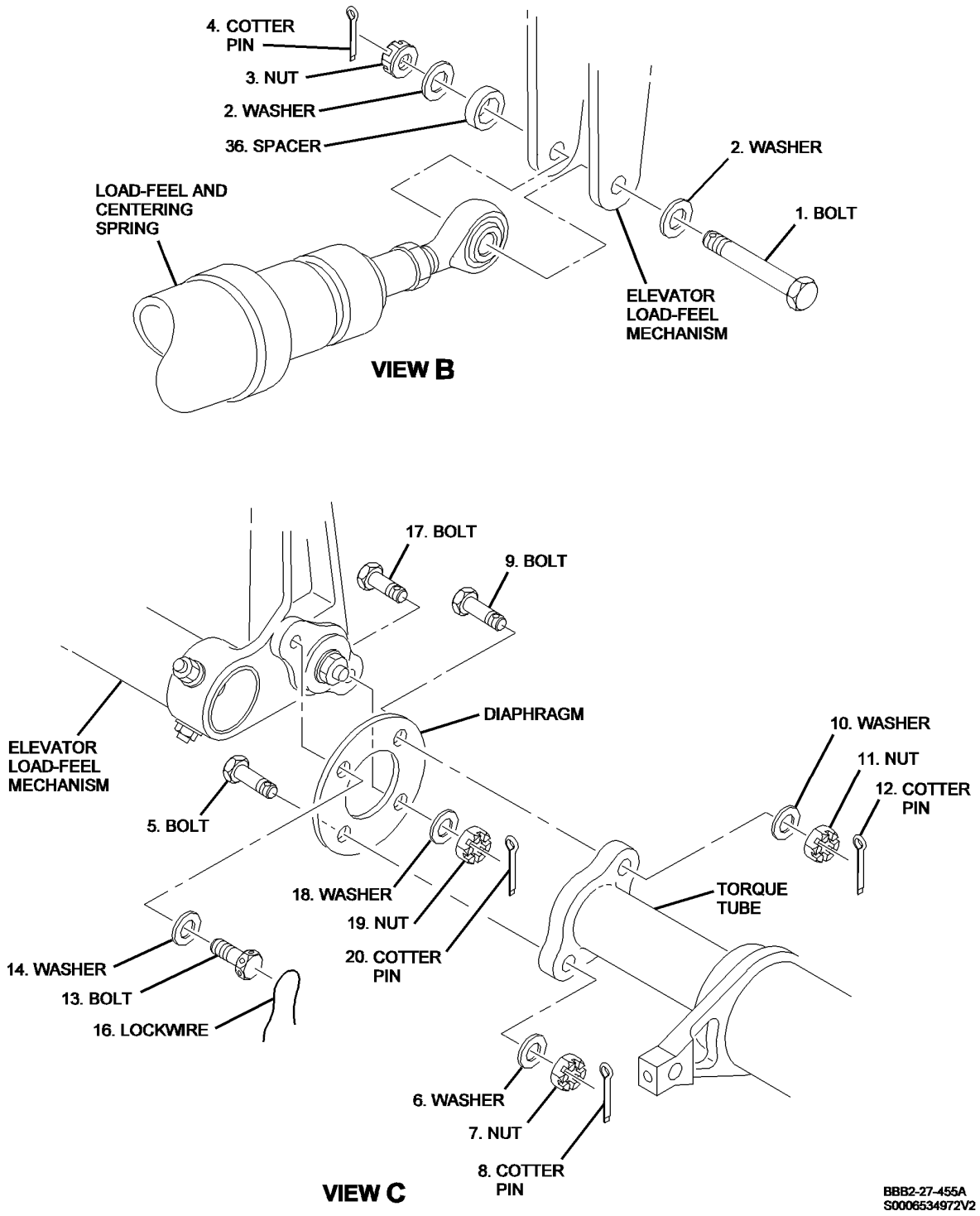
Elevator Load-Feel Mechanism Rig Pin Setting
Figure 401/27-30-01-990-802



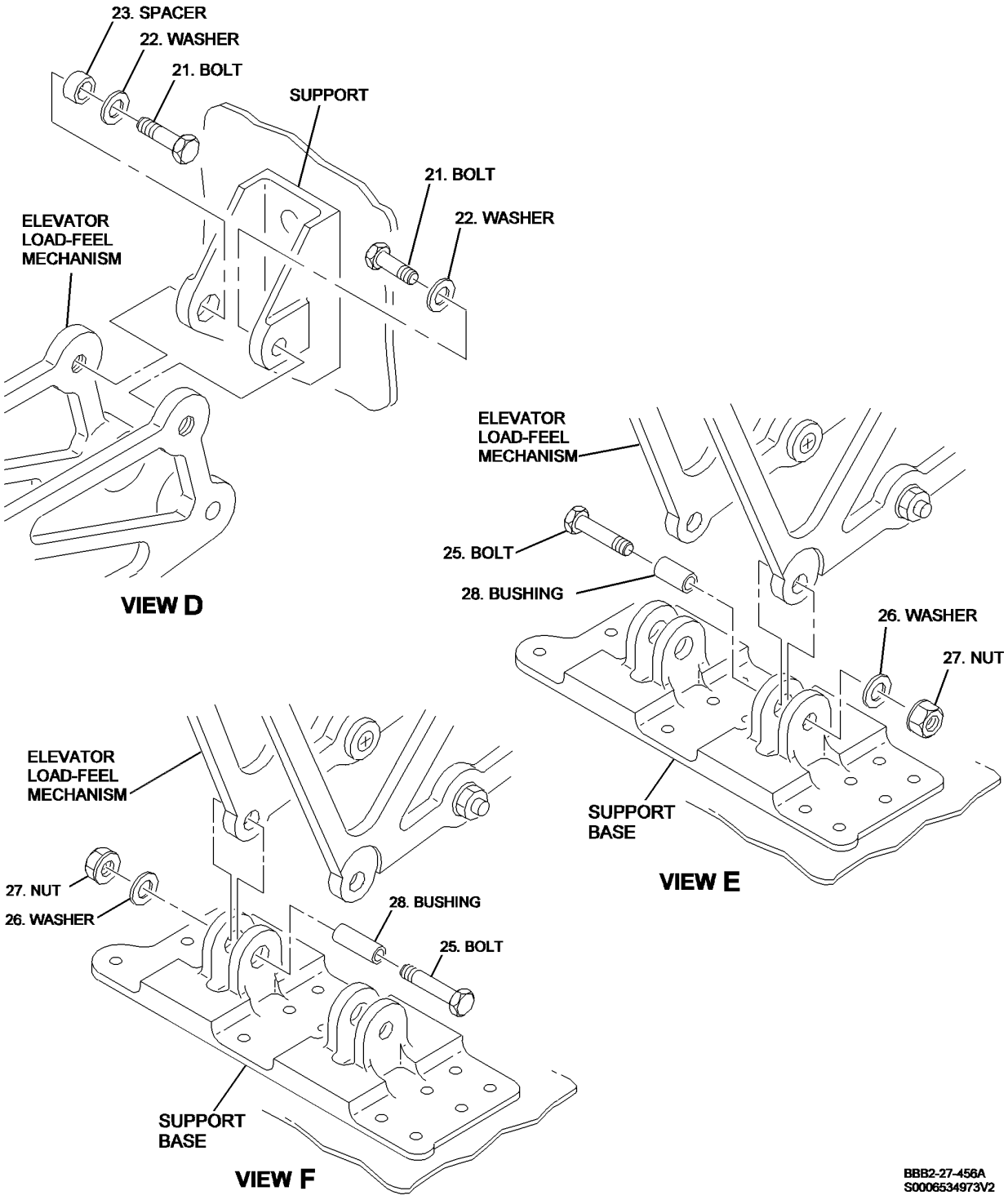
Elevator Load-Feel Mechanism Cables - Removal/Installation
Figure 402/27-30-01-990-803



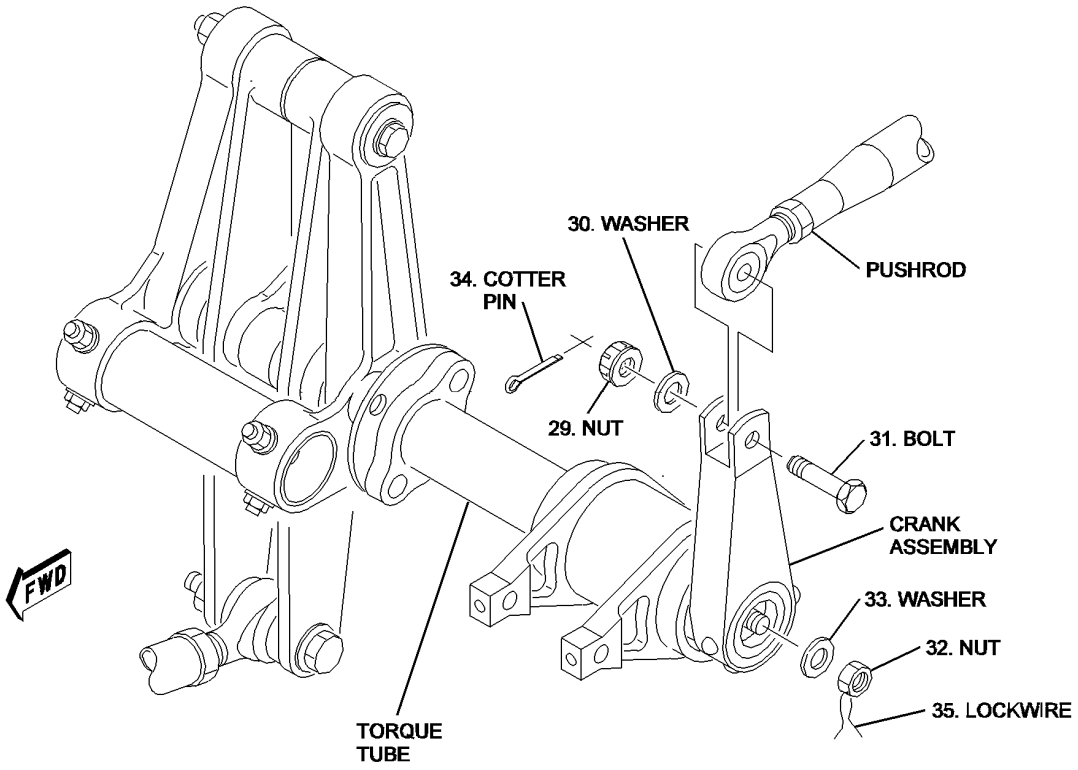
Elevator Load-Feel Mechanism - Removal/Installation
Figure 403/27-30-01-990-804 (Sheet 1 of 4)



Elevator Load-Feel Mechanism - Removal/Installation
Figure 403/27-30-01-990-804 (Sheet 2 of 4)



Elevator Load-Feel Mechanism - Removal/Installation
Figure 403/27-30-01-990-804 (Sheet 3 of 4)



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Elevator Load-Feel Mechanism - Removal/Installation
Figure 403/27-30-01-990-804 (Sheet 4 of 4)

ELEVATOR VARIABLE LOAD-FEEL TORQUE TUBE - INSPECTION/CHECK

1. General
   A. This procedure contains task card data.
   B. Refer to Service Letter MD-80-SL-27-104.

TASK 27-30-01-211-801

2. Elevator Variable Load Feel Torque Tube Assembly Inspection

A. Inspection

SUBTASK 27-30-01-211-001

(1) Do a detailed inspection of the elevator variable load feel torque tube assembly per service letter MD-80-SL-27-104.

NOTE: Refer to the service letter for applicable part numbers and inspection procedures.

——— END OF TASK ———

ELEVATOR - REMOVAL/INSTALLATION

1. General

A. The elevators are hinged to the horizontal stabilizer rear closing spar. For convenience hinges are numbered 1 through 6, inboard to outboard. The removal and installation procedures are identical for the left and right elevators.

B. Access to the elevator attach fittings is through panels in the upper and lower surfaces of the elevator at the inboard hinge; through the lower surface at each of the other hinge points; and through the leading edge at the dampers.

C. Numbers in parentheses in the following test correspond to callouts in Figure 401.

D. Each elevator and tabs weigh approximately 390 lb (177 kg).

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 401

Name and Number	Manufacturer
Universal handling sling (5916712-1)	Douglas Aircraft Co.
Hoist	
Protractor (5916715)	Douglas Aircraft Co.
Torque Wrench (0 in-lb (0 N·m)-2000 in-lb (226 N·m))	
Parker O-Lube (DPM 5367)	Parker Seal Co. Culver City, CA.

3. Removal/Installation Elevator

A. Remove Elevator (Figure 401) (Figure 402)

(1) Make certain that horizontal stabilizer position indicator, on control pedestal, is at neutral (0 degrees) position.

(2) Depressurize left hydraulic system. (PAGEBLOCK 29-00-00/201)

(3) Remove bolt (1) to disconnect damper link from stabilizer rear spar fitting at No. 2 hinge.

(4) On airplanes without Service Bulletin 27-262, remove nut (2) and washer (10). (Figure 401, View A)

(5) On airplanes with Service Bulletin 27-262, remove cotter pin (13), nut (12) and PLI washer (11). Discard used PLI washer (11). (Figure 401, View A)

(6) Remove bolts (3) to disconnect geared tab inboard and outboard pushrod links from stabilizer rear spar fittings. (Figure 401, View C)

(7) Remove bolt (8) to disconnect anti-float tab pushrod and spring cartridge pushrod from elevator front spar fitting. (Figure 401, View D)

NOTE: Note and record position of anti-float tap pushrod and spring cartridge pushrod before removing bolt (8).

WJE 401-404, 412, 414, 873-879, 886, 887, 892, 893

(8) Remove bolt (4) to disconnect control tab pushrod and follow-up balance link from torque tube end fitting. (Figure 402)

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 880, 881, 883, 884, 891

(9) Remove bolt (4) to disconnect control tab pushrod and follow-up balance link from torque tube end fitting. (Figure 402) If bolt (4) is installed with head outboard (head next to hinge) perform following:

(a) Loosen jamnut on forward end of control tab pushrod and thread off pushrod from forward rod end.

(b) Remove trailing edge tab access cover 3523A or 3624A as applicable.

(c) Remove pushrod through access opening.

WJE ALL

(10) Remove bolt (5) to disconnect elevator follow-up pushrod from elevator fitting.

(11) Install elevator sling (Figure 403), connect hoist to sling, and take up slack to remove weight from hinges.

WJE 401-404, 873-879, 886, 887, 892, 893

(12) Remove bolt (6) to disconnect elevator from horizontal stabilizer at No. 1 hinge. (Figure 402)

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 880, 881, 883, 884, 891

(13) Remove stabilizer tip and remove nuts (7) and washers (9) to disconnect elevator from eyebolts at hinges 2 through 6. (Figure 401)

NOTE: Rotate elevator about hinge No. 1 bolt to gain access to nuts. If required, remove hinge covers for additional access and prevent possible damage to covers.

(14) Remove bolt (6) to disconnect elevator from horizontal stabilizer at No. 1 hinge and remove elevator. (Figure 402)

WJE 401-404, 412, 414, 873-879, 886, 887, 892, 893

(15) Remove nuts (7) and washers (9) to disconnect elevator from eyebolts at hinges 2 through 6, and remove elevator. (Figure 401)

NOTE: If lateral movement is insufficient for elevator removal, remove stabilizer tip.

WJE ALL

(16) Remove sling and insert screws in sling attach holes in upper surface of elevator.

B. Install Elevator

(1) Make certain that horizontal stabilizer position indicator, on control pedestal, is at neutral (0 degrees) position.

(2) Make certain left hydraulic system is depressurized.

(3) Remove screws from sling attach holes in upper surface of elevator and install sling.

(4) Check that elevator hinge eyebolts attach bolts are installed as follows: 2 and 3 bolt heads inboard, 4, 5, and 6 bolt heads outboard.

NOTE: Check that grease fitting for No. 6 hinge eyebolt bearing is installed toward lower fairing.

(5) Clean contact area between base of eyebolt and elevator fitting at each hinge to provide good electrical bond.

(6) Hoist elevator in position.

(7) Install nut and bolt (6) (with head outboard) to connect elevator to stabilizer at hinge 1. Do not torque at this time.

NOTE: Install washer under head of bolt and under nut.

WARNING: LUBRICANT IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN LUBRICANT IS USED.

- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET THE LUBRICANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

(8) Apply coat of Parker O-Lube to hinge rod end shank on hinges 2 through 6.

WJE 401-404, 412, 414, 873-879, 886, 887, 892, 893

(9) Hoist elevator in position and install nuts to connect hinges 2 through 6. (Figure 401)

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 880, 881, 883, 884, 891

(10) Rotate elevator forward pivoting about hinge 1 to engage hinges 2 through 6.

WJE 401-404, 412, 414, 873-879, 886, 887, 892, 893

(11) Tighten hinge 2 nut to torque value of 1850 in-lb (209 N·m) to 1950 in-lb (220 N·m).

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 880, 881, 883, 884, 891

(12) Install and tighten hinge 2 nut to torque value of 1850 in-lb (209 N·m) to 1950 in-lb (220 N·m).

WJE ALL; AIRPLANES WITH 5910410-507 OR 5910410-508 ELEVATORS

(13) Install and tighten hinge 3, 4, and 5 nuts to torque value of 300 in-lb (34 N·m) to 375 in-lb (42 N·m).

WJE ALL; AIRPLANES WITH 5910410-509 OR 5910410-510 ELEVATORS

(14) Install and tighten hinge 3, 4, and 5 nuts to torque value of 740 in-lb (84 N·m) to 820 in-lb (93 N·m).

WJE 401-404, 412, 414, 873-879, 886, 887, 892, 893

(15) Tighten hinge 6 nut to torque value of 200 in-lb (23 N·m) to 225 in-lb (25 N·m).

WJE ALL

(16) Install and tighten hinge 6 nut to torque value of 200 in-lb (23 N·m) to 225 in-lb (25 N·m).

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(17) Install bolt (6) (with head outboard) to connect elevator to stabilizer at hinge 1. Tighten nut to torque value of 160 in-lb (18 N·m) to 190 in-lb (21 N·m). Safety with cotter pin. (Figure 402)

NOTE: Install washer under head of bolt and under nut.

WJE ALL

(18) Remove elevator sling and insert screws in sling attach holes.

(19) Install bolt (5) to connect elevator follow-up pushrod to elevator fitting. Safety nut with cotter pin.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 880, 881, 883, 884, 891

(20) Install bolt (4) (with bolt head inboard) to connect control tab pushrod and follow-up balance link to torque tube end fitting. Safety nut with cotter pin.

(21) If bolt (4) was removed, install bolt (with bolt head inboard) to connect control tab pushrod and follow-up balance link to torque tube end fitting. Safety nut with cotter pin.

(22) If control tab pushrod was threaded off at forward rod end, perform following:

(a) Install pushrod through trailing edge tab access.

(b) Thread forward end of pushrod onto rod end until threads are visible in witness hole.

WJE ALL

(23) Install bolts (3) to connect geared tab inboard and outboard pushrod links to stabilizer rear spar fittings. Safety nut with cotter pin.

NOTE: Install washer under head of bolt and under nut.

WJE 401-404, 412, 414, 873-879, 886, 887, 892, 893

WARNING: LUBRICANT IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN LUBRICANT IS USED.

- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET LUBRICANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(24) Position antifloat tab pushrod and spring cartridge pushrod in elevator front spar fitting, as recorded in Paragraph 3.B.(9) Apply Parker O-Lube on bolt (8) and install. Safety nut with cotter pin.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 880, 881, 883, 884, 891

WARNING: LUBRICANT IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN LUBRICANT IS USED.

- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET THE LUBRICANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(25) Position antifloat tab pushrod and spring cartridge pushrod in elevator front spar fitting, as recorded in Paragraph 3.B.(6) Apply Parker O-Lube on bolt (8) and install. Safety nut with cotter pin.

WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891

CAUTION: MAKE CERTAIN THAT EYEBOLT IS INSTALLED WITH SHORT TAB DOWN AND THAT BOLT CONNECTING UNIVERSAL TO PISTON SHAFT IS INSTALLED WITH HEAD DOWN TO PREVENT INTERFERENCE.

(26) Connect elevator hydraulic boost cylinder to elevator as follows:

(a) On aircraft without Service Bulletin 27-262 (rod-end eyebolt without cotter pin hole, and without PLI-washer) apply Parker O-Lube to eyebolt shank that connects elevator hydraulic boost cylinder to elevator and install nut (2). Using torque wrench check that initial running torque of nut (2) is 18 in-lb (2 N·m) minimum, tighten nut (2) to final torque of 400 in-lb (45 N·m)(±50 in-lb (6 N·m)).

NOTE: If the initial running torque of nut does not meet the 18 in-lb (2 N·m) minimum requirement, replace the nut with a new nut that does meet the minimum 18 in-lb (2 N·m) initial running torque requirement.

(b) On aircraft with Service Bulletin 27-262 (rod-end eyebolt with cotter pin hole and PLI-washer installed) apply Parker O-Lube to eyebolt shank connecting elevator hydraulic boost cylinder to elevator and install nut (2). Tighten nut (2) to torque of 250 in-lb (28 N·m) to 270 in-lb (31 N·m) and safety with cotter pin.

NOTE: If slot in nut and cotter pin hole in eyebolt align, install cotter pin. If slot in nut and cotter pin hole in rod end do not align, tighten nut a minimum amount required to obtain alignment (60°arc (1 rad)) max reference) to the next slot and install cotter pin. PLI washer must be replaced if nut is loosened any amount for any reason. Ring on PLI washer must be free to rotate after cotter pin installation. Cotter pin hole direction is machined on the end of rod end for use as an installation aid.

1) Apply sealant PR-1422 A-2 to encapsulate PLI washer to ensure anti-tampering after installation of cotter pin.

WJE 401-412, 414, 873-881, 883, 884, 886, 887, 892, 893

CAUTION: MAKE CERTAIN THAT EYEBOLT IS INSTALLED WITH SHORT TAB DOWN AND THAT BOLT CONNECTING UNIVERSAL TO PISTON SHAFT IS INSTALLED WITH HEAD DOWN TO PREVENT INTERFERENCE.

(27) On airplanes without Service Bulletin 27-262, apply Parker O-Lube to eyebolt shank that connects to elevator hydraulic boost cylinder to elevator with washer (10) and nut (2). Using torque wrench check that initial running torque of nut (2) is 18 in-lb (2 N·m) minimum, tighten nut (2) to final torque of 400 in-lb (45 N·m)(±50 in-lb (6 N·m)). (Figure 401 View A)

NOTE: If the initial running torque of nut does not meet the 18 in-lb (2 N·m)) minimum requirement, replace the nut with a new nut that does meet the minimum 18 in-lb (2 N·m) initial running torque requirement.

(28) On airplanes with Service Bulletin 27-262, apply Parker O-Lube to eyebolt shank connecting elevator hydraulic boost cylinder to elevator and install a new PLI washer (11) and a new nut (12). Tighten nut (12) to torque of 250 in-lb (28 N·m) to 270 in-lb (31 N·m) and safety with cotter pin (13). (Figure 401 View A)

NOTE: If slot in nut and cotter pin hole in eyebolt align, install cotter pin. If slot in nut and cotter pin hole in rod end do not align, tighten nut a minimum amount required to obtain alignment (60°arc (1 rad) max reference) to the next slot and install cotter pin. PLI washer must be replaced if nut is loosened any amount for any reason. Ring on PLI washer must be free to rotate after cotter pin installation. Cotter pin hole direction is machined on the end of rod end for use as an installation aid.

WARNING: INTEGRAL FUEL TANKS SEALING COMPOUND (POLYSULFIDE SEALANT B1/2 AND B2) IS AN AGENT THAT IS POISONOUS AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN INTEGRAL FUEL TANKS SEALING COMPOUND IS USED.

- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET INTEGRAL FUEL TANKS SEALING COMPOUND IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(29) On airplanes with Service Bulletin 27-262, examine the rod end bolt on the elevator boost cylinder before sealant is applied.

(a) Make sure that cotter pin (13) is installed in nut (12).

NOTE: The rod end bolt is made safe with cotter pin (13) installed.

(b) Make sure that ring on PLI washer (11) is free to rotate.

WJE 401-412, 414, 873-881, 883, 884, 886, 887, 892, 893 (Continued)

(30) On airplanes with Service Bulletin 27-262, apply a layer of low viscosity, polysulfide sealant, PR-1422 A-2 around the rod end bolt, PLI washer (11), nut (12) and the adjacent area of the elevator and tab assembly.

(a) The minimum thickness of the sealant must be 0.030 in. (0.762 mm) to 0.035 in. (0.889 mm).

WJE ALL

(31) Install bolt (1) to connect damper link to stabilizer rear spar fitting. Safety nut with cotter pin.

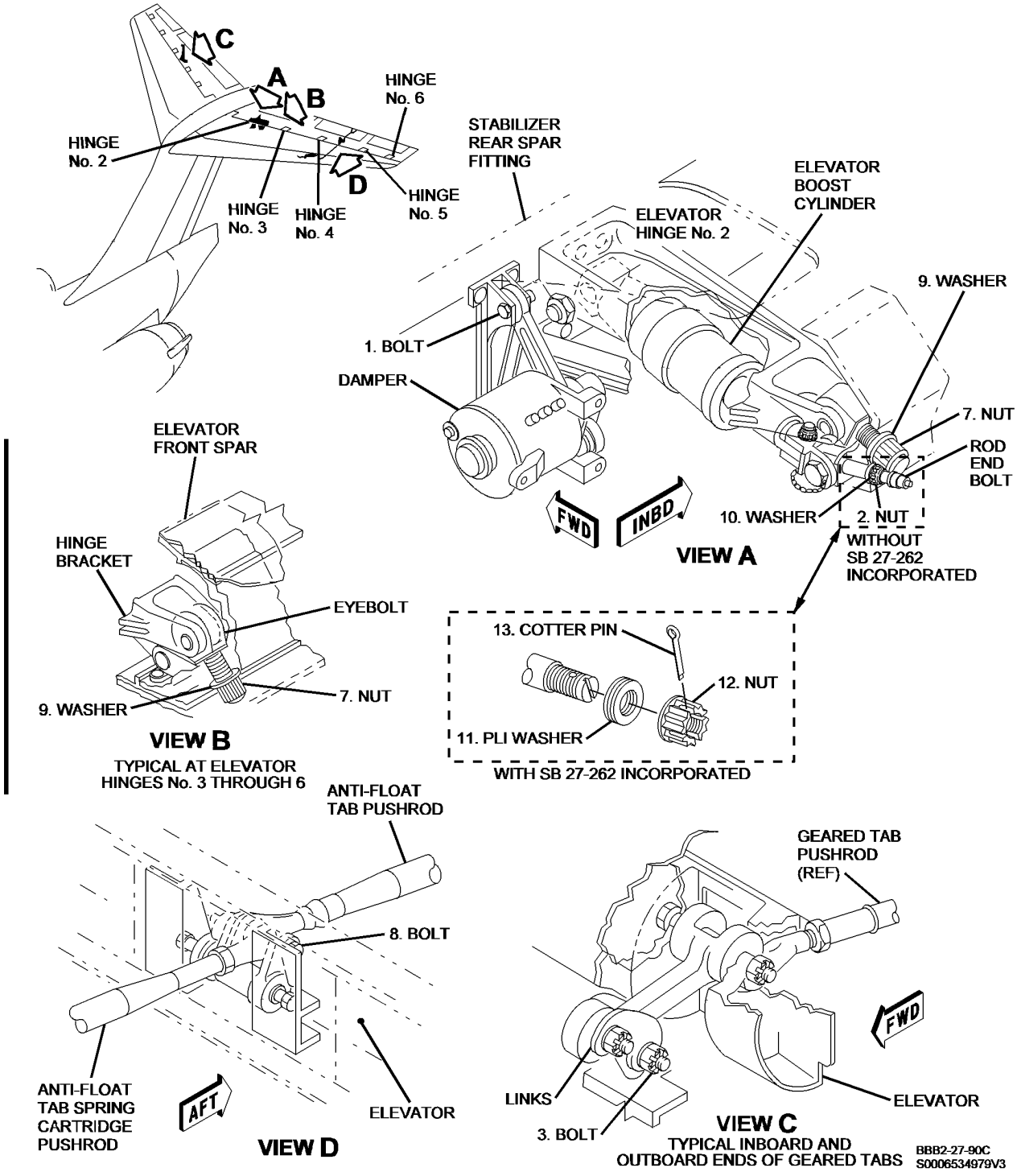
(32) If control tab pushrod was removed from rod end for elevator removal and installation, adjust elevator control tab. (PAGEBLOCK 27-30-00/501)

(33) Lubricate elevator and tab fittings as applicable. (PAGEBLOCK 12-21-02/301)

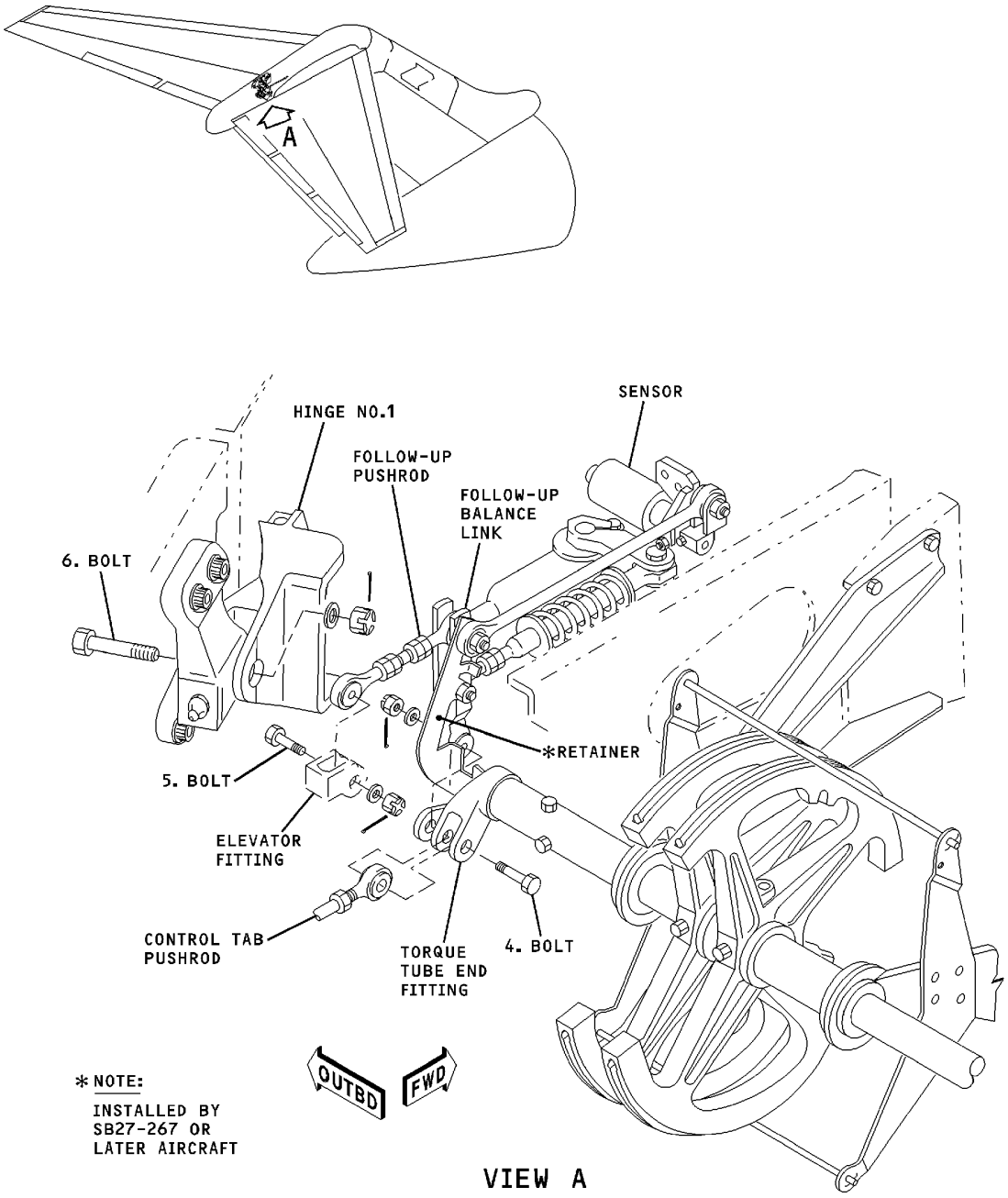
(34) Check elevator and tabs. (ELEVATOR AND TAB CLEARANCES- CHECK, PAGEBLOCK 27-30-02/601)

(35) Check elevator position sensor. (PAGEBLOCK 22-01-03/201)

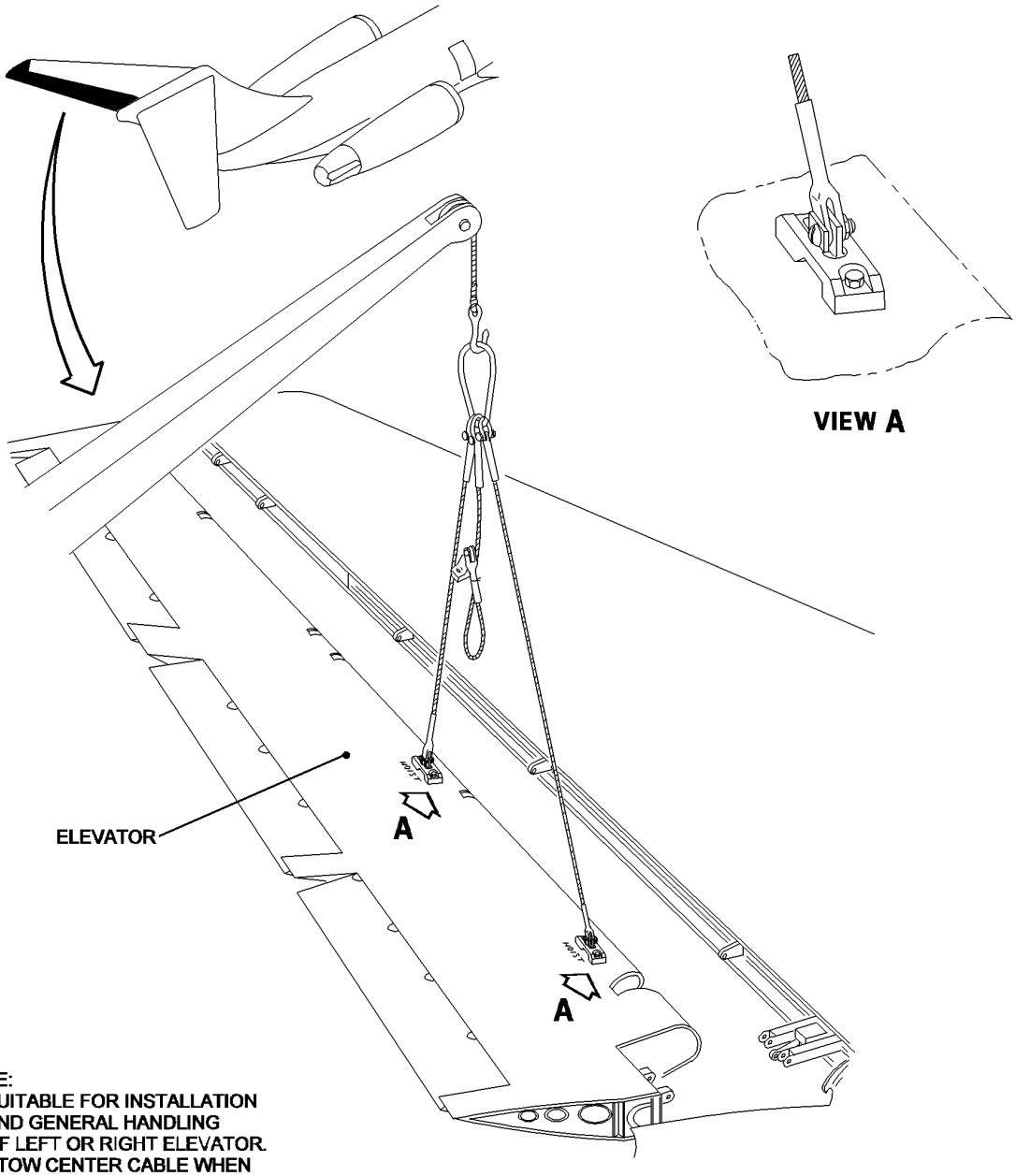
(36) Perform Return to Service (RTS) Test (DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201).



Elevator -- Removal/Installation
Figure 401/27-30-02-990-801



Elevator -- Removal/Installation
Figure 402/27-30-02-990-803



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Elevator Sling -- Installation
Figure 403/27-30-02-990-804

ELEVATOR AND TAB CLEARANCES- CHECK

1. General

A. This procedure has the elevator and tabs clearances dimensions.

NOTE: When checking elevator and tabs clearances and throws, the horizontal stabilizer and elevators must be in the neutral position.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 601

Name and Number	Manufacturer
Protractor (5916715)	ITEL 27-02-03

3. Check Elevator and Tab

A. Check Elevator and Tab Clearances (Figure 601)

(1) Check the clearances between elevator leading edge and horizontal stabilizer. (Figure 601)

(2) Check the clearances between control tab and elevator. (Figure 601)

(3) Check that clearances between geared tab and elevator. (Figure 601)

(4) Check that clearances between anti-float tab and elevator. (Figure 601)

B. Check Elevator and Tab Throws

(1) Make certain horizontal stabilizer is in neutral position.

NOTE: The horizontal stabilizer is in neutral position when two protruding head rivets on left hand leading edge of horizontal stabilizer is aligned with protruding head rivet on vertical fin. Rivets are identified by a circle and crossline target.

(2) Hold left and right elevators in neutral position.

NOTE: Elevator is in neutral position when center of aft inboard edge of elevator lines up with center of protruding rivet head in vertical fin. Rivet is identified by a circle and crossline target.

(3) Check that left and right control tabs, geared tabs and anti-float tabs are faired with elevators within 1/4 degree.

(4) Hold elevators in neutral position and move right control column forward until upper stop on elevator control tab crank contacts stop on elevator control tab inboard hinge fittings. Check that trailing edge of left and right control tabs rotate up 20(±2) degrees from neutral position.

(5) Hold elevators in neutral position and move right control column aft until lower stop on elevator control tab crank contacts stop on elevator control tab inboard hinge fittings. Check that trailing edge of left and right control tabs rotate down 26(±2) degrees from neutral position.

(6) Move right control column full forward, and elevator trailing edge full down. Check the following:

(a) Trailing edge of left and right elevators are down 10.66 ±0.32 in. (270.76 ±8.13 mm), measured from protruding rivet head in vertical fin to inboard end of trailing edge of elevator.

(b) Left and right control tabs are up 18 1/2(±3 1/2) degrees from faired position.

(c) Left and right geared tabs are up 4 3/4(+2, -1) degrees from faired position.

(d) Left and right anti-float tabs are faired with elevators.

(7) Move right control column full aft, and elevator trailing edge full up. Check the following:

(a) Trailing edge of left and right elevators are up 17.35 ±0.32 in. (440.69 ±8.13 mm), measured from protruding rivet head on vertical stabilizer to inboard end of elevator trailing edge.

(b) Left and right control tabs are down 26 1/2(±2 1/2) degrees from faired position.

(c) Left and right geared tabs are down 27 3/4(+1, -2) degrees from faired position.

(d) Left and right anti-float tabs are faired with elevators.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(8) Pressurize left hydraulic power system (PAGEBLOCK 29-00-00/201).

(9) With control column in neutral position (held only by load-feel spring), manually position both elevators to neutral.

(10) Lift right elevator and hold against elevator up stop.

(11) Slowly lift left elevator until right boost cylinder just begins to move right elevator down.

(12) Check that left elevator control tab trailing edge is 10(±2) degrees up.

(13) Return both elevators to neutral position.

(14) Lift left elevator and hold against elevator up stop.

(15) Slowly lift right elevator until left boost cylinder just begins to move left elevator down.

(16) Check that right elevator control tab trailing edge is 10(±2) degrees up.

(17) Return both elevators to neutral position.

(18) Manually move both elevators down against elevator stops.

(19) Slowly move control column forward.

(20) Check that ELEVATOR PWR ON light (located on flight compartment overhead panel), is illuminated by time control column stop is contacted.

(21) Return control column to neutral position.

NOTE: During this step the elevator is to be faired with the stabilizer.

WARNING: BEFORE MOVING PRIMARY LONGITUDINAL TRIM CONTROL WHEEL SWITCHES, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

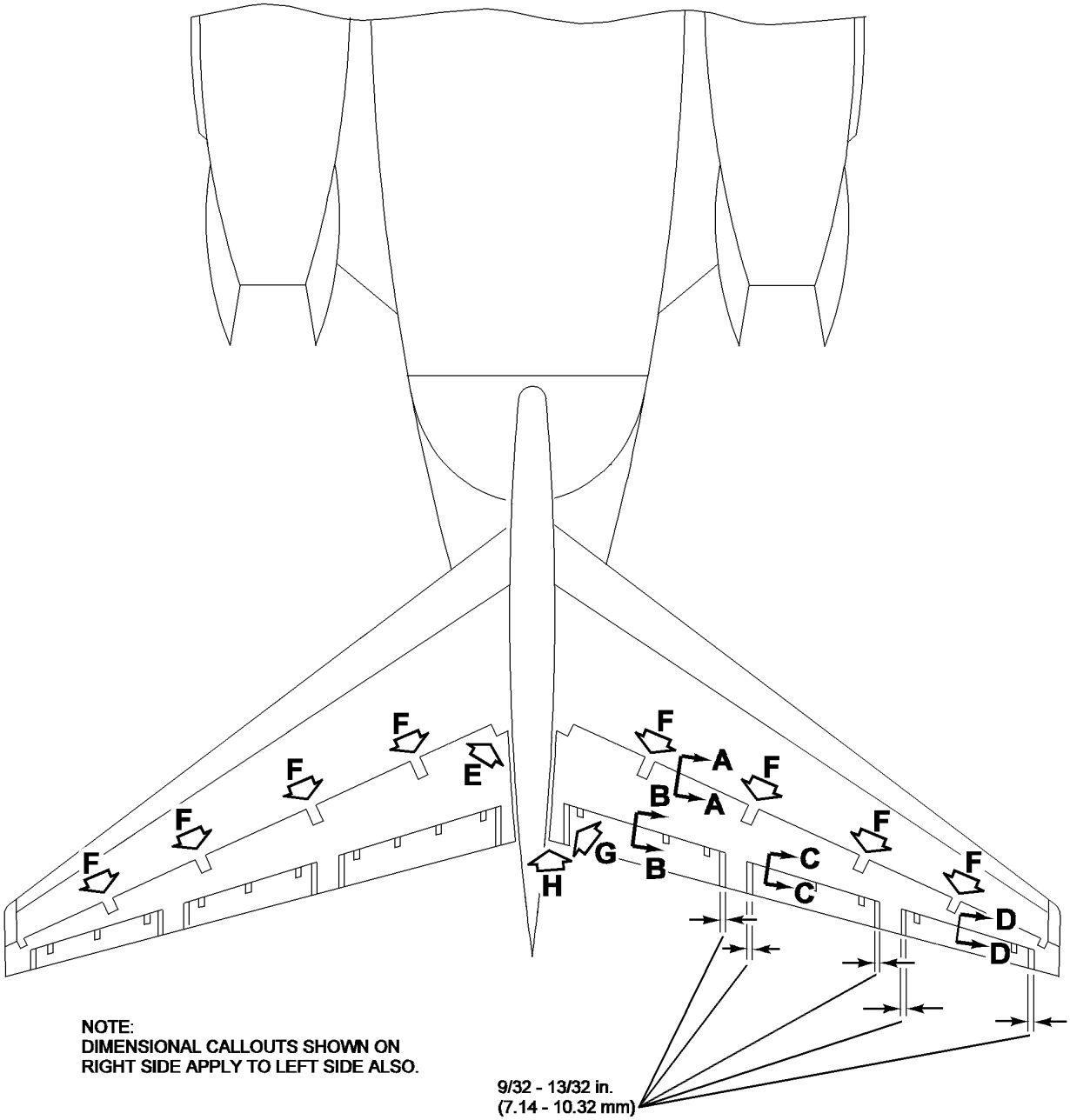
(22) Using primary longitudinal trim control wheel switches move horizontal stabilizer to approximately 2 degrees Aircraft-Nose-Down (AND), move stabilizer from this position to 10(+0.0, -0.5) degrees Aircraft-Nose-Up (ANU), anti-float tabs should remain faired with elevator.

(23) Move stabilizer to 12.2 degrees ANU, anti-float tabs should move to 26 1/4(±3) degrees Trailing Edge Down (TED).

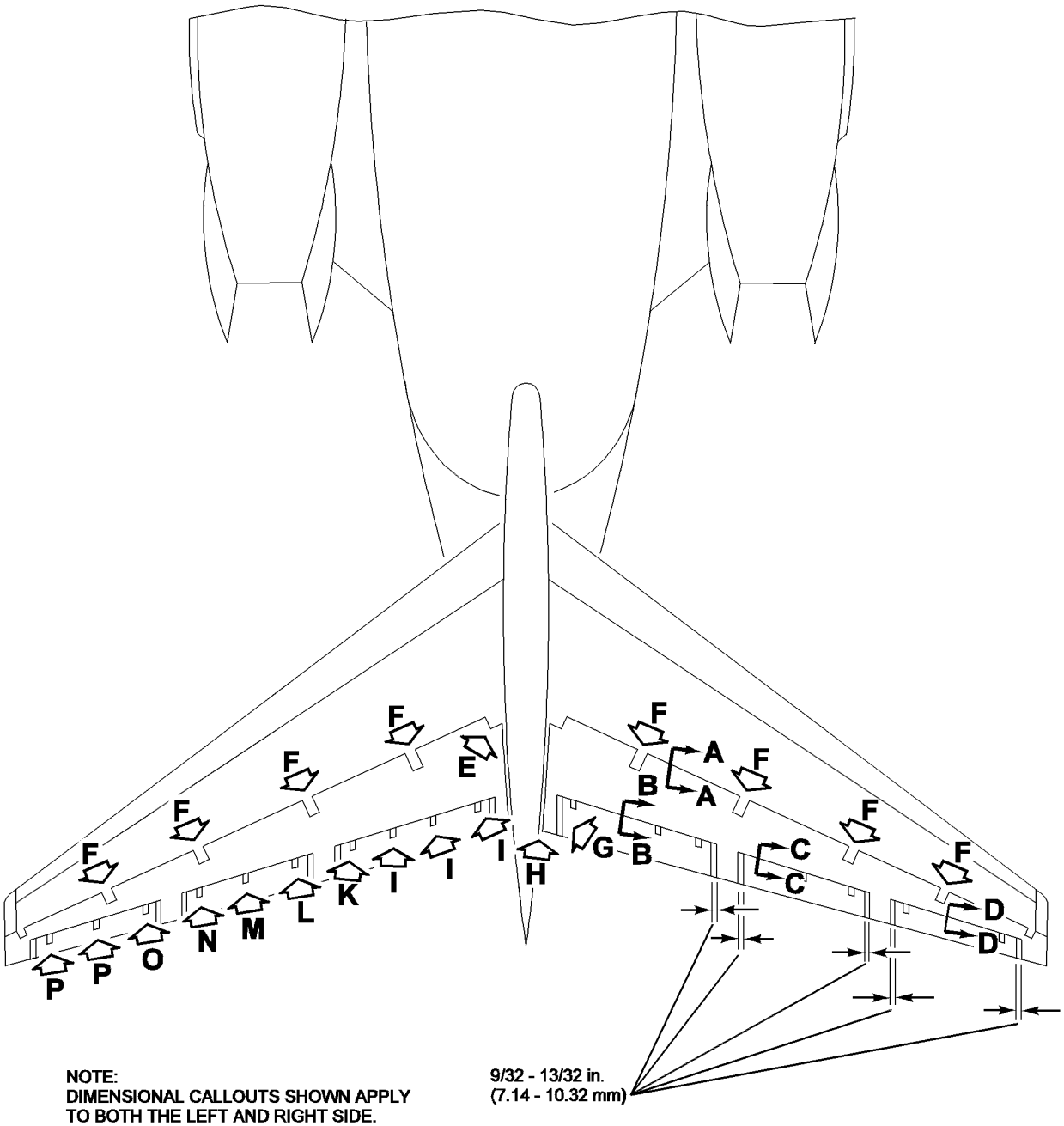
(24) Return stabilizer to neutral position. Anti-float tabs should fair with elevators when stabilizer passes 10 degrees ANU and remain faired at stabilizer positions below 10 degrees ANU.

(25) If elevator and tab throws are not within tolerance readjust elevator and tabs. (PAGEBLOCK 27-30-00/501)

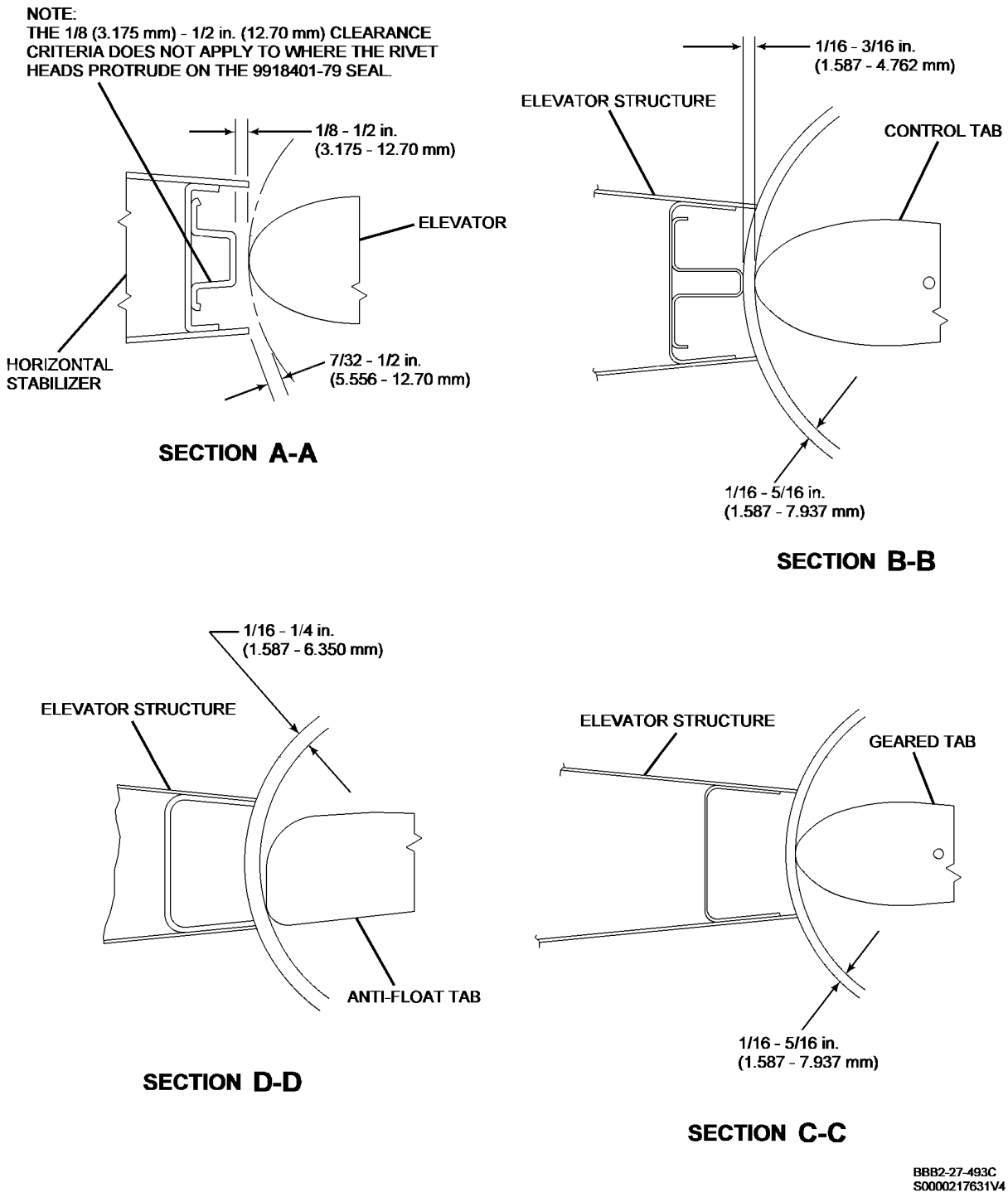
(26) Shut off hydraulic power pressure source.



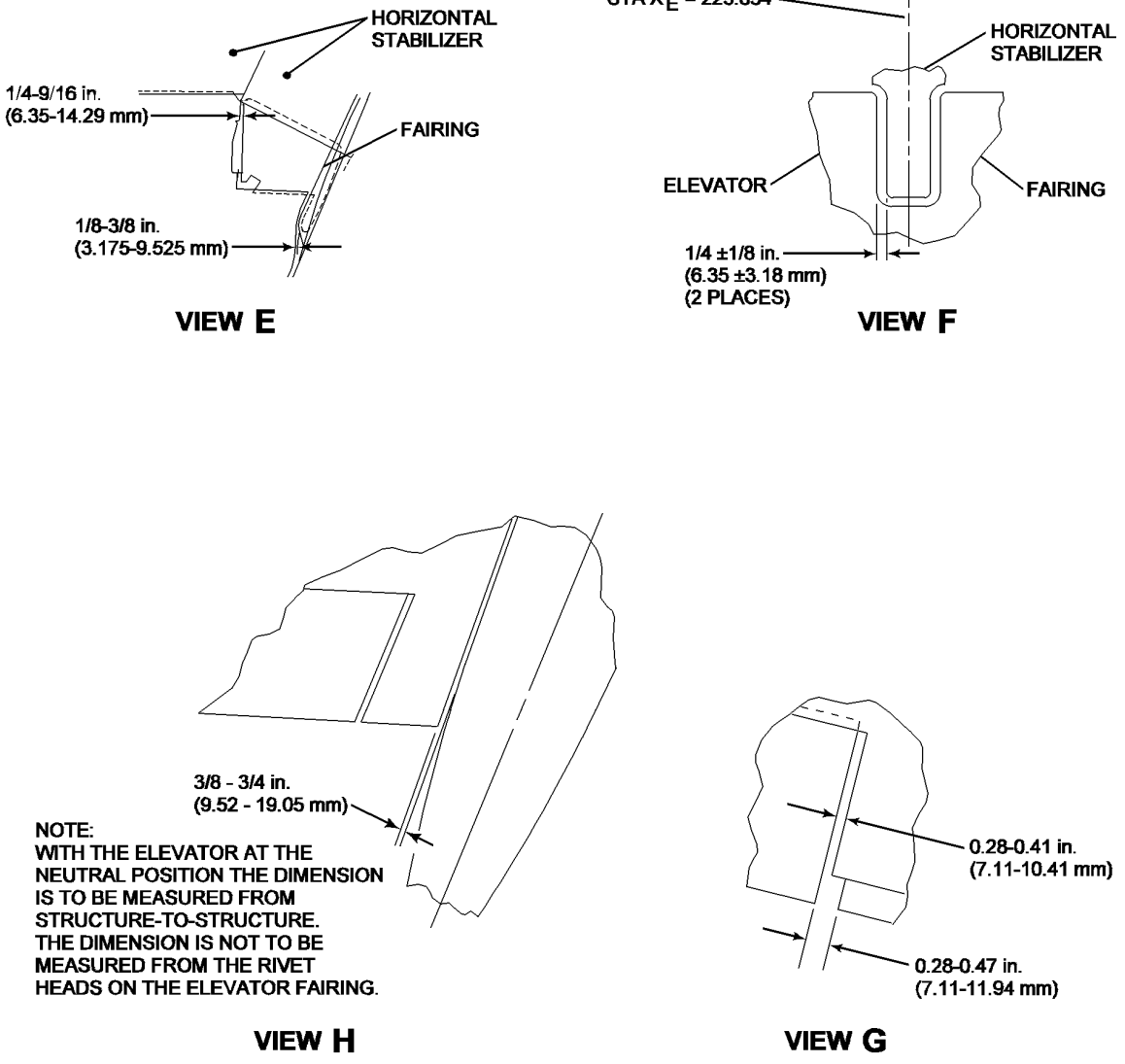
Elevator and Tabs Clearances
Figure 601/27-30-02-990-805 (Sheet 1 of 6)



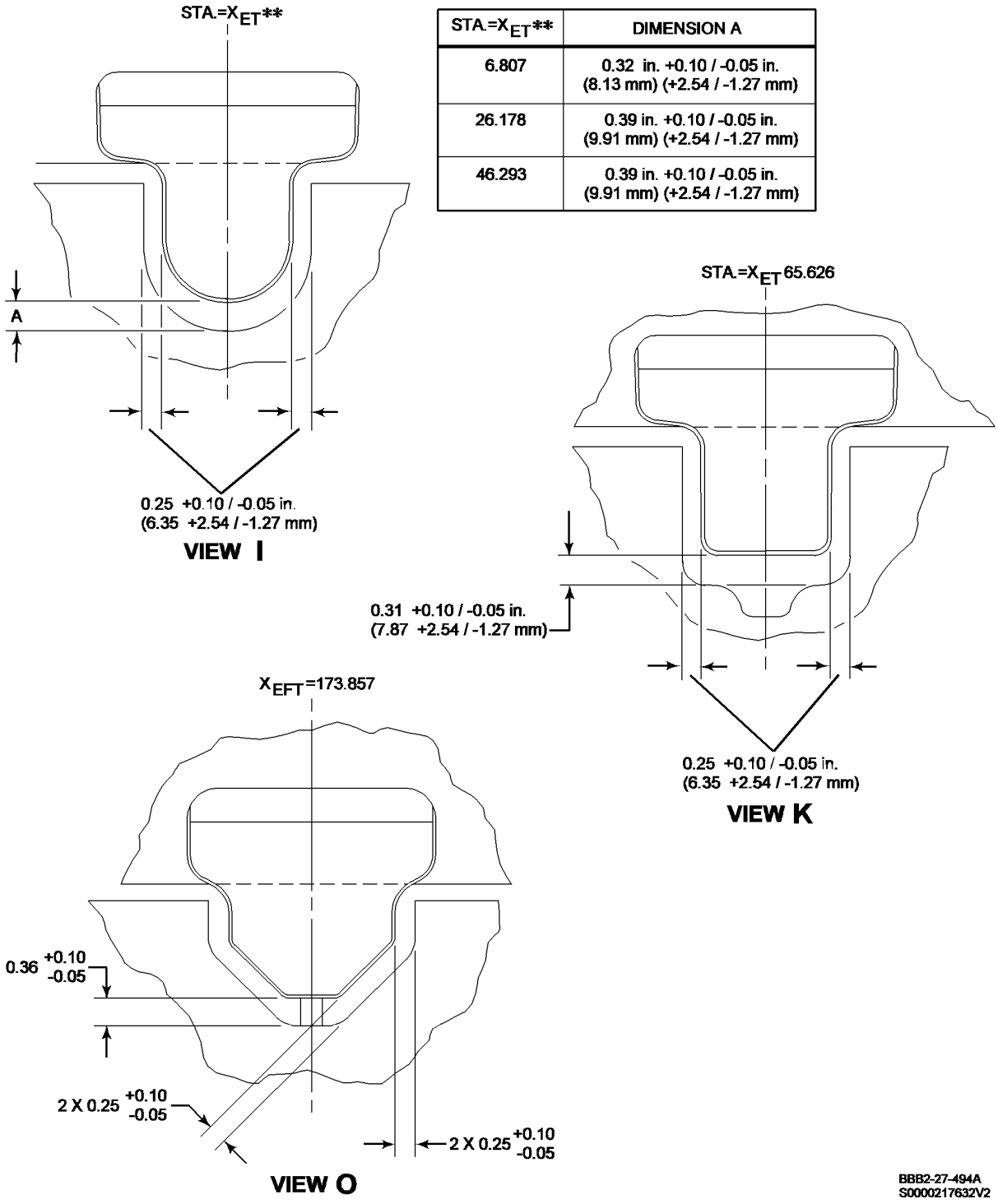
Elevator and Tabs Clearances
Figure 601/27-30-02-990-805 (Sheet 2 of 6)



Elevator and Tabs Clearances
Figure 601/27-30-02-990-805 (Sheet 3 of 6)

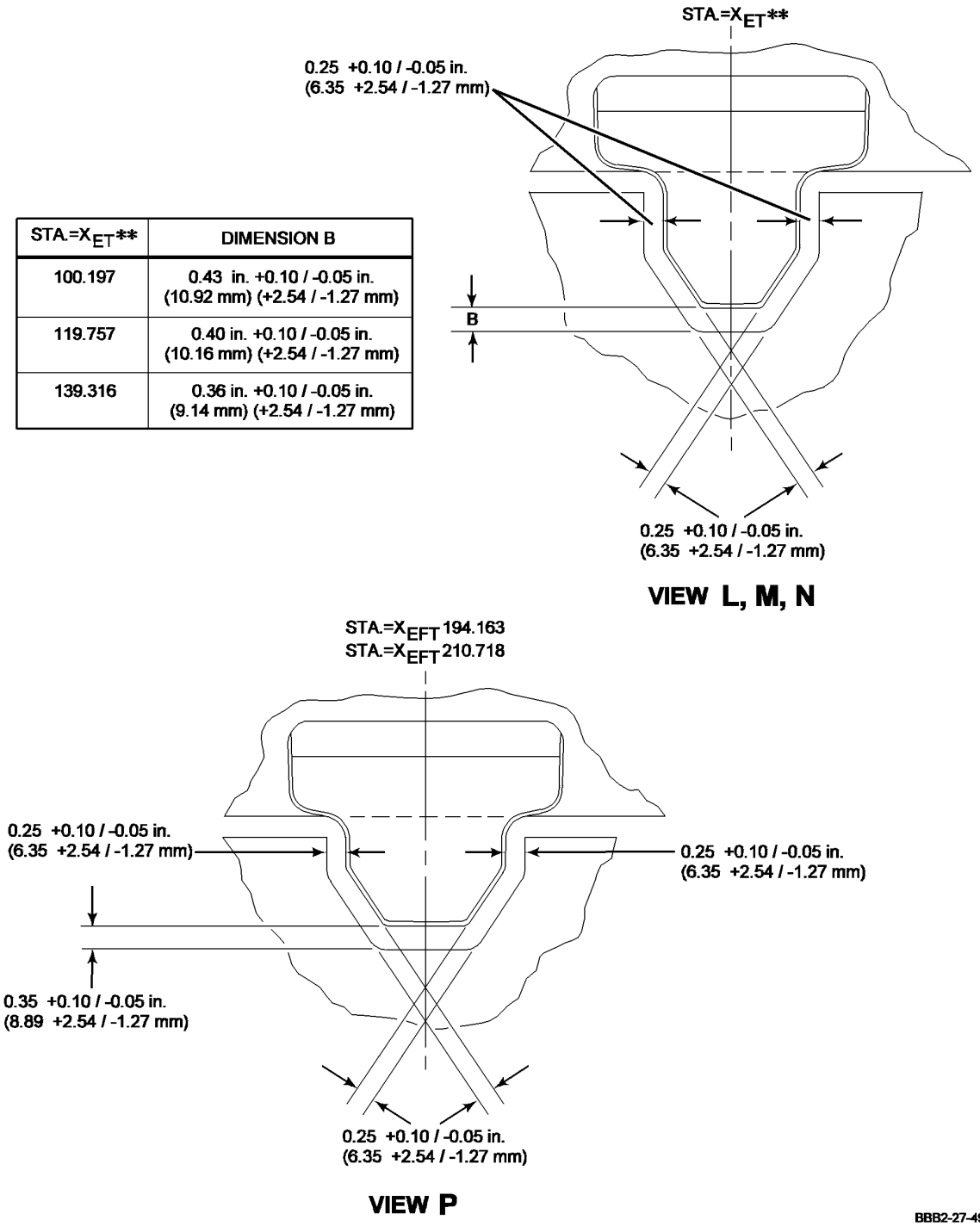


Elevator and Tabs Clearances
Figure 601/27-30-02-990-805 (Sheet 4 of 6)



STA.=X_{ET}**	DIMENSION A
6.807	0.32 in. +0.10 / -0.05 in. (8.13 mm) (+2.54 / -1.27 mm)
26.178	0.39 in. +0.10 / -0.05 in. (9.91 mm) (+2.54 / -1.27 mm)
46.293	0.39 in. +0.10 / -0.05 in. (9.91 mm) (+2.54 / -1.27 mm)

Elevator and Tabs Clearances
Figure 601/27-30-02-990-805 (Sheet 5 of 6)



STA.=X ET**	DIMENSION B
100.197	0.43 in. +0.10 / -0.05 in. (10.92 mm) (+2.54 / -1.27 mm)
119.757	0.40 in. +0.10 / -0.05 in. (10.16 mm) (+2.54 / -1.27 mm)
139.316	0.36 in. +0.10 / -0.05 in. (9.14 mm) (+2.54 / -1.27 mm)

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Elevator and Tabs Clearances
Figure 601/27-30-02-990-805 (Sheet 6 of 6)

ELEVATOR CONTROL TABS - MAINTENANCE PRACTICES

1. General

A. The elevator control tabs are located on the inboard trailing edge of the left and right elevator. Access to the tab hinge attach bolts is through the removable pushrod fairing and cutouts in the tab leading edge.

B. Rig pin holes are provided in the elevator control tab sector and sector guard pin brackets, located in the horizontal stabilizer center section, for establishing control system neutral position. Access to the sectors and sector guard pin brackets is through the top of the vertical fin.

C. Maintenance practices are identical for the left and right control tabs.

D. Numbers in parentheses in the following test correspond to callouts in Figure 201.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 201

Name and Number	Manufacturer
Protractor (5916715)	ITEL 27-02-03
Torque Wrench (0-300 inch-pounds) (0 to 33.6 N·m)	
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified
Rig pins (2) (RA-1) 3/8 by 10 1/2 (9.525 x 266.7 mm)	Douglas Aircraft Co.
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch) (15.875 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Control Tab

A. Remove Control Tab

(1) Depressurize left hydraulic power system. (PAGEBLOCK 29-00-00/201)

(2) Remove bolt (1) to disconnect crank fitting (2) from control tab pushrod (3).

(3) Remove nut (4) to disconnect crank fitting (2) from eyebolt (5) at inboard hinge (6).

(4) Remove bolts (7) to disconnect tab from elevator. Remove tab.

B. Install Control Tab

(1) Make certain left hydraulic system is depressurized.

(2) Place tab in position and install bolts (7) to connect tab to hinge brackets. Safety nut with cotter pin.

(3) Install nut (4) to connect crank fitting (2) to eyebolt (5). Tighten nut to a torque of 200 to 225 inch-pounds (22.4 to 25.2 N·m).

(4) Connect crank fitting (2) to control tab pushrod (3). Install bolt (1). Safety nut with cotter pin.

(5) Make certain that horizontal stabilizer position indicator, on control pedestal, is at neutral (0 degrees) position.

(6) Place elevator in neutral position.

NOTE: Elevator is in neutral position when center of aft inboard edge of elevator lines up with center of protruding rivet head in vertical fin. Rivet is identified by a circle and crossline target.

(7) Check that control tab is faired with elevator within 1/4 degree. If necessary, perform following.

(a) Install rig pins (RA-1) in rig pin holes (R-2) in control sector. (Figure 201, View B)

(b) Loosen jamnuts at each end of pushrod (3) (View A) and adjust pushrod to fair control tab with elevator within 1/4 degree. Tighten pushrod (3) jamnuts and safety as follows:

1) Check forward and aft rod ends for proper thread engagement through witness holes.

2) Tighten aft jamnut snug, plus an additional one-half nut flat rotation and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

3) Tighten forward jamnut snug, plus an additional one-half nut flat rotation.

(c) Remove rig pins (RA-1) from control sector.

(8) Check that looseness at inboard trailing edge of tab does not exceed 3/64 inch (1.188 mm) when tab is neutral position and faired with elevator within 1/4 degree.

(9) Check that control tab clearances. (ELEVATOR AND TAB CLEARANCES- CHECK, PAGEBLOCK 27-30-02/601).

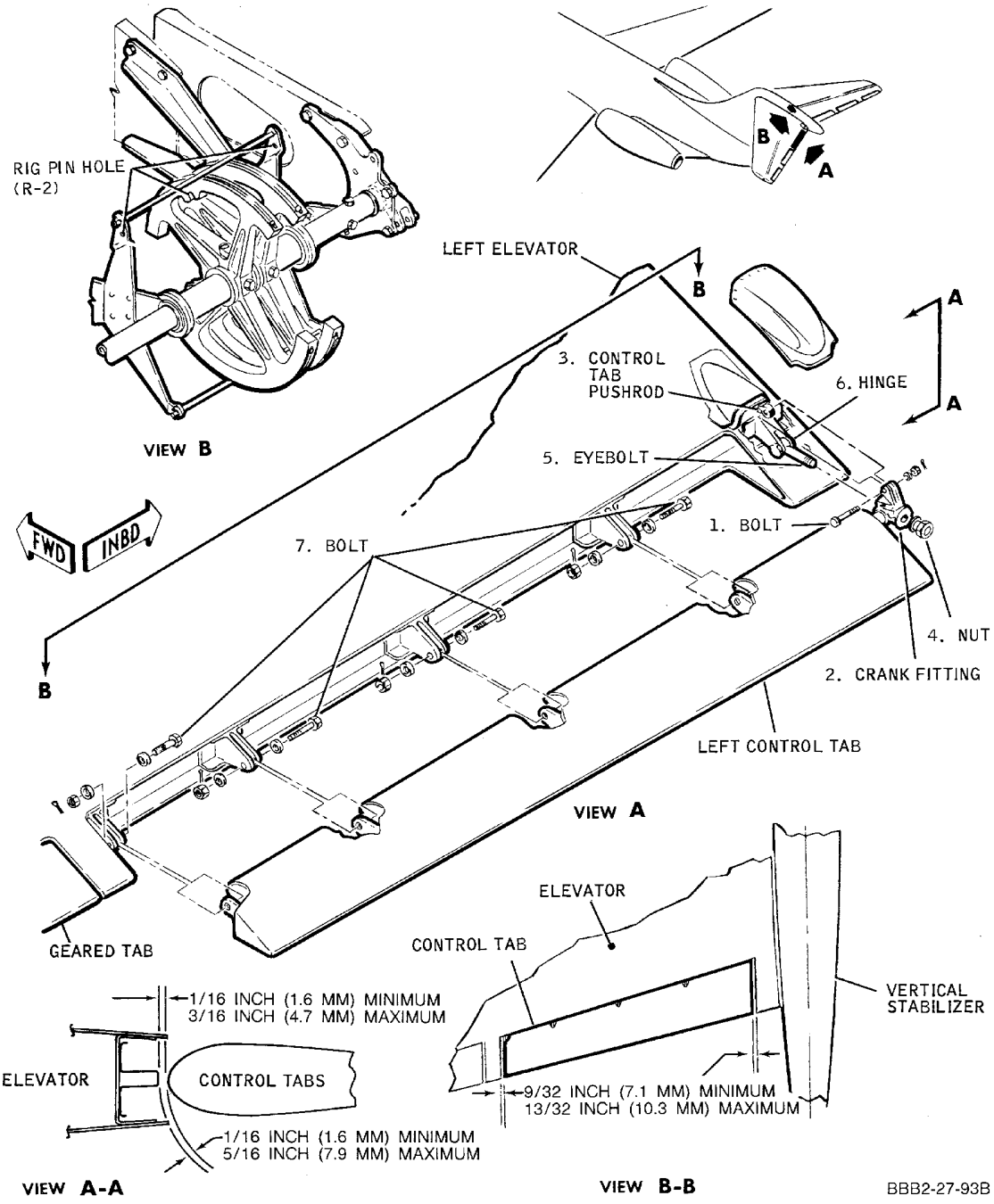
(10) Lubricate control tab hinges as applicable. (PAGEBLOCK 12-21-02/301)

(11) Hold elevator in neutral position and move right control column forward until upper stop on elevator control tab crank contacts stop on elevator control tab inboard hinge fitting. Check that trailing edge of control tab rotates up 20 (±2) degrees from neutral position.

(12) Hold elevator in neutral position and move right control column aft until lower stop on elevator control tab crank contacts stop on elevator control tab inboard hinge fitting. Check that trailing edge of control tab rotates down 26 (±2) degrees from neutral position.

(13) Move right control column forward, and elevator to full down position. Control tab should rotate up not less than 15 degrees from faired position.

(14) Hold elevator in full up position and move right control column full aft. Control tab should rotate down not less than 24 degrees from faired position.



Elevator Control Tab -- Removal/Installation
Figure 201/27-30-03-990-801

GEARED TABS - MAINTENANCE PRACTICES

1. General

A. The geared tabs are located on the trailing edge of the left and right elevator outboard of the control tabs. Access to the attach bolts is through the pushrod fairing at each end of the tab, and through a cutout in the leading edge of the tab at each inner hinge point. The removal and installation procedures are identical for the left and right geared tab.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 201

Name and Number	Manufacturer
Protractor (5916715)	Douglas Aircraft Co.
Torque Wrench (0-200 inch pounds) (0 to 22.4 N·m)	
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Geared Tab

A. Remove Geared Tab (Figure 201)

(1) Depressurize left hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Remove bolts (1) to disconnect pushrods (2) from crank fittings (3) each end of tab.

(3) Remove nuts (4) to disconnect crank fitting (3) from eyebolt (5) at each end of tab.

(4) Remove bolts (6) to disconnect tab from hinge brackets; remove tab.

B. Install Geared Tab (Figure 201)

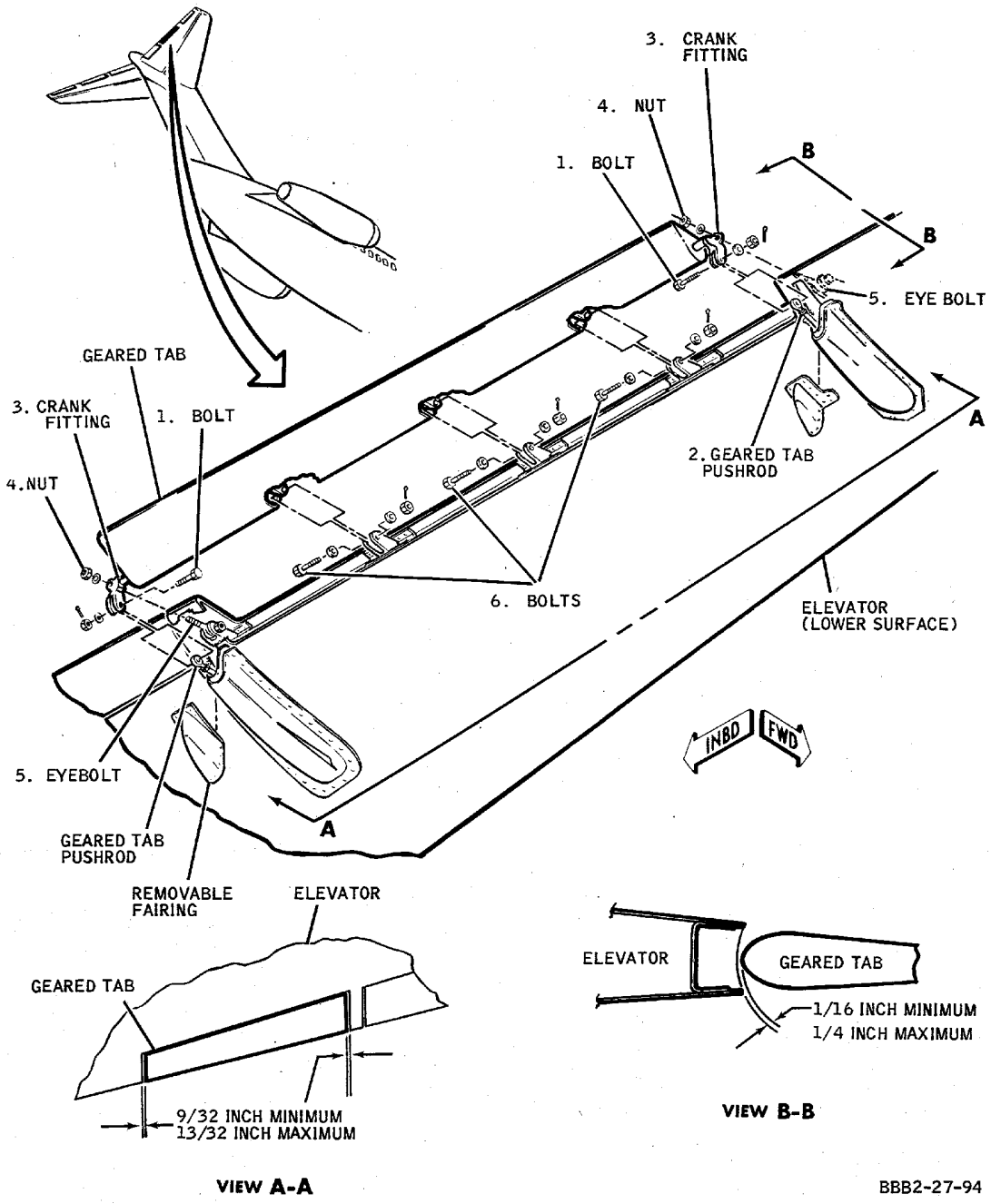
(1) Make certain left hydraulic system is depressurized.

(2) Place tab in position and install bolts (6) to connect tab to elevator hinge brackets. Tighten nuts to provide 0.005 inch gap under washer, then tighten nut to next cotter pin slot and safety nuts with cotter pins.

(3) Install nuts (4) to connect crank fittings (3) to eyebolt (5) at each end of tab. Tighten nuts to a torque of 80 to 100 inch-pounds, (9.04 to 11.3 N·m).

(4) Lubricate geared tab hinges as applicable. (PAGEBLOCK 12-21-02/301)

(5) Perform Adjustment/Test (Paragraph 6.)



Geared Tab -- Removal/Installation
Figure 201/27-30-04-990-802

4. Removal/Installation Geared Tab Pushrod)

A. Remove Geared Tab Pushrod (Figure 202)

(1) Depressurize left hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Disconnect aft end of pushrod from geared tab by removing bolt (1).

(3) Disconnect forward end of pushrod from actuating crank by removing bolt (2).

(4) Pull pushrod aft through pushrod fairing and remove from airplane.

B. Install Geared Tab Pushrod (Figure 202)

(1) Make certain left hydraulic system is depressurized.

(2) Insert pushrod forward through pushrod fairing.

(3) Connect inboard pushrod as follows:

(a) Connect forward end of pushrod to actuating crank by installing bolt (2). Safety nut with cotter pin.

NOTE: Install bolt with head outboard.

(b) Connect aft end of pushrod to geared tab by installing bolt (1). Safety nut with cotter pin.

NOTE: Install bolt (1) with head outboard.

(4) Connect outboard pushrod as follows:

(a) Connect forward end of pushrod to actuating crank by installing bolt (2). Safety nut with cotter pin.

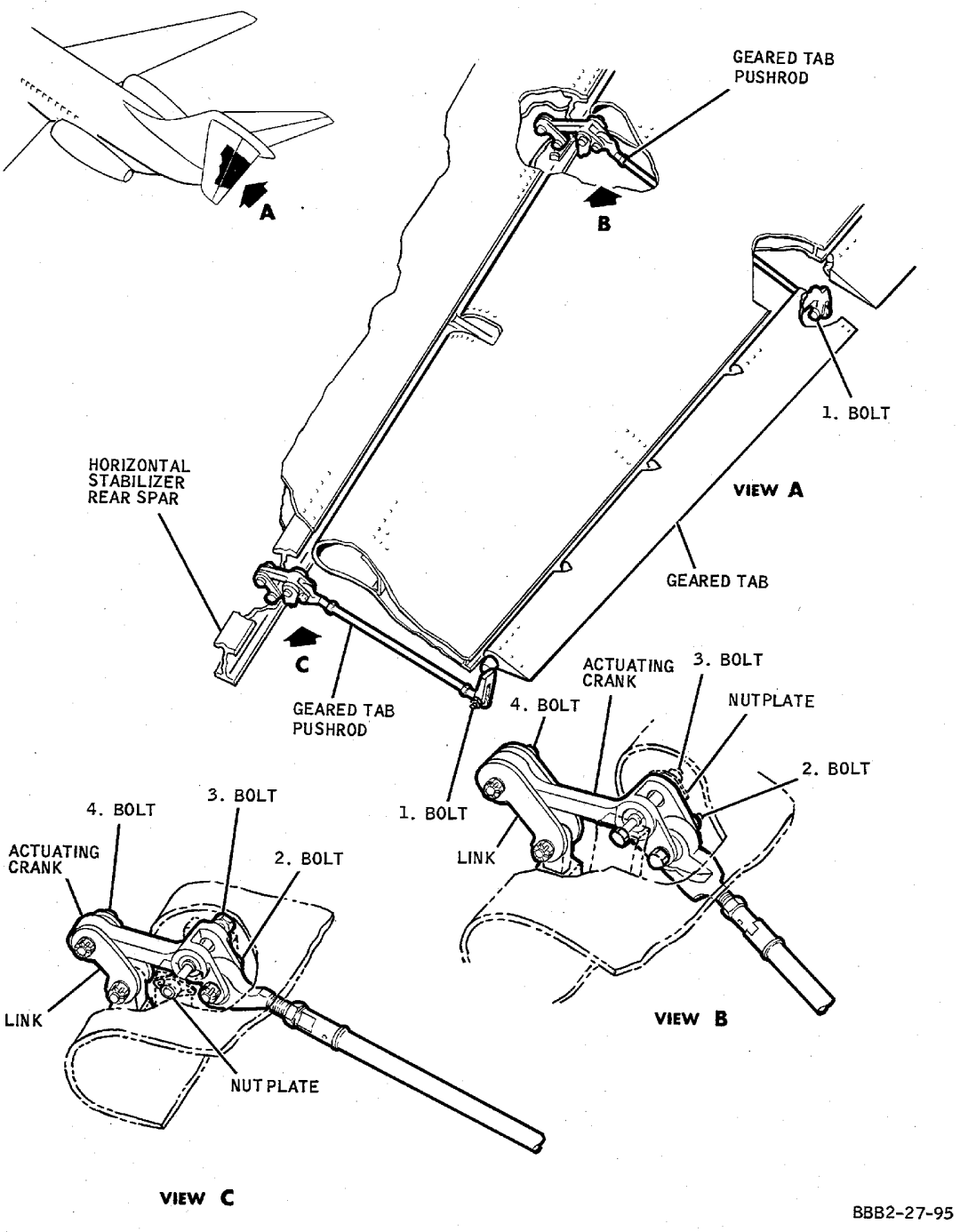
NOTE: Install bolt with head inboard.

(b) Connect aft end of pushrod to geared tab by installing bolt (1). Safety nut with cotter pin.

NOTE: Install outboard bolt (1) with head inboard.

(5) Perform Adjustment/Test (Paragraph 6.)

(6) Lubricate pushrod ends as applicable. (PAGEBLOCK 12-21-02/301)



Geared Tab Pushrod and Actuating Crank -- Removal/Installation
Figure 202/27-30-04-990-803

5. Removal/Installation Geared Tab Actuating Crank

A. Remove Outboard Actuating Crank (Figure 202)

(1) Depressurize left hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Disconnect aft end of pushrod from geared tab by removing bolt (1).

(3) Disconnect actuating crank from horizontal stabilizer connecting link by removing bolt (4).

(4) Remove bolt (3) and withdraw actuating crank and pushrod assembly from forward end of pushrod fairing.

(5) Separate pushrod from actuating crank by removing bolt (2).

B. Install Outboard Actuating Crank (Figure 202)

(1) Make certain left hydraulic system is depressurized.

(2) Connect pushrod to actuating crank by installing bolt (2). Safety nut with cotter pin.

(3) Insert pushrod and actuating crank assembly into leading edge of pushrod fairing and install bolt (3). Safety bolt head with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(4) Connect actuating crank and horizontal stabilizer connecting link by installing bolt (4). Safety nut with cotter pin.

(5) Perform Adjustment/Test (Paragraph 6.)

(6) Lubricate actuating crank and pushrod ends as applicable. (PAGEBLOCK 12-21-02/301)

C. Remove Inboard Actuating Crank (Figure 202)

(1) Depressurize left hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Disconnect aft end of pushrod from geared tab by removing bolt (1).

(3) Disconnect actuating crank from horizontal stabilizer connecting link by removing bolt (4).

(4) Remove bolt (3) and withdraw actuating crank and pushrod assembly from forward end of pushrod fairing.

(5) Separate pushrod from actuating crank by removing bolt (2).

D. Install Inboard Actuating Crank (Figure 202)

(1) Make certain left hydraulic system is depressurized.

(2) Connect pushrod to actuating crank by installing bolt (2). Safety nut with cotter pin.

(3) Insert pushrod and actuating crank assembly into leading edge of pushrod fairing and install bolt (3). Safety nut with cotter pin.

(4) Connect actuating crank and horizontal stabilizer connecting link by installing bolt (4). Safety nut with cotter pin.

(5) Perform Adjustment/Test (Paragraph 6.)

(6) Lubricate actuating crank and pushrod ends as applicable. (FLIGHT CONTROLS - LUBRICATION, PAGEBLOCK 12-21-02/301)

6. Adjustment/Test Geared Tab

A. Adjust Geared Tab

NOTE: Tab displacement measurements shall be made with rigging protractor held at rigging reference lines as described in GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201.

(1) Make certain that horizontal stabilizer position indicator, on control pedestal, is at neutral (0 degrees) position.

(2) Remove bolt (1) to disconnect pushrod from geared tab.

(3) Place elevator in neutral position.

NOTE: Elevator is in neutral position when center of aft inboard edge of elevator lines up with center of protruding rivet head in vertical fin. Rivet is identified by a circle and crossline target.

(4) Loosen jamnuts at aft end of pushrods and adjust rod ends until bolts (1) can be inserted through crank fittings and rod ends, when geared tab is faired with elevator within one-quarter degree.

(5) Secure bolts (1). Safety with cotter pin.

(6) Tighten jamnuts and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

B. Test Geared Tab

(1) Make certain that horizontal stabilizer position indicator, on control pedestal, is at neutral (0 degrees) position.

(2) Hold elevator in neutral position. Geared tab should be faired with elevator within one-quarter degree.

(3) Move elevator to the full down position. Geared tab should rotate up 4 3/4 (+2, -1) degrees.

(4) Move elevator to the full up position. Geared tab should rotate down 27 3/4 (+1, -2) degrees.

(5) Check geared tab (Paragraph 7.)

7. Check Geared Tab

A. Check Tab

(1) Check that geared tab clearances are as shown in Figure 201.

(2) Check that play at inboard end of trailing edge of tab does not exceed 1/32 inch, (.792 mm) when tab is in neutral position and faired with elevator within 0(±1/4) degree.

ELEVATOR DAMPERS - MAINTENANCE PRACTICES

1. General

A. Each elevator has a viscous-type damper located at the No. 2 hinge. Access to the damper is through an access door in the leading edge of the elevator. Removal and installation procedures are identical for the left and right dampers.

B. Letters in parentheses in the following text correspond to callouts in Figure 201.

2. Removal/Installation Elevator Dampers

WARNING: TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT RESULTING FROM INADVERTENT OPERATION OF ELEVATOR POWER CONTROL MECHANISM, LEFT HYDRAULIC POWER SYSTEM SHALL BE DEPRESSURIZED WHILE PERFORMING MAINTENANCE PRACTICES ON ELEVATOR DAMPER.

A. Remove Damper

(1) Depressurize left hydraulic power system. (PAGEBLOCK 29-00-00/201)

(2) Disconnect damper crank arm (1) from link (2).

(3) Remove damper from mounting plate (3) at elevator front spar.

B. Install Damper

(1) Make certain left hydraulic system is depressurized.

(2) Install damper on mounting plate (3) at elevator front spar.

(3) Connect link (2) to damper crank arm (1) at hole in end of arm. Safety nut with cotter pin.

(4) Check damper. (Paragraph 3.)

3. Check Elevator Damper

A. Check Damper

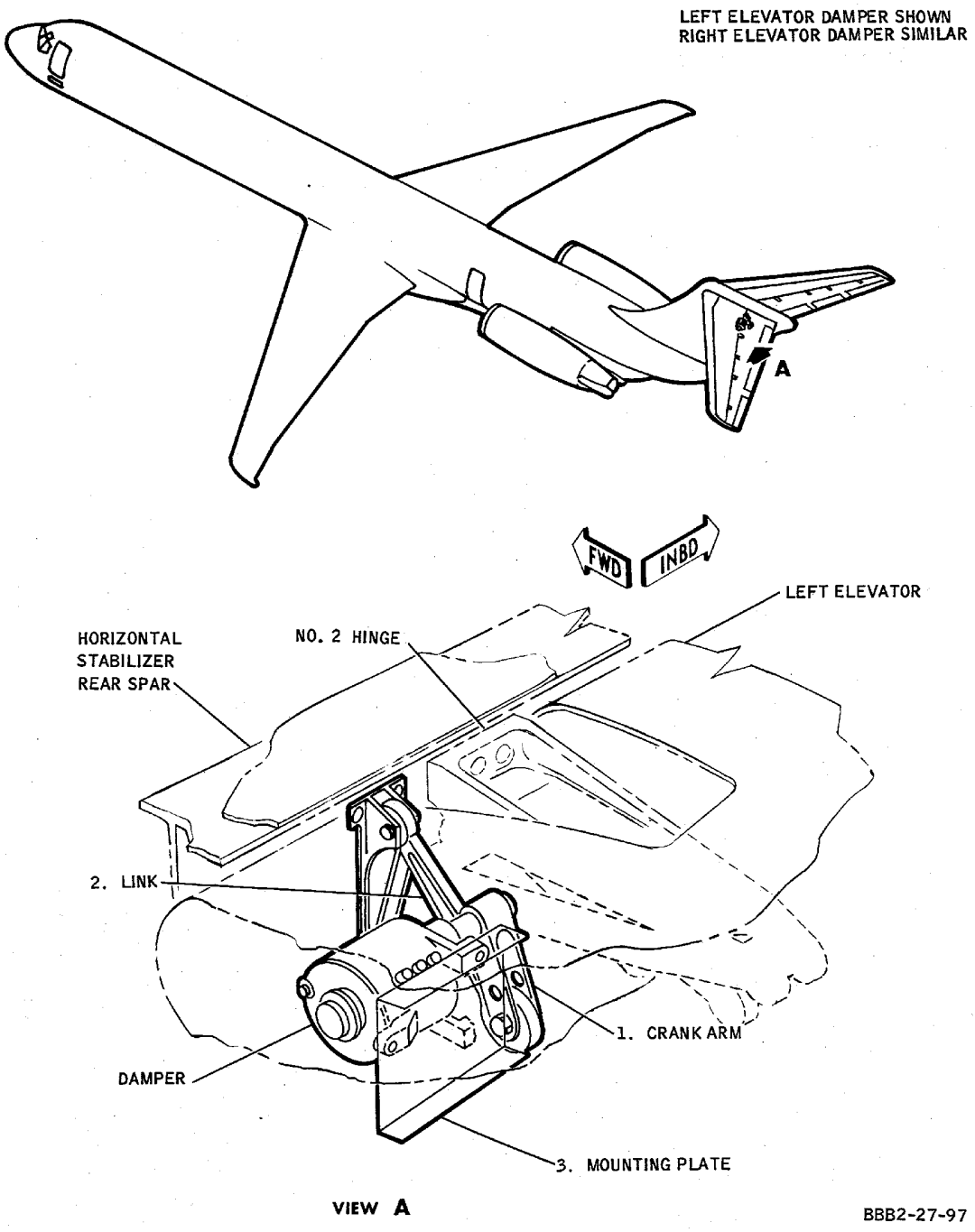
(1) Visually check damper housing and shaft seals for sign of leakage. If evidence of leakage exists, following should be accomplished:

(a) Clean damper and adjacent area.

(b) Monitor damper for evidence of continued or increased fluid leakage for 100 flight hours. If fluid leak continues or increases, replace damper.

NOTE: Damper should be replaced when there is any evidence of leakage, and a pilot item has been written against the system. If no pilot item has been written against the system, and evidence of leakage (pooled silicone) is small, then clean the damper and adjacent area, and check for leakage signs after one hour. If leakage signs occur, replace the damper. If no leakage signs occur, damper may remain installed. (Leakage to be checked again at next scheduled visit.)

(2) Move elevator to full up and down positions. Check damper and linkage for freedom-of-operation, and that no binding, roughness, scraping, or interference exists.



Elevator Damper -- Removal/Installation
Figure 201/27-30-05-990-801

ELEVATOR POWER CONTROL FOLLOW-UP MECHANISM - MAINTENANCE PRACTICES

1. General

A. The elevator power control follow-up mechanism is located in the aft inboard section of the left and right side of the horizontal stabilizer, at the inboard elevator hinge. Access to the mechanism is through the upper and lower surfaces of the stabilizer and elevator.

B. Maintenance practices are identical for the left and right follow-up mechanism. Components of the mechanism may be removed and installed separately. Adjustment procedure need not be performed if components have been adjusted before installation, to the exact dimension as those removed.

C. Numbers in parentheses in the following text correspond to callouts in Figure 27-30-05-990-801.

WARNING: THE SAFETY BELT LUG DOES NOT MEET CURRENT FALL PROTECTION REQUIREMENTS. DO NOT USE THE SAFETY BELT LUG FOR FALL PROTECTION. OTHER METHODS MUST BE USED TO ENSURE ADEQUATE FALL PROTECTION.

D. A safety belt attachment lug is located on top of vertical stabilizer for use by personnel performing maintenance on elevator power control mechanism.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 201

Name and Number	Manufacturer
Protractor (5916715)	Douglas Aircraft Co.
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified
Rig pins (2) (RA-1) 3/8 by 10 1/2 (9.525 x 266.7 mm)	Douglas Aircraft Co.
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch), (15.875 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Control Valve Pushrod

A. Remove Control Valve Pushrod

(1) Remove bolt (1) to disconnect control valve pushrod (2) from control valve crank.

(2) Remove bolt (3) to disconnect control valve pushrod (2) from follow-up balance link (4). Remove pushrod.

(3) Measure length of removed pushrod, center-to-center of bolt holes (5) and (6), and record dimension.

B. Install Control Valve Pushrod

(1) Adjust length of replacement pushrod to exact dimension of old pushrod.

(2) Place adjustable end of control valve pushrod (2) in balance link slot and align with center hole. Install bolt (3) to connect pushrod to balance link. Safety nut with cotter pin.

(3) Install bolt (1) to connect pushrod (2) to control valve crank. Safety nut with cotter pin.

(4) Perform test. (Paragraph 6.)

4. Removal/Installation Follow-up Balance Link

A. Remove Follow-up Balance Link

(1) Remove bolt (7) to disconnect elevator follow-up pushrod (8) and elevator position sensor link from follow-up balance link (4).

(2) Remove bolt (3) to disconnect control valve pushrod (2) from follow-up balance link (4).

(3) Remove bolt (9) to disconnect follow-up balance link (4) from torque tube crank (10). Remove balance link.

B. Install Follow-up Balance Link

(1) With bolt head inboard, install bolt (9) to connect follow-up balance link (4) to torque tube crank (10). Safety nut with cotter pin.

(2) Install bolt (3) to connect control valve pushrod (2) and lower portion of retainer (16), to follow-up balance link (4), at center hole. Safety nut with cotter pin.

(3) Install bolt (7) to connect elevator follow-up pushrod (8), upper portion of retainer (16), and elevator position sensor link to follow-up balance link (4). Safety nut with cotter pin.

5. Removal/Installation Elevator Follow-up Pushrod

A. Remove Elevator Follow-up Pushrod

(1) Remove bolt (11) to disconnect follow up pushrod (8) from elevator bracket (12).

(2) Remove bolt (7) to disconnect follow-up pushrod (8) from follow-up balance link (4). Remove pushrod.

(3) Measure length of removed pushrod, center-to-center of bolt holes (13) and (14) and record dimension.

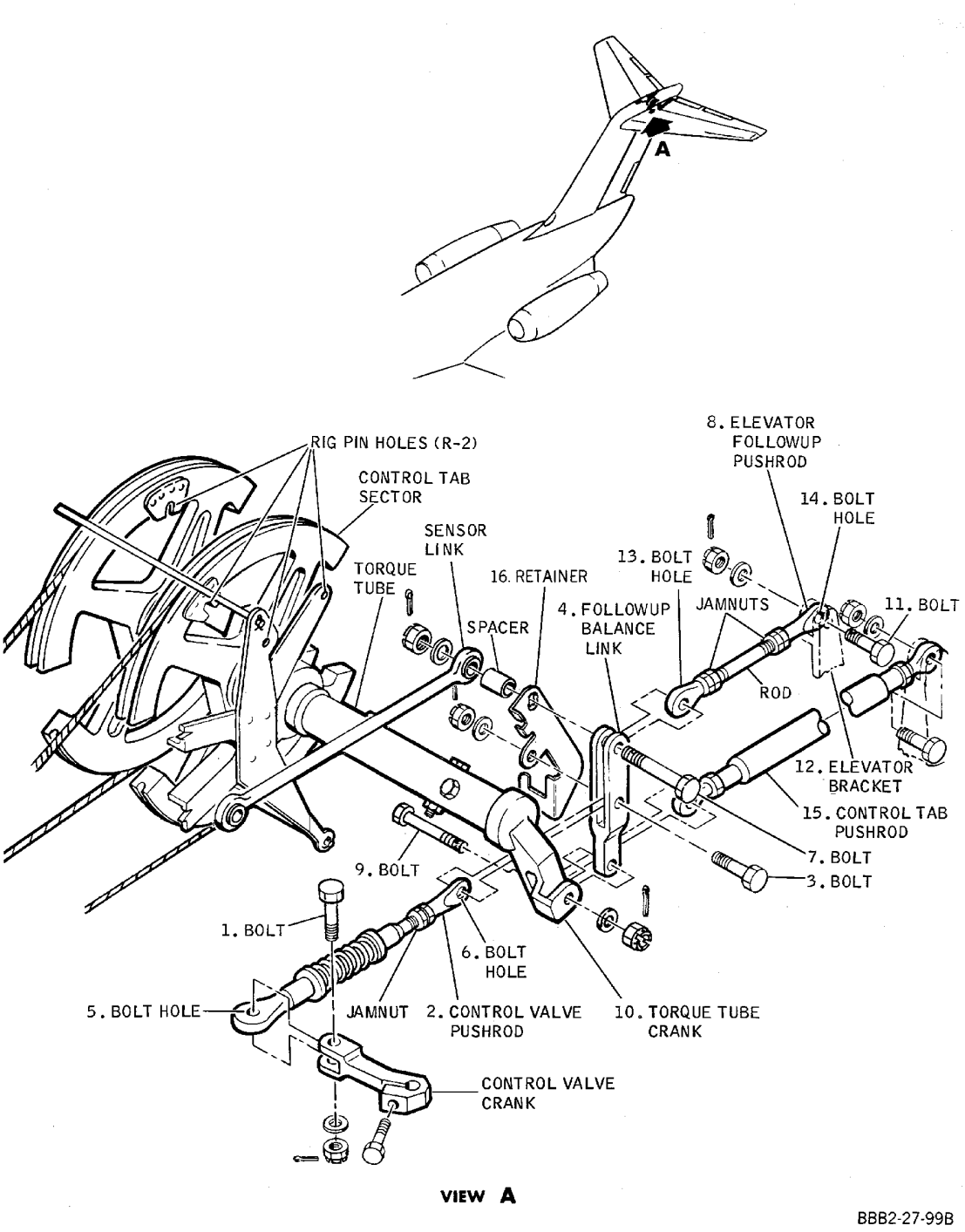
B. Install Elevator Follow-up Pushrod

(1) Adjust replacement pushrod to exact dimension of old pushrod.

(2) Install bolt (7) to connect follow-up pushrod (8) to follow-up balance link (4). Safety nut with cotter pin.

(3) Install bolt (11) to connect follow-up pushrod (8) to elevator bracket (12). Safety nut with cotter pin.

(4) Perform test. (Paragraph 6.)



Elevator Power Control Follow-up Mechanism -- Removal/Installation
Figure 201/27-30-06-990-801

6. Adjustment/Test Elevator Power Control Follow-up Mechanism

A. Adjust Follow-up Mechanism

NOTE: Horizontal stabilizer, elevator, and elevator control system shall be in neutral position when making adjustment. Horizontal stabilizer is in neutral position when two protruding rivet heads on left side of stabilizer line up with protruding rivet head in vertical fin. Elevators are in neutral position when center of aft inboard edge of elevator lines up with protruding rivet head in vertical fin. Rivets are identified by a circuit and crossline target. Rig pin holes are provided in the elevator control tab section and sector guard pin brackets for establishing control system neutral position. Access to sectors and sector guard pin brackets is through top of vertical fin.

(1) Place horizontal stabilizer in neutral position.

(2) Place elevator control tab sector in neutral position and install rig pins (RA-1) in rig pin holes (R-2).

(3) Place elevator in neutral position. If necessary, loosen jamnuts on control tab pushrod (15) and adjust pushrod to fair control tab with elevator within one-quarter degree. Tighten jamnuts and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Elevator is in neutral position when center of aft inboard edge of elevator lines up with center of protruding rivet head in vertical fin. Rivet is identified by a circle and crossline target.

(4) Adjust elevator follow-up pushrod (8) to a dimension of 4(±3/32) inches, (101.6(±2.38) mm) center-to-center of bolts (7) and (11).

(5) Remove bolt (1) to free control valve pushrod (2) from control valve crank.

(6) Place hydraulic control valve in neutral detent and adjust pushrod (2) until bolt (1) can be freely inserted.

(7) Secure bolt (1). Safety nut with cotter pin.

(8) Remove rig pins (RA-1).

B. Test Follow-up Mechanism

WARNING: MAKE CERTAIN THAT ALL CONTROLS ARE IN THE CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR EQUIPMENT.

(1) Pressurize left hydraulic power system. (PAGEBLOCK 29-00-00/201)

(2) With control column in neutral position (held only by load-feel spring), manually position both elevators to neutral.

(3) Lift right elevator and hold against elevator up stop.

(4) Slowly lift left elevator until right boost cylinder just begins to move right elevator down.

(5) Check that left elevator control tab trailing edge is 10(±2) degrees up.

(6) Return both elevators to neutral position.

(7) Lift left elevator and hold against elevator up stop.

(8) Slowly lift right elevator until left boost cylinder just begins to move left elevator down.

(9) Check that right elevator control tab trailing edge is 10(±2) degrees up.

(10) Manually move both elevators down against elevator stops.

(11) Slowly move control column forward.

(12) Check that elevator power on light (located on flight compartment overhead panel), is on by time control column stop is contacted.

(13) Return both elevators to neutral position.

(14) Return control column to neutral position.

(15) Shut off hydraulic pressure source.

ELEVATOR POWER CONTROL VALVES - MAINTENANCE PRACTICES

1. General

A. The elevator power control valves are located in the inboard section of the horizontal stabilizer, forward of the elevator hinge, on the left and right side of the airplane. Access to the control valves is through the upper and lower surfaces of the stabilizer.

B. Numbers in parentheses in the following text correspond to callouts in Figure 201.

WARNING: THE SAFETY BELT LUG DOES NOT MEET CURRENT FALL PROTECTION REQUIREMENTS. DO NOT USE THE SAFETY BELT LUG FOR FALL PROTECTION. OTHER METHODS MUST BE USED TO ENSURE ADEQUATE FALL PROTECTION.

C. A safety belt attachment lug is located on top of vertical stabilizer for use by personnel performing maintenance on elevator power control valves.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 201

Name and Number	Manufacturer
Protractor (5916715)	Douglas Aircraft Co.
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified
Rig Pins (2) (RA-1) 3/8 by 10 1/2 (9.525 x 266.7 mm)	Douglas Aircraft Co.
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch) (15.875 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Elevator Power Control Valve

A. Remove Control Valve

(1) Depressurize left hydraulic power system. (PAGEBLOCK 29-00-00/201)

(2) Disconnect control valve pushrod (1) from control valve crank (2).

(3) Disconnect hydraulic lines from control valve (3).

(4) Remove control valve (3).

(5) If required, remove fittings from control valve (3). Retain fittings for installation in new valve.

B. Install Control Valve

(1) If required, install fittings in control valve (3). Use new seals.

(2) Install control valve (3) on support bracket.

(3) Connect hydraulic lines to control valve (3).

(4) Connect control valve crank (2) to control valve pushrod (1). Safety nut with cotter pin.

WARNING: MAKE CERTAIN THAT ALL CONTROLS ARE IN THE CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR EQUIPMENT.

(5) Pressurize left hydraulic power system (PAGEBLOCK 29-00-00/201)

(6) Bleed air from elevator power control accumulators, lines, boost cylinders, and control valves as follows:

(a) Move elevator surface to full trailing edge down position and hold.

(b) Manually operate both elevator control valve input arms simultaneously to full open position.

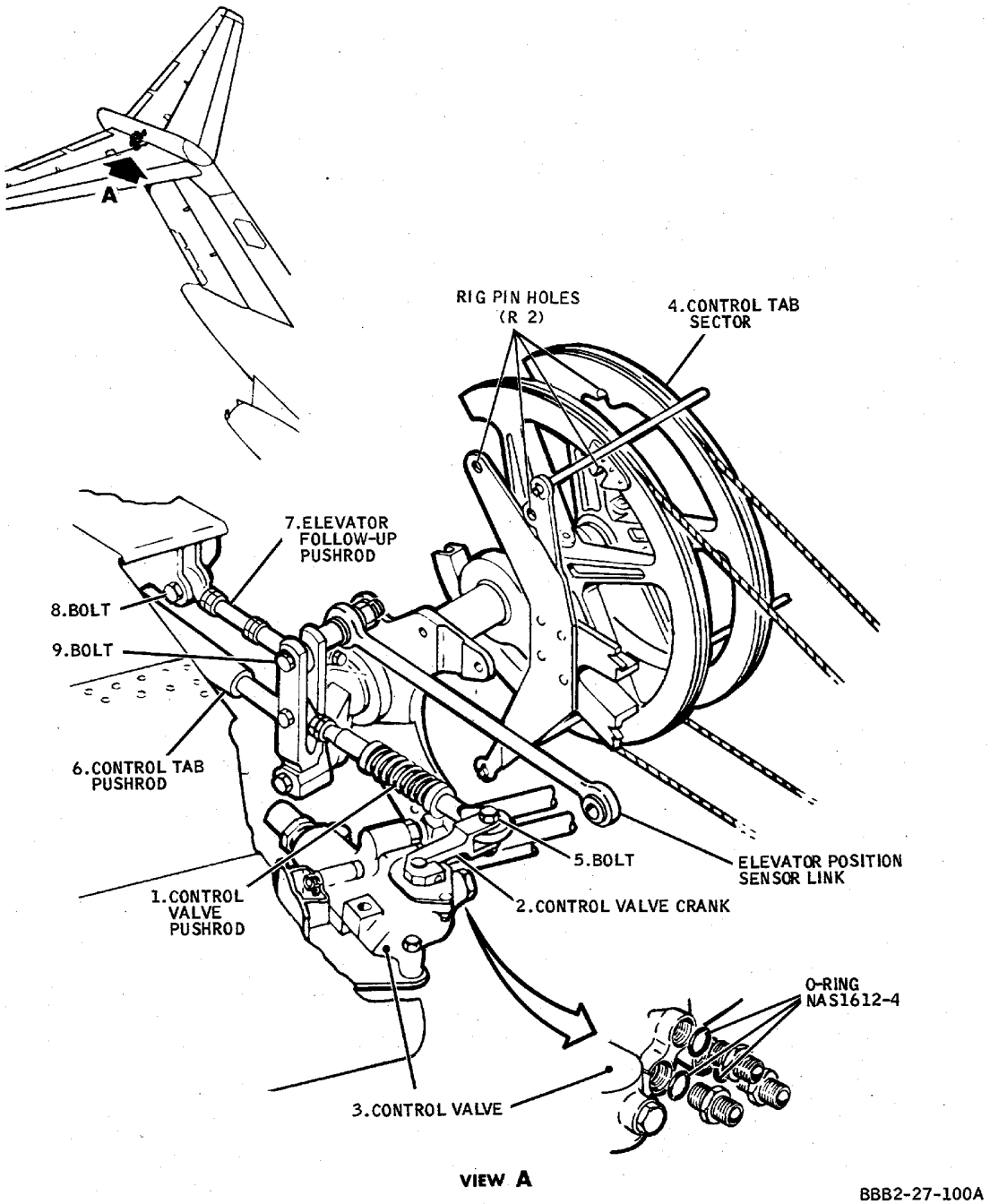
NOTE: Summing link may be manually actuated to place valve in full open position.

(c) Allow flow to continue through valves for 30 to 60 seconds.

(d) Release both elevator control valve input arms.

(e) Check control valve fittings and lines for leakage.

(f) Shut off hydraulic pressure source.



Elevator Power Control Valve -- Removal/Installation
Figure 201/27-30-07-990-801

4. Adjustment/Test Elevator Power Control Valve Linkage

A. Adjust Control Valve Linkage

NOTE: Horizontal stabilizer, elevator, and elevator control system should be in neutral position when making adjustment. Horizontal stabilizer is in neutral position when centers of two protruding rivet heads on left side of stabilizer line up with center of protruding rivet head in vertical fin. Elevators are in neutral position when center of aft inboard edge of elevator lines up with protruding head rivet in vertical fin. Rivets are identified by a circle and crossline target. Rig pin holes are provided in the elevator control tab sectors and sector guard pin brackets for establishing control system neutral position. Access to sectors and sector guard pin brackets is through top of vertical fin.

(1) Place horizontal stabilizer in neutral position.

(2) Place elevator control tab sector (4) in neutral position and install rig pins (RA-1) in rig pin holes (R-2).

(3) Place elevator in neutral position. If necessary, loosen jamnuts on control tab pushrod (6) and adjust pushrod to fair control tab with elevator within one-quarter degree. Tighten jamnuts and safety as follows:

NOTE: Elevator is in neutral position when center of aft inboard edge of elevator lines up with center of protruding rivet head in vertical fin. Rivet is identified by a circle and crossline target.

(a) Check forward and aft rod ends for proper thread engagement through witness holes.

(b) Tighten aft jamnut snug, plus an additional one-half nut flat rotation and safety with . (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(c) Tighten forward jamnut snug, plus an additional one-half nut flat rotation.

(4) Loosen jamnuts on elevator follow-up pushrod (7) and adjust pushrod to a dimension of 4(±3/32) inches, (101.6(±2.38) mm), center-to-center of bolts (8) and (9). Tighten jamnuts.

(5) Remove bolt (5) to free control valve pushrod (1) from control valve crank (2).

(6) Place control valve (3) in neutral detent. Loosen jamnut on control valve pushrod (1) and adjust pushrod until bolt (5) can be freely inserted through valve crank and pushrod. Tighten jamnut.

(7) Secure bolt (5). Safety nut with cotter pin.

(8) Remove rig pins (RA-1).

CAUTION: TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT RESULTING FROM ELEVATOR POWER CONTROL MECHANISM OPERATION, MAKE CERTAIN THAT MOVEMENT OF ELEVATOR IS UNOBSTRUCTED.

B. Test Elevator Power Control Mechanism

(1) Place elevator in neutral position.

(2) Place control tab in neutral position (faired with elevator within one-fourth degree).

(3) Measure length of control valve pushrod (1) and note dimension. This is normal length of pushrod to be used for comparison in steps (4) through (7).

(4) Move control column full forward. Control valve pushrod should not be compressed from normal length.

(5) Move control column full aft. Control valve pushrod should not be compressed from normal length.

(6) Move elevator trailing edge full up. Control valve push-rod should not be compressed from normal length.

(7) Move elevator trailing edge full down. Control valve pushrod should not be compressed from normal length.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT ALL CONTROLS ARE IN THE CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR EQUIPMENT.

(8) Pressurize left hydraulic power system. (PAGEBLOCK 29-00-00/201)

(9) With control column in neutral position (held only by load-feel spring), manually position both elevators to neutral.

(10) Lift right elevator and hold against elevator up stop.

(11) Slowly lift left elevator until right boost cylinder just begins to move right elevator down.

(12) Check that left elevator control tab trailing edge is 10(±2) degrees up.

(13) Return both elevators to neutral position.

(14) Lift left elevator and hold against elevator up stop.

(15) Slowly lift right elevator until left boost cylinder just begins to move left elevator down.

(16) Check that right elevator control tab trailing edge is 10(±2) degrees up.

(17) Return both elevators to neutral position.

(18) Manually move both elevators down against elevator stops.

(19) Slowly move control column forward.

(20) Check that elevator power on light (located on flight compartment overhead panel), is on by time control column stop is contacted.

ELEVATOR POWER CONTROL BOOST CYLINDERS - MAINTENANCE PRACTICES

1. General

A. The elevator power control boost cylinders are located at the No. 2 elevator hinge on the left and right side of the aircraft. The cylinders are attached to the hinge bracket at the horizontal stabilizer rear spar at one end and to a fitting in the elevator leading edge at the other end. Access to the boost cylinders is through access doors at the hinge cutouts in the elevator.

B. Maintenance practices are identical for the left and right boost cylinders.

C. Numbers in parentheses in the following text correspond to callouts in Figure 201 or Figure 202.

WARNING: THE SAFETY BELT LUG DOES NOT MEET CURRENT FALL PROTECTION REQUIREMENTS. DO NOT USE THE SAFETY BELT LUG FOR FALL PROTECTION. OTHER METHODS MUST BE USED TO ENSURE ADEQUATE FALL PROTECTION.

D. A safety belt attachment lug is located on top of vertical stabilizer for use by personnel performing maintenance on elevator power control boost cylinders.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed item.

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

Name and Number	Manufacturer
Parker-O-Lube (DPM 5367)	Parker Seal Co. Culver City, CA.
Compound, sealing PR-1422 A-2 (DPM 2292-2)	Courtaulds Aerospace, Inc. Glendale, CA
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Elevator Power Control Boost Cylinder

A. Remove Boost Cylinder

(1) Depressurize left hydraulic power system. (PAGEBLOCK 29-00-00/201)

(2) Disconnect hydraulic lines from boost cylinder (1).

(3) Disconnect boost cylinder pushrod (2) from universal (3).

(4) Remove boost cylinder (1) from hinge bracket (4) by holding elevator trailing edge down and removing nut (5) then holding elevator trailing edge up and removing bolt (6).

(5) If required, remove fittings from boost cylinder (1). Retain fittings for installation in new boost cylinder.

(6) Check universal (3) for excessive wear, if required, remove as follows:

(a) Disconnect universal from elevator hinge eyebolt. Retain bushing that was installed between universal and retainer for installation of new universal.

B. Install Boost Cylinder

NOTE: Make certain that correct hydraulic line attach support is installed on cylinder. Supports are different for left-and right-hand installation.

CAUTION: PRIOR TO INSTALLING NEW CYLINDER, MAKE CERTAIN THAT CYLINDER BEING INSTALLED IS CORRECT PART NUMBER.

(1) If required, install fittings in boost cylinder (1). Use new seals.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 880, 881, 883, 884, 891

(2) If replacement of boost cylinder eyebolt (7) was required, install as follows:

WARNING: LUBRICANT IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN LUBRICANT IS USED.

- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET THE LUBRICANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

(a) Without Service Bulletin 27-262, on eyebolt without cotter pin hole, apply Parker O-Lube to eyebolt shank and install nut. Using torque wrench check that initial running torque of nut is 18 inch-pounds minimum, (2.03 N·m), tighten nut to final torque of 400 (±50) inch-pounds, (44.2 (±5.6) N·m).

NOTE: If the initial running torque of nut does not meet the 18 inch-pound (2.03 N·m) minimum requirement, replace the nut with a new nut that does meet the minimum 18 inch-pound (2.03 N·m) initial running torque requirement.

WARNING: LUBRICANT IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN LUBRICANT IS USED.

- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET THE LUBRICANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 880, 881, 883, 884, 891 (Continued)

(WARNING PRECEDES)

(b) With Service Bulletin 27-262, on eyebolt with cotter pin hole, apply Parker O-Lube to eyebolt shank (not threads) and install PLI washer and nut. Tighten nut to torque of 250-270 inch-pounds (28.25-30.51 N·m) and safety with cotter pin.

NOTE: If slot in nut and cotter pin hole in eyebolt align, install cotter pin. If slot in nut and cotter pin hole in rod end do not align, tighten nut a minimum amount required to obtain alignment (60 degrees max reference) to the next slot and install cotter pin. Ring on PLI washer must be free to rotate after cotter pin installation. Cotter pin hole direction is machined on the end of rod end for use as an installation aid.

WARNING: LOW VISCOSITY POLYSULFIDE SEALANT IS AN AGENT THAT IS POISONOUS AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN LOW VISCOSITY POLYSULFIDE SEALANT IS USED.

- GAS/AIR MIXTURE MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET LOW VISCOSITY POLYSULFIDE SEALANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

1) Apply sealant (PR-1422 A-2) to encapsulate PLI washer to make certain of anti-tampering after installation of cotter pin.

WJE 401-404, 412, 414, 873-879, 886, 887, 892, 893

WARNING: LUBRICANT IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN LUBRICANT IS USED.

- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET THE LUBRICANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

WJE 401-404, 412, 414, 873-879, 886, 887, 892, 893 (Continued)

(WARNING PRECEDES)

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

(3) On airplanes without Service Bulletin 27-262, apply Parker O-Lube to the shank of the eyebolt (7) that connects the elevator hydraulic boost cylinder to elevator with washer (8) and nut (9). Using torque wrench, check that initial running torque of nut (9) is 18 inch-pounds (2 N·m) minimum, tighten nut (9) to final torque of 400 (±50) inch-pounds, (45 (±6) N·m). (Figure 202 View A)

NOTE: If the initial running torque of nut does not meet the 18 inch-pounds (2 N·m) minimum requirement, replace the nut with a new nut that does meet the minimum 18 inch-pounds (2 N·m) initial running torque requirement.

(4) On airplanes with Service Bulletin 27-262, apply Parker O-Lube to the shank of the eyebolt (7) that connects the elevator hydraulic boost cylinder to elevator and install a new PLI washer (10) and a new nut (11). Tighten nut (11) to torque of 250 inch-pounds (28 N·m) to 270 inch-pounds (31 N·m) and safety with cotter pin (12). (Figure 202 View B)

WARNING: LOW VISCOSITY POLYSULFIDE SEALANT IS AN AGENT THAT IS POISONOUS AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN LOW VISCOSITY POLYSULFIDE SEALANT IS USED.

- GAS/AIR MIXTURE MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET LOW VISCOSITY POLYSULFIDE SEALANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

(5) On airplanes with Service Bulletin 27-262, examine the end of the eyebolt (7) on the elevator boost cylinder (1) before the sealant is applied.

(a) Make sure that the cotter pin (12) is installed in nut (11).

NOTE: The rod end bolt is made safe with cotter pin (12) installed.

(b) Make sure that ring on PLI washer (10) is free to rotate.

(6) On airplanes with Service Bulletin 27-262, apply a layer of low viscosity, polysulfide sealant, PR-1422 A-2 around the rod end bolt, PLI washer (10), nut (11) and the adjacent area of the elevator and tab assembly.

- The minimum thickness of the sealant must be 0.030 in. (0.762 mm) to 0.035 in. (0.889 mm).

WJE ALL

(7) If replacement of universal (3) was required, perform following:

WARNING: LUBRICANT IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN LUBRICANT IS USED.

- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET THE LUBRICANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

(a) Apply coat of Parker-O-Lube to shank and adjacent face of bearing.

(b) Place bushing between universal and retainer, and connect universal (3) to boost cylinder eyebolt.

NOTE: Tighten nut just enough to close gap between bushing and universal. Do not over torque nut as binding of retainer may result.

WJE 401-404, 412, 414, 873-879, 886, 887, 892, 893

(8) Install boost cylinder (1) on elevator hinge bracket (4); install washers (AN960C916L), (2 places), as required, to achieve cylinder installation free of binding Safety head and shank of boost cylinder attach bolt with lockwire to hinge bracket attach bolts. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201) (Figure 202, View D)

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 880, 881, 883, 884, 891

(9) Install boost cylinder (1) on elevator hinge bracket (4). Safety head and shank of boost cylinder attach bolt with lockwire to hinge bracket attach bolts. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

WJE ALL

CAUTION: MAKE CERTAIN THAT BOLT IS INSTALLED WITH HEAD DOWN TO PREVENT INTERFERENCE WITH STRUCTURE.

(10) Connect boost cylinder pushrod (2) to universal (3) with two bolts, washers and nuts.

(11) Use one continuous length of lockwire and safety the head and shank of the forward bolt to the head and shank of the aft bolt on the universal. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Lockwire must not restrict movement of retainer.

(12) Connect hydraulic lines to boost cylinder (1).

(13) Lubricate boost cylinder as applicable. (PAGEBLOCK 12-21-02/301)

(14) If replacement of universal (3) was required, perform following:

WARNING: LUBRICANT IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN LUBRICANT IS USED.

- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET THE LUBRICANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

(a) Apply coat of Parker-O-Lube to shank and adjacent face of bearing.

(b) Place bushing between universal and retainer, and connect universal (3) to boost cylinder eyebolt.

NOTE: Tighten nut just enough to close gap between bushing and universal. Do not over torque nut as binding of retainer may result.

(15) Install boost cylinder (1) on elevator hinge bracket (4). Safety head and shank of boost cylinder attach bolt with lockwire to hinge bracket attach bolts. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

CAUTION: MAKE CERTAIN THAT BOLT IS INSTALLED WITH HEAD DOWN TO PREVENT INTERFERENCE WITH STRUCTURE.

(16) Connect boost cylinder pushrod (2) to universal (3). Safety head and shank of bolt with lockwire to head and shank of bolt at opposite end of universal. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Lockwire must not restrict movement of retainer.

(17) Connect hydraulic lines to boost cylinder (1).

(18) Connect hydraulic lines to boost cylinder (1).

(19) Lubricate boost cylinder as applicable (PAGEBLOCK 12-21-02/301).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT ALL CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF SYSTEMS OR EQUIPMENT.

(20) Pressurize left hydraulic system (PAGEBLOCK 29-00-00/201).

(21) Bleed air from elevator control accumulators, lines, boost cylinders, and control valves as follows:

NOTE: The elevator power control valves are located in the inboard section of the horizontal stabilizer, forward of the elevator hinge, on the left and right side of the airplane. Access to the control valves is through the upper and lower surfaces of the stabilizer.

(a) Move elevator surface to full trailing edge down position and hold.

(b) Manually operate both elevator control valve input arms simultaneously to full open position.

NOTE: Summing link may be manually actuated to place valve in full open position.

(c) Allow flow to continue through valves for 30 to 60 seconds.

(d) Release both elevator control valve input arms.

(22) Check boost cylinder ports and connections for leakage.

(23) With control column in neutral position (held only by load-feel spring), manually position both elevators to neutral.

(24) Lift right elevator and hold against elevator up stop.

(25) Slowly lift left elevator until right boost cylinder just begins to move right elevator down.

(26) Check that left elevator control tab trailing edge is 10 (±2) degrees up.

(27) Return both elevators to neutral position.

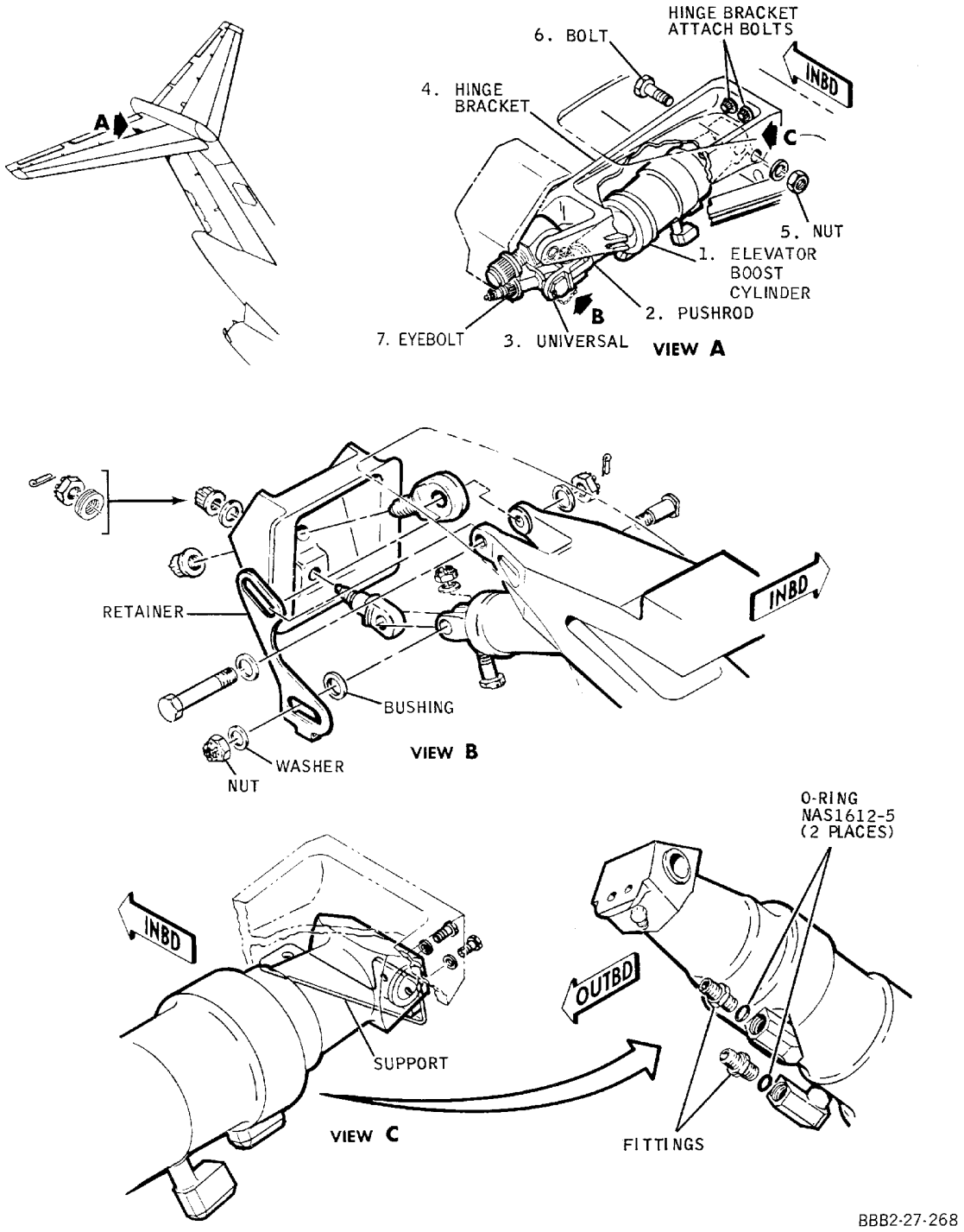
(28) Lift left elevator and hold against elevator up stop.

(29) Slowly lift right elevator until left boost cylinder just begins to move left elevator down.

(30) Check that right elevator control tab trailing edge is 10 (±2) degrees up.

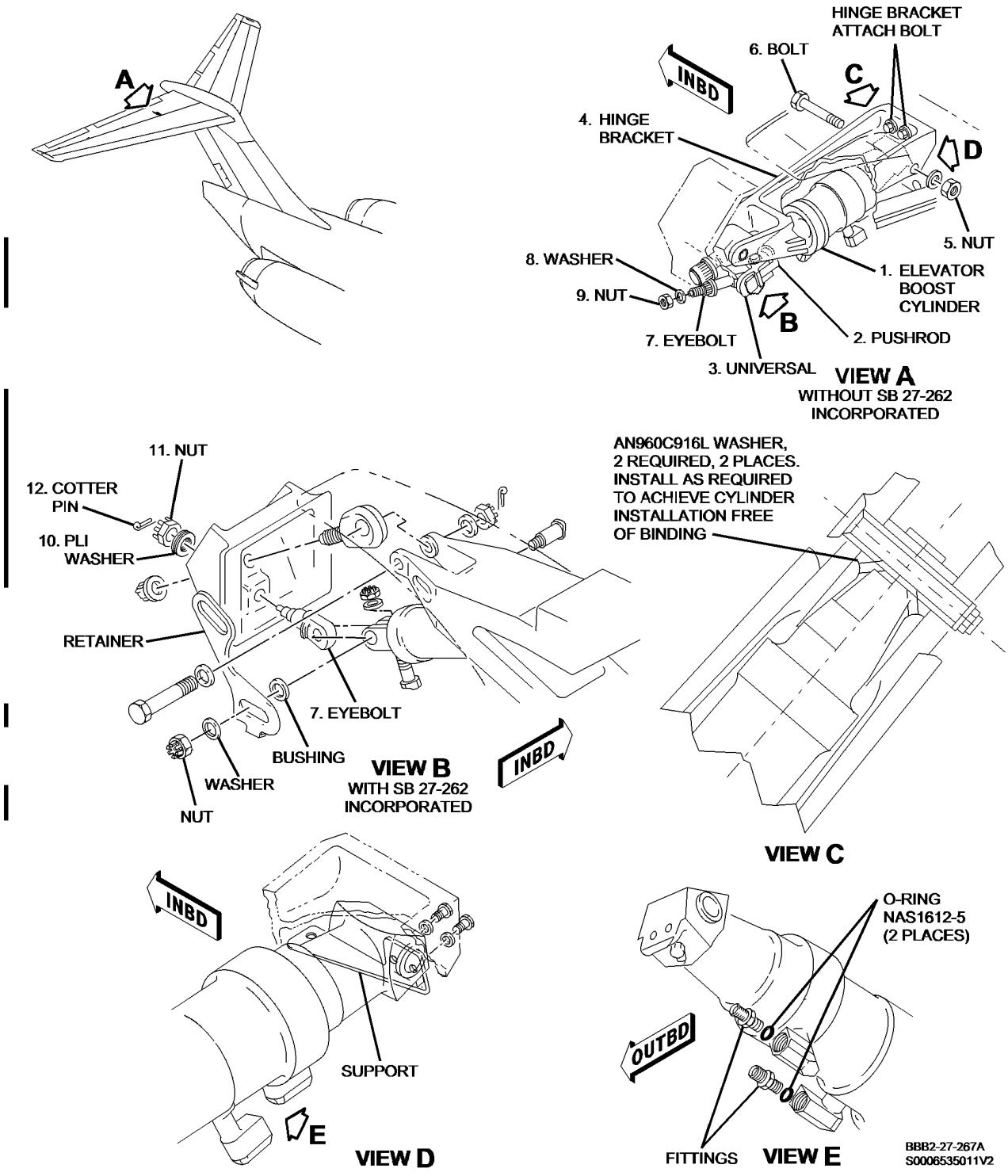
(31) Return both elevators to neutral position.

(32) Shut off hydraulic pressure source.



Elevator Power Control Actuating Cylinder - Removal/Installation
Figure 201/27-30-08-990-801

EFFECTIVITY
WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 880, 881, 883, 884, 891



Elevator Power Control Actuating Cylinder - Removal/Installation
Figure 202/27-30-08-990-802

4. External Leakage Check of Boost Cylinder

A. Check Boost Cylinder

(1) Pressurize left hydraulic power system. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT ALL CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF SYSTEMS OR EQUIPMENT.

(2) Push either pilot's control column full forward to stops. Elevator boost cylinders drive elevators down.

(3) Check for hydraulic leakage from boost cylinders. (Paragraph 4.A.(6)) , (Paragraph 4.A.(7)) and (Paragraph 4.A.(8))

(4) Place control column to neutral position.

(5) Manually move elevator approximately 4 to 8 degrees in each direction. Trailing edge down position should be limited to less than 10 degrees. At this position control valves open and direct pressure to elevator boost cylinders.

(6) Allowable leakage during normal operation is a trace (barely observable) of hydraulic fluid.

(7) Allowable leakage for dispatch operation to avoid delay is 1 drop per cycle.

(8) Leakage in excess of 1 drop per cycle of elevator operation is cause for replacement of boost cylinder. One cycle of operation equals 4 to 8 degrees of trailing edge down movement and 4 to 8 degrees of trailing edge up movement.

(9) Shut off hydraulic pressure source.

ELEVATOR POWER CONTROL RETURN RELIEF VALVE - MAINTENANCE PRACTICES

1. General

A. The elevator return relief valve is installed in hydraulic piping located in aft section of fuselage, at lower right side of the airplane. Access to the valve for removal and installation is through an access door in fuselage pressure dome or through access door in tailcone.

2. Removal/Installation Return Relief Valve

A. Remove Valve

(1) Depressurize left hydraulic power system. (PAGEBLOCK 29-00-00/201)

(2) Disconnect hydraulic lines from return relief valve. Remove valve.

(3) If required, remove fittings from return relief valve. Retain fittings for installation in new valve.

B. Install Valve

(1) Make certain left hydraulic system is depressurized.

(2) If required, install fittings in return relief valve. Use new seals.

(3) Place return relief valve in position; connect hydraulic lines.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT ALL CONTROLS ARE IN THE CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OF EQUIPMENT.

(4) Pressurize left hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Bleed air from elevator power control accumulator, lines, boost cylinders, and control valves as follows.

NOTE: The elevator power control valves are located in the inboard section of the horizontal stabilizer, forward of the elevator hinge, on the left and right side of the aircraft. Access to the control valves is through the upper and lower surfaces of the stabilizer.

(a) Move elevator surface to full trailing edge down position and hold.

(b) Manually operate both elevator control valve input arms simultaneously to full open position.

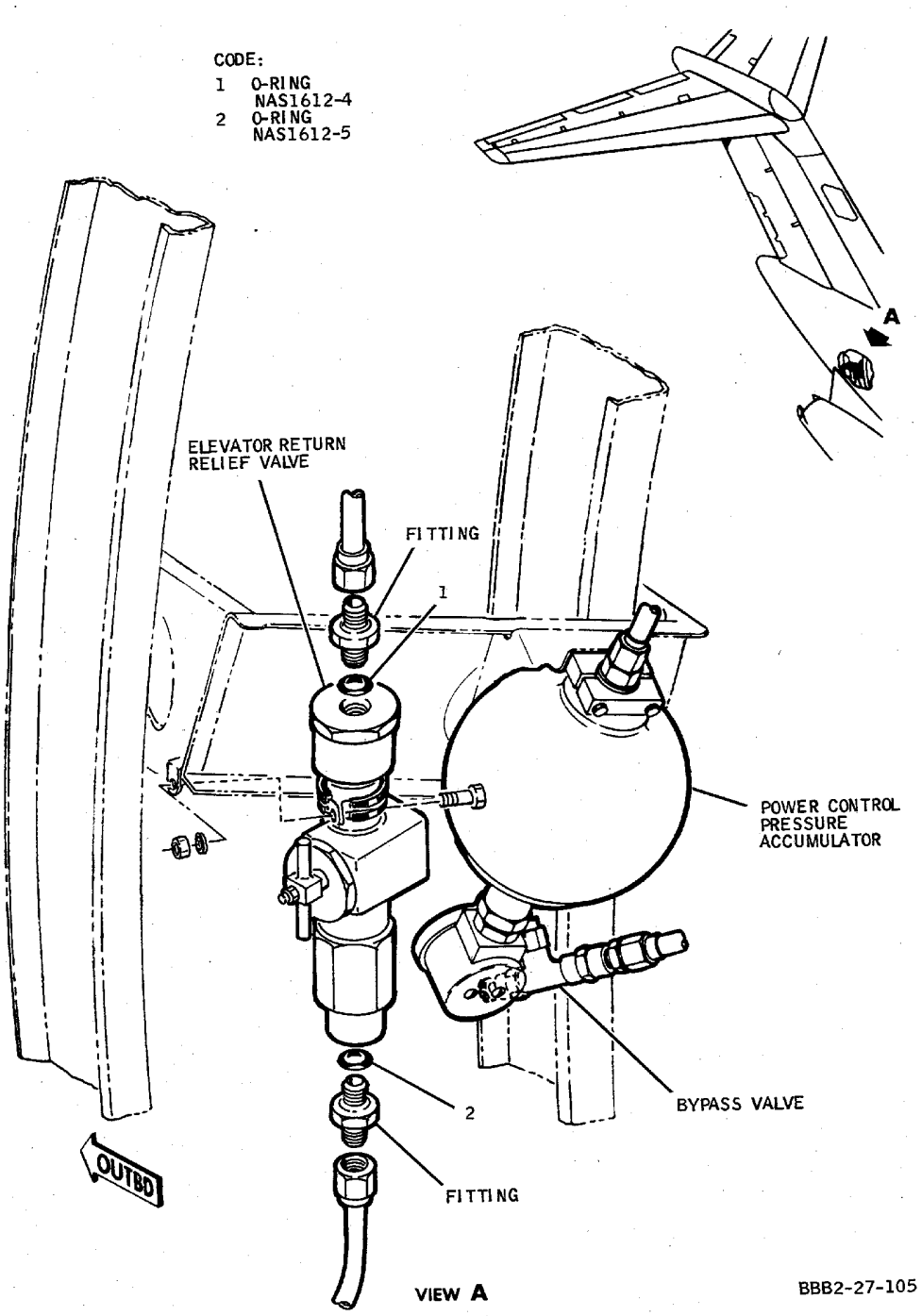
NOTE: Summing link may be manually actuated to place valve in full open position.

(c) Allow flow to continue through valves for 30 to 60 seconds.

(d) Release both elevator control valve input arms.

(6) Check valve fittings and hydraulic line connections for leakage.

(7) Shut off hydraulic pressure source.



Elevator Power Control Return Relief Valve -- Removal/Installation
Figure 201/27-30-10-990-801

ELEVATOR POWER CONTROL PRESSURE ACCUMULATOR - MAINTENANCE PRACTICES

1. General

A. This procedure has the maintenance practices for the elevator pressure accumulator. The procedure includes:

- Servicing Accumulator
- Removal/Installation Accumulator
- Removal/Installation Accumulator Pressure Gage
- Function Check Elevator Hydraulic System.

B. The elevator pressure accumulator is attached to a mounting plate on fuselage formers located in aft section of fuselage at lower right side of aircraft. Access to the accumulator is through an access door in fuselage pressure dome or through access door in the tailcone.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed item:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

Name and Number	Manufacturer
DO NOT OPERATE tag	
Pressure cylinder (compressed nitrogen)	
Accumulator, holding fixture	
Suitable container 2 gallon	
Flared Plug, AN 806	
Flared Cap, AN 929	

3. Servicing Accumulator

A. Checking Elevator Accumulator for Service

CAUTION: MAKE CERTAIN THAT ELEVATOR SURFACES ARE CLEAR OF PERSONNEL AND EQUIPMENT BEFORE CYCLING CONTROL COLUMN.

(1) Depressurize accumulator by opening small bypass valve located just aft of accumulator pressure gage or cycle control column several times.

(2) Check accumulator pressure gage for proper service. Gage should read 2000(±50) psi (13800(±345) kPa).

B. Recharging Accumulator

(1) Remove cap from filler valve in fitting at lower end of accumulator.

(2) Check for bladder leakage.

(a) Prepare a container and a hose to collect hydraulic fluid that can flow from the filler valve when opened.

WARNING: MAKE CERTAIN THAT FILLER VALVE IS NOT LOOSENED BEYOND THREE-QUARTERS OF A TURN. INJURY TO PERSONNEL COULD RESULT.

(b) Slowly turn the filler valve swivel nut three quarters of a turn CCW (Counterclockwise).

(c) Collect and measure all the hydraulic fluid that flows from the filler valve.

(d) If the quantity is less than 1 fl-oz (32 cc), the accumulator can stay in service.

(e) If the quantity is more than 1 fl-oz (32 cc) or if hydraulic fluid flows continuously for more than 1 minute, replace the accumulator. (Paragraph 4.)

(3) Attach nitrogen service hose chuck to filler valve.

(4) Charge accumulator with dry nitrogen to 2000(±50) psi (13800(±345) kPa).

(5) Tighten swivel nut to torque of 50(±10) inch-pounds (5.6(±1.13) N·m).

(6) Remove service hose.

(7) Check for external nitrogen leakage after servicing.

(8) Install valve cap and tighten cap to maximum finger tightness.

(9) Place bypass valve to closed position and safety as necessary.

4. Removal/Installation Accumulator

A. Remove Accumulator

(1) Depressurize left hydraulic power system. (PAGEBLOCK 29-00-00/201)

(2) Depressurize accumulator by opening small bypass valve beneath accumulator pressure gage.

WARNING: DO NOT PERMIT ANY PART OF BODY TO COME IN CONTACT WITH ESCAPING NITROGEN.

(3) Loosen valve swivel nut slightly until nitrogen can be heard escaping to relieve pressure charge from accumulator lower chamber.

(4) Put a clean container below the brake accumulator.

WARNING: FIRE RESISTANT HYDRAULIC FLUID IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN FIRE RESISTANT HYDRAULIC FLUID IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET FIRE RESISTANT HYDRAULIC FLUID IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

(5) Disconnect hydraulic line from accumulator.

(a) Install a cap on the fitting and plug on the hydraulic line.

(6) Remove accumulator from mounting plate.

NOTE: Maintain accumulator in upright position until fluid in upper chamber is drained.

(7) If required, loosen pressure gage jamnut and remove pressure gage. Discard back-up ring and O-ring.

CAUTION: MAKE SURE THAT THE ACCUMULATOR IS FIRMLY RESTRAINED DURING THE LINE HYDRAULIC FITTING REMOVAL AND INSTALLATION. DAMAGE TO THE ACCUMULATOR BLADDER AND INDEX PIN INSIDE THE ACCUMULATOR CAN OCCUR. THIS WILL HELP PREVENT DAMAGE CAUSED BY TWISTING BETWEEN THE SHELL AND AIR CAP.

(8) If required, remove fitting and filler valve from lower port of accumulator as follows:

(a) Use an accumulator restraining fixture or non-metallic/fabric strap to hold accumulator.

(b) Remove fitting and discard O-ring.

(c) If required, remove fitting from top port of accumulator. Retain fitting for installation in new accumulator. Discard O-ring.

B. Install Accumulator

(1) Make certain left hydraulic system is depressurized.

CAUTION: MAKE SURE THAT THE ACCUMULATOR IS FIRMLY RESTRAINED DURING THE LINE HYDRAULIC FITTING REMOVAL AND INSTALLATION. DAMAGE TO THE ACCUMULATOR BLADDER AND INDEX PIN INSIDE THE ACCUMULATOR CAN OCCUR. THIS WILL HELP PREVENT DAMAGE CAUSED BY TWISTING BETWEEN THE SHELL AND AIR CAP.

(2) If required, install fittings in upper and lower ports of accumulator as follows:

(a) Use an accumulator restraining fixture or non-metallic/fabric strap to hold accumulator.

(b) Install fitting with new seals.

(c) If required, install filler valve in lower port of accumulator using new seals. Make certain filler valve will be accessible after installation in accumulator.

1) Tighten filler valve swivel nut to 125(±5) inch-pounds, (14.0(±0.56) N·m). Torque two successive times and loosen swivel nut to free swiveling condition after each torque application. Tighten swivel nut to 50(±10) inch-pounds (5.6(±1.12) N·m) final torque.

NOTE: Increased tightening of filler valve body as a result of swivel nut torque application is acceptable.

(3) Install pressure gage as outlined in Paragraph 5.B..

(4) Install accumulator on mounting plate.

WARNING: FIRE RESISTANT HYDRAULIC FLUID IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN FIRE RESISTANT HYDRAULIC FLUID IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET FIRE RESISTANT HYDRAULIC FLUID IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

(WARNING PRECEDES)

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

(5) Remove the cap from the fitting and the plug from the hydraulic line.

(6) Connect hydraulic line to accumulator.

(7) Charge accumulator lower chamber with dry nitrogen. (Paragraph 3.B.)

(8) Return bypass valve to closed position and safety as necessary.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(9) Pressurize left hydraulic system. (PAGEBLOCK 29-00-00/201)

(10) Bleed air from elevator power control boost cylinders, lines, control valves, and accumulators as follows:

NOTE: The elevator power control valves are located in the inboard section of the horizontal stabilizer, forward of the elevator hinge, on the left and right side of the aircraft. Access to the control valves is through the upper and lower surfaces of the stabilizer.

(a) Move elevator surface to full trailing edge down position and hold.

(b) Manually operate both elevator control valve input arms simultaneously to full open position.

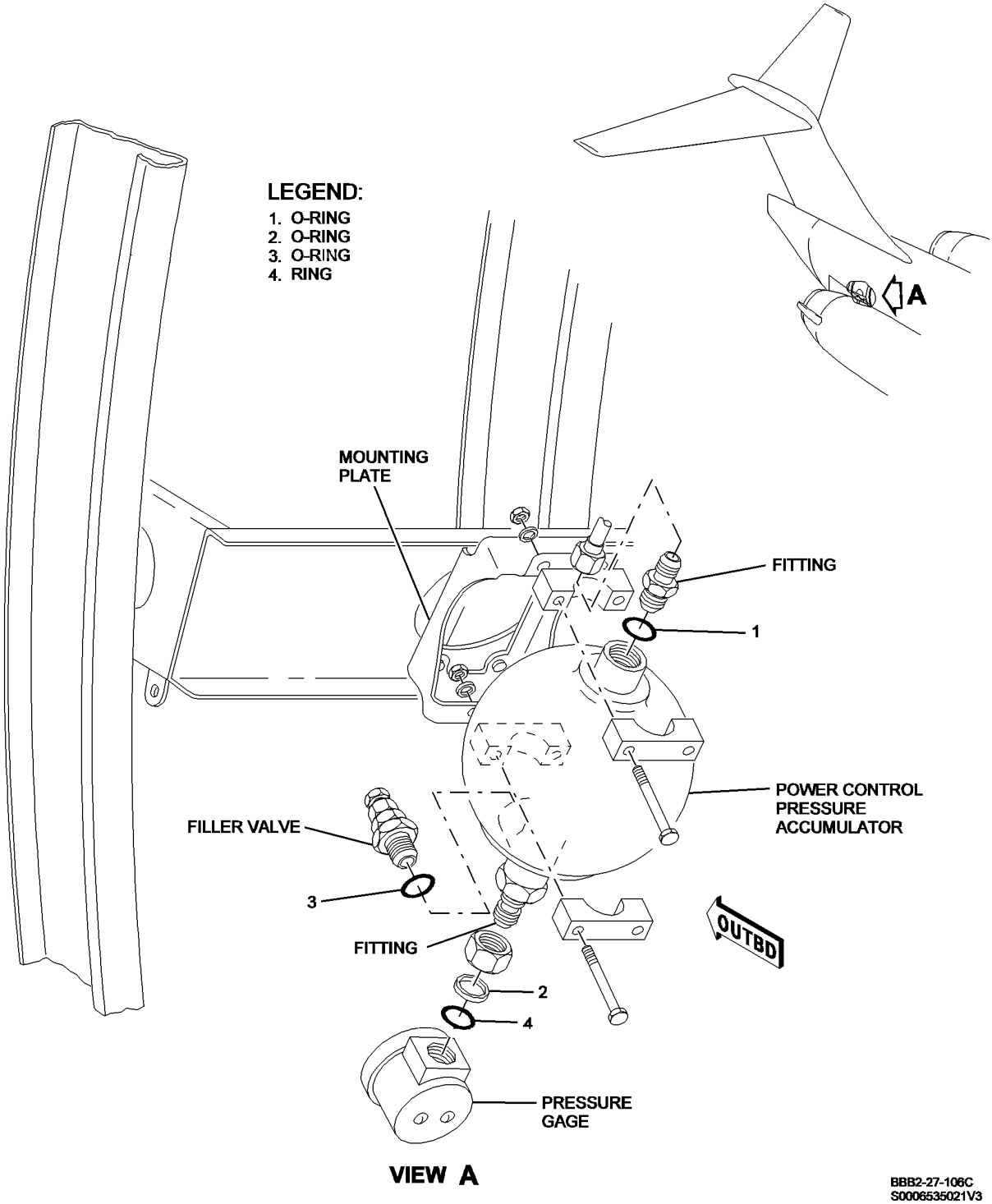
NOTE: Summing link may be manually actuated to place valve in full open position.

(c) Allow flow to continue through valves for 30 to 60 seconds.

(d) Release both elevator control valve input arms.

(11) Check accumulator, fittings and line connections for leakage.

(12) Check that accumulator pressure gage reads approximately 3000 psi.



Elevator Pressure Accumulators -- Removal/Installation
Figure 201/27-30-11-990-801

5. Removal/Installation Accumulator Pressure Gage

A. Remove Gage

(1) Depressurize left hydraulic power system. (PAGEBLOCK 29-00-00/201)

(2) Depressurize accumulator by opening small bypass valve beneath accumulator pressure gage.

WARNING: DO NOT PERMIT ANY PART OF BODY TO COME IN CONTACT WITH ESCAPING NITROGEN.

(3) Loosen valve swivel nut slightly until nitrogen can be heard escaping to relieve pressure charge from accumulator lower chamber.

(4) Loosen pressure gage jamnut.

(5) Remove pressure gage, back-up ring and O-ring.

(6) Discard back-up ring and O-ring.

B. Install Gage

(1) Make certain left hydraulic system is depressurized.

(2) Install pressure gage jamnut on accumulator fitting. Turn jamnut until free of thread relief area.

(3) Install back-up ring on fitting thread relief area.

(4) Lubricate O-ring with Hi-Lo MS No. 1 grease or Skydrol fluid and install on thread relief area.

(5) Turn jamnut until back-up ring is overlapped. If necessary, work ring into nut recess.

(6) Continue turning jamnut until O-ring is pressed firmly against threaded portion of fitting.

(7) Install pressure gage on fitting. Tighten until boss contacts O-ring.

(8) Back jamnut off one turn and tighten pressure gage one turn. To assure proper accessibility, pressure gage may be tightened an additional amount, not to exceed one turn.

(9) Tighten jamnut to 125 inch-pounds (14.0 N·m).

(10) Service accumulator per Paragraph 3.B. and check pressure gage connections for leaks.

6. Function Check Elevator Hydraulic System

A. Check Accumulator

(1) Make sure that the aircraft hydraulic system is not pressurized.

(2) Open access panel 5902C.

CAUTION: MAKE CERTAIN THAT ELEVATOR SURFACES ARE CLEAR OF PERSONNEL AND EQUIPMENT BEFORE CYCLING CONTROL COLUMN.

(3) Depressurize elevator accumulator by opening small bypass valve located just aft of accumulator pressure gage or cycle control column several times.

(4) Check the accumulator pressure gage for correct service. Gage should read 2000(±50) psi (13800(±345) kPa).

(5) Elevator accumulator shall not drop more than 100 psi within 30 minutes.

(6) Close the elevator system bypass valve.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(7) Pressurize the hydraulic system. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

NOTE: Allow system to stabilize for 3 to 5 minutes.

(8) Accumulator pressure gage should read 3000 psi.

(9) Set the stabilizer to zero.

(10) Make sure the elevators are faired.

(11) Put a DO NOT OPERATE tag on the control wheels.

(12) Do a functional check of the elevator hydraulic system to maintain pressure without aircraft system pressure as follows:

(a) Shutoff the hydraulic pressure source and wait 10 minutes to get a stabilized accumulator pressure.

NOTE: Minimum stabilized pressure is 2200 psi.

(b) Check the elevator accumulator pressure and make a record of the stabilized pressure reading.

(c) Accumulator pressure for system under test shall not drop below 2200 psi within 10 minutes.

(13) Depressurize the elevator hydraulic system. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

(14) Remove the DO NOT OPERATE tag from the control wheels.

ELEVATOR POWER CONTROL PRESSURE ACCUMULATOR - SERVICING

1. General

A. This procedure contains MSG-3 task card data.

TASK 27-30-11-614-801

2. Service the Elevator Accumulator to Proper Charge

NOTE: This procedure is a scheduled maintenance task.

A. Tools/Equipment

Reference	Description
STD-3918	Pressure Source - Dry Nitrogen, 0 to 5000 psi (0 to 3447 kPa)

B. Prepare to Service the Elevator Accumulator to Proper Charge

SUBTASK 27-30-11-010-001

(1) Open access door.

C. Service the Elevator Accumulator to Proper Charge

SUBTASK 27-30-11-864-001

CAUTION: MAKE CERTAIN THAT ELEVATOR SURFACES ARE CLEAR OF PERSONNEL AND EQUIPMENT BEFORE CYCLING CONTROL COLUMN.

(1) Depressurize accumulator by opening small bypass valve located just aft of accumulator pressure gage or cycle control column several times.

SUBTASK 27-30-11-212-001

(2) Check accumulator pressure gage for proper service. Gage should read 2000 ±50 psi (13,790 ±345 kPa).

SUBTASK 27-30-11-090-001

(3) Remove cap from filler valve in fitting at lower end of accumulator.

SUBTASK 27-30-11-790-001

(4) Check for bladder leakage.

(a) Prepare a container and a hose to collect hydraulic fluid that can flow from the filler valve when opened.

WARNING: MAKE CERTAIN THAT FILLER VALVE IS NOT LOOSENED BEYOND THREE-QUARTERS OF A TURN. INJURY TO PERSONNEL COULD RESULT.

(b) Slowly turn the filler valve swivel nut three quarters of a turn CCW (Counterclockwise).

(c) Collect and measure all the hydraulic fluid that flows from the filler valve.

(d) If measured quantity is less than 1 fl-oz (32 cc), the accumulator can stay in service.

(e) If the quantity is more than 1 fl-oz (32 cc) or if hydraulic fluid flows continuously for more than 1 minute, replace the accumulator.

SUBTASK 27-30-11-490-001

(5) Attach nitrogen service hose chuck to filler valve.

SUBTASK 27-30-11-614-001

(6) Charge accumulator with 0 to 5000 psi (0 to 3447 kPa) dry nitrogen pressure source, STD-3918 to 2000 ±50 psi (13,790 ±345 kPa).

SUBTASK 27-30-11-220-001

(7) Tighten swivel nut to torque of 50 ±10 in-lb (5.65 ±1.13 N·m).

SUBTASK 27-30-11-090-002

(8) Remove service hose.

SUBTASK 27-30-11-790-002

(9) Check for external nitrogen leakage after servicing.

SUBTASK 27-30-11-430-001

(10) Install valve cap and tighten cap to maximum finger tightness.

(11) Place bypass valve to closed position and safety as necessary.

D. Job Close-up

SUBTASK 27-30-11-942-001

(1) Remove all the tools and equipment from the work area. Make sure the area is clean.

SUBTASK 27-30-11-410-001

(2) Close access door.

——— END OF TASK ———

ELEVATOR POWER CONTROL PRESSURE ACCUMULATOR - ADJUSTMENT/TEST

1. General

A. This procedure contains MSG-3 task card data.

TASK 27-30-11-720-801

2. Functional Check of the Elevator Hydraulic System to Maintain Pressure Without Main Hydraulic Pressure

NOTE: This procedure is a scheduled maintenance task.

A. Equipment and Materials

Name and Number	Manufacturer
DO NOT OPERATE tag	
Pressure cylinder (compressed nitrogen)	

NOTE: It is possible that some materials in the Consumable Materials chart cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local and provincial laws and regulations when it is necessary to work with these materials.

B. References

Reference	Title
29-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES

C. Prepare for the Functional Check of the Elevator Hydraulic System to Maintain Pressure Without Main Hydraulic Pressure

SUBTASK 27-30-11-040-001

(1) Make sure that the aircraft hydraulic system is not pressurized.

(2) Open access panel.

D. Functional Check of the Elevator Hydraulic System to Maintain Pressure Without Main Hydraulic Pressure

SUBTASK 27-30-11-720-001

CAUTION: MAKE CERTAIN THAT ELEVATOR SURFACES ARE CLEAR OF PERSONNEL AND EQUIPMENT BEFORE CYCLING CONTROL COLUMN.

(1) Do the functional check of the elevator hydraulic system to maintain pressure without main hydraulic pressure.

(a) Depressurize elevator accumulator by opening small bypass valve located just aft of accumulator pressure gage or cycle control column several times.

(b) Check the accumulator pressure gage for correct service. Gage should read 2000 ±50 psi (13,790 ±345 kPa).

(c) Elevator accumulator shall not drop more than 100 psi (689 kPa) within 30 minutes.

(d) Close the elevator system bypass valve and safety as necessary.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(e) Pressurize the hydraulic system. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

NOTE: Allow system to stabilize for 3 to 5 minutes.

(f) Accumulator pressure gage should read 3000 psi (20,684 kPa).

(g) Set the stabilizer to zero.

(h) Make sure the elevators are faired.

(i) Put a DO NOT OPERATE tag on the control wheels.

(2) Do a functional check of the elevator hydraulic system to maintain pressure without aircraft system pressure as follows:

(a) Shutoff the hydraulic pressure source and wait 10 minutes to get a stabilized accumulator pressure.

NOTE: Minimum stabilized pressure is 2200 psi (15,168 kPa).

(b) Check the elevator accumulator pressure and make a record of the stabilized pressure reading.

(c) Accumulator pressure for system under test shall not drop below 2200 psi (15,168 kPa) within 10 minutes.

E. Job Close-up

SUBTASK 27-30-11-040-002

(1) Depressurize the elevator hydraulic system. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

(2) Remove all the tools and equipment from the work area. Make sure the area is clean.

(3) Close access panel.

(4) Remove the DO NOT OPERATE tag from the control wheels.

——— END OF TASK ———

ELEVATOR POWER CONTROL PRESSURE SWITCH - MAINTENANCE PRACTICES

1. General

A. The elevator power control pressure switch is located in the horizontal stabilizer center section, on left side of airplane, forward of the elevator hinge line. Access to the pressure switch is through top of vertical fin.

WARNING: THE SAFETY BELT LUG DOES NOT MEET CURRENT FALL PROTECTION REQUIREMENTS. DO NOT USE THE SAFETY BELT LUG FOR FALL PROTECTION. OTHER METHODS MUST BE USED TO ENSURE ADEQUATE FALL PROTECTION.

B. A safety belt attachment lug is located on top of vertical stabilizer for use by personnel performing maintenance on elevator power control pressure switch.

2. Removal/Installation Elevator Power Control Pressure Switch

A. Remove Pressure Switch

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	27	B1-377	ELEVATOR POWER ON ADVISORY

(2) Depressurize left hydraulic power system. (PAGEBLOCK 29-00-00/201)

(3) Disconnect electrical plug from pressure switch.

(4) Remove hydraulic line from pressure switch.

(5) Remove pressure switch.

(6) If required, remove fitting from pressure switch. Retain fittings for installation on new pressure switch.

B. Install Pressure Switch

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that this circuit breaker is open and has safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	27	B1-377	ELEVATOR POWER ON ADVISORY

(2) Make certain left hydraulic system is depressurized.

(3) If required, install fittings in pressure switch; use new seals.

(4) Install pressure switch.

(5) Connect hydraulic line to pressure switch.

(6) Connect electrical plug to pressure switch.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT ALL CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR EQUIPMENT.

(7) Pressurize left hydraulic system. (PAGEBLOCK 29-00-00/201)

(8) Bleed air from elevator power control accumulators, lines, boost cylinders, and control valves as follows:

NOTE: The elevator power control valves are located in the inboard section of the horizontal stabilizer, forward of the elevator hinge, on the left and right side of the aircraft. Access to the control valves is through the upper and lower surfaces of the stabilizer.

(a) Move elevator surface to full trailing edge down position and hold.

(b) Manually operate both elevator control valve input arms simultaneously to full open position.

NOTE: Summing link may be manually actuated to place valve in full open position.

(c) Allow flow to continue through valves for 30 to 60 seconds.

(d) Release both elevator control valve input arms.

(9) Check pressure switch fitting and line connection for leakage.

(10) Remove the safety tag and close this circuit breaker:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	27	B1-377	ELEVATOR POWER ON ADVISORY

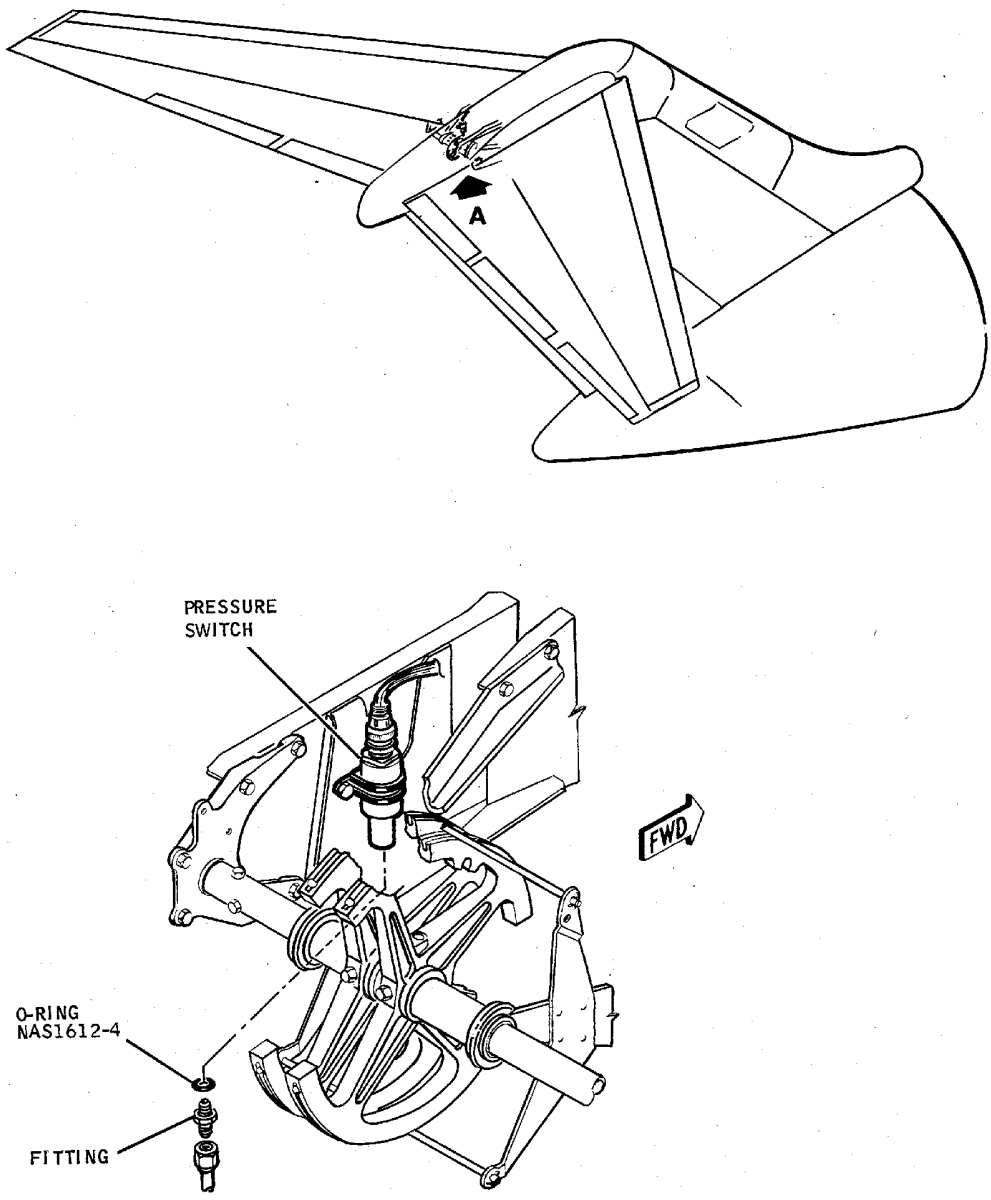
(11) With control column in neutral position (held only by load-feel spring), manually position both elevators down against elevator stops.

(12) Slowly move control column forward.

(13) Check that elevator power on light (located on flight compartment overhead panel), is on by time control column stop is contacted.

(14) Release control column.

(15) Shut off hydraulic pressure source.



Elevator Power Control Pressure Switch -- Removal/Installation
Figure 201/27-30-12-990-801

ANTI-FLOAT TABS - MAINTENANCE PRACTICES

1. General

A. The anti-float tabs are located on the trailing edge of the left and right elevator outboard of the geared tabs. Access to the attach bolts is through the pushrod fairing at inboard end of tab, and through a cutout in the leading edge of the tab at each inner hinge point. The removal and installation procedures are identical for the left and right anti-float tabs.

B. The elevators are in the neutral position when, with the horizontal stabilizer in neutral position, the center of the aft inboard edge of each elevator lines up with the center of a protruding head rivet in the vertical fin. Alignment rivets are identified by a circle and crossline target.

C. The horizontal stabilizer is in the neutral position when the centers of two protruding head rivets on the left hand inboard leading edge of the horizontal stabilizer line up with the center of the protruding head rivet on the vertical fin. Alignment rivets are identified by a circle and crossline target.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 201

Name and Number	Manufacturer
Protractor (5916715)	Douglas Aircraft Co.
Torque wrench (0-200 inch pounds) (0-22.4 N·m)	
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Anti-Float Tab

A. Remove Anti-Float Tab (Figure 201)

(1) Make certain horizontal stabilizer position indicator, on control pedestal, is at neutral (0 degrees) position.

(2) Depressurize left hydraulic system. (PAGEBLOCK 29-00-00/201)

(3) Remove bolt (1) to disconnect pushrod (2) from crank fitting (3) at inboard end of tab.

(4) Remove nut (4) to disconnect crank fitting (3) from eyebolt (5).

(5) Remove bolts (6) to disconnect tab from hinge brackets; remove tab from elevator.

B. Install Anti-Float Tab (Figure 201)

(1) Make certain left hydraulic system is depressurized.

(2) Make certain horizontal stabilizer position indicator is at neutral (0 degrees) position.

(3) Place tab in position on elevator hinges and install bolts (6). Tighten nuts to provide 0.005 inch gap under washer, then tighten to next cotter pin slot and safety nuts with cotter pins.

(4) Install nut (4) to connect crank fitting (3) to eyebolt (5). Tighten nut to torque of 80 to 100 inch-pounds, (8.96 to 11.2 N·m).

(5) Install bolt (1) to connect pushrod (2) to crank fitting (3). Safety nut with cotter pin.

(6) Check that anti-float tab is faired with elevator within 1/4 degree. If necessary, adjust spring cartridge pushrod to fair tab with elevator. (Paragraph 6.)

(7) Lubricate tab fittings as applicable. (FLIGHT CONTROLS - LUBRICATION, PAGEBLOCK 12-21-02/301)

4. Check Anti-Float Tab

A. Check Tab

(1) Check that anti-float tab clearances are as shown in Figure 201.

(2) Check that play at inboard end of trailing edge of tab does not exceed 1/16 inch (1.587 mm), when tab is in neutral position and faired with elevator.

5. Removal/Installation Anti-Float Tab Pushrod

A. Remove Pushrod (Figure 201 (Sheet 2))

(1) Make certain horizontal stabilizer position indicator is at neutral (0 degrees) position.

(2) Depressurize left hydraulic system. (PAGEBLOCK 29-00-00/201)

(3) Remove bolt (1) to disconnect pushrod from anti-float tab.

(4) Remove bolt (7) to disconnect pushrod and spring cartridge pushrod from crank fitting.

NOTE: Note and record arrangement of pushrod and spring cartridge pushrod in crank fitting.

(5) Remove pushrod from elevator.

B. Install Pushrod (Figure 201 (Sheet 2))

(1) Make certain left hydraulic system is depressurized.

(2) Make certain horizontal stabilizer position indicator is at neutral (0 degrees) position.

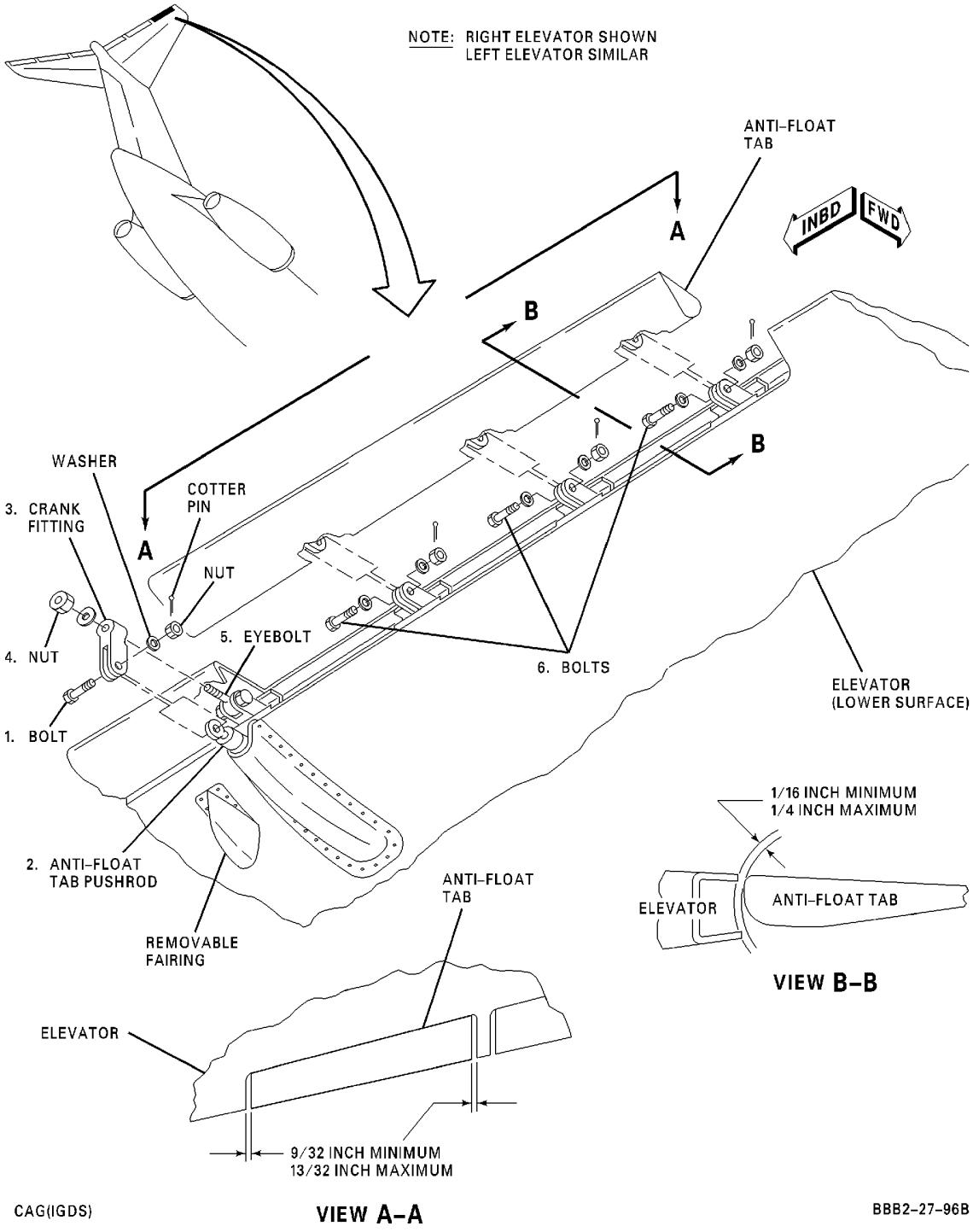
(3) Position pushrod and spring cartridge pushrod as noted in 4.A.(4) in crank fitting and install bolt (7). Safety nut with cotter pin.

(4) Connect aft end of pushrod to anti-float tab by installing bolt (1) with bolt head inboard. Safety nut with cotter pin.

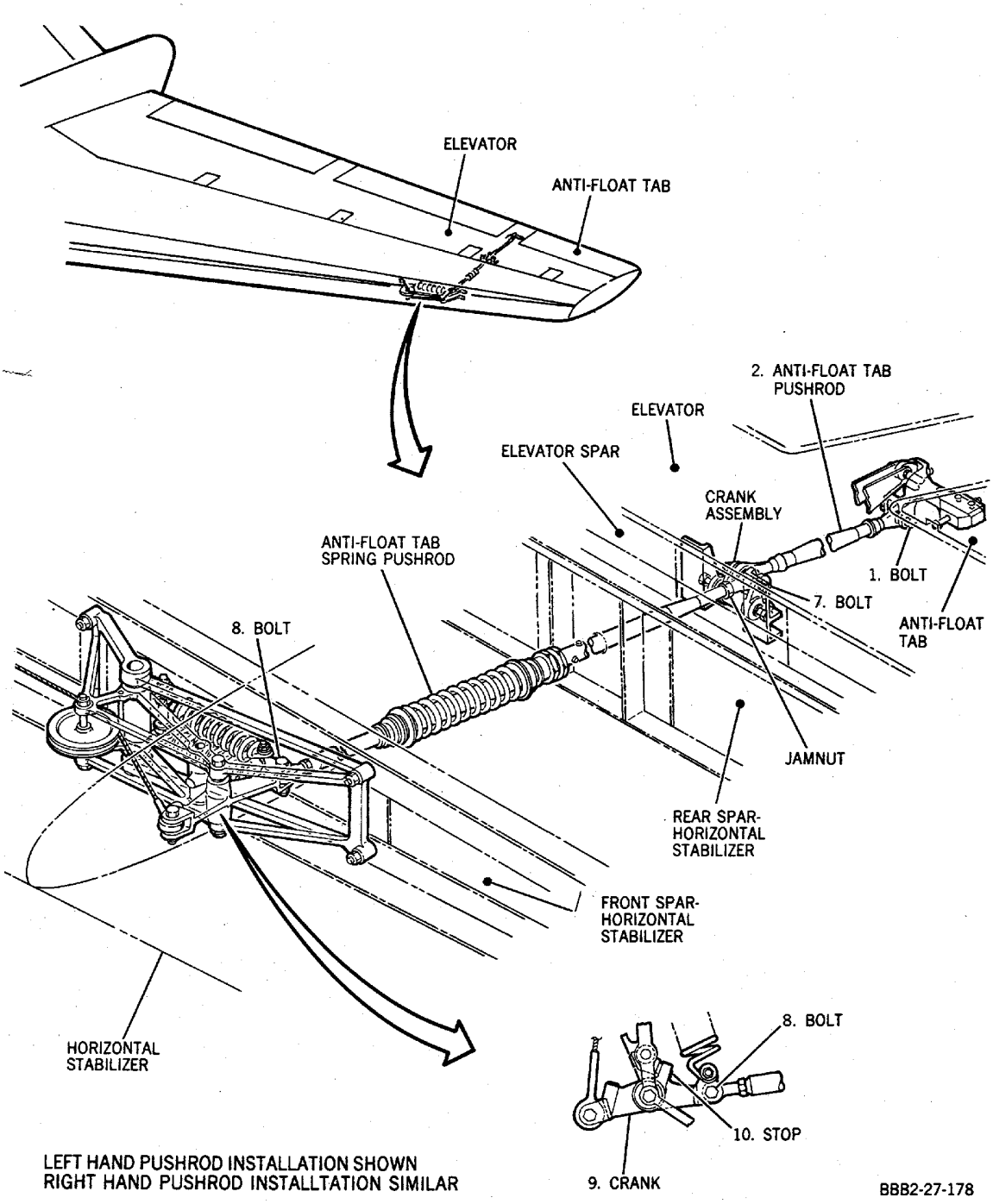
(5) Check that anti-float tab is faired with elevator within 1/4 degree. If necessary, adjust spring cartridge push rod to fair tab with elevator. (Paragraph 6.)

NOTE: Anti-float tab pushrod is preset. No adjustment of pushrod should be attempted.

(6) Lubricate pushrod ends as applicable. (PAGEBLOCK 12-21-02/301)



Elevator Anti-Float Tab -- Removal/Installation
Figure 201/27-30-14-990-801 (Sheet 1 of 2)



Elevator Anti-Float Tab -- Removal/Installation
Figure 201/27-30-14-990-801 (Sheet 2 of 2)

6. Removal/Installation Spring Cartridge Pushrod

A. Remove Spring Cartridge Pushrod

WARNING: BEFORE MOVING PRIMARY LONGITUDINAL TRIM CONTROL WHEEL SWITCHES, MAKE CERTAIN AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(1) Using primary longitudinal trim control wheel switches, place horizontal stabilizer in neutral position.

NOTE: The horizontal stabilizer is in the neutral position when the centers of two protruding head rivets on the left hand inboard leading edge of horizontal stabilizer line up with the center of the protruding head rivet on vertical fin. Alignment rivets are identified by a circle and crossline target.

(2) Depressurize left hydraulic system. (PAGEBLOCK 29-00-00/201)

(3) Remove horizontal stabilizer outboard leading edge. (PAGEBLOCK 55-10-01/201)

(4) Remove bolt (7) to disconnect spring cartridge and anti-float tab pushrod from crank fitting.

NOTE: Note and record arrangement of spring cartridge pushrod and anti-float tab pushrod in crank fitting.

(5) Remove bolt (8) to disconnect spring cartridge pushrod from crank (9).

(6) Remove spring cartridge pushrod from horizontal stabilizer.

B. Install Spring Cartridge Pushrod

(1) Make certain left hydraulic system is depressurized.

(2) Make certain horizontal stabilizer is in neutral position.

(3) Position spring cartridge pushrod in stabilizer and install bolt (8) to connect pushrod to crank (9).

(4) Place elevator in neutral position.

NOTE: The elevators are in neutral position when, with the horizontal stabilizer in neutral position, the center of the aft inboard edge of each elevator lines up with the center of a protruding head rivet in the vertical fin. Alignment rivet is identified by a circle and crossline target.

(5) Check that stop on crank (9) is in contact with stop (10) on support bracket.

(6) Position spring cartridge pushrod and anti-float tab push-rod as noted in Paragraph 6.A.(4) and install bolt (7). Safety nut with cotter pin.

(7) Check that anti-float tab is faired with elevator within 0(±1/4) degree (0.004 rad). If necessary, remove bolt (7) and adjust spring cartridge pushrod rod end as necessary to fair anti-float tab to elevator, reinstall bolt (7). Safety nut with cotter pin. Safety pushrod jamnut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

WARNING: BEFORE MOVING PRIMARY LONGITUDINAL TRIM CONTROL WHEEL SWITCHES, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(8) Using primary longitudinal trim control wheel switches, move horizontal stabilizer to approximately 2 degrees (0.035 rad) aircraft nosedown, move stabilizer from this position to 10 (+0, -0.5) degrees (0.17 (+0, -0.008) rad) aircraft noseup, anti-float tabs should remain faired with elevator.

(9) Move stabilizer to 12.2(±0.5) degrees (0.213(±0.008) rad) ANU, anti-float tabs should move to 26 1/4(±3) degrees (0.458(±0.052) rad) trailing edge down.

NOTE: Elevator must be held faired with the horizontal stabilizer when measuring anti-float tab deflection.

(10) Return stabilizer to neutral position. Anti-float tabs should fair with elevators when stabilizer passes 10 degrees ANU and remain faired at stabilizer positions below 10 degrees (0.17 rad) ANU.

(11) If anti-float tabs do not meet the requirements of Paragraph 6.B.(8) through Paragraph 6.B.(10), adjust anti-float tab control system. (PAGEBLOCK 27-30-00/501)

(12) Lubricate spring cartridge rod ends as applicable. (PAGEBLOCK 12-21-02/301)

(13) Install horizontal stabilizer outboard leading edge. (PAGEBLOCK 55-10-01/201)

HORIZONTAL STABILIZER - DESCRIPTION AND OPERATION

1. General

A. The horizontal stabilizer is located at the top of the vertical stabilizer. It is hinged forward of the rear spar so that the leading edge can be moved up and down to provide longitudinal trim for the airplane. Movement of the horizontal stabilizer is controlled from the flight compartment by the longitudinal trim control system.

B. For the MD-81, MD-82, MD-83 and MD-88 series aircraft, the range of motion for the stabilizer is 12.2 degrees leading edge down to 2.1 degrees leading edge up.

C. For the MD-87 series aircraft, the range of motion for the stabilizer is 14.5 degrees leading edge down to 2.1 degrees leading edge up.

D. The system is electrically operated and consists of a primary system, an alternate system, an actuating mechanism, an indicating system, a take-off warning system, and a motion warning system.

E. On aircraft with Service Bulletin 27-282, a heater cap is installed on the horizontal stabilizer brake assembly dust cover on the primary longitudinal trim actuator motor. This heater cap is thermostatically controlled and minimizes the potential for freezing of condensate moisture on the brake disc.

F. Movement of the primary or alternate longitudinal trim controls energizes the electrical circuit to the actuating mechanism to drive the horizontal stabilizer to the position desired. The indicating system shows the position of the horizontal stabilizer, and acts as a followup system to actuate the travel limit switches to deenergize the electrical circuit when the stabilizer reaches the travel limits. The indicating system also drives a sensing device which provides an audible signal in the flight compartment, when the stabilizer is in motion.

2. Primary Longitudinal Trim Control System

A. The primary longitudinal trim control system consists of two control wheel switches in the outboard horn of each aileron control wheel; dual control handles located on the left side of the control pedestal; primary trim brake switch located on the aft side of the control pedestal; two contactors, two brake control relays; a manual override and shutoff control, and a brake switch, all located behind the lining in the forward lower cargo compartment; and the primary longitudinal trim actuator motor mounted on the actuating mechanism in the vertical stabilizer. The system is controlled electrically or mechanically. Rate-of-trim using the primary system is approximately one-third degree per second.

B. Electrical control is provided by the control wheel switches. One switch in each control wheel is a motor control switch; the other switch is a brake control switch. Both switches must be moved simultaneously, in the same direction, to move the horizontal stabilizer. Moving the motor control switch on either control wheel energizes the airplane noseup or airplane nose-down contactor. Energizing either of the contactors completes the circuit to the motor section of the primary actuator motor. Moving the brake control switch in the same control wheel energizes the corresponding brake control relay and completes a circuit to release the brake in the actuator motor. Energizing this relay disengages the autopilot trim circuit. The control wheel switches are arranged in the circuit so that when the switches on one control wheel are being operated, operation of the switches on the other control wheel in the opposite direction opens the circuit and stops the movement of the horizontal stabilizer.

C. Mechanical control is provided by the dual handles on the control pedestal. The two-way cable system attached to the inboard handle is routed to a bellcrank and a shaft in the horizontal stabilizer longitudinal trim control system mechanism. A link rod connects the shaft to the manual override control located between the the primary and alternate longitudinal trim contactors. When the inboard handle is moved, the manual override control actuates the contactor and completes the circuit to the motor section of the primary actuator motor. The two-way cable attached to the outboard handle is routed to another bellcrank and shaft located inboard and aft of manual override and shutoff control and linked to the primary longitudinal trim brake switch. Movement of outboard handle actuates this brake switch. Closing the trim brake switch creates a circuit, which bypasses the brake control relays and releases the brake in the primary trimactuator motor. To operate the horizontal stabilizer, both trim control handles must be moved together to the aircraft noseup or nosedown condition, as required. Operation of the split control handles in a trim direction opposite to that selected by operation of the primary trim switches on either aileron control wheel will stop horizontal stabilizer motion. It may also create a reverse trim direction to that selected by the control wheel trim switches. Such trim direction reversal is not a system operational requirement and should be avoided during normal maintenance/operational use of the stabilizer trim system due to potential damage to system components.

D. For the MD-81, MD-82, MD-83 and MD-88 series aircraft, the above described horizontal stabilizer longitudinal trim control system mechanism is located in the forward cargo compartment overhead, right side, forward of forward cargo door. It is accessible through the adjacent compartment ceiling liner panels.

E. For the MD-87 series aircraft, the above described horizontal stabilizer longitudinal trim control system mechanism is located in the center cargo compartment overhead, right side, forward of center cargo door. It is accessible through the adjacent compartment ceiling liner panels.

F. The trim indicating system followup cable is connected mechanically to the manual override and shutoff control to provide shutoff control as the horizontal stabilizer reaches the limit of travel. The followup cable is routed around a drum in the forward lower cargo compartment. A link rod connects the shaft of the drum to the shutoff control. As the stabilizer reaches the limit of travel, the link rod operates the shutoff control on the contactors, breaking the circuit to the primary actuator motor.

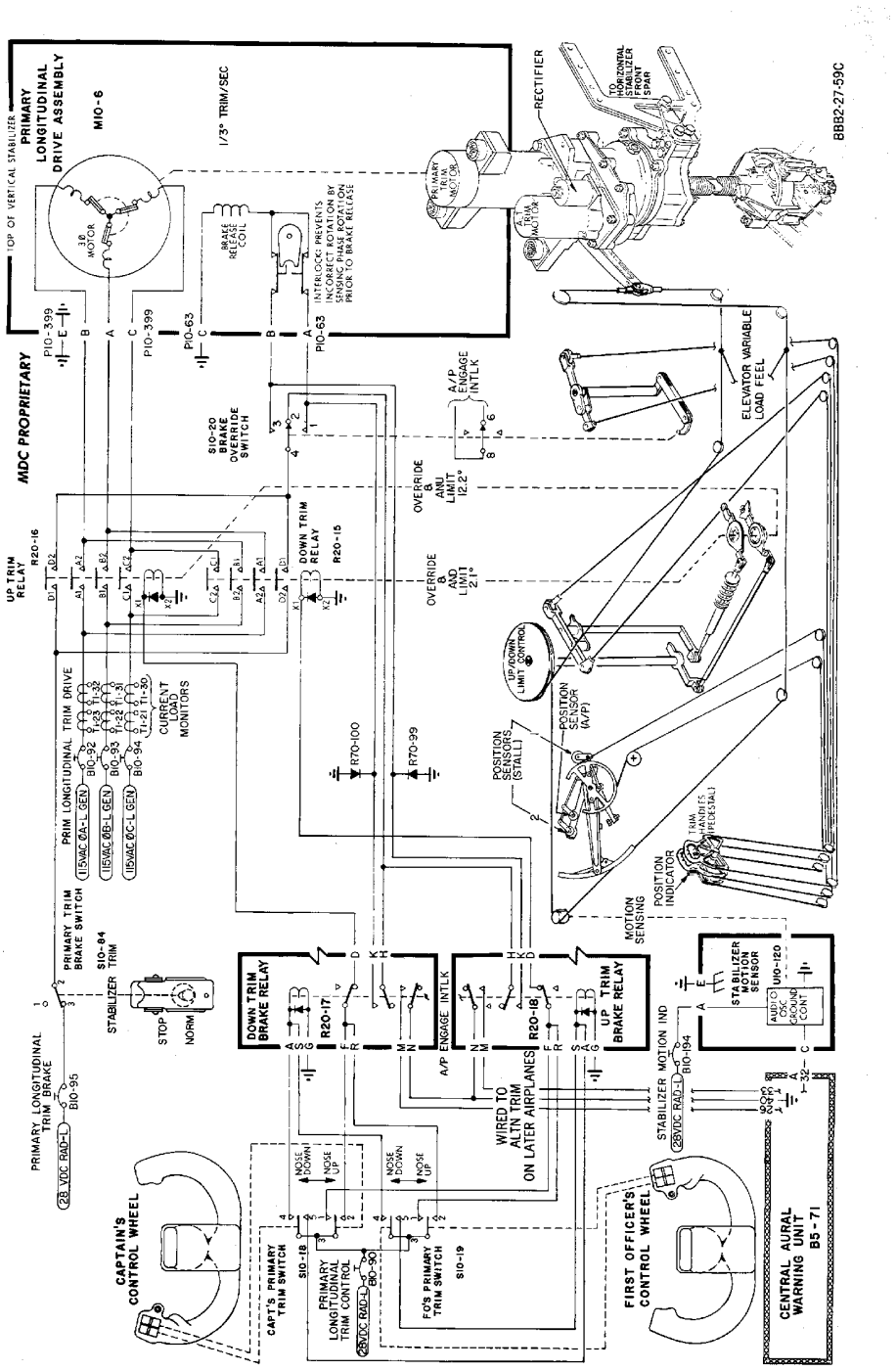
G. The primary trim brake switch provides a means to stop horizontal stabilizer movement if a malfunction occurs in the primary longitudinal trim control system. The primary trim brake switch is a two-position normally closed switch installed in the circuit to the primary longitudinal trim contactors and brake coil in the actuator motor. Movement of the switch to the stop position opens the circuit and interrupts electrical power to the contactors and brake coil, causing the brake to engage and stop movement of the stabilizer.

3. Alternate Longitudinal Trim Control System

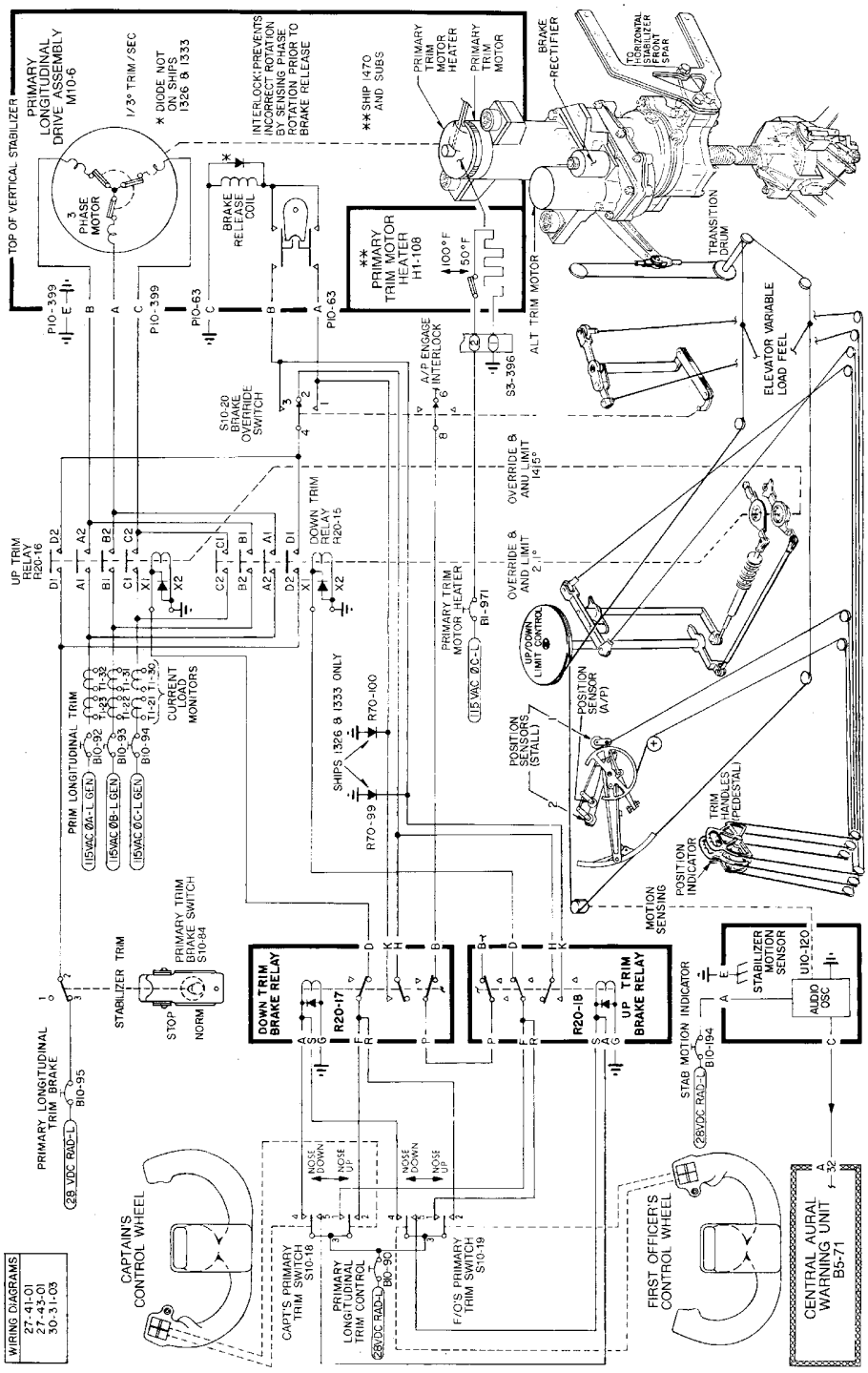
A. The alternate longitudinal trim control system consists of a motor control switch and a brake switch, both connected to levers located on the control pedestal; an alternate longitudinal trim actuator motor mounted on the actuating mechanism in the vertical stabilizer, and two limit switches located at the lower end of the trim indicating system control drum shaft. Rate-of-trim using the alternate longitudinal trim system is approximately 1/10 degree per second.

B. The control switches, when in the normal position, are included in the autopilot trim circuit. No action occurs unless the autopilot trim and brake relays are energized. The motor control switch is a three-position rotary switch with the center position maintained in the autopilot circuit. Moving this switch either way bypasses the autopilot trim relays and completes a circuit through the motor limit switches to the motor section of the alternate longitudinal trim actuator motor. The brake control switch is a two-position switch with the normal position maintained in the autopilot circuit. Moving the brake control switch bypasses the autopilot brake relays and completes a circuit to release the brake in the actuator motor. To move horizontal stabilizer, operate both control handles simultaneously in the same direction to the full noseup or nosedown position.

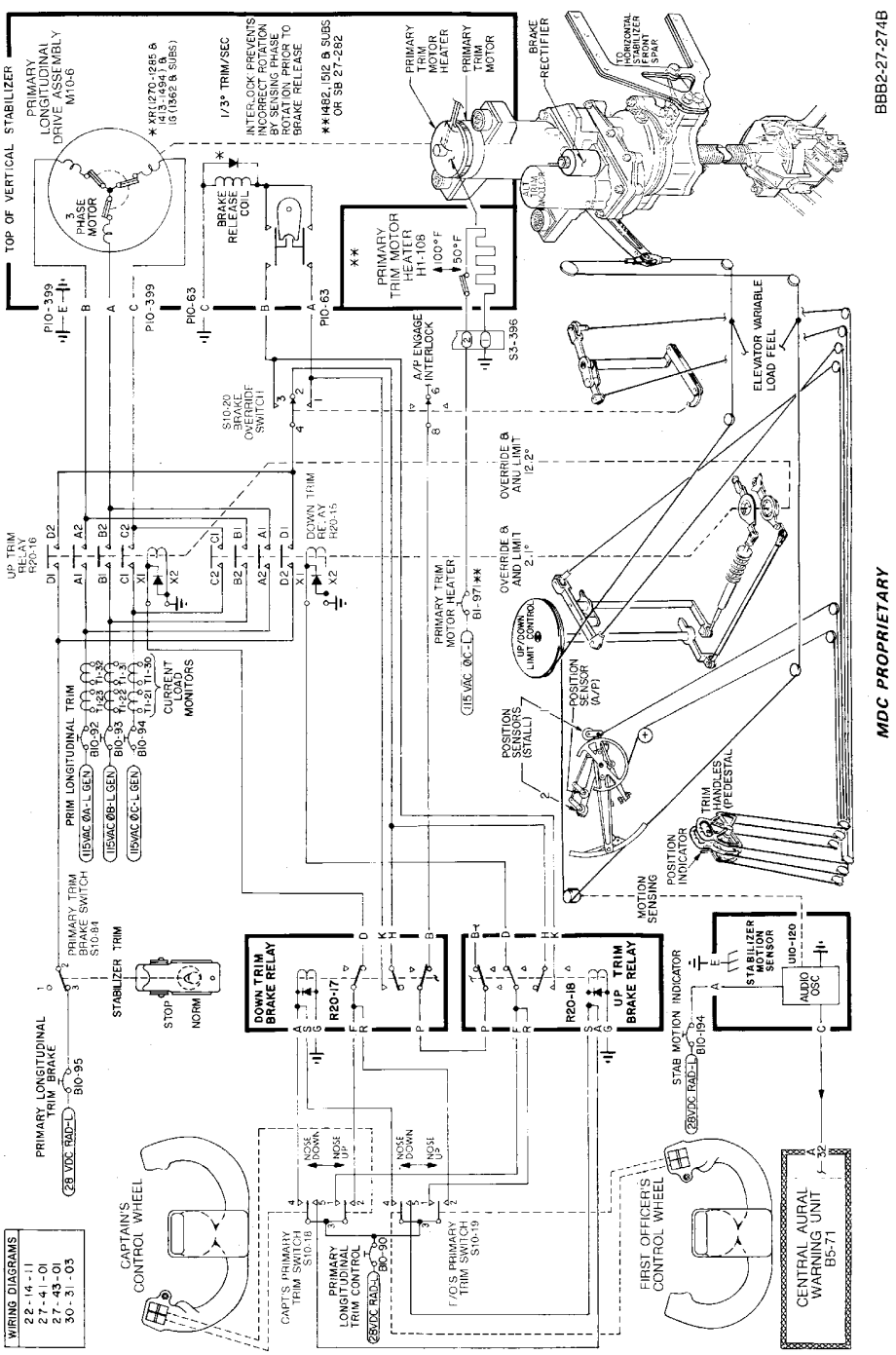
C. The two limit switches provide the shutoff control for the alternate system to prevent overtravel when the horizontal stabilizer reaches the limits of the travel range. As the horizontal stabilizer reaches the limit of travel, the actuator roller on the limit switch is moved by an arm attached to the drum shaft and the circuit to the actuator motor is opened.



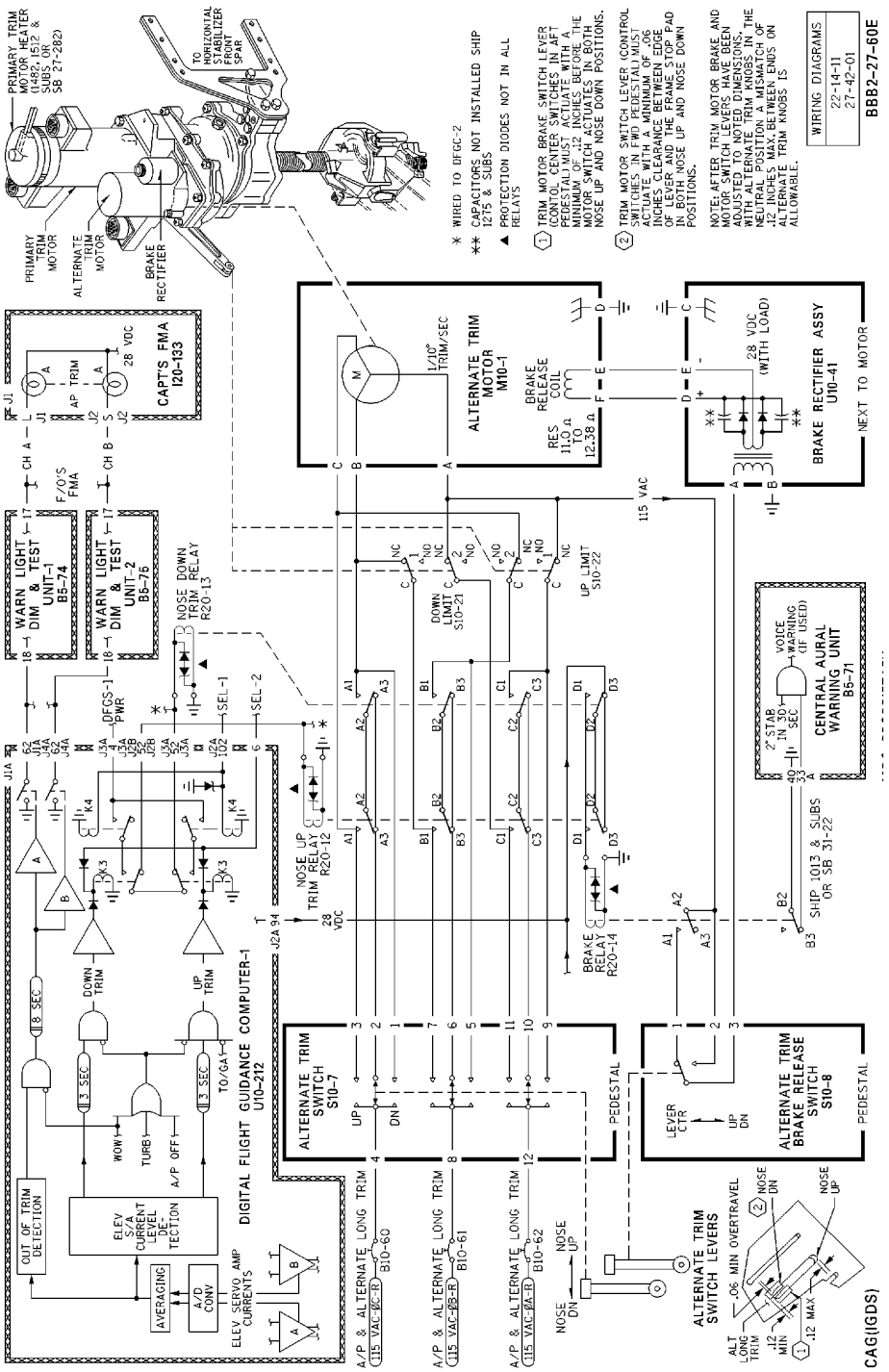
Primary Longitudinal Trim Control -- Schematic
Figure 1/27-40-00-990-801



Primary Longitudinal Trim Control -- Schematic
Figure 2/27-40-00-990-803



Primary Longitudinal Trim Control -- Schematic
Figure 3/27-40-00-990-804



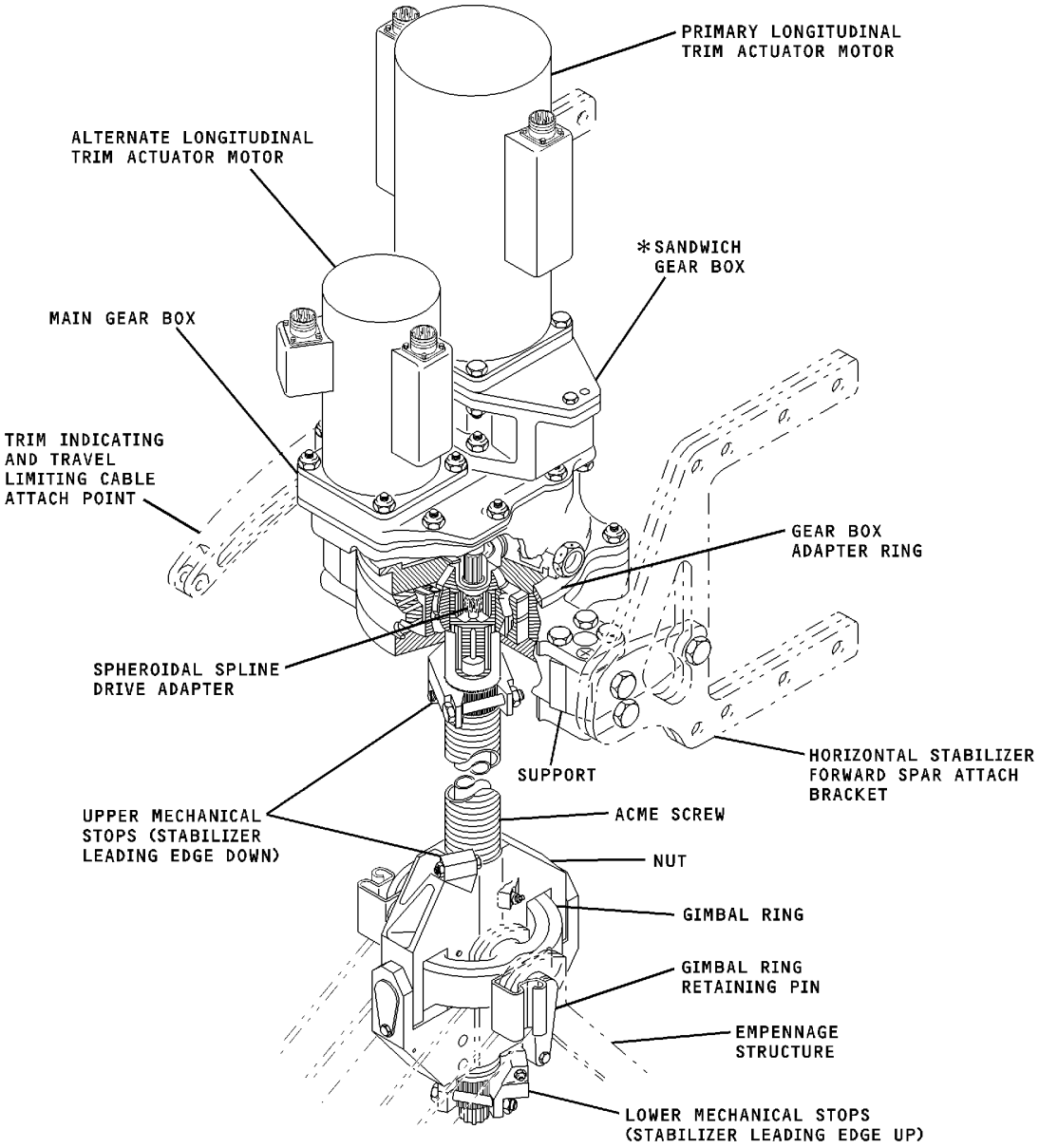
Alternate Longitudinal Trim Control -- Schematic
Figure 4/27-40-00-990-807

4. Longitudinal Trim Actuating Mechanism

A. The longitudinal trim actuating mechanism is located within the vertical stabilizer forward of the horizontal stabilizer front spar. The actuating mechanism consists of an acme screw and nut, main gearbox, sandwich gearbox (Figure 5) (NOTE below), primary longitudinal trim actuator motor, alternate longitudinal trim actuator motor, and support. The main gearbox and the acme screw and nut are common to both the primary and alternate systems. The nut is attached to the empennage structure by a gimbal ring and retaining pins, and the acme screw is installed in the nut and attached to the support which is installed at the stabilizer front spar center section. The main gearbox is a dual planetary gear assembly and is installed on the support directly above the acme screw.

NOTE: Sandwich gearbox is applicable only to aircraft fuselage numbers 2180 and prior, without effects of All Operator Letter 9-2521, dated 12/19/1996. This A.O.L. installs an EEMCO Corp. motor/brake assembly which does not use the sandwich gearbox. Except for customer options specifying otherwise, aircraft fuselage numbers 2181 and subsequent will incorporate modified motor/brake assemblies (P.N. 846D100-3) without the sandwich gearbox.

B. The actuator motors are mounted on the top of the gearbox and connected to the first stage of the gear system. Reduction is obtained through the planetary gear arrangement. The second stage of the gear system is connected to the acme screw by a spheroidal spline drive adapter. When either actuator motor is actuated, the gear system is driven, and the acme screw is rotated within the nut, moving the stabilizer leading edge up or down. Each motor is protected from excessive heating by a thermal cutout unit that interrupts 3-phase electrical power during an overheat condition. The alternate actuator motor thermal unit will open after approximately 60 seconds of over-heating. The primary motor thermal unit will open after 15 to 30 seconds of overheating.



*NOTE: SANDWICH GEARBOX IS APPLICABLE ONLY TO AIRCRAFT FUSELAGE NUMBERS 2180 AND PRIOR, WITHOUT EFFECTS OF ALL OPERATOR LETTER 9-2521, DATED 12/19/1996. THIS A.O.L. INSTALLS AN EEMCO CORP. MOTOR/BRAKE ASSEMBLY WHICH DOES NOT USE THE SANDWICH GEARBOX. EXCEPT FOR CUSTOMER OPTIONS SPECIFYING OTHERWISE, AIRCRAFT FUSELAGE NUMBERS 2181 AND SUBSEQUENT WILL INCORPORATE MODIFIED MOTOR/BRAKE ASSEMBLIES (P.N. 846D100-3) WITHOUT THE SANDWICH GEARBOX.

CAG(IGDS) BBB2-27-61B

Longitudinal Trim Actuating Mechanism
Figure 5/27-40-00-990-809

5. Horizontal Stabilizer Takeoff Warning System

A. The horizontal stabilizer takeoff warning system is a mechanically actuated, electrical system which sounds a warning horn if the throttle is advanced for takeoff when the stabilizer is not in the correct position. The longitudinal trim indicator scale on the control pedestal is marked with a green illuminated band to indicate the range-of-trim allowable for takeoff.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893

B. The system consists of a crank, cam, sector, takeoff warning switch, and portions of the takeoff warning circuit. The takeoff warning switch consists of a microswitch and a lever type actuator. The switch is installed on the end of a crank so that a roller on the end of the switch actuator lever rests against the lower surface of the cam when the stabilizer is within the takeoff range. The position of the switch in relation to the cam is adjusted by a link which connects the lower end of crank to the indicator mechanism, and by raising or lowering the cam.

WJE 886, 887

C. The system consists of a crank, cam, sector, (green band) takeoff warning switch, and portions of the takeoff warning circuit. The takeoff warning switch consists of a microswitch and a lever type actuator. The switch is installed on the end of a crank so that a roller on the end of the switch actuator lever rests against the lower surface of the cam when the stabilizer is within the takeoff range. The position of the switch in relation to the cam is adjusted by a link which connects the lower end of crank to the indicator mechanism, and by raising or lowering the cam.

WJE ALL

D. When the horizontal stabilizer is moved out of the takeoff range, the raised portion of the cam releases the switch actuator lever, closes the switch contacts and completes a portion of the takeoff warning circuit.

(1) On aircraft without SB 31-34, if the aircraft is on the ground, the horizontal stabilizer position indicator is moved out of the green band takeoff range and either throttle lever is advanced more than 2 1/8 inches forward of idle detent on throttle quadrant, the remainder of the circuit is completed and the flight compartment warning horn is sounded.

(2) On aircraft with SB 31-34, if the aircraft is on the ground, the horizontal stabilizer position indicator is moved out of the green band takeoff range and both throttle levers are advanced more than 2 1/8 inches forward of idle detent on throttle quadrant, the remainder of the circuit is completed and the flight compartment warning horn is sounded.

6. Longitudinal Trim Indicating System

A. The longitudinal trim indication system is a mechanical system which shows the position of the horizontal stabilizer. The system consists of the pointer sector on the main shaft in the center control pedestal, the trim indication cable system, the following cable system and the indicator sector, which is located above the ceiling panels of the lower cargo compartment, described as follows for the different model aircraft.

(1) For the MD-81, MD-82, MD-83 and MD-88 series aircraft, the horizontal stabilizer longitudinal trim control system sector and mechanism is located in the forward cargo compartment overhead, right side, forward of the forward cargo door. It is accessible through the adjacent compartment ceiling liner panels.

(2) For the MD-87 series aircraft, the horizontal stabilizer longitudinal trim control system sector and mechanism is located in the center cargo compartment overhead, right side, forward of the center cargo door. It is accessible through the adjacent compartment ceiling liner panels.

(3) The trim indication cable system is routed from the pointer sector to the indicating sector. Position of the horizontal stabilizer leading edge (degree of longitudinal trim) is indicated by the pointer on the center control pedestal.

B. When the longitudinal trim system moves the stabilizer up or down, the crank on the actuating mechanism moves the followup cable, rotating the control drum and the indicator sector. The indicator sector moves the trim indicating system cable, positioning the indicator pointer to show the amount of trim.

7. Horizontal Stabilizer Motion Warning System

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

A. The horizontal stabilizer motion warning system consists of a motion sensing mechanism, located in the forward lower cargo compartment, attached to the trim indicating system followup cable; and electrically to the central aural warning unit, located in the electrical/electronics compartment.

WJE 412, 414

B. The horizontal stabilizer motion warning system consists of a motion sensing mechanism, located in the forward lower cargo compartment, attached to the trim indicating system followup cable; and a dual tone generator, located on the main instrument panel.

WJE ALL

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

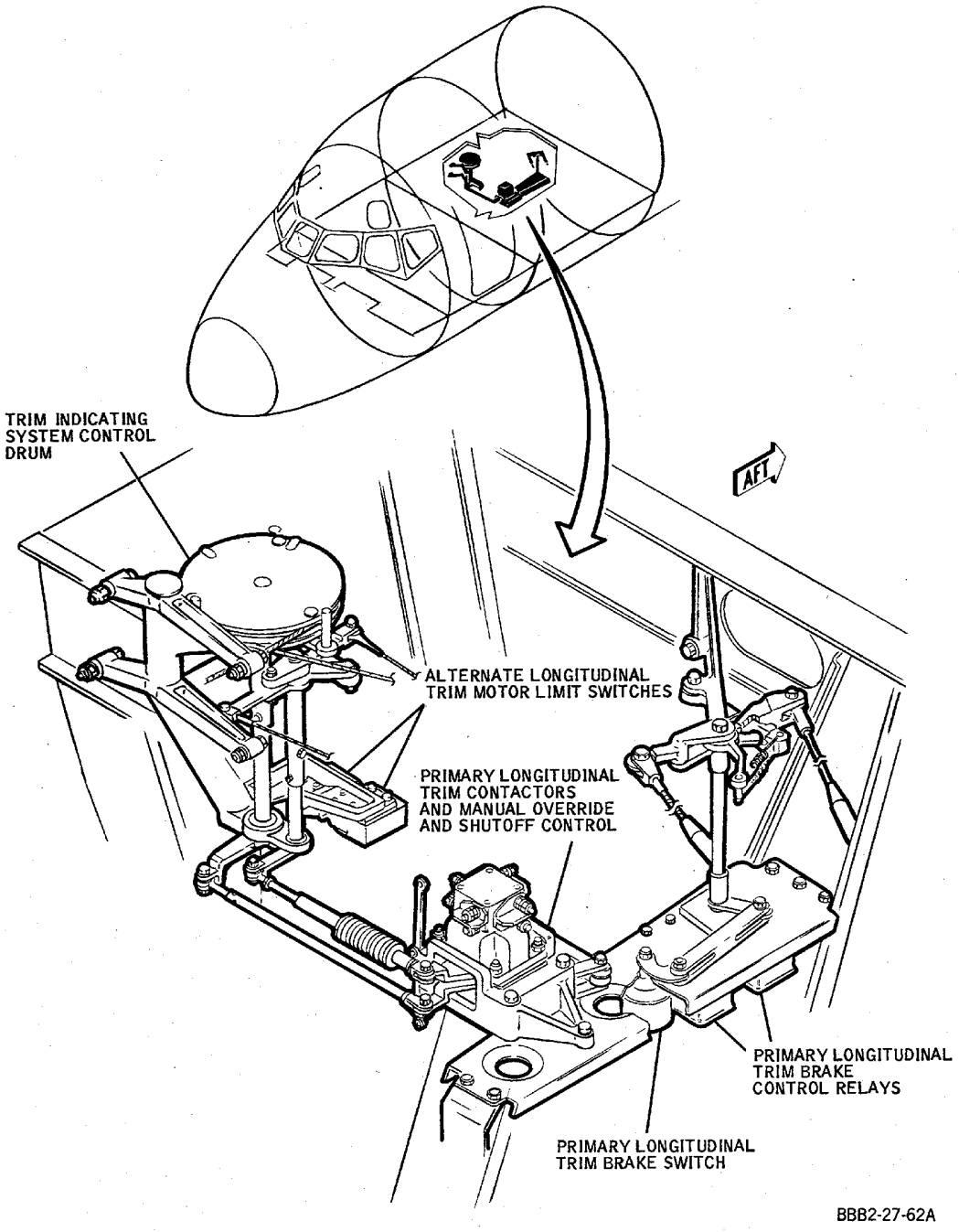
C. The central aural warning unit provides an audible signal when the horizontal stabilizer motion sensor switch is actuated.

WJE 412, 414

The dual tone generator provides an audible signal when the horizontal stabilizer motion sensor switch is actuated. The dual tone generator consists of a speaker and a signal generating circuit in a cover. A perforated plate is installed on the front of the cover as a speaker grille. Power to the generating circuit is furnished from the 28-volt dc power supply through the stabilizer motion sensor.

WJE ALL

D. Movement of the horizontal stabilizer is transmitted mechanically to the motion sensor by the trim indicating system followup cable. When the stabilizer is moving, an audible signal will sound once for approximately each 1/2 degree of travel.



Longitudinal Trim Components -- Forward Lower Cargo Compartment
Figure 6/27-40-00-990-810

8. Primary Longitudinal Trim Contactors and Manual Override and Shutoff Control

A. The primary longitudinal trim contactors and the manual over-ride and shutoff control interconnect the electrical and mechanical control of the primary longitudinal trim control system. The contactors and shutoff control are common to both electrical and mechanical control. The manual override is connected to the mechanical control only to provide a priority over the electrical control. The manual override and shutoff control has two cranks. The upper crank is for the manual override function of the control and is connected mechanically to the inboard primary longitudinal trim control handle on the control pedestal. The lower crank is for the shutoff function of the control and is connected by a link rod to the trim indicating system control drum arm. The aircraft noseup trim con-tactor is located on the top of the control and the aircraft nosedown trim contactor is located on the bottom of the control.

B. Actuating the longitudinal trim switch to the aircraft noseup trim or aircraft nosedown trim position energizes the coil to the corresponding trim contactor. The normally open contacts of the trim contactor are closed and the circuit to the primary trim actuating motor are completed to drive the actuating mechanism and move the horizontal stabilizer. Releasing the control switches deenergizes the contactor coil and opens the circuit to the actuator motor to stop horizontal stabilizer movement, when the desired amount of trim is attained. Movement of the primary longitudinal trim control handle to the aircraft noseup trim or aircraft nosedown trim position is transmitted mechanically to the upper crank of the manual over-ride control. Moving the crank rotates the trim contactor shaft to close the normally open contacts in the corresponding contactor, completes the circuit to the actuator motor to drive the actuating mechanism and moves the horizontal stabilizer. Releasing the primary trim control handle allows it to return to neutral. This movement is transmitted to the crank which rotates the shaft to open the contacts and to break the circuit to the actuator motor to stop horizontal stabilizer movement.

C. When the horizontal stabilizer reaches the limit of its travel range (Paragraph 8.D.) and (Paragraph 8.E.) for aircraft model series differences) by operation of the primary system through the electrical or mechanical controls, the link rod attached to the trim indicating system control drum shaft moves the lower crank on the manual override shutoff control. Moving the crank rotates the contactor shaft to open the contacts and to open the circuit to the actuator motor.

D. For the MD-81, MD-82, MD-83 and MD-88 series aircraft, the range of motion for the stabilizer is 12.2 degrees leading edge down to 2.1 degrees leading edge up.

E. For the MD-87 series aircraft, the range of motion for the stabilizer is 14.5 degrees leading edge down to 2.1 degrees leading edge up.

9. Primary Longitudinal Trim Brake Switch

A. The primary longitudinal trim brake switch is a two-pole, three-position rotary switch. The switch is actuated by the outboard primary longitudinal trim control handle through a two-way cable system and mechanical linkage.

B. When the primary longitudinal trim control handle is in the neutral position the brake control switch is in the normal position and is included in the circuit from the brake control relays to the brake coil in the primary longitudinal trim actuator motor. Moving the control handle to the airplane noseup trim or airplane nosedown trim position mechanically moves the arm on the brake switch. Moving the switch either direction from normal position bypasses the circuit to the brake control relays, and a direct circuit is completed to the brake coil in the primary longitudinal trim actuating motor. The brake switch returns to normal position when the control handle is released.

HORIZONTAL STABILIZER - TROUBLE SHOOTING

1. General

A. Trouble shooting the horizontal stabilizer is accomplished initially by determining whether the trouble exists in the primary system, in the alternate system, in the primary and alternate systems, or in the trim indicating system.

B. If trouble shooting a system indicates that adjustment or replacement of components is required, or that cable tensions require adjustment, that segment of the system containing the components or cable must be completely adjusted. (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501)

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 101

Name and Number	Manufacturer
Multimeter (Model 260)	Simpson
Tensiometer	Pacific Scientific Co.

3. Trouble Shooting

A. Use the following table to trouble shooting the horizontal stabilizer.

Table 102

Possible Causes		Isolation Procedure	Correction
(1)	PRIMARY SYSTEM IS INOPERATIVE (ALTERNATE SYSTEM NORMAL)		
(a)	Circuit breakers open	Check position of circuit breakers.	Close circuit breakers unless breakers are known to have tripped due to circuit fault. If circuit is known to be faulty, leave breakers open and proceed to step (c).
1)	Primary actuator motor overheated		Allow motor to cool approximately 30 minutes to allow thermal cutout unit to reset.

Table 102 (Continued)

(b)	Primary actuator motor/brake malfunction	Gain access to primary longitudinal trim contractors and manual override and shutoff control. (PRIMARY LONGITUDINAL TRIM CONTACTORS AND MANUAL OVERRIDE AND SHUTOFF CONTROL - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-04/401)	Check for 115 VAC on relay R20-15 at contacts A1, B1, and C1. Check for 28 VDC at X1 and D1. Check for 28 VDC at S10-20 on contact 1.
		Close primary longitudinal trim (3) circuit breakers located on left generator bus panel and primary longitudinal trim control circuit breaker located on left radio DC bus panel (Ref. Wiring Diagram Manual 27-40-01). Hold primary longitudinal trim control wheel switches in the nose down position.	If power is available, proceed to step (b) 1). If power is not available, proceed to step (c).
NOTE: Make certain that the brake override switch (S10-20) is operating properly before considering the removal of the primary trim motor. Brake override switch has been found to cause many of the primary trim motor inoperative occurrences.			
1)	Primary actuator motor/brake malfunction	Hold primary longitudinal trim control wheel switches in the nose up position.	Check for 115 VAC on relay R20-16 at contacts A2, B2, and C2. Check for 28 VDC at X1 and D2. Check for 28 VDC at S10-20 on contact 3.
			If power is available, proceed to step (b) 2). If power is not available, proceed to step (c).
2)	Alternate actuator motor (brake section) trim circuit breakers. malfunction	Close autopilot and alternate longitudinal Move left alternate longitudinal trim control switch lever. If stabilizer moves, a defective brake is indicated.	Replace defective actuator motor. (LONGITUDINAL TRIM ACTUATOR MECHANISM - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-01/401)
			If brake section operates properly, proceed to step (c).
NOTE: Both the primary and alternate trim units output to a differential gearbox. This requires the uncommanded trim units brake to hold, thus allowing the commanded unit to drive the stabilizer jackscrew. Should the uncommanded units brake slip or be released, the commanded unit will only back drive the uncommanded, resulting in no surface movement.			
NOTE: If power is available as described in step (b), step (b) 1) and step (b) 2) is correct, replace actuator motor.			
(c)	Electrical circuit faulty (wiring or components).	Open primary longitudinal trim circuit breakers. Use test leads as required.	Repair system wiring or replace faulty components as required.
		Check wiring and components for open circuits, wire to wire, and wire to ground short circuits. (Ref. Wiring Diagram Manual)	
		Restore system to normal.	

Table 102 (Continued)

(2)	ALTERNATE SYSTEM INOPERATIVE (PRIMARY SYSTEM NORMAL)		
(a)	Circuit breakers open	Check position of circuit breakers.	Close circuit breakers unless breakers are known to have tripped due to circuit fault. If circuit is known to be faulty, leave breakers open and proceed to step (e).
1)	Alternate actuator motor overheated		Allow motor to cool approximately 60 seconds to allow thermal cutout unit to reset.
(b)	Alternate actuator motor (brake rectifier malfunction)	Open the primary longitudinal trim circuit breakers located on left radio bus panel and the autopilot and alternate longitudinal trim circuit able, proceed to breakers on right radio bus panel.	If power is available, proceed to step (b) 1). If power is not avail step (e).
		Disconnect electrical connector at rectifier box.	
		Close autopilot and alternate longitudinal trim circuit breakers.	
		Hold left alternate longitudinal trim control switch lever in noseup or nosedown position.	
		Use multimeter to check for 115-volt ac power between each of three rectifier power pins and ground pin (Ref. Wiring Diagram Manual).	
1)	Primary actuator motor (brake section) malfunction	Move inboard trim control handle. If stabilizer moves, faulty brake is indicated.	Replace defective actuator motor. (LONGITUDINAL TRIM ACTUATOR MECHANISM - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-01/401) If brake section operates properly, proceed to step (c).
(c)	Alternate actuator motor (motor section) malfunction	Hold right control lever in noseup or nosedown position. Use multimeter to check for 115-volt ac power between each of three motor power pins and ground pin. (Ref. Wiring Diagram Manual)	If power is available at this point, and in step (b), replace actuator motor. (LONGITUDINAL TRIM ACTUATOR MECHANISM - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-01/401) If power is not avail able, proceed to step (e).
(d)	Motor limit switch out of adjustment	Open autopilot and alternate longitudinal trim circuit breakers. Check limit switch actuators for improper adjustment.	Adjust limit switch. HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501

Table 102 (Continued)

(e)	Electrical circuit faulty (wiring or components)	Use test leads as required. Check wiring and components for open circuits, wire to wire, or wire to ground short circuits. (Ref. Wiring Diagram Manual) Remove test equipment and restore system to normal.	Repair wiring or replace components as required.
(f)	Motor brake coil resistance faulty	Check motor brake coil resistance is 10 to 12.38 ohm between pins (E) and (F). If resis tance exceeds tolorance, faulty brake is indicated.	Replace defective actuator motor.
(3)	PRIMARY AND ALTERNATE SYSTEMS ARE INOPERATIVE		
(a)	Circuit breakers open	Check position of circuit breakers.	Close circuit breakers unless breakers are known to have tripped due to circuit fault.
(b)	Acme screw malfunction	Check acme screw for grit or other foreign matter, damaged threads, or for improper adjust- ment of stops.	Clean acme screw, or replace acme screw (LONGITUDINAL TRIM ACTUATOR MECHANISM - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-01/401) or adjust stops. (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501)
(c)	Longitudinal trim gearbox malfunction	If acme screw was found to be normal in step (b) and either actuator motor is operating satisfactorily, gearbox malfunc tion is indicated.	Replace gearbox.
		Restore system to normal.	
(4)	PRIMARY SYSTEM CONTROL HANDLES ARE INOPERATIVE (CONTROL WHEEL SWITCHES NORMAL)		
(a)	Brake switch linkage out of adjustment	Check brake switch linkage for improper adjustment.	Adjust brake switch control. (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501)
(b)	Manual override control linkage out of adjustment	Check manual override control linkage for improper adjustment.	Adjust manual override control. (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501)

Table 102 (Continued)

(c)	Brake switch malfunction	Open the primary longitudinal trim circuit breakers located on left radio bus panel and the autopilot and alternate longitudinal trim circuit breakers on right radio bus panel. Disconnect electrical connector from primary actuator motor. Close primary longitudinal trim circuit breakers. Hold control handle in noseup then nosedown position. Use multimeter to check for 28-volt dc power between brake power pin and ground pin. (Ref. Wiring Diagram Manual) Restore system to normal.	If power is not available, replace brake switch. (PRIMARY LONGITUDINAL TRIM BRAKE SWITCH - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-07/401)
(5)	PRIMARY SYSTEM IS IRREGULAR (OVERSHOOT CONDITION)		
(a)	Manual override and shutoff control malfunction	Check shutoff control for tardy operation.	If tardy operation is noted, proceed to step (b). If operation is normal, proceed to step (c).
(b)	Trim indicating and followup system out of adjustment	Check cables and linkage to shutoff control for improper adjustment.	Adjust trim indicating and shutoff control. (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501)Ref.
(c)	Actuator motor (brake) malfunction	Move inboard trim control handle. If stabilizer moves, faulty brake is indicated.	Replace defective actuator motor. (LONGITUDINAL TRIM ACTUATOR MECHANISM - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-01/401)
(d)	Acme screw stops	After overshoot condition, check acme screw stops for improper adjustment or damage.	Adjust stops (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501) or replace acme screw. (LONGITUDINAL TRIM ACTUATOR MECHANISM - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-01/401)
(6)	ALTERNATE SYSTEM IS IRREGULAR (OVERSHOOT CONDITION)		

Table 102 (Continued)

(a)	Limit switch malfunction	Check limit switch for tardy operation. Open the primary longitudinal trim circuit breakers located on left radio bus panel and the autopilot and alternate longitudinal trim circuit breakers on right radio bus panel. Connect ohmmeter to limit switch terminals, actuate switch by pressing actuator lever on switch and check for continuity.	If tardy operation is noted, proceed to step (b). If continuity is indicated, replace limit switch. (ALTERNATE LONGITUDINAL TRIM CONTROL SWITCHES - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-09/401)
(b)	Trim indicating followup system out of adjustment	Check cables, control drum and linkage to limit switches for improper adjustment.	Adjust trim indicating system. (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501)
(c)	Actuator motor (brake) malfunction	Close autopilot and alternate longitudinal trim circuit breakers. Move left alternate longitudinal trim control switch lever. If stabilizer moves, a defective brake is indicated.	Replace defective actuator motor. (LONGITUDINAL TRIM ACTUATOR MECHANISM - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-01/401)
(d)	(4) Acme screw stops	After overshoot condition, check acme screw stops for improper adjustment or damage. Remove test equipment and restore system to normal.	Adjust stops. (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501) or replace acme screw. (LONGITUDINAL TRIM ACTUATOR MECHANISM - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-01/401)
(7)	PRIMARY OR ALTERNATE SYSTEM IS IRREGULAR (UNDERTRAVEL CONDITION)		
(a)	Manual override and shutoff control malfunction	Check shutoff control for premature operation.	If premature operation is noted, proceed to step (b). If operation is normal, proceed to step (c).
(b)	Trim indicating system out of adjustment	Check cables and link- age to shutoff control for improper adjustment.	Adjust trim indicating system. (HORIZONTAL STABILIZER POSITION INDICATOR MODULE - MAINTENANCE PRACTICES, PAGEBLOCK 27-40-12/201)
(c)	Acme screw stops out of adjustment	Check acme screw stops for obstruction or improper adjustment.	Remove obstruction or adjust stops. (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501)
(8)	TRIM INDICATING SYSTEM POINTER SHOWS INCORRECT READING		

Table 102 (Continued)

(a)	Improper adjustment of cables.	Actuate horizontal stabilizer by degrees and use protractor to check position of stabilizer in relation to pointer. If reading is lagging, check for cables with in sufficient tension.	Adjust cables. (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501)
(9)	TRIM INDICATING SYSTEM POINTER BINDS		
NOTE: There may be a momentary hesitation in stabilizer position indicator motion when indicator is between one and two degrees airplane noseup, and when indicator is between one and two degrees airplane nosedown. This condition is acceptable.			
(a)	Loose cable fittings or obstruction	Check for disconnected cable end fittings, cables out of pulley grooves or obstruction.	Remove obstruction, install cables properly, or adjust cables if required. (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501)
(b)	Improper adjustment	Check cables and components for improper adjustment.	Adjust as required.

HORIZONTAL STABILIZER - ADJUSTMENT/TEST

1. General

A. If only part of the longitudinal trim control system or trim indicating and follow-up system has been disturbed, perform applicable procedures described in following paragraphs. A test of that segment of the system must be performed after adjustment is completed.

B. When moving the horizontal stabilizer with either primary trim control handles or alternate trim control levers, operate both primary handles or both alternate levers simultaneously in the same direction to noseup or nosedown position. This procedure insures proper synchronization of brake switch and motor contactor operation.

WARNING: THE SAFETY BELT LUG DOES NOT MEET CURRENT FALL PROTECTION REQUIREMENTS. DO NOT USE THE SAFETY BELT LUG FOR FALL PROTECTION. OTHER METHODS MUST BE USED TO ENSURE ADEQUATE FALL PROTECTION.

C. A safety belt attachment lug is located on top of vertical stabilizer for use by personnel performing maintenance in area of stabilizer actuator mechanism.

D. Location and access to components of the trim control and indicating system is as follows:

Table 501

Component	Location	Access
Indicating system sector	Forward section, right side, forward lower cargo compartment above ceiling liner	Remove forward section right side ceiling liner.
Indicating system control drum; alternate longitudinal trim motor loading door, behind limit switches; manual override shutoff control; and primary longitudinal trim brake switch	Right side, forward lower cargo compartment, forward of cargo side liner	Remove side liner, forward of cargo loading door.
Horizontal stabilizer position sensors (stall warning DFGC)	Forward section, right side, forward cargo compartment above ceiling liner	Remove forward section right side ceiling liner.
Horizontal stabilizer takeoff warning switch	Pilot's control pedestal left side	Remove access panel left side control pedestal.
Longitudinal trim actuating mechanism	Top of vertical stabilizer	Remove horizontal stabilizer fairing and access doors.

E. Horizontal stabilizer is in neutral position when centers of two protruding rivets on left side of horizontal stabilizer are aligned with protruding rivet on vertical stabilizer ±1/8 inch, (±3.18 mm). Rivets are identified by circle and crossline target.

F. Numbers and letters enclosed by the hexagon-shaped symbols shown in the adjustment diagrams correspond to cable run numbers and segments listed at the end of this section. Each cable run number is posted adjacent to the corresponding cable in the aircraft.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE). DO NOT ALLOW TRIM ACTUATOR STOPS TO CONTACT. REPEATED CONTACT OF STOPS CAN CAUSE DAMAGE TO STOPS, GEARBOXES, AND ACTUATOR MOTOR.

G. Numbers in parentheses in the following text correspond to callouts in Figure 501.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed item:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 502

Name and Number	Manufacturer
Tensiometer	Pacific Scientific Co.
Rig pin (4-3) 1/4 by 3 5/8 (6.35 x 92.08 mm)	Douglas Aircraft Co.
Tensioner Control Cable (1/16 to 3/8) inch (1.59 to 9.53 mm) (5954644-1, -503, -505)	Douglas Aircraft Co.
Rig pin (6-5) 3/8 by 5 5/8 (9.53 X 142.88 mm)	
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch), (15.88 mm).	
Lockwire, NASM20995N20, DPM 684*[1]	Not Specified
Elevator servoactuator tester	Local fabrication Figure 504)
Fixture - rigging elevator force limiter (5961707)	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Adjust/Test Horizontal Stabilizer

NOTE: Elevator and control tab controls and flap bus to elevator servo force limiter must be properly adjusted, (PAGEBLOCK 27-30-00/501), prior to adjusting horizontal stabilizer trim indicating system and shutoff controls.

A. Adjust Trim Indicating System and Shutoff Controls (Figure 501)

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE). DO NOT ALLOW TRIM ACTUATOR STOPS TO CONTACT. REPEATED CONTACT OF STOPS CAN CAUSE DAMAGE TO STOPS, GEARBOXES, AND ACTUATOR MOTOR.

(1) Using both alternate trim control levers, on control pedestal, move stabilizer to neutral position so that reference rivets on vertical and horizontal stabilizers are aligned within 1/8 inch, (3.18 mm). (BG) dimension should be 3 1/64 (±3/64) inches, (77.47 (±1.19) mm). (Figure 501, View C-C)

NOTE: Verify primary trim brake switch, (Stabilizer trim) located aft. left side of pedestal, is in NORM position before performing the following procedures.

(2) Make certain flaps/slats are in UP/RET position.

(3) Clamp stopbolt (BD) against stop (BE). Make certain that stopbolt BD gap is adjusted correctly. (Figure 502, Sheet 1, View A)

(4) Adjust turnbuckles (E), (G), (H), (L), and (M) until tension is between minimum and maximum load per cable tension table for 3/32 inch (2.38 mm) cables 129A, B, C, D, E, F, and 130A, B, F, while maintaining 0.80 inch (20.32 mm) gap between stopbolt (BB) and stop (BC). (Figure 503, Sheet 1)

NOTE: Access to turnbuckle (E) is through forward cargo compartment side panel 5128C, turnbuckle (G) is through ceiling panel 5154C, turnbuckle (H) is through ceiling panel 5150C, and turnbuckles (L) and (M) is through ceiling panel 5910A, located aft of aft pressure bulkhead.

NOTE: Subsequent adjustments in Paragraph 3.D.(2) may affect final tension of cable runs 129 and 130. It is not necessary to readjust cable runs 129 and 130.

(5) Adjust turnbuckles (A) and (N) until tension is between minimum and maximum load per cable tension table for 1/16 inch (1.59 mm) cables (131A, B and 132A, B). (Figure 503, Sheet 2)

(6) Differentially adjust turnbuckles (A) and (N) until indicator (B) on control pedestal points to 0 (±1/8) degree.

NOTE: Access to turnbuckle (A) is through forward cargo compartment ceiling panel 5151C. Access to turnbuckle (N) is in electrical and electronics compartment between stairwell and aft bulkhead.

(7) With servoactuator in relaxed (autopilot disengaged) position, measure and note dimension (AV).

NOTE: Dimension (AV) is measured from station Y237 to lower inboard mounting surface of servoactuator.

(8) If using weights to test elevator servoactuator, perform the following:

(a) Securely attach elevator servoactuator tester to underside of aft floor beam webs between fuselage stations 218 and 237 as shown in Figure 504. Attach tester cable hook to servoactuator and route cable over tester pulley. Check tester for proper alignment and freedom of operation.

(b) Place 22 pound weight (9.9 kg) on tester cable. Dimension (AV) should move no more than 3/8 inch (9.53 mm) from dimension noted in Paragraph 3.A.(7). Apply 24 pound weight (10.8 kg) (2 pounds (0.9 kg) additional), servoactuator should move through its whole travel (approximately 5 inches), (127.0 mm).

(c) If requirements of Paragraph 3.A.(8)(b) cannot be met, remove weight and adjust stopbolt (BD) until requirements of Paragraph 3.A.(8)(b) can be met when weight is applied. Remove weight.

(9) If using rigging fixture with force gauge (Figure 505) to test elevator servoactuator, perform following:

(a) Remove eyebolt (AW) from arm (BK) and attach rigging tool to aft side of servoactuator. Install rigging tool bolt through hole for eyebolt (AW).

(b) Position force gauge against free end of rigging tool and apply force of 6 2/3 (+1/3, -0) pounds (3.1 (+0.15, -0) kg) against end of rigging tool in direction of servo-actuator travel. Dimension (AV) should not move more than 3/8 inch (9.53 mm) from recorded dimension.

(c) Increase force to 8 pounds (3.6 kg) maximum, servo-actuator should move through full travel, (approximately 5 inches (127 mm)).

(d) If requirements of Paragraph 3.A.(9)(b) and Paragraph 3.A.(9)(c) cannot be met, adjust stopbolt (BD) until requirements of Paragraph 3.A.(9)(b) and Paragraph 3.A.(9)(c) can be met.

(e) Install eyebolt (AW).

(10) Adjust stopbolt (BB) to obtain dimension of 0.80 inch, (20.32 mm) between stopbolt (BB) and stop (BC).

(11) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(12) Remove clamp from stopbolt (BD).

(13) Using control wheel trim switches, move horizontal stabilizer to 8 (±1/4) degrees aircraft noseup position (dimension (BG) should be 9 7/16 (±9/64) inches, (239.71 (±3.57) mm). (Figure 501, View C-C)

(14) With servoactuator in relaxed position, measure and record dimension (AV).

(15) If using weights to test elevator servoactuator, perform following:

(a) Place 25 pound weight (11.25 kg) on tester cable. Dimension (AV) should move no more than 3/8 inch (9.52 mm) from dimension recorded in step (15). Apply 30 pound weight (13.50 kg) (5 pounds (2.25 kg) additional), servoactuator should move through its whole travel (approximately 5 inches), (127 mm).

(16) If using rigging tool with force gauge to test elevator servoactuator, perform following: (Figure 505)

(a) Remove eyebolt (AW) from arm (BK) and attach rigging tool to aft side of servoactuator. Install rigging tool bolt through hole for eyebolt (AW).

(b) Position force gauge against free end of rigging tool and apply force of 8 1/3 (+1/3, -0) pounds (3.75 (+0.15, -0) kg) against end of rigging tool in direction of servo-actuator travel. Dimension (AV) should not move more than 3/8 inch (9.53 mm) from recorded dimension.

(c) Increase force to 10 pounds (4.5 kg) maximum, servo-actuator should move through full travel, (approximately 5 inches (127 mm)).

(d) Install eyebolt (AW).

(17) If requirements of Paragraph 3.A.(15) cannot be met, remove weight and differentially adjust turnbuckles (E) and (G) until requirements of Paragraph 3.A.(15) can be met when weight is applied. Remove weight.

NOTE: Differential adjustment of turnbuckles (E) and (G) per Paragraph 3.A.(17) will require differential adjustment of turnbuckles (A) and (N) per Paragraph 3.A.(5) and Paragraph 3.A.(6) when horizontal stabilizer is at 0° degrees (0 rad) and (BG) dimension should be 3 1/64(±3/64) inches, (77.47(±1.19) mm).

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE). DO NOT ALLOW TRIM ACTUATOR STOPS TO CONTACT. REPEATED CONTACT OF STOPS CAN CAUSE DAMAGE TO STOPS, GEARBOXES, AND ACTUATOR MOTOR.

(18) Using trim switches move horizontal stabilizer to neutral position so that rivets on vertical and horizontal stabilizers are aligned ±1/8 inch, (3.17 mm). (BG) dimension should be 3 1/64 (±3/64) inches, (77.47 (±1.19) mm).

(19) Remove elevator servoactuator tester and cable from aircraft.

(20) Using control wheel trim switches, move stabilizer to aircraft nosedown direction until pedestal trim indicator reads 1.7 degrees (0.03 rad).

(21) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B

(Continued)

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(22) Adjust length of stopbolt (AF) until top of bolthead projects 9/16 (±1/32) inch (14.28 (±.79) mm) from face of arm (AD). (Figure 502, Sheet 2, View F-F)

(23) Differentially adjust turnbuckles (E) and (H) to position arm (AE) 0.005 to 0.015 inch (0.13 to 0.38 mm) from stopbolt (AF).

(24) Initially adjust position of alternate longitudinal trim motor limit switch (AG) until gap (AT) is 0.000 to 0.030 inch (0.000 to 0.76 mm) and gap (AU) is 0.000 to 0.015 inch (0.000 to 0.38 mm) between arm rollers and actuating ramp of cam on arm (AD) as follows: (Figure 502, Sheet 2, View H)

(a) Loosen switch plate support screws.

(b) Position serrated plates as required.

(c) Tighten support screws.

(25) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(26) Move control wheel trim switches to aircraft noseup position. Hold until stabilizer is in approximately neutral 0 degree position indicated.

CAUTION: OBSERVE ARM OF SECTOR IN FWD CARGO COMPARTMENT TO ENSURE IT DOES NOT CONTACT HORIZONTAL STABILIZER POSITION SENSORS DURING INITIAL CHECK OF SHUTOFF FUNCTION IN STABILIZER LEADING EDGE UP. SENSOR MAY BE DAMAGED, IF CONTACTED.

(27) Using control wheel trim switches, move stabilizer to aircraft nosedown direction until shutoff functions. Horizontal stabilizer should be at 2.1 degrees (0.037 rad). Dimension (BG) should be 1 5/16 (±9/64) inches, (33.33 (±3.57) mm). (Figure 501)

(28) If requirement of Paragraph 3.A.(27) is not met, adjust stopbolt (AF) as required to meet these limits. Repeat Paragraph 3.A.(26) and Paragraph 3.A.(27). (Figure 502 (Sheet 2))

(29) Using control wheel trim switches, move stabilizer to approximately neutral 0 degree position indicated.

(30) Using primary trim control handles (C) and (D), move stabilizer to aircraft nosedown direction until shutoff functions. Horizontal stabilizer should be at 2.1 degrees (0.037 rad). Dimension (BG) should be 1 5/16 (±9/64) inches, (33.33 (±3.57) mm).

NOTE: Horizontal stabilizer may shut off slightly later when using handles (C) and (D) versus pilot's control wheel trim switches.

(31) If requirement of Paragraph 3.A.(29) is not met, adjust stopbolt (AF) as required to meet these limits. Repeat Paragraph 3.A.(28) and Paragraph 3.A.(29). (Figure 502, Sheet 2)

(32) Using control wheel trim switches, move stabilizer to approximately neutral 0 degree position indicated.

(33) Move alternate trim control levers (W) to aircraft nosedown position. Hold until shutoff functions. Horizontal stabilizer should be at 2.1 degrees (0.037 rad). Dimension (BG) should be 1 5/16 (±9/64 inches, (33.33 (±3.57) mm) AND.

(34) If requirement of Paragraph 3.A.(33) is not met, adjust position of alternate longitudinal trim limit switch (AG) as required to meet these limits. Repeat Paragraph 3.A.(32) and Paragraph 3.A.(33).

(35) Using control wheel trim switches, move horizontal stabilizer to 11.7 degrees (0.204 rad) aircraft noseup position indicated.

(36) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(37) Adjust length of stopbolt (AB) until gap between bolthead and arm (AE) is from 0.005 to 0.015 inch, (0.13 to 0.38 mm).

(38) Initially adjust position of alternate longitudinal trim motor limit switch (AC) until gap (AT) between arm roller and actuating cam on arm (AD) is 0.000 to 0.030 inch (0.000 to 0.76 mm) as follows:

(a) Loosen switch plate support screws.

(b) Position serrated plates as required.

(c) Tighten support plates.

(39) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(40) Using control wheel trim switches, move stabilizer to approximately 10 degrees aircraft noseup position indicated.

(41) Using control wheel trim switches, move stabilizer to aircraft noseup direction until shutoff functions. Horizontal stabilizer should be at 12.2 degrees (0.213 rad) ANU. Dimension (BG) should be 12 13/16 (±5/32) inches, (325.44 (±3.97) mm).

(42) If requirement of Paragraph 3.A.(41) is not met, adjust stopbolt (AB) as required to meet these limits. Repeat Paragraph 3.A.(40) and Paragraph 3.A.(41)

(43) Using control wheel trim switches, move stabilizer to approximately 10 degrees aircraft noseup position indicated.

(44) Using primary trim control handles (C) and (D), move stabilizer to aircraft noseup direction until shutoff functions. Horizontal stabilizer should be at 12.2 degrees (0.213 rad) ANU. Dimension (BG) should be 12 13/16 (±5/32) inches, (325.44 (±3.97) mm).

NOTE: Horizontal stabilizer may shut off slightly later when using handles (C) and (D) versus pilot's control wheel trim switches.

(45) If requirement of Paragraph 3.A.(44) is not met, adjust stopbolt (AB) as required to meet these limits. Repeat Paragraph 3.A.(48) and Paragraph 3.A.(44).

(46) Using control wheel trim switches, move stabilizer to approximately 10 degrees (0.175 rad) aircraft noseup position indicated.

(47) Move alternate trim control levers (W) to aircraft noseup position. Hold until shutoff functions. Horizontal stabilizer should be at 12.2 degrees (0.213 rad) ANU. Dimension (BG) should be 12 13/16 (±5/32) inches, (325.44 (±3.97) mm).

(48) If the requirement of Paragraph 3.A.(47) is not met, adjust position of alternate longitudinal trim motor limit switch (AC) as required to meet these limits. Repeat Paragraph 3.A.(46) and Paragraph 3.A.(47).

(49) Safety stopbolts (AF), (AB), (BB) and (BD) with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(50) Safety all turnbuckles with clips.

(51) Test trim indicating system and shutoff control. (Paragraph 3.G.)

(52) Test primary longitudinal trim control system. (Paragraph 3.J.)

(53) Test alternate longitudinal trim control system. (Paragraph 3.K.)

B. Adjust Manual Override Control

(1) Make certain horizontal stabilizer is in neutral position. Reference rivets on vertical and horizontal stabilizer are aligned within 1/8 inch, (3.175 mm). Dimension (BG) should be 3 1/64 (±3/64) inches, (77.51 (±1.19) mm).

(2) Remove bolt (AP) from pushrod (AA). (Figure 502, Sheet 2)

(3) With trim control handle (C) in mid-center position. Install rig pin (4-3) in rig pin hole (R-13). (Figure 501)

NOTE: Access to rig pin holes is through control pedestal side panel.

(4) Adjust turnbuckles (J) and (V) until tension is between minimum and maximum load per cable tension table for 1/16 inch (1.59 mm) cables 125A, B and 126A, B. (Figure 503, Sheet 2)

NOTE: Access to turnbuckles (J) and (V) is through forward cargo compartment ceiling panel 5150C.

(5) Differentially adjust turnbuckles (J) and (V) to center roller (AL) in detent of arm of cam (AK).

(6) Position roller (AJ) in center of detent of cam (AH). Loosen jamnut on pushrod (AA) and adjust pushrod to permit free installation of bolt (AP) through crank and pushrod (AA).

NOTE: Rollers (AL) and (AJ) must be centered in their respective detents when making adjustment to pushrod (AA).

(7) Install bolt (AP). Safety nut with cotter pin. Tighten jamnut on pushrod (AA).

(8) Remove rig pin (4-3).

(9) Safety all turnbuckles with clips.

(10) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(11) Test manual override control. (Paragraph 3.H.)

C. Adjust Brake Switch Control

(1) Make certain horizontal stabilizer is in neutral position. Reference rivets on vertical and horizontal stabilizers aligned within 1/8 inch, (3.175 mm). Dimension (BG) should be 3 1/64 (±3/64) inches, (77.51 (±1.19) mm).

(2) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A

(Continued)

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(3) With trim control handle (D) in mid-center position. Install rig pin (4-3) in rig pin hole (R-13). (Figure 501, View A-A)

NOTE: Access to rig pin holes is through control pedestal side panel.

(4) Adjust turnbuckles (Z) and (K) until tension is between minimum and maximum load per cable tension table for 1/16 inch (1.59 mm) cables 127A, B and 128A, B. (Figure 503, Sheet 2)

NOTE: Access to turnbuckles (Z) and (K) is through forward cargo compartment ceiling panel 5151C.

(5) Differentially adjust turnbuckles (Z) and (K) to center roller (AN) in detent of cam (AM).

(6) Remove rig pin (4-3).

(7) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

D. Adjust Elevator Variable Load and Feel Mechanism (Figure 502, Sheet 1)

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE). DO NOT ALLOW TRIM ACTUATOR STOPS TO CONTACT. REPEATED CONTACT OF STOPS CAN CAUSE DAMAGE TO STOPS, GEARBOXES, AND ACTUATOR MOTOR.

(1) Using alternate trim levers, move horizontal stabilizer in aircraft noseup direction until shutoff functions.

(2) Adjust turnbuckles (W) and (Y) until tension is between minimum and maximum load per cable tension table for 1/16 inch (1.59 mm) cables 255A, and 256A, B. (Figure 503 (Sheet 2))

NOTE: Access to turnbuckles (W) and (Y) is through forward cargo compartment ceiling panel 5151C.

(3) Differentially adjust turnbuckles (W) and (Y) until gap (R) is 0.015 inch (0.38 mm) minimum between crank (T) and stop (S1). (Figure 502, Sheet 1, View B)

(4) Using alternate trim levers, move horizontal stabilizer in aircraft nosedown direction until shutoff functions. Check that gap (R) between crank (T) and stop (S2) is 0.015 inch (0.38 mm) minimum.

(5) Using control wheel trim switches, position horizontal stabilizer to 0° neutral. Dimension (BG) should be 3 1/64 (±3/64) inches (77.51 (±1.19) mm).

(6) Remove bolt (AC) from forward end of elevator load feel spring (A). (Figure 502, Sheet 1, View B)

NOTE: Elevator load feel spring is part of the elevator variable load feel mechanism, located by lower end of right control column.

(7) Install rig pin (6-5) in rig hole (R-1). (Figure 502, Sheet 1, View B)

NOTE: Rig pin holes are located at lower end of left elevator control column.

(8) Loosen jamnut on rod end (B) and adjust shaft (M) on rod end (B) until bolt (AC) can be freely inserted. Install bolt (AC) and safety nut with cotter pin. Tighten rod end jamnut.

(9) Remove rig pin (6-5).

(10) Safety all turnbuckles with clips.

(11) Test brake switch control. (Paragraph 3.I.)

E. Adjust Horizontal Stabilizer Position Sensors (Figure 502, Sheet 1)

(1) If adjusting stabilizer position sensors (stall warning, 2 places), perform following:

(a) Using control wheel trim switches, position horizontal stabilizer until dimension (BG) is 4 5/16 (±3/16) inches, (109.54 (±4.76) mm). (Figure 501)

(b) Remove bolt connecting arm and link. (Figure 502, Sheet 2)

CAUTION: SENSOR WILL BE DAMAGED IF ROTATED BEYOND INTERNAL STOPS.

(c) Rotate arm until sensor internal detent is located.

(d) Loosen sensor housing clamp bolt and rotate sensor housing (keeping arm in detent position) until bolt connecting arm and link can be freely installed.

(e) Tighten sensor housing clamp bolt.

(f) Install bolt through arm and link. Safety nut with cotter pin.

(2) If adjusting stabilizer position sensor (DFGC) perform following:

(a) Using control wheel trim switches, position horizontal stabilizer to 0° (±1/4°), dimension (BG) should be 3.01 (±0.04) inches, (76.5 (±1.02) mm).

(b) Remove bolt connecting arm and link.

CAUTION: SENSOR WILL BE DAMAGED IF ROTATED BEYOND INTERNAL STOPS.

(c) Rotate arm until sensor internal detent is located.

(d) Loosen sensor housing clamp bolt and rotate sensor housing (keeping arm in detent position) until bolt connecting arm and link can be freely installed.

(e) Tighten sensor housing clamp bolt.

(f) Install bolt through arm and link. Safety nut with cotter pin.

(3) Check stabilizer position sensors (stall warning). (PAGEBLOCK 34-19-00/201)

(4) Perform return to service (RTS) test for DFGC sensor. (DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201)

F. Adjust Horizontal Stabilizer Takeoff Warning Switch

(1) Using thumbwheel on TAKEOFF CONDTN panel, left side of pedestal, set FLAP dial to read 4.0 and CG dial to read 24.0. LONG TRIM dial should read 3.1(±0.25).

(2) Place flap slat handle in 4.0 T.O. EXT detent.

(3) Using control wheel trim switches position horizontal stabilizer until LONG TRIM position indicator (B) reads 3.1(±0.25) NOSE UP.

(4) Check that switch actuating roller is centered on cam surface actuating flat. If necessary adjust pushrod (L) to center actuating roller. Figure 501. View J-J

(5) Loosen cam mounting bolts and move cam as far away from switch as it will go. Adjust cam back towards switch until switch just actuates, move cam one additional serration towards switch and tighten cam bolts.

(6) Check that switch actuating roller is centered on cam actuating flat. If necessary readjust pushrod (L).

(7) Using control wheel trim switches move horizontal stabilizer to 0° indicated.

(8) Place flap/slat handle in RET detent.

(9) Test horizontal stabilizer takeoff warning switch. (Paragraph 3.L.)

G. Test Trim Indicating System and Shutoff Controls

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE). DO NOT ALLOW TRIM ACTUATOR STOPS TO CONTACT. REPEATED CONTACT OF STOPS CAN CAUSE DAMAGE TO STOPS, GEARBOXES, AND ACTUATOR MOTOR.

(1) Using control wheel trim switches, run horizontal stabilizer in aircraft noseup (ANU) direction until shutoff functions. Check following:

(a) Indicator (B) on control pedestal points to 12.2(±1/2) degrees aircraft noseup. Dimension (BG) should be 12 13/16(±5/32 inches, (325.44(±3.97) mm).

NOTE: There may be a momentary hesitation in stabilizer position indicator motion when indicator is between one and two degrees aircraft noseup, and again when indicator is moving between one and two degrees aircraft nosedown. This condition is acceptable.

(2) Using control wheel trim switches, run horizontal stabilizer to approximately 10 degrees aircraft noseup indicated position.

(3) Using alternate longitudinal trim control levers, run horizontal stabilizer in airplane noseup direction until shutoff functions. Horizontal stabilizer should be at 12.2 degrees ANU. Dimension (BG) should be 12 13/16 (±5/32) inches, (325.437 (±3.967) mm)

(4) Using control wheel trim switches, run horizontal stabilizer to approximately 10 degree ANU, indicated position.

(5) Using primary trim control handles (C) and (D), run horizontal stabilizer in airplane noseup direction until shutoff functions. Horizontal stabilizer should be at 12.2 degrees ANU. Dimension (BG) should be 12 13/16 (±5/32) inches, (325.437 (±3.967) mm)

(6) Using control wheel trim switches, run horizontal stabilizer in airplane nosedown (AND) direction until shutoff functions. Check following:

(a) Horizontal stabilizer position indicator (B) should read 2.1 degree, (±.25°) AND. Dimension (BG) should be 1 5/16 (±9/64) inches, (33.337 (±3.571) mm).

(7) Using control wheel trim switches, run horizontal stabilizer to approximately 1 degree ANU, indicated position.

(8) Using alternate longitudinal trim control levers, run horizontal stabilizer in airplane nosedown direction until shutoff functions. Horizontal stabilizer should be at 2.1 degrees AND. Dimension (BG) should be 1 5/16 (±9/64) inches (33.337 (±3.571) mm).

(9) Using control wheel trim switches, run horizontal stabilizer to approximately 1 degree ANU, indicated position.

(10) Using primary trim control handles (C) and (D), run horizontal stabilizer in airplane nosedown direction until shutoff functions. Horizontal stabilizer should be at 2.1 degrees AND. Dimension (BG) should be 1 5/16 (±9/64) inches (33.337 (±3.571) mm).

(11) Return horizontal stabilizer to approximately neutral (0 degrees) indicated position.

(12) If any of the above requirements are not met, adjust position of appropriate alternate longitudinal trim motor limit switches or stopbolts as necessary. (Paragraph 3.A.)

H. Test Manual Override Control

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE). DO NOT ALLOW TRIM ACTUATOR STOPS TO CONTACT. REPEATED CONTACT OF STOPS CAN CAUSE DAMAGE TO STOPS, GEARBOXES, AND ACTUATOR MOTOR.

(1) Move primary trim control handles (C) and (D) to aircraft noseup position, then release. Check following:

(a) Control handles return to center position when released.

(b) Manual override linkage does not bind.

(c) Stabilizer leading edge moved down and stabilizer movement stopped when control handles returned to center position.

(2) Move primary trim control handles (C) and (D) to aircraft nosedown position, then release. Check following:

(a) Control handles return to center position when released.

(b) Manual override linkage does not bind.

(c) Stabilizer leading edge moved up and stabilizer movement stopped when control handles returned to center position.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE). DO NOT ALLOW TRIM ACTUATOR STOPS TO CONTACT. REPEATED CONTACT OF STOPS CAN CAUSE DAMAGE TO STOPS, GEARBOXES, AND ACTUATOR MOTOR.

(3) Move both captain's control wheel trim switches in each direction and check that opposing control from inboard primary trim control handle (C) will stop stabilizer motion. Make sure primary control handle is firmly against stops to ensure positive electrical contact.

(4) Move both captain's control wheel trim switches in each direction and check that opposing control from both primary trim handles (C) and (D) will stop stabilizer motion. Make sure primary control handle is firmly against stops to ensure positive electrical contact.

NOTE: During this test primary trim control handles may produce trim action opposite from switches on control wheel. This result is acceptable but not required.

I. Test Brake Switch Control

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE). DO NOT ALLOW TRIM ACTUATOR STOPS TO CONTACT. REPEATED CONTACT OF STOPS CAN CAUSE DAMAGE TO STOPS, GEARBOXES, AND ACTUATOR MOTOR.

(1) Move outboard primary trim control handle (D) to aircraft noseup position, then release. Check following:

(a) Control handle returns to center position.

(b) Brake switch linkage does not bind.

(c) Stabilizer should not move.

(2) Move outboard primary trim control handle (D) to aircraft nosedown position, then release. Check following:

(a) Control handle returns to center position.

(b) Brake switch linkage does not bind.

(c) Stabilizer should not move.

(3) Move primary trim control handles (C) and (D) to aircraft noseup position, then release. Check following:

(a) Stabilizer leading edge moved down.

(b) Control handles return to neutral position.

(4) Move primary trim control handles (C) and (D) to aircraft nosedown position, then release. Check following:

(a) Stabilizer leading edge moved up.

(b) Control handles return to neutral position.

(5) Move primary trim control handles (C) and (D) to aircraft noseup position. Hold until stabilizer leading edge is in neutral position.

J. Test Primary Longitudinal Trim Control System

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE). DO NOT ALLOW TRIM ACTUATOR STOPS TO CONTACT. REPEATED CONTACT OF STOPS CAN CAUSE DAMAGE TO STOPS, GEARBOXES, AND ACTUATOR MOTOR.

(1) Move primary trim control handles (C) and (D) to aircraft noseup position. Hold until shutoff functions, release handles. Check following:

(a) Control handles return to neutral position.

(b) Dimension (BG) should be 12 13/16 (±5/32) inches, (325.44 (±3.97) mm). Horizontal stabilizer should be at 12.2 degrees ANU.

(2) Move primary trim control handles (C and D) to aircraft nosedown position. Hold until shutoff functions, release handles. Check following:

(a) Control handles return to neutral position.

(b) Dimension (BG) should be 1 5/16 (±9/64) inches, (33.34 (±3.57) mm). Horizontal stabilizer should be at 2.1 degrees AND.

(3) Move primary trim control handles (C and D) to aircraft noseup position. Hold until indicator (B) moves to zero-degree position.

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE). DO NOT ALLOW TRIM ACTUATOR STOPS TO CONTACT. REPEATED CONTACT OF STOPS CAN CAUSE DAMAGE TO STOPS, GEARBOXES, AND ACTUATOR MOTOR.

(4) Momentarily move primary trim control handle (C) to noseup position. Check that stabilizer remains stationary.

(5) Move captain's control wheel trim switches to aircraft nosedown position, then release. Check that stabilizer leading edge moved up.

(6) Move captain's control wheel trim switches to aircraft noseup position, then release. Check that stabilizer leading edge moved down.

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE). DO NOT ALLOW TRIM ACTUATOR STOPS TO CONTACT. REPEATED CONTACT OF STOPS CAN CAUSE DAMAGE TO STOPS, GEARBOXES, AND ACTUATOR MOTOR.

(7) Momentarily move captain's right trim control switch to aircraft nosedown position. Check that stabilizer remains stationary.

(8) Repeat Paragraph 3.J.(5), Paragraph 3.J.(6), and Paragraph 3.J.(7) using first officer's control wheel trim switches.

(9) Return stabilizer to neutral position.

K. Test Alternate Longitudinal Trim Control System

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE). DO NOT ALLOW TRIM ACTUATOR STOPS TO CONTACT. REPEATED CONTACT OF STOPS CAN CAUSE DAMAGE TO STOPS, GEARBOXES, AND ACTUATOR MOTOR.

(1) Move alternate trim control levers to aircraft noseup position. Hold until shutoff functions. Dimension (BG) should be 12 13/16 (±5/32) inches, (325.44 (±3.97) mm). Horizontal stabilizer should be at 12.2 degrees (0.21 rad) ANU.

(2) Move alternate trim control levers to aircraft nosedown position. Hold until shutoff functions. Dimension (BG) should be 1 5/16(±9/64) inches, (33.34 (±3.57) mm). Horizontal stabilizer should be at 2.1 degrees (0.04 rad) AND.

(3) Return stabilizer to neutral position.

CAUTION: SPECIFIC POSITIONING OF THROTTLE LEVERS, SPEEDBRAKE CONTROL LEVER, FLAPS, SLATS, AND STABILIZER APPLY ONLY TO THE FOLLOWING TEST PROCEDURES. NO ATTEMPT SHOULD BE MADE TO ADJUST VARIOUS SYSTEM TAKEOFF WARNING SWITCHES TO POSITIONS REFERENCED DURING THIS TEST. SEE APPROPRIATE SYSTEM ADJUSTMENT PROCEDURES FOR ADJUSTMENT OF TAKEOFF WARNING SWITCHES.

L. Test Horizontal Stabilizer Takeoff Warning Switch

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(2) Using thumbwheels on TAKEOFF CONDTN calculator set FLAP dial at 4.0 and CG dial at 24.0. LONG TRIM dial should read 3.1 (±0.25). Reset FLAP dial at 8.0 and CG dial at 13.0. LONG TRIM dial should read 6.0 (±0.25).

(3) Using DIAL-A-FLAP (DAF) thumbwheel set DAF indicator dial at 8.0 (±1/2) degrees against stop.

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE). DO NOT ALLOW TRIM ACTUATOR STOPS TO CONTACT. REPEATED CONTACT OF STOPS CAN CAUSE DAMAGE TO STOPS, GEARBOXES, AND ACTUATOR MOTOR.

(4) Set flap/slat handle at DAF detent.

(5) Using pilots wheel trim switch run horizontal stabilizer in aircraft nose up direction until LONG TRIM position indicator reads 6.0 (±1/2) degrees NOSE UP.

(6) Make certain that both throttles are in idle position (against aft stops).

(7) Make certain that parking brakes are released.

(8) Make certain that speedbrake control lever is in retract position (against forward stop with red arm label not visible).

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(9) Open this circuit breaker and install safety tag:

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
G	24	B10-194	STAB MOTION INDICATOR

(10) Move both throttles 2 1/8 inch (53.98 mm) forward of idle stops, as measured along curved top of pedestal from idle stop to aft edge of throttle lever. Takeoff warning horn should not sound.

(11) Run horizontal stabilizer position towards aircraft nose up until takeoff warning horn sounds. LONG TRIM position indication should be between 7.0 and 7.5 when horn starts sounding.

(12) Run horizontal stabilizer position towards aircraft nose down until takeoff warning horn stops sounding and then starts sounding again. LONG TRIM position indication should be between 5.0 and 4.5 when horn starts sounding again.

WJE 401-403, 405, 409, 412, 873, 874, 880, 881, 883, 884, 892 PRE MD80-31-034

(13) With right throttle aft, pull left throttle aft until takeoff warning horn stops sounding. Left throttle should be forward no less than 1 1/4 inches (31.75 mm) from idle stop. Advance left throttle until takeoff warning horn sounds. Throttle should be no more than 2 1/8 inches (53.98 mm) forward of idle stop when horn initially sounds.

WJE 404, 406-408, 410, 411, 414-427, 429, 861-866, 868, 869, 871, 872, 875-879, 886, 887, 891, 893; WJE 401-403, 405, 409, 412, 873, 874, 880, 881, 883, 884, 892 POST MD80-31-034

(14) With right throttle aft, pull left throttle aft until takeoff warning horn stops sounding. The left throttle should be forward no less than 1 1/4 inches (31.75 mm) from idle stop. Advance left throttle until takeoff warning horn sounds. The throttle should be no more than 2 1/8 inches (53.975 mm) forward of idle stop when horn initially sounds.

(15) Perform functional test of Takeoff Warning System:

(a) Make certain aircraft control surfaces are in non-takeoff mode.

(b) Make certain that both throttles are at idle stops.

(c) Make sure that these circuit breakers are closed:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	38	B1-832	CAWS, SSRS-1, LDG GR, T/O, A/P, SP BK, CAB ALT

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 404, 406-408, 410, 411, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-879, 886, 887, 891, 893; WJE 401-403, 405, 409, 412, 873, 874, 880, 881, 883, 884, 892 POST MD80-31-034			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 404, 406-408, 410, 411, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-879, 886, 887, 891, 893; WJE 401-403, 405, 409, 412, 873, 874, 880, 881, 883, 884, 892 POST MD80-31-034			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 404, 406-408, 410, 411, 414-427, 429, 861-866, 868, 869, 871, 872, 875-879, 886, 887, 891, 893; WJE 401-403, 405, 409, 412, 873, 874, 880, 881, 883, 884, 892 POST MD80-31-034

(d) Set parking brake.

(e) Move left throttle at takeoff power setting (greater than 2 1/8 inches (53.98 mm) forward of idle stop); no warning should sound.

(f) Move the right throttle to a takeoff power setting (greater than 2 1/18 inches (53.98 mm) forward of the idle stop.

(g) With right and left throttles at takeoff power setting (greater than 2 1/8 inches (53.98 mm) forward of idle stop; takeoff warning should sound.

NOTE: On aircraft with CAWS voice option, other warnings may be heard.

(h) Move right and left throttles back to the idle stop; takeoff warning goes off.

(i) Release parking brake.

(j) Put the left and right throttles back to a position that is greater than 2 1/8 inches (53.98 mm).

(k) Run horizontal stabilizer position towards aircraft nose up until takeoff warning horn stops sounding and LONG TRIM indication is 6.0.

(l) Place horizontal stabilizer to 0° indicated.

(m) Place both throttles to idle stop.

(n) Place flap/slat handle in RET detent.

(o) Set DAF thumbwheel at 0 position.

(p) Set parking brakes.

(q) Shut off hydraulic pressure source.

WJE ALL

(16) Remove the safety tag and close this circuit breaker:

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
G	24	B10-194	STAB MOTION INDICATOR

M. Horizontal Stabilizer Dynamic Brake Test

(1) Energize the primary trim system (push both wheel switch buttons in either direction).

CAUTION: DO NOT STALL MOTOR FOR A PERIOD EXCEEDING 5 SECONDS.

(2) When stabilizer motion is observed, place the primary trim brake switch on the pedestal to the STOP position. If the stabilizer motion stops, the brake is acceptable. If motion continues, either the brake or brake switch has failed.

(3) To identify which element is malfunctioning, perform the following check:

CAUTION: DO NOT STALL MOTOR FOR A PERIOD EXCEEDING 5 SECONDS.

(a) Return the primary trim brake switch to the NORMAL position.

(b) Energize the primary trim system as above.

(c) Open the "Primary Longitudinal Trim Brake" circuit breaker.

(d) If stabilizer motion continues, the primary trim motor brake is defective.

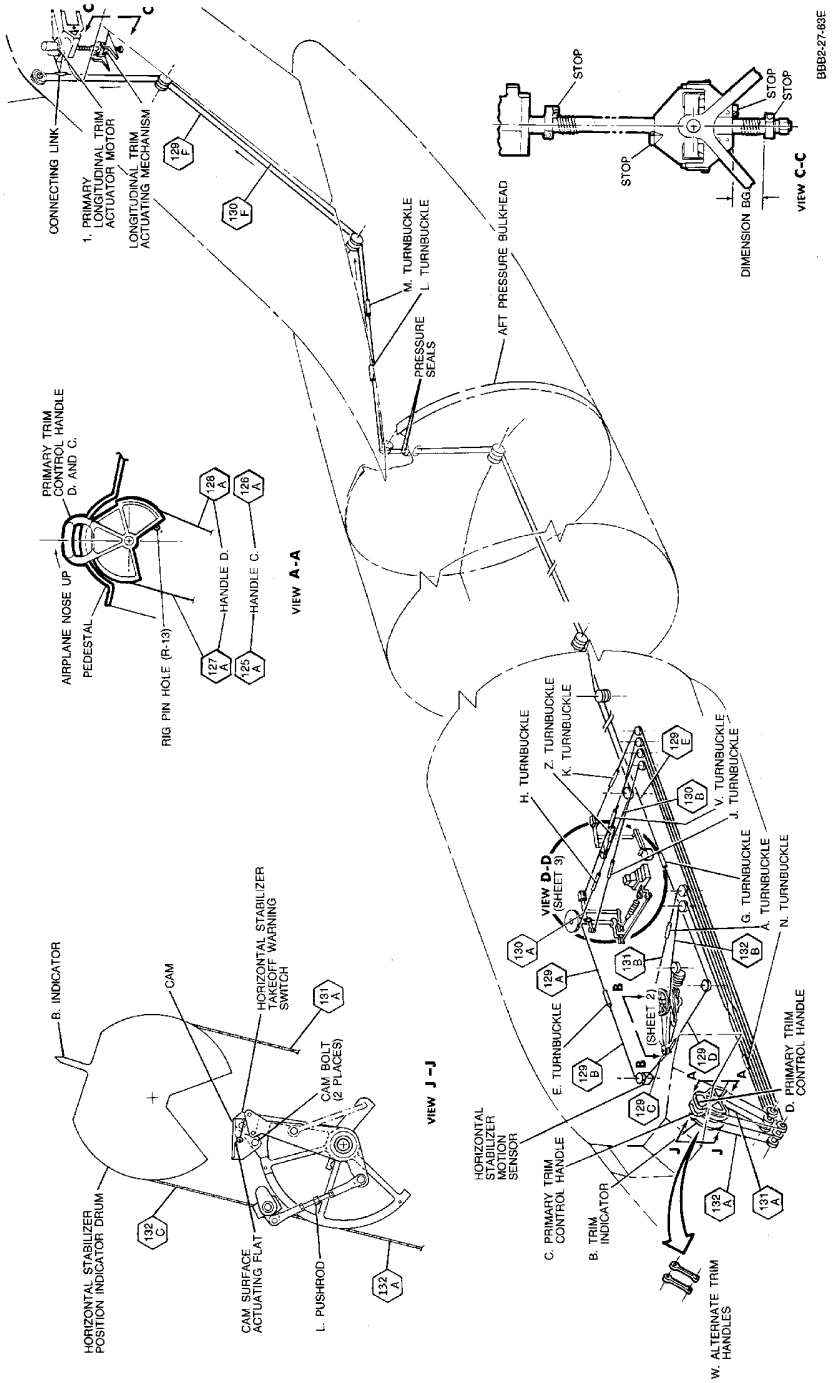
(e) If stabilizer motion ceases, the primary trim brake switch is defective.

(4) After test is completed, and also after primary trim brake switch replacement, perform the following:

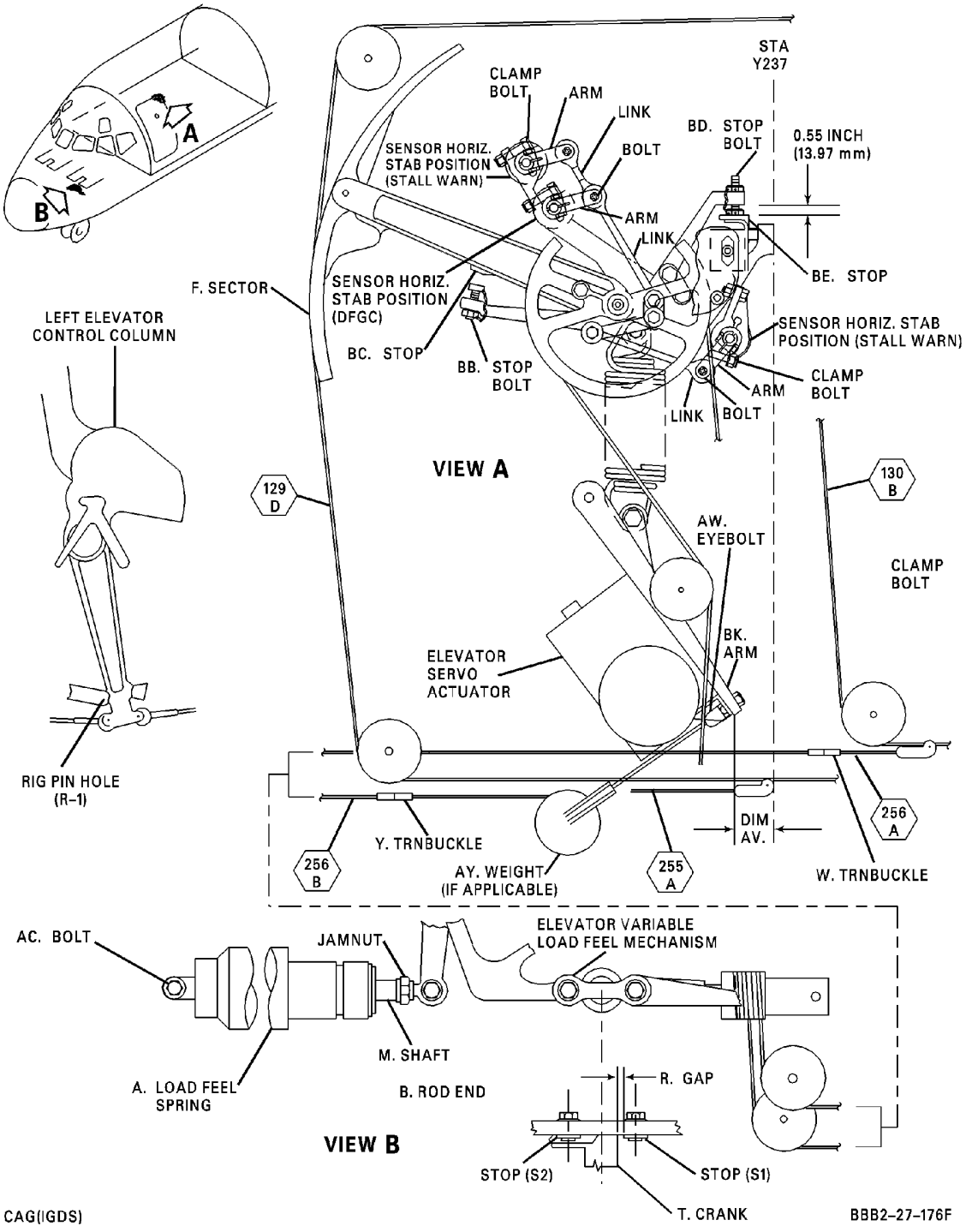
(a) Place primary trim brake switch to NORMAL position.

(b) Safety switch guard with 0.020 (0.508 mm) soft copper wire.

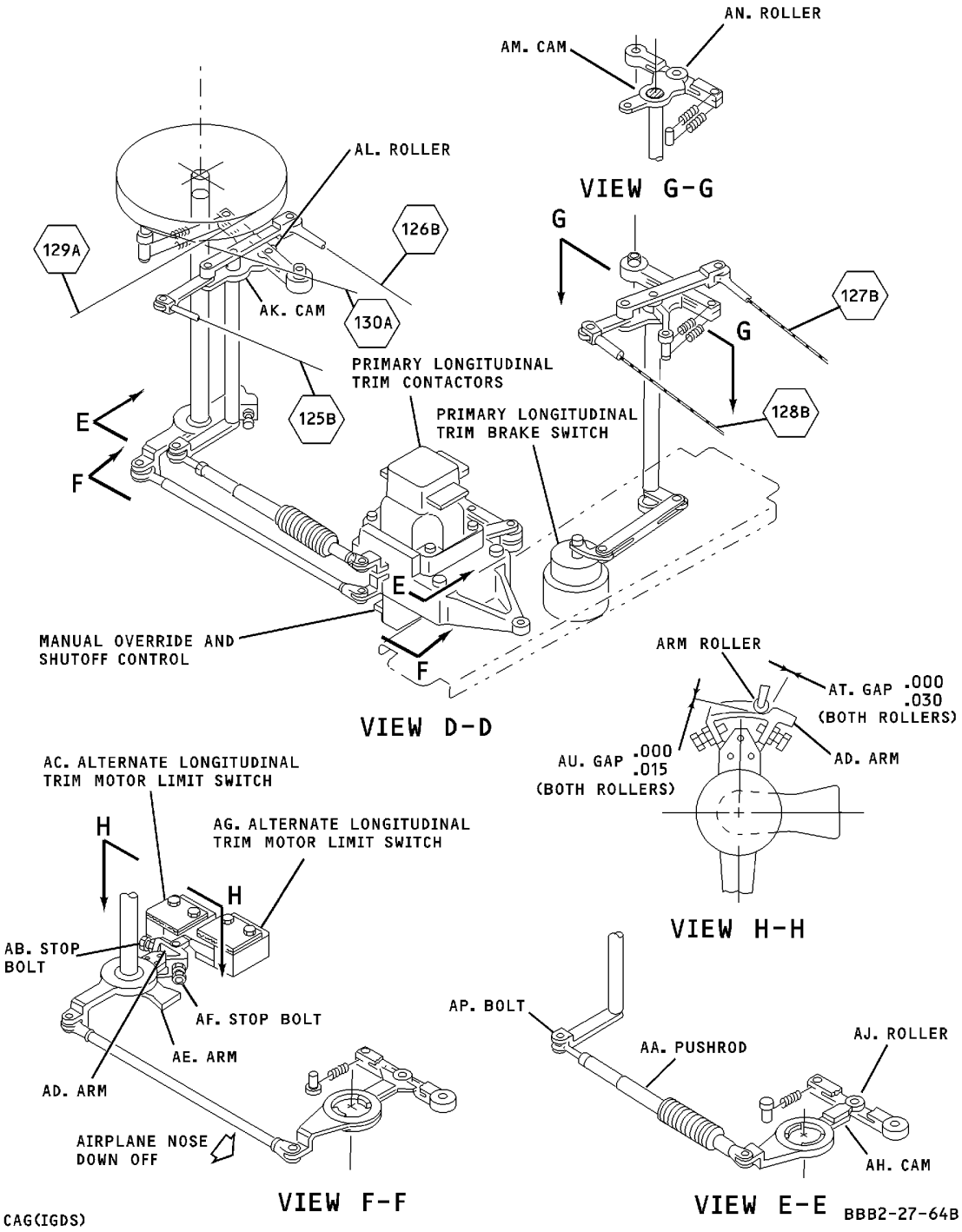
NOTE: Do not twist wire between switch handle and screw head.



Longitudinal Trim Control System
Figure 501/27-40-00-990-812



Longitudinal Trim Control System
Figure 502/27-40-00-990-816 (Sheet 1 of 2)



Longitudinal Trim Control System
Figure 502/27-40-00-990-816 (Sheet 2 of 2)

CABLE TENSION TABLE – HORIZONTAL STABILIZER SHUT-OFF

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD
– 60	47	27	18	40	119	99	74
–58	49	29	20	42	121	101	75
–56	50	30	21	44	122	102	76
–54	52	32	22	46	123	103	77
–52	53	33	23	48	125	105	78
–50	55	35	25	50	126	106	79
–48	57	37	26	52	128	108	80
–46	58	38	27	54	129	109	81
–44	60	40	28	56	130	110	83
–42	61	41	30	58	132	112	84
–40	63	43	31	60	133	113	85
–38	64	44	32	62	135	115	86
–36	66	46	33	64	136	116	87
–34	68	48	34	66	138	118	88
–32	69	49	35	68	139	119	89
–30	70	50	37	70	141	121	90
–28	72	52	38	72	142	122	92
–26	73	53	39	74	144	124	93
–24	75	55	40	76	145	125	94
–22	76	56	41	78	147	127	95
–20	78	58	42	80	148	128	96
–18	79	59	43	82	150	130	98
–16	81	61	44	84	151	131	99
–14	82	62	45	86	153	133	100
–12	83	63	47	88	155	135	101
–10	85	65	48	90	156	136	103
–8	86	66	49	92	158	138	104
–6	88	68	50	94	160	140	105
–4	89	69	51	96	161	141	106
–2	90	70	52	98	163	143	108
0	92	72	53	100	165	145	109
2	93	73	54	102	166	146	110
4	95	75	55	104	168	148	112
6	96	76	56	106	170	150	113
8	97	77	57	108	172	152	114
10	99	79	58	110	173	153	116
12	100	80	59	112	175	155	117
14	101	81	60	114	177	157	119
16	103	83	61	116	179	159	120
18	104	84	62	118	181	161	121
20	105	85	63	120	183	163	123
22	107	87	64	122	185	165	124
24	108	88	66	124	187	167	126
26	110	90	67	126	189	169	127
28	111	91	68	128	191	171	129
30	112	92	69	130	193	173	130
32	114	94	70	132	195	175	132
34	115	95	71	134	197	177	134
36	116	96	72	136	199	179	135
38	118	98	73	138	201	181	137
				140	203	183	138

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-65B

Cable Tension Table
Figure 503/27-40-00-990-813 (Sheet 1 of 2)

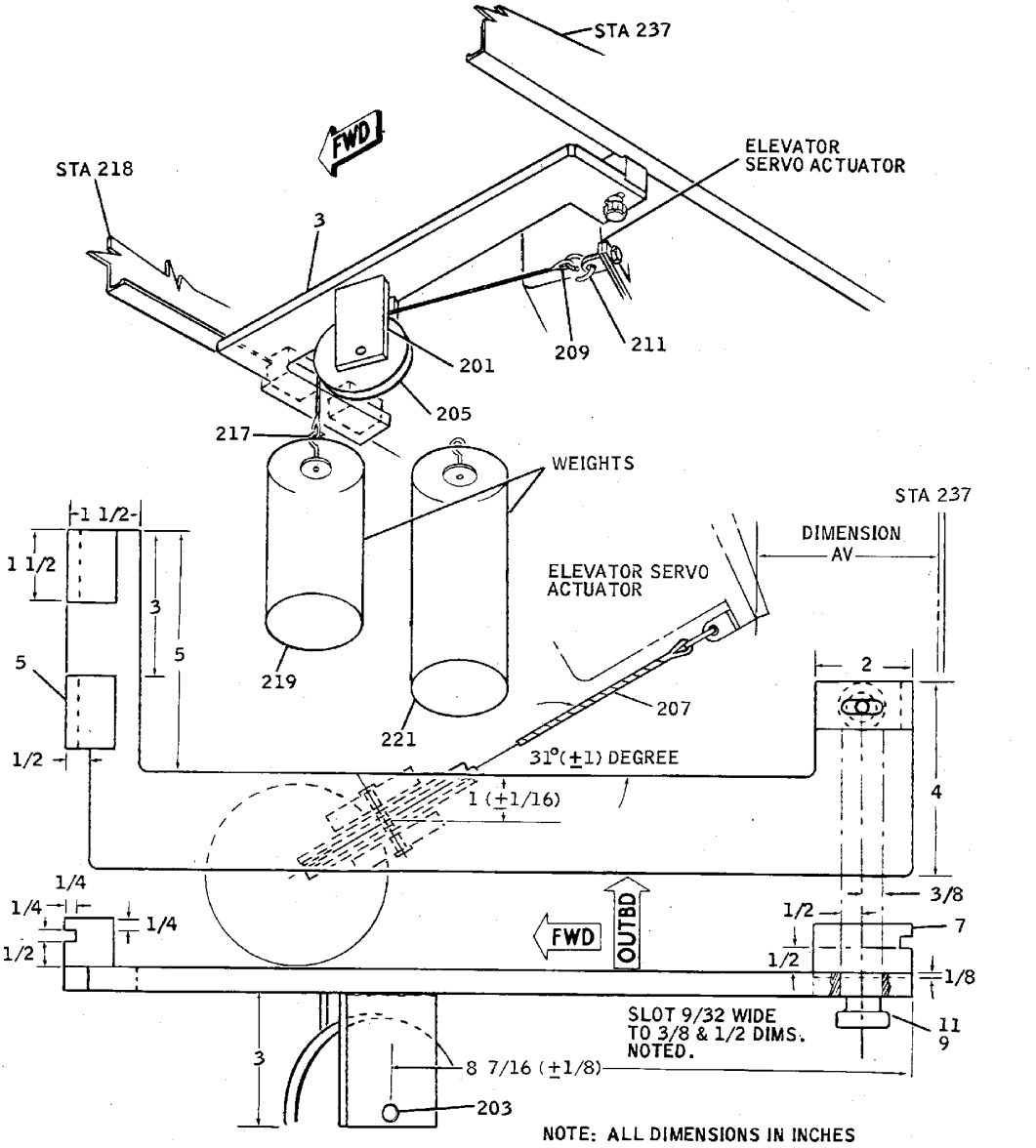
CABLE TENSION TABLE – 1/16 DIAMETER

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
–60	5	0	0	40	18	12	8
–58	5	0	0	42	18	12	9
–56	5	0	0	44	18	12	9
–54	6	0	0	46	19	13	9
–52	6	0	0	48	19	13	9
–50	6	0	0	50	19	13	9
–48	7	1	0	52	20	14	10
–46	7	1	0	54	20	14	10
–44	7	1	0	56	20	14	10
–42	7	1	0	58	20	14	10
–40	8	2	1	60	21	15	11
–38	8	2	1	62	21	15	11
–36	8	2	1	64	21	15	11
–34	8	2	1	66	22	16	11
–32	9	3	1	68	22	16	12
–30	9	3	2	70	22	16	12
–28	9	3	2	72	23	17	12
–26	9	3	2	74	23	17	12
–24	10	4	2	76	23	17	13
–22	10	4	2	78	24	18	13
–20	10	4	2	80	24	18	13
–18	10	4	3	82	24	18	13
–16	11	5	3	84	25	19	14
–14	11	5	3	86	25	19	14
–12	11	5	3	88	25	19	14
–10	11	5	3	90	26	20	15
–8	12	6	4	92	26	20	15
–6	12	6	4	94	27	21	15
–4	12	6	4	96	27	21	16
–2	12	6	4	98	27	21	16
0	13	7	4	100	28	22	16
2	13	7	5	102	28	22	16
4	13	7	5	104	28	22	17
6	13	7	5	106	29	23	17
8	14	8	5	108	29	23	17
10	14	8	5	110	30	24	18
12	14	8	6	112	30	24	18
14	14	8	6	114	31	25	18
16	15	9	6	116	31	25	19
18	15	9	6	118	31	25	19
20	15	9	6	120	32	26	19
22	15	9	7	122	32	26	20
24	16	10	7	124	33	27	20
26	16	10	7	126	33	27	20
28	16	10	7	128	34	28	21
30	16	10	7	130	34	28	21
32	17	11	8	132	35	29	21
34	17	11	8	134	35	29	22
36	17	11	8	136	36	30	22
38	18	12	8	138	36	30	23
				140	37	31	23

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-279A

Cable Tension Table
Figure 503/27-40-00-990-813 (Sheet 2 of 2)

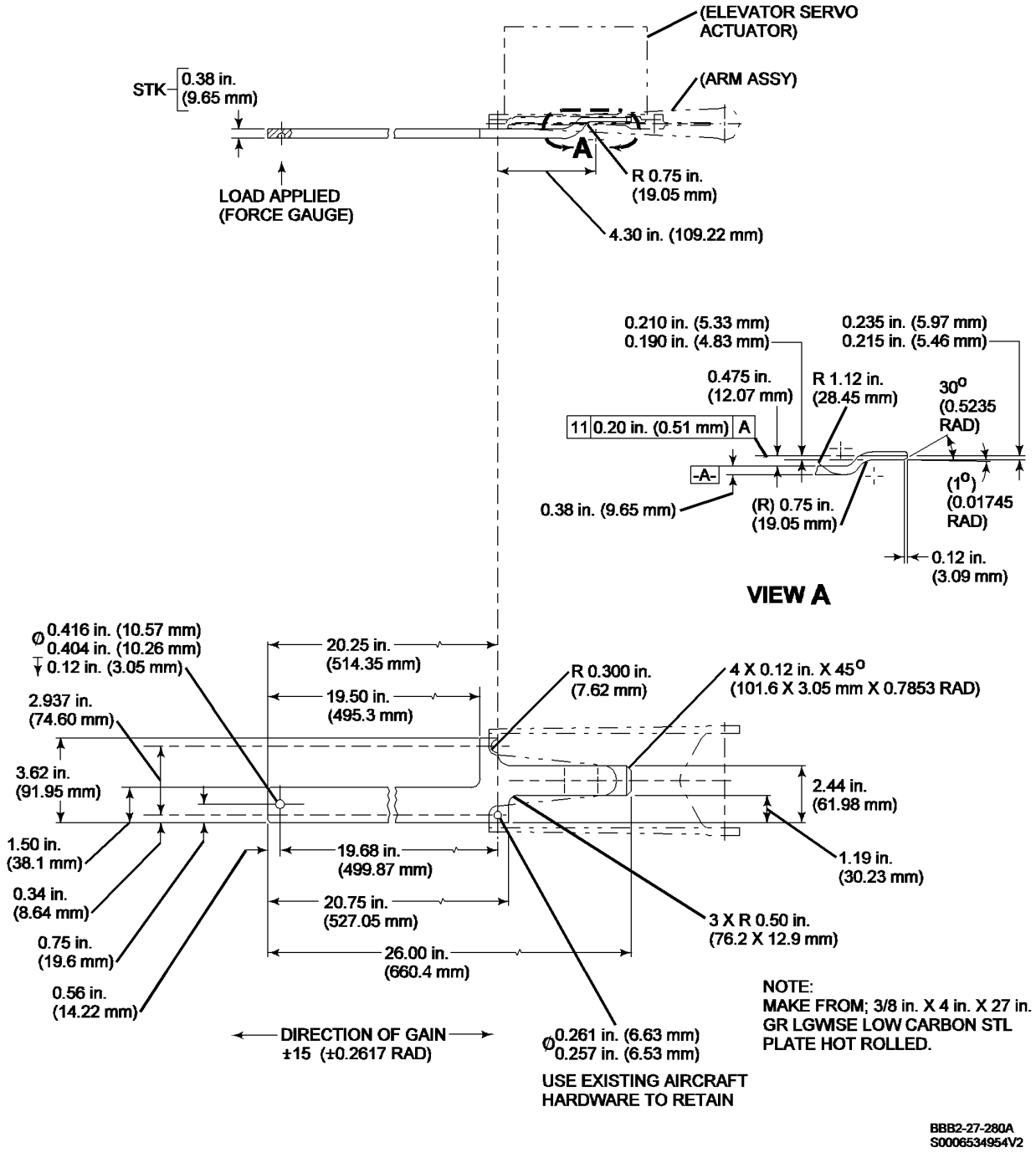


NOTE: ALL DIMENSIONS IN INCHES

11	1	THD BAR STOCK
9	1	KNOB OR EQUIV.
7	1	1 X 1 1/2 X 2 1/4 6061-T6 ALUM.
5	2	1 X 1 1/4 X 1 3/4 6061-T6 ALUM.
3	1	1/2 X 7 1/4 X 18 6061-T6 ALUM.
221	1	4 1/2 DIA X 9 C.R.S.
219	1	4 1/2 DIA X 6 C.R.S.
217	2	T-53013-5 EYEBOLT OR EQUIV.
211	1	1/8 DIA. X 3 DR. ROD
209	2	CLAMPS FOR 207
207	18	1/16 (7 X 7) MIL-C-1511 CABLE
205	1	MS20220-3 PULLEY
203	1	5/16 DIA. X 1 1/2 DWL.
201	2	3/8 X 2 1/4 X 3 1/4 6061-T6 ALUM.

BBB2-27-66A

Elevator Servoactuator Tester
Figure 504/27-40-00-990-814



Elevator Servo Force Limiter Drum -- Fixture
Figure 505/27-40-00-990-815

4. Cable Assemblies

Table 503

Cable run numbers and segment letters listed below correspond to callouts in hexagonal symbols in Figure 204.		
Function	**Cable Run Number**	**Segment Letter**
Horizontal stabilizer primary motor contactor override (airplane noseup)	125 125	A B
Horizontal stabilizer primary motor contactor override (airplane nosedown)	126 126	A B
Horizontal stabilizer primary brake override switch (airplane noseup)	127 127	A B
Horizontal stabilizer primary brake override switch (airplane nosedown)	128 128	A B
Horizontal stabilizer shutoff (airplane noseup)	129 129 129 129 129 129	A B C D E F
Horizontal stabilizer shutoff (airplane nosedown)	130 130 130	A B F
Horizontal stabilizer position indicator (airplane noseup)	131 131	A B
Horizontal stabilizer position indictor (airplane nosedown)	132 132	A B
Variable load-feel drive horizontal stabilizer (airplane noseup)	255	A
Variable load-feel drive horizontal stabilizer (airplane nosedown)	256	A
Variable load-feel drive (drum)	256	B

HORIZONTAL STABILIZER - ADJUSTMENT/TEST

1. General

A. This procedure contains MSG-3 task card data.

TASK 27-40-00-710-801

2. Operational Check of the Horizontal Stabilizer Brake Override Switch

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
27-40-00 P/B 001	HORIZONTAL STABILIZER - DESCRIPTION AND OPERATION

B. Operational Check of the Horizontal Stabilizer Brake Override Switch

SUBTASK 27-40-00-710-001

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING THE STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE).

(1) Do an operational check of the horizontal stabilizer brake override switch.

(a) Set the horizontal stabilizer to neutral position. (HORIZONTAL STABILIZER - DESCRIPTION AND OPERATION, PAGEBLOCK 27-40-00/001)

(b) Move the outboard primary longitudinal trim control handle to aircraft noseup position and then to aircraft nosedown position.

1) Check that the brake switch linkage does not bind.

2) Make sure the horizontal stabilizer remains stationary.

3) Make sure the control handle returns to center position when released.

(c) Move the inboard control handle to aircraft noseup position then to aircraft nosedown position.

1) Make sure the horizontal stabilizer remains stationary.

2) Make sure the control handle returns to center position when released.

(d) Move both control handles to aircraft noseup position.

1) Check that the stabilizer leading edge moves down.

(e) Move both control handles to aircraft nosedown position.

1) Check that the stabilizer leading edge moves up.

(f) Move both the primary longitudinal trim control wheel switches on Captain's aileron control wheel to aircraft noseup position.

1) Check that the stabilizer leading edge moves down.

(g) Move both primary longitudinal trim control wheel switches to aircraft nosedown position.

1) Check that the stabilizer leading edge moves up.

C. Job Close-up

SUBTASK 27-40-00-860-001

(1) Return stabilizer to neutral position. (HORIZONTAL STABILIZER - DESCRIPTION AND OPERATION, PAGEBLOCK 27-40-00/001)

——— END OF TASK ———

LONGITUDINAL TRIM ACTUATOR MECHANISM - REMOVAL/INSTALLATION

1. General

A. The longitudinal trim actuator mechanism is located in the vertical stabilizer immediately forward of the horizontal stabilizer. Access to the mechanism is through the top of the vertical stabilizer leading edge; access doors in the side of the vertical stabilizer and on upper surface of the horizontal stabilizer leading edge; and the horizontal stabilizer fairing on each side of the vertical fin.

B. Procedures for removal and installation of the actuator mechanism components are described in the succeeding paragraphs as follows:

Table 401

Paragraph	Component
3	Removal/Installation Primary Longitudinal Trim Actuator Motor
WJE 401-404, 406-408, 410-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 886, 887, 892, 893; WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-282	
4	Removal/Installation Primary Longitudinal Trim Actuator Motor Heater Cap
5	Adjustment/Test Primary Longitudinal Trim Actuator Motor Heater Cap
WJE ALL	
6	Removal/Installation Alternate Longitudinal Trim Actuator Motor
7	*Removal/Installation Sandwich Gearbox
NOTE: * Sandwich gearbox is applicable only to aircraft fuselage numbers 2180 and prior, without effects of All Operator Letter 9-2521, dated 12/19/1996. This A.O.L. installs an EEMCO Corp. motor/brake assembly which does not use the sandwich gearbox. Except for customer options specifying otherwise, aircraft fuselage numbers 2181 and subsequent will incorporate modified motor/brake assemblies (P.N. 846D100-3) without the sandwich gearbox.	
8	Removal/Installation Longitudinal Trim Gearbox
9	Removal/Installation Acme Screw and Nut

C. Approximate weights of the actuator mechanism components are as follows:

Table 402

Weight		Component
14 pounds	(6 kg)	Primary longitudinal trim actuator motor
4 pounds	(2 kg)	Alternate longitudinal trim actuator motor
28 pounds	(13 kg)	Longitudinal trim gearbox
32 pounds	(14 kg)	Acme screw and nut (with gimbal ring and support)
4 pounds	(2 kg)	*Sandwich gearbox.
NOTE: * Sandwich gearbox is applicable only to aircraft fuselage numbers 2180 and prior, without effects of All Operator Letter 9-2521, dated 12/19/1996. This A.O.L. installs an EEMCO Corp. motor/brake assembly which does not use the sandwich gearbox. Except for customer options specifying otherwise, aircraft fuselage numbers 2181 and subsequent will incorporate modified motor/brake assemblies (P.N. 846D100-3) without the sandwich gearbox.		

WARNING: THE SAFETY BELT LUG DOES NOT MEET CURRENT FALL PROTECTION REQUIREMENTS. DO NOT USE THE SAFETY BELT LUG FOR FALL PROTECTION. OTHER METHODS MUST BE USED TO ENSURE ADEQUATE FALL PROTECTION.

D. A safety belt attachment lug is located on top of vertical stabilizer for use by personnel performing maintenance on actuator mechanism.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 403

Name and Number	Manufacturer
Horizontal stabilizer restraining fixture 4916750	Douglas Aircraft Co.
Lockwire, NASM20995N20, DPM 684*[1]	Not specified
Lockwire, NASM20995N32, DPM 684*[1]	Not specified
Torque Wrench, 0 in-lb (0.0 N·m)- 200 in-lb (22.6 N·m)	Not Specified
WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-874, 880, 881, 883, 884, 886, 887, 891-893	
Thermometer, surface 0 to 500°F (0 to 260°C)	
Ammeter, clamp-on type 278000	Biddle
Ice or equivalent coolant	
WJE ALL	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Primary Longitudinal Trim Actuator Motor

A. Remove Actuator Motor

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Disconnect electrical connectors from actuator motor.

WJE 401-404, 406-408, 410-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 886, 887, 892, 893; WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-282

(3) On aircraft with primary longitudinal trim actuator motor heater system installed, loosen clamp and temporarily move heater cap and electrical wires out of the way for replacement of actuator motor. (Figure 401)

WJE ALL

(4) Remove actuator motor and gasket from gearbox mounting pad.

(5) If applicable, remove sandwich gearbox. (Paragraph 7.)

B. Install Actuator Motor (Figure 401)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Position gasket on gearbox mounting pad.

(3) If applicable, install sandwich gearbox. (Paragraph 7.B.)

(4) Install actuator motor with bolts, washers and nuts on gearbox with larger male electrical connector on left side.

(5) Torque the nuts 100 in-lb (11.3 N·m) to 140 in-lb (15.8 N·m).

NOTE: Outer-diameter edges of washers between aft support mounting bolt heads and spacers can bend in the direction of the horizontal stabilizer structure when the bolts are tightened. This bend is permitted if the washer edges do not break through the primer and dent the structure.

(6) Connect electrical connectors to actuator motor and safety with .020 lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(a) Ensure correct routing of electrical connector wire bundles to prevent chafing and electrical arcing as follows:(Figure 403)

1) Check all wire bundle lengths between clamps, starting from 1 thru 10.

a) If wire bundle lengths are incorrect, loosen clamps and adjust to correct lengths.

2) If disturbed, check wire bundles radius length at the transition from the horizontal center box to the vertical stabilizer.

a) If the radius length of the wire bundles are incorrect, loosen clamps and adjust to correct radius lengths.

(7) On aircraft with primary longitudinal trim actuator motor heater system, install heater cap and secure with clamp. (Figure 401)

WJE 401-404, 406-408, 410-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 886, 887, 892, 893; WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-282

(8) Install heater cap and secure with clamp.

WJE ALL

(9) Remove the safety tags and close these circuit breakers:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

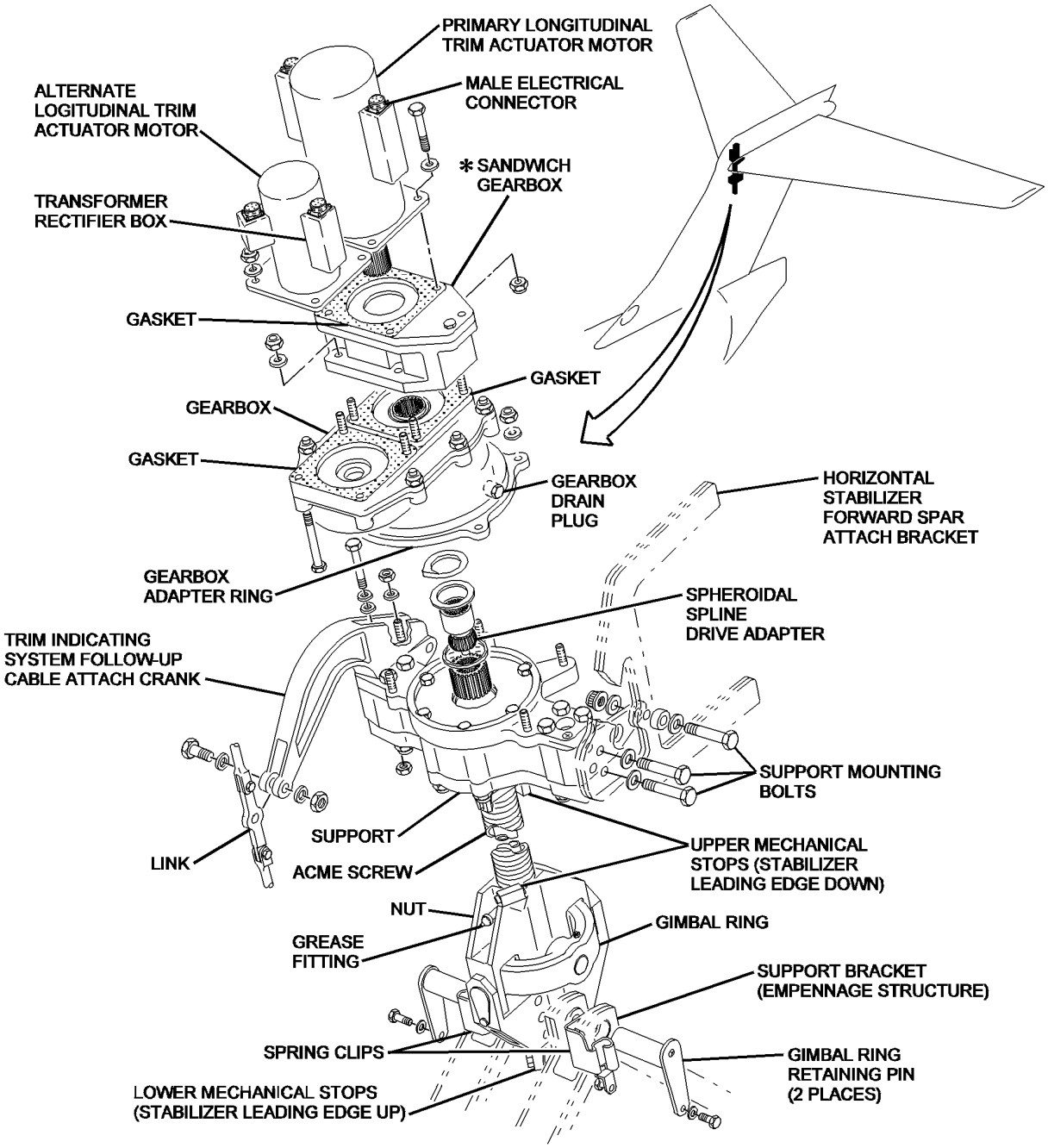
Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(10) Perform primary longitudinal trim actuator motor check. (LONGITUDINAL TRIM ACTUATOR MECHANISM - CHECK, PAGEBLOCK 27-40-01/601)

(11) Perform adjustment/test primary longitudinal trim actuator motor heater cap. (Paragraph 5.)



*NOTE: SANDWICH GEARBOX IS APPLICABLE ONLY TO AIRCRAFT FUSELAGE NUMBERS 2180 AND PRIOR, WITHOUT EFFECTS OF ALL OPERATOR LETTER 9-2521, DATED 12/19/1996. THIS A.O.L. INSTALLS AN EEMCO CORP. MOTOR/BRAKE ASSEMBLY WHICH DOES NOT USE THE SANDWICH GEARBOX. EXCEPT FOR CUSTOMER OPTIONS SPECIFYING OTHERWISE, AIRCRAFT FUSELAGE NUMBERS 2181 AND SUBSEQUENT WILL INCORPORATE MODIFIED MOTOR/BRAKE ASSEMBLIES (P.N. 846D100-3) WITHOUT THE SANDWICH GEARBOX.

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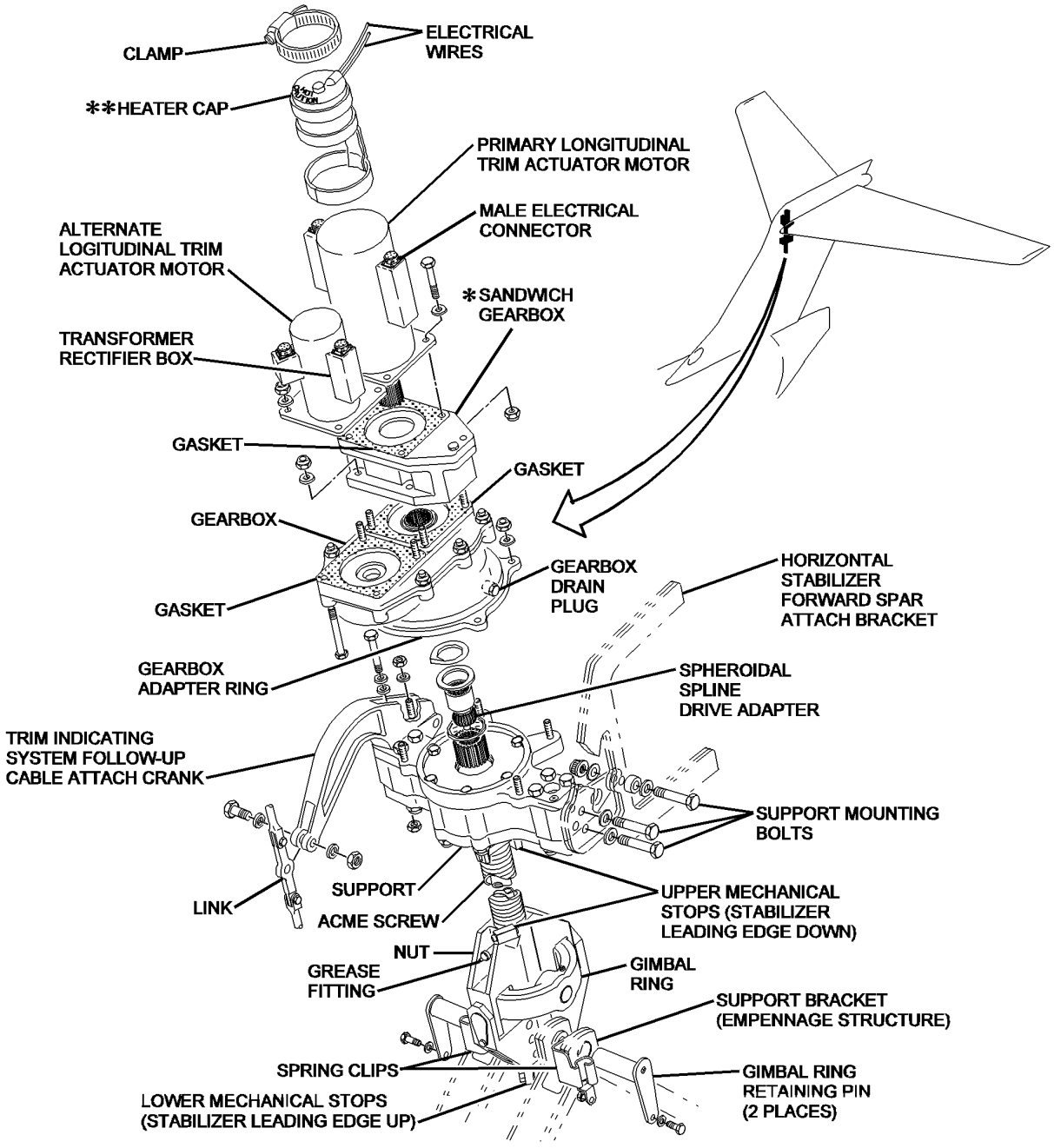
S0006535103V4

Longitudinal Trim Actuating Mechanism -- Removal/Installation
Figure 401/27-40-01-990-801 (Sheet 1 of 2)

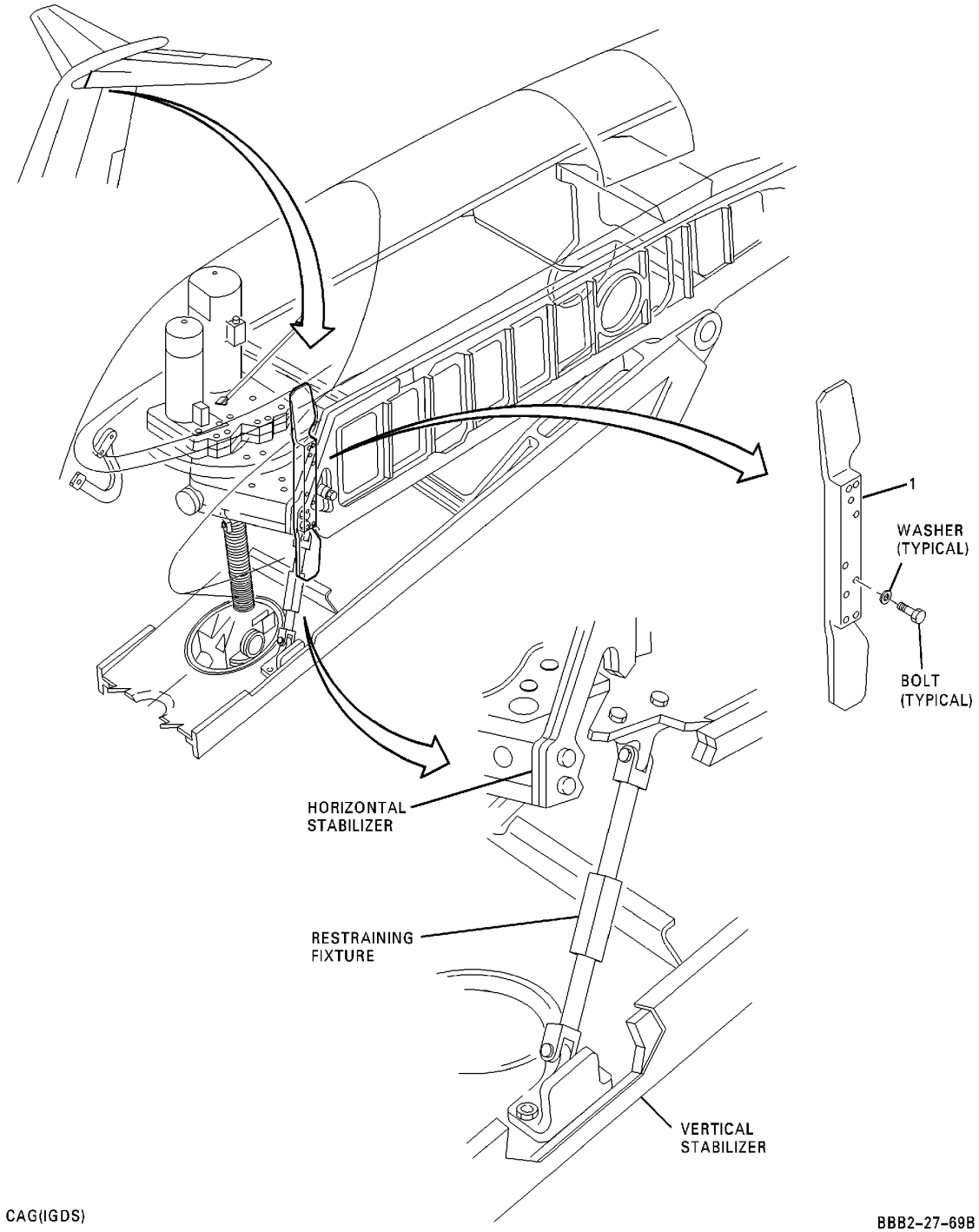


*NOTE: SANDWICH GEARBOX IS APPLICABLE ONLY TO AIRCRAFT FUSELAGE NUMBERS 2180 AND PRIOR, WITHOUT EFFECTS OF ALL OPERATOR LETTER 9-2521, DATED 12/19/1996. THIS A.O.L. INSTALLS AN EEMCO CORP. MOTOR/BRAKE ASSEMBLY WHICH DOES NOT USE THE SANDWICH GEARBOX. EXCEPT FOR CUSTOMER OPTIONS SPECIFYING OTHERWISE, AIRCRAFT FUSELAGE NUMBERS 2181 AND SUBSEQUENT WILL INCORPORATE MODIFIED MOTOR/BRAKE ASSEMBLIES (P.N. 846D100-3) WITHOUT THE SANDWICH GEARBOX.

**NOTE: FOR AIRCRAFT AFTER S/B 27-282 WHICH INCORPORATES HEATER CAP.

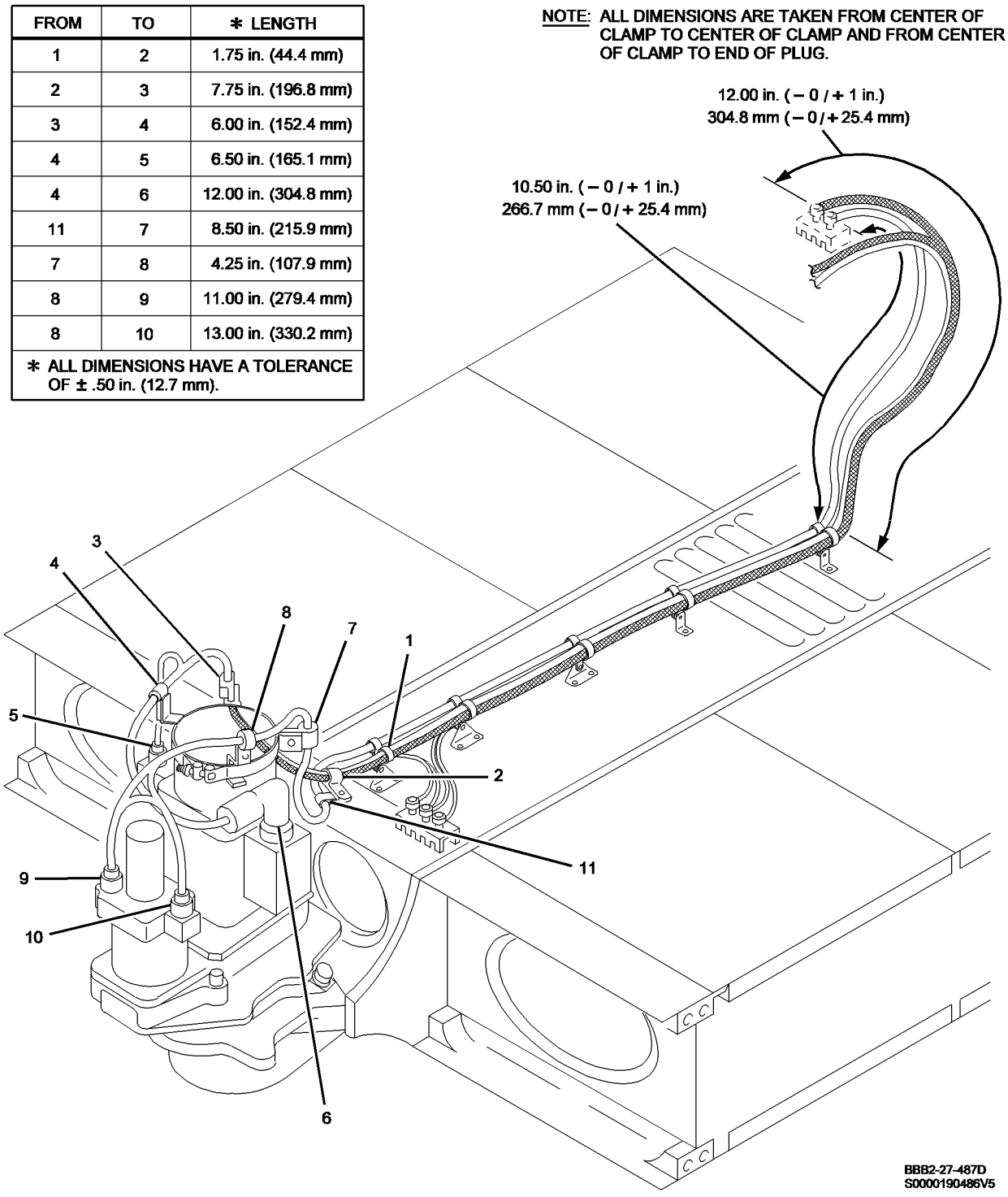
BBB2-27-314E
S0006535114V4

Longitudinal Trim Actuating Mechanism -- Removal/Installation
Figure 401/27-40-01-990-801 (Sheet 2 of 2)



Horizontal Stabilizer Restraining Fixture and Fairing Supports
Figure 402/27-40-01-990-803

FROM	TO	* LENGTH
1	2	1.75 in. (44.4 mm)
2	3	7.75 in. (196.8 mm)
3	4	6.00 in. (152.4 mm)
4	5	6.50 in. (165.1 mm)
4	6	12.00 in. (304.8 mm)
11	7	8.50 in. (215.9 mm)
7	8	4.25 in. (107.9 mm)
8	9	11.00 in. (279.4 mm)
8	10	13.00 in. (330.2 mm)
* ALL DIMENSIONS HAVE A TOLERANCE OF ± .50 in. (12.7 mm).		



Primary and Alternate Trim Motor - Wire Routing
Figure 403/27-40-01-990-816

WJE 401-404, 406-408, 410-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 881, 883, 886, 887, 892, 893; WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 884, 891 POST MD80-27-282

4. Removal/Installation Primary Longitudinal Trim Actuator Motor Heater Cap

A. Remove Heater Cap

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Remove and retain access doors 6315C and 6308C.

(3) Disconnect heater cap electrical connectors.

(4) Loosen clamp and remove heater cap.

B. Install Heater Cap

(1) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B

(Continued)

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Install heater cap and secure with clamp.

(3) Connect heater cap electrical connectors.

(4) Remove the safety tags and close these circuit breakers:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(5) Perform primary longitudinal trim actuator motor heater cap test. (Paragraph 5.)

WJE ALL

5. Adjustment/Test Primary Longitudinal Trim Actuator Motor Heater Cap

A. Test Primary Longitudinal Trim Actuator Motor Heater Cap

(1) Make sure that this circuit breaker is closed:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

(2) Attach clamp-on ammeter to either unnumbered wire from heater cap and measure current flow. Current flow should indicate 0.0 amps.

(3) Measure temperature of heater cap. Temperature should indicate more than 50°F (10°C).

(4) Apply ice or equivalent coolant around heater cap to actuate thermal switch.

(5) Note temperature of heater cap when ammeter shows current flow. Temperature should read 40 to 60°F (4.4 to 15.6°C).

(6) Measure current flow. Current flow should indicate 0.45 to 0.60 amps.

(7) Measure temperature of heater cap when ammeter indicates 0.0 amps. Temperature should indicate 100 to 140°F (37.8 to 60°C).

(8) Remove clamp-on ammeter.

(9) Install access doors 6315C and 6308C.

6. Removal/Installation Alternate Longitudinal Trim Actuator Motor

A. Remove Actuator Motor

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Disconnect electrical connectors from actuator and transformer-rectifier box.

(3) Remove actuator motor and gasket from gearbox mounting pad.

B. Install Actuator Motor

(1) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A

(Continued)

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Position gasket on gearbox mounting pad.

(3) Install actuator motor on gearbox with transformer-rectifier box on left side.

(4) Connect electrical connectors to transformer-rectifier box and actuator. Safety connectors with .020 lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(a) Ensure correct routing of electrical connector wire bundles to prevent chafing and electrical arcing as follows:(Figure 403)

1) Check all wire bundle lengths between clamps, starting from 1 thru 10.

a) If wire bundle lengths are incorrect, loosen clamps and adjust to correct lengths.

2) If disturbed, check wire bundles radius length at the transition from the horizontal center box to the vertical stabilizer.

a) If the radius length of the bundles are incorrect, loosen clamps and adjust to correct radius lengths.

(5) Remove the safety tags and close these circuit breakers:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(6) Check alternate longitudinal trim actuator motor. (LONGITUDINAL TRIM ACTUATOR MECHANISM - CHECK, PAGEBLOCK 27-40-01/601)

7. Removal/Installation Sandwich Gearbox

NOTE: Sandwich gearbox is applicable only to aircraft fuselage numbers 2180 and prior, without effects of All Operator Letter 9-2521, dated 12/19/1996. This A.O.L. installs an EEMCO Corp. motor/brake assembly which does not use the sandwich gearbox. Except for customer options specifying otherwise, aircraft fuselage numbers 2181 and subsequent will incorporate modified motor/brake assemblies (P.N. 846D100-3) without the sandwich gearbox.

A. Remove Gearbox

(1) Remove primary longitudinal trim actuator motor. (Paragraph 3.)

(2) Remove nuts and washers securing gearbox.

(3) Remove sandwich gearbox and gasket from longitudinal trim gearbox.

B. Install Gearbox

(1) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Install a new gasket with the sandwich gearbox on longitudinal trim gearbox using washers and nuts.

(3) Install primary longitudinal trim actuator motor on sandwich gearbox. (Paragraph 3.B.)

(4) Remove the safety tags and close these circuit breakers:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A

(Continued)

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(5) Check operation of gearbox. (LONGITUDINAL TRIM ACTUATOR MECHANISM - CHECK, PAGEBLOCK 27-40-01/601)

8. Removal/Installation Longitudinal Trim Gearbox

A. Remove Gearbox

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Remove primary longitudinal trim actuator motor. (Paragraph 3.A.)

(a) If necessary, remove sandwich gearbox. (Paragraph 7.A.)

(3) Remove alternate longitudinal trim actuator motor. (Paragraph 6.A.)

(4) Remove nuts from gearbox adapter ring.

(5) Remove gearbox from support.

(6) Install spheroidal spline drive adapter back in acme screw if adapter is removed with gearbox.

(7) Remove adapter ring from gearbox.

B. Install Gearbox

(1) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Check oil level in gearbox. (PAGEBLOCK 12-21-02/301).

(3) Install adapter ring on gearbox.

(4) Make certain that spheroidal spline drive adapter is installed properly in acme screw.

NOTE: Replace grease seal if spline drive adapter was disturbed during removal of gearbox.

(5) Install gearbox on support with output shaft of gearbox in spline drive adapter.

(a) If necessary install sandwich gearbox. (Paragraph 7.B.)

(6) Install primary longitudinal trim actuator motor on gearbox. (Paragraph 3.B.)

(7) Install alternate longitudinal trim actuator motor on gearbox. (Paragraph 6.B.)

(8) Remove the safety tags and close these circuit breakers:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(9) Check longitudinal trim gearbox. (PAGEBLOCK 27-40-01/601)

9. Removal/Installation Acme Screw and Nut

NOTE: Acme screw and nut are serialized with the same number and must be replaced in matched sets.

A. Remove Acme Screw and Nut

WARNING: BEFORE MOVING CONTROL WHEEL TRIM SWITCHES, MAKE CERTAIN AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(1) Move control wheel trim switches to position stabilizer approximately one degree Aircraft-Nose-Up (ANU).

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(3) Remove bolts (6) retaining vertical fairing supports (Ref. 1) to stabilizer inboard rib adjacent to forward support mounting bolts for acme screw, left and right sides. Remove and retain supports and attach bolts. (Figure 402)

(4) Disconnect electrical connectors from primary longitudinal trim actuator motor.

(5) Disconnect electrical connectors from alternate longitudinal trim actuator motor and transformer-rectifier box.

CAUTION: COMBINED WEIGHT OF GEARBOX AND ACTUATOR MOTORS IS APPROXIMATELY 46 POUNDS (20 KG).

(6) Remove nuts from gearbox adapter ring and remove gearbox and actuator motors from support. If necessary, motors can be removed before or with gearbox. (Paragraph 3.A. and Paragraph 7.A.)

(7) Install spheroidal spline drive adapter back in acme screw if adapter is not removed with gearbox.

(8) Disconnect trim indicating system follow-up cable link from attach crank on support.

(a) Remove trim indicating system follow-up cable attach crank from support.

(9) Install stabilizer restraining fixture. Connect fixture to fittings on vertical and horizontal stabilizer structures.

(10) Remove bolts from gimbal ring retaining pin flanges.

(11) Remove gimbal ring retaining pins as follows:

(a) Loosen support mounting bolts. Do not remove bolts at this time.

(b) Install bolts in threaded holes of retaining pins.

(c) Using bolts as pullers, remove retaining pins.

NOTE: Adjust the stabilizer restrain fixture up or down to remove effect of horizontal stabilizer weight to make pins easier to remove.

(12) Remove support mounting bolts and remove support, acme screw and nut, and gimbal ring.

(13) Remove bolts from retaining pins.

B. Install Acme Screw and Nut

(1) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Check that acme screw thread is free of grit or other foreign matter.

(3) Rotate nut and acme screw until lower stops contact.

(4) Position gimbal ring in support brackets on empennage structure. Make sure grease fitting points forward.

(5) Install support between horizontal stabilizer attach fittings.

NOTE: Install aft bolt on each side before installing four forward bolts (two each side).

(6) Tighten bolts to a torque value of 800 to 1140 inch-pounds (90.4 to 128.80 N·m).

(7) Align holes in gimbal ring and support bracket on empennage structure by rotating acme screw.

CAUTION: DO NOT ATTEMPT TO FORCE RETAINING PINS INTO POSITION. IF EXCESSIVE FORCE IS REQUIRED, GIMBAL RING AND ATTACHING FITTINGS MUST BE CHECKED FOR MISALIGNMENT.

(8) Deflect gimbal ring retaining pin spring clips and insert retaining pins.

(9) Install bolts in flanges of retaining pins and safety with .032 lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(10) Install trim indicating system follow-up cable attach crank on support.

(11) Install trim indicating system follow-up cable link on attach crank.

(12) Make sure that spheroidal spline drive adapter and grease seal are installed in acme screw.

(13) Install gearbox and actuator motors on support with output shaft of gearbox in spline drive adapter. If gearbox and actuator motors were removed separately, install actuator motors. (Paragraph 3.B.) (Paragraph 6.B.)

(14) Connect electrical connectors to primary actuator motor. Safety connectors with .020 lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(a) Ensure correct routing of electrical connector wire bundles to prevent chafing and electrical arcing as follows:(Figure 403)

1) Check all wire bundle lengths between clamps, starting from 1 thru 10.

a) If wire bundle lengths are incorrect, loosen clamps and adjust to correct lengths.

2) If disturbed, check wire bundles radius length at the transition from the horizontal center box to the vertical stabilizer.

a) If the radius length of the wire bundles are incorrect, loosen clamps and adjust to correct radius lengths.

(15) Connect electrical connectors to transformer-rectifier box and alternate actuator motor. Safety connectors with .020 lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(a) Ensure correct routing of electrical connector wire bundles to prevent chafing and electrical arcing as follows:(Figure 403)

1) Check all wire bundle lengths between clamps, starting from 1 thru 10.

a) If radius length of the wire bundles are incorrect, loosen clamps and adjust to correct lengths.

2) If disturbed, check wire bundles radius length at the transition from the horizontal center box to the vertical stabilizer.

a) If the radius length of the wire bundles are incorrect, loosen clamps and adjust to correct radius lengths.

(16) Install left and right vertical fairing supports using retained bolts (Ref. 1). (Figure 402)

(17) Remove stabilizer restraining fixture.

(18) Lubricate actuator assembly as applicable. (PAGEBLOCK 12-21-02/301)

(19) Check the horizontal stabilizer actuator assembly wear. (LONGITUDINAL TRIM ACTUATOR MECHANISM - CHECK, PAGEBLOCK 27-40-01/601)

(20) Test trim indicating system and shutoff controls. (PAGEBLOCK 27-40-00/501)

(21) Remove the safety tags and close these circuit breakers:

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	9	B1-971	PRIMARY TRIM MOTOR HEATER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(22) Check acme screw and nut operation. (PAGEBLOCK 27-40-01/601)

LONGITUDINAL TRIM ACTUATOR MECHANISM - REMOVAL/INSTALLATION

1. General

A. This procedure contains MSG-3 task card data.

TASK 27-40-01-902-801

2. Restoration of the Primary Trim Motor Relays

A. References

Reference	Title
27-40-04 P/B 401	PRIMARY LONGITUDINAL TRIM CONTACTORS AND MANUAL OVERRIDE AND SHUTOFF CONTROL - REMOVAL/INSTALLATION
27-40-04 P/B 501	PRIMARY LONGITUDINAL TRIM CONTACTORS AND MANUAL OVERRIDE AND SHUTOFF CONTROL - ADJUSTMENT/TEST

B. Restore the Primary Trim Motor Relays

SUBTASK 27-40-01-902-001

(1) Do a restoration of the primary trim motor relays.

(a) Remove the primary trim motor relays. (PRIMARY LONGITUDINAL TRIM CONTACTORS AND MANUAL OVERRIDE AND SHUTOFF CONTROL - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-04/401)

SUBTASK 27-40-01-510-001

(2) Send the primary trim motor relays to the shop for restoration.

SUBTASK 27-40-01-420-001

(3) Install the primary trim motor relays. (PRIMARY LONGITUDINAL TRIM CONTACTORS AND MANUAL OVERRIDE AND SHUTOFF CONTROL - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-04/401)

SUBTASK 27-40-01-720-001

(4) Do a functional check of the primary trim motor relays. (PRIMARY LONGITUDINAL TRIM CONTACTORS AND MANUAL OVERRIDE AND SHUTOFF CONTROL - ADJUSTMENT/TEST, PAGEBLOCK 27-40-04/501)

C. Job Close-up

SUBTASK 27-40-01-942-002

(1) Remove all the tools and equipment from the work area. Make sure the area is clean.

END OF TASK

LONGITUDINAL TRIM ACTUATOR MECHANISM - ADJUSTMENT/TEST

1. General

A. This procedure contains MSG-3 task card data.

TASK 27-40-01-710-801

2. Operational Check of the Primary Trim Motor Heater

NOTE: This procedure is a scheduled maintenance task.

A. Tools/Equipment

Reference	Description
STD-85	Ammeter - Clamp-on
STD-1429	Thermometer - Digital

B. Consumable Materials

NOTE: Equivalent replacements are permitted for the items that follow.

NOTE: It is possible that some materials in the Consumable Materials chart cannot be used for some or all of the necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Reference	Description	Specification
G60147	Ice - Dry	DPM 5476

C. Prepare for the Operational Check of the Primary Trim Motor Heater

SUBTASK 27-40-01-865-003

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	24	B10-353	AUTOPILOT-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

E	12	B10-354	AUTOPILOT-2

WJE ALL

SUBTASK 27-40-01-010-002

(2) Open access panels.

D. Operational Check of the Primary Trim Motor Heater

SUBTASK 27-40-01-710-001

(1) Do an operational check of the primary trim motor heater.

(a) Attach a clamp-on ammeter, STD-85 to either unnumbered wire from the heater cap and measure current flow. Current flow should indicate 0.0 amps.

(b) Use a digital thermometer, STD-1429 and measure the temperature of heater cap. The temperature should indicate more than 50°F (10°C).

(c) Apply dry ice, G60147 or equivalent coolant around heater cap to actuate thermal switch.

(d) Note the temperature of the heater cap when ammeter shows current flow. The temperature should read 40°F (4°C) to 60°F (16°C).

(e) Measure the current flow. Current flow should indicate 0.45 to 0.60 amps.

(f) Measure temperature of heater cap when ammeter indicates 0.0 amps. Temperature should indicate 100°F (38°C) to 140°F (60°C).

E. Job Close-up

SUBTASK 27-40-01-020-001

(1) Remove clamp-on ammeter.

SUBTASK 27-40-01-865-002

(2) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	24	B10-353	AUTOPILOT-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893			
E	12	B10-354	AUTOPILOT-2

WJE ALL

(3) Remove all the tools and equipment from the work area. Make sure the area is clean.

(4) Install access doors.

END OF TASK

LONGITUDINAL TRIM ACTUATOR MECHANISM - CHECK

1. General

A. The longitudinal trim actuator mechanism is located in the vertical stabilizer immediately forward of the horizontal stabilizer. Access to the mechanism is through the top of the vertical stabilizer leading edge; access doors in the side of the vertical stabilizer and on upper surface of horizontal stabilizer leading edge; and the horizontal stabilizer fairing on each side of the airplane.

WARNING: THE SAFETY BELT LUG DOES NOT MEET CURRENT FALL PROTECTION REQUIREMENTS. DO NOT USE THE SAFETY BELT LUG FOR FALL PROTECTION. OTHER METHODS MUST BE USED TO ENSURE ADEQUATE FALL PROTECTION.

B. A safety belt attachment lug is located on top of vertical stabilizer for use by personnel performing maintenance in area of actuator mechanism.

C. When moving the horizontal stabilizer with either primary or alternate control handles, operate both primary or both alternate control handles simultaneously in the same direction to the noseup or nosedown position. This procedure insures proper synchronization of brake switch and motor contactor operation.

D. Procedures for checking the actuator mechanism components are described separately in 3 as follows:

Table 601

A	Primary longitudinal trim actuator motor
B	Alternate longitudinal trim actuator motor
C	Gearbox
D	Acme screw and nut operation
E	Acme screw and nut wear

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 602

Name and Number	Manufacturer
Horizontal stabilizer restraining fixture	The Boeing Co.
WJE 412, 414, 420, 422, 424, 427, 429, 891	
4916750-1	
WJE 401-412, 414-419, 421, 423, 425, 426, 861-866, 868, 869, 871-875, 877-881, 883, 884, 886, 887, 892, 893	
4916750-503 or 4916750-501	
WJE ALL	
Dial indicator (196)	Starrett

Table 602 (Continued)

Name and Number	Manufacturer
Lubricant, oil preservative VV-L-800 DPM 5481 MIL-PRF-32033	Castrol Industrial North America, Inc.
Lockwire, NASM20995N51, DPM684*[1]	Not specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. **Check Longitudinal Trim Actuator Motor**

A. Check Primary Longitudinal Trim Actuator Motor

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE). DO NOT ALLOW TRIM ACTUATOR STOPS TO CONTACT. REPEATED CONTACT OF STOPS CAN CAUSE DAMAGE TO STOPS, GEARBOXES, AND ACTUATOR MOTOR.

(1) Move both primary longitudinal trim control handles to noseup position. Check that horizontal stabilizer leading edge moves downward. Release handles, stabilizer should stop moving and handles should return to neutral position.

(2) Move both primary longitudinal trim control handles to nosedown position. Check that horizontal stabilizer leading edge moves upward. Release handles, stabilizer should stop moving and handles should return to neutral position.

(3) Move inboard primary longitudinal trim control handle to noseup and then to nosedown position. Check that horizontal stabilizer remains stationary. Repeat using opposite trim handle.

(4) Move both primary longitudinal trim control switches on captain's aileron control wheel to nosedown position, then release. Check that horizontal stabilizer leading edge moves upward.

(5) Move both primary longitudinal trim control switches on Captain's aileron control wheel to noseup position, then release. Check that horizontal stabilizer leading edge moves downward.

(6) Momentarily move captain's right aileron control wheel switch to nosedown position. Check that horizontal stabilizer remains stationary.

(7) Repeat Paragraph 3.A.(3), Paragraph 3.A.(4) and Paragraph 3.A.(5) using First Officer's primary longitudinal aileron control wheel switches.

(8) Return horizontal stabilizer to neutral position.

B. Check Alternate Longitudinal Trim Actuator Motor

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE). DO NOT ALLOW TRIM ACTUATOR STOPS TO CONTACT. REPEATED CONTACT OF STOPS CAN CAUSE DAMAGE TO STOPS, GEARBOXES, AND ACTUATOR MOTOR.

(1) Move both alternate longitudinal trim control levers, located on control pedestal, to aircraft noseup position; check that horizontal stabilizer leading edge moves down.

(2) Move both alternate longitudinal trim control levers to aircraft nosedown position; check that horizontal stabilizer leading edge moves up.

(3) Using both alternate longitudinal trim control levers, return horizontal stabilizer to neutral position.

C. Check Gear Box

WARNING: BEFORE MOVING CONTROL WHEEL TRIM SWITCHES, MAKE CERTAIN AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING THE STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE).

(1) Move both primary longitudinal trim control wheel switches, located on outboard horn of aileron control wheel, to aircraft noseup position; hold until shutoff functions. Check rate of horizontal stabilizer movement is approximately 1/3° per second.

(2) Move both primary longitudinal trim control wheel switches to aircraft nosedown position; hold until shutoff functions. Check that rate of horizontal stabilizer movement is approximately 1/3° per second.

(3) Move both alternate longitudinal trim control levers, located on control pedestal, to aircraft noseup position; hold until shutoff functions. Check that rate of horizontal stabilizer movement is approximately 1/10° per second.

(4) Move both alternate longitudinal trim control levers to aircraft nosedown position; hold until shutoff functions. Check that rate horizontal stabilizer movement is approximately 1/10° per second.

(5) Using both alternate longitudinal trim control levers, return horizontal stabilizer to neutral position.

D. Horizontal Stabilizer Actuator Jackscrew Installation - General Visual Inspection

(1) Open the following door and panel to gain access to the work area:

- 3701A Upper End Horizontal Stabilizer Actuator.
- 6701A Lower End Horizontal Stabilizer Actuator.

(2) Perform an inspection of the horizontal stabilizer actuator jackscrew installation. Conditions to check for, and their corrective actions, include the following:

(a) Inspect for damaged upper and lower ACME screw and nut rotational stops (total of four places). If damage is found, replace the horizontal stabilizer actuator screw and support assembly (ACME screw and nut) with a serviceable unit. (LONGITUDINAL TRIM ACTUATOR MECHANISM - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-01/401)

(b) Inspect for missing or broken lockwire on the torque tube nut located at the lower end of the ACME screw. If the lockwire is unserviceable, replace the horizontal stabilizer actuator screw and support assembly (ACME screw and nut) with a serviceable unit. (LONGITUDINAL TRIM ACTUATOR MECHANISM - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-01/401)

NOTE: The torque tube nut has left-handed threads, and is properly safetied with two separate double-wire safeties made with .051 lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(c) Inspect for corrosion or damage, especially raised sharp edges (burrs), on all ACME screw threads not covered by the upper and lower rotation stops. If unserviceable ACME screw threads are found, replace the horizontal stabilizer actuator screw and support assembly (ACME screw and nut) with a serviceable unit. (LONGITUDINAL TRIM ACTUATOR MECHANISM - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-01/401)

(d) Inspect for foreign materials on the jackscrew and within the structural compartments surrounding the jackscrew. Such materials include metal fragments larger than 0.125 inch in any dimension and materials such as abrasive blast media, dirt, or sand. If foreign materials are found, do the following:

CAUTION: DO NOT ALLOW SOLVENT CONTACT WITH THE JACKSCREW.

1) Thoroughly clean all foreign materials from the jackscrew and the structural compartments.
2) Re-inspect the ACME screw threads. (Paragraph 3.D.(2)(c))
3) Perform check of ACME screw and nut wear. (Paragraph 3.F.)

(e) Close the following door and panel:

- 3701A Upper End Horizontal Stabilizer Actuator
- 6701A Lower End Horizontal Stabilizer Actuator

E. Check Acme Screw and Nut Operation

WARNING: BEFORE MOVING CONTROL WHEEL TRIM SWITCHES, MAKE CERTAIN AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING THE STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE).

(1) Move both primary longitudinal trim control wheel switches, located on outboard horn of aileron control wheel, to aircraft noseup position; hold until shutoff functions.

(2) Check that horizontal stabilizer is at 12.2°. Dimension (BG) should be 12.86 ±0.16 in. (326.64 ±4.07 mm). (Figure 601)

(3) Using control wheel trim switches, run horizontal stabilizer in aircraft nosedown (AND) direction until shutoff functions.

(4) Check that horizontal stabilizer is at 2.1°. Dimension (BG) should be 1.32 ±0.14 in. (33.53 ±3.56 mm).

(5) Using control wheel trim switches, return horizontal stabilizer to neutral position.

F. Check Acme Screw and Nut Wear

(Figure 601)

(1) Using control wheel trim switches, move horizontal stabilizer to approximately 1° Aircraft-Nose-Up (ANU) position.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(3) Remove panel and stabilizer fairing to gain access to work area.

(4) Clamp dial indicator mounting bracket to lower stop on jackscrew and position dial indicator probe against Acme nut. (Figure 601, View A)

(5) Clamp dial indicator mounting bracket to upper stop on jackscrew and position dial indicator probe against lower plate of support assembly. (Figure 601, View C)

(6) Install horizontal stabilizer restraining fixture. (Figure 601, View B)

NOTE: Prior to installation, restraining fixture should be checked for general condition and freedom of operation. Fixture should be free of defects such as damaged or contaminated threads that could restrict movement. Fixture ends must rotate easily, using light hand effort, through entire range of travel.

WJE 401-412, 414-419, 421, 423, 425, 426, 861-866, 868, 869, 871-875, 877-881, 883, 884, 886, 887, 892, 893

(a) Install bracket on lower surface of horizontal stabilizer at leading edge.

WJE ALL

WARNING: LUBRICANT IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN LUBRICANT IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET LUBRICANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE MIST.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

(b) Ensure restraining fixture threads are clean and lubricated with lubricant (VV-L-800, DPM 5481).

WJE 412, 414, 420, 422, 424, 427, 429, 891

(c) Install 4916750-1 restraining fixture between brackets.

NOTE: If 4916750-1 fixture is not available, the 4916750-501 or -503 can be used, by not using removable upper mounting bracket.

WJE 401-412, 414-419, 421, 423, 425, 426, 861-866, 868, 869, 871-875, 877-881, 883, 884, 886, 887, 892, 893

(d) Install 4916750-503 or 4916750-501 restraining fixture.

WJE ALL

(7) Prevent Acme screw from rotating during each torquing step.

NOTE: A wrench may be used on lower torque tube nut to prevent screw rotation.

(8) Do these steps to apply torque to the restraining fixture.

(a) Apply 100 in-lb (11 N·m) torque to restraining fixture in lengthening direction.

(b) Preload both indicator probes to as least 0.100 in. (2.540 mm) while maintaining probe preload, adjust dials to read zero.

(c) Apply 300 in-lb (34 N·m) torque to restraining fixture in shortening direction.

(d) Preload both indicator probes to at least 0.100 in. (2.540 mm) while maintaining probe preload and check that dial indicator has returned to zero preload reading.

(9) Perform the previous step several times to insure consistent results (within 0.001 in. (0.025 mm)).

(10) With 300 in-lb (34 N·m) torque applied to restraining fixture in shortening direction, record dial indicator readings.

(11) Check that end play limits are not less than 0.003 in. (0.076 mm) and not more than 0.040 in. (1.016 mm) (Refer to Figure 601 View A). Readings in excess of above are cause for replacement of horizontal stabilizer actuator assembly. (PAGEBLOCK 27-40-01/401)

(12) Check that free play between jackscrew and upper support does not exceed 0.010 in. (0.254 mm) (Refer to Figure 601 View C). If free play does exceed that dimension, replace horizontal stabilizer actuator assembly. (PAGEBLOCK 27-40-01/401)

(13) Release load and remove restraining fixture, dial indicators, and attaching bracket and clamps.

(14) Lubricate horizontal stabilizer. (FLIGHT CONTROLS - LUBRICATION, PAGEBLOCK 12-21-02/301)

(15) Install stabilizer fairing and panel.

(16) Remove the safety tags and close these circuit breakers:

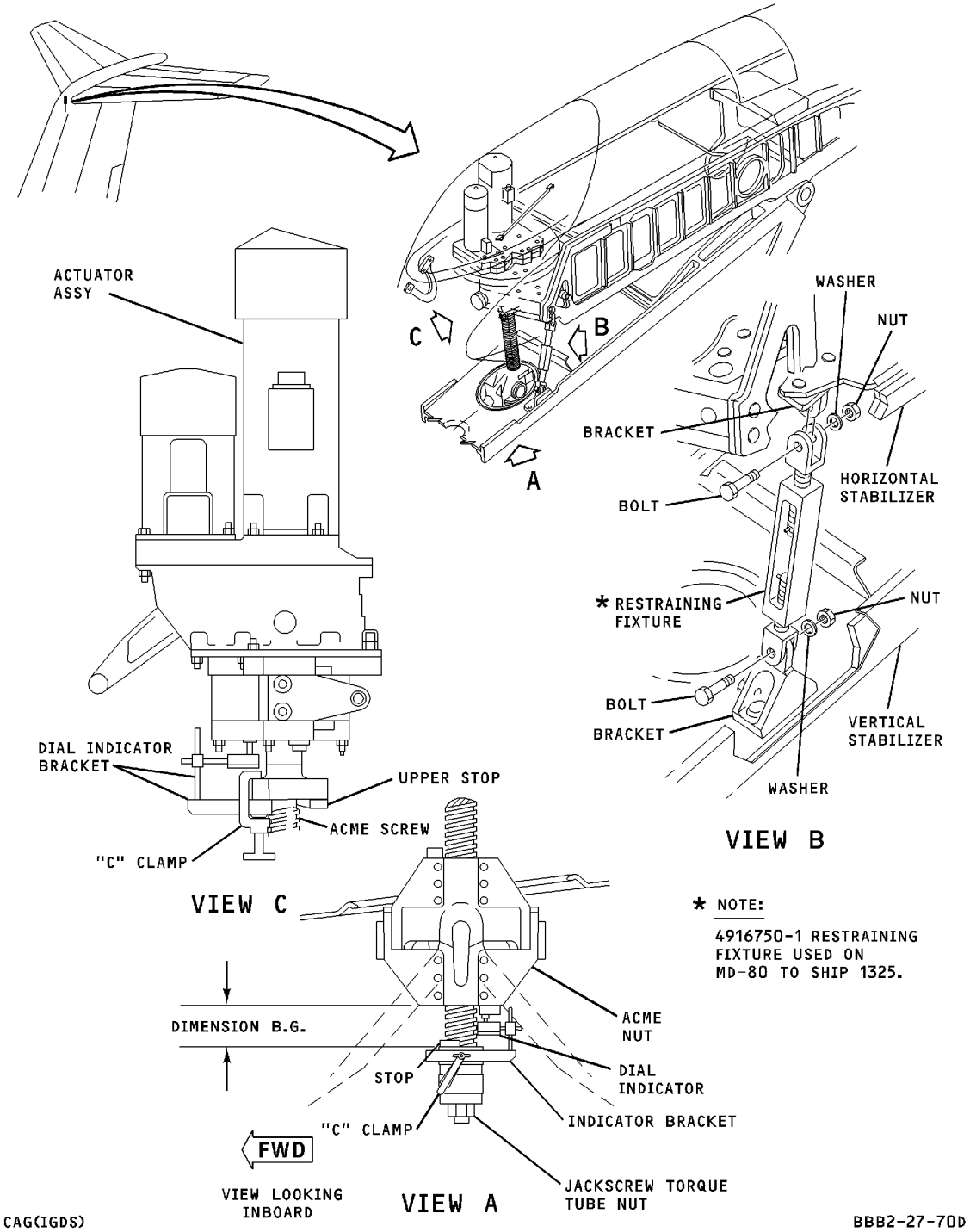
UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

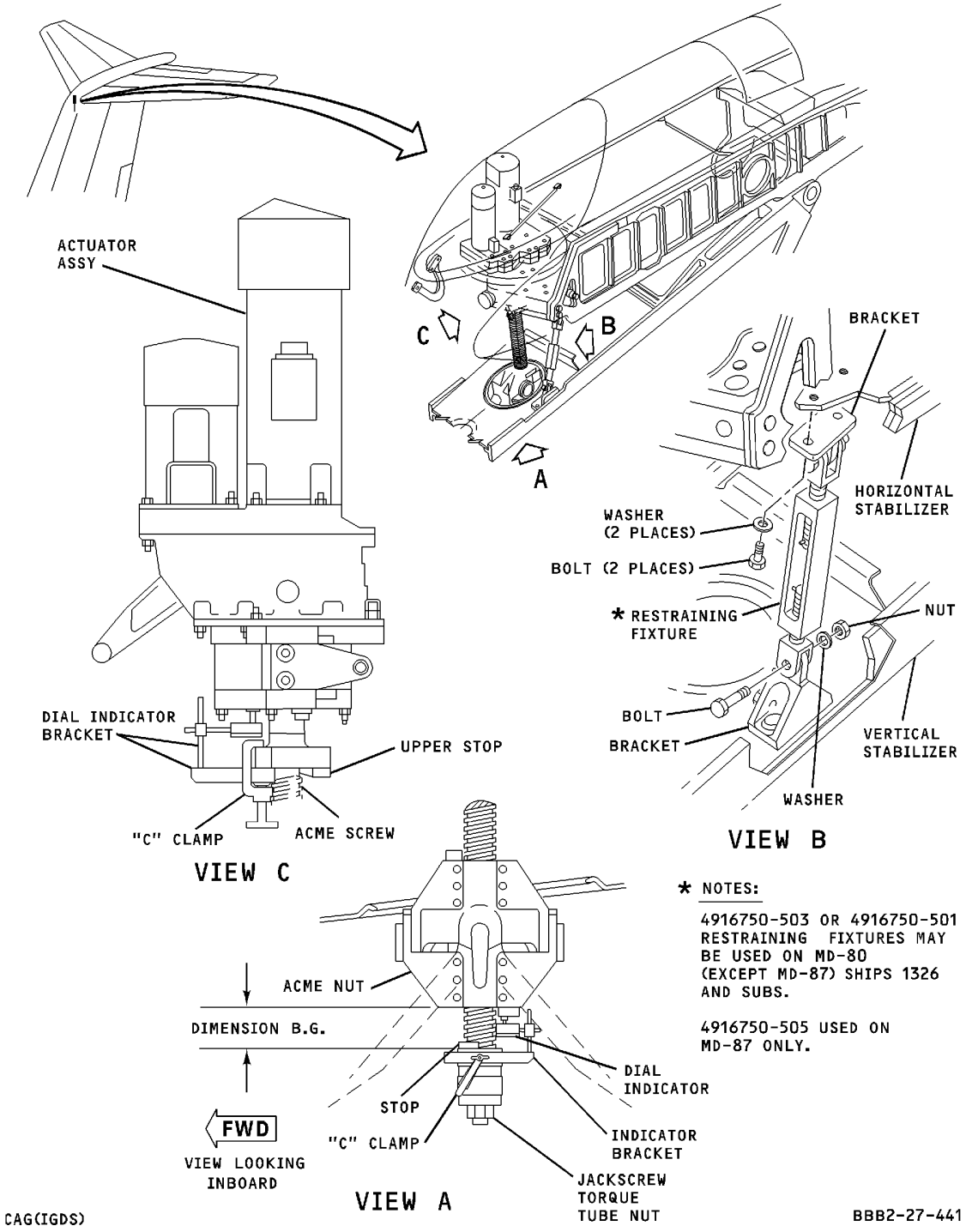
UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(17) Return horizontal stabilizer to neutral.



Horizontal Stabilizer Actuator Wear Check
Figure 601/27-40-01-990-810 (Sheet 1 of 2)



Horizontal Stabilizer Actuator Wear Check
Figure 601/27-40-01-990-810 (Sheet 2 of 2)

LONGITUDINAL TRIM ACTUATOR MECHANISM - INSPECTION/CHECK

1. General

A. This procedure contains MSG-3 task card data.

TASK 27-40-01-211-801

2. Detailed Inspection of the Acme Screw and Nut

A. References

Reference	Title
20-10-18 P/B 201	LOCKWIRE SAFETYING - MAINTENANCE PRACTICES
27-40-00 P/B 001	HORIZONTAL STABILIZER - DESCRIPTION AND OPERATION
27-40-01 P/B 401	LONGITUDINAL TRIM ACTUATOR MECHANISM - REMOVAL/INSTALLATION
27-40-01 P/B 601	LONGITUDINAL TRIM ACTUATOR MECHANISM - CHECK

B. Prepare for the Detailed Inspection of the Acme Screw and Nut

SUBTASK 27-40-01-010-001

(1) Using control wheel trim switches, move horizontal stabilizer to approximately 1° aircraft nose up (ANU) position. (HORIZONTAL STABILIZER - DESCRIPTION AND OPERATION, PAGEBLOCK 27-40-00/001)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B10-92	PRIMARY LONGITUDINAL TRIM PHASE A
		B10-93	PRIMARY LONGITUDINAL TRIM PHASE B
		B10-94	PRIMARY LONGITUDINAL TRIM PHASE C

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	24	B10-353	AUTOPILOT-1
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893			
E	12	B10-354	AUTOPILOT-2

WJE ALL

(3) Open access panels.

C. Detailed Inspection of the Acme Screw and Nut

SUBTASK 27-40-01-211-001

(1) Do the detailed inspection of the acme screw and nut.

(a) Inspect for damaged upper and lower ACME screw and nut rotational stops (total of four places). (LONGITUDINAL TRIM ACTUATOR MECHANISM - CHECK, PAGEBLOCK 27-40-01/601)

(b) Inspect for missing or broken safety wire on the torque tube nut located at the lower end of the ACME screw (LONGITUDINAL TRIM ACTUATOR MECHANISM - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-01/401). If the safety wire is unserviceable, replace the horizontal stabilizer actuator screw and support assembly (ACME screw and nut) with a serviceable unit. (LONGITUDINAL TRIM ACTUATOR MECHANISM - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-01/401)

NOTE: The torque tube nut has left-hand threads, and is properly safe tied with two separate doublewire safeties made with 0.051-inch-diameter inconel or corrosion-resistant steel lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(c) Inspect for corrosion or damage, especially raised sharp edges (burrs), on all ACME screw threads not covered by the upper and lower rotational stops. If unserviceable ACME screw threads are found, replace the horizontal stabilizer actuator screw and support assembly (ACME screw and nut) with a serviceable unit. (LONGITUDINAL TRIM ACTUATOR MECHANISM - CHECK, PAGEBLOCK 27-40-01/601)

(d) Inspect for foreign materials (presence of metallic particles including slivers and dust, as well as shavings and flakes in the lubrication of the jackscrew assembly) on the jackscrew and within the structural compartments surrounding the jackscrew. Such materials include metal fragments larger than 0.125 inch in any dimension and materials such as abrasive blast media, dirt, or sand.

D. Job Close-up

SUBTASK 27-40-01-942-001

(1) Remove all the tools and equipment from the work area. Make sure the area is clean.

(2) Close access panels.

SUBTASK 27-40-01-865-001

(3) Remove the safety tags and close these circuit breakers:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B10-92	PRIMARY LONGITUDINAL TRIM PHASE A
		B10-93	PRIMARY LONGITUDINAL TRIM PHASE B
		B10-94	PRIMARY LONGITUDINAL TRIM PHASE C

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	24	B10-353	AUTOPILOT-1
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893			
E	12	B10-354	AUTOPILOT-2

WJE ALL

(4) Using control wheel trim switches, return horizontal stabilizer to neutral. (HORIZONTAL STABILIZER - DESCRIPTION AND OPERATION, PAGEBLOCK 27-40-00/001)

——— END OF TASK ———

PRIMARY LONGITUDINAL TRIM CONTROL WHEEL SWITCHES - MAINTENANCE PRACTICES

1. General

A. Two primary longitudinal control wheel switches are located in the outboard horn of each aileron control wheel. The removal and installation procedures for the captain's and the first officer's control wheel switches are identical.

2. Removal/Installation Primary Longitudinal Trim Control Wheel Switches

A. Remove Control Wheel Switches

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Remove screws holding switch bracket in horn of control wheel.

(3) Remove switches and bracket from control wheel and disconnect electrical leads from switches. Tag leads to provide identification for installation.

(4) Remove bracket from switches.

B. Install Control Wheel Switches

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B

(Continued)

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Install bracket on switches.

(3) Connect electrical leads to switch terminals. Make certain that all wires are connected properly. (Ref. Wiring Diagram Manual).

(4) Install bracket and switches in control wheel.

(5) Remove the safety tags and close these circuit breakers:

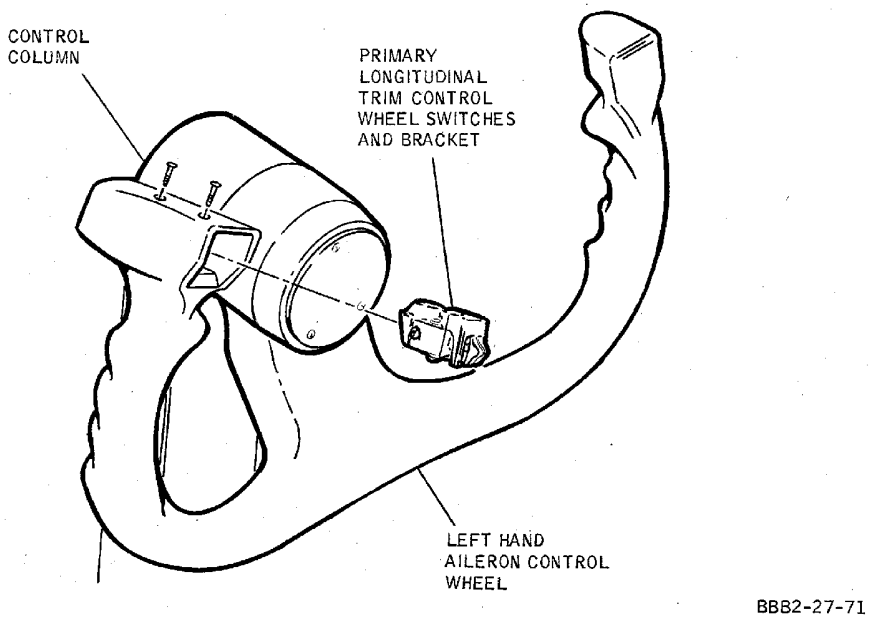
UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(6) Test control wheel switches. (Paragraph 3.) (Figure 201)



Primary Longitudinal Trim Control Wheel Switches -- Removal/Installation
Figure 201/27-40-02-990-801

3. **Adjustment/Test Primary Longitudinal Trim Control Wheel Switches**

A. Test Control Wheel Switches

WARNING: BEFORE MOVING CONTROL WHEEL TRIM SWITCHES, MAKE CERTAIN AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE).

(1) Move both primary longitudinal trim wheel switches in captain's aileron control wheel to aircraft noseup position. Check that horizontal stabilizer leading edge moves down.

(2) Move both switches in captain's wheel to aircraft nosedown position. Check that horizontal stabilizer leading edge moves up.

(3) Move both switches in first officer's wheel to aircraft noseup position. Check that horizontal stabilizer moves down.

(4) Move both switches in first officer's wheel to aircraft nosedown position. Check that horizontal stabilizer moves up.

(5) Move both switches in first officer's wheel to aircraft noseup position, when horizontal stabilizer begins to move, move both switches in captain's wheel to aircraft nosedown position. Stabilizer should stop moving when captain's switches are moved.

(6) Move both switches in first officer's wheel to aircraft nosedown position, when horizontal stabilizer begins to move, move both switches in captain's wheel to aircraft noseup position. Stabilizer should stop moving when captain's switches are moved.

(7) Move both switches in captain's wheel to aircraft noseup position, when horizontal stabilizer begins to move, move both switches in first officer's wheel to aircraft nosedown position. Stabilizer should stop moving when first officer's switches are moved.

(8) Move both switches in captain's wheel to aircraft nosedown position, when horizontal stabilizer begins to move, move both switches in first officer's wheel to aircraft noseup position. Stabilizer should stop moving when first officer's switches are moved.

PRIMARY LONGITUDINAL TRIM BRAKE CONTROL RELAYS - MAINTENANCE PRACTICES

1. General

A. Two primary longitudinal trim brake control relays are located in the forward lower cargo compartment. Access to the relays is through the removable cargo compartment liner forward of the forward cargo compartment door.

B. The forward brake control relay is for aircraft nosedown trim and the aft brake control relay is for aircraft noseup trim. Removal and installation procedures for the aircraft nosedown and aircraft noseup brake control relays are identical.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 201

Name and Number	Manufacturer
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Primary Longitudinal Brake Control Relays

A. Remove Brake Control Relay

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Remove electrical connector from relay.

(3) Remove relay from intercostal.

B. Install Brake Control Relay

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Install relay on intercostal.

(3) Install electrical connector on relay and safety connector with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(4) Remove the safety tags and close these circuit breakers:

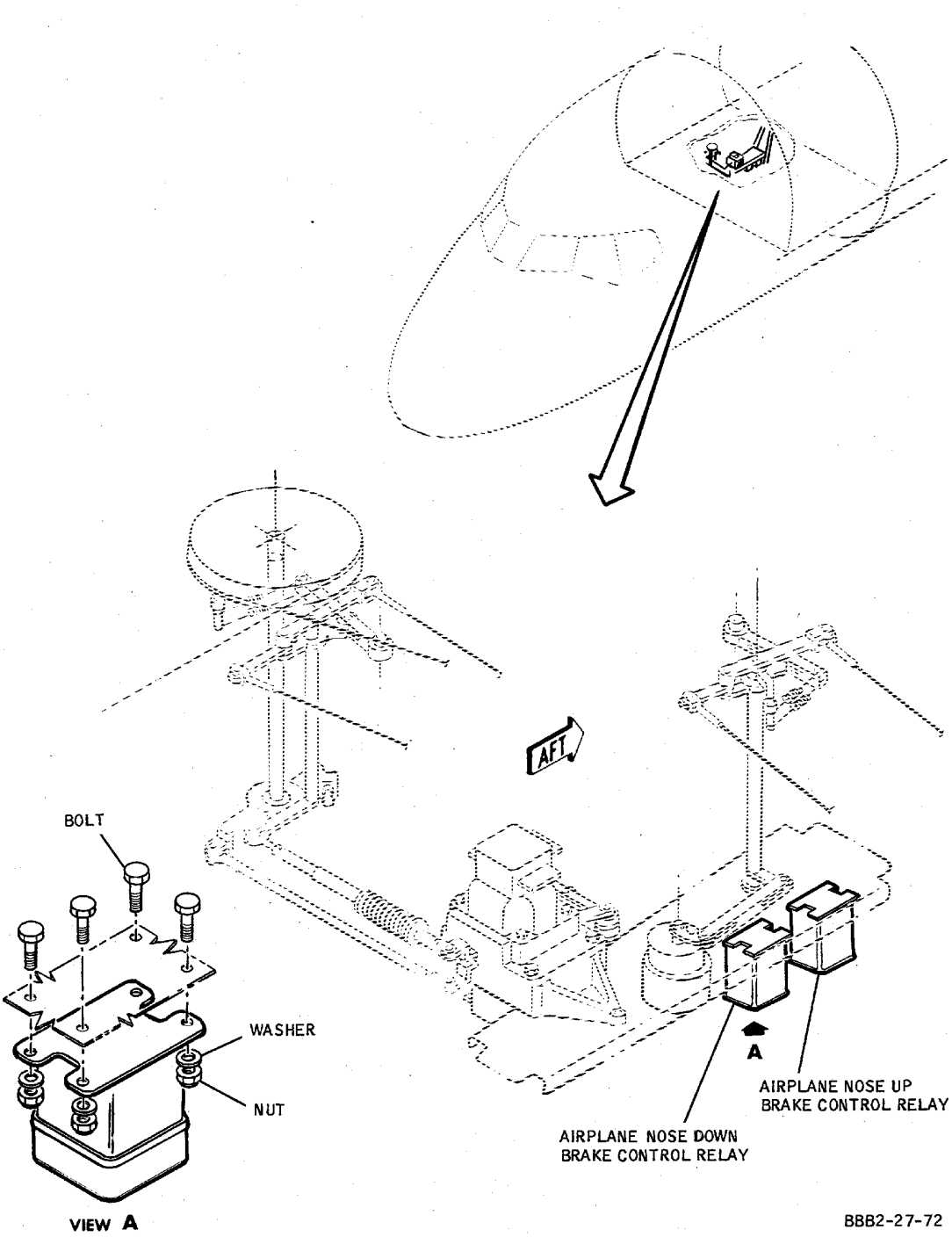
UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(5) Test primary longitudinal trim brake control relay. (Paragraph 4.)



Primary Longitudinal Trim Brake Control Relays -- Removal/Installation
Figure 201/27-40-03-990-801

4. **Adjustment/Test Primary Longitudinal Trim Brake Control Relays**

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE).

A. Test Brake Control Relay

WARNING: BEFORE MOVING CONTROL WHEEL TRIM SWITCHES, MAKE CERTAIN AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(1) Place both primary longitudinal trim control switches in either aileron control wheel to aircraft noseup position. Check that horizontal stabilizer leading edge moves downward.

(2) Place both switches in either control wheel to aircraft nosedown position. Check that horizontal stabilizer leading edge moves upward.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE).

(3) Place right switch in either control wheel to aircraft noseup position. Check that horizontal stabilizer remains stationary.

(4) Place right switch in either control wheel to aircraft nose-down position. Check that horizontal stabilizer remains stationary.

(5) Place both primary longitudinal trim control switches on first officer's aileron control wheel to noseup position. When horizontal stabilizer position indicator on control pedestal begins to move, place both primary longitudinal trim control switches on captain's control wheel to nosedown position. Indicator should stop moving when captain's switches are moved.

(6) Place both primary longitudinal trim control switches on first officer's aileron control wheel to nosedown position. When horizontal stabilizer position indicator begins to move, place both primary longitudinal trim control switches in captain's aileron control wheel to noseup position. Indicator should stop moving when captain's switches are moved.

(7) Place both primary longitudinal trim control switches on captain's aileron control wheel to noseup position. When horizontal stabilizer position indicator begins to move, place both primary longitudinal trim control switches on first officer's aileron control wheel to nosedown position. Indicator should stop moving when first officer's switches are moved.

(8) Place both primary longitudinal trim control switches on captain's aileron control wheel to nosedown position. When horizontal stabilizer position indicator begins to move, place both primary longitudinal trim control switches in first officer's aileron control wheel to noseup position. Indicator should stop moving when first officer's switches are moved.

(9) Place both primary longitudinal trim control switches, on captain's aileron control wheel in either direction. When stabilizer motion is observed, place primary trim brake switch, on control pedestal, to STOP position. Stabilizer motion should stop. If stabilizer motion continues either trim brake or trim brake switch has failed.

(10) To determine if trim brake or trim brake switch is malfunctioning perform following steps:

(a) Place trim brake switch, on control pedestal, in NORMAL position.

(b) Move both primary longitudinal trim control switches in captains aileron control wheel in either direction.

(c) When stabilizer motion is observed open PRIMARY LONGITUDINAL TRIM-BRAKE circuit breaker, located on upper main circuit breaker panel.

CAUTION: DO NOT STALL TRIM BRAKE MOTOR FOR PERIOD EXCEEDING 5 SECONDS.

(d) If stabilizer motion continues, primary trim motor brake is defective.

(e) Close PRIMARY LONGITUDINAL TRIM-BRAKE circuit breakers.

(f) If stabilizer motion ceases, primary trim brake switch is defective.

(11) Repeat Paragraph 4.A.(9) and Paragraph 4.A.(10) using primary longitudinal trim control switches in first officers aileron control wheel.

(12) After test is completed, and also after primary trim brake switch replacement, perform the following:

(a) Place primary trim brake switch to NORMAL position.

(b) Safety switch guard with 0.020 soft copper lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Do not twist wire between switch handle and screw head.

(13) Return stabilizer to neutral position.

PRIMARY LONGITUDINAL TRIM CONTACTORS AND MANUAL OVERRIDE AND SHUTOFF CONTROL - REMOVAL/INSTALLATION

1. General

A. The primary longitudinal trim contactors and manual override and shutoff control are located in the forward lower cargo compartment. Access to the contactors and manual override and shutoff control is through the removable compartment liner for-ward of the forward cargo compartment door.

B. The aircraft noseup trim contactor is located on the top of the manual override and shutoff control, and the aircraft nose-down contactor is located on the bottom. Removal and installation procedures are identical for the aircraft noseup and aircraft nosedown trim contactors.

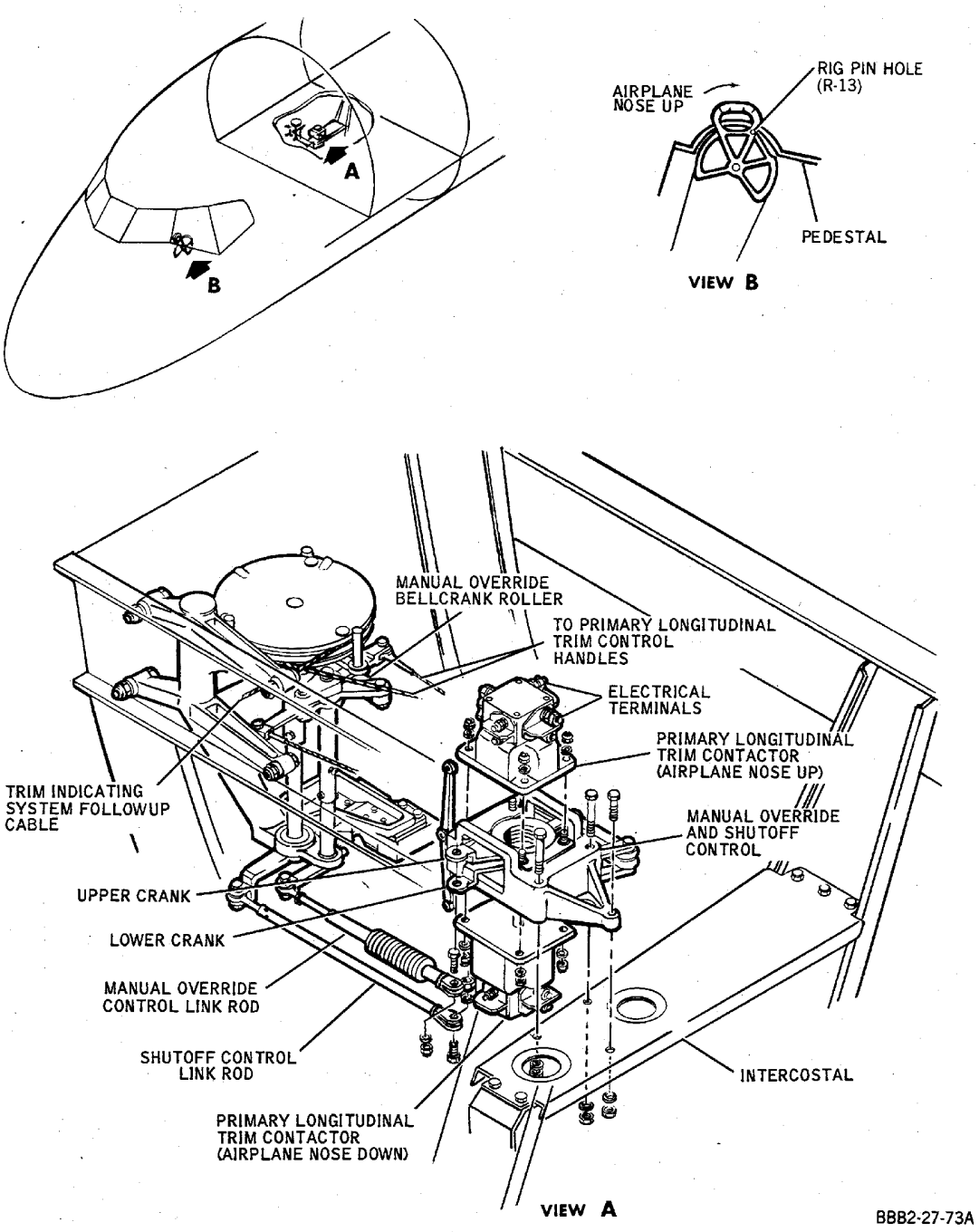
2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following items:

Table 401

Name and Number	Manufacturer
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified
Rig pin (4-3) 1/4 by 3 5/8 (6.35 X 92.075 mm)	Douglas Aircraft Co.
NOTE: Rig pin sizes are in inches (diameter x length, length = grip plus 5/8 inch), (15.875 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.



Primary Longitudinal Trim Contactors and Manual Override and Shutoff Control -- Removal Installation
Figure 401/27-40-04-990-801

3. **Removal/Installation Primary Longitudinal Trim Contactors**

A. Remove Primary Longitudinal Trim Contactor

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B10-92	PRIMARY LONGITUDINAL TRIM PHASE A
		B10-93	PRIMARY LONGITUDINAL TRIM PHASE B
		B10-94	PRIMARY LONGITUDINAL TRIM PHASE C

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Remove covers from contactor electrical lead terminals.

(3) Disconnect electrical leads from contactor terminals. Tag wires to provide identification for installation.

(4) Remove contactor from manual override and shutoff control.

B. Install Primary Longitudinal Trim Contactor

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B10-92	PRIMARY LONGITUDINAL TRIM PHASE A
		B10-93	PRIMARY LONGITUDINAL TRIM PHASE B
		B10-94	PRIMARY LONGITUDINAL TRIM PHASE C

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Check serviceability of contactor. The contactor may only be overhauled a maximum of two (2) occurrences. An overhaul date code will be added ending with letter “E”. If an “R” follows the date code on the contactor, the contactor was repaired and not overhauled (zero timed) and is not acceptable for service. Only overhauled (zero timed) contactors are acceptable. The original date code, if present which is not followed by a letter, does not impact serviceability requirements.

(3) Install contactor on manual override and shutoff control with coil terminals (marked X1-X2) facing aft.

(4) Connect electrical leads to contactor terminals. Make certain that all wires are connected properly. (TERMINALS - MAINTENANCE PRACTICES, SWPM 20-20-01)

(a) Torque terminal nuts as follows:

- Terminals D1 and D2 (8-32 lug) =12.0 in-lb (1.356 N·m) to 14.0 in-lb (1.582 N·m)
- Terminals A1, A2, B1, B2, C1, and C2 (1/4-28 lug) = 54.0 in-lb (6 N·m) to 57.0 in-lb (6.440 N·m)

(5) Install covers on three ac electrical lead terminals.

(6) Remove the safety tags and close these circuit breakers:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B10-92	PRIMARY LONGITUDINAL TRIM PHASE A
		B10-93	PRIMARY LONGITUDINAL TRIM PHASE B
		B10-94	PRIMARY LONGITUDINAL TRIM PHASE C

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(7) Test primary longitudinal trim contactors. (PRIMARY LONGITUDINAL TRIM CONTACTORS AND MANUAL OVERRIDE AND SHUTOFF CONTROL - ADJUSTMENT/TEST, PAGEBLOCK 27-40-04/501)

4. **Removal/Installation Manual Override and Shutoff Control**

A. Remove Manual Override and Shutoff Control

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B10-92	PRIMARY LONGITUDINAL TRIM PHASE A
		B10-93	PRIMARY LONGITUDINAL TRIM PHASE B
		B10-94	PRIMARY LONGITUDINAL TRIM PHASE C

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Remove covers from contactor electrical lead terminals.

(3) Disconnect electrical leads from contactor terminals. Tag wires to provide identification for installation.

(4) Remove contactors from manual override and shutoff control.

NOTE: Contactors may be left installed and removed with manual override control as one unit.

(5) Disconnect manual override control link rod from upper crank on control.

(6) Disconnect shutoff control link rod from lower crank on control.

(7) Remove manual override and shutoff control from intercostal.

(8) If installed, remove contactors from manual override control.

B. Install Manual Override and Shutoff Control

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B10-92	PRIMARY LONGITUDINAL TRIM PHASE A
		B10-93	PRIMARY LONGITUDINAL TRIM PHASE B
		B10-94	PRIMARY LONGITUDINAL TRIM PHASE C

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Move inboard primary longitudinal trim control handle, located on control pedestal, to center position, and install rig pin (4-3) in rig pin hole (R-13).

(3) Install manual override and shutoff control on intercostal.

(4) Connect shutoff control link rod to lower crank on control. Install bolt so bolt head is down. Safety bolt head with lockwire and nut with cotter pin. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: No adjustment of system should be required to install link rod, providing cable tension of trim indicating system has not been disturbed.

(5) Make certain that manual override control bellcrank roller is in detent or cam on bellcrank of shaft and that roller on manual override control arm is in detent position.

(6) Connect manual override control link rod on upper crank on control. Safety nut with cotter pin.

NOTE: Holes in link rod and control upper crank should align, permitting bolt to be inserted freely when roller on bellcrank and roller on control are in detent. If holes do not align, adjust link rod. No tension should be on link rod spring at installation.

(7) Install contactors on control with coil terminals (marked X1-X2) facing aft.

(8) Connect electrical leads to contactor terminals. Make certain that all wires are connected properly. (Ref. Wiring Diagram Manual)

(9) Install covers on three ac electrical lead terminals on each contactor.

(10) Remove rig pin (4-3) from control handle.

(11) Remove the safety tags and close these circuit breakers:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B10-92	PRIMARY LONGITUDINAL TRIM PHASE A
		B10-93	PRIMARY LONGITUDINAL TRIM PHASE B
		B10-94	PRIMARY LONGITUDINAL TRIM PHASE C

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(12) Test trim contactors and manual override and shutoff control. (PAGEBLOCK 27-40-00/501)

PRIMARY LONGITUDINAL UP/DOWN CONTACTORS - REMOVAL/INSTALLATION

1. General

A. This procedure contains MSG-3 task card data.

TASK 27-40-04-901-801

2. Remove and Replace Primary Longitudinal Up/Down Contactors

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
27-40-04 P/B 401	PRIMARY LONGITUDINAL TRIM CONTACTORS AND MANUAL OVERRIDE AND SHUTOFF CONTROL - REMOVAL/INSTALLATION

B. Remove and Replace Primary Longitudinal Up/Down Contactors.

SUBTASK 27-40-04-901-001

(1) Remove the primary longitudinal up/down contactors. (PRIMARY LONGITUDINAL TRIM CONTACTORS AND MANUAL OVERRIDE AND SHUTOFF CONTROL - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-04/401)

(2) Discard the removed contactors.

(3) Install serviceable primary longitudinal up/down contactors. (PRIMARY LONGITUDINAL TRIM CONTACTORS AND MANUAL OVERRIDE AND SHUTOFF CONTROL - REMOVAL/INSTALLATION, PAGEBLOCK 27-40-04/401)

C. Job Close-up

SUBTASK 27-40-04-942-001

(1) Remove all the tools and equipment from the work area. Make sure the area is clean.

——— END OF TASK ———

PRIMARY LONGITUDINAL TRIM CONTACTORS AND MANUAL OVERRIDE AND SHUTOFF CONTROL - ADJUSTMENT/TEST

1. General

A. The primary longitudinal trim contactors and manual override and shutoff control are located in the forward lower cargo compartment. Access to the contactors and manual override and shutoff control is through the removable compartment liner for-ward of the forward cargo compartment door.

B. The aircraft noseup trim contactor is located on the top of the manual override and shutoff control, and the aircraft nosedown contactor is located on the bottom. Adjustment/Test procedures are identical for the aircraft noseup and the aircraft nosedown trim contactors.

2. Adjustment/Test Primary Longitudinal Trim Contactors

A. Test Primary Longitudinal Trim Contactors and Manual Override and Shutoff Control

NOTE: When moving horizontal stabilizer with either primary or alternate control handles, operate both primary or both alternate control handles simultaneously in same direction to full noseup or nosedown position. This procedure insures proper synchronization of brake switch and motor contactor operation.

WARNING: BEFORE MOVING PRIMARY LONGITUDINAL TRIM CONTROL SWITCHES OR HANDLES, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE).

(1) Make sure that these circuit breakers are closed:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B10-92	PRIMARY LONGITUDINAL TRIM PHASE A
		B10-93	PRIMARY LONGITUDINAL TRIM PHASE B
		B10-94	PRIMARY LONGITUDINAL TRIM PHASE C

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Move both primary longitudinal trim control handles, located on control pedestal, to aircraft noseup position; hold until shutoff functions. Check that horizontal stabilizer is at 12.2 degrees, ANU. Dimension (BG) should be 12 13/16(±5/32) inches, (325.44(±3.97) mm). (Figure 501)

(3) Move both primary longitudinal trim control handles to aircraft nosedown position; hold until shutoff functions. Check that horizontal stabilizer is at 2.1 degrees AND. Dimension (BG) should be 1 5/16(±9/64) inches, (33.34(±3.57) mm).

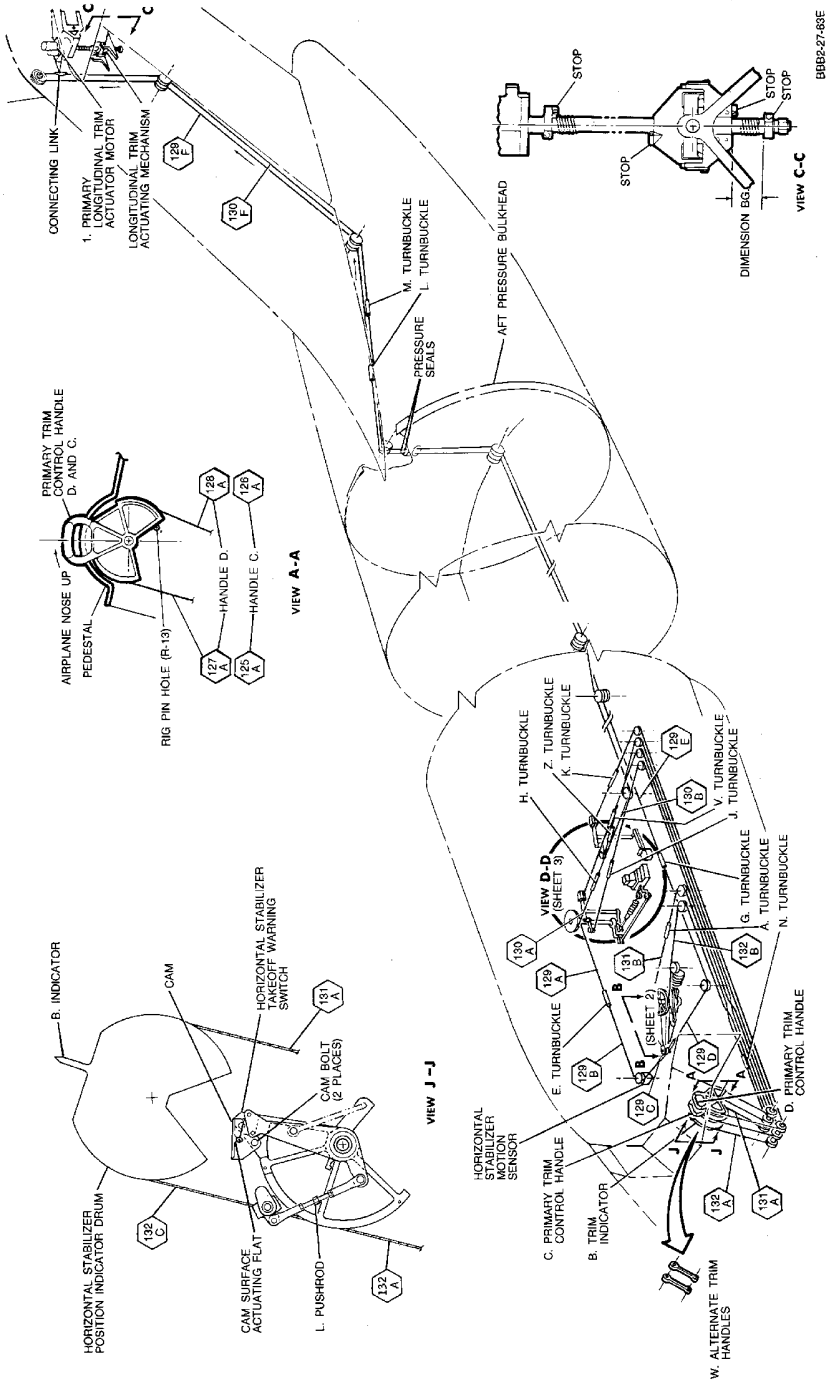
(4) Move both primary longitudinal trim control wheel switches, located on either Capt's or F/O's control wheel to aircraft noseup position. Check that horizontal stabilizer leading edge moves down.

(5) Move both primary longitudinal trim control switches on either control wheel to aircraft nosedown position. Check that horizontal stabilizer leading edge moves up.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE).

(6) Move both primary longitudinal trim switches on captain's control wheel in each direction and check that opposing control from both primary longitudinal trim handles will stop stabilizer motion.

NOTE: During this test primary longitudinal trim control handles may produce trim action opposite from switches on Capt's or F/O's control wheel. This result is acceptable but not required.



Adjustment/Test Primary Longitudinal Trim Contactors
Figure 501/27-40-04-990-802

PRIMARY LONGITUDINAL TRIM MANUAL OVERRIDE AND SHUTOFF CONTROL MECHANICAL INTERCONNECT - REMOVAL/INSTALLATION

1. General

A. The primary longitudinal trim manual override and shutoff control mechanical interconnect components, and the alternate longitudinal trim motor limit switches are all mounted on a common bracket located in the forward lower cargo compartment. Access is through the lining forward of the forward lower cargo door.

B. The limit switches may be removed separately. (ALTERNATE LONGITUDINAL TRIM MOTOR LIMIT SWITCHES - MAINTENANCE PRACTICES, PAGEBLOCK 27-40-10/201) The manual override control bellcrank and shaft can be removed or installed with the bracket installed on the bulkhead, as described in (Paragraph 3.), describe removal and installation of the bracket, complete with all components. The longitudinal trim indicating system and shutoff controls must be adjusted upon completion of installation. Numbers in parentheses in the following text correspond to callouts in Figure 401.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following items:

Table 401

Name and Number	Manufacturer
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified
Rig pin (4-3)	Douglas Aircraft Co.
Tensiometer	Pacific Scientific Co.
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch), (15.88 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Manual Override and Shutoff Control Mechanical Interconnect

A. Remove Manual Override Control Bellcrank and Shaft

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Disconnect manual override control link rod from arm at base of bellcrank shaft.

(3) Loosen turnbuckles (1) to relieve tension and disconnect cables from bellcrank.

(4) Remove detent roller springs from detent roller arm and bracket.

(5) Remove roller arm from bracket.

(6) Remove bellcrank from shaft.

(7) Remove bolts securing upper section of shaft to lower section.

(8) Remove upper and lower sections of shaft from bearings in bracket.

B. Install Manual Override Control Bellcrank and Shaft

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Move inboard primary longitudinal trim control handle on control pedestal to center position and insert rig pin (4-3) in rig pin hole (R-13).

(3) Position upper section of shaft in upper bearing in bracket with detent of cam facing aft.

(4) Install lower section of shaft through bearing on bracket and upper section with arm on lower section facing forward.

(5) Install bellcrank on shaft.

(6) Install detent roller arm on bracket.

(7) Install detent roller springs on detent roller arm.

(8) Position detent roller in detent of cam on shaft and connect free ends of detent roller springs to bracket.

(9) Connect cables to bellcrank and adjust turnbuckles (1) to obtain tension of 16 pounds (7.2 kg) at 70°F for 1/16-inch(1.587 mm) cables. Compensate for temperature. (Figure 402).Safety bolt heads with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(10) Differentially adjust turnbuckles (1) to center roller in detent of cam on bellcrank shaft.

(11) Safety turnbuckles with clips.

(12) Check that rollers on manual override and shutoff control are in detent position.

(13) Align holes in manual override control link rod with holes in arm at base of bellcrank. Adjust link rod, if necessary.

(14) Connect link rod to arm. Make certain there is no tension on link rod spring. Safety nut with cotter pin.

(15) Remove rig pin (4-3) from control handle.

(16) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(17) Test manual override control. (PAGEBLOCK 27-40-00/501)

C. Remove Bracket with Components

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Disconnect manual override control link rod from arm at base of bellcrank shaft.

(3) Disconnect shutoff control link rod from limit switch control arm.

(4) Disconnect electrical leads from limit switch.

NOTE: If serving on wire bundles is broken, tag wires to to provide identification for installation.

(5) Loosen turnbuckles (1) to relieve cable tension and disconnect cables from bellcrank.

(6) Loosen turnbuckles (2) and disconnect cables from control drum.

(7) Remove bracket with components from bulkhead.

(8) Remove control drum and arm from bracket as follows.

(a) Remove bolts holding control drum arm inside control drum shaft and slide arm from shaft and lower bracket bearing.

(b) Remove control drum from upper bearing in bracket.

D. Install Bracket with Components

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Move inboard primary longitudinal trim control handle on control pedestal to center position and insert rig pin (4-3) in rig pin hole (R-13).

(3) Position control drum through upper bearing in bracket.

(4) Install control drum arm through lower bearing in bracket and in control drum shaft with limit switch actuator rollers in detent of cam on limit switch control arm.

(5) Install bracket on bulkhead.

(6) Connect cables to control drum, and adjust turnbuckles (2) to take up cable slack. Safety cable ball ends in drum with cotter pins.

NOTE: Cable tension is temporary; trim indicating system cables are adjusted after installation is completed.

(7) Connect cables to manual override control bellcrank and adjust turnbuckles (1) to obtain tension of 16 pounds (6.803 kg) at 70° F for 1/16 inch (1.587 mm) cables. Compensate for temperature. (Figure 402) Safety bolt heads with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(8) Differentially adjust turnbuckles (1) to center roller in detent of cam on bellcrank shaft. Safety turnbuckles with clips.

(9) Check that rollers on manual override and shutoff control are in detent positions.

(10) Align hole in manual override control link rod with holes in arm at base of bellcrank shaft; adjust link rod if necessary and connect link rod to arm, making certain that there is no tension on link rod spring. Safety nut with cotter pin.

(11) Connect shutoff control link rod to limit switch control arm. Safety nut with cotter pin.

(12) Connect electrical leads to limit switch terminals, making certain that all wires are connected properly. (Ref. Wiring Diagram Manual)

(13) Remove rig pin (4-3) from control handle.

(14) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO DC BUS

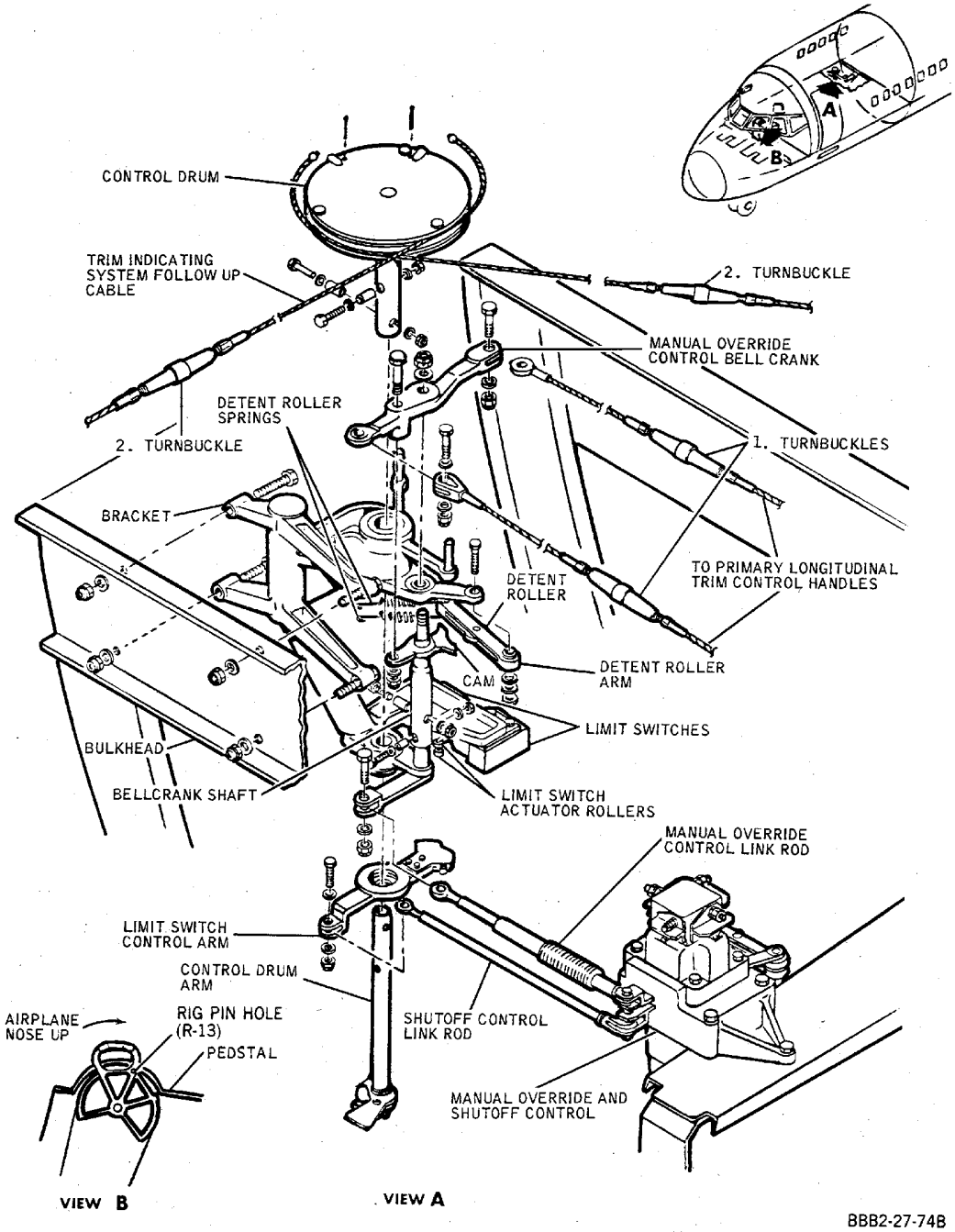
Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(15) Adjust shutoff control and indicating system mechanism. (PAGEBLOCK 27-40-00/501)

(16) Test manual override control. (PAGEBLOCK 27-40-00/501)



Primary Longitudinal Trim Manual Override and Shutoff Control Mechanical Interconnect
Figure 401/27-40-05-990-801

CABLE TENSION TABLE – 1/16 DIAMETER

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
–60	5	0	0	40	18	12	8
–58	5	0	0	42	18	12	9
–56	5	0	0	44	18	12	9
–54	6	0	0	46	19	13	9
–52	6	0	0	48	19	13	9
–50	6	0	0	50	19	13	9
–48	7	1	0	52	20	14	10
–46	7	1	0	54	20	14	10
–44	7	1	0	56	20	14	10
–42	7	1	0	58	20	14	10
–40	8	2	1	60	21	15	11
–38	8	2	1	62	21	15	11
–36	8	2	1	64	21	15	11
–34	8	2	1	66	22	16	11
–32	9	3	1	68	22	16	12
–30	9	3	2	70	22	16	12
–28	9	3	2	72	23	17	12
–26	9	3	2	74	23	17	12
–24	10	4	2	76	23	17	13
–22	10	4	2	78	24	18	13
–20	10	4	2	80	24	18	13
–18	10	4	3	82	24	18	13
–16	11	5	3	84	25	19	14
–14	11	5	3	86	25	19	14
–12	11	5	3	88	25	19	14
–10	11	5	3	90	26	20	15
–8	12	6	4	92	26	20	15
–6	12	6	4	94	27	21	15
–4	12	6	4	96	27	21	16
–2	12	6	4	98	27	21	16
0	13	7	4	100	28	22	16
2	13	7	5	102	28	22	16
4	13	7	5	104	28	22	17
6	13	7	5	106	29	23	17
8	14	8	5	108	29	23	17
10	14	8	5	110	30	24	18
12	14	8	6	112	30	24	18
14	14	8	6	114	31	25	18
16	15	9	6	116	31	25	19
18	15	9	6	118	31	25	19
20	15	9	6	120	32	26	19
22	15	9	7	122	32	26	20
24	16	10	7	124	33	27	20
26	16	10	7	126	33	27	20
28	16	10	7	128	34	28	21
30	16	10	7	130	34	28	21
32	17	11	8	132	35	29	21
34	17	11	8	134	35	29	22
36	17	11	8	136	36	30	22
38	18	12	8	138	36	30	23
				140	37	31	23

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-279A

Cable Tension Table
Figure 402/27-40-05-990-802

PRIMARY LONGITUDINAL TRIM BRAKE SWITCH - REMOVAL/INSTALLATION

1. General

A. The primary longitudinal trim brake switch is located in the forward lower cargo compartment. Access to the switch is through the removable compartment liner forward of the forward cargo compartment door.

B. The brake switch is connected mechanically to a bellcrank and shaft. (Paragraph 3.) describes the removal and installation of the brake switch, and (Paragraph 4.) describes the removal and installation of the bellcrank and shaft. The bellcrank and shaft are connected by a cable system to the outboard primary longitudinal trim control handle installed on the main lever shaft of the control pedestal.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 401

Name and Number	Manufacturer
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified
Tensiometer	Pacific Scientific Co.
Rig pin (4-3)	Douglas Aircraft Co.
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch), (15.88 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Primary Longitudinal Trim Brake Switch

A. Remove Brake Switch

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Move outboard primary longitudinal trim control handle on control pedestal to center position and insert rig pin (4-3) in rig pin hole (R-13).

(3) Disconnect and tag electrical leads from brake switch terminals. Tag wires to provide identification for installation.

(4) Disconnect lever from arm on switch shaft.

(5) Remove arm from switch shaft.

(6) Remove switch from intercostal.

B. Install Brake Switch

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Install brake switch on intercostal. Safety bolts with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(3) Check that brake switch bellcrank roller is in detent of cam on bellcrank shaft. Differentially adjust turnbuckles to center roller in detent as required. Safety turnbuckles with clips.

(4) Place arm on brake switch shaft and align with brake switch lever. Connect lever to arm with bolt head up. Safety bolt head with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(5) Install nut on switch shaft and safety.

(6) Connect electrical leads to switch terminals making certain that all wires are connected properly. (Ref. Wiring Diagram Manual)

(7) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO DC BUS

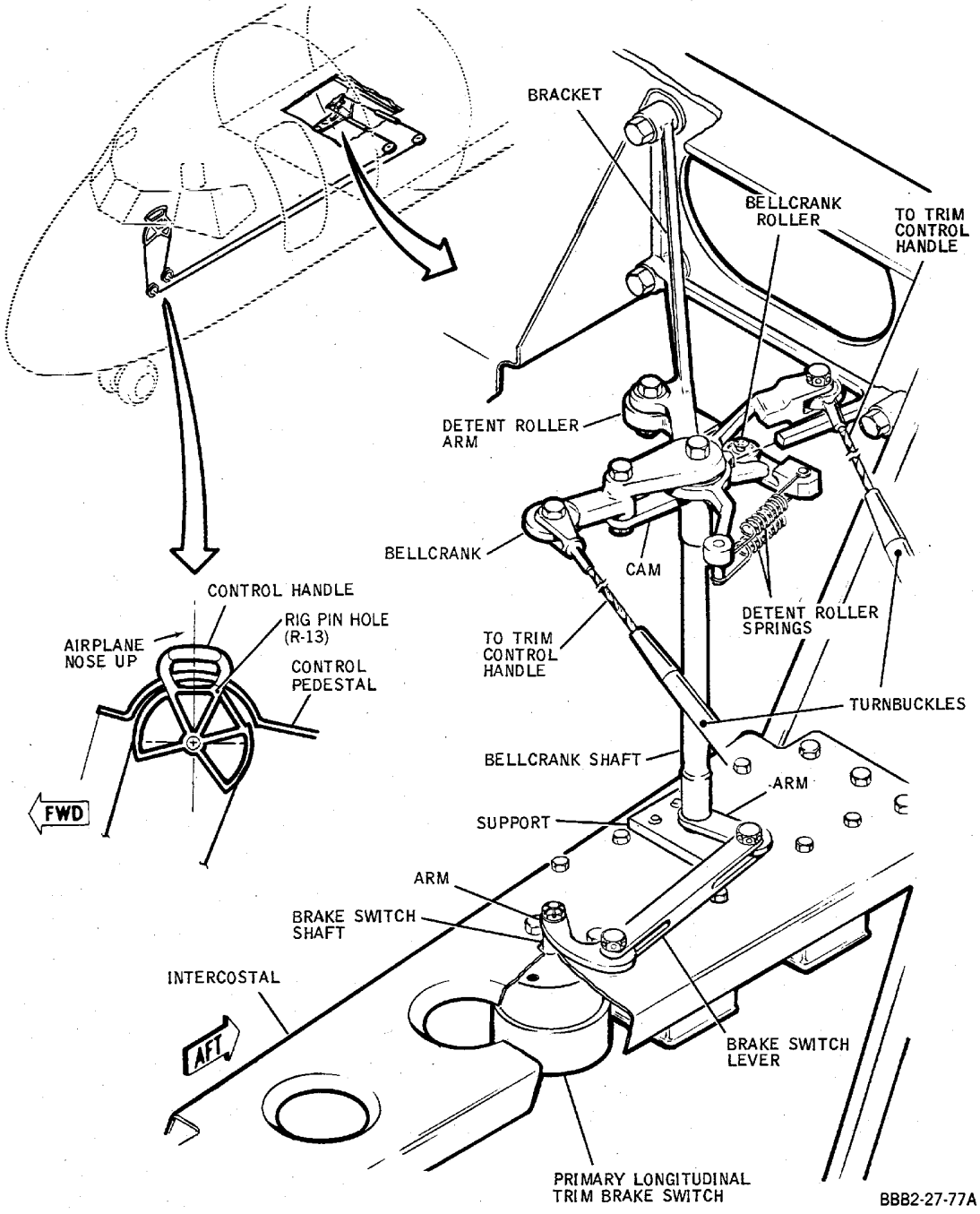
Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(8) Remove rig pin (4-3) from control handle.

(9) Test brake switch control. (PRIMARY LONGITUDINAL TRIM BRAKE SWITCH - ADJUSTMENT/TEST, PAGEBLOCK 27-40-07/501)



Primary Longitudinal Trim Brake Switch -- Removal/Installation
Figure 401/27-40-07-990-801

4. Removal/Installation Brake Switch Bellcrank and Shaft

A. Remove Bellcrank and Shaft

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Move outboard primary longitudinal control handle to center position and insert rig pin (4-3) in rig pin hole (R-13).

(3) Disconnect lever from arm at base of bellcrank shaft.

(4) Back off turnbuckles to relieve cable tension and disconnect cables from bellcrank.

(5) Remove bellcrank from shaft.

(6) Remove detent roller springs from bracket and detent roller arm.

(7) Remove detent roller arm from bracket.

(8) Remove bracket from bulkhead and shaft.

(9) Remove shaft and bearings from support on intercostal.

B. Install Bellcrank and Shaft

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B

(Continued)

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Position shaft in support on intercostal and install bearing at base of shaft. Safety nut with cotter pin.

(3) Position bracket on upper end of shaft and install bracket on bulkhead.

(4) Install detent roller arm on bracket. Safety nut with cotter pin.

(5) Install detent roller springs on detent roller arm.

(6) Position roller in detent of cam on shaft and connect detent roller springs to bracket.

(7) Install bellcrank on shaft.

(8) Connect cables to bellcrank and adjust turnbuckles to obtain tension of 16 pounds (7.2 kg) at 70° F for 1/16 inch (1.587 mm) cable. Compensate for temperature. (Figure 402)

(9) Differentially adjust turnbuckles to center roller in detent of cam on shaft.

(10) Safety turnbuckles with clips.

(11) Connect brake switch lever to arm at base of bellcrank shaft. Install bolt with bolt head up. Safety bolt head with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(12) Remove rig pin (4-3) from control handle.

(13) Test brake switch control. (PRIMARY LONGITUDINAL TRIM BRAKE SWITCH - ADJUSTMENT/TEST, PAGEBLOCK 27-40-07/501)

CABLE TENSION TABLE – 1/16 DIAMETER

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
–60	5	0	0	40	18	12	8
–58	5	0	0	42	18	12	9
–56	5	0	0	44	18	12	9
–54	6	0	0	46	19	13	9
–52	6	0	0	48	19	13	9
–50	6	0	0	50	19	13	9
–48	7	1	0	52	20	14	10
–46	7	1	0	54	20	14	10
–44	7	1	0	56	20	14	10
–42	7	1	0	58	20	14	10
–40	8	2	1	60	21	15	11
–38	8	2	1	62	21	15	11
–36	8	2	1	64	21	15	11
–34	8	2	1	66	22	16	11
–32	9	3	1	68	22	16	12
–30	9	3	2	70	22	16	12
–28	9	3	2	72	23	17	12
–26	9	3	2	74	23	17	12
–24	10	4	2	76	23	17	13
–22	10	4	2	78	24	18	13
–20	10	4	2	80	24	18	13
–18	10	4	3	82	24	18	13
–16	11	5	3	84	25	19	14
–14	11	5	3	86	25	19	14
–12	11	5	3	88	25	19	14
–10	11	5	3	90	26	20	15
–8	12	6	4	92	26	20	15
–6	12	6	4	94	27	21	15
–4	12	6	4	96	27	21	16
–2	12	6	4	98	27	21	16
0	13	7	4	100	28	22	16
2	13	7	5	102	28	22	16
4	13	7	5	104	28	22	17
6	13	7	5	106	29	23	17
8	14	8	5	108	29	23	17
10	14	8	5	110	30	24	18
12	14	8	6	112	30	24	18
14	14	8	6	114	31	25	18
16	15	9	6	116	31	25	19
18	15	9	6	118	31	25	19
20	15	9	6	120	32	26	19
22	15	9	7	122	32	26	20
24	16	10	7	124	33	27	20
26	16	10	7	126	33	27	20
28	16	10	7	128	34	28	21
30	16	10	7	130	34	28	21
32	17	11	8	132	35	29	21
34	17	11	8	134	35	29	22
36	17	11	8	136	36	30	22
38	18	12	8	138	36	30	23
				140	37	31	23

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-279A

Cable Tension Table
Figure 402/27-40-07-990-802

PRIMARY LONGITUDINAL TRIM BRAKE SWITCH - ADJUSTMENT/TEST

1. Adjustment/Test Primary Longitudinal Trim Brake Switch

A. Test Brake Switch Control

NOTE: When moving the horizontal stabilizer with either primary or alternate control handles, operate both primary or both alternate control handles simultaneously, except as noted, in the same direction to the full noseup or nosedown position. This procedure insures proper synchronization of brake switch and motor contactor operation.

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE).

(1) Move outboard primary longitudinal trim control handle to aircraft noseup position and then to aircraft nosedown position. Check that brake switch linkage does not bind.

(a) Horizontal stabilizer remains stationary.

(b) Control handle returns to center position when released.

(2) Move inboard control handle to aircraft noseup position then to aircraft nosedown position.

(3) Move both control handles to aircraft noseup position. Check that stabilizer leading edge moves down.

(4) Move both control handles to aircraft nosedown position. Check that stabilizer leading edge moves up.

(5) Move both primary longitudinal trim control wheel switches on captain's aileron control wheel to aircraft noseup position. Check that stabilizer leading edge moves down.

(6) Move both primary longitudinal trim control wheel switches to aircraft nosedown position. Check that stabilizer leading edge moves up.

(7) Return stabilizer to neutral position.

HORIZONTAL STABILIZER TAKEOFF WARNING SWITCH - MAINTENANCE PRACTICES

1. General

A. This maintenance practice provides removal/installation and adjustment/test instructions for the horizontal stabilizer takeoff warning switch (Green Band switch S1-491). The switch is located in the control pedestal.

B. Maintenance of the horizontal stabilizer takeoff warning switch is limited to removal/installation and adjustment/test. Access to the switch is through the control pedestal forward left access panel.

C. For switch adjustment, refer to HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501, paragraph 3.E. For switch test, refer to 2HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501, paragraph 3.L.

2. Removal/Installation Horizontal Stabilizer Takeoff Warning Switch (S1-491)

A. Remove Switch

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	38	B1-832	CAWS, SSRS-1, LDG GR, T/O, A/P, SP BK, CAB ALT

(2) Remove forward access panel from left side of control pedestal.

(3) Using thumbwheel on TAKEOFF CONDTN calculator, set FLAP dial full aft and CG full forward to position switch for easy access.

(4) Disconnect and tag electrical wires.

(5) Remove switch attaching screws and remove switch.

B. Install Switch

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that this circuit breaker is open and has safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	38	B1-832	CAWS, SSRS-1, LDG GR, T/O, A/P, SP BK, CAB ALT

(2) Position switch on crank and install switch.

(3) Remove tags and connect electrical wires.

(4) Remove the safety tag and close this circuit breaker:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

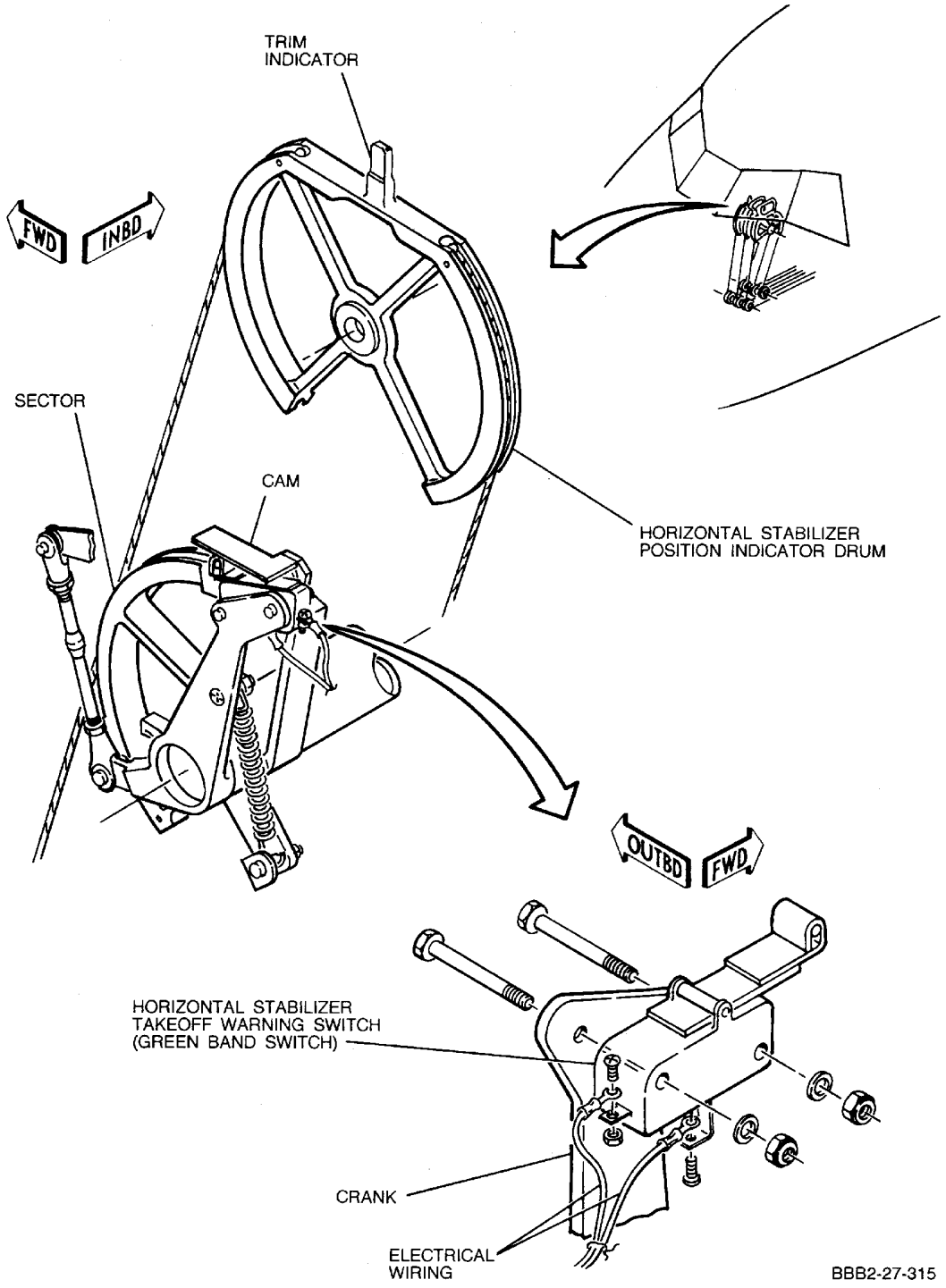
Row	Col	Number	Name
P	38	B1-832	CAWS, SSRS-1, LDG GR, T/O, A/P, SP BK, CAB ALT

(5) Adjust switch. Refer to HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501, paragraph 3.E.

(6) Test switch. Refer to HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501, paragraph 3.L.

(7) Remove tools, equipment, loose hardware, and debris from maintenance area.

(8) Install access panel.



Horizontal Stabilizer Takeoff Warning Switch -- Removal/Installation
Figure 201/27-40-08-990-801

ALTERNATE LONGITUDINAL TRIM CONTROL SWITCHES - REMOVAL/INSTALLATION

1. General

A. Two alternate longitudinal trim control switches are located in the control pedestal. Access to the control switches is through a cover plate on the left side of the pedestal and through the top of the pedestal (on some aircraft, if so equipped) the HUD control module and the radar control panel.

WJE 407, 408, 411

(PAGEBLOCK 34-25-03/201)

WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879

WEATHER RADAR CONTROL PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 34-41-03/201 Config 1

WJE ALL

B. This document has the removal and installation of the motor control switch and the brake control switch. Both switches are actuated by levers installed on the main lever shaft of the control pedestal.

2. Removal/Installation Alternate Longitudinal Trim Motor Control Switches

A. Remove Motor Control Switch (Figure 401, View A)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Remove cover from left side of control pedestal.

(3) Disconnect electrical connector from switch bracket.

(4) Disconnect pushrod from crank on switch shaft.

(5) Remove bracket and switch from channel.

(6) Remove crank from switch shaft.

(7) Remove electrical connector from bracket.

(8) Remove bracket from switch.

B. Install Motor Control Switch

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Install bracket on switch.

(3) Install crank on switch shaft.

(4) Install electrical connector on bracket.

(5) Install bracket and switch on channel.

(6) Connect pushrod to crank on switch shaft.

(7) Adjust pushrod, if necessary, to obtain the following condition.

(a) After simultaneous operation of motor control and brake control switch levers, motor control switch actuates 1/8 inch (3.175 mm) of control lever travel after brake switch actuates.

(b) Motor control switch actuation with 1/16-inch (1.587 mm) minimum clearance between edge of lever and frame stop pad in both noseup and nosedown positions.

NOTE: Switch actuation is determined by an audible click made by the switch when the contacts close. Position of levers, when switch actuation occurs, can be compared by moving each switch lever separately and marking position of lever on control pedestal, when contacts close. Take care not to mar or scar pedestal when marking lever positions.

(8) Connect electrical connector to connector on bracket.

(9) Install cover on control pedestal.

(10) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

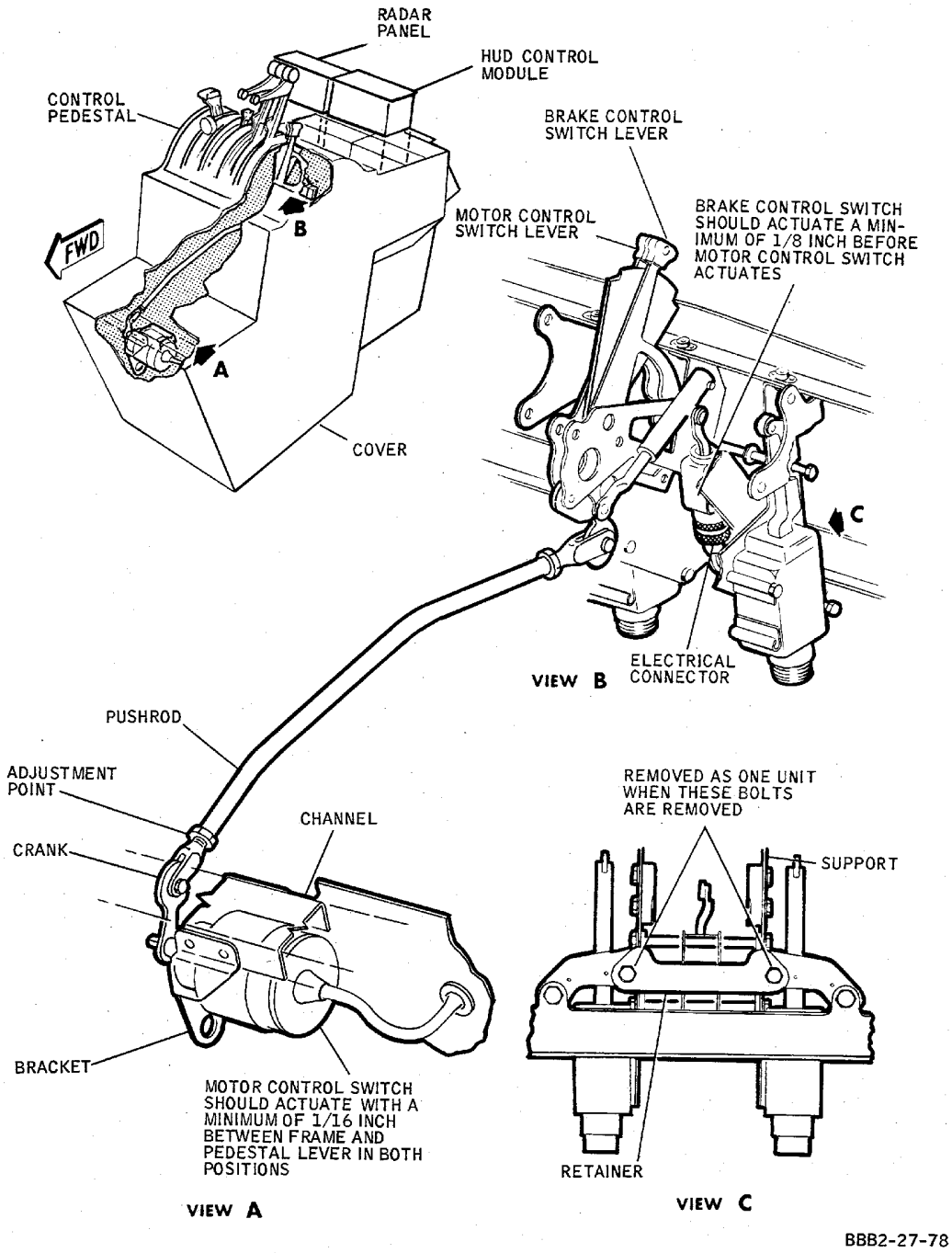
Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A

(Continued)

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(11) Test alternate longitudinal trim control switches. (ALTERNATE LONGITUDINAL TRIM CONTROL SWITCHES - ADJUSTMENT/TEST, PAGEBLOCK 27-40-09/501)



Alternate Longitudinal Trim Control Switches -- Removal/Installation
Figure 401/27-40-09-990-801

3. **Removal/Installation Alternate Longitudinal Trim Brake Control**

A. Remove Brake Control Switch (Figure 401, View B)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Remove cover from left side of control pedestal.

(3) If installed, remove HUD control module and then radar control panel.

WJE 407, 408, 411

(PAGEBLOCK 34-25-03/201)

WJE ALL

(PAGEBLOCK 34-31-03/201)

(4) Disconnect electrical connector from brake control switch.

(5) Remove retainer from control pedestal.

(6) Remove switch from slot in support.

B. Install Brake Control Switch

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B

(Continued)

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Position switch and spacers in support slots with actuator roller facing aft.

(3) Install retainer on pedestal frame.

(4) If necessary, adjust pushrod to obtain the following:

(a) After simultaneous operation of motor control and brake control switch levers, motor control switch actuates 1/8 inch (3.175 mm) of control lever travel after brake switch actuates.

(b) Motor control switch actuation with 1/16-inch (1.587 mm) minimum clearance between edge of lever and frame stop pad in noseup and nosedown positions.

NOTE: Switch actuation is determined by an audible click made by the switch when the contacts close. Position of levers, when switch actuation occurs, can be compared by moving each switch lever separately and marking position of lever on control pedestal, when contacts close. Take care not to mar or scar pedestal when marking lever positions.

(5) Install electrical connectors on brake control switch.

(6) Install HUD control module and radar control panel on control pedestal.

(7) Install cover on side of control pedestal.

(8) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(9) Test alternate longitudinal trim control switches. (ALTERNATE LONGITUDINAL TRIM CONTROL SWITCHES - ADJUSTMENT/TEST, PAGEBLOCK 27-40-09/501)

ALTERNATE LONGITUDINAL TRIM CONTROL SWITCHES - ADJUSTMENT/TEST

1. General

A. The alternate longitudinal trim motor control and brake control switches are located in the control pedestal. Access to the motor control switch, at the forward end of the pedestal, is through the cover plate on the left side of the pedestal. Access to the brake control switch is through the top of the pedestal (on some aircraft, if so equipped, the heads up display (HUD) control module) and radar control panel.

B. When moving the horizontal stabilizer with either primary or alternate control handles, operate both primary or both alternate control handles simultaneously in the same direction to the full noseup or nosedown position. This procedure insures proper synchronization of brake switch and motor control operation.

2. Adjustment/Test Alternate Longitudinal Trim Control Switches

A. Adjust Control Switches

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Remove cover from left side of control pedestal.

(3) If installed, remove HUD control module and remove radar control panel from control pedestal.

WJE 407, 408, 411

- (PAGEBLOCK 34-25-03/201)

WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879

- WEATHER RADAR CONTROL PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 34-41-03/201 Config 1

WJE ALL

(4) Move right hand motor control switch lever in both directions until motor control switch contacts close.

NOTE: Closing of contacts is indicated by an audible click made by switch when switch is actuated.

(5) Mark position of the edge of motor control switch lever on control pedestal. Adjust motor control pushrod, if necessary, so switch closes 1/16 inch (1.59 mm) minimum from lever edge to frame stop pad in both directions.

(6) Move left hand brake control switch lever and adjust brake control switch until brake control switch contacts close 1/8 inch (3.18 mm) before motor control switch lever position mark on control pedestal.

(7) Install HUD control module and radar control panel in control pedestal.

(8) Install cover on left side of control pedestal.

(9) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(10) Test alternate longitudinal trim control switches.

B. Test Alternate Longitudinal Trim Control Switches

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE).

(1) Move both alternate longitudinal trim control levers to aircraft noseup position. Check that horizontal stabilizer leading edge moves down, and that clearance between edge of right control lever and stop pad on frame is at least 1/16 inch, (1.59 mm).

(2) Move both alternate longitudinal trim control levers to aircraft nosedown position. Check that horizontal stabilizer leading edge moves up, and that clearance between edge of right control lever and stop pad on frame is at least 1/16 inch, (1.59 mm).

ALTERNATE LONGITUDINAL TRIM MOTOR LIMIT SWITCHES - MAINTENANCE PRACTICES

1. General

A. Two alternate longitudinal motor limit switches are located in the forward lower cargo compartment. Access to the switches is through the removable cargo compartment liner forward of the forward lower cargo compartment door.

B. The inboard switch is the aircraft nosedown trim limit switch, and the outboard switch is the aircraft noseup trim limit switch. Removal and installation procedures are identical for aircraft noseup trim limit switch and aircraft nosedown trim limit switch.

2. Removal/Installation Alternate Longitudinal Trim Limit Switches

A. Remove Trim Limit Switch

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B10-92	PRIMARY LONGITUDINAL TRIM PHASE A
		B10-93	PRIMARY LONGITUDINAL TRIM PHASE B
		B10-94	PRIMARY LONGITUDINAL TRIM PHASE C

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Disconnect electrical leads from limit switch terminal. Tag wires to provide identification for installation.

(3) Remove limit switch and serrated plate from bracket.

(4) Remove actuator from limit switch.

B. Install Trim Limit Switch

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B10-92	PRIMARY LONGITUDINAL TRIM PHASE A
		B10-93	PRIMARY LONGITUDINAL TRIM PHASE B
		B10-94	PRIMARY LONGITUDINAL TRIM PHASE C

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(2) Install switch actuator on limit switch.

(3) Install serrated plate on upper surface of limit switch and flat clamping plate on lower surface.

(4) Install limit switch on bracket. Position serrated plates on bracket and switch so that switch actuator roller is 0.010 to 0.030 inch (0.254 to 0.762 mm) from actuating ramp of cam.

(5) Connect electrical leads to limit switch terminals. Make certain that all wires are connected properly (Ref. Wiring Diagram Manual).

(6) Remove the safety tags and close these circuit breakers:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B10-92	PRIMARY LONGITUDINAL TRIM PHASE A
		B10-93	PRIMARY LONGITUDINAL TRIM PHASE B
		B10-94	PRIMARY LONGITUDINAL TRIM PHASE C

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, RIGHT RADIO AC BUS

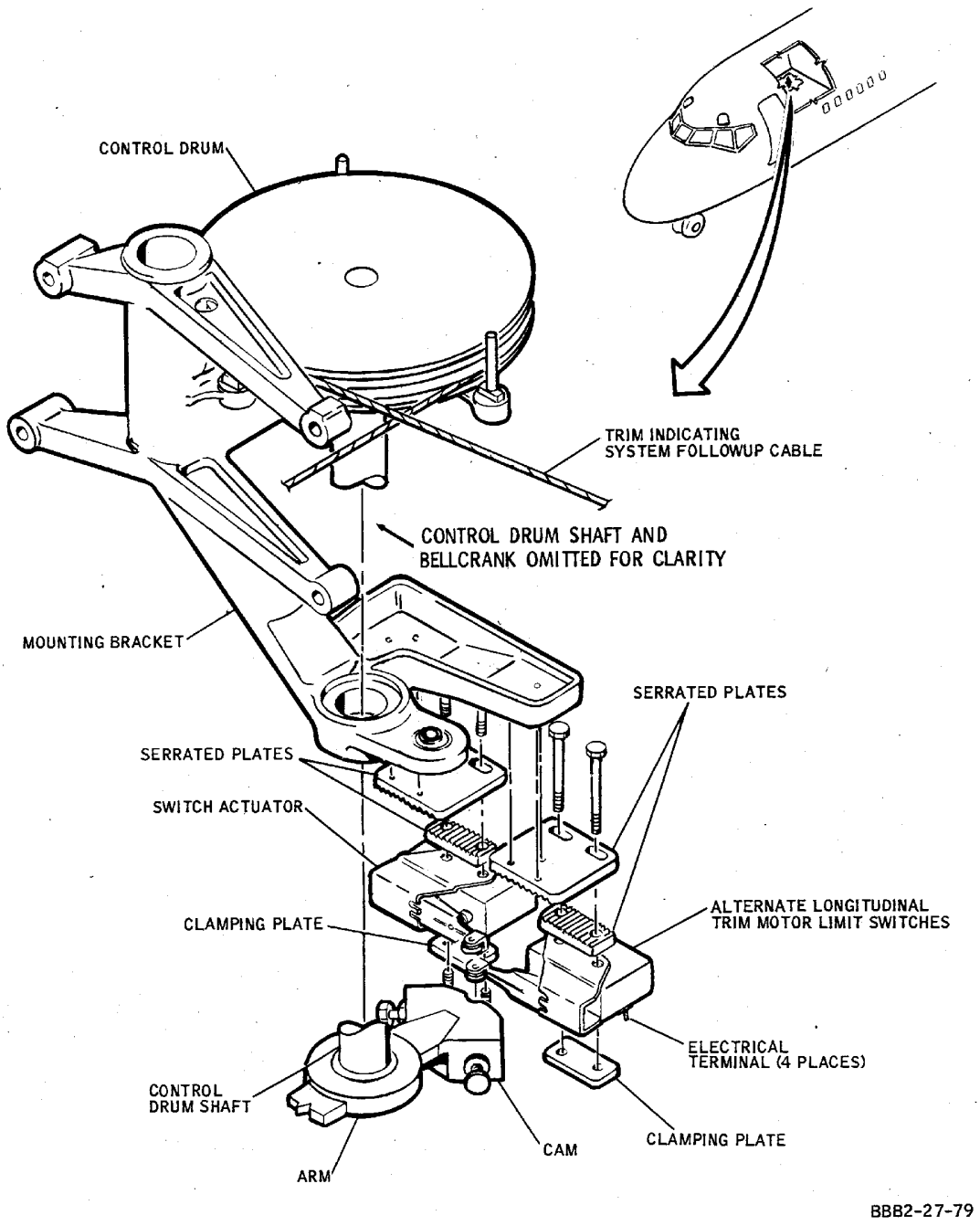
Row	Col	Number	Name
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B

(Continued)

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

(7) Test alternate longitudinal trim motor limit switch. (PAGEBLOCK 27-40-00/501)



Alternate Longitudinal Trim Motor Limit Switches -- Removal/Installation
Figure 201/27-40-10-990-801

HORIZONTAL STABILIZER MOTION WARNING SENSOR - MAINTENANCE PRACTICES

1. General

A. The horizontal stabilizer motion warning sensor is located in the forward lower cargo compartment. Access to motion warning sensor is gained by removing forward right panel from forward cargo compartment ceiling, and primary radio rack cooling fan and adjacent ducting. Sensor is located outboard of elevator servo. The horizontal stabilizer warning sensor may be removed without disturbing the cables or case by removing the sensor cover assembly.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed item:

Table 201

Name and Number	Manufacturer
Lockwire, NASM20995N20, DPM684*[1]	Not specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Horizontal Stabilizer Motion Warning Sensor

A. Remove Sensor Cover Assembly

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open this circuit breaker and install safety tag:

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
G	24	B10-194	STAB MOTION INDICATOR

(2) Disconnect electrical connector from sensor.

(3) Remove cover assembly from case.

NOTE: Pull cover straight out from case until shaft clears pulley spline.

B. Install Sensor Cover Assembly

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that this circuit breaker is open and has safety tag:

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
G	24	B10-194	STAB MOTION INDICATOR

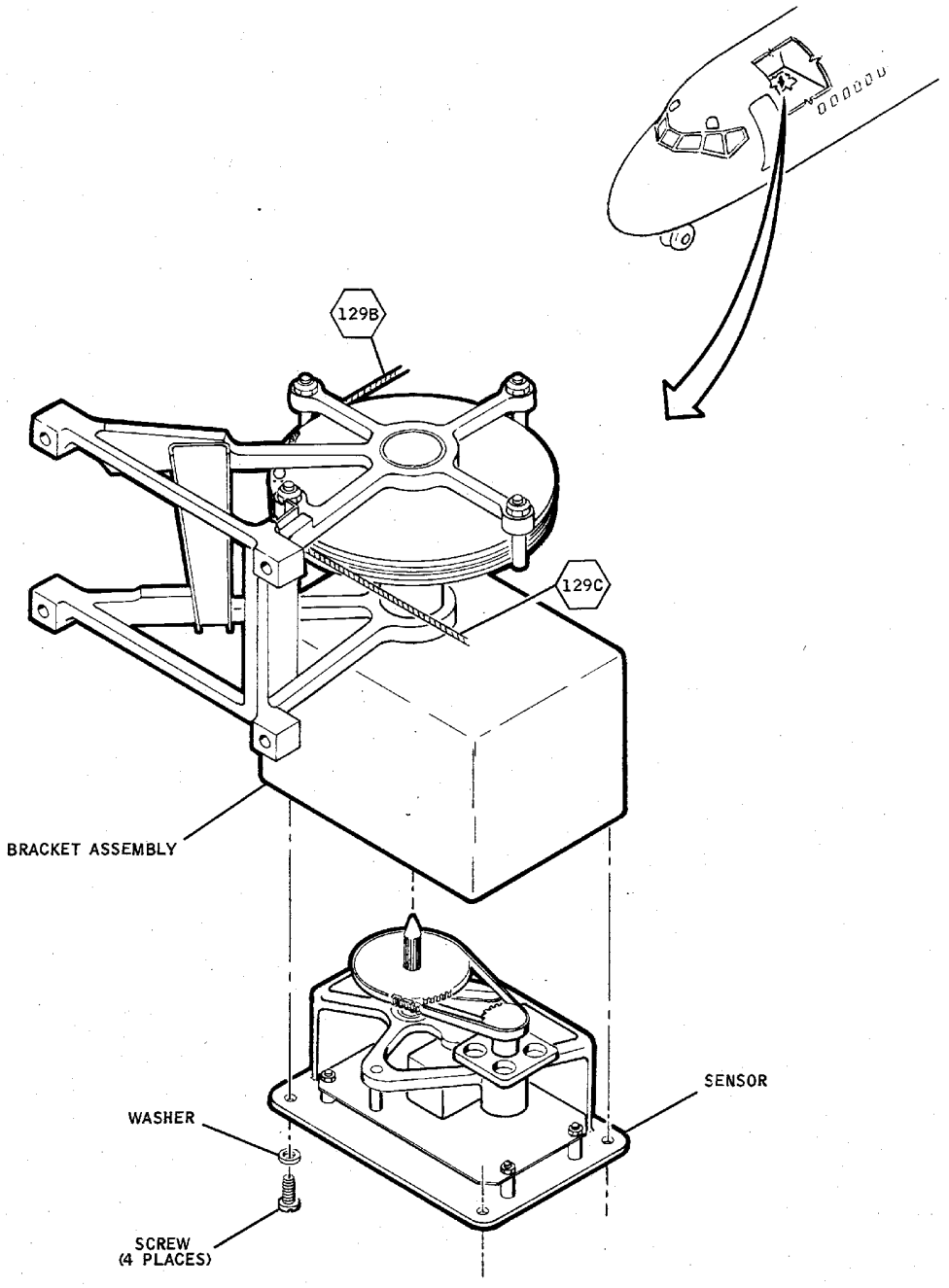
(2) Carefully insert shaft into pulley spline, make certain cover assembly is properly seated on case and install attaching screws. Safety screws with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(3) Connect electrical connector on sensor.

(4) Remove the safety tag and close this circuit breaker:

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
G	24	B10-194	STAB MOTION INDICATOR



Horizontal Stabilizer Motion Warning Sensor -- Removal/Installation
Figure 201/27-40-11-990-801

4. Adjustment/Test Horizontal Stabilizer Motion Warning Sensor

A. Test Sensor

NOTE: Longitudinal trim indicating and motion warning system must be properly adjusted before performing the following test.

WARNING: BEFORE MOVING ALTERNATE LONGITUDINAL TRIM CONTROL LEVERS, MAKE CERTAIN THAT AREAS AROUND HORIZONTAL STABILIZER AND ELEVATORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: TO PREVENT OVERHEATING STABILIZER MOTOR, DO NOT HOLD PEDESTAL HANDLES OR CONTROL WHEEL SWITCHES IN NOSEUP OR NOSEDOWN POSITION FOR MORE THAN 1 1/2 MINUTES OUT OF EVERY 6 MINUTES, OR MORE THAN 1 1/2 MINUTES CONTINUOUSLY (ONE FULL NOSEUP AND NOSEDOWN CYCLE).

(1) Using alternate longitudinal trim control levers located on pilots control pedestal, move horizontal stabilizer toward aircraft noseup position. Check that motion warning horn sounds.

NOTE: During stabilizer movement warning horn should sound for approximately 1/2-second duration with each 1/2-degree of stabilizer motion.

(2) Using alternate longitudinal trim control levers, move stabilizer back to neutral position. Motion warning horn should sound once for every 1/2-degree of stabilizer motion.

HORIZONTAL STABILIZER POSITION INDICATOR MODULE - MAINTENANCE PRACTICES

1. General

A. The horizontal stabilizer position indicator module is mounted on the control pedestal in the flight compartment.

B. Access to position indicator module attach bolts and connecting linkage is through the access panels on left side of pedestal.

2. Removal/Installation Horizontal Stabilizer Position Indicator Module

A. Remove Module

(1) Remove left hand access panels from control pedestal.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open this circuit breaker and install safety tag:

UPPER EPC, LIGHTS - LEFT AC BUS

Row	Col	Number	Name
K	19	B1-309	INTEGRAL LIGHTS PEDESTAL

(3) Remove lightplate attach screws and carefully remove lightplates from module. Retain lightplates for reinstallation.

NOTE: Lightplates plug into a receptacle on top of module. A small cross on the lightplate identifies plug location.

(4) Disconnect rod at point shown. (Figure 201)

(5) Disconnect lower center arm at point shown. (Figure 201)

(6) Remove nuts from attach bolts, three (3) places.

(7) Carefully, push attach bolts inboard out of indicator module until bolt ends are flush with mounting surface. Remove module from pedestal by holding slightly outboard to extract pin from gear detent then lift up to clear rod and arm assemblies extending from lower end.

NOTE: Do not push bolts out of indicator module beyond inboard surface of module to prevent hardware from possibly dropping into lower pedestal area.

(8) While supporting position indicator module, disconnect electrical leads from lightplate receptacle.

B. Install Module

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that this circuit breaker is open and has safety tag:

UPPER EPC, LIGHTS - LEFT AC BUS

Row	Col	Number	Name
K	19	B1-309	INTEGRAL LIGHTS PEDESTAL

(2) While supporting indicator module, connect electrical leads to lightplate receptacle.

(3) Install position indicator module in pedestal by inserting lower end first. When positioning upper portion of module, make certain pin protruding from indicator lever on mating surface, is in gear detent before installing attach bolts. (Figure 201)

(4) Align bolt holes in module with attach bolts. Carefully push bolts outboard through holes in indicator module and install nuts.

(5) Connect rod at lower end. Tighten nut and safety with cotter pin.

(6) Connect lower center arm. Tighten nut and safety with cotter pin.

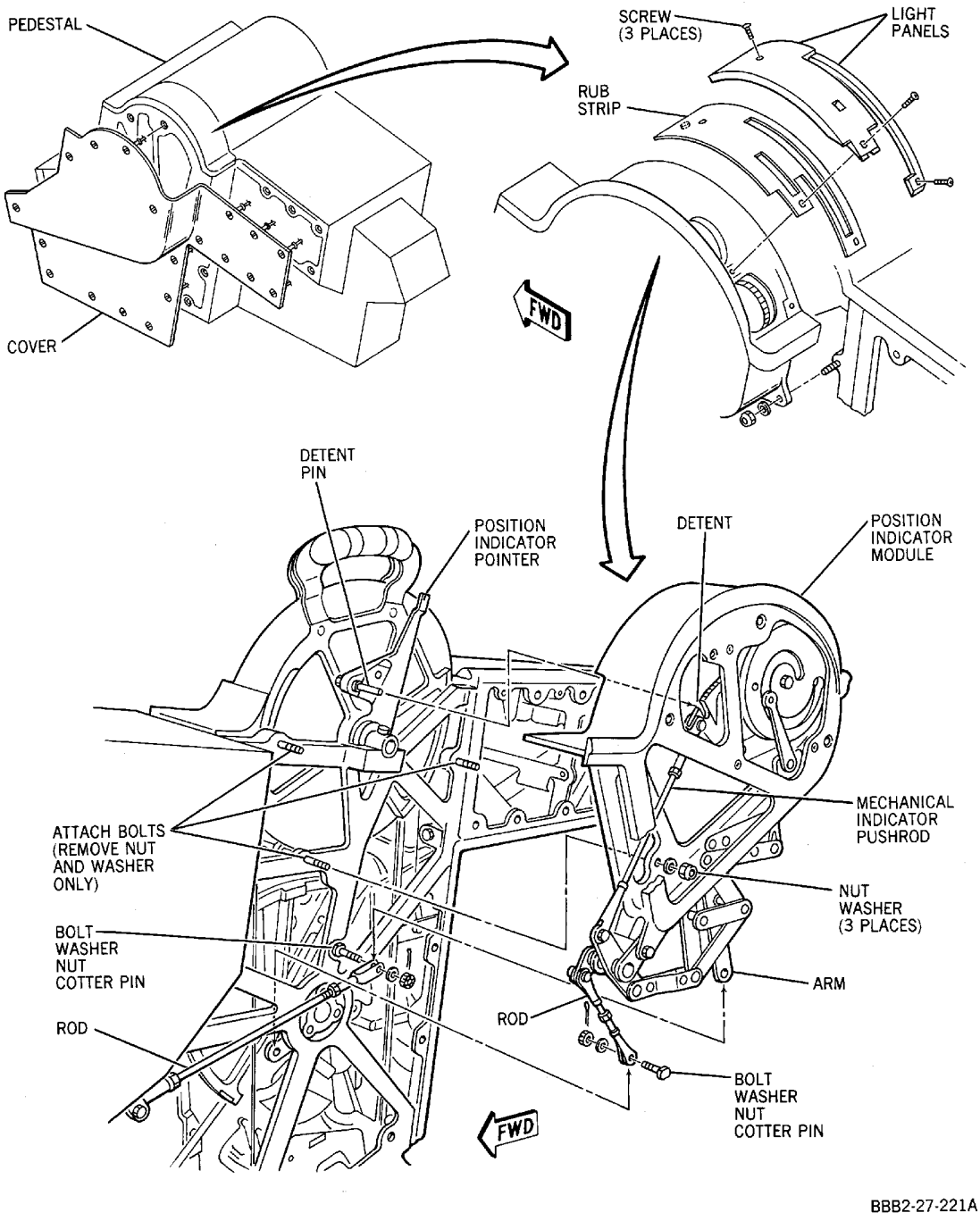
(7) Carefully plug module lightplates into receptacle and install lightplate attach screws.

(8) Remove the safety tag and close this circuit breaker:

UPPER EPC, LIGHTS - LEFT AC BUS

Row	Col	Number	Name
K	19	B1-309	INTEGRAL LIGHTS PEDESTAL

(9) Install left hand access panels on pedestal.



Horizontal Stabilizer Position Indicator Module - Removal/Installation
Figure 201/27-40-12-990-801

3. **Adjustment/Test - Horizontal Stabilizer Position Indicator Module**

A. Test Module

(1) Dial CG and Flap thumbwheels to obtain settings (a) through (g) as shown below. After dialing each setting, make certain figure appearing in horizontal trim window and the position of green band indicator pointer are reading the same as shown. Both horizontal stabilizer position indicators should show the same reading within ±1/4° degree.

Table 201

	CG SETTING	FLAP SETTING	HORIZONTAL STABILIZER READING (±1/4 DEGREE)
(a)	13	8	6.00
(b)	14	11	6.00
(c)	2.5	23	10.80
(d)	5	0	6.80
(e)	10	20	8.00
(f)	24	24	4.00
(g)	24	4	3.10
NOTE: Some numbers viewed in horizontal trim window will appear above center arrow. Reading should be taken at arrow point to get true position.			
NOTE: If necessary, adjust mechanical indicator pushrod to achieve values listed in Figure 201, to achieve values listed in Paragraph 3.A.(1).			

B. Test Flap Takeoff Warning Switch (FLAP WARNING SWITCHES - MAINTENANCE PRACTICES, PAGEBLOCK 27-53-01/201, 3.B. step (4)-(11))(Ref.

C. Test Horizontal Stabilizer Takeoff Warning Switch (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501, 3.F.)

D. Test Takeoff Warning System (GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 27-00-00/501, 11.B.(1) -(23))

HORIZONTAL STABILIZER POSITION SENSOR (STALL WARNING) - MAINTENANCE PRACTICES

1. General

A. The horizontal stabilizer position sensors may be removed and replaced without disturbing the control cables. The sensors are located above the ceiling panels in the lower cargo compartments.

B. The horizontal stabilizer longitudinal trim control system position sensors and mechanism are located in the forward cargo compartment overhead, right side, forward of the forward cargo door. They are accessible through the adjacent compartment ceiling liner panels.

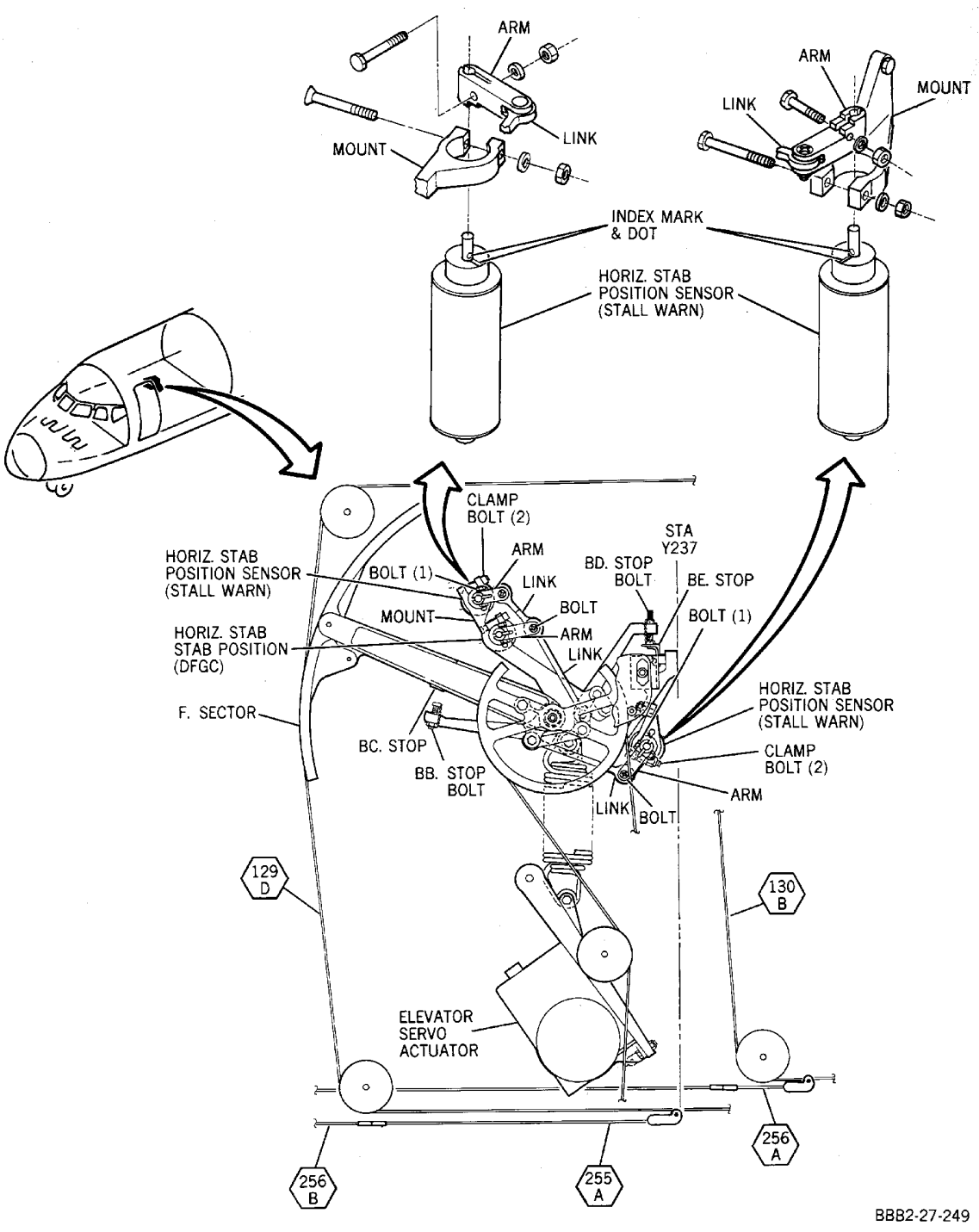
2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed item:

Table 201

Name and Number	Manufacturer
Lockwire, NASM20995N20, DPM684*[1]	Not specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.



Horizontal Stabilizer Position Sensor -- Removal/Installation
Figure 201/27-40-13-990-801

3. **Removal/Installation Horizontal Stabilizer Position Sensor**

A. Remove Position Sensor

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
A	13	B1-838	STALL WARNING ALPHA FLAP-1

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	9	B1-837	STALL WARNING ALPHA FLAP-2

(2) Disconnect electrical connector from sensor.

(3) Loosen bolts (1) and (2) sufficient to remove sensor.

(4) Remove position sensor.

B. Install Position Sensor

(1) Make certain that horizontal stabilizer is at 1 degree 36(±15) minutes.

CAUTION: SENSOR WILL BE DAMAGED IF ROTATED BEYOND INTERNAL STOPS.

(2) Align index mark on sensor body with dot on sensor shaft.

(3) Position sensor body in mount with shaft positioned in arm. Install bolts (1) and (2).

(4) Connect electrical connector on sensor, safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(5) If necessary, perform adjustment of sensor (PAGEBLOCK 27-40-00/501).

(6) Perform return to service test. (DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201)

FLAPS - DESCRIPTION

1. General

A. The flaps are movable surfaces that are extended during takeoff to increase lift, or during the landing approach and roll to increase drag and reduce speed of the aircraft. The flap system consists of the flaps and five subsystems: flap mechanical controls, flap hydraulic actuation, flap bus, flap position indicating and flap position warning switches.

2. Flaps

A. There are four flaps, located at the wing trailing edge, one inboard and one outboard on each wing. Each inboard flap is supported at two points. Support at the inboard end is provided by roller supports attached to the fuselage. A circular arc track, attached to the inboard end of the flap, travels along the roller supports. The outboard end is supported by an external hinge and bracket attached to the wing rear spar. Each outboard flap is supported at three points by external hinges and brackets attached to the wing rear spar. Each flap hinge point is located below the wing and each flap track is contoured so that flap movement from the retracted position is aft and downward. The inboard and outboard flaps are joined together by a flexible joint, consisting of linkage, self aligning bearings and pivot bolts. The flexible joint is sealed with aerodynamically clean fairing at all positions of flap settings.

3. Flap Mechanical Controls

A. Description (Figure 1 or Figure 2)

(1) The flap control system controls the movement and positioning of the flaps. The system consists of three subsystems: the flap actuating system, the flap followup system combine to control the movement and positioning of the flaps. The actuating system moves the flaps toward the desired setting and the followup system stops the movement at the desired position. The bus system maintains symmetrical extension and retraction throughout the flap operating range. The bus system also provides an input to the elevator servo force limiter and to the slat system.

(2) The actuating system consists of a flap/slat control lever, dual closed loop cable system, flap/slat sequencing mechanism, closed loop cable system, control valve, flap two-speed valve, and eight actuating cylinders. The followup system consists of two followup drums, two two-way cable systems, and mechanical linkage attached to each flap. The bus system consists of two, two-piece cable assemblies and the necessary pulleys to form a two-way closed circuit cable system that connect the right and left inboard flap tracks. The two segments of each cable assembly are connected together by a shear bolt in the turnbuckle and clevis assembly. One cable segment end fitting ties the elevator servo force limiter input cables to the bus cable system. The bus cables will separate at the shear bolt to prevent structural damage occurring should one flap jam at some midpoint of travel.

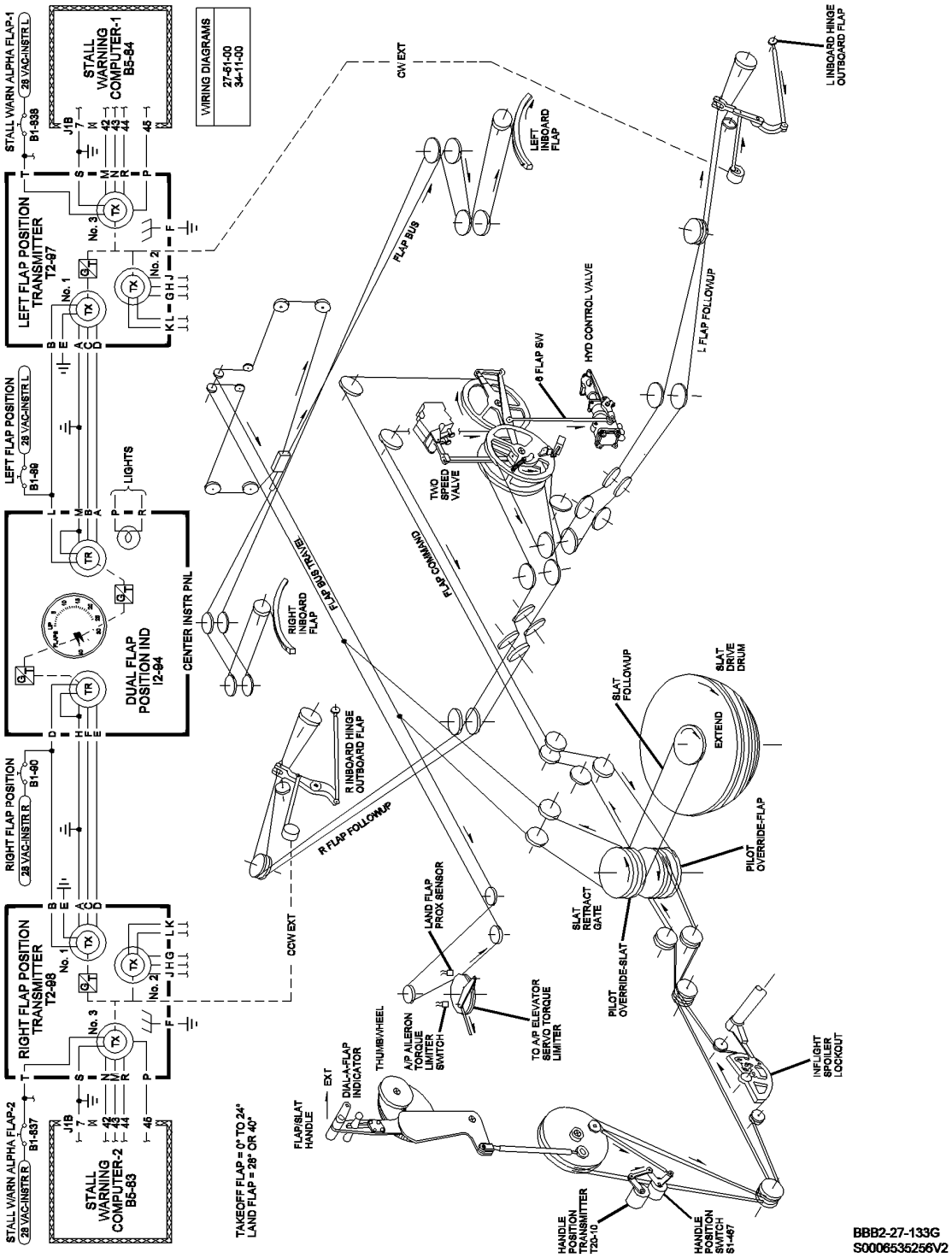
(3) The control lever is located on the control pedestal. The control drive drum, control valve, flap two-speed valve, and followup drums are located in the left main gear wheel-well. The flap/slat sequencing mechanism is located on the front spar of the center wing section.

(4) The flap/slat control lever is connected by the dual closed loop cable system to the flap/slat sequencing mechanism, separate flap and slat commands are output by the sequencing mechanism, the flap command is transferred from the dual cable system drum by a set of spring-loaded overrides to another cable drum driving a closed loop cable system connected to the flap control valve actuating mechanism. A walking beam interconnect the control drive drum, two followup sectors, control valve, and flap two-speed valve. One end of the walking beam is linked to the control drive drum, the other end of the walking beam is connected to a crank which is located between the two followup drums and mounted on the followup drum shaft. The opposite end of the crank is connected to the two followup sectors by a spring-positioned crosspin. The flap two-speed valve is connected by a pushrod which is connected to the outboard followup drum. The followup drums are connected by separate cable systems to a crank and pushrod attached to each of the flaps at the inboard hinge. The control valve is connected to the walking beam by a pushrod so that movement of either the control drive drum or followup drums changes the position of the valve.

B. Operation

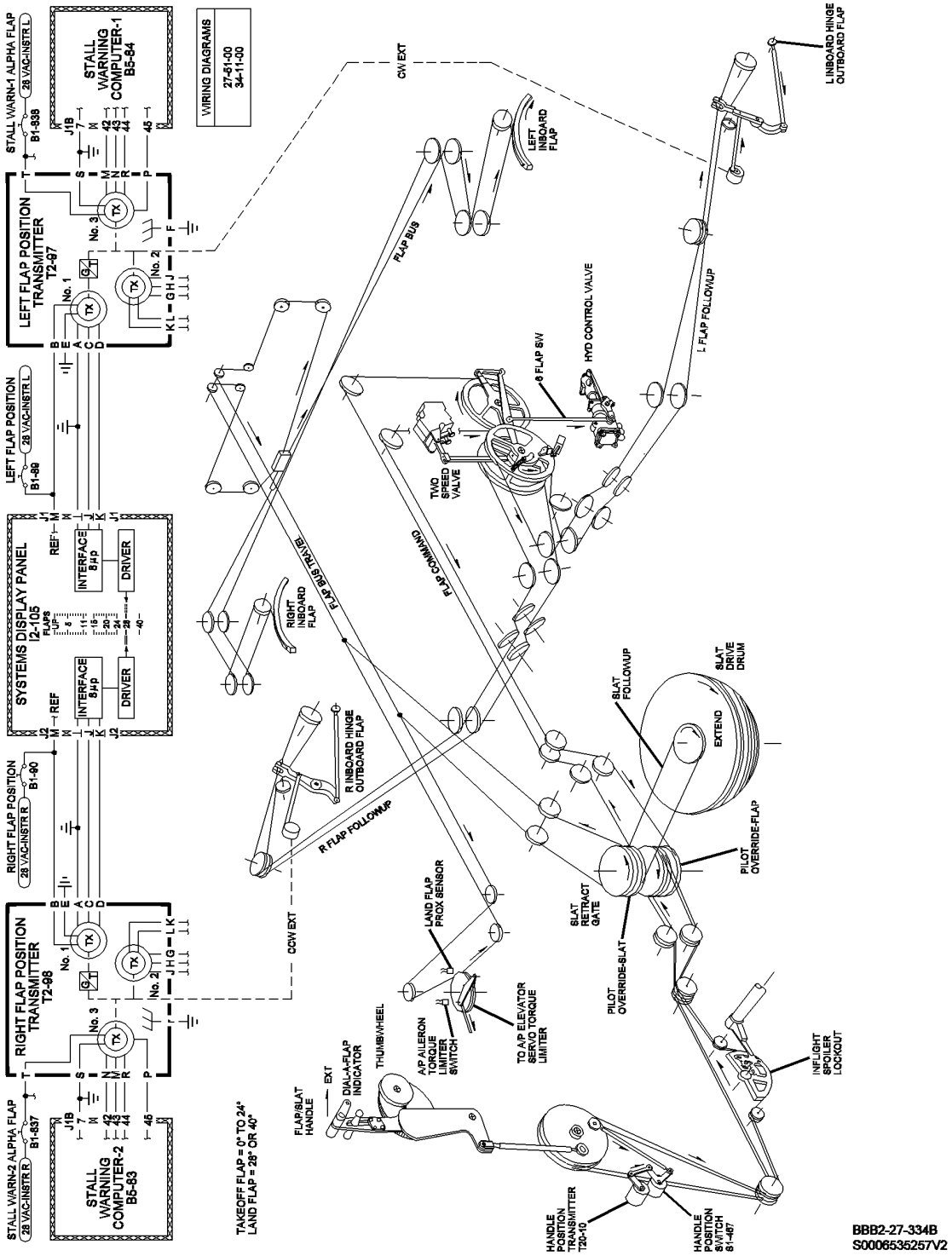
(1) Extension and retraction of both the flaps and slats is controlled by a single lever or handle located on the right side of the pilots control pedestal. Conventional detents are provided for the lever at UP, 0, 11, 15, 28, and 40 degree positions. However, the flaps may be set to any position between 0 and 24 degrees by means of a dial-a-flap takeoff selection thumb wheel, located adjacent to the control lever. The optimum setting for takeoff is based on takeoff weight and other prevailing field conditions, which are computed during the flight planning.

(2) Movement of the flap/slat control lever is transmitted through the cable system to the control drive drum. Rotation of the drum displaces the walking beam and control valve pushrod, positioning the control valve slide to direct pressure to the actuating cylinders to extend or retract the flaps. As the flaps move, the pushrods attached to the flaps actuate the cranks to move the followup system cables and rotate the followup drums. The followup drums move the crosspin and walking beam crank, which in turn moves the walking beam in a direction opposite to that imparted by the control drive drum. As the walking beam moves, the control valve pushrod returns the control valve slide toward the neutral position. At the same time, the followup drum moves the pushrod connected to the flap two-speed valve to position the valve slide to direct the flow of fluid through the valve. The actuating cylinders continue to move the flaps until the control drive drum displacement of the walking beam is equalled by an opposite displacement from the followup drums, and the control valve slide is returned to the neutral position.



Flap Control and Indication -- Schematic
Figure 1/27-50-00-990-801

EFFECTIVITY
WJE 405-411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891-893



Flap Control and Indication -- Schematic
Figure 2/27-50-00-990-802

EFFECTIVITY
WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 886, 887

4. Flap Hydraulic Actuation

A. Description (Figure 3)

(1) The flap hydraulic actuation components are powered by the left and right hydraulic systems. Each flap segment is powered by two single, hydraulic cylinders. One actuating cylinder on each flap segment is supplied hydraulic fluid / pressure by the left hydraulic system, and the second actuating cylinder on each flap segment is supplied hydraulic fluid/pressure by the right hydraulic system. The tandem control valve consists of two individual control valves in tandem. The left and right hydraulic systems are connected to their respective individual ports at the control valve. The flap two-speed valve is a dual assembly consisting of two identical valves mounted side by side. The valve varies the rate of return flow from the flap actuating cylinders, to provide a reduced rate of flap retraction in the flap range from approximately 20 degrees to the faired position. The valves are placed in series with the control valves, one for the left hydraulic system and one for the right.

(2) Each flap control valve consists of two, identical, matched slide valves, mechanically interconnected for simultaneous operation. Each slide valve has an inlet port, a return port, and two outlet ports. The inlet and return ports on one valve are connected to the left hydraulic system and the outlet ports are connected to the extend and retract sides of the outboard actuating cylinder on the corresponding flap. The second slide valve inlet and return ports are connected to the right hydraulic system and the outlet ports are connected to the extend and retracts sides of the inboard actuating cylinder on the corresponding flap.

(3) The flap actuating cylinders are standard, two-way hydraulic cylinders, used to extend and retract the flaps. Each cylinder has a barrel with integral formed clevis, a piston with integral rod and an eyebolt with self aligning bearing. The barrel has an extend port on one end and a retract port on the opposite end. The two cylinders for each outboard flap segment are located at the hinge brackets. Each inboard flap segment has one cylinder located at the inboard support structure and one cylinder at the outboard hinge bracket.

(4) The flap two-speed valve is a dual assembly consisting of two identical slide valves mounted side-by-side. The valve varies the rate-of-return flow from the flap actuating cylinders, to provide a reduced rate of flap retraction in the flap range from approximately 20 degrees to the faired position. The valves are placed in series with the control valves. One of the valves is connected in the system to the outboard actuating cylinders, the other valve is connected in the system to the inboard cylinders. Each slide valve consists of a body, lap assembly, internal check valve, two two-way restrictor orifices, two filter screens, and the necessary seals. The valve body has two ports; one port is connected to the down pressure line from control valve, the other port is connected to the extend side of the actuating cylinders. The slides of both valves are connected by a yoke so as to be moved simultaneously. The slides are positioned in the sleeves to direct the flow of fluid from the actuating cylinders through one or both orifices by a pushrod connected to the followup drums.

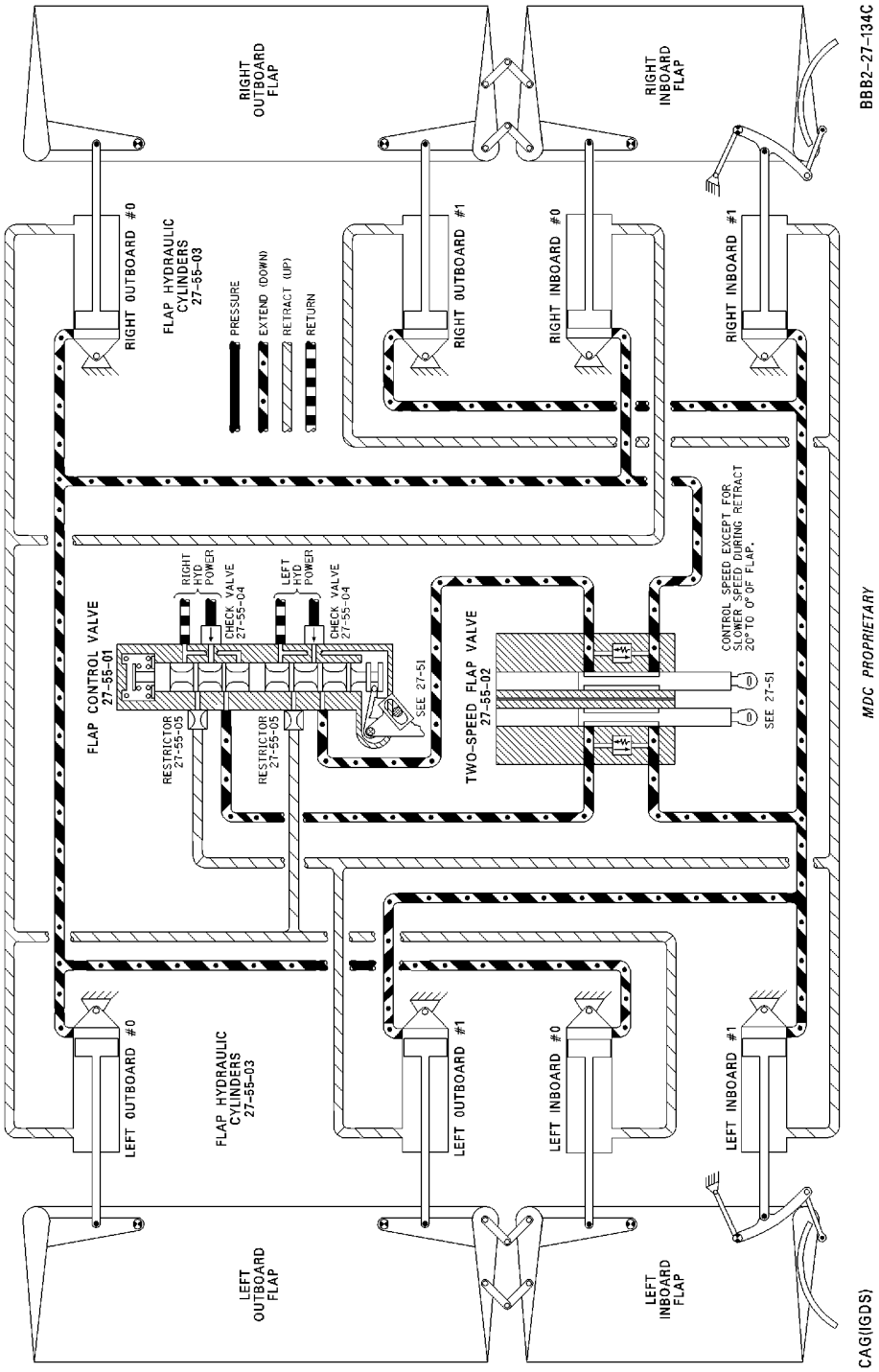
B. Operation

(1) When the flap control lever is actuated, the control valve slide is positioned to allow main system pressure to enter the control valve inlet port and flow through one of the outlet ports, at the same time block the flow of pressure from the inlet port to the second outlet port, and open a path between the second outlet port and the return port. Direction of movement of the control lever determines to which of the outlet ports main system pressure will be directed while the other is open to return. If the control lever is moved to extend the flaps, pressure is directed to the outlet connected to the flap two-speed valve and then to the extend side of the actuating cylinder. The outlet port connected to the retract side of the actuating cylinder is then open to the return, and fluid flows from the retract side of the cylinder through the control valve back to the main system reservoir. When the control lever is moved to retract the flaps, the flow through the control valve outlet ports is reversed. When the flaps reach the selected position and the control valve slide is moved back to the neutral position by the followup system, flow of fluid through the return port is blocked and pressure to the extend and retract sides of the actuating cylinder is locked in the lines.

(2) Direction of flow of fluid through the flap two-speed valve is controlled by the direction of movement of the flap control lever. Rate-of-flow through the flap two-speed valve is controlled by the position of the flaps through the followup system.

(3) When the control lever is moved to extend the flaps, pressure from the control valve is directed to the flap two-speed valve. The pressure follows a path through two orifices and an internal check valve to a second port in the flap two-speed valve, and then to the extend side of the actuating cylinders. As the flaps move downward, the valve slide is moved by the followup system to open the path through the sleeve and allow the pressure to bypass the check valve and follow the path through the sleeve to the second port. Rate-of-flow through the flap two-speed valve is constant throughout the entire flap extension range.

(4) When the control lever is moved to retract the flaps the flow of fluid through the flap two-speed valve is reversed. Fluid from the extend side of the actuating cylinder is forced back to the flap two-speed valve by the piston as the flaps move toward the retracted position. Fluid enters the port connected to the extend side of the actuating cylinder and follows the path through the two orifices to the port connected to the return side of the control valve. Fluid flows through the two orifices until the valve slide is moved by the followup system to block the flow to one of the orifices; the rate-of-flow through the flap two-speed valve is then reduced. This reduced rate-of-flow reduces the rate at which the flaps are retracted in the range of high lift to drag ratio loss as the flap angle decreases.



Flap Hydraulic -- Schematic
Figure 3/27-50-00-990-803

5. Flap Bus

A. The flap bus system consists of two cables, routed over pulleys, which mechanically interconnect the left and right wing flaps. Each cable attaches to one end of a circular track, on the inboard end of the left wing flap, and to the opposite end of a similar track on the right wing flap. One of the cables is connected to a swivel fitting to a flap position cable.

B. The primary function of the flap bus system is to provide synchronization of the flaps by direct mechanical drive. When one flap is moved to any position the bus will move the other flap to the same position. The bus cables are designed to act as a mechanical fuse which fails should one flap surface jam. The bus also drives a followup cable loop which transfers flap position input to the slat system, the autopilot elevator servo force limiter, and the landing flap position proximity switch.

6. Flap Position Indicating

A. Description

(1) The flap position indicating system is a mechanically actuated electrical system that transmits the position of the left and right flaps to an indicator in the flight compartment. The system consists of the flap position indicator and two flap position transmitters with connecting linkage.

(2) The flap position transmitters are synchro transmitters with an internal gear ratio so 1 degree of transmitter shaft rotation results in 2 degrees of rotation at the indicator shaft. A transmitter is attached to each wing rear spar adjacent to the outboard flap inboard hinge fitting. A crank on each transmitter is connected by pushrod to the flap followup crank. The transmitters are connected electrically to the flap position indicator.

(3) Without Electronic Overhead Annunciator Panel (EOAP) and Electronic Center Instrument Panel installed, the flap position indicator, located on the center instrument panel, is a dual synchro-type indicator. The indicator pointers are superimposed, one in front of the other, so any mismatch between left and right flap position is shown directly on the indicator. The outer pointer is rotated by output from the left flap position transmitter. Output from the right transmitter rotates the inner pointer. The indicator scale covers a range of from 0 (flaps retracted) to 40 degrees (flaps fully extended.

(4) With Electronic Overhead Annunciator Panel (EOAP) and Electronic Center Instrument Panel installed (with Electronic Flight Instrument System (EFIS)), the flap position indicator, located on center instrument panel (lower right side) is a vertical scale, dual pointer indicator. The left indicator is driven by electronic signals from the left flap position transmitter. The right indicator is driven by electronic signals from the right flap transmitter. The indicator scale covers a range of from UP (0 or flaps retracted) to 40 degrees (flaps fully extended).

B. Operation

(1) With the aircraft electrical buses energized, and the flap position indicator circuit breakers closed, the flap position indicator is continuous-reading, indicating the actual position of each flap.

7. Flap Position Warning Switches

A. Flap position warning switches are part of the central aural warning system (PAGEBLOCK 31-51-00/201). The flap handle/flap thumbwheel warning switch, located in the pedestal below the flap/slat handle, alerts the central aural warning system, through the proximity switch electronic unit, if the flap thumbwheel flap position indication on the TAKE-OFF CONDTN panel is not in agreement with the flap/slat handle position for takeoff. The landing flap position proximity switch, located on the autopilot force limiter mechanism in the forward cargo compartment, alerts the central warning system, through the proximity switch electronic unit, if the flaps are not in the correct position for landing. The flap extend switch, located on the flap control mechanism in the left wheelwell, alerts the central aural warning system if the flaps are extended past 6° and the speedbrake lever is extended. In addition, the spoiler flap extended light on the overhead annunciator panel comes on.

B. When the aircraft is on the ground, the central aural warning system generates the takeoff warning if one or both engine throttles are advanced and the flap handle position is set at a position that differs with the flap thumbwheel flap setting on the TAKE-OFF CONDTN panel. The takeoff warning will continue to sound until the flaps are moved to the proper takeoff position or the throttles are retarded. During landing approach, the warning will sound if the flaps are in landing configuration and the landing gear is not down and locked. The warning will continue to sound until the gear is down and locked.

C. During flight, the central aural warning system generates the spoiler extended warning if the flaps are positioned 6° or greater and the speedbrake lever is in extended position. The spoiler flap extend light on the overhead annunciator panel will also come on. The aural warning will cease sounding and the spoiler flap extend light will go off when the speedbrake lever is placed in the retract position.

FLAP CONTROL SYSTEM - TROUBLE SHOOTING

1. General

A. Trouble shooting provided in this section are basic procedures for isolating and correcting a faulty flap control system.

B. Flap control system components and location are as follows:

Table 101

Component	Location
Flap/slat handle	Control pedestal flight compartment
Flap control valve	Left main gear wheel well
Flap two-speed valve	Left main gear wheel well
Flap position indicator	Center instrument panel
Flap position transmitter (two places)	Left and right outboard flaps, inboard hinge
Flap actuators (eight places)	Two for each inboard and outboard flap surface.
Stall warning and alpha flap circuit breakers	Upper C/B panel

2. Equipment and Materials

NOTE: Equivalent substitutes can be used instead of the following listed item.

Table 102

Name and Number	Manufacturer
Multimeter (2000A)	Dana

3. Trouble Shooting Flap Control System

WARNING: IF HYDRAULIC AND ELECTRICAL POWER IS REQUIRED DURING CHECK, MAKE CERTAIN FLAP AND SLAT SURFACES ARE CLEAR OF PERSONNEL AND EQUIPMENT.

WARNING: WHEN THE AIRPLANE IS ON THE GROUND, WITH WEIGHT ON WHEELS, THE BITE TEST OF THE AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME THE FLAP/SLAT HANDLE IS MOVED FROM THE RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. THE SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

A. Trouble Shoot

NOTE: During prolonged periods with the hydraulic systems unpressurized, the flaps may droop due to system lap leakage. This is a normal occurrence and will vary from aircraft to aircraft. Unpressurized flap droop in itself is not a problem (except for ground support equipment interference), as long as the flaps/slats position and operate properly with the hydraulic systems pressurized. If unpressurized flap droop is considered excessive on a particular aircraft, it should be reported so trouble shooting can be performed at the next maintenance period.

NOTE: To identify a leaking flap cylinder, pressurize both hydraulic systems and retract the flaps. Wait 10 minutes and lower the flaps to 15 degrees or more to expose the flap hydraulic cylinders. The cylinders should be cold to the touch. If a cylinder is warm, it is leaking and should be replaced.

Table 103

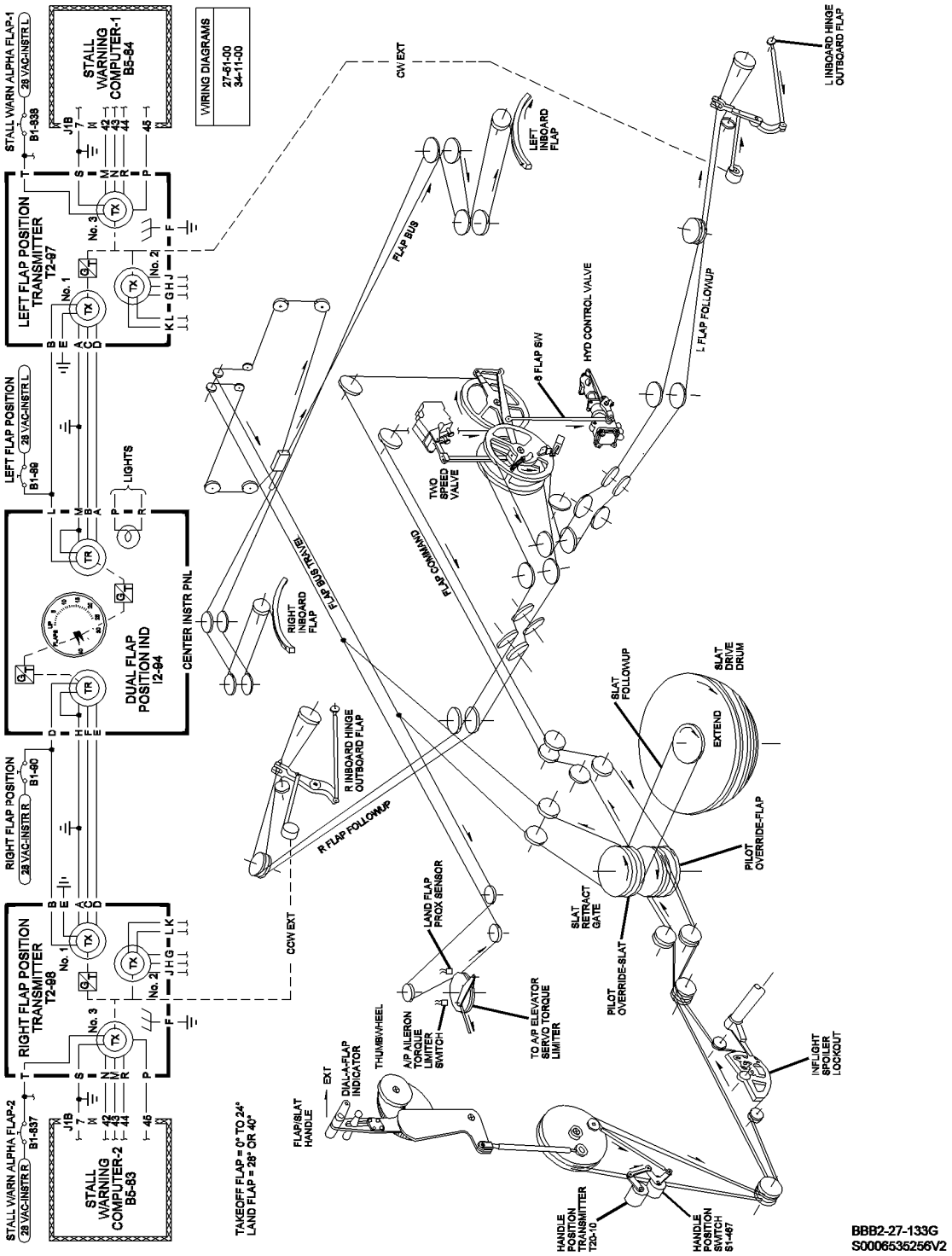
Possible Causes		Isolation Procedure	Correction
(1)	FLAPS DO NOT EXTEND IN RESPONSE TO CONTROL HANDLE MOVEMENT		
(a)	Broken or jammed cables	Check control cables.	Repair or replace, as necessary.
(b)	Missing or broken linkage or attach bolts	Check control linkage.	Replace parts, as required.
(c)	Defective flap control valve	Check control valve.	Replace valve.
(d)	Flap control cables out of rig	Make rig check of cables.	Rerig cables.
(e)	Flap followup system out of adjustment	Check followup adjustment.	Adjust system as required.
(2)	FLAP MOTION IS SLOWER THAN NORMAL		
(a)	One hydraulic system inoperative	Check hydraulic system pressures.	Repair, replace, or reactivate system, as necessary.
(b)	(b) Obstruction in hydraulic line	Check for damaged, bent or kinked lines.	Repair or replace damaged lines.
(c)	(c) Contamination in actuator lines	Check for fluid contamination.	Flush hydraulic lines in actuator circuit.
(d)	(d) Defective control valve or followup valve	Check valve operation.	Replace or adjust as required.
(3)	FLAP POSITION INDICATOR SHOWS MISMATCH OR FLAP POSITION		
(a)	Flap bus system jammed	Check for obstructions.	Remove obstructions.
(b)	Broken or loose system parts	Check linkage and parts for condition and security.	Replace or repair as necessary.

Table 103 (Continued)

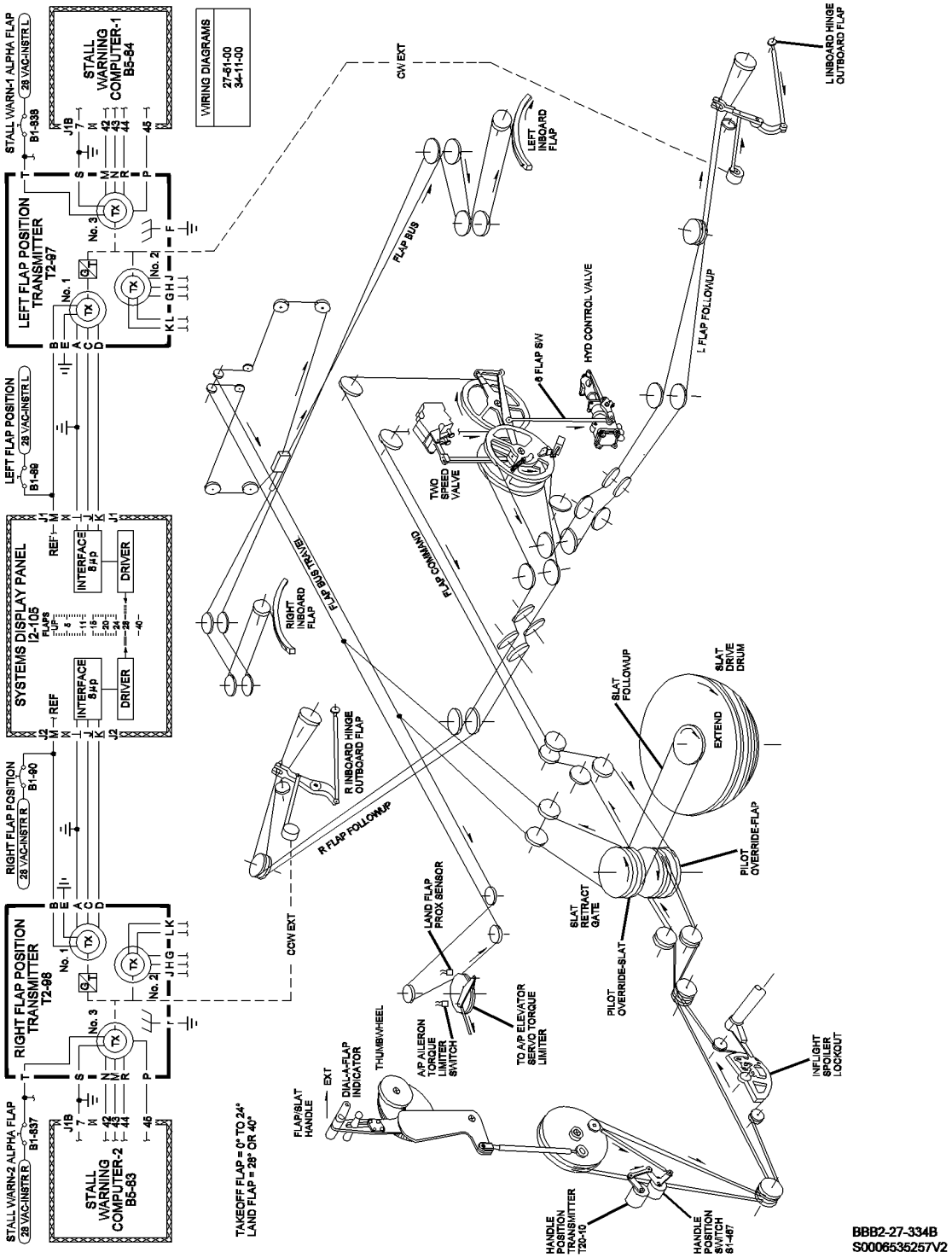
Possible Causes		Isolation Procedure	Correction
(c)	Flap bus system not properly rigged	Check for bus system rigging.	Rerig system, as necessary.
(d)	Flap instruments malfunctioning	Check flap position transmitters and indicator.	Replace as necessary.
(4)	FLAPS DO NOT RETRACT TO FULLY FAIRED POSITION		
NOTE: With the BUTE doors up, the flaps/slats will not fully retract. If possible, use both hydraulic systems to retract the flaps.			
(a)	Flap control valve pushrod improperly adjusted	Check pushrod adjustment.	Adjust pushrod.
(b)	Flap followup system out of rig	Check followup rigging.	Rerig followup control system.
(c)	Low hydraulic pressure	Check system pressure.	Correct low pressure condition.
(d)	Low fluid supply	Check fluid level.	Add fluid to proper level.
(e)	Flap control valve malfunctioning	Check control valve operation.	Replace faulty valve.
(f)	Improperly adjusted flap stops	Check stop adjustment.	Adjust stops as required.
(g)	Binding in flap hinges or linkages	Check for freedom of movement.	Repair, adjust, or lubricate, as necessary.
(h)	Bent or deformed wing trailing edges	Check wing trailing edge access doors.	Replace damaged parts.
(i)	Actuators improperly adjusted	Check flap actuator length.	Adjust flap actuators, as necessary.
(5)	FLAP TRAVEL LIMITS ARE INCORRECT		
(a)	Actuators incorrectly adjusted	Check actuators.	Adjust actuator length.
(b)	Flap controls incorrectly adjusted	Check control rigging.	Rerig control system.
(c)	Flap followup system incorrectly adjusted	Check followup rigging.	Rerig followup system.
(d)	Flap control defective	Check control valve action.	Replace control valve.
(6)	FLAP TRAVEL DISAGREES WITH FLAP HANDLE POSITION		
(a)	Flap control or followup system jammed or binding	Check system for jammed, broken or binding parts.	Clear, replace or free as necessary.
(b)	Control cables rigged incorrectly	Check control cable rigging.	Rerig control cables.
(c)	Control valve pushrod incorrectly adjusted	Check setting of control valve neutral.	Readjust control valve pushrod.
(d)	Broken cables or parts	Check for breakage.	Replace any broken parts.
(7)	FLAP CONTROL HANDLE MOVEMENT IS ROUGH OR ERRATIC		
(a)	Frayed control cables	Check cables for frayed or broken strands.	Replace damaged cables.
(b)	Loose objects fouling turnbuckles	Check turnbuckle locations for obstructions.	Remove obstructions.
(c)	Cables improperly routed	Check cable routing and pulleys.	Correct routing and/or replace cables on pulleys.

Table 103 (Continued)

Possible Causes		Isolation Procedure	Correction
(d)	Worn cable fairleads or grommets	Check condition of cable run fairleads and grommets.	Replace worn parts.
(e)	Sticking or binding cable pressure seal	Check cable pressure seals for cleanliness and freedom.	Clean and free sticky seals.
(8)	FLAP HANDLE MOVEMENT IS STIFF		
(a)	Excessive rigging tension on control cables	Check control cable rig tension.	Rerig control cables.
(b)	Foreign objects fouling control mechanism	Check control system for obstructions.	Remove obstructions.
(c)	Broken pulleys or fairleads	Check pulleys and fairleads.	Replace worn or defective parts.
(d)	Broken or misaligned pulley or fairlead brackets	Check security and alignment of pulleys and fairleads.	Correct discrepancies found.
(e)	Defective bearings in flap handle or control drum	Check condition of bearings.	Replace defective bearings.
(f)	Control cable pressure seals sticking	Check seals for cleanness.	Clean sticky or foreign matter from seals.
(9)	AIRPLANE TENDS TO ROLL WITH FLAPS EXTENDED		
(a)	Fixed flap vane requires adjustment	Adjust vane angle and clearance within allowable tolerance.	FLAP FIXED VANES - MAINTENANCE PRACTICES, PAGEBLOCK 27-51-03/201 for detailed procedures.
(b)	Unsynchronized flap operation	Check flap angles at each flap control detent.	Adjust flap control system as required. FLAPS - ADJUSTMENT/TEST, PAGEBLOCK 27-50-00/501
(10)	BITE TEST OF AUTO-SLAT EXTEND SYSTEM NOT ENABLED WHEN FLAP/SLAT HANDLE IS PLACED IN T.O. EXT DETENT		
(a)	Flap/slat handle position switches		LIFT AUGMENTING, SUBJECT 27-80-00, Page 101.
(b)	Proximity switch unit		STALL WARNING SYSTEM, SUBJECT 34-19-00, Page 101.



Flap Control and Indication -- Schematic
Figure 101/27-50-00-990-804



Flap Control and Indication -- Schematic
Figure 102/27-50-00-990-805

FLAPS - ADJUSTMENT/TEST

1. General

A. The following paragraphs provide instructions for the adjustment/test of the entire flap system. Specific segments of the system may be adjusted or tested by following the instructions in the applicable paragraph.

B. Integral rig marks are provided for flap rigging positions. On the inboard flap, a rig mark on the inboard lower roller fitting aligns with triangular rig marks on the adjacent track. The base of each triangular rig mark provides a tolerance bar for the corresponding flap position.

C. General maintenance practices must be read and understood before proceeding with the adjustment procedures. (PAGEBLOCK 27-00-00/201)

D. All rig pins are assigned individual numbers in the following paragraphs; corresponding rig pin numbers and sizes are listed in the general maintenance practices. (PAGEBLOCK 27-00-00/201)

E. The tension of nylon coated cables is to be measured with a tensiometer using tensiometer riser and calibration chart corresponding to the outside diameter of the cable including the coating. The temperature compensation curve in Figure 503 corresponds to the actual diameter of the steel cable.

F. The numbers enclosed by hexagon-shaped symbols in the adjustment diagrams correspond to cable runs and segments listed in Paragraph 4.. Each cable run number is posted adjacent to the corresponding cable on the airplane. The letters in parentheses in the following text correspond to callouts in the adjustment diagrams.

G. Access to turnbuckles is given in text as required. Access to other major components is as follows:

Table 501

Item	Access Door	Location
Flap control mechanism and control valve	Left main landing gear doors	Left wheelwell on inboard bulkhead
Flap/slat sequence mechanism	Forward cargo compartment aft panel 5138C	Center wing section front spar
Flap position transmitters	Left and right outboard flap inboard hinge fairings	Inboard hinge of left and right outboard flaps
Flap/slat control handle	Panel right side pilots control pedestal	Flight compartment

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 502

Name and Number	Manufacturer
Tensiometer	Pacific Scientific Co.
Tensioner Control Cable (1/16 to 3/8) inch (1.587 to 9.525 mm) (5954644-1, -503, -505)	Douglas Aircraft Co.
Door safety locks 3936851-1 or -501 as applicable. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co.
Protractor	
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified

Table 502 (Continued)

Name and Number	Manufacturer
Rig pins(2) (5-5) 5/16 by 5 5/8 (7.937 x 142.875 mm)	
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch) (15.875 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Adjustment/Test Flaps

NOTE: Inboard and outboard flaps must be properly adjusted prior to adjusting flap control systems. (PAGEBLOCK 27-51-01/401)

A. Adjust Flap Bus (Figure 501 (Sheet 2))

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

(2) Place BUTE (bent up trailing edge) doors in a restrained faired (down) position.

WARNING: BEFORE PRESSURING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(3) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

WARNING: WHEN THE AIRPLANE IS ON THE GROUND, WITH WEIGHT ON WHEELS, THE BITE TEST OF THE AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME THE FLAP/SLAT HANDLE IS MOVED FROM THE RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. THE SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

CAUTION: MAKE SURE THE FLAP/SLAT HANDLE IS IN THE 0/EXT DETENT WHEN RETRACTING THE FLAP/SLATS UNTIL THE FLAPS ARE FULLY RETRACTED. THEN MAKE SURE THE HANDLE IS PUT IN THE UP/RET DETENT TO RETRACT THE SLATS. THIS WILL HELP PREVENT DAMAGE TO THE UPPER ARM OF THE SLAT SEQUENCE MECHANISM CRANK.

CAUTION: MAKE SURE THE FLAP/SLAT HANDLE AND THE ACTUAL SURFACE POSITION ARE NO MORE THAN TWO DETENTS APART, WHEN THE FLAPS OR SLATS ARE OPERATED IN ONE OF THE TWO DIRECTIONS. THIS WILL HELP PREVENT DAMAGE TO THE FLAP/SLAT SEQUENCE MECHANISMS.

(4) Place flap/slat handle in 11°/T.O. EXT detent.

(5) Adjust flap bus turnbuckles (A) and (B) until tension is between minimum and maximum load per cable tension table for 3/16 inch (4.76 mm) cables. For newly installed cable tension, perform Paragraph 3.A.(6). (Figure 503)

NOTE: Flap bus turnbuckles are located in right wheelwell at rear bulkhead.

NOTE: If the nylon coating is removed, use the tensiometer riser and tensiometer calibration card corresponding to the outside diameter of the cable where tension reading is taken.

Example - Nylon coating installed - A 3/16 inch diameter cable with a 1/32 inch nylon coating equals 1/4 inch. Use tensiometer riser and tensiometer calibration card for a 1/4 inch cable. The tension table corresponds to the correct tension for the actual diameter of the steel cable.

Example - Nylon coating removed - A 3/16 inch diameter cable with a 1/32 inch nylon coating removed, use tensiometer riser and tensiometer calibration card for a 3/16 inch cable. The tension table corresponds to the correct tension for the actual diameter of the steel cable.

(6) If new flap bus cable was installed, pretension cables 33 and 34 to rig loads between 720 pounds (326.6 Kg) and 816 pounds (370.14 Kg) and cycle flaps minimum of 15 times, then reduce cable tension to requirements of Paragraph 3.A.(5).

NOTE: On the turnbuckles used to achieve pretension loads, assure threaded cable ends are lubricated prior to tensioning.

NOTE: Side by side cable contact may occur where bus cables cross at inboard flap tracks.

(7) Differentially adjust flap bus turnbuckles (A) and (B) so that 11° indicator on left and right flap tracks are aligned within ± 0.128 inch (± .25°) of scribe line on structure.

(8) Extend and retract flaps minimum of five cycles. Place flap/slat handle in 11° detent. Check that flap bus cable tension is within requirements of cable tension table. If necessary, readjust flap bus turnbuckles to comply with specified tension tolerance range.

(9) Check that left and right flap track 11° indicators are within ± 0.128 inch (± .25°) of scribe lines on structure. If necessary repeat Paragraph 3.A.(5), Paragraph 3.A.(8) and Paragraph 3.A.(9).

(10) Safety flap bus turnbuckles (A) and (B) with lockwire as shown on Figure 505 (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201).

(11) Remove restraint holding BUTE (bent up trailing edge) doors in faired (down) position.

(12) Place flap/slat handle in UP/RET detent.

(13) Shut off hydraulic pressure source.

(14) Remove door safety locks and place main gear door bypass lever to normal position (lever retracted).

(15) Check flap bus to elevator servo force limiter and slat limiter cables for correct adjustment. (ELEVATOR AND TAB - ADJUSTMENT/TEST, PAGEBLOCK 27-30-00/501, Paragraph 3.L.)

B. Adjust Flap Mechanical Controls (Figure 501)

NOTE: Flap bus must be properly adjusted prior to adjusting flap mechanical controls. (Paragraph 3.A.)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

(2) Place BUTE (bent up trailing edge) doors in a restrained faired (down) position.

(3) Place Dial-A-Flap (DAF) thumbwheel at 0 degrees position.

WARNING: BEFORE PRESSURING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(4) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

WARNING: WHEN AIRCRAFT IS ON GROUND, WITH WEIGHT ON WHEELS, BITE TEST OF AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME FLAP/SLAT HANDLE IS MOVED FROM RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

(5) Place flap/slat handle in 11°/T.O. EXT detent.

(6) Remove bolt at pushrod (G). (Figure 501 (Sheet 1))

(7) Remove bolt at pushrod (E), left and right flaps. (Figure 501 (Sheet 1))

WARNING: DUE TO NORMAL FLAP CONTROL VALVE INTERNAL LEAKAGE, FLAPS MAY SLOWLY RETRACT WHEN FLAP FOLLOW-UP MECHANISM IS DISCONNECTED AND HYDRAULIC SYSTEMS ARE PRESSURIZED.

(8) Install rig pin (5-5) in rig pin hole (R-49) in drums (L) and (M), located on flap/slat sequencing mechanism. (Figure 501 (Sheet 1))

NOTE: Flap/slat sequencing mechanism is located on center wing front spar. Access is through forward cargo compartment aft bulkhead panels 5107C and 5138C.

(9) Adjust turnbuckles (A), (B), (C) and (D) until tension is between minimum and maximum load per cable tension table for 1/16 inch (1.6 mm) cables. (Figure 504 (Sheet 1))

NOTE: Turnbuckles (A), (B), (C) and (D) are located in forward cargo compartment. Access to turnbuckles is through number 2 center ceiling panel from forward end of compartment.

NOTE: On aircraft with in-flight spoiler lockout mechanism installed, tensions for cable segments 241A and 243A between flap handle drum and flap input sector of spoiler lockout mechanism will be between zero (slack) or twice the appropriate cable tension. This is acceptable. Do not readjust cables 241 and 242 for this condition. Rig pin 5-5 must fit freely in rig pin hole R-49 with cables so rigged. (Figure 502)

(10) Differentially adjust turnbuckles (A), (B), (C) and (D) until rig pin (5-5) can be freely removed and inserted in rig pin hole (R-49) in drums (L) and (M).

(11) Install rig pin (5-5) in rig pin hole (R-49) in drums (L) and (M).

(12) Install rig pin (5-5) in rig pin hole (R-9) in drum (J). (Figure 501 (Sheet 1))

(13) Adjust turnbuckles (E) and (F) until tension is between minimum and maximum load per cable tension table for 1/16 inch (1.6 mm) cables. (Figure 504 (Sheet 1))

NOTE: Turnbuckles (E) and (F) are accessible through cabin floor panels just forward of wing center section right side or through access panels 5107C and 5138C at aft bulkhead of center cargo compartment.

(14) Differentially adjust turnbuckles (E) and (F) until rig pin (5-5) can be freely removed and installed in drum (J).

(15) Remove rig pins (5-5) from drum (J) and drums (L) and (M).

(16) At left flap, verify bolt is free in pushrod (E) and adjust pushrod (E) until index hole on bracket and index hole in crank are aligned within ±1/32 inch (±0.8 mm).

(17) Adjust turnbuckles (T) and (U) until tension is between minimum and maximum load per cable tension table for 1/16 inch (1.6 mm) cables. (Figure 504 (Sheet 2))

NOTE: Turnbuckles (T) and (U) are accessible through wing trailing edge access doors.

(18) Differentially adjust turnbuckles (T) and (U) until mark (S) on drum (K) is aligned with sight hole in bracket. (Figure 501 (Sheet 1))

(19) Adjust turnbuckles (V) and (W) until tension is between minimum and maximum load per cable tension table for 1/16 inch (1.6 mm) cables. (Figure 504 (Sheet 2))

(20) Differentially adjust turnbuckles (V) and (W) until right flap pushrod (E) crank index hole aligns with index hole in bracket within ±1/32 inch (±0.8 mm).

(21) Adjust right flap pushrod (E) until attach bolt can be freely inserted.

(22) Install bolt in right flap pushrod (E).

(23) Place flap/slat handle in UP/RET detent.

NOTE: Paragraph 3.B.(24) through Paragraph 3.B.(46) adjust Dial-A-Flap (DAF).

(24) Place flap/slat handle in 11°/T.O. EXT detent.

(25) Remove screws (B) from lightplate (C) and lift lightplate clear of pedestal. (Figure 501 (Sheet 3))

(26) Remove access panel from right side of pedestal.

CAUTION: WHEN FLAP/SLAT HANDLE IS ENGAGED IN MOVABLE DETENT THUMBWHEEL IS LOCKED IN BOTH DIRECTIONS UNTIL FLAP/SLAT HANDLE TRIGGER B IS LIFTED OUT OF MOVABLE DETENT. DO NOT ATTEMPT TO ROTATE (FORCE) THUMBWHEEL IN THIS CONDITION AS DAMAGE MAY OCCUR.

(27) Rotate thumbwheel (A) until flap/slat handle trigger (B) snaps into movable detent (D). (Figure 501 (Sheet 3))

(28) Check that 11° on dial wheel (E) is aligned with rig mark (G) on pedestal. If necessary, adjust dial wheel (E) as follows:

(a) Disengage dial wheel (E) from gear (H) by sliding dial wheel (E) outboard and compressing spring (F).

(b) Keep spring compressed and rotate dial wheel (E) until 11° position is opposite rig mark (G) on pedestal.

(c) Carefully engage dial wheel (E) with gear (H).

(29) Lift flap/slat handle trigger (A) from fixed detent.

(30) Using thumbwheel (A) increase DAF dial wheel (E) reading until movable detent (D) hits its stop. Dial wheel (E) should indicate approximately 24°.

(31) Scribe line on structure should be 2.11 (+0.768, -0) inches, (53.59 (+19.51 -0.00) mm) from 28° indicator on left flap track.

(32) If flaps are not within tolerance.

- Adjust pushrod (M) per requirements of Paragraph 3.B.(35) and repeat Paragraph 3.B.(30) and Paragraph 3.B.(31).

NOTE: Paragraph 3.B.(33) through Paragraph 3.B.(35) adjust flap two-speed valve.

(33) Lift flap/slat handle trigger (A) and using thumbwheel (A) decrease DAF dial wheel (E) reading until 20° position is opposite rig mark (G) on pedestal.

(34) Adjust length of pushrod (G) to set aft end of slide (F) flush with aft end of sleeves (AA) by ±0.005 inch (0.13 mm) with pushrod (G) attach bolt installed. Install attach bolt.

(35) Place flap/slat handle in UP/RET position, then place handle in 11° T.O. EXT detent. Check that left and right flap track 11° indicators are aligned with scribe line within ±0.128 inch (±3.25 mm). If necessary adjust pushrod (M) turnbuckle to meet 11°(±0.128 inch) (±3.25 mm) requirement.

(36) Install lightplate (C) on pedestal.

NOTE: Paragraph 3.B.(37) through Paragraph 3.B.(56) adjust wing flap position transmitters and flap/slat handle position transmitter.

NOTE: Flap bus Paragraph 3.A. flap mechanical controls Paragraph 3.B. must be adjusted before adjusting flap position transmitter.

(37) Place flap/slat handle in 11° T.O. EXT detent.

(38) Using protractor, for determining flap angles, reference readout to 11° for 11° flap.

NOTE: Flap angles are measured perpendicular to hinge line.

(39) Place flap/slat handle in 11° T.O. EXT detent.

(40) Flap position markings on "lead" flap track indicator may be used for determining flap angles. Track indicator at 11° flap shall be 11(±0.128) inches (279.4(±3.25) mm).

(41) Place flap/slat handle in 40°/LAND EXT detent.

(42) Loosen bolt clamping crank (AA) to flap position transmitter shaft.

(43) Place flap/slat handle in UP/RET detent, after flaps stabilize, place flap/slat handle in 11°/T.O. EXT detent.

(44) Measure actual angle of each flap ±0.25°.

(45) With flap/slat handle in 11°/T.O. EXT detent, rotate each flap position transmitter shaft until zero reference marks on transmitter shaft and case are in line.

(46) Rotate transmitter shaft aft (reference mark on shaft moving aft) until flap position indicator in flight compartment, reads 11.0°(±0.25°).

(47) Tighten bolt clamping crank (AA) to flap position transmitter shaft. Verify that flap position indicator indicates 11.0°(±1.0°).

(48) Place flap/slat handle in 0°/T.O. EXT detent.

(49) Check that Status Test Panel (STP) reads 0.1°(±0.25°). If necessary, adjust flap/slat handle position transmitter, located on right side of pedestal, as follows.

(a) Rotate transmitter until Status Test Panel reads 0.1°(+0.25°, -0°).

(b) Tighten transmitter clamp screws.

(50) Place flap/slat handle in 40°/LAND EXT detent.

(51) Remove restraint holding BUTE (bent up trailing edge) doors in faired (down) position.

NOTE: When the lower wing trailing edge BUTE (bent up trailing edge) doors are raised and secured after full rigging and the flap is retracted, there may be a gap between the stop bolts and pads at the inboard and outboard ends. The stop bolts should not be readjusted for this condition. The flaps will move against the stops when airloads are applied in flight. Transmitters and indicators will not indicate 0° on the ground.

(52) Place flap/slat handle in UP/RET detent.

(53) Install access panel on right side of pedestal.

(54) Shut off hydraulic pressure source.

(55) Safety all turnbuckles with clips.

(56) Remove door safety locks and place main gear door bypass lever in normal position (lever retracted).

C. Test Flap Control System

NOTE: Flap angle measurement is determined by the leading flap. The leading flap is the flap which has rotated farthest down from the UP position. Either flap may be the leading flap. Example: Flap/slat handle in 11/T.O. detent; left flap at 11.5°; right flap at 11°. The left flap is leading flap and right flap is trailing flap.

NOTE: When the flap/slat handle is in the 0/T.O. EXT detent, the flap may not be fully against the UP stops. This condition is acceptable providing the scribe line is within the tolerance range of the 0° indicator and the flaps fully retract when the flap/slat handle is moved to the UP/RET detent.

WARNING: BEFORE PRESSURING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

WARNING: WHEN AIRCRAFT IS ON GROUND, WITH WEIGHT ON WHEELS, BITE TEST OF AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME FLAP/SLAT HANDLE IS MOVED FROM RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

(2) Perform flap timing check as follows:

(a) Move flap/slat handle from UP/RET to 40 degree detent and check that flaps extend simultaneously. Flap travel time should be 17(±2) seconds.

NOTE: Timing should begin with control handle actuation and stop when flaps visually change actuation rate. Flap rate will change approximately three degrees prior to selected position.

(b) Move flap/slat handle from 40 degree detent up to 28 degree detent. Check that flap travel is 6(±1) seconds.

(c) Move flap/slat handle from 28 degree detent up to zero degree detent. Check that flaps retract to full up position in 21(±1) seconds.

(d) Move flap/slat handle from zero degree detent to 40 degree detent.

(e) Move flap/slat handle from 40 degree detent to zero degree detent. Check that the flaps retract to full up position in 26(±2) seconds.

(3) Place flap/slat handle in UP/RET detent and allow flaps to stabilize.

(4) Move flap/slat handle to each successive detents as noted in chart and check position of leading flap. Allow approximately 1 minute for flaps to stabilize in each position.

NOTE: Flap position indicator, in flight compartment, should be within ±2 degrees at each position (except 11°/T.O EXT and 15°/T.O. EXT). At 11° and 15° T.O. EXT position, flap position should be within ±1°.

NOTE: Leading flap angle should not exceed tolerances for each position. Flap split (difference between leading and trailing flap position) should not exceed 1° for each position.

Table 503

Handle Detent Streamwise	L&R Inboard Track Indicators (Position) Streamwise
0/T.O. EXT	0 Position (±0.768 inch) (19.51 mm)
11/T.O. EXT	11 Position (±0.256 inch) (6.50 mm)
15/T.O. EXT	15 Position (±0.512 inch) (13.00 mm)
28/LAND EXT	28 Position (±0.768 inch) (19.51 mm)
40/LAND EXT	40 Position (±1.024 inch) (26.01 mm)

(5) Place flap/slat handle in UP/RET detent and then place handle in 11°/T.O. EXT detent. Allow flaps to stabilize.

(6) Check that mark (S) is aligned with sight hole and that flaps are within noted tolerances of Paragraph 3.C.(4). If necessary, perform following: (Figure 501 (Sheet 1))

(a) If flaps are within tolerance and mark (S) is not aligned, existing position of mark (S) is acceptable. Proceed to Paragraph 3.C.(7).

(b) If flaps are not within tolerance and mark (S) is aligned, adjust pushrod (M) to bring flaps within noted tolerances of Paragraph 3.C.(4). (Figure 501 (Sheet 1))

(c) If flaps are not within tolerances of Paragraph 3.C.(4) and mark (S) is not aligned with sight hole, perform following:

1) Align mark (S) with sight hole by readjusting flap follow up system per Paragraph 3.B.(16) through Paragraph 3.B.(22).

2) Adjust pushrod (M) to bring flaps within noted tolerances of Paragraph 3.C.(4). (Figure 501 (Sheet 1))

(d) Retest flap control system in accordance with Paragraph 3.C.(3) through Paragraph 3.C.(6).

(7) Lift and hold trigger (B) on flap/slat handle and rotate Dial-A-Flap (DAF) thumbwheel to 24° position (against stop). Release trigger (B).

(8) Move flap/slat handle aft until DAF movable detent is engaged. Check following:

(a) Flap position indicator, in flight compartment, indication for each flap should be approximately 24°.

(b) Scribe line on structure for leading flap should be 2.11 (+1.03, -0.0) inch (53.594 (+26.162 -0.0) mm) away from 28° flap track indicator toward 15° indicator.

(9) Place flap/slat handle in UP/RET detent.

(10) Rotate DAF thumbwheel to 0 position.

(11) Shut off hydraulic pressure source.

D. Test Flap Control Force

WARNING: BEFORE PRESSURING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

WARNING: WHEN THE AIRPLANE IS ON THE GROUND, WITH WEIGHT ON WHEELS, THE BITE TEST OF THE AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME THE FLAP/SLAT HANDLE IS MOVED FROM THE RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. THE SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

(2) Place flap/slat handle in 0/T.O. EXT detent and rotate DAF thumbwheel to STOW position. Allow flaps to stabilize.

(3) Check force required to raise each flap/slat handle latch to its full-up position. Force required to release latch shall not exceed 5 pounds.

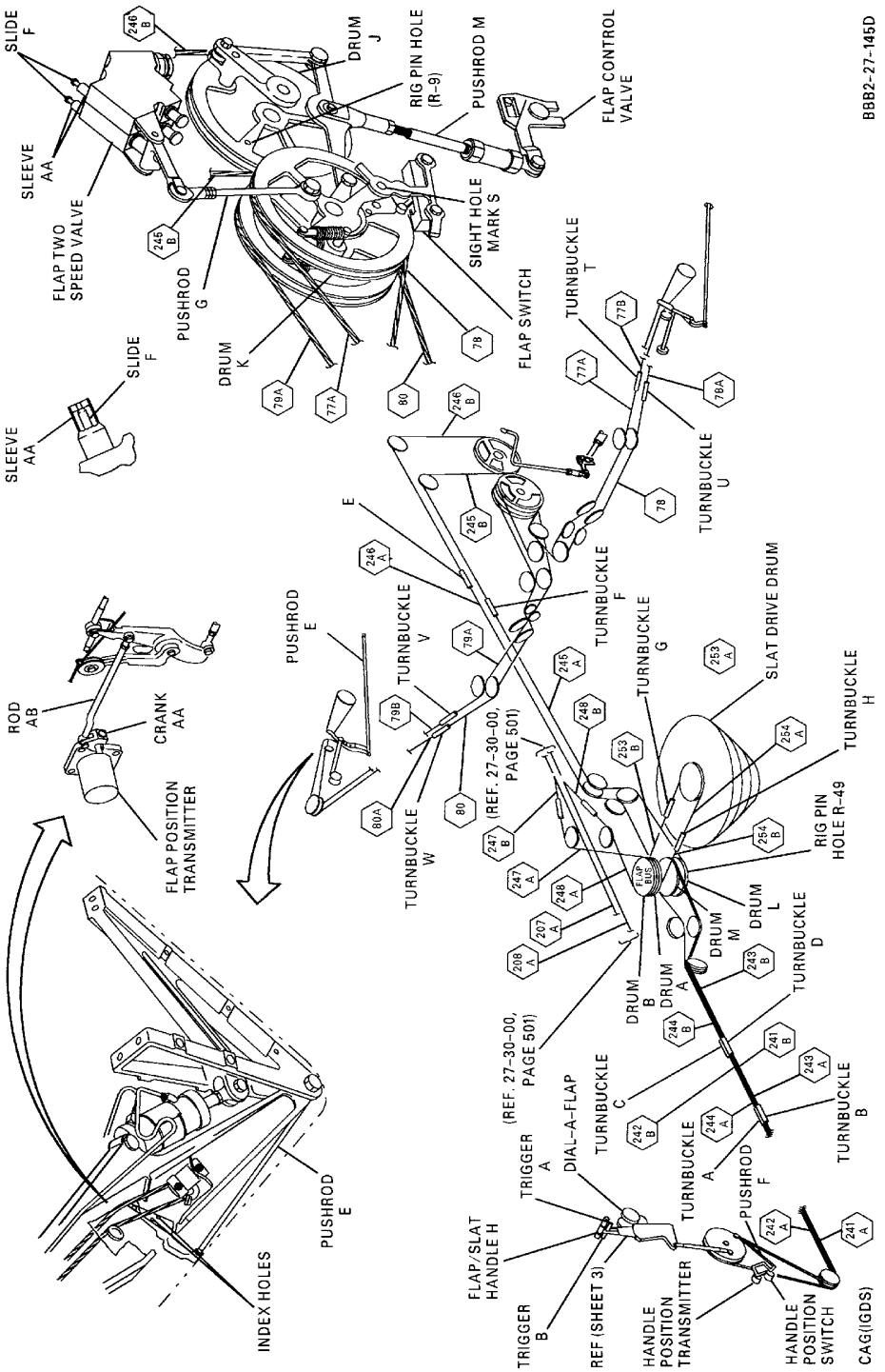
(a) Manually hold flap/slat handle so that it is not preloaded against detent in either forward or aft direction.

(b) Attach spring scale to flap/slat handle latch and measure force required to move the flap/slat handle. Force required shall not exceed 10 pounds.

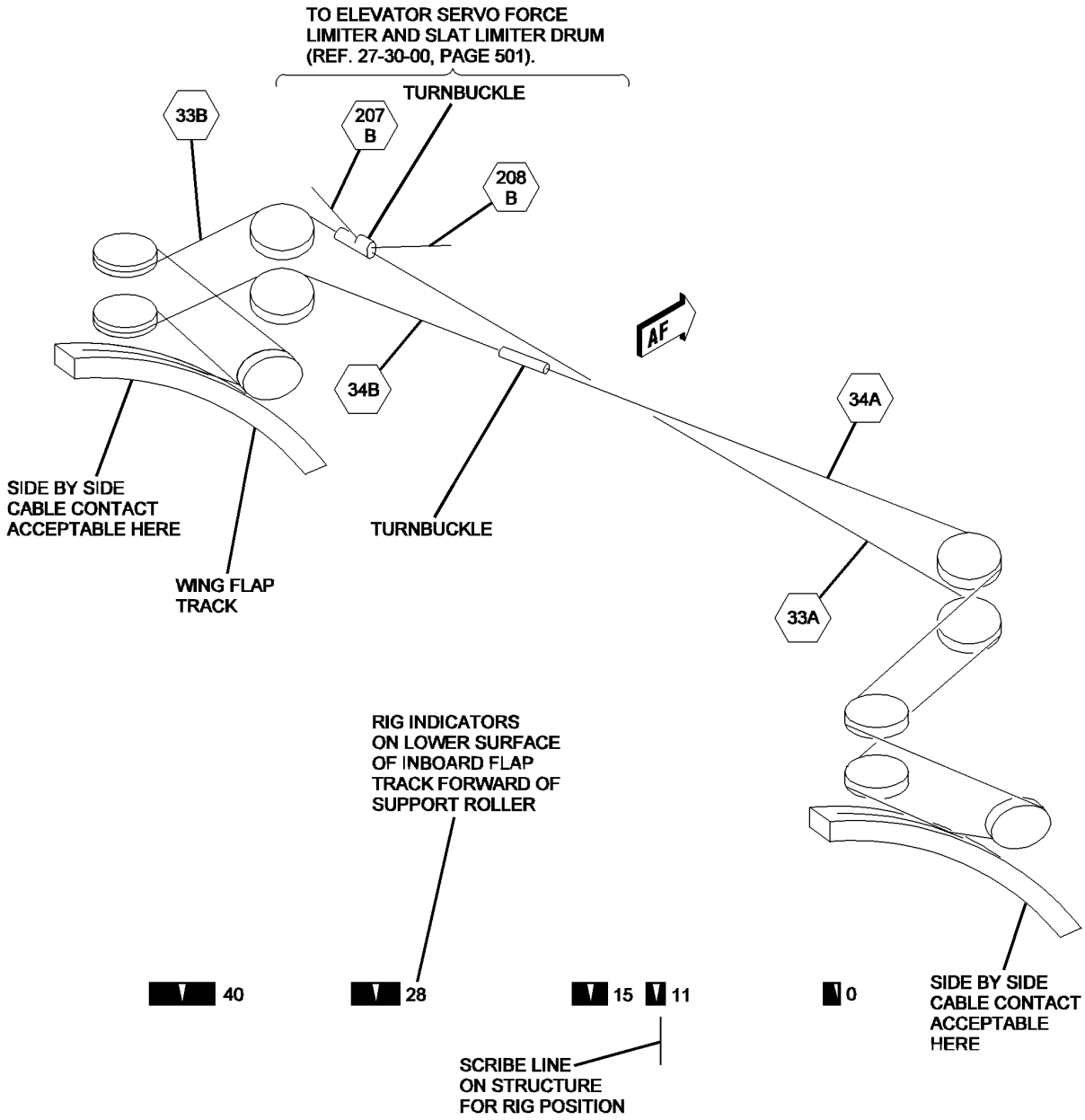
NOTE: Do not include force with flap/slat handle against position stops or gates; or with more than 23° mismatch between actual flap position and handle position.

(4) Place flap/slat handle in UP/RET detent.

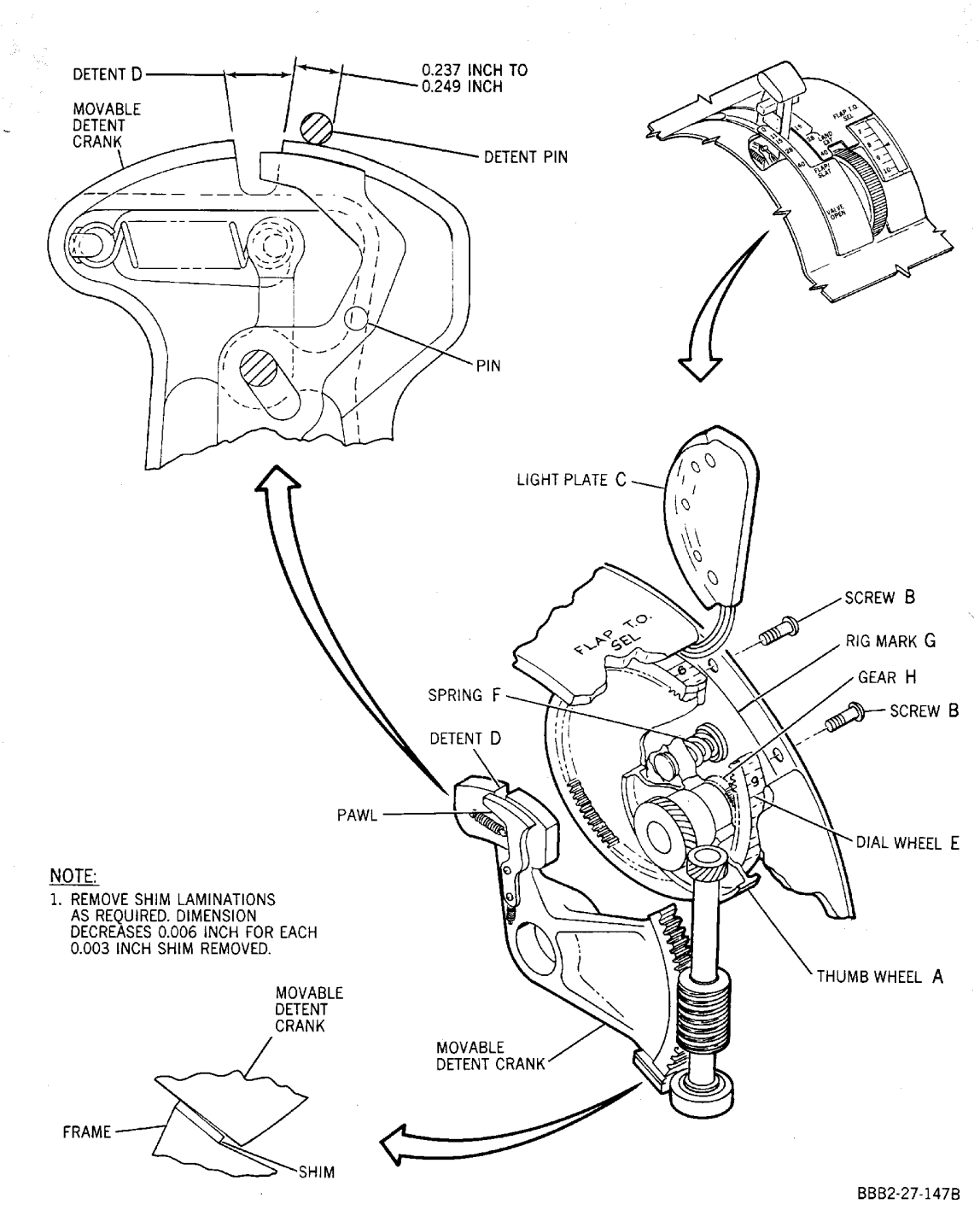
(5) Shut off hydraulic pressure source.



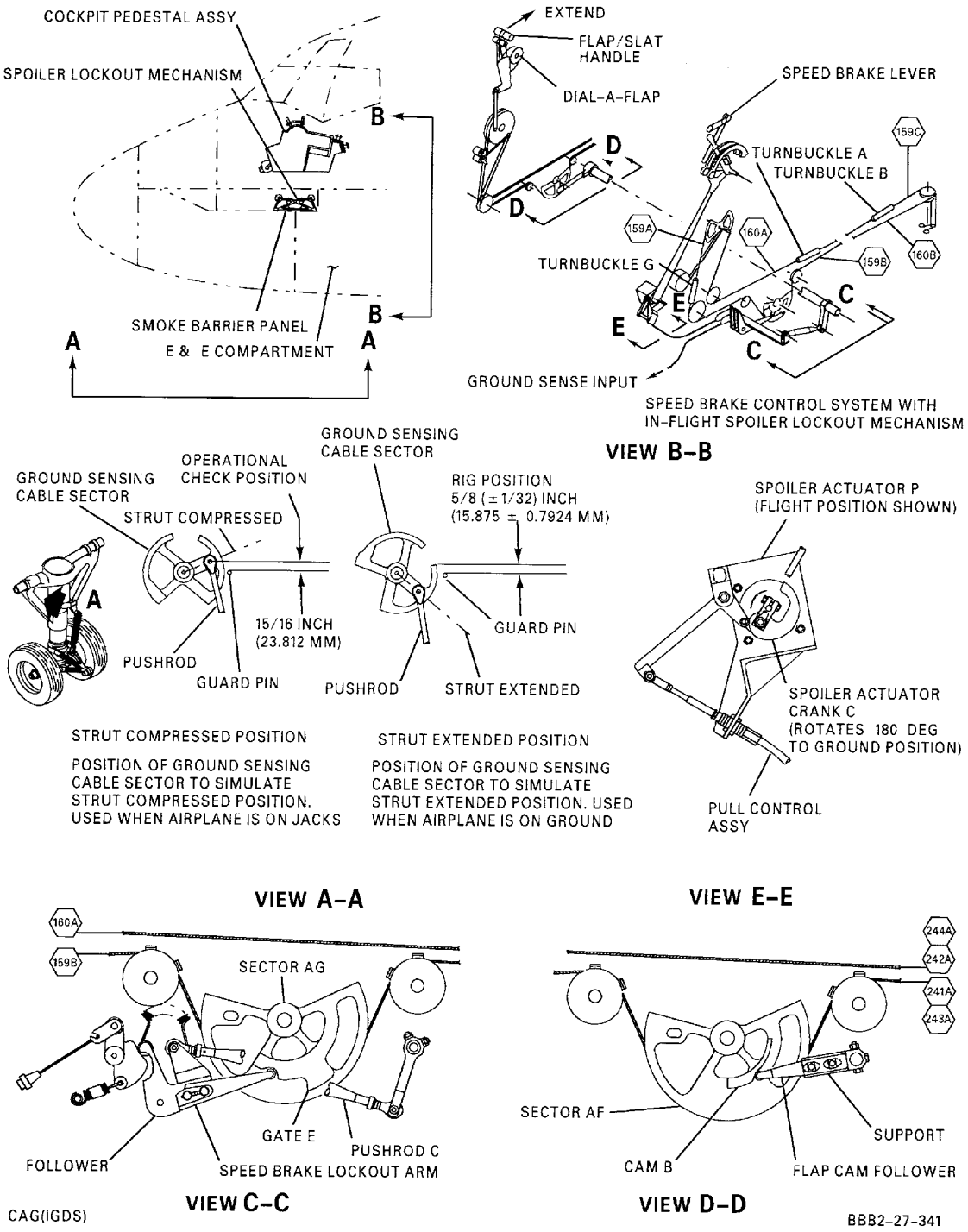
Flap Mechanical Controls -- Adjustment/Test
Figure 501/27-50-00-990-806 (Sheet 1 of 3)



Flap Mechanical Controls -- Adjustment/Test
Figure 501/27-50-00-990-806 (Sheet 2 of 3)



Flap Mechanical Controls -- Adjustment/Test
Figure 501/27-50-00-990-806 (Sheet 3 of 3)



In-Flight Spoiler Lockout Mechanism -- Adjustment/Test
Figure 502/27-50-00-990-807

CABLE TENSION TABLE - FLAP BUS (3/16 INCH DIAMETER)

TEMP °F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
-60	503	465	348
-58	505	466	350
-56	507	468	351
-54	509	470	352
-52	511	471	354
-50	513	473	355
-48	514	475	356
-46	516	477	357
-44	518	478	359
-42	520	480	360
-40	522	482	361
-38	524	483	363
-36	526	485	364
-34	527	487	365
-32	529	489	366
-30	531	490	368
-28	533	492	369
-26	535	494	370
-24	537	495	372
-22	539	497	373
-20	540	499	374
-18	542	501	375
-16	544	502	377
-14	546	504	378
-12	548	506	379
-10	550	507	381
- 8	552	509	382
- 6	553	511	383
- 4	555	513	384
- 2	557	514	386
0	559	516	387
2	561	518	388
4	563	519	390
6	565	521	391
8	566	523	392
10	568	525	393
12	570	526	395
14	572	528	396
16	574	530	397
18	576	531	399
20	578	533	400
22	579	535	401
24	581	537	402
26	583	538	404
28	585	540	405
30	587	542	406
32	589	543	408
34	591	545	409
36	592	547	410
38	594	549	411
40	596	550	413
42	598	552	414
44	600	554	415
46	602	555	417
48	604	557	418
50	605	559	419
52	607	561	420
54	609	562	422
56	611	564	423
58	613	566	424
60	615	567	426
62	617	569	427
64	618	571	428
66	620	573	429
68	622	574	431
70	624	576	432
72	626	578	433
74	628	579	435
76	630	581	436
78	631	583	437
80	633	585	438
82	635	586	440
84	637	588	441
86	639	590	442
88	641	591	444
90	643	593	445
92	644	595	446
94	646	597	447
96	648	598	449
98	650	600	450
100	652	602	451
102	654	603	453
104	656	605	454
106	657	607	455
108	659	609	456
110	661	610	458
112	663	612	459
114	665	614	460
116	667	615	462
118	669	617	463
120	670	619	464
122	672	621	465
124	674	622	467
126	676	624	468
128	678	626	469
130	680	627	471
132	682	629	472
134	683	631	473
136	685	633	474
138	687	634	476
140	689	636	477

NOTE:
THE MINIMUM ALLOWABLE SERVICE LOAD IS THE MINIMUM CABLE LOADS ACCEPTABLE BEFORE TENSIONING IS REQUIRED. WHEN TENSIONING IS REQUIRED, TENSION CABLE UNTIL THE FINAL RIG LOAD IS BETWEEN MAXIMUM RIG LOAD AND MINIMUM RIG LOAD. FOR NYLON COATED CABLES, USE 1/4 INCH TENSIOMETER RISER AND TENSIOMETER CALIBRATION CARD.

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Flap Bus Cable Tension Table
Figure 503/27-50-00-990-808

CABLE TENSION TABLE – 1/16 DIAMETER

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
–60	5	0	0	40	18	12	8
–58	5	0	0	42	18	12	9
–56	5	0	0	44	18	12	9
–54	6	0	0	46	19	13	9
–52	6	0	0	48	19	13	9
–50	6	0	0	50	19	13	9
–48	7	1	0	52	20	14	10
–46	7	1	0	54	20	14	10
–44	7	1	0	56	20	14	10
–42	7	1	0	58	20	14	10
–40	8	2	1	60	21	15	11
–38	8	2	1	62	21	15	11
–36	8	2	1	64	21	15	11
–34	8	2	1	66	22	16	11
–32	9	3	1	68	22	16	12
–30	9	3	2	70	22	16	12
–28	9	3	2	72	23	17	12
–26	9	3	2	74	23	17	12
–24	10	4	2	76	23	17	13
–22	10	4	2	78	24	18	13
–20	10	4	2	80	24	18	13
–18	10	4	3	82	24	18	13
–16	11	5	3	84	25	19	14
–14	11	5	3	86	25	19	14
–12	11	5	3	88	25	19	14
–10	11	5	3	90	26	20	15
–8	12	6	4	92	26	20	15
–6	12	6	4	94	27	21	15
–4	12	6	4	96	27	21	16
–2	12	6	4	98	27	21	16
0	13	7	4	100	28	22	16
2	13	7	5	102	28	22	16
4	13	7	5	104	28	22	17
6	13	7	5	106	29	23	17
8	14	8	5	108	29	23	17
10	14	8	5	110	30	24	18
12	14	8	6	112	30	24	18
14	14	8	6	114	31	25	18
16	15	9	6	116	31	25	19
18	15	9	6	118	31	25	19
20	15	9	6	120	32	26	19
22	15	9	7	122	32	26	20
24	16	10	7	124	33	27	20
26	16	10	7	126	33	27	20
28	16	10	7	128	34	28	21
30	16	10	7	130	34	28	21
32	17	11	8	132	35	29	21
34	17	11	8	134	35	29	22
36	17	11	8	136	36	30	22
38	18	12	8	138	36	30	23
				140	37	31	23

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-279A

Flap Control Cable Tension Table
Figure 504/27-50-00-990-809 (Sheet 1 of 2)

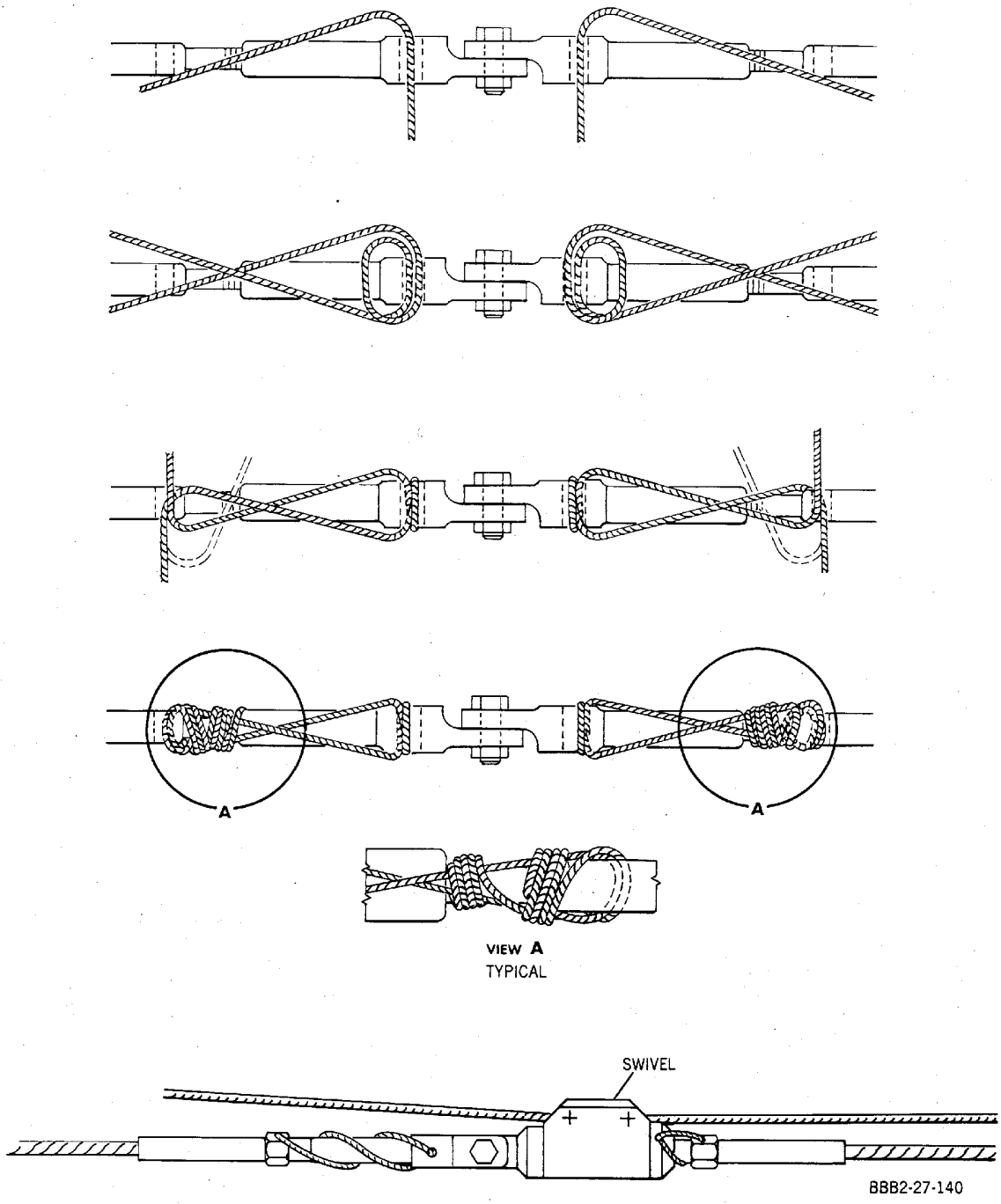
CABLE TENSION TABLE – FLAP FOLLOW-UP (1/16 INCH DIAMETER)

TEMP. deg. F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD	TEMP. deg. F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD
– 60	11	5	3	40	32	26	19
– 58	11	5	3	42	32	26	20
– 56	12	6	4	44	33	27	20
– 54	12	6	4	46	33	27	20
– 52	13	7	5	48	33	27	20
– 50	13	7	5	50	34	28	21
– 48	14	8	5	52	34	28	21
– 46	14	8	6	54	35	29	21
– 44	15	9	6	56	35	29	22
– 42	15	9	6	58	35	29	22
– 40	16	10	7	60	36	30	22
– 38	16	10	7	62	36	30	22
– 36	17	11	7	64	36	30	23
– 34	17	11	8	66	37	31	23
– 32	18	12	8	68	37	31	23
– 30	18	12	9	70	38	32	24
– 28	18	12	9	72	38	32	24
– 26	19	13	9	74	38	32	24
– 24	19	13	10	76	39	33	25
– 22	20	14	10	78	39	33	25
– 20	20	14	10	80	40	34	25
– 18	21	15	11	82	40	34	25
– 16	21	15	11	84	40	34	26
– 14	21	15	11	86	41	35	26
– 12	22	16	11	88	41	35	26
– 10	22	16	12	90	42	36	27
– 8	23	17	12	92	42	36	27
– 6	23	17	12	94	43	37	27
– 4	23	17	13	96	43	37	28
– 2	24	18	13	98	43	37	28
0	24	18	13	100	44	38	28
2	25	19	14	102	44	38	29
4	25	19	14	104	45	39	29
6	25	19	14	106	45	39	29
8	26	20	15	108	46	40	30
10	26	20	15	110	46	40	30
12	27	21	15	112	47	41	30
14	27	21	15	114	47	41	31
16	27	21	16	116	47	41	31
18	28	22	16	118	48	42	32
20	28	22	16	120	48	42	32
22	29	23	17	122	49	43	32
24	29	23	17	124	49	43	33
26	29	23	17	126	50	44	33
28	30	24	17	128	50	44	33
30	30	24	18	130	51	45	34
32	30	24	18	132	51	45	34
34	31	25	18	134	52	46	35
36	31	25	19	136	53	47	35
38	32	26	19	138	53	47	36
				140	54	48	36

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-148D

Flap Control Cable Tension Table
Figure 504/27-50-00-990-809 (Sheet 2 of 2)



Flap Bus Turnbuckles -- Safety Wire Method
Figure 505/27-50-00-990-810

4. Cable Assemblies

NOTE: Cable run numbers and segment letters listed below correspond to callouts in hexagonal symbols in Figure 501.

Table 504

Function	Cable Run Number	Segment Letter
Flap bus - left drive right down	33 33	A B
Flap bus - left drive right up	34 34	A B
Flap control dual 1 - flap down	241 241	A B
Flap control dual 1 - flap up	242 242	A B
Flap control dual 2 - flap down	243 243	A B
Flap control dual 2 - flap up	244 244	A B
Flap control - flap down	245 245	A B
Flap control - flap up	246 246	A B
Flap follow-up - down left wing	77 77	A B
Flap follow-up - left wing	78 (Identical to run 77A) 78	 A
Flap follow-up - down right wing	79 79	A B
Flap follow-up - right wing	80 (Identical to run 79A) 80	 A

FLAPS - REMOVAL/INSTALLATION

1. General

A. The inboard flap and vane and the outboard flap and vane, on each wing trailing edge, are removed and installed individually. The inboard flap and vane is mounted on an outboard hinge bracket and on flap track that rides in roller supports attached to the fuselage. The outboard flap and vane is mounted on three hinge brackets. The inboard and outboard flaps are mechanically linked together by the flap flex joint.

B. Removal and installation procedures for the left and right inboard and outboard flaps are identical except as noted. The inboard flap and vane weighs approximately 334.9 pounds (151.9 kg). The outboard flap and vane weighs approximately 333 pounds (151 kg). Paragraph 3.A. and Paragraph 3.B. covers removal/installation of the inboard flap, Paragraph 3.C. and Paragraph 3.D. covers removal/installation of the outboard flap.

C. Access to the flap hinge bolts for both inboard and outboard flaps is through the flap hinge fairing. Access to the flap bus turnbuckles is through the flap bus cable shroud, located on the aft end of the right wheel well. Access to the flap flex joint is through the upper and lower flex joint fairing.

D. The lower wing trailing edge service access doors must be down and the inboard BUTE doors attached to the fixed trailing edge panels must be restrained in the faired position or down throughout the flap installation procedure. Each wing tank should contain no more than 1000 pounds (453.592 kg) of fuel.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 401

Name and Number	Manufacturer
Torque wrench (0-3000 inch pounds) (0.0 to 336.0 N·m)	
Torque Wrench (0-300 inch pounds) (0.0 to 33.6 N·m)	
Sling, inboard flap (5952430-1)	The Boeing Company
Sling, outboard flap (5952431-501 or 5952431-505)	The Boeing Company
Fixture, rigging inboard flap (5952919-1)	The Boeing Company
Fixture, rigging outboard flap (5952652-1)	The Boeing Company
Door safety locks (3936851-1 or -501 as applicable. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)Ref.	The Boeing Company
Tensiometer	Pacific Scientific Co.
Grease (MIL-G-81322) (DPM 5348)	Mobile Grease Aeroshell 22
Grease Parker-O-Lube (DPM 5367)	Parker Seal Co. Culver City, CA

Table 401 (Continued)

Name and Number	Manufacturer
Lockwire, NASM20995N32, DPM684*[1]	Not specified
MPK Blend Solvent DMS 2458	Chemetall Oakite, La Mirada, CA
Sealing compound, integral fuel tank, #PR-1422 B 1/2 or B-2 (DMS QPL 2082)	Courtaulds Aerospace Inc. Sealants, Adhesives and Coatings Division Glendale, CA

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. **Removal/Installation Flaps**

NOTE: With Service Bulletin 27-341 incorporated, perform Paragraph 5.. which is the removal/installation of the inboard flap drive arm assembly. Perform the inspection of the Service Bulletin 27-341.

A. Remove Inboard Flap. (Figure 401)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(4) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Remove bolts (18) from inboard fairing attach points and remove fairing from flap.

(6) Remove flex joint fairing from bottom surface of flap.

(7) Remove screws from leading edge of flex joint upper fairing.

WJE 412, 414

(8) On aircraft without nut strips, remove screws and nuts from leading edge of flex joint upper fairing.

(9) On aircraft with nut strips, remove screws from leading edge of flex joint upper fairing.

WJE ALL

(10) Pressurize hydraulic system.

(11) Place flap/slat handle in UP/RET detent. Tag flap/slat handle with warning tag that handle is not to be moved.

NOTE: The flaps must be held in the UP position by either hydraulic pressure or some other suitable means to gain access for upper fairing nuts and flex joint attach points.

(12) Remove remaining screws from flex joint upper fairing and remove fairing.

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(13) Remove remaining screws, and if applicable, nuts from flex joint upper fairing and remove fairing.

WJE ALL

(14) Remove bolts (1) from lower track and bar and remove track.

NOTE: Note and record number of shims between track and bar.

(15) Remove bolts (2) from upper track and bar and remove track.

NOTE: Note and record number of shims between track and bar.

(16) Remove bolt (3) from aft linkage and upper bar.

(17) Remove bolt (4) from aft linkage and lower bar.

(18) Remove bolts (5) from aft linkage and brackets, inboard and outboard flaps, and remove aft linkage.

(19) Remove bolt (6) from forward linkage and upper bar.

(20) Support upper bar and remove bolt (10) and remove upper bar.

(21) Remove bolts (5) from forward linkage and brackets, inboard and outboard flaps, and remove forward linkage.

(22) Support lower bar, remove bolt (7) and remove lower bar.

(23) Remove bolts (8) and (9) and remove lower forward linkage.

(24) Remove bolt (11) connecting forward bearing links.

(25) Remove bolts (12) from forward bearing link, on flap being removed, and remove link.

(26) Remove bolt (13) connecting mid bearing links.

(27) Remove bolts (12) from mid bearing link, on flap being removed, and remove link.

(28) Remove bolt (14) connecting aft bearing links.

(29) Remove bolts (12) from aft bearing link, on flap being removed, and remove link.

(30) Carefully extend flaps to 40 degree detent, making certain that remaining bearing links are clear of flap structures.

(31) Shut off hydraulic pressure source.

(32) Loosen flap bus turnbuckles to remove tension from cables.

(33) Remove and retain cable retainers from forward and aft end of flap track. Secure bus cable ends to adjacent structure.

(34) Remove and retain screws from flap hoist attach points. Attach flap sling fittings to flap hoist points with AN4-7 bolts. Raise sling sufficiently to support weight of flap.

(35) Remove stop from forward lower end of flap track.

(36) Remove bolt (15) from flap drive lever and flap.

(37) Remove bolt (16) to disconnect inboard flap outboard actuating cylinder from hinge bracket.

(38) Remove bolt (17) from outboard hinge point.

(39) Carefully remove flap from flap track support rollers and remove flap from wing.

(40) Remove and retain flex joint link fittings, serrated plates and shims from flap bulkhead. Note fitting position.

NOTE: Remove serrated plates and fittings as a unit as an aid in adjustment procedures. Note and record number of shims between serrated plate and structure.

(41) If necessary remove and retain inboard fairing attach fittings.

(42) Remove and retain flex joint track roller fittings from flap bulkhead.

(43) Remove flap sling from flap hoist attach points and retain bolts. Install retained screws, Paragraph 3.A.(34), in the flap hoist attach points.

B. Install Inboard Flap

(1) Make certain left and right hydraulic systems are depressurized.

(2) Make certain door safety locks are installed on main gear inboard doors.

(3) If installed remove inboard fairing from flap.

(4) If necessary, install fairing attach fittings.

(5) Install flex joint link fittings, serrated plates and shims, as noted in Paragraph 3.A.(40) on flap bulkhead. Tighten bolts to torque of 50 to 70 inch-pounds, (5.6 to 7.84 N·m).

(6) Install flex joint track roller fittings on flap bulkhead. Tighten bolts.

(7) Make certain that stop on forward end of flap track is removed.

(8) Loosen bolt on stop at aft end of flap track and move stop to most aft position.

(9) Remove and retain screws from flap hoist attach points. Attach flap sling fittings to flap hoist points with AN4-7 bolts. Raise sling sufficiently to support weight of flap.

(10) Carefully raise flap and position flap track in support rollers while engaging outboard hinge points.

WARNING: USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1170, LUBRICANT (DPM 5367)

HAZMAT 1000, REFER TO MSDS

(11) Coat bolt (17) (view H/B) shank with Parker-O-Lube and install bolt (17) in inboard flap outboard hinge point, making certain bolt head is seated fully at anti-rotation lug. Install nut with washer under nut and tighten nut to torque of 1050 to 1760 inch-pounds, (117.6 to 197.12 N·m). Safety nut with cotter pin.

(12) Coat bolt (16) (view H/B) shank with Parker-O-Lube and using hoist position flap so that inboard flap outboard actuating cylinder attach bolt (16) is easily installed. Install with washer under bolt head and with bolt head inboard. Install nut with washer under nut. Tighten nut to torque of 150 inch-pounds (16.8 N·m). Back off nut to nearest locking hole. Safety nut with cotter pin.

WARNING: USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1170, LUBRICANT (DPM 5367)

HAZMAT 1000, REFER TO MSDS

(WARNING PRECEDES)

(13) Coat bolt (15) shank with Parker-O-Lube and install bolt (15) in flap drive lever and flap. Tighten nut and safety nut with cotter pin.

NOTE: Install one, maximum of two washers under nut only.

(14) Install stop on forward end of drive track.

(15) Position flap bus cables in track groove, install retainers on cable ends and install retainers on forward and aft ends of tracks. Safety cable end in retainers with cotter pins.

(16) Remove flap sling from flap hoist attach points and retain bolts. Install retained screws, Paragraph 3.B.(9), in the flap hoist attach points.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROLS SYSTEMS.

(17) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(18) Slowly retract flaps to UP/RET detent, making certain that flex joint linkage on flap is clear of flap structures. Tag flap/slat handle with warning tag not to move flap/slat handle.

NOTE: The flaps must be held in the UP position by either hydraulic power or some other suitable means to gain access to flex joint attach points.

(19) Position aft bearing link on flap fitting. Install bolts (12). Tighten nuts to torque of 50 to 190 inch pounds (5.6 to 21.28 N·m). Safety nuts with cotter pins.

(20) Position aft bearing links together and install bolt (14) making certain bolthead is seated. Tighten nut to first locking slot after snugging washer. Safety nut with cotter pin.

(21) Position mid bearing link on flap fitting. Install bolts (12). Tighten nuts to torque of 50 to 190 inch-pounds (5.6 to 21.28 N·m). Safety nuts with cotter pins.

(22) Position mid bearing links together and install bolt (13) making certain bolthead is seated. Tighten nut to first locking slot after snugging washer. Safety nut with cotter pin.

(23) Position forward bearing link on flap fitting. Install bolts (12). Tighten nuts to torque of 50 to 190 inch-pounds, (5.6 to 21.28 N·m). Safety nuts with cotter pins.

(24) Position forward bearing links together and install bolt (11) making certain bolthead is seated. Tighten nut to first locking slot after snugging washer. Safety nut with cotter pin.

(25) Position lower forward linkage on mid bearing linkage. Install bolt (9) with head facing forward. Install bolt (8) with head facing forward. Safety head of bolt (9) with lockwire to bearing link. Safety nut on bolt (8) with cotter pin. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(26) Position lower bar on lower forward linkage and install bolt (7). Safety nut with cotter pin.

(27) Position forward linkage on inboard and outboard flap link fittings and install bolts (5). Safety nuts with cotter pins.

(28) Position upper bar on forward linkage and install bolt (6) with head facing outboard. Safety nut with cotter pin.

(29) Install bolt (10) with head facing inboard to connect upper and lower bars. Safety nut with cotter pin.

(30) Position aft linkage on inboard and outboard flap link fittings and install bolts (5). Safety nuts with cotter pins.

(31) Install bolt (4) to connect aft linkage and lower bar. Safety nut with cotter pin.

(32) Install bolt (3) to connect aft linkage and upper bar. Safety nut with cotter pin.

(33) Position upper track on inboard and outboard track rollers. Install shims as recorded in Paragraph 3.A.(15) between track and upper bar. Install bolt (2) in aft hole. Tighten nut.

NOTE: Make sure that upper bar is flush to 0.03 inch (0.762 mm) high relative to flap. If necessary, add or remove shims as required.

(34) Position lower track on inboard and outboard track rollers. Install shims as noted in Paragraph 3.A.(14) between track and lower bar. Install bolts (1) and tighten nuts.

NOTE: Make sure that lower bar is 0.12 inch (3.048 mm) low relative to flap. If necessary, add or remove shims as required.

(35) Install upper flex joint fairing. Tighten screws. It may be necessary to extend flaps to install screws in forward end of fairing.

(36) Check that clearance, measured at most forward inboard edge of fairing, is 0.001 to 0.015 inch (0.025 to 0.381 mm) between surfaces of inboard flap and fairing. If necessary, adjust aft linkage fittings on serrated plates as required.

NOTE: 000 inch (0.000 mm) clearance may occur between surfaces of inboard and outboard flaps and fairing during flap extension and retraction.

(37) If necessary, perform removal/installation of flap flex joint shims. (Paragraph 4.)

(38) Check that clearance, measured in plane of aft linkage at inboard and outboard edges of fairing, is 0.000 to 0.015 inch (0.000 to 0.381 mm) between surfaces of inboard and outboard flaps and fairing. If necessary, adjust forward linkage fittings on serrated plates as required.

(39) Install lower flex joint fairing on lower bar. Tighten screws.

(40) Retract flaps to UP/RET detent.

(41) Position inboard flap rigging fixture on upper surface of wing. (Figure 404 (Sheet 1)) Check that dimension (A), between aft upper flap surface and fixture plate is 0.250 (+0.225, -0.125) inch (6.35 (+5.71, -3.17) mm). Check that dimension (B), between flap trailing edge and fixture is 0.375 (+0.250, -0.125) inch (9.52 (+6.35, -3.17) mm). If necessary adjust inboard flap within tolerances. (Paragraph 4.)

(42) Adjust stop on aft end of flap track to just contact stop on roller fitting. Mark position of stop, slightly extend flaps, position stop one serration forward of mark and tighten stop bolt.

(43) Place flap/slat handle in UP/RET detent and check that 0 degree indicator on lower surface of flap track is aligned with scribe line on structure.

(44) Place flap/slat handle in 11 degree detent.

(45) Adjust flap bus turnbuckles to obtain tension per cable tension table for 3/16 inch (4.762 mm) cables. (Figure 402)

(46) Differentially adjust flap bus turnbuckles so that 11° indicator on left and right flap track is aligned within 1/8 inch (3.18 mm) of scribe line on structure.

(47) Extend and retract flaps a minimum of five cycles. Check that flap bus cable tension is per cable tension table. (Figure 402) Readjust bus turnbuckles, if necessary, to comply with specified tension tolerance range.

(48) Safety flap bus turnbuckles with lockwire as shown in Figure 403. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(49) Place flap/slat handle in 40° detent.

(50) Position inboard fairing on flap attach points. Install bolts (18) but do not tighten nuts at this time.

(51) Adjust fairing inboard and outboard to obtain 0.030 to 0.250 inch (0.76 to 6.35 mm) dimension between fairing and flap fairing jamb, when flaps are retracted. Tighten bolts (18) lightly.

(52) Adjust fairing fore and aft by loosening bolts (19) to obtain dimension in Paragraph 3.B.(51) and to match fuselage fillet, when flaps are retracted. Tighten bolts (19) lightly to secure serrated plates.

(53) For up and down adjustment of fairing, loosen bolts (20) and adjust fairing if necessary to obtain dimension noted in Paragraph 3.B.(51), when flaps are retracted. Tighten bolts (20) lightly.

(54) If necessary, repeat Paragraph 3.B.(51) through Paragraph 3.B.(52) until flap fairing matches the fuselage fairing and tolerance is met per dimension noted in Paragraph 3.B.(51).

(55) Tighten bolts (18), (19) and (20).

(56) Lubricate flap fittings as necessary. (PAGEBLOCK 12-21-02/301)

(57) Extend and retract flaps several times. Check for smooth operation without binding.

(58) Raise and secure wing trailing edge access doors.

(59) If applicable, install all removed fairings.

(60) Place flaps in UP/RET detent.

(61) Check flap clearances. FLAPS - CHECK, PAGEBLOCK 27-51-01/601

(62) Shut off hydraulic pressure source.

(63) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

C. Remove Outboard Flap

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Place flap/slat handle in 40 degree detent.

(3) Shut off hydraulic pressure source.

(4) Remove flex joint fairing from lower surface of flap.

(5) Remove screws from leading edge of flex joint upper fairing.

WJE 412, 414

(6) On aircraft without nut strips, remove screws and nuts from leading edge of flex joint upper fairing.

(7) On aircraft with nut strips remove screws from leading edge of flex joint upper fairing.

WJE ALL

(8) Pressurize hydraulic system.

(9) Place flap/slat handle in UP/RET detent. Tag flap/slat handle with warning tag that handle is not to be moved.

NOTE: The flaps must be held in the up position by either hydraulic pressure or some other suitable means to gain access to flex joint mechanism attachments.

(10) Perform Paragraph 3.C.(13) through Paragraph 3.C.(20) as outlined in Paragraph 3.A. to disconnect flex joint linkage from flaps.

(11) Carefully extend flap to 40° detent, making certain that remaining flex joint linkage is clear of flap structures.

(12) Shut off hydraulic pressure source.

(13) Remove and retain screws from flap hoist attach points. Attach flap sling fittings to flap hoist points with AN4-10 bolts. Raise sling sufficiently to support weight of flap.

(14) Remove bolt (21) to disconnect flap follow-up pushrod from crank on inboard hinge bracket.

(15) Remove bolts (22) to disconnect flap inboard and outboard actuating cylinders.

(16) Remove bolts (23) and (24) to disconnect flap hinge points.

(17) Carefully remove flap, making certain that remaining flex joint linkage is clear of flap structures.

(18) Remove and retain flex joint link fittings, serrated plates and shims from flap bulkhead. Note fitting position.

NOTE: Remove serrated plates and fittings as a unit as an aid in adjustment procedures. Note and record number of shims between serrated plate and structure.

(19) Remove and retain flex joint track roller fittings from flap bulkhead.

(20) Remove flap sling from flap attach hoist attach points and retain bolts. Install retained screws, Paragraph 3.C.(13), in the flap hoist attach points.

D. Install Outboard Flap

(1) Make certain left and right hydraulic systems are depressurized.

(2) Install flex joint link fittings, serrated plates and shims, as noted in Paragraph 3.C.(18) on flap bulkhead. Tighten bolts to torque of 50 in-lb (5.6 N·m) to70 in-lb (7.9 N·m) inch-pounds.

(3) Install flex joint track roller fittings on flap bulkhead. Tighten bolts.

(4) Remove and retain screws from flap hoist attach points. Attach flap sling fittings to flap hoist points with AN4-10 bolts. Raise sling sufficiently to support weight of flap.

(5) Carefully raise flap and position flap on hinge points.

WARNING: USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1170, LUBRICANT (DPM 5367)

HAZMAT 1000, REFER TO MSDS

(WARNING PRECEDES)

(6) Coat bolt (23) shanks with Parker-O-Lube and install bolts (23), making certain boltheads are fully seated at anti-rotation lug. Tighten nuts to torque of 2000 in-lb (226.0 N·m) to 2500 in-lb (282.5 N·m). Safety nuts with cotter pins.

NOTE: Install one washer under bolthead and three washers under nut.

WARNING: USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1170, LUBRICANT (DPM 5367)

HAZMAT 1000, REFER TO MSDS

(7) For aircraft without Service Bulletin 57-211, coat bolt (24) shank with Parker-O-Lube and install bolt (24). Tighten nut and safety nut with cotter pin.

NOTE: With Service Bulletin 57-189 Revision 1 incorporated, torque bolt (24) to 360-420 in-lbs (40.68-47.46 N·m).

(8) For aircraft with Service Bulletin 57-211, install higher strength bolt (24), nut and washers. Torque bolt to 360-420 in.-lbs. (40.68-47.46 N·m).

WARNING: USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1170, LUBRICANT (DPM 5367)

HAZMAT 1000, REFER TO MSDS

(9) For aircraft with Service Bulletin 57-229, coat bolt (24) shank with Parker-O-Lube and install bolt (24), nut and washers. Torque bolt to 260-320 in.-lbs. (29.38-36.15 N·m).

WARNING: USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1588, SOLVENT/MPK BLEND (DMS QPL 2458)

HAZMAT 1000, REFER TO MSDS

(10) Clean surface of bolt head and nut (24) with MPK Blend Solvent, DMS 2458.

WARNING: USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

(WARNING PRECEDES)

HAZMAT 1117, COMPOUND/INTEGRAL FUEL TANKS SEALING (DMS QPL 2082 B1/2 AND B2)

HAZMAT 1000, REFER TO MSDS

(11) Apply integral fuel tank sealing compound #PR-1422 B 1/2 or B-2 (DMS QPL 2082) to surface of bolt head and nut (24).

WARNING: USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1170, LUBRICANT (DPM 5367)

HAZMAT 1000, REFER TO MSDS

(12) Coat bolts (22) shanks with Parker-O-Lube and using hoist position flap so that bolts (22) are easily installed at inboard and outboard flap actuating cylinder attach points. Tighten nuts to torque of 150 inch-pounds (16.95 N·m) and back off nut to nearest locking hole. Safety nuts with cotter pins.

NOTE: Install one washer under bolthead and one washer under nut.

(13) Install bolt (21) to connect follow-up pushrod to crank on inboard hinge. Safety nut with cotter pin.

(14) Remove flap sling from flap hoist points and retain bolts. Install retained screws Paragraph 3.D.(4), in the flap hoist attach points.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROLS SYSTEMS.

(15) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(16) Slowly retract flaps to UP/RET detent, making certain that flex joint linkage on flap is clear of flap structures. Tag flap/slat handle with warning tag not to move flap/slat handle.

NOTE: The flaps must be held in the UP position by either hydraulic power or some other suitable means to gain access to flex joint attach points.

(17) Perform Paragraph 3.B.(19) through Paragraph 3.B.(39) as outlined in Paragraph 3.B. to connect flex joint linkage to flaps.

(18) Lubricate flap fittings as required. (PAGEBLOCK 12-21-02/301)

(19) Extend and retract flaps several times. Check for smooth operation without binding.

(20) Place flap/slat handle in UP/RET detent.

(21) Position outboard flap rigging fixture on upper surface of wing. (Figure 404 (Sheet 2)) Check that dimension (C), between aft upper surface of flap and rigging fixture, is 0.300(±0.07) inch (7.62(±1.78) mm). If necessary adjust outboard flap within tolerances. (Paragraph 4.)

(22) Raise and secure wing trailing edge access doors.

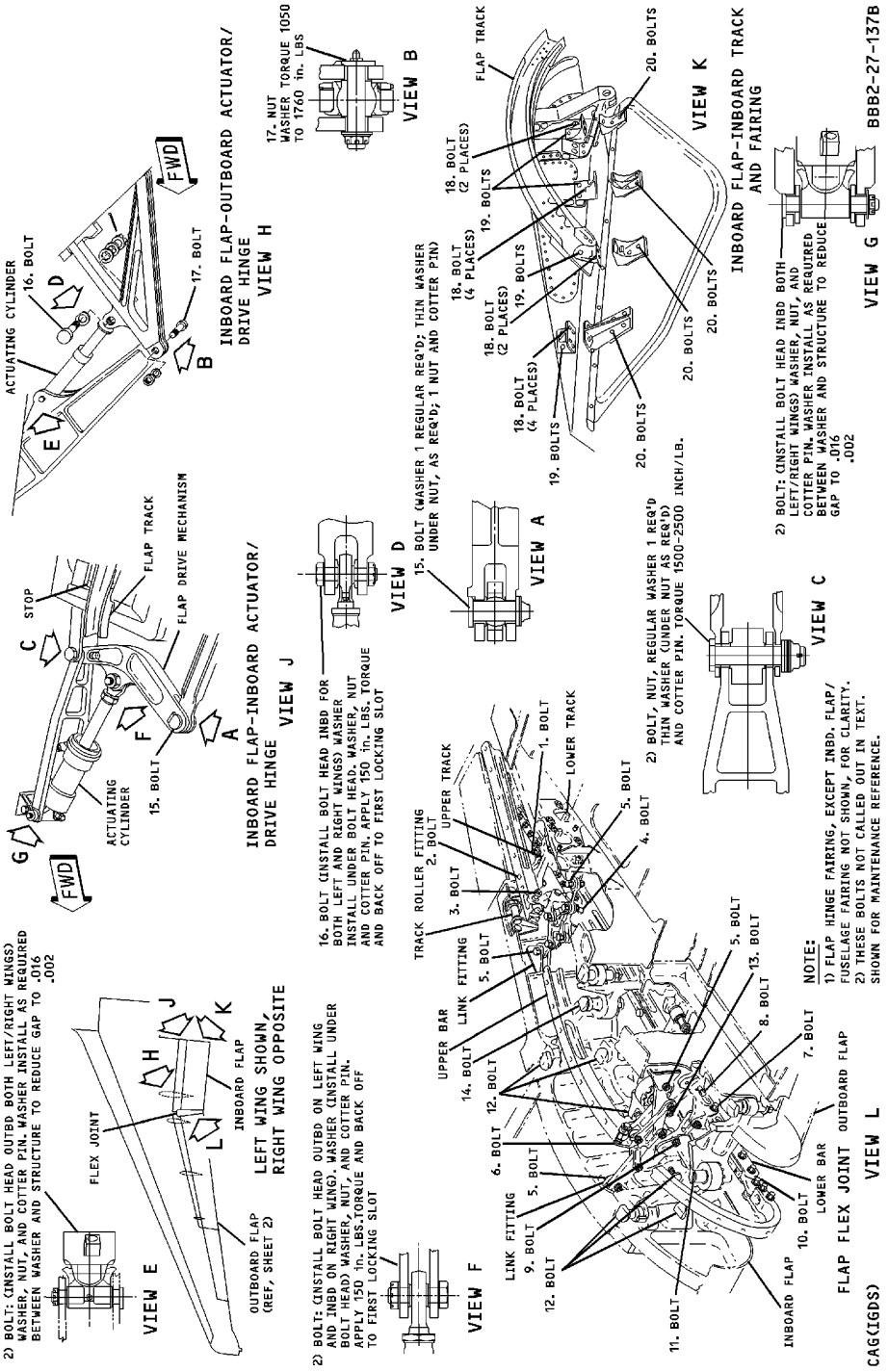
(23) If applicable, install all removed fairing.

(24) Place flaps in UP/RET detent.

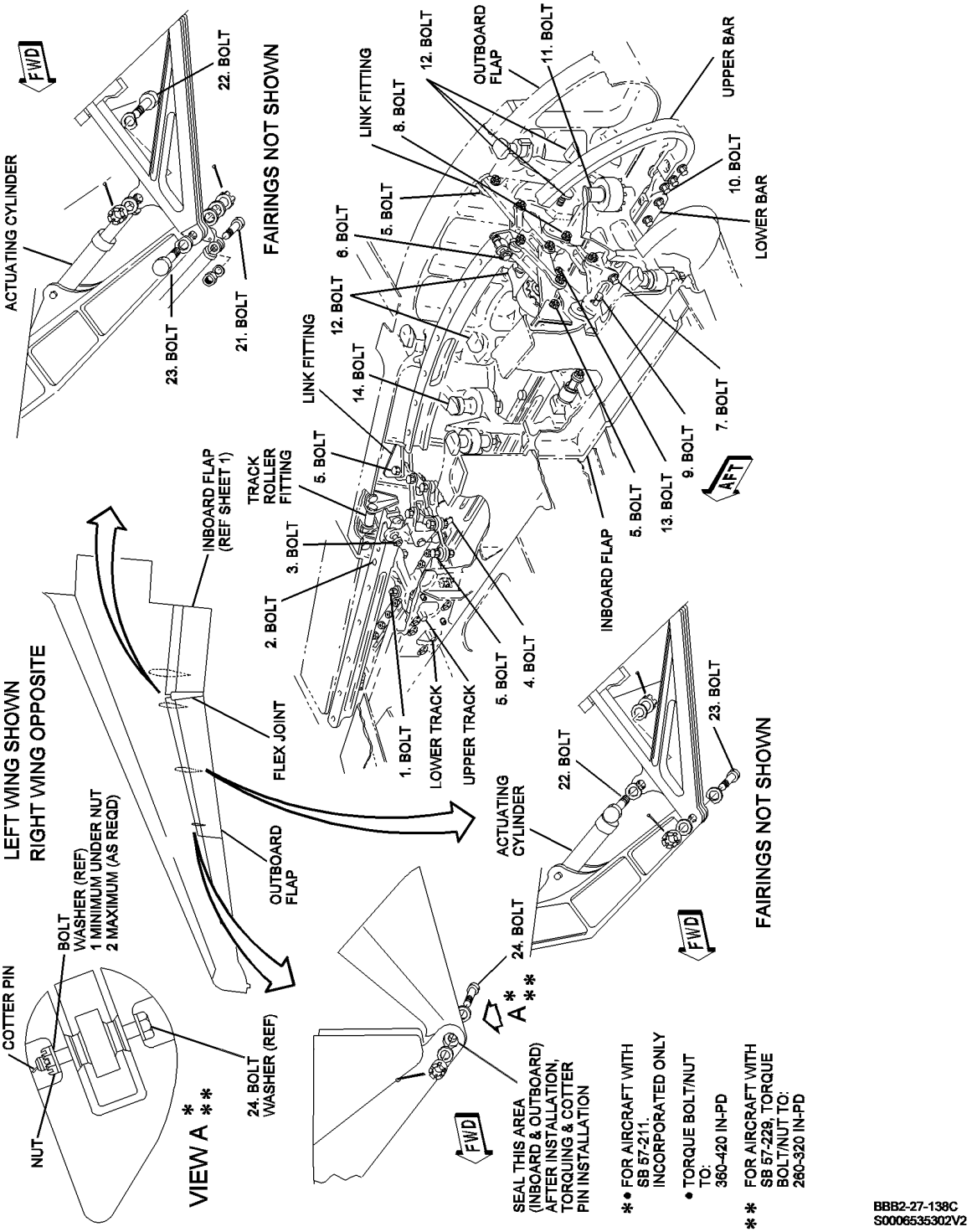
(25) Check flap clearances. (FLAPS - CHECK, PAGEBLOCK 27-51-01/601)

(26) Shut off hydraulic pressure source.

(27) Remove flap rigging fixture.



Flaps - Removal/Installation
Figure 401/27-51-01-990-801 (Sheet 1 of 2)



Flaps - Removal/Installation
Figure 401/27-51-01-990-801 (Sheet 2 of 2)

CABLE TENSION TABLE - FLAP BUS (3/16 INCH DIAMETER)

TEMP °F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
-60	503	465	348
-58	505	466	350
-56	507	468	351
-54	509	470	352
-52	511	471	354
-50	513	473	355
-48	514	475	356
-46	516	477	357
-44	518	478	359
-42	520	480	360
-40	522	482	361
-38	524	483	363
-36	526	485	364
-34	527	487	365
-32	529	489	366
-30	531	490	368
-28	533	492	369
-26	535	494	370
-24	537	495	372
-22	539	497	373
-20	540	499	374
-18	542	501	375
-16	544	502	377
-14	546	504	378
-12	548	506	379
-10	550	507	381
- 8	552	509	382
- 6	553	511	383
- 4	555	513	384
- 2	557	514	386
0	559	516	387
2	561	518	388
4	563	519	390
6	565	521	391
8	566	523	392
10	568	525	393
12	570	526	395
14	572	528	396
16	574	530	397
18	576	531	399
20	578	533	400
22	579	535	401
24	581	537	402
26	583	538	404
28	585	540	405
30	587	542	406
32	589	543	408
34	591	545	409
36	592	547	410
38	594	549	411

TEMP °F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
40	596	550	413
42	598	552	414
44	600	554	415
46	602	555	417
48	604	557	418
50	605	559	419
52	607	561	420
54	609	562	422
56	611	564	423
58	613	566	424
60	615	567	426
62	617	569	427
64	618	571	428
66	620	573	429
68	622	574	431
70	624	576	432
72	626	578	433
74	628	579	435
76	630	581	436
78	631	583	437
80	633	585	438
82	635	586	440
84	637	588	441
86	639	590	442
88	641	591	444
90	643	593	445
92	644	595	446
94	646	597	447
96	648	598	449
98	650	600	450
100	652	602	451
102	654	603	453
104	656	605	454
106	657	607	455
108	659	609	456
110	661	610	458
112	663	612	459
114	665	614	460
116	667	615	462
118	669	617	463
120	670	619	464
122	672	621	465
124	674	622	467
126	676	624	468
128	678	626	469
130	680	627	471
132	682	629	472
134	683	631	473
136	685	633	474
138	687	634	476
140	689	636	477

NOTE:
THE MINIMUM ALLOWABLE SERVICE LOAD IS THE MINIMUM CABLE LOADS ACCEPTABLE BEFORE TENSIONING IS REQUIRED. WHEN TENSIONING IS REQUIRED, TENSION CABLE UNTIL THE FINAL RIG LOAD IS BETWEEN MAXIMUM RIG LOAD AND MINIMUM RIG LOAD. FOR NYLON COATED CABLES, USE 1/4 INCH TENSIOMETER RISER AND TENSIOMETER CALIBRATION CARD.

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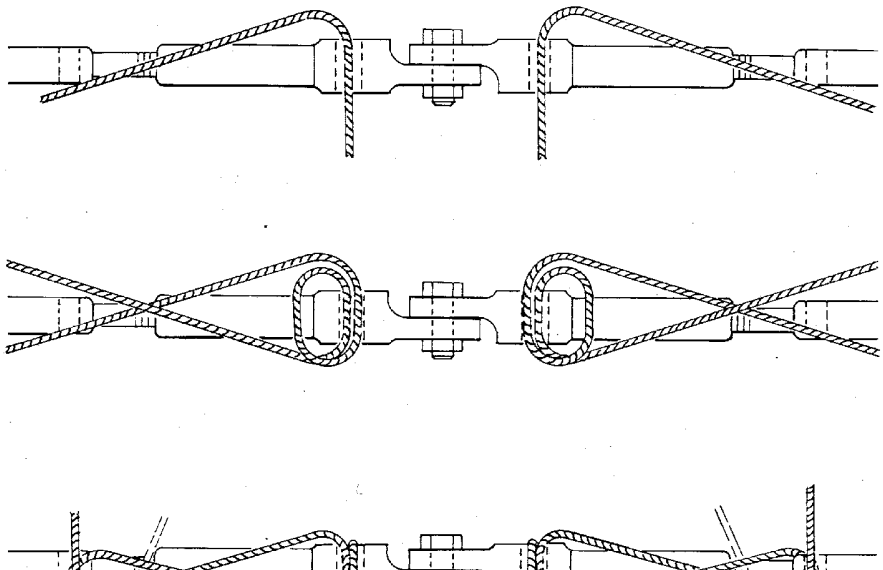
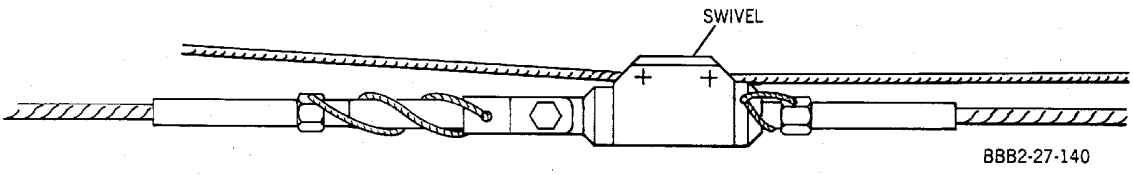
Flap Bus Cable Tension Table
Figure 402/27-51-01-990-802





Safety Wire Method -- Flap Bus Turnbuckles
Figure 403/27-51-01-990-803

4. Adjustment/Test - Flaps

A. Adjust Flaps

(1) Position inboard and outboard flap rigging fixtures on upper surface of wing. (Figure 404 (Sheet 1))

(2) Place BUTE (bent up trailing edge) doors in a restrained faired (down) position.

(3) Remove aft half flap hinge fairings.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(4) Place main gear door maintenance bypass lever in bypass position (lever extended). Open main gear inboard doors and install door safety locks.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(5) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(6) Place flap/slat handle in 40° detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(7) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(8) Position inboard and outboard upstops to obtain a maximum clearance with flaps in up position. (Figure 404 (Sheet 1))

(9) Remove cylinder to flap attach bolts at hinge point 2, inboard flap and hinge point 4, outboard flap. Temporarily insert small diameter bolt (approximately 3/8 inch) in both holes to hold cylinders in position while raising and lowering flaps.

CAUTION: FLAPS SHALL BE LOWERED WITH HYDRAULIC SYSTEMS DEPRESSURIZED AND RAISED WITH HYDRAULIC SYSTEMS PRESSURIZED TO PREVENT DAMAGE TO BUSHINGS IN OUTBOARD CYLINDER ROD END AND ADJACENT FLAP FITTINGS.

(10) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(11) Slowly retract flaps to UP/RET detent.

(12) On inboard flaps, check that dimension (A), between aft upper flap surface and fixture plate is 0.250 (+0.225, -0.125) inch (6.35 (+5.71, -3.17) mm). Check that dimension (B), between flap trailing edge and fixture is 0.625 (+0.000, -0.375) inch (15.87 (+0.00, -9.52) mm). If necessary, adjust inboard flap as follows:

(a) Loosen locknut on inboard flap actuator eyebolt.

(b) Rotate piston in cylinder to adjust inboard flap within dimension (A) and (B) tolerances.

NOTE: For adjustment of inboard and outboard flap actuator cylinders, flaps must first be lowered to provide access to actuator eyebolt and piston.

(c) Temporarily tighten locknut on inboard actuator eyebolt.

(d) Loosen eyebolt locknut at hinge point 2 actuating cylinder.

(e) While maintaining tolerances of dimensions (A) and (B), adjust actuator at hinge point 2 so that attach bolt can be inserted and removed freely. Remove small diameter bolt temporarily installed in Paragraph 4.A.(9) at hinge point 2. Install attach bolt and torque to 150 inch-pounds, (16.8 N·m). Back nut off to nearest locking hole and safety nut with cotter pin.

NOTE: Install cylinder to flap attach bolts with one washer under bolthead and one washer under nut.

NOTE: Temporarily installed small diameter bolt must be momentarily removed to check hole alignment in Paragraph 4.A.(12)(e). Reinstall each time flaps are lowered and raised for adjustment, to prevent possibility of damage.

(f) Tighten eyebolt locknut at hinge point 2 to a torque of 52(±3) foot-pounds, (624(±36) inch-pounds) (69.888(±4.032) N·m). Safety the locknut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(13) On outboard flap, check that dimension (C), between upper aft surface of outboard flap and fixture plate is 0.300(±0.070) inch, (7.62(±1.78) mm). If necessary, adjust outboard flap as follows:

(a) Loosen eyebolt locknut on actuating cylinder at hinge point 3.

(b) Rotate piston in cylinder, at hinge point 3, to adjust outboard flap within dimension (C) tolerances.

NOTE: For adjustment of inboard and outboard flap actuator cylinders, flaps must first be lowered to provide access to actuator eyebolt and piston.

(c) Tighten eyebolt locknut on actuating cylinder at hinge point 3 to a torque of 52(±3) foot-pounds (624(±36) inch-pounds), (69.888(±4.032) N·m). Safety the locknut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(d) Deleted.

(e) Loosen eyebolt locknut at hinge point 4 actuating cylinder.

(f) While maintaining tolerances of dimension (C), adjust actuator at hinge point 4 so that attach bolt can be inserted and removed freely. Remove small diameter bolt, temporarily installed in Paragraph 4.A.(9), at hinge point 4. Install attach bolt and torque to 150 inch-pounds, (16.8 N·m). Back nut off to nearest locking hole and safety nut with cotter pin.

NOTE: Install cylinder to flap attach bolts with one washer under bolthead and one washer under nut.

NOTE: Temporarily installed small diameter bolt must be momentarily removed to check hole alignment in Paragraph 4.A.(12)(e). Reinstall each time flaps are lowered and raised for adjustment, to prevent possibility of damage.

(g) Tighten eyebolt locknut on actuating cylinder at hinge point 4 to a torque of 52(±3) foot-pounds, (624(±36) inch-pounds) (69.888(±4.032) N·m). Safety the locknut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(14) With power on and flaps in faired position, adjust inboard and outboard upstops as follows:

(a) Position inboard upstop firmly against flap roller fitting. Tighten upstop attach bolts.

(b) Loosen jamnut on outboard upstop at hinge point 5. Turn stop bolt out until it just touches aft flap hinge bracket.

(c) Lower flaps slightly. Loosen inboard flap upstop attach bolts and advance stop one serration towards flap roller fitting to preload flaps when fully retracted. Tighten upstop attach bolts.

(d) Adjust outboard upstop, at hinge point 5, by turning stop bolt out an additional one-half to one full turn to preload flaps when fully retracted. Tighten jamnut on stop bolt and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(15) Adjust inboard flap inboard actuator by shortening rod end by 1/2 turn (piston rotated four lock notches). Torque actuator eyebolt locknut to 52(±3) foot-pounds (624(±36) inch-pounds) (69.888(±4.052) N·m). Safety locknut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(16) Install aft half flap hinge fairings.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(17) Slowly retract flaps to UP/RET detent and check that inboard flap dimensions (A) and (B) (Paragraph 4.A.(12)), are within tolerance. Check that outboard flap dimension (C) is within tolerance.

WJE ALL

(18) With power on, check that scribe line on track roller fitting is aligned with target indicator located on flap track.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(19) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

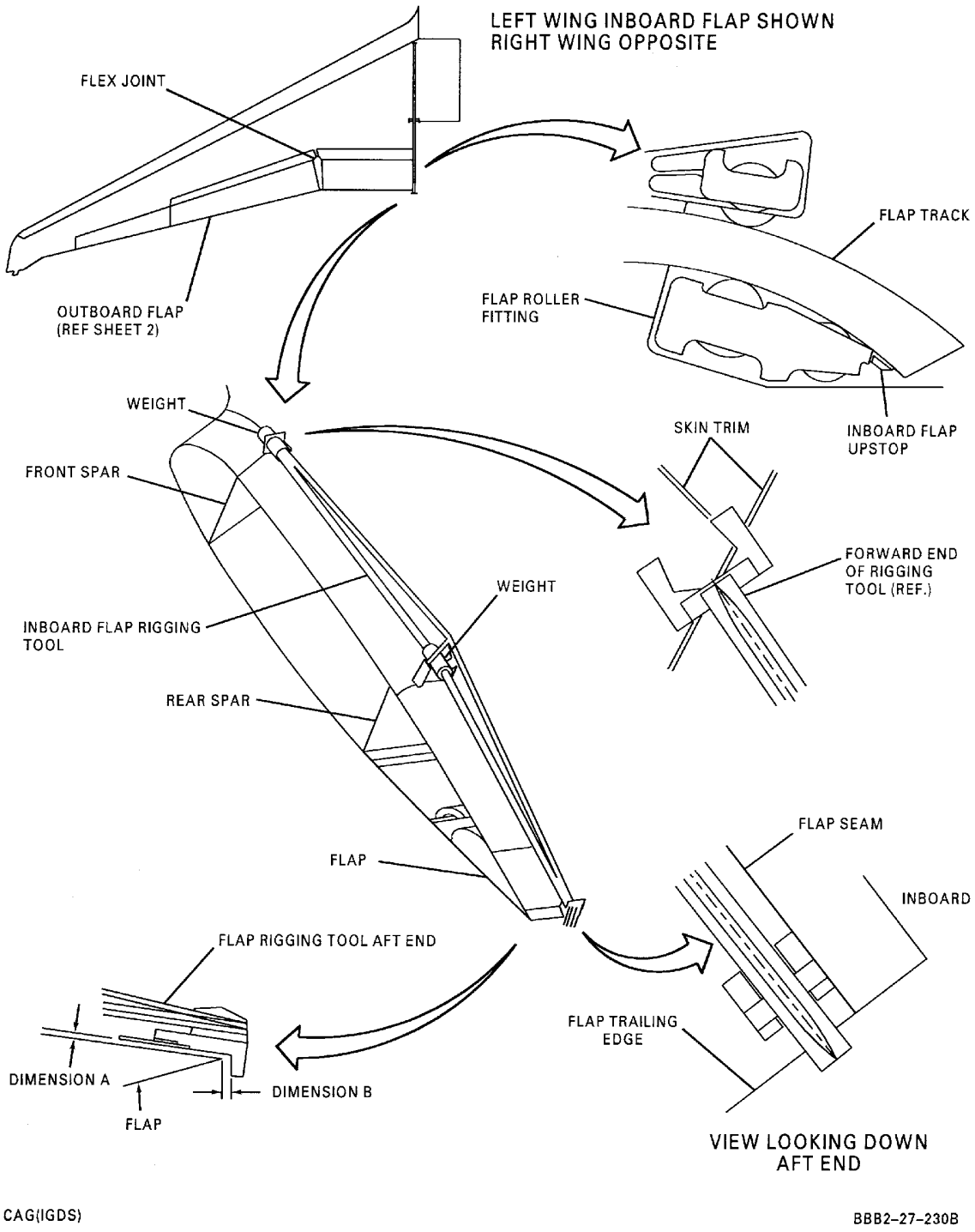
(20) Remove restraint from BUTE (bent up trailing edge) doors.

(21) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

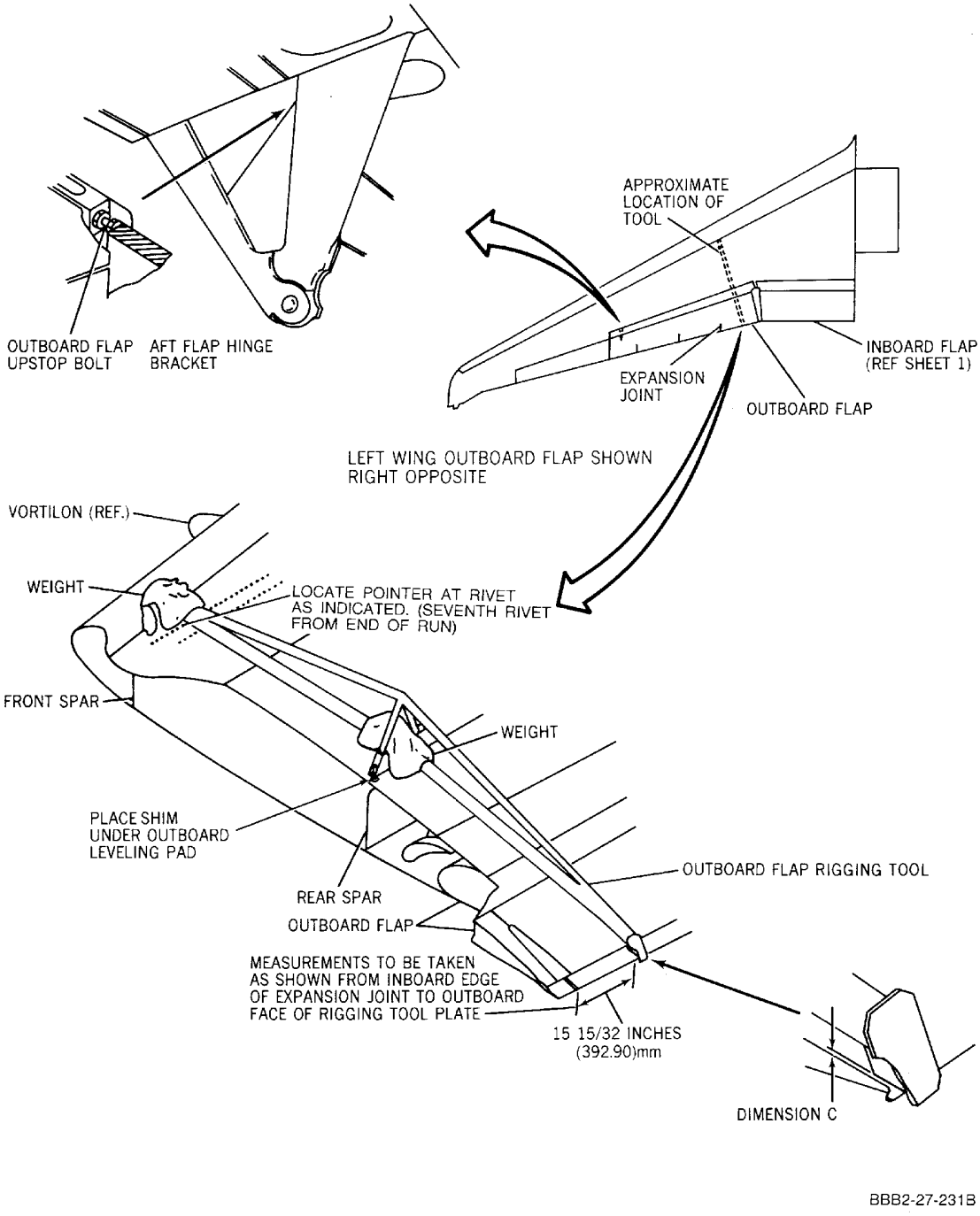
(22) Remove inboard and outboard flap rigging fixtures from upper surface of wing.

(23) Adjust and test flap, and flap cable system. (PAGEBLOCK 27-50-00/501)

(24) Adjust elevator servoactuator. (PAGEBLOCK 27-30-00/501)



Flaps - Adjustment/Test
Figure 404/27-51-01-990-804 (Sheet 1 of 2)



Flaps - Adjustment/Test
Figure 404/27-51-01-990-804 (Sheet 2 of 2)

5. Flap Flex Joint Shims Removal/Installation

NOTE: With Service Bulletin 57-208 incorporated and for aircraft experiencing chafing of wing structures due to flex of flaps, the following procedure applies.

A. Removal of Flap Flex Joint Shims (Figure 405 (Sheet 2))

(1) Inspect area of shims and shim for wear and if worn down replace shim(s) and repair area of damage.

NOTE: These shims should be inspected for wear and/or cracks at 450 flight hours (A check). If no damages are found, repetitive inspections are performed every C check. Inspections may be eliminated at a later date when no damages/failures are found.

(2) Remove shims and area of damage. Use structural repair standard procedures.

B. Install Flap Flex Joint Shims (Figure 405 (Sheet 2))

(1) Attach shim(s) and repair structural area in accordance with standard structural repair procedures.

(2) Check that clearance, measured at most forward inboard edge of fairing, is 0.001 to 0.015 inch (0.025 to 0.381 mm) between surfaces of inboard flap and fairing. If necessary, adjust aft linkage fittings on serrated plates as required.

6. Removal/Installation of Inboard Flap Drive Arm Assembly

A. Inboard Flap Drive Arm Assembly Removal (Figure 406)

(1) Gain access to inspection area by extending wing flaps to full down position.

NOTE: If necessary, support inboard flap scissor jack to prevent damage to equipment.

(2) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(3) Open main landing gear doors and install doorkeepers. (PAGEBLOCK 32-00-00/201)

(4) Remove wing fillet fairing panel 2106C left side or 2206C right side to enable bolt (1) (P/N 4952132-1) removal.

(5) Loosen flap bus cable 33A left side or 34B right side enough to remove bolt (1) (P/N 4952132-1). (FLAPS, SUBJECT 27-50-00)

(6) Remove bolt (2) (P/N ARC2326-503), and associated hardware and retain.

(7) Remove bolt (3) (P/N 4923396-503), and associated hardware and retain.

(8) Remove bolt (1) (P/N 4952132-1), and associated hardware and retain.

(9) Remove arm assembly (4) (P/N 5935973-1) and replace with new arm assembly -501.

B. Inboard Flap Drive Arm Assembly Installation (Figure 406)

(1) Reinstall bolt (1) (P/N 4952132-1) and attached hardware with new cotter pin (MS24665-376). Torque bolt from 1500 to 2500 in-lbs.

NOTE: Apply a coat of Parker O-Lube compound to bolt shank before installation.

(2) Reinstall bolt (3) (P/N 4923396-503) on rod end of actuator and associated hardware with new cotter pin (MS24665-371). Torque bolt to 150.0 in-lbs and back off to nearest locking hole.

NOTE: Apply a coat of Parker O-Lube compound to bolt shank before installation.

NOTE: Eyebolt actuating cylinder lubrication fitting must be pointing down.

(3) Reinstall bolt (2) (P/N ARC2326-503) and associated hardware with new cotter pin MS24665-300.

NOTE: Apply a coat of Parker O-Lube compound to bolt shank before installation.

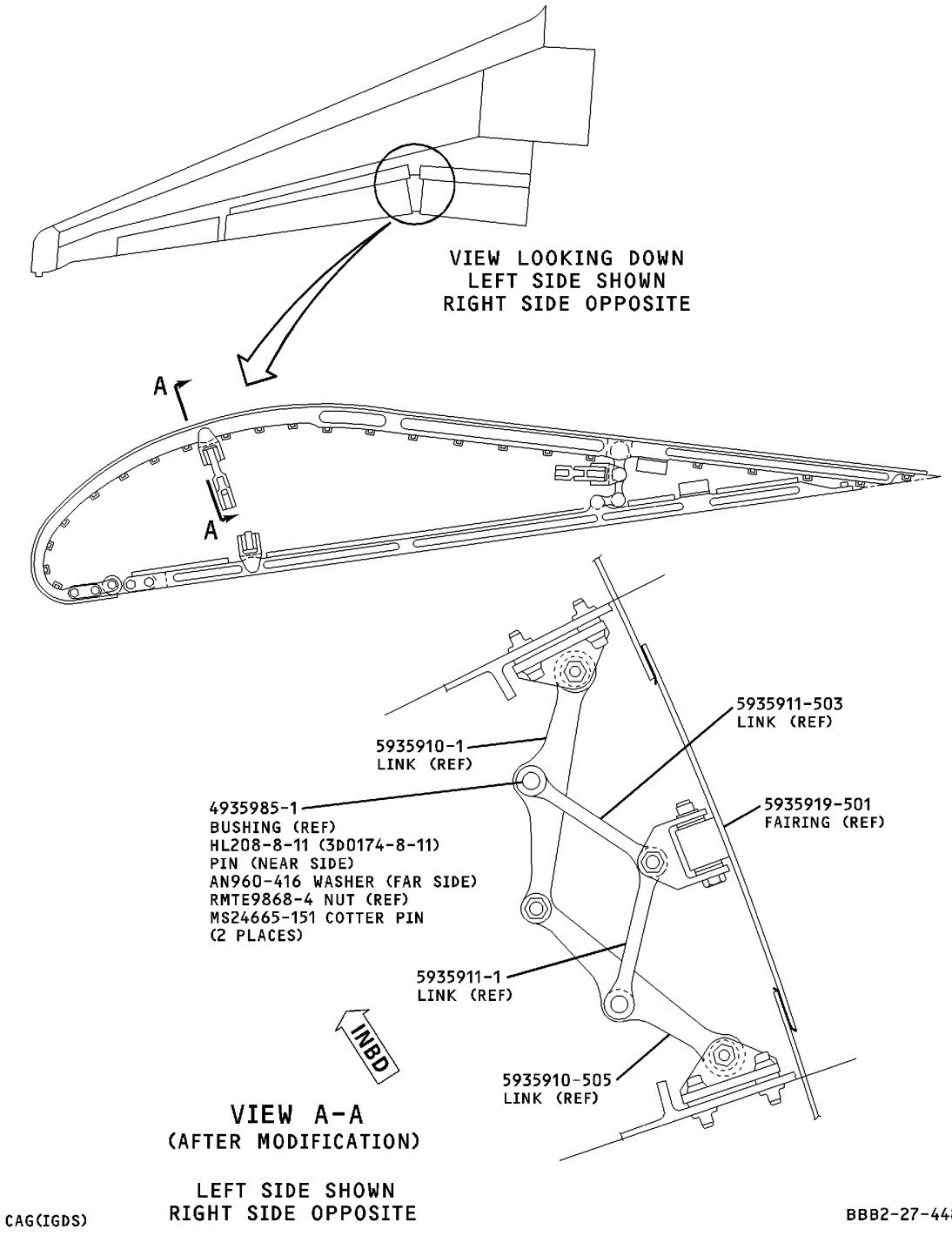
(4) Using grease gun, lubricate arm assembly and actuating cylinder.

(5) Rig flap bus cable for cable 34A left side or 34B right side. (PAGEBLOCK 27-50-00/501)

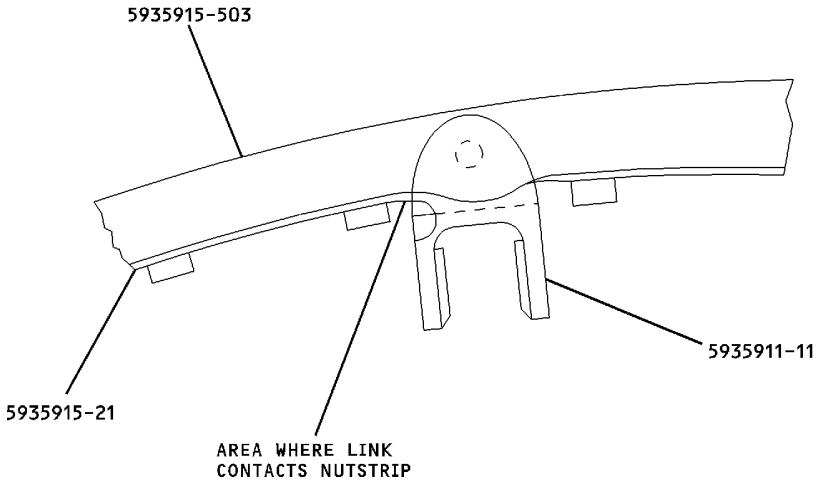
(6) Reinstall wing fillet panel 2106C left side or 2206C right side.

WARNING: BEFORE THE FLAPS ARE MOVED, MAKE SURE THE AREA AROUND THE FLAPS IS CLEAR OF EQUIPMENT AND PERSONS. THIS WILL PREVENT INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(7) Pressurize hydraulic system and perform functional check of flaps to full extend and retract. Check that flaps operate smoothly.

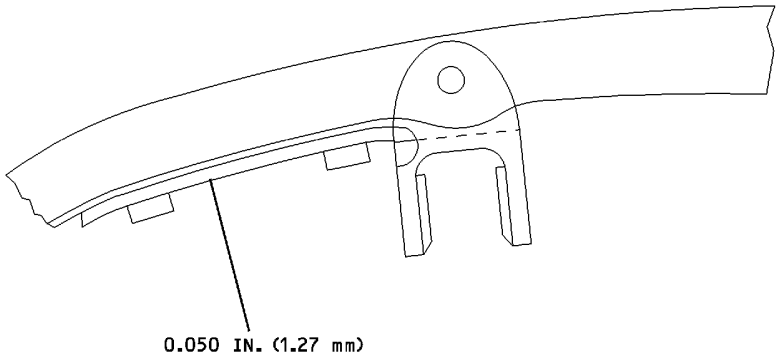


Flap Flex Joint Shim(s) - Removal/Installation
Figure 405/27-51-01-990-805 (Sheet 1 of 2)



VIEW A
CURRENT CONFIGURATION

NOTE: PART NUMBER OF SHIM
IS 17-4PH.



VIEW B
SHIM INSTALLATION

CAG(IGDS)

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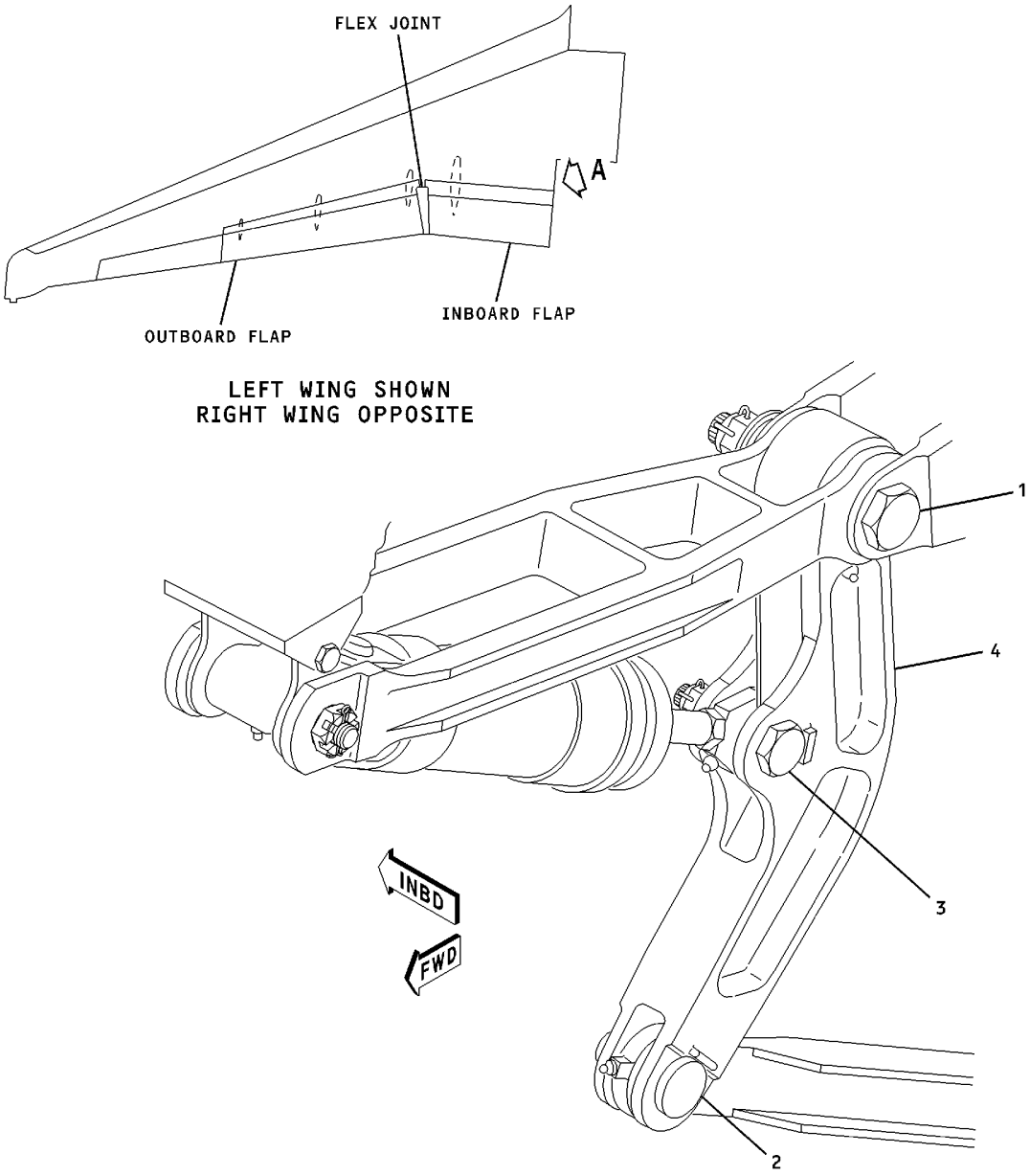
Flap Flex Joint Shim(s) - Removal/Installation
Figure 405/27-51-01-990-805 (Sheet 2 of 2)



Inboard Flap Drive Arm Assembly - Removal/Installation
Figure 406/27-51-01-990-806

FLAPS - CHECK

1. Check Flaps

A. Check Flap Clearances (Figure 601) (Figure 602)

(1) With flaps fully retracted, check that clearances are as shown in Figure 601.

(2) Check that mismatch between outboard end of flap and inboard end of aileron trailing edge does not exceed 1/4 inch (6.35 mm) in either direction when outboard end of aileron is faired with adjacent wing trailing edge.

B. Check Vane Clearances

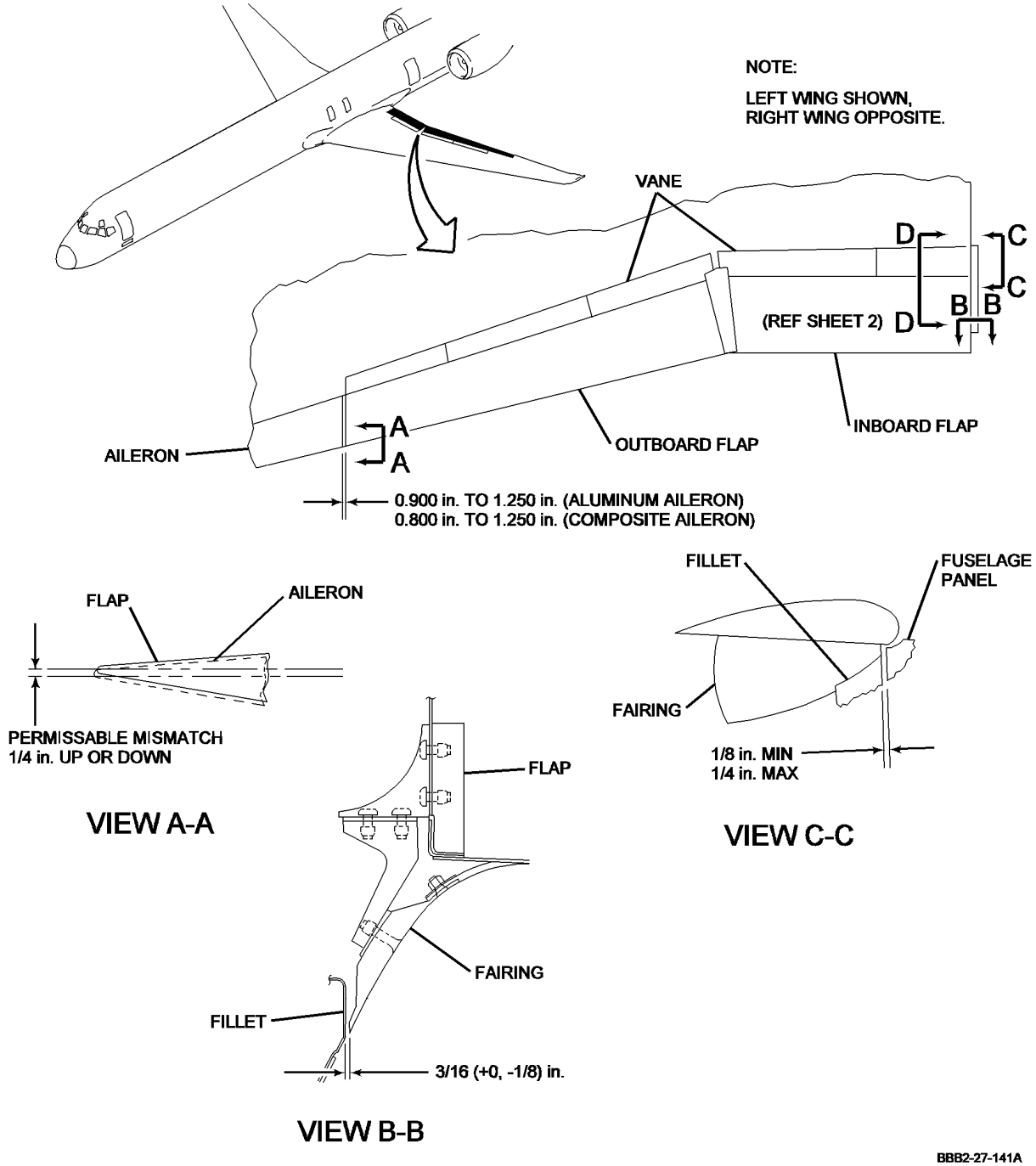
(1) Check that clearance between wing trailing edge and upper surface of fixed vane is 5/16 inch (7.94 mm) minimum throughout full flap travel.

(2) Check that clearance between vane and flap is as shown in Figure 602.

C. Check that clearances between flap fixed vane and all spoiler panels throughout full flap travel is as shown in Figure 603.

D. Check Flap Track

(1) Check track for wear and other discrepancies. Wear limits are provided in Component Maintenance Manual, Chapter 27-50-01.



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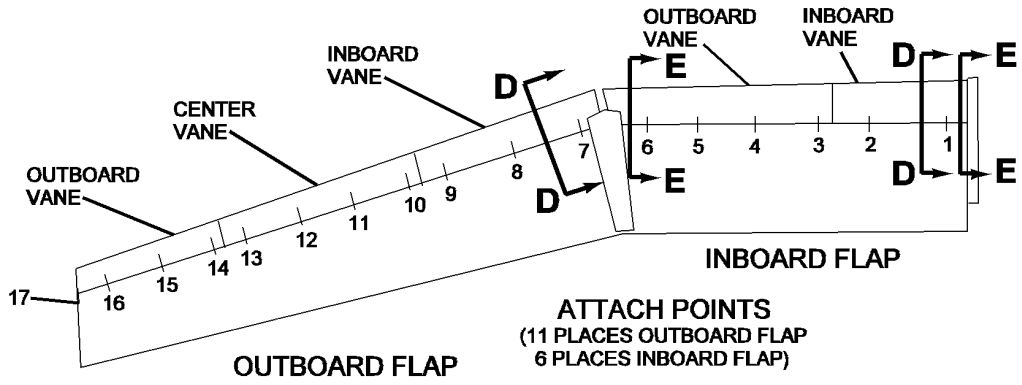
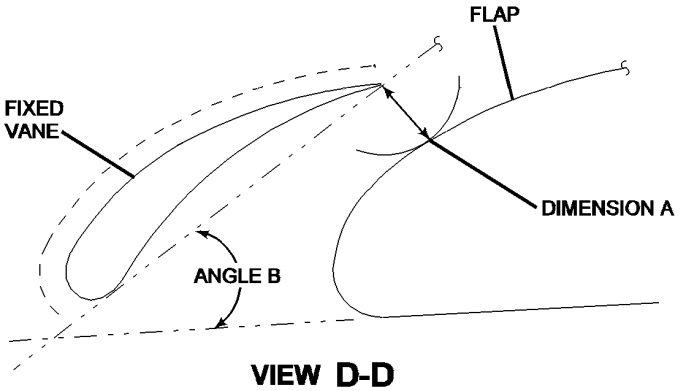
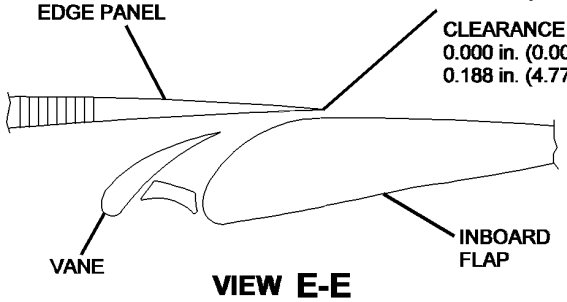
Flap and Vane Clearances
Figure 601/27-51-01-990-807





VIEW D-D
(TYPICAL 17 PLACES)

ATTACH POINT	ANGLE ✻B	DIMENSION A INCHES	DIMENSION A METRIC
1	34°36'	2.460 (±0.098)	62.484 (±2.489)
2	35°30'	2.360 (±0.094)	59.944 (±2.387)
3	35°48'	2.330 (±0.092)	59.182 (±2.336)
4	35°06'	2.430 (±0.100)	61.722 (±2.540)
5	34°36'	2.470 (±0.100)	62.738 (±2.540)
6	33°30'	2.580 (±0.103)	65.538 (±2.616)
✻ 7	34°00'	2.838 (±0.113)	72.085 (±2.870)
✻ 8	34°00'	2.686 (±0.106)	68.224 (±2.692)
✻ 9	34°00'	2.459 (±0.097)	62.458 (±2.463)
✻10	34°00'	2.455 (±0.097)	62.357 (±2.463)
✻11	34°00'	2.316 (±0.092)	58.826 (±2.336)
✻12	34°00'	2.177 (±0.086)	55.295 (±2.184)
✻13	34°00'	2.076 (±0.082)	52.730 (±2.082)
✻14	34°00'	2.075 (±0.082)	52.705 (±2.082)
✻15	34°00'	1.961 (±0.078)	49.809 (±1.981)
✻16	34°00'	1.850 (±0.073)	46.990 (±1.854)
✻17	34°00'	1.747 (±0.069)	44.373 (±1.752)



FOR INBD END OF WING TRAILING EDGE.
0.125 in. (3.175 mm) INTERFERENCE
0.063 in. (1.600 mm) CLEARANCE

CLEARANCE FOR OUTBD END OF WING TRAILING EDGE.
0.000 in. (0.000 mm)
0.188 in. (4.775 mm)

VIEW E-E

NOTE: 0.125 in. (3.175 mm) INTERFERENCE EXISTS WHEN FLAP TRAVELS 0.69 in. (17.526 mm) FWD AFTER INITIAL CONTACT WITH WING TRAILING EDGE.

✻ NOTE: ANGLE "B" TOLERANCE FOR ATTACH POINTS 7 THRU 17 IS: ±1/2°.

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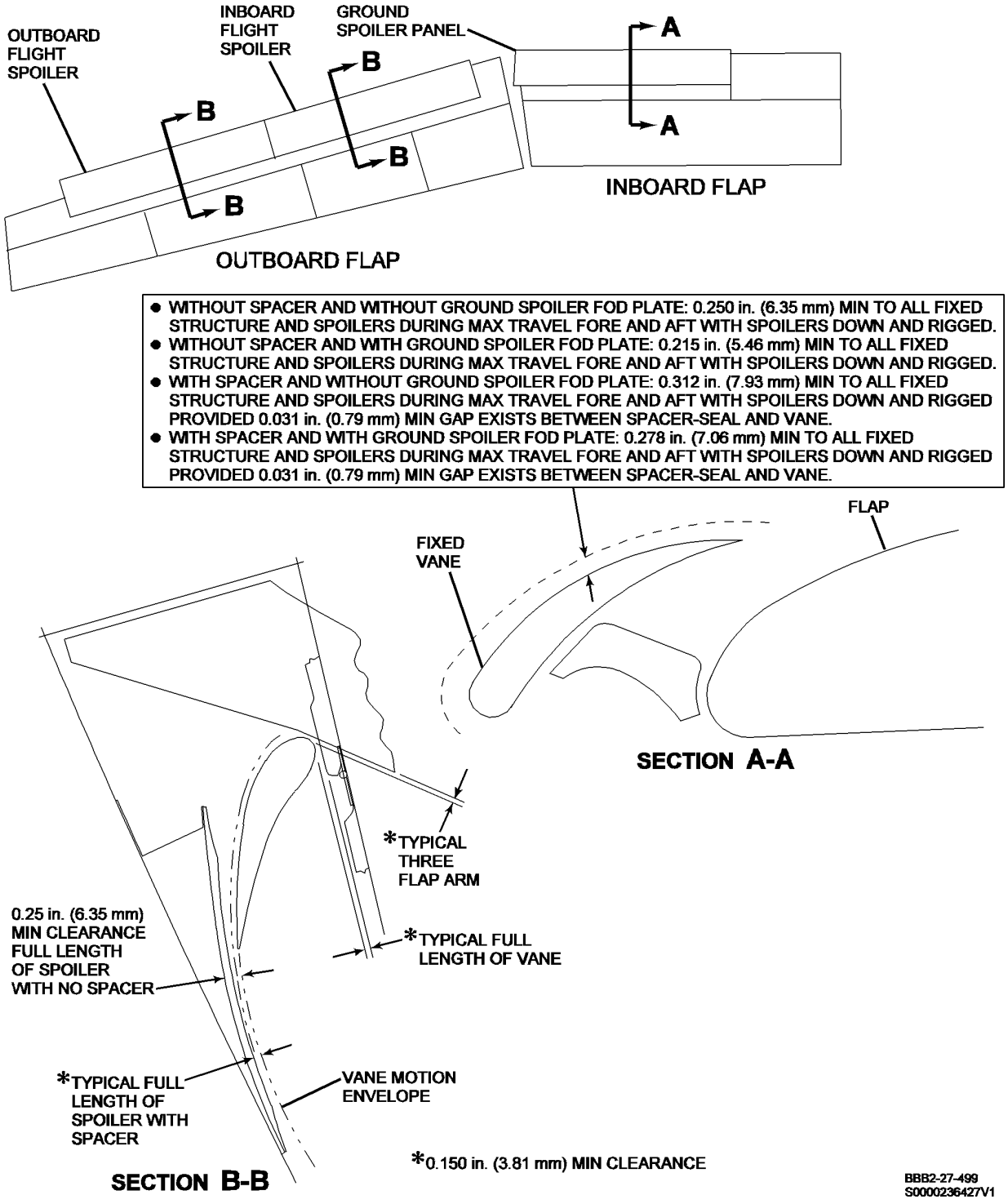
Flap and Vane Clearances
Figure 602/27-51-01-990-808



Flight and Ground Spoiler Clearances
Figure 603/27-51-01-990-810

FLAP FIXED VANES - MAINTENANCE PRACTICES

1. General

A. The flap fixed vanes are attached to brackets at the leading edge of the left and right wing inboard and outboard flaps. The inboard flap has two vanes and the outboard flap has three vanes which may be removed and installed individually. The removal and installation procedures are identical for all left and right fixed vanes, except as noted.

B. The ground spoiler debris plate helps to reduce engine Foreign Object Damage (FOD). The debris plate is mounted just below the ground spoiler in a horizontal plane and closes the gap (slot) between the deployed spoiler and the flap/vane, reducing the risk of debris flung by a main tire becoming ingested into an engine by disrupting its trajectory.

C. Attach points of all three vanes are numbered for convenience only. Numerals do not apply to markings on aircraft. (Figure 202)

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

Name and Number	Manufacturer
Sealing compound (PR1422, B-1/2) (DMS 2082)	Courtaulds Aerospace Inc. Glendale, CA

3. Removal/Installation Flap Fixed Vane

A. Remove Vane

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

(4) Remove metal patches from upper surface of vane to gain access to attach points.

NOTE: Metal patches, on the outboard flap vanes, at two center attach points on each vane are secured by screws. Patches at all other attach points of both inboard and outboard flap vanes are bonded to vane surface and must be pried loose with plastic putty knife or equivalent.

NOTE: Existing vanes may also be removed and installed by removing external mounting bolts only. If a different vane is to be installed per this method, check clearance. (Figure 202)

(5) Remove vane from supporting brackets. Retain washers, and note number, and position for installation.

B. Install Vane

(1) Install vane on support brackets, using washers in positions noted in Paragraph 3.A..

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Slowly retract flaps to UP/RET detent, while observing flap clearance.

(4) Check that clearance between upper surface of vane and wing structure and retracted spoilers are as shown in Figure 202 and Figure 203 throughout entire flap travel.

(5) Check that clearance between vane and flap upper surface are as shown in Figure 202.

(6) Extend flaps to full down position.

(7) If clearance requires adjusting, add or remove washers at applicable attach points as determined in Paragraph 3.B.(4) and Paragraph 3.B.(5).

(8) Cover two center attach point access holes with metal patches. Secure patches with screws.

WARNING: INTEGRAL FUEL TANKS SEALING COMPOUND (POLYSULFIDE SEALANT B1/2 AND B2) IS AN AGENT THAT IS POISONOUS AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN INTEGRAL FUEL TANKS SEALING COMPOUND IS USED.

- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET INTEGRAL FUEL TANKS SEALING COMPOUND IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS MSDS FOR:

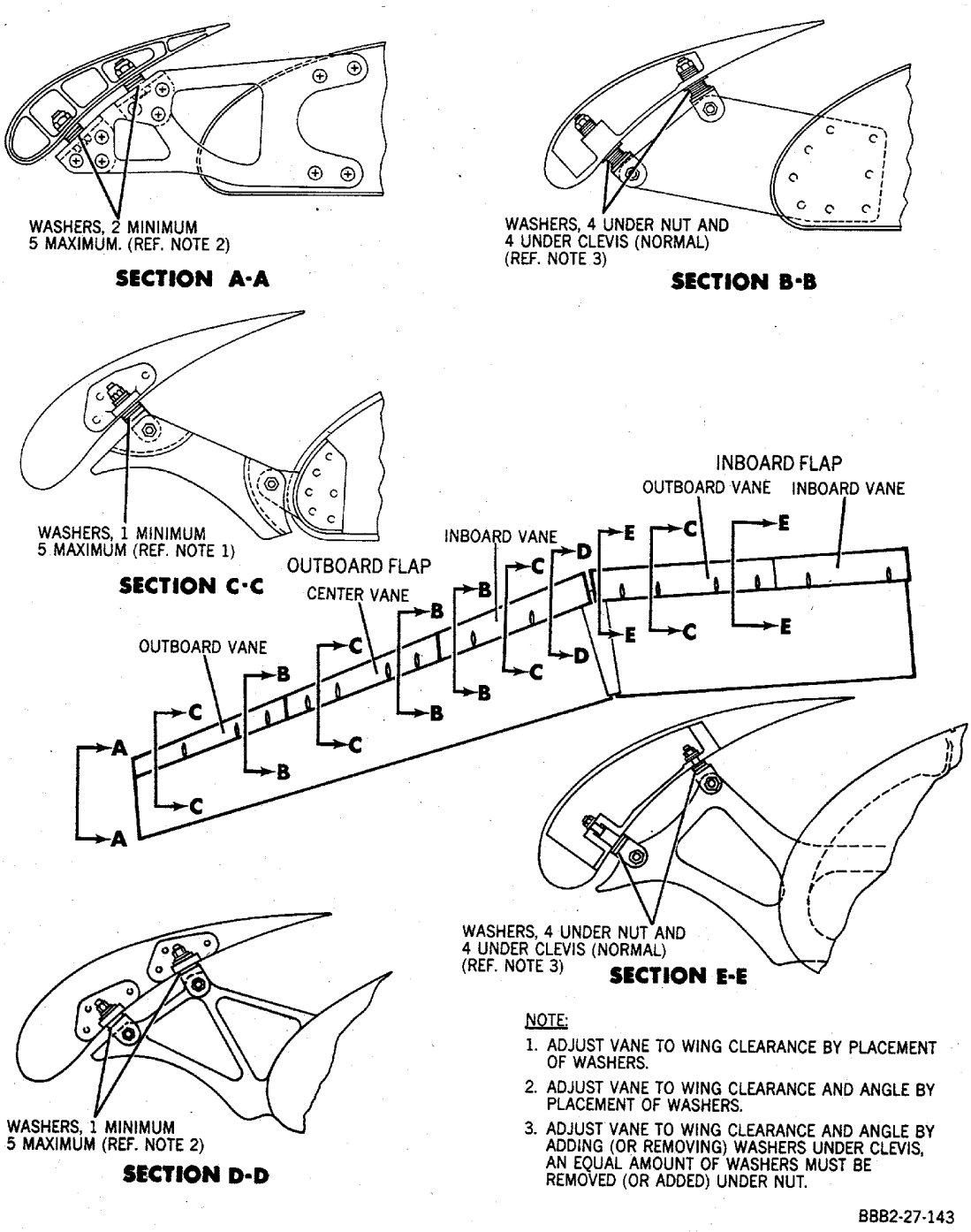
- MORE PRECAUTIONARY DATA.
- APPROVED SAFETY EQUIPMENT.
- EMERGENCY MEDICAL AID.
- TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(9) Bond metal patches over inboard and/or outboard access holes, using sealing compound (PR1422 B-1/2). (PAGEBLOCK 20-20-01/201)

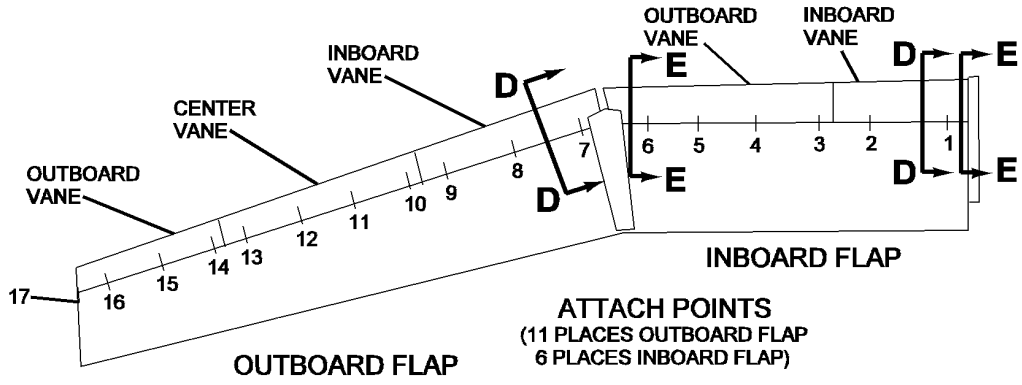
(10) Place flap/slat handle in UP/RET detent.

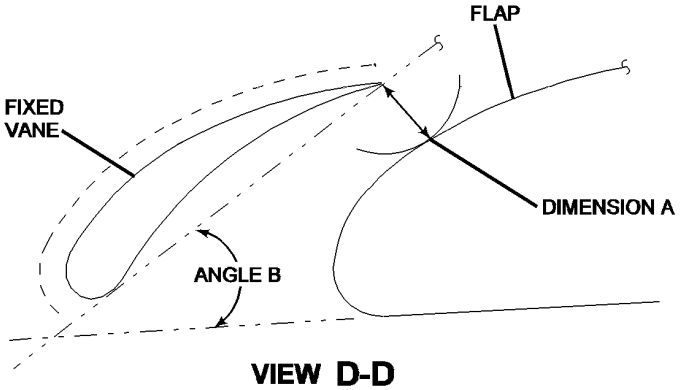
(11) Shut off hydraulic pressure source.

(12) Check fixed vane clearances. (Paragraph 4.)



Flap Fixed Vane -- Installation and Adjustment
Figure 201/27-51-03-990-801





VIEW D-D
(TYPICAL 17 PLACES)

ATTACH POINT	ANGLE ✻B	DIMENSION A INCHES	DIMENSION A METRIC
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2	35°30'	2.360 (±0.094)	59.944 (±2.387)
3	35°48'	2.330 (±0.092)	59.182 (±2.336)
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✻15	34°00'	1.961 (±0.078)	49.809 (±1.981)
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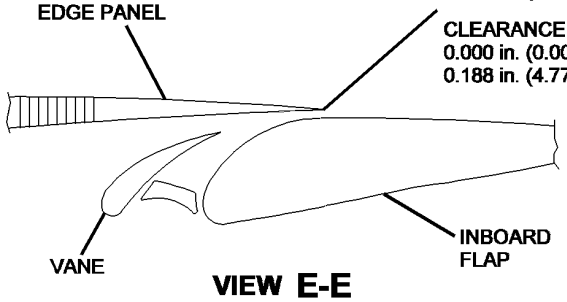

FOR INBD END OF WING TRAILING EDGE.
0.125 in. (3.175 mm) INTERFERENCE
0.063 in. (1.600 mm) CLEARANCE

CLEARANCE FOR OUTBD END OF WING TRAILING EDGE.
0.000 in. (0.000 mm)
0.188 in. (4.775 mm)

NOTE: 0.125 in. (3.175 mm) INTERFERENCE EXISTS WHEN FLAP TRAVELS 0.69 in. (17.526 mm) FWD AFTER INITIAL CONTACT WITH WING TRAILING EDGE.

✻ NOTE: ANGLE "B" TOLERANCE FOR ATTACH POINTS 7 THRU 17 IS: ±1/2°.

VIEW E-E

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Flap Fixed Vane -- Clearances
Figure 202/27-51-03-990-802

4. Inspection/Check Flap Fixed Vanes

A. Check Fixed Vane Clearances

(1) Check that clearances between fixed vane and flap are as shown in Figure 202.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent. Check that clearance between upper surface of fixed vane and retracted spoilers or other wing structure are as shown in Figure 202 and Figure 203 through entire flap travel.

(4) Place flap/slat handle in UP/RET detent.

(5) Shut off hydraulic pressure source.

5. Adjustment of Fixed Vanes Within Allowable Tolerances

NOTE: Although fixed vanes are installed within specified angles, dimensions and tolerances, some aircraft while in flight may have a tendency to roll when flaps are extended. If this condition is determined to be caused by improperly adjusted flap fixed vanes, perform the following adjustment procedures. Correction of roll tendency is usually accomplished by removal or installation of one washer thickness which results in the vane being in the nominal mid-point of the tolerance range.

A. Adjustment of Fixed Vanes (Figure 201) (Figure 202)

(1) If aircraft has tendency to roll to right when flaps are extended, adjust position of outboard flap outboard fixed vane on both wings by adding or removing washers at vane attach points as required.

(a) Right Wing - Decrease gap A and angle between outboard vane and flap.

(b) Left Wing - Increase gap A and angle between outboard vane and flap.

(c) Check that vane clearances and angles are within limits shown in Figure 202.

(2) If aircraft has tendency to roll to left when flaps are extended, adjust position of outboard flap outboard fixed vane on both wings by adding or removing washers at vane attach points as required.

(a) Right Wing - Increase gap A and angle between outboard vane and flap.

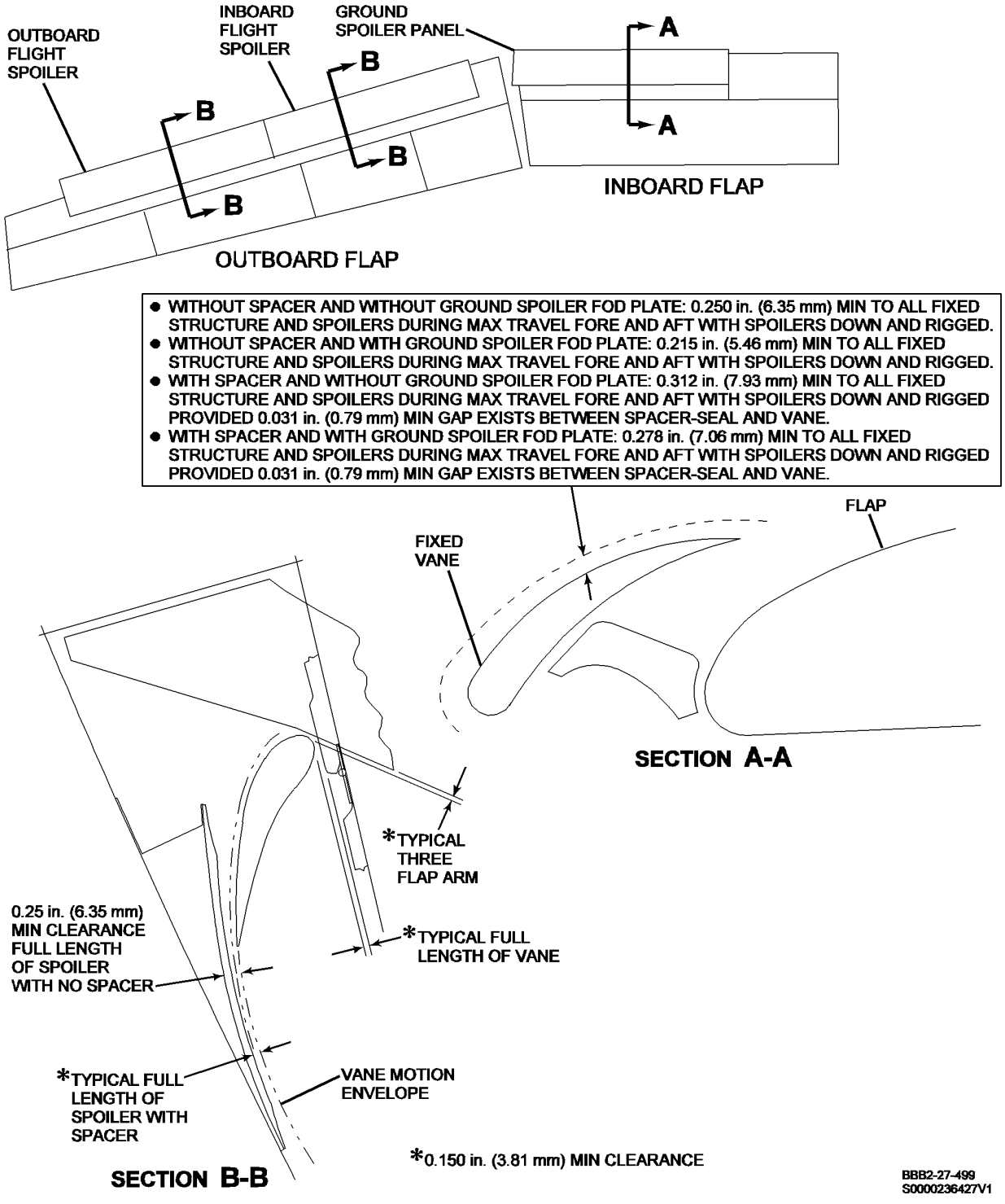
(b) Left Wing - Decrease gap A and angle between outboard vane and flap.

(c) Check that vane clearances and angles are within limits shown in Figure 202.

6. Inspection/Check Flat Fixed Vane and All Spoiler Panel Clearances

A. Check Flat Fixed Vane and All Spoiler Panel Clearances

(1) Check that clearances between flap fixed vanes and all spoiler panels are as shown in Figure 203.



Flap Fixed Vane and Spoiler Panel Clearances - Inspection/Check
Figure 203/27-51-03-990-804

7. **Adjustment of Debris Deflector Plates with Ground Spoilers**

NOTE: Only on aircraft with SB 57-182.

A. Adjust the debris deflector plate. (Figure 204)

(1) Open wing lower surface access doors 1579C and 1679C to gain access to flap vanes and deflector shields.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Raise flaps to full retract position. Allow sufficient time with hydraulic pressure on to make certain flaps are fully up.

(4) Add or remove S124682-4D20-3 washers as required to provide contact between spoiler and deflector plate, then remove one additional washer to obtain preload.

(5) Check the clearance between the spoiler and the debris deflector shield.

(a) Gap between upper surface of debris deflector plate and ground spoiler lower surface is .030 inch minimum (0.76 mm).

(b) Gap between upper surface of flap fixed vane and lower surface of debris deflector plate, at their closest point is 0.12 inch (3.04 mm) minimum.

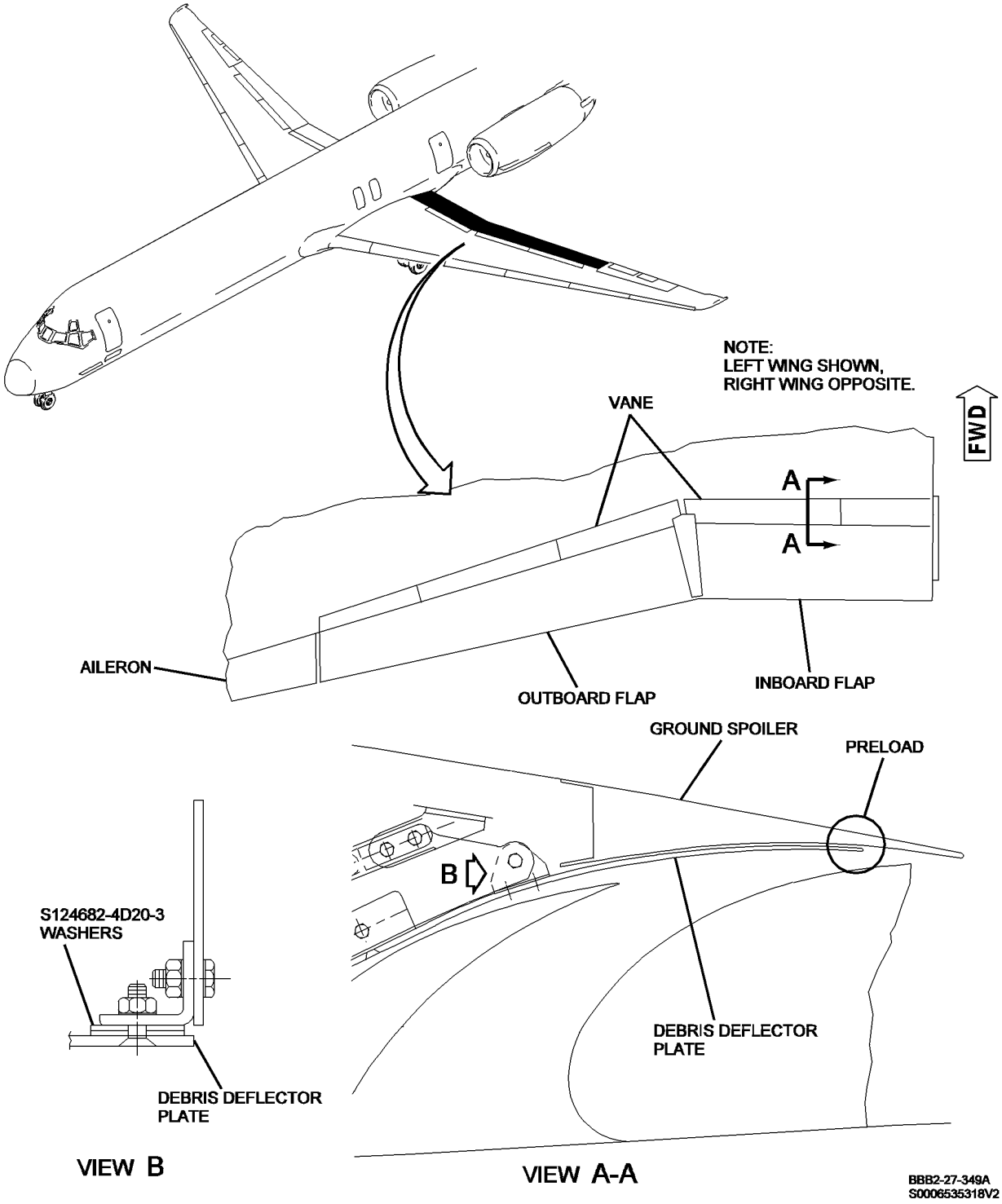
NOTE: Cold form of debris deflector plates to obtain required minimum gaps between plates and ground spoiler and flap fixed vane is permissible. Preload and minimum gap requirements must still be maintained after any adjustments are made.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(6) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(7) Reinstall wing lower surface access doors 1579C, 1679C and attaching parts.

(8) Return all affected controls to normal operating condition.



Ground Spoiler to Debris Deflector Plate -- Adjustment
Figure 204/27-51-03-990-803

FLAP FLEX JOINT - MAINTENANCE PRACTICES

1. General

A. The flap flex joint is mounted on the closure bulkheads of the inboard and outboard flaps, and mechanically links the flaps together.

B. The flap flex joint consists of upper and lower fairings, upper and lower tracks, upper and lower bars, link assemblies, and fittings.

C. The removal/installation of the flex joint is identical for left and right flaps except as noted.

D. The letters in parentheses in the following text correspond to callouts in Figure 201.

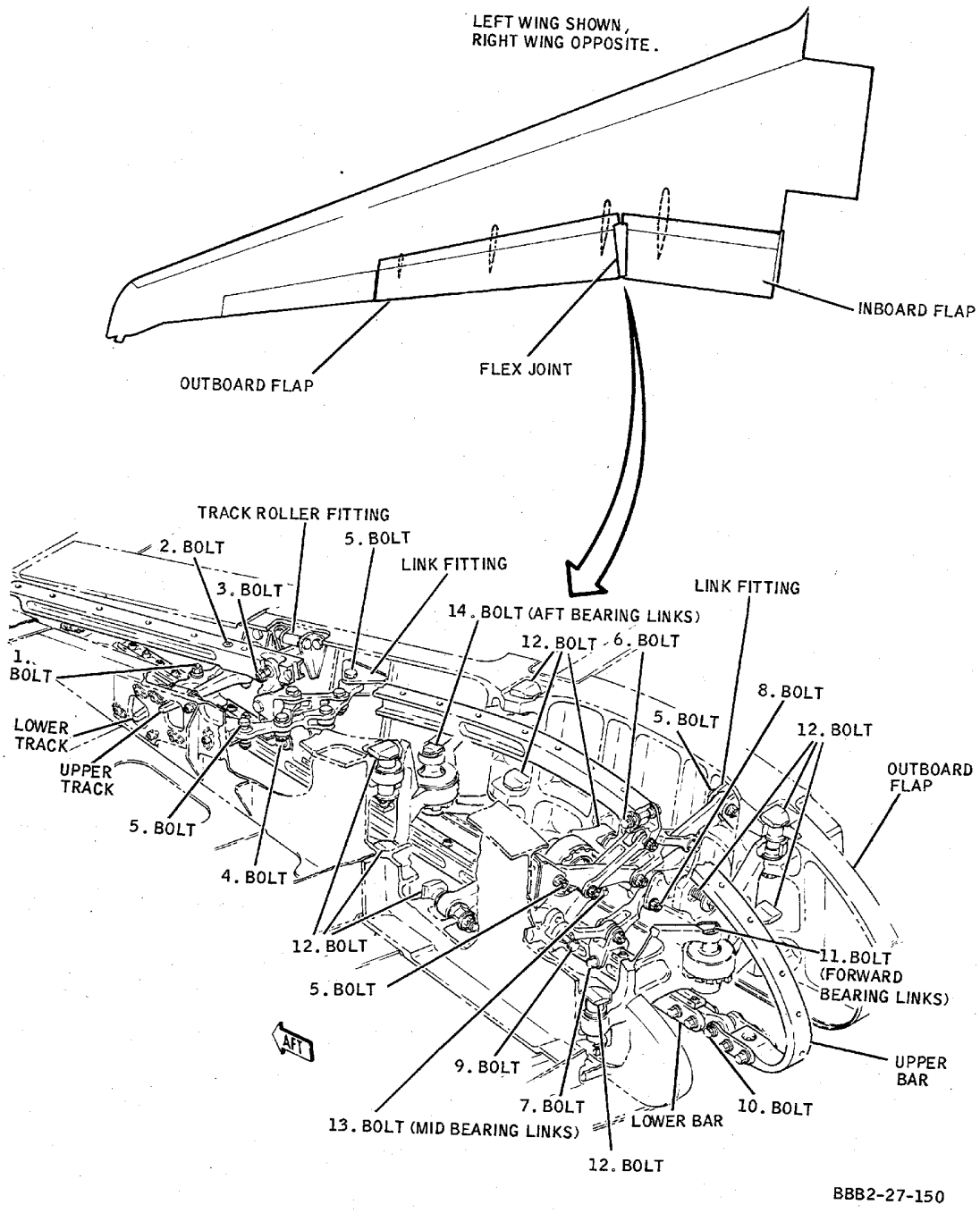
2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
Torque wrench (0-300) inch pounds) (0.0 to 33.6 N·m)	
Lockwire, NASM20995N32, DPM684*[1]	Not specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.



Flap Flex Joint -- Removal/Installation
Figure 201/27-51-07-990-801

3. **Removal/Installation Flap Flex Joint**

A. Remove Flap Flex Joint. (Figure 201)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(4) Remove flex joint fairing from bottom surface of flap.

WJE 412, 414

(5) Remove screws, and if applicable nuts, from leading edge of flex joint upper fairing.

WJE ALL

Remove screws from leading edge of flex joint upper fairing.

WJE 412, 414

NOTE: On later aircraft flex joint fairing nuts are retained by nut plates, and need not be removed.

WJE ALL

NOTE: Record position of screws when removing upper fairing as an aid when installing screws.

(6) Pressurize hydraulic system.

(7) Place flap/slat handle in UP/RET detent. Tag flap/slat handle with warning tag that handle is not to be moved.

NOTE: The flaps must be held in the UP position by either hydraulic pressure or some other suitable means to gain access for upper fairing nuts and flex joint attach points.

WJE 412, 414

(8) Remove remaining screws, and if applicable nuts, from flex joint upper fairing and remove fairing.

Remove remaining screws from flex joint upper fairing and remove fairing.

WJE ALL

(9) Remove bolts (1) from lower track and bar and remove track.

WJE 412, 414

NOTE: Note number of shims between track and bar to aid installation.

WJE ALL

NOTE: Note and record number of shims between track and bar.

(10) Remove bolt (2) from upper track and bar and remove track.

WJE 412, 414

NOTE: Note number of shims between track and bar to aid installation.

WJE ALL

NOTE: Note and record number of shims between track and bar.

(11) Remove bolt (3) from aft linkage and upper bar.

(12) Remove bolt (4) from aft linkage and lower bar.

(13) Remove bolts (5) from aft linkage and brackets, inboard and outboard flaps, and remove aft linkage.

(14) Remove bolt (6) from forward linkage and upper bar.

(15) Support upper bar and remove bolt (10) and remove upper bar.

(16) Remove bolts (5) from forward linkage and brackets, inboard and outboard flaps, and remove forward linkage.

(17) Support lower bar, remove bolt (7) and remove lower bar.

(18) Remove bolts (8) and (9) and remove lower forward linkage.

(19) Remove bolt (11) connecting forward bearing links.

(20) Remove bolts (12) from forward bearing links, inboard and outboard flaps, and remove links.

(21) Remove bolt (13) connecting mid bearing links.

(22) Remove bolts (12) from mid bearing links, inboard and out-board flaps, and remove links.

(23) Remove bolt (14) connecting aft bearing links.

(24) Remove bolts (12) from aft bearing links, inboard and out-board flaps, and remove links.

(25) Check condition of flex joint link fittings on flap bulk-heads, if necessary, remove flex joint link fittings, serrated plates and shims from flap bulkhead. Note fitting position.

NOTE: Remove serrated plates and fittings as a unit as an aid in adjustment procedures. Note and record number of shims between serrated plate and structure.

(26) Check condition of flex joint track roller fittings on flap bulkheads, if necessary, remove flex joint track roller fittings from flap bulkhead.

(27) Check all linkage, bearings and fittings for cleanliness, binding, or looseness. (Ref. Component Maintenance Manual 27-50-12)

(28) Check inboard and outboard inner flap bulkheads for any evidence of wear, chafing or other damage resulting from flap flex joint link bolts contacting the respective bulkheads. (Ref. Service Bulletin 57-208)

(29) Remove flap flex joint shims. (Figure 202)

NOTE: With Service Bulletin 57-208 incorporated and for aircraft experiencing chafing of wing structures due to flex of flaps, the following procedure applies.

(a) Inspect area of shims and shim for wear and if worn down replace shim(s) and repair area of damage.

NOTE: These shims should be inspected for wear and/or cracks at (A check). If no damages are found, repetitive inspections are performed every C check. Inspections may be eliminated at a later date when no damages/failures are found.

(b) Remove shims and area of damage. Use structural repair standard procedures.

(30) Shut off hydraulic pressure source.

B. Install Flap Flex Joint

(1) Make certain that flap/slat handle is in UP/RET position and that handle is tagged with warning tag not to move flap/slat handle.

NOTE: The flaps must be held in the UP position by either hydraulic power or some other suitable means to gain access to flex joint attach points.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(3) If necessary, install flex joint link fittings, serrated plates and shims, as noted in Paragraph 3.A.(25) on flap bulkhead. Tighten bolts to torque of 50 to 70 inch-pounds (5.6 to 7.84 N·m).

(4) If necessary, install flex joint track roller fittings on flap bulkhead. Tighten bolts.

(5) Position aft bearing links on flap fitting. Install bolts (12). Tighten nuts to torque of 50 to 190 inch pounds, (5.6 to 21.28 N·m). Safety nuts with cotter pins.

(6) Position aft bearing links together and install bolt (14) making certain bolthead is seated. Tighten nut to first locking slot after snugging washer. Safety nut with cotter pin.

(7) Position mid bearing links on flap fittings. Install bolts (12). Tighten nuts to torque of 50 to 190 inch-pounds, (5.6 to 21.28 N·m). Safety nuts with cotter pins.

(8) Position mid bearing links together and install bolt (13) making certain bolthead is seated. Tighten nut to first locking slot after snugging washer. Safety nut with cotter pin.

(9) Position forward bearing links on flap fittings. Install bolts (12). Tighten nuts to torque of 50 to 190 inch-pounds, (5.6 to 21.28 N·m). Safety nuts with cotter pins.

(10) Position forward bearing links together and install bolt (11) making certain bolthead is seated. Tighten nut to first locking slot after snugging washer. Safety nut with cotter pin.

(11) Position lower forward linkage on mid bearing linkage. Install bolt (9) with head facing forward. Install bolt (8) with head facing aft. Safety head of bolt (9) with lockwire to bearing link. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201) Safety nut on bolt (8) with cotter pin.

(12) Position lower bar on lower forward linkage and install bolt (7). Safety nut with cotter pin.

(13) Position forward linkage on inboard and outboard flap link fittings and install bolts (5). Safety nuts with cotter pins.

(14) Position upper bar on forward linkage and install bolt (6) with head facing outboard. Safety nut with cotter pin.

(15) Install bolt (10) with head facing inboard to connect upper and lower bars. Safety nut with cotter pin.

(16) Position aft linkage on inboard and outboard flap link fittings and install bolts (5). Safety nuts with cotter pins.

(17) Install bolt (4) to connect aft linkage and lower bar. Safety nut with cotter pin.

(18) Install bolt (3) to connect aft linkage and upper bar. Safety nut with cotter pin.

(19) Position upper track on inboard and outboard track rollers. Install shims as recorded in Paragraph 3.A.(10) between track and upper bar. Install bolt (2) in aft hole. Tighten nut.

NOTE: Check that upper bar is flush to 0.03 inch (0.762 mm) high relative to flap. If necessary, add or remove shims as required.

(20) Position lower track on inboard and outboard track rollers. Install shims as recorded in Paragraph 3.A.(11) between track and lower bar. Install bolts (1) and tighten nuts.

NOTE: Check that lower bar is 0.12 inch (3.048 mm) low relative to flap. If necessary, add or remove shims as required.

(21) Install upper flex joint fairing. Install screws as noted in Paragraph 3.A.(5) as applicable. Tighten screws. It may be necessary to extend flaps to install screws in forward end of fairing.

(a) Attach shim(s) and repair structural area in accordance with standard structural repair procedures. (Figure 202)

(22) Check that clearance, measured at most forward inboard edge of fairing, is 0.000 to 0.015 inch (0.000 to 0.381 mm) between surfaces of inboard flap and fairing. If necessary, adjust aft linkage fittings on serrated plates as required.

(23) Check that clearance, measured in plane of aft linkage at inboard and outboard edges of fairing, is 0.000 to 0.015 inch (0.000 to 0.381 mm) between surfaces of inboard and outboard flaps and fairing. If necessary, adjust forward linkage fittings on serrated plates as required.

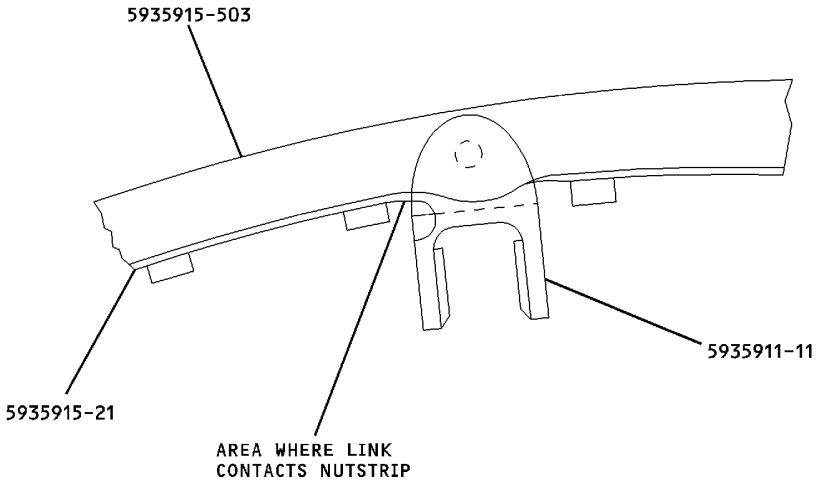
(24) Slowly extend and retract flaps. Check flex joint linkage for smooth operation without binding.

(25) Extend flaps.

(26) Install lower flex joint fairing.

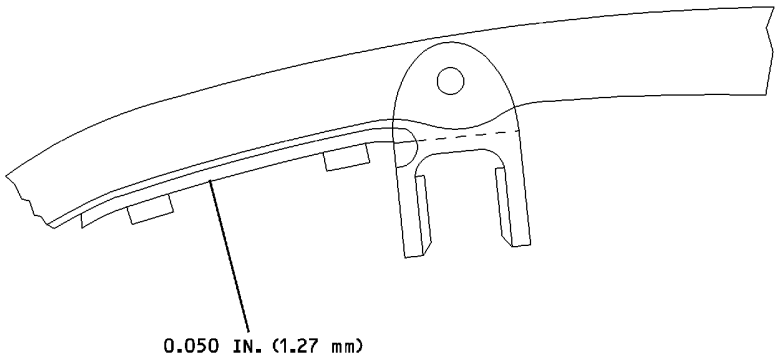
(27) Place flap/slat handle in UP/RET position.

(28) Shut off hydraulic pressure source.



VIEW A
CURRENT CONFIGURATION

NOTE: PART NUMBER OF SHIM
IS 17-4PH.



VIEW B
SHIM INSTALLATION

CAG(IGDS)

BBB2-27-449

Flap Flex Joint Shim(s) - Removal/Installation
Figure 202/27-51-07-990-802

FLAP CONTROL VALVE - MAINTENANCE PRACTICES

1. General

A. The flap control valve is located in the left main gear wheelwell on the center panel. The valve is a tandem valve and is removed as a unit. The forward end of the valve controls the 2 and 4 flap actuators on the left and right wing and the aft end of the valve controls the 1 and 3 actuating cylinders on left and right wing.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
Door safety locks 3936851-1 or -501 as applicable. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co.

3. Removal/Installation Flap Control Valve

A. Remove Valve

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in by-pass position (lever extended), open main gear inboard doors and install door safety locks.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(4) Depressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Disconnect hydraulic lines from fittings in valve ports. Plug open lines.

(6) Disconnect pushrod from valve actuating arm.

(7) Remove attach bolts from support. Retain spacer at aft attach point and remove valve from support.

(8) If required, remove hydraulic fittings in valve ports. Discard O-rings. Plug or cap open valve ports.

B. Install Valve

(1) Make certain door safety locks are installed on main gear doors.

(2) Make certain left and right hydraulic systems are depressurized.

(3) If required, install hydraulic fittings in valve ports, as shown in Figure 201, using new O-rings.

(4) Install attach bolt at forward end of valve, install spacer and bolt at aft end of valve.

(5) Connect hydraulic lines to fittings in valve ports.

(6) Connect pushrod to actuating arm with bolt, bushing, washer, and nut. Safety nut with cotter pin.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(7) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(8) Retract and extend flaps several times. Place flap/slat handle in UP/RET detent.

(9) Visually check valve fittings and line connections for leakage.

(10) Place flap/slat handle in 11/MID degree detent. Check that 11° placard on each inboard track is lined up with scribe line on structure within ± 0.128 inch (± 0.25°). If necessary, adjust valve as follows:

(a) Loosen jamnuts on pushrod turnbuckle.

(b) Adjust turnbuckle adjustment on pushrod until 11° placard on inboard track is lined up with scribe line on structure within ± 0.128 inch (± 0.25°).

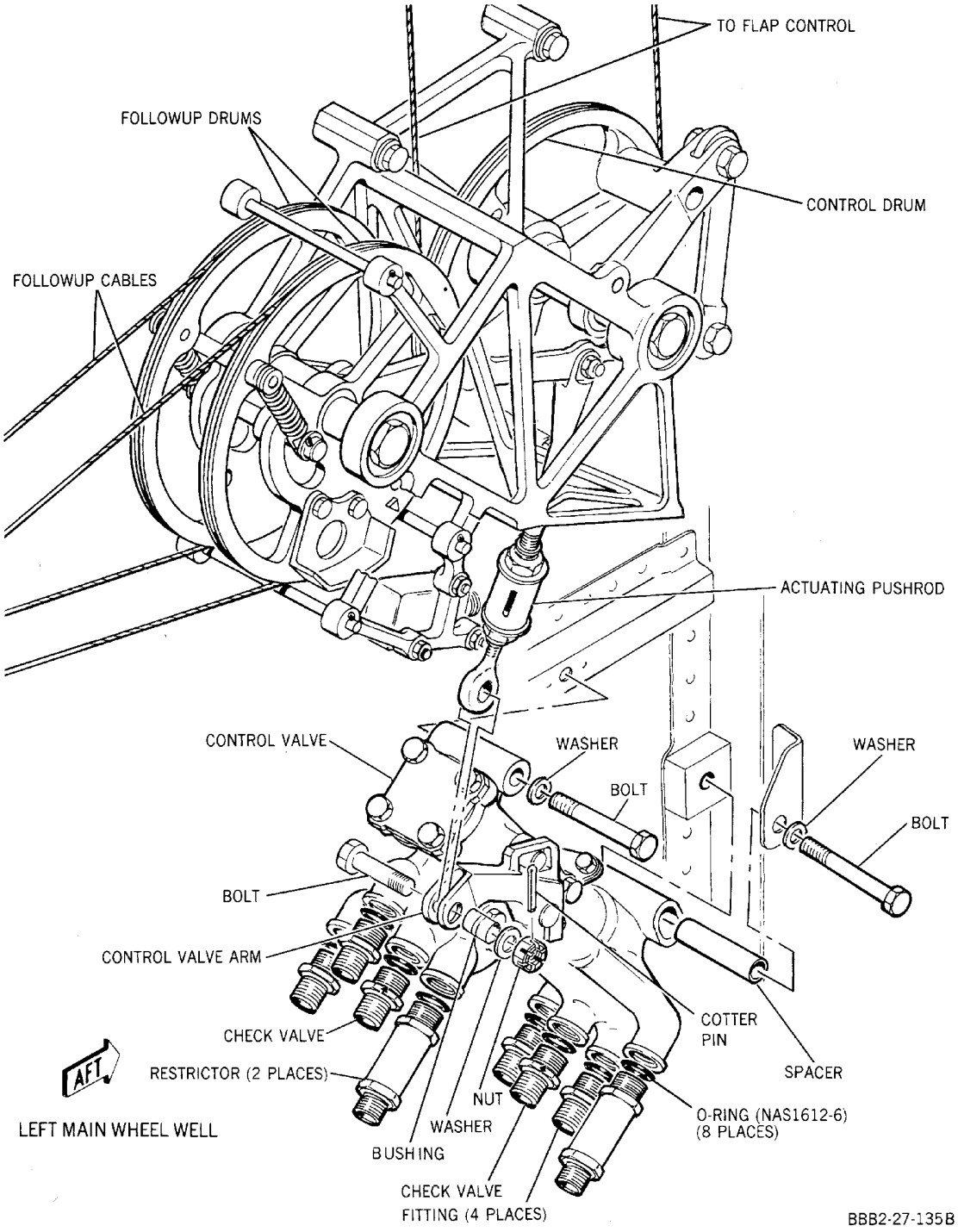
NOTE: Threads from both rod ends must be at least flush (visible) with ends of witness slot.

(c) Tighten pushrod turnbuckle jamnuts.

(11) Place flap/slat handle in UP/RET detent.

(12) Shut off hydraulic pressure source.

(13) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Flap Control Valve -- Removal/Installation
Figure 201/27-52-01-990-801

FLAP ACTUATING CYLINDERS - MAINTENANCE PRACTICES

1. General

A. There are eight flap actuating cylinders, two for each inboard flap and two for each outboard flap. Removal and installation procedures are identical for all actuating cylinders except as noted.

B. Access to attachments is through aft hinge fairings and forward hinge fairings.

2. Tools and Equipment Required

NOTE: Equivalent substitutes may be used instead of the following listed items.

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

Name and Number	Manufacturer
Sling 5916712-1	Douglas Aircraft Co.
Torque wrench (0-300 inch pounds) (0.0 to 33.6 N·m)	
Grease (MIL-G-81322) (DPM 5348)	Mobile Grease 28 Aeroshell Grease 22
Parker O-Lube (DPM 5367)	Parker Seal Co. Culver City, CA
Torque wrench (0-100 foot pounds) (0.0 to 134.4 N·m)	
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Flap Actuating Cylinder

A. Remove Actuating Cylinder

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

(4) Remove fairing from forward and aft hinge brackets, as required, for access to cylinder attach points.

(5) Disconnect hydraulic lines from cylinder. Cap or plug open lines and fittings.

(6) If removing outboard cylinders, disconnect eyebolt at aft end of piston rod from flap hinge bracket. If removing inboard flap inboard cylinder, disconnect eyebolt from drive link.

NOTE: Flap actuating cylinders should be removed and installed individually. If more than one cylinder, on one wing, is being removed the flap should be supported in the extended position with sling or other suitable means.

CAUTION: USE CARE TO PREVENT DAMAGE TO HYDRAULIC LINES AND FITTINGS DURING REMOVAL OF CYLINDER.

(7) Disconnect forward end of cylinder from bracket on wing rear spar, and remove cylinder.

(8) Remove and retain block from forward end of cylinder.

(9) Move cylinder piston rod in to fully bottomed position.

(10) Measure and record dimension from centerline of forward attach hole on cylinder to centerline of hole in eyebolt at aft end of piston rod.

NOTE: This dimension is to be used when preparing replacement cylinder for installation.

(11) If required, remove hydraulic fittings from cylinder ports. Discard O-rings. Plug open cylinder ports.

B. Install Actuating Cylinder

(1) If required, install hydraulic fittings in cylinder ports, using new O-rings.

(2) Depress piston rod, until piston bottoms in cylinder.

(3) Loosen eyebolt jamnut, and adjust eyebolt to obtain dimensions recorded in Paragraph 3.A.(10). Tighten eyebolt jamnut to torque of 52(±3) foot-pounds (69.888(±4.032) N·m). Safety jamnut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Eyebolt on actuating cylinders installed on outboard hinge brackets must have lubrication fitting pointing up. Eyebolt on cylinder installed on inboard drive link the lubrication fitting must be pointing down.

WARNING: USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1170, LUBRICANT (DPM 5367)

HAZMAT 1000, REFER TO MSDS

(4) Install block in forward clevis of cylinder, making certain that bolthead and washer are properly seated against shoulder on cylinder and that lubrication fitting is in same direction as lubrication fitting on eyebolt.

NOTE: Apply a coat of Parker O-Lube compound to bolt shank before installation.

(5) Connect block to bracket, making certain that head of bolt is seated properly against bracket. Shim with washers as required to obtain clearance of 0.002 to 0.016 inch (0.050 to 0.406 mm) between bracket and washer under nut. Safety nut with cotter pin.

NOTE: Apply a coat of Parker O-Lube compound to bolt shank before installation.

(6) Install bolt in rod end. Tighten nut to torque of 150 inch-pounds (16.8 N·m) and back off nut to nearest locking hole. Safety nut with cotter pin.

NOTE: Apply a coat of Parker O-Lube compound to bolt shank before installation.

(7) Connect hydraulic lines to fittings in cylinder ports.

(8) Using grease gun, lubricate actuating cylinder attach points. (PAGEBLOCK 12-21-02/301)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(9) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(10) Retract and extend flaps several times. Place flap/slat handle in 40 degree detent. Check that flaps operate smoothly.

(11) Visually check fittings and line connections for leakage.

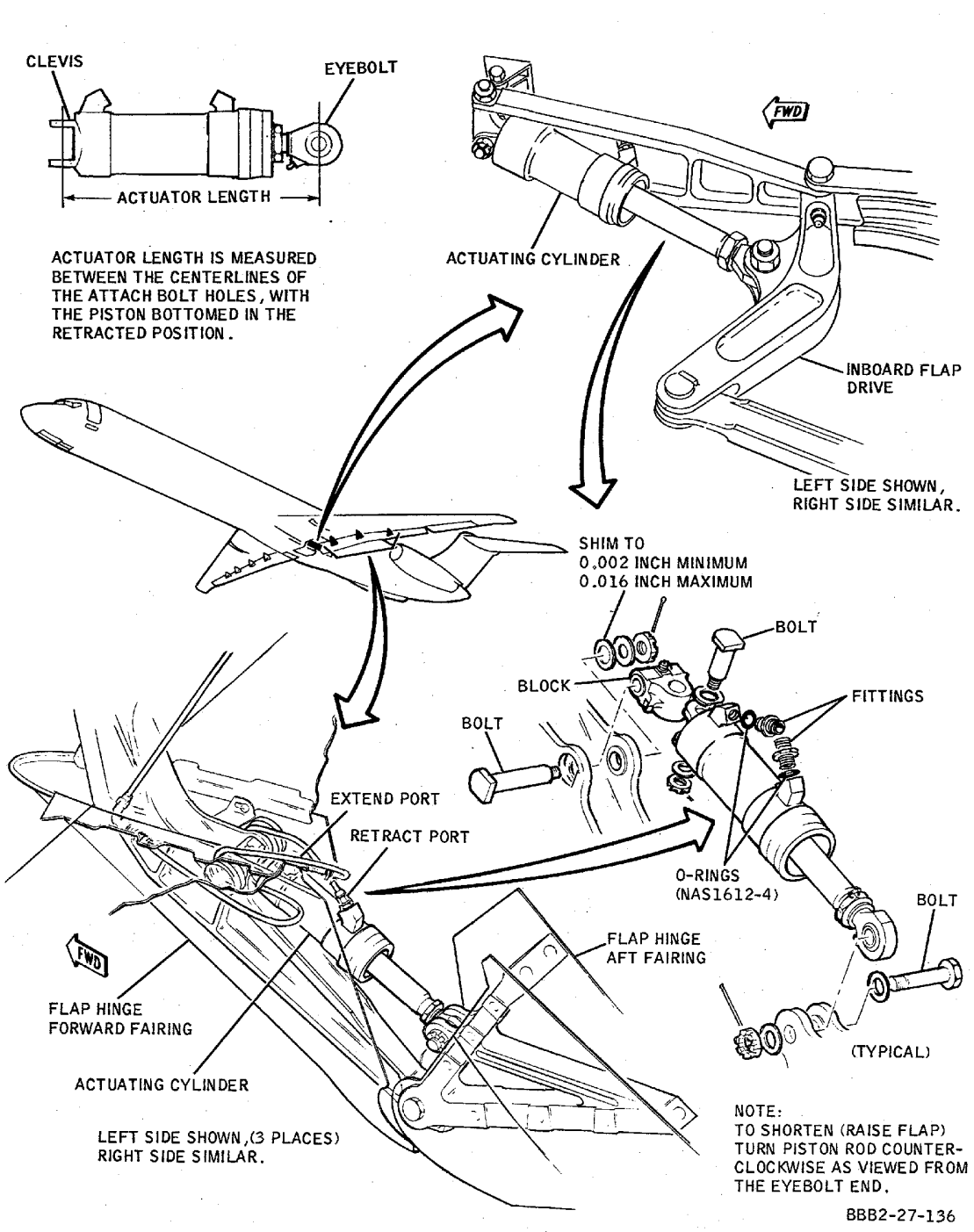
(12) Shut off hydraulic pressure source.

(13) Install fairing, as required, on forward and aft hinge brackets.

(14) Pressurize left and right hydraulic systems.

(15) Place flap/slat handle in UP/RET detent.

(16) Shut off hydraulic pressure source.



Flap Actuating Cylinder -- Removal/Installation
Figure 201/27-52-02-990-801

FLAPS TWO-SPEED VALVE - MAINTENANCE PRACTICES

1. General

A. There are two flap two-speed valves located in the left main gear wheelwell on the center panel. Both valves are attached by common mounting bolts to the flap follow-up control bracket on the inboard bulkhead. Removal and installation procedures are identical for both valves.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
Door safety locks Douglas Aircraft Co. 3936851-1 or -501 as applicable. GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201	

3. Removal/Installation Flap Two-Speed Valves

A. Remove Valve

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in by-pass position (lever extended), open main gear inboard doors and install door safety locks.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(4) Depressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Disconnect hydraulic lines from fittings in valve ports. Plug open lines.

(6) Disconnect pushrod from valve actuating arm.

(7) Remove lockring and remove pin from valve actuating arm and valve rod ends. (Figure 201)

(8) Remove valve from support. Install mounting bolts to support remaining valve temporarily.

(9) If required, install hydraulic fittings in valve ports. Discard O-rings. Plug or cap open valve ports.

B. Install Valve

(1) Make certain door safety locks are installed on main gear doors.

(2) Make certain left and right hydraulic systems are depressurized.

(3) If required, install hydraulic fittings in valve ports, using new O-rings.

(4) Remove attach bolts from valve temporarily supported on bracket.

(5) Install attach bolts to secure both valves to support.

(6) Connect hydraulic lines to fittings in valve ports.

(7) Install pin in actuating arm and through valve rod ends. Install lockring in groove of actuating arm, making certain lockring is seated properly.

(8) Connect pushrod to actuating arm. Safety nut with cotter pin.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(9) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(10) Retract and extend flaps several times. Place flap/slat handle in UP/RET detent.

(11) Visually check valve fittings and line connections for leakage.

(12) Using Dial-A-Flap (DAF) thumbwheel position DAF dial wheel until 20° position is opposite rig mark on pedestal. Move flap/slat handle until handle snaps into movable detent at 20°.

(13) Check that aft ends of flap two-speed valve slides are flush with aft ends of sleeves by +0.005 inch, (+0.127 mm). If necessary, adjust valve as follows:

(a) Disconnect pushrod from actuating arm.

(b) Position actuating arm so that slides are flush with sleeves by 0.005 inch, (0.13 mm).

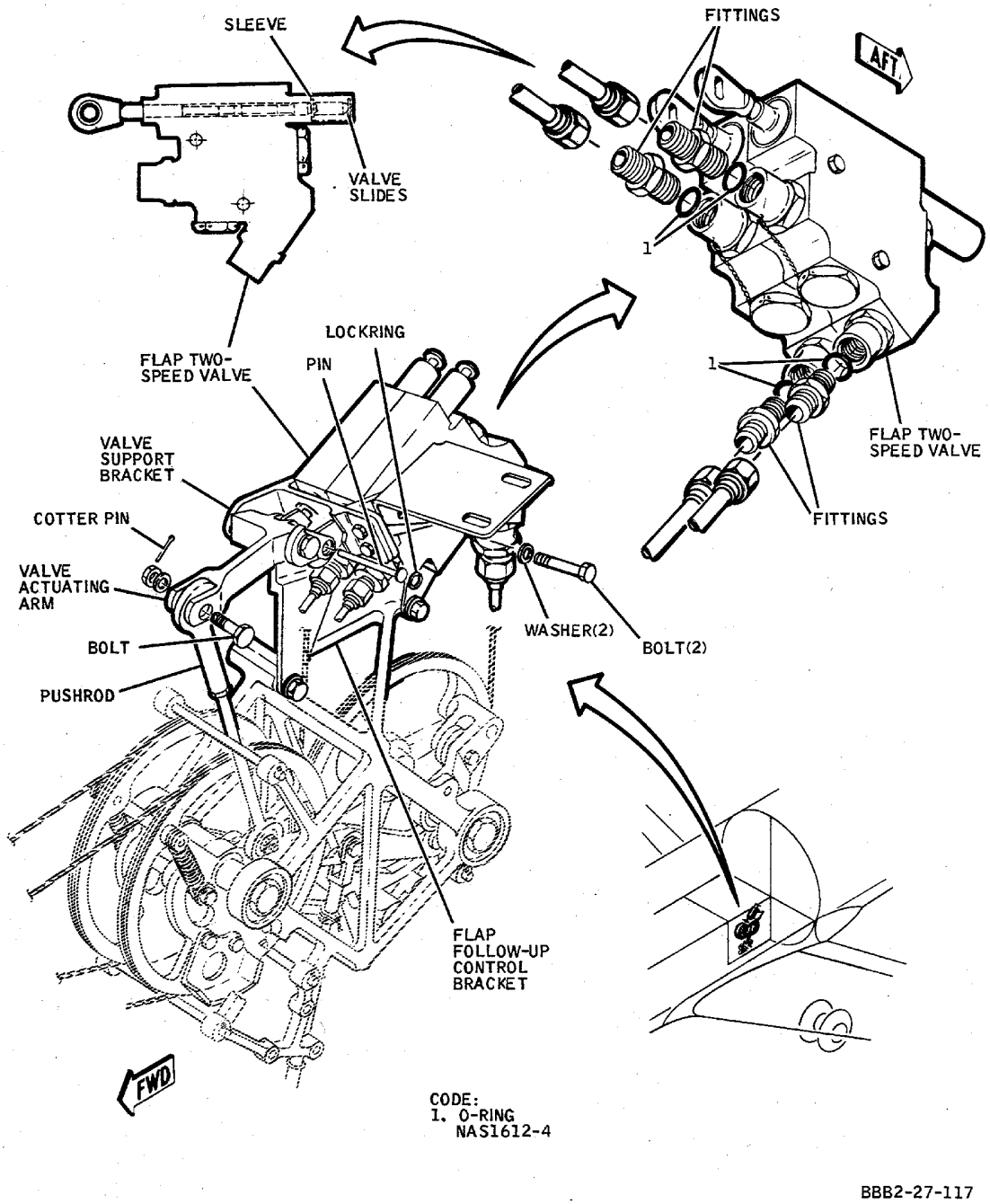
(c) Adjust pushrod until attach bolt can be freely installed. Safety nut with cotter pin, tighten pushrod jamnut.

(14) Place flap/slat handle in UP/RET detent, then to 11°/T.O. EXT detent. Check that left and right flap track 11° indicators are aligned with scribe line within ±0.25 inch, (±6.351 mm). If necessary, adjust pushrod turnbuckle to meet 11° (±0.25), (±6.35 mm) inch requirement.

(15) Place flap/slat handle in UP/RET detent.

(16) Shut off hydraulic pressure source.

(17) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Flap Two-Speed Valve -- Removal/Installation
Figure 201/27-52-03-990-801

FLAP CONTROL MODULE - MAINTENANCE PRACTICES

1. General

A. The flap control module is mounted on the pedestal in the flight compartment.

B. Access to control pushrod, electrical connector and attach bolts is through the access panel on right side of pedestal.

C. Two bolts, located at forward end of module, are accessible by removing, if installed, the following items:

- SELCAL panel. (SUBJECT 23-21-02 Page 201)
- AUDIO control panel. (AUDIO CONTROL PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 23-50-02/201)
- ATC control panel. (ATC/TCAS CONTROL PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 34-54-02/201 Config 1)
- ADF control panel. (ADF CONTROL PANEL, SUBJECT 34-53-04, Page 201)
- ALTITUDE PRESELECT-ALERT panel. (PAGEBLOCK 22-01-06/201)
- Blank panel.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

Name and Number	Manufacturer
Rod, brass (18 inches (457.2 mm) long x 1/2 inch (12.7 mm) dia.)	Local
Wood block (10 inches (254. mm) long x 4 1/4 inches (107.95 mm) high x 2 inches (50.8 mm) thick)	Local
Pads, abrasive nylon (DPM 3427)	Local
Sand paper, 320-grit (DPM 923)	Local
Wiper, cleaning (DMS 1820)	Dickies Standard Industrial Towel and Uniform Supply 17711 Crabb Lane Hunington Beach, CA 92647
Isopropyl alcohol (DPM 530)	Local
Adhesive, Lefkoweld 109 (DPM 6047)	E.V. Roberts (distributor) Carson, CA #Lord 721, Parts A/B
Activator, LM52 (for Lefkoweld 109 adhesive, DPM 6047)	E.V. Roberts (distributor) Carson, CA #Lord 721, Parts A/B

3. **Removal/Installation Flap Control Module**

A. Remove Module

(1) Make certain left and right hydraulic systems are depressurized. (PAGEBLOCK 29-00-00/201)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open this circuit breaker and install safety tag:

UPPER EPC, LIGHTS - LEFT AC BUS

Row	Col	Number	Name
K	19	B1-309	INTEGRAL LIGHTS PEDESTAL

(3) Remove access panel from right side of pedestal.

(4) Remove upper cover plate from pedestal.

(5) Remove applicable control panel, located immediately forward of module. (Paragraph 1.C.)

(6) Disconnect electrical connector P1-1195, at forward lower end of pedestal.

(7) Remove attaching screws from dial lighting module and remove lighting module from pedestal.

(8) Disconnect and tag electrical leads from flap/slat light-plate receptacle on module frame.

(9) Remove flap/slat lightplate attach screws and carefully remove lightplate from module.

NOTE: Lightplate plugs into a receptacle located approximately top center of module. A small cross on lightplate identifies plug location.

(10) Disconnect pushrod from drum below module.

(11) Remove nut and washer(s) from shaft.

NOTE: Record number of washers removed.

(12) Remove attach bolts from upper forward and aft end of module.

(13) Remove attach bolts from forward end of pedestal.

(14) Remove attach bolts from base of module.

WARNING: FLAP CONTROL MODULE SUPPORTS RIGHT END OF SHAFT RUNNING WIDTH OF PEDESTAL. SHAFT MUST BE SUPPORTED DURING AND AFTER REMOVAL OF FLAP CONTROL MODULE TO PREVENT POSSIBLE DAMAGE TO PEDESTAL AND/OR COMPONENTS.

CAUTION: DO NOT APPLY EXCESSIVE UPWARD FORCE TO SHAFT. USE JUST ENOUGH FORCE TO ALLOW FLAP CONTROL MODULE TO SEPARATE FROM PEDESTAL MOUNTING FRAME, MAINTAIN UPWARD FORCE UNTIL WOOD BLOCK IS PLACED BETWEEN SHAFT AND PEDESTAL MOUNTING FRAME.

(15) Insert brass rod into bore of pedestal shaft, manually apply sufficient upward force on rod to just allow flap control module to separate from mounting frame. While maintaining upward force, slide module onto rod and install wood block between shaft and mounting frame.

(16) Remove brass rod from bore of shaft and remove module from rod.

B. Install Module

(1) Make certain left and right hydraulic systems are depressurized.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Make sure that this circuit breaker is open and has safety tag:

UPPER EPC, LIGHTS - LEFT AC BUS

Row	Col	Number	Name
K	19	B1-309	INTEGRAL LIGHTS PEDESTAL

CAUTION: DO NOT APPLY EXCESSIVE UPWARD FORCE TO SHAFT. USE JUST ENOUGH FORCE TO ALLOW WOOD BLOCK TO BE REMOVED AND FOR MODULE TO BE POSITIONED ON SHAFT AND PEDESTAL MOUNTING FRAME.

(3) Position module on brass rod and insert brass rod in bore of pedestal shaft. Manually apply sufficient upward force on rod to allow wood block to be removed. While maintaining upward force, slide module on shaft and mounting frame. Remove brass rod.

(4) Install attach bolts at base of module.

(5) Install attach bolts at forward end of module.

(6) Install attach bolts at upper forward and aft end of module.

(7) Install washer(s), as recorded during removal, and nut on shaft. Tighten nut until washer(s) rotation just stops (washer no longer spins freely), back off nut one cotter pin slot and install cotter pin.

(8) Position pushrod in module and install upper attach bolt. Safety nut with cotter pin.

NOTE: Adjustment of pushrod may be required to obtain agreement between actual flap position and flap/slat handle setting.

(9) Connect lower end of pushrod to drum. Safety nut with cotter pin.

(10) Connect electrical leads to lightplate receptacle on module frame.

(11) Carefully plug flap/slat lightplate into receptacle and install lightplate attach screws.

(12) Connect electrical leads to lightplate receptacle on module frame.

(13) Place flap/slat handle in 11° detent.

(14) Rotate module thumbwheel (A) until flap/slat handle out-board trigger snaps into movable detent (D).

CAUTION: WHEN FLAP/SLAT HANDLE IS ENGAGED IN MOVABLE DETENT, THE THUMBWHEEL IS LOCKED IN BOTH DIRECTIONS UNTIL FLAP/SLAT HANDLE OUTBOARD TRIGGER IS LIFTED OUT OF DETENT. DO NOT ATTEMPT TO ROTATE (FORCE) THUMBWHEEL IN THIS CONDITION DAMAGE TO PARTS MAY RESULT.

(15) Check that 11(±1/2) degree, on dial wheel (E) is aligned with rig mark (G). If necessary, adjust dial wheel (E) as follows:

(a) Disengage dial wheel (E) from gear (H) by sliding dial wheel (E) outboard and compressing spring (F).

(b) With spring (F) compressed, rotate dial wheel (E) until 11 position is aligned with rig mark (G).

(c) Carefully engage dial wheel (E) with gear (H).

(16) Connect electrical connector P1-1195 at forward lower end of pedestal.

(17) Position dial lighting module and install attach screws.

(18) Install upper cover plate on pedestal.

(19) Install access cover on right side of pedestal.

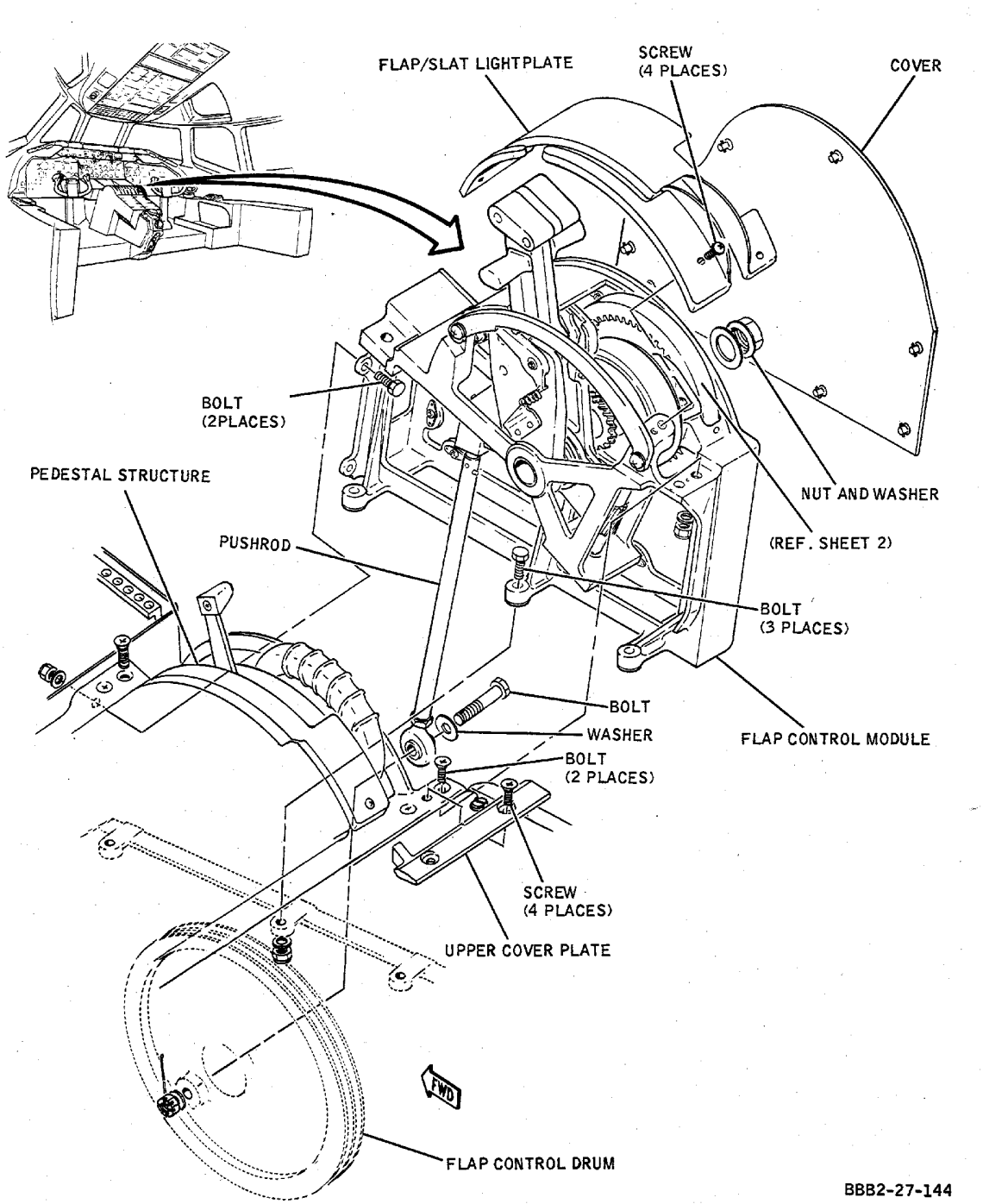
(20) Install applicable control panel. (Paragraph 1.C.)

(21) Place flap/slat handle in UP/RET detent.

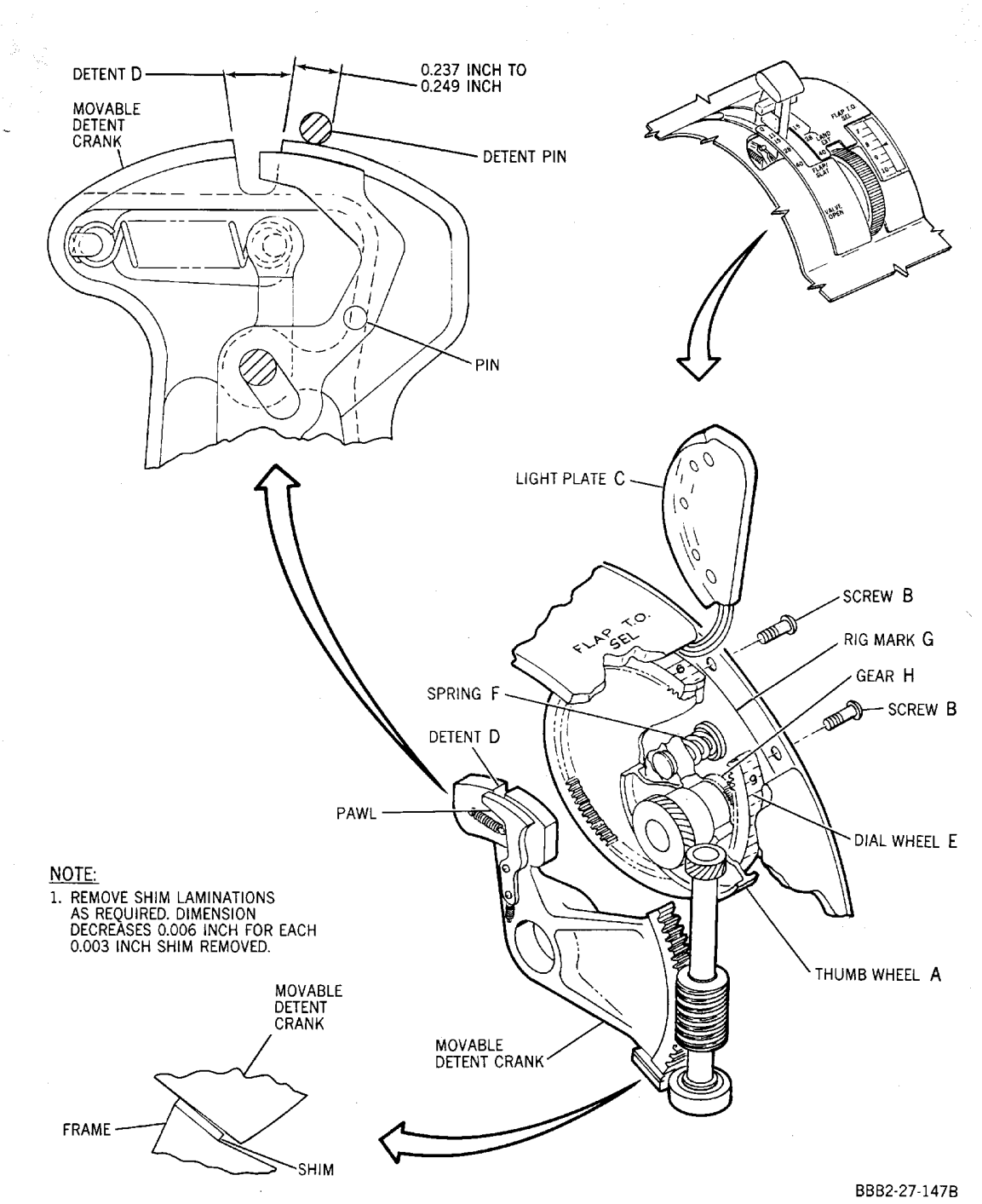
(22) Remove the safety tag and close this circuit breaker:

UPPER EPC, LIGHTS - LEFT AC BUS

Row	Col	Number	Name
K	19	B1-309	INTEGRAL LIGHTS PEDESTAL



Flap Control Module -- Removal/Installation
Figure 201/27-52-05-990-801 (Sheet 1 of 2)



Flap Control Module -- Removal/Installation
Figure 201/27-52-05-990-801 (Sheet 2 of 2)

4. **Adjustment/Test Flap Control Module**

A. Test Flap Control Module

(1) Make certain flap/slat handle is in UP/RET position.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

WARNING: WHEN AIRCRAFT IS ON GROUND, WITH WEIGHT ON WHEELS, BITE TEST OF AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME FLAP/SLAT HANDLE IS MOVED FROM RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

(3) Place flap/slat handle in following positions and observe flap position indicator for corresponding display.

NOTE: Allow flaps to stabilize at each position.

Table 202

Handle Position	Flap Position Indicator
UP/RET	0° (±2.0°)
0/T.O. EXT	0° (±2.0°)
11/T.O. EXT	11° (±1.0°)
15/T.O. EXT	15° (±1.0°)
28/LAND EXT	28° (±2.0°)
40/LAND EXT	40° (±2.0°)

(4) Place flap/slat handle in UP/RET position.

(5) Using Dial-A-Flap thumbwheel, set dial indicator at 11°.

(6) Place flap/slat handle in 11°/T.O. EXT detent. Check that flap track 11° indicator is within ±0.128 inch (±3.251 mm) of scribe line on structure.

(7) Lift flap/slat handle outboard trigger out of movable detent and rotate thumbwheel until movable detent contacts stop, release trigger. Dial wheel should indicate approximately 24°.

(8) Move flap/slat handle until movable detent is engaged. Check that flap position indicator indicates approximately 24°. Check that scribe line on structure is 2.11 (+1.03, -0.00) inches (53.594 (+26.162 -0.000) mm) away from 28° indicator on flap track towards 15° indicator.

NOTE: If 24°/2.11 (+1.03, - 0.00) inches (53.594 (+26.162, -0.000) mm) values are not obtained, adjust thickness of laminated shim as described in Paragraph 4.B..

(9) Place flap/slat handle in UP/RET position.

(10) Perform adjustment/test flap/slat handle position switches. (FLAP/SLAT HANDLE POSITION SWITCHES AND TRANSMITTER - MAINTENANCE PRACTICES, PAGEBLOCK 27-80-07/201, 3.A.) If limits and operation are not met, adjust again per Paragraph 3.A. and Paragraph 3.B.. (PAGEBLOCK 27-80-07/201)

(11) Perform takeoff system warning test. (PAGEBLOCK 27-00-00/201)

(12) Perform Alternate Auto Pressurization Ground Checkout (CABIN PRESSURE CONTROL, SUBJECT 21-32-00, Page 201) , and check that handwheel moves freely.

(13) Shut off hydraulic pressure source.

B. Adjustment Thumbwheel Laminated Shim/Stop

(1) Perform Paragraph 3.A.(1) through Paragraph 3.A.(9).

(2) Perform Paragraph 3.B.(13) through Paragraph 3.B.(15)

(3) Move flap handle to 28 degree detent position.

CAUTION: DO NOT FORCE THUMBWHEEL.

(4) Rotate thumbwheel until movable detent crank contacts laminated shim/stop.

(5) Measure dimension from aft face of detent D to aft face of detent pin. Dimension shall be 0.237 to 0.249 inch (6.020 to 6.235 mm). (Figure 201).

(a) If dimension is greater than 0.249 inch (6.235 mm) peel laminations from shim/stop. Each decrease of 0.003 inch (0.076 mm) of shim equals 0.006 inch (0.152 mm) decrease of measured dimension.

(b) If dimension is less than 0.237 inch (6.020 mm), laminated shim/stop should be replaced as follows:

1) Remove the old shim from the frame assembly.

2) Clean any adhesive residue from frame assembly with abrasive nylon pads or 320-grit abrasive paper.

3) Clean the applicable faying surface of the frame assembly with clean wipers moistened with isopropyl alcohol.

4) Dry the clean areas with a clean, dry wiper before solvent evaporates.

a) Do not let the cleaner to dry on the faying surface of the frame assembly.

5) Mix 100 parts by weight of Lefkoweld 109 adhesive and 74 parts by weight of LM52 activator.

6) Apply a uniform layer of adhesive, approximately 0.005 in. (0.127 mm) to 0.010 in. (0.254 mm) thick, to each faying surface.

7) Immediately install the laminated shim on the frame with sufficient pressure to keep a 0.003 in. (0.076 mm) to 0.010 in. (0.254 mm) thickness of adhesive.

8) Remove unwanted adhesive with clean wipers moistened with isopropyl alcohol.

9) Let the adhesive dry for 24 hours.

(c) Repeat Paragraph 4.B.(3) through Paragraph 4.B.(5)

(6) Perform Paragraph 3.B.(16) through Paragraph 3.B.(22).

(7) Repeat Paragraph 4..

FLAP WARNING SWITCHES - MAINTENANCE PRACTICES

1. General

A. There are four warning switches in the flap system. A takeoff warning switch, located in the control pedestal. A spoiler/ flap extended switch, located on the flap control mechanism in the left main gear wheelwell. A land flap sensor and a 26° flap position switch, both located on the flap bus input drum to the elevator servo force limiter mechanism.

WJE 412, 414

B. The removal and installation of each switch is contained in separate paragraphs as follows:

- Removal/Installation Spoiler Flap Switch
- Removal/Installation Land Flap Sensor
- Removal Torque Limiter Switch (26° flap position switch)

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

C. The removal and installation of each switch is contained in separate paragraphs. The flap takeoff warning switch and the 26° flap position switch is adjustable. The spoiler flap extend switch and land flap sensor are not adjustable and actuation is dependent on flap position.

D. A BITE test of the Proximity Sensor System can be performed at any time to determine if Proximity Switch Electronics Unit (PSEU) and Proximity Sensors are functioning properly. (PAGEBLOCK 32-60-00/101)

WJE 412, 414

WJE E. A BITE test of the Proximity Sensor System can be performed at any time to determine if Proximity Switch Electronics Unit (PSEU) and Proximity Sensors are functioning properly. (PAGEBLOCK 32-60-00/101)

WJE NOTE: The ELDEC Corporation has designated Go-Gauges, P/N KHT8-750-01 (Rectangular) and P/N 8–756–01 (Round), for troubleshooting systems, which incorporate the ELDEC proximity sensors. The Go-gauge tool is extremely useful in detecting sensors with shifted actuation gaps, a common problem of ferrite core sensors which is undetectable by most BITE checks.

WJE NOTE: The use of a Go-gauge may reduce the unconfirmed removals of the Proximity Switch Electronics Unit (PSEU). A target inside the Go-Gauge is positioned at the minimum sensor actuation point when the Go-Gauge face is placed against the sensor face. This will induce a cockpit or PSEU readout indication of target-near. If a damaged sensor has the actual activation point shifted below minimum actuation point, the sensor will remain in the target-far state. Go-Gauges should be used to test suspect sensors prior to replacing the PSEU.

WJE NOTE: Non-Target metal structure (Side Metal) closet than about 0.25 inches to the sensor face may alter the effective actuation gap (aluminum side metal will cause an apparent gap reduction, and steel side metal causes an apparent gap increase). If sensor fails the Target Near test using a Go-Gauge, in an installation with suspected side metal effect, the mechanic should remove the sensor from it's mounting bracket and retest it (wiring intact) prior to sensor replacement. If the sensor functions correctly in this manner, it is a good sensor.

WJE NOTE: The following are general instructions for testing a proximity sensor using the ELDEC GO-Gauges.

WJE • Select the appropriate GO-Gauge for shape of proximity sensor being checked.

WJE • Hold the gauge squarely against the sensor face making sure the alignment is correct.

WJE **WJE 412, 414 (Continued)**

WJE

WJE • An assistant should perform the PSEU “Target Test” function (See PSEU front panel placard), or observe the cockpit indication, to verify that the system indicates that the target is near.

WJE • Replace any sensor, which fails step 3 IAW the appropriate MM procedure.

WJE **WJE ALL**

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
MLG door safety locks 3936851-1, or -501 as applicable. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co.

3. Removal/Installation Flap Warning Switches

A. Remove Flap Takeoff Warning Switch

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	38	B1-832	CAWS, SSRS-1, LDG GR, T/O, A/P, SP BK, CAB ALT

(2) Remove access panel from right side of control pedestal.

(3) Disconnect electrical connector (P1-1196) at forward base of pedestal.

(4) Remove switch attaching screws and remove switch.

B. Install Flap Takeoff Warning Switch

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that this circuit breaker is open and has safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	38	B1-832	CAWS, SSRS-1, LDG GR, T/O, A/P, SP BK, CAB ALT

(2) Position switch on mount and install attach screws.

(3) Connect electrical connector (P1-1196) at forward base of pedestal.

(4) Using flap thumbwheel on TAKEOFF CONDTN panel, left side of control pedestal, set FLAP dial to read 8°.

(5) Using dial-a-flap (DAF) thumbwheel, right side of pedestal, set FLAP T.O. SEL dial to read 8°.

(6) Place flap/slat handle in flap moveable detent at 8°.

(7) Check that switch actuating roller is centered on cam surface actuating flat. If necessary adjust pushrod (A) to center actuating roller. (Figure 201)

(8) Loosen cam mounting screws and move cam as far away from switch as it will go. Adjust cam back toward switch until switch just actuates (audible click), move cam one additional serration towards switch and tighten cam screws.

(9) Check that switch actuating roller is centered on cam actuating flat. If necessary readjust pushrod (A).

(10) Using flap thumbwheel on TAKEOFF CONDTN panel verify that switch actuates (audible click) at FLAP dial readings of 5 1/2(±1/2) and 10 1/2(±1/2). If switch actuation is not within tolerances adjust switch as follows:

(a) Adjust rod (A), as required, to shift the switch actuating points.

(b) Cam may be raised or lowered to affect the width of the switch actuating band, to achieve the above tolerances. If cam was lowered, check for 0.030 inch (0.762mm) minimum clearance between switch crank and cam.

(11) Test flap takeoff warning switch. (PAGEBLOCK 27-00-00/201)

(12) Install access panel on right side of pedestal.

(13) Place flap/slat handle in UP/RET detent.

(14) Remove the safety tag and close this circuit breaker:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	38	B1-832	CAWS, SSRS-1, LDG GR, T/O, A/P, SP BK, CAB ALT

C. Remove Spoiler Flap Extend Switch

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	34	B1-677	SPOILER FLAP EXTENDED ADVISORY

(3) Disconnect electrical connector from switch.

(4) Remove switch from flap followup drum bracket.

D. Install Spoiler Flap Extend Switch

(1) Make certain door safety locks are installed on main gear inboard doors.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Make sure that this circuit breaker is open and has safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	34	B1-677	SPOILER FLAP EXTENDED ADVISORY

(3) Install switch on flap followup drum bracket.

(4) Connect electrical connector to switch.

(5) Remove the safety tag and close this circuit breaker:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	34	B1-677	SPOILER FLAP EXTENDED ADVISORY

(6) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

(7) Test spoiler flap extend switch. (PAGEBLOCK 27-00-00/201)

E. Remove Land Flap Sensor

WJE 412, 414

NOTE: Land flap sensor is located adjacent to flap bus input drum to elevator servo force limiter in the forward cargo compartment right side. (Figure 201

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

NOTE: Land flap sensor is located adjacent to flap bus input drum to elevator servo force limiter in the forward cargo compartment right side.

WJE ALL

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

(2) Remove sensor from mount.

(3) Disconnect sensor wires at splice and remove sensor.

F. Install Land Flap Sensor

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

(2) Connect sensor wires at splice. (Ref. Wiring Diagram Manual 20-10-03, Page 201).

(3) Install sensor on mount.

(4) Check that the gap between sensor face and target on cable drum is 0.025 to 0.100 inch (0.635 to 2.54 mm).

(5) Remove the safety tags and close these circuit breakers:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

(6) Test land flap sensor. (PAGEBLOCK 32-60-00/201)

NOTE: If land flap sensor does not actuate per above reference, check flap bus to elevator servo force limiter cable system. (PAGEBLOCK 27-30-00/501)

G. Remove Torque Limiter Switch (26° Flap Position Switch)

NOTE: The 26 degree (0.454 rad) flap position switch is mounted directly below the land flap sensor adjacent to the flap bus input drum to the elevator servo force limiter in the forward cargo compartment right side. (Figure 201)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	24	B10-353	AUTOPILOT-1

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893			
E	12	B10-354	AUTOPILOT-2
WJE ALL			
G	13	B10-346	YAW DAMPER-2

(2) Disconnect and tag electrical leads from switch.

(3) Remove switch from mount.

H. Install Torque Limiter Switch (26° Flap Position Switch)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	24	B10-353	AUTOPILOT-1

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893			
E	12	B10-354	AUTOPILOT-2
WJE ALL			
G	13	B10-346	YAW DAMPER-2

(2) Install switch on mount.

(3) Connect electrical leads to switch as noted in Paragraph 3.G.(2).

(4) Remove the safety tags and close these circuit breakers:

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	24	B10-353	AUTOPILOT-1

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893			
E	12	B10-354	AUTOPILOT-2
WJE ALL			
G	13	B10-346	YAW DAMPER-2

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(5) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(6) Place flap/slat handle in 28°/LAND EXT detent.

(7) Using flap/slat handle, in a flaps UP direction, position flaps until scribe line, on structure, is 1.020(±0.250) inches (26° (±1/2°) flap position) from 28° flap position indicator on leading inboard flap track.

NOTE: Leading flap is the flap which has rotated farthest up from the 28°/LAND EXT detent position. Either flap may be the leading flap. Example: Left flap track 28° indicator is 1.020(±0.250) inches (25.908(±6.35) mm) from scribe line. Right flap track 28° indicator is 1.000(±0.250) inches (25.400(±6.35) mm) from scribe line. The left flap is the leading flap and right flap is trailing flap.

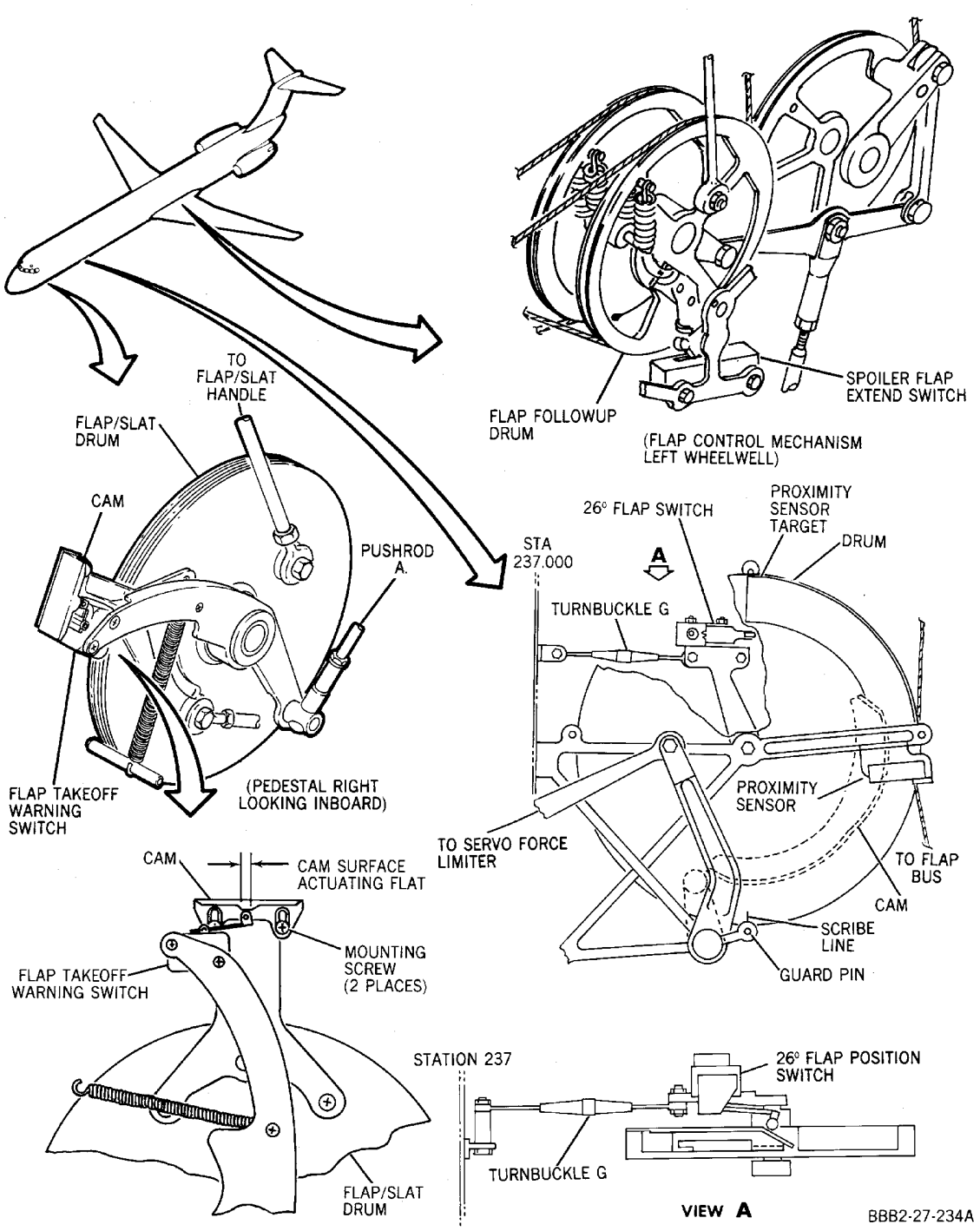
(8) Check that 26° flap switch actuates (audible click) when flaps are positioned as in . If necessary, adjust turnbuckle (G) until 26° flap switch just actuates (audible click).

(9) Safety turnbuckle (G) with clip.

(10) Place flap/slat handle in UP/RET detent.

(11) Shut off hydraulic pressure source.

(12) Check 26° flap position switch. (PAGEBLOCK 22-10-01/101) (DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201)



Flap Warning Switches -- Removal/Installation
Figure 201/27-53-01-990-801

FLAP POSITION INDICATING TRANSMITTER - MAINTENANCE PRACTICES

1. General

A. The left and right flap position indicating transmitters are mounted on the inboard forward hinge bracket of the left and right outboard flaps. Removal and installation procedures are identical for the left and right transmitter.

B. Access to the transmitters is through access panels located on the trailing edge and lower surface of wing, and/or by removal of the hinge fairing.

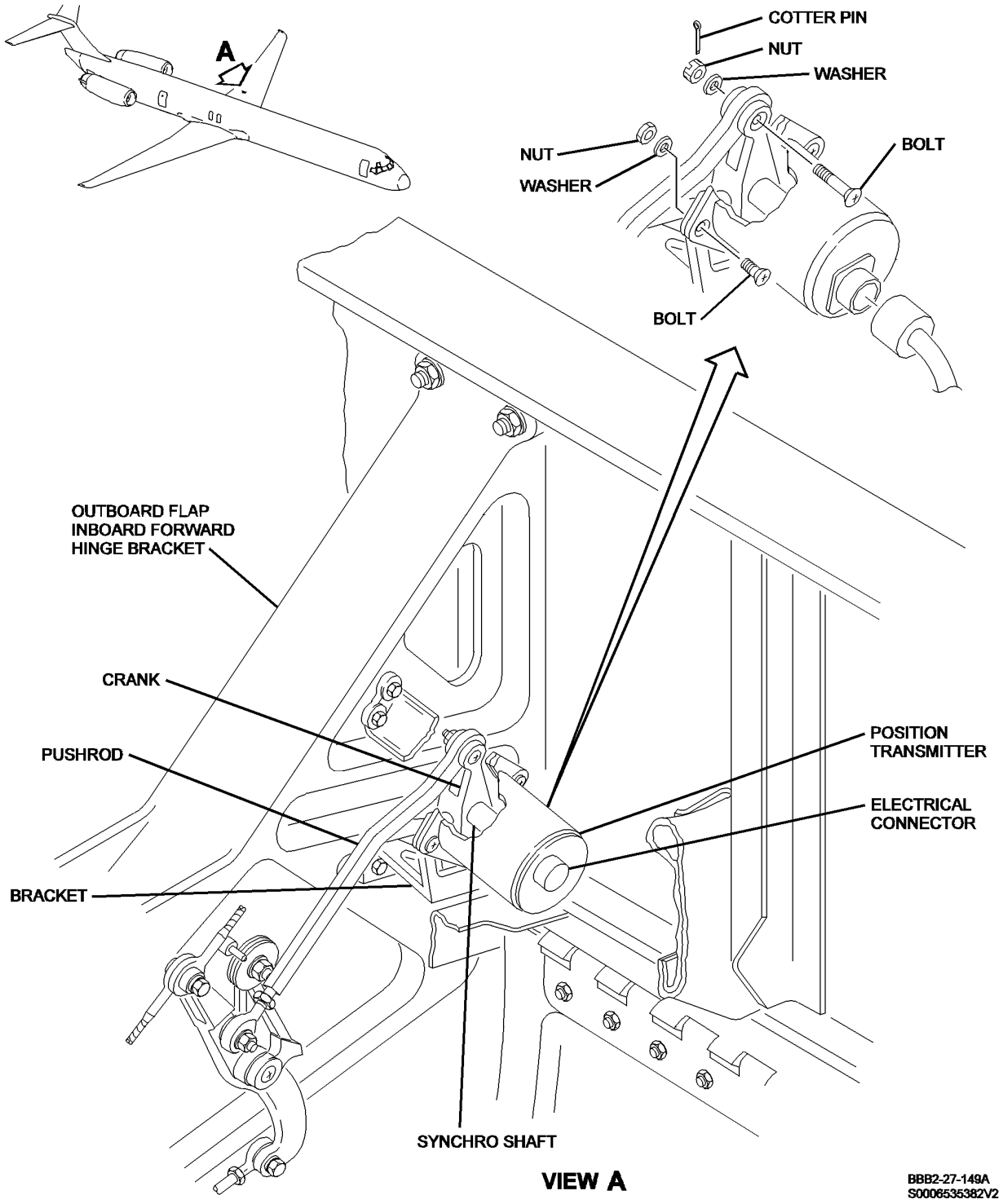
2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

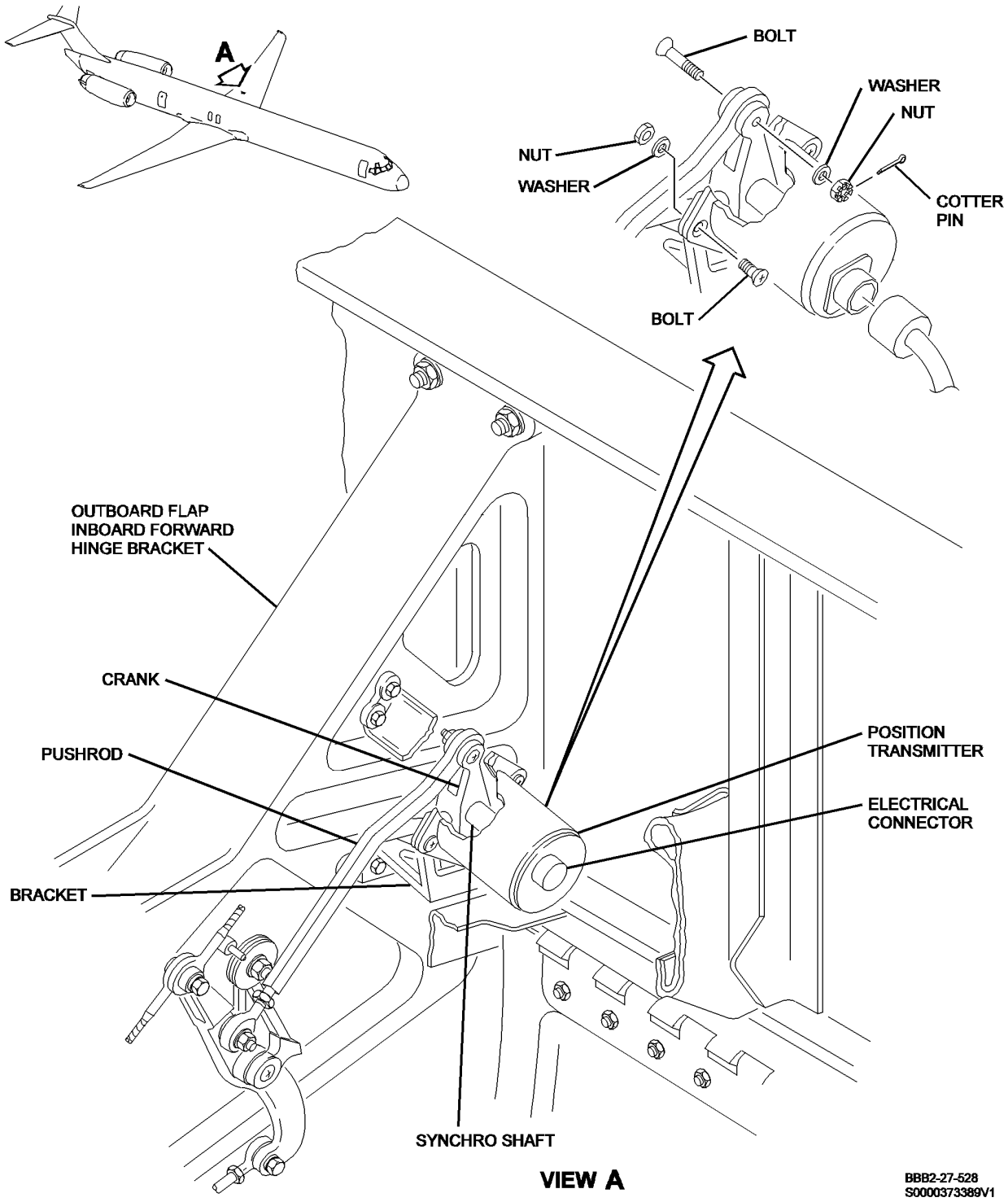
Table 201

Name and Number	Manufacturer
Protractor	
Lockwire, NASM20995N32, DPM 684*[1]	Not specified
Tape, Type 2 Red DMS 2186 P/N AR 386 or 600T-Series	Not specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.



Flap Position Indicating Transmitter -- Removal/Installation
Figure 201/27-54-01-990-801 (Sheet 1 of 2)



Flap Position Indicating Transmitter -- Removal/Installation
Figure 201/27-54-01-990-801 (Sheet 2 of 2)

EFFECTIVITY
WJE 401-408, 410-412, 414, 415, 417-419, 421, 423, 861, 863-866, 869, 871-873, 875-881, 883, 886, 887, 892, 893

3. **Removal/Installation Flap Position Indicating Transmitter**

A. Remove Transmitter

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	23	B1-589	CAPTAIN'S STALL WARNING
Z	23	B1-590	FIRST OFFICER'S STALL WARNING

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	35	B1-26	STALL WARNING AND AUTO SLAT-2

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
A	11	B1-89	LEFT FLAP POSITION
A	13	B1-838	STALL WARNING ALPHA FLAP-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	12	B10-339	DIGITAL FLIGHT GUIDANCE SYSTEM ALPHA-1
C	13	B10-337	DIGITAL FLIGHT GUIDANCE SYSTEM FLAP POSITION-1

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	2	B1-90	RIGHT FLAP POSITION
A	9	B1-837	STALL WARNING ALPHA FLAP-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	3	B10-340	DIGITAL FLIGHT GUIDANCE SYSTEM ALPHA-2
C	4	B10-338	DIGITAL FLIGHT GUIDANCE SYSTEM FLAP POSITION-2

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

(4) Shut off hydraulic pressure source.

(5) Disconnect electrical connector from transmitter.

(6) Disconnect pushrod from synchro crank.

(7) Remove crank from transmitter shaft.

(8) Remove transmitter from bracket.

B. Install Transmitter

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	23	B1-589	CAPTAIN'S STALL WARNING
Z	23	B1-590	FIRST OFFICER'S STALL WARNING

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	35	B1-26	STALL WARNING AND AUTO SLAT-2

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
A	11	B1-89	LEFT FLAP POSITION
A	13	B1-838	STALL WARNING ALPHA FLAP-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	12	B10-339	DIGITAL FLIGHT GUIDANCE SYSTEM ALPHA-1
C	13	B10-337	DIGITAL FLIGHT GUIDANCE SYSTEM FLAP POSITION-1

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	2	B1-90	RIGHT FLAP POSITION
A	9	B1-837	STALL WARNING ALPHA FLAP-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	3	B10-340	DIGITAL FLIGHT GUIDANCE SYSTEM ALPHA-2

(Continued)

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	4	B10-338	DIGITAL FLIGHT GUIDANCE SYSTEM FLAP POSITION-2

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Make certain left and right hydraulic systems are depressurized. (PAGEBLOCK 29-00-00/201)

WJE ALL PRE MD80-27-365

(3) Make certain the electrical connector boot is not damaged. Replace the boot if it is damaged. (RESILIENT POTTING OF ELECTRICAL CONNECTORS, SWPM 20-31-20)

WJE ALL POST MD80-27-365

(4) Wrap connector with DMS 2186, Type 2 red tape, part number AR 386 or 600T-Series. (SHIELDING - MAINTENANCE PRACTICES, SWPM 20-10-02)

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(5) Install transmitter on mounting bracket. Connect electrical connector to transmitter. Safety connector with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

WJE ALL

(6) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	23	B1-589	CAPTAIN'S STALL WARNING
Z	23	B1-590	FIRST OFFICER'S STALL WARNING

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	35	B1-26	STALL WARNING AND AUTO SLAT-2

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
A	11	B1-89	LEFT FLAP POSITION
A	13	B1-838	STALL WARNING ALPHA FLAP-1

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	12	B10-339	DIGITAL FLIGHT GUIDANCE SYSTEM ALPHA-1

(Continued)

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
C	13	B10-337	DIGITAL FLIGHT GUIDANCE SYSTEM FLAP POSITION-1

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	2	B1-90	RIGHT FLAP POSITION
A	9	B1-837	STALL WARNING ALPHA FLAP-2

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
C	3	B10-340	DIGITAL FLIGHT GUIDANCE SYSTEM ALPHA-2
C	4	B10-338	DIGITAL FLIGHT GUIDANCE SYSTEM FLAP POSITION-2

(7) Rotate transmitter shaft until flap position indicator pointers are approximately aligned and agree with status/test panel flap position readings. Install crank on shaft.

WJE 409, 416, 420, 422, 424-427, 429, 862, 868, 874, 884, 891

(8) Connect pushrod to crank. Install bolt with bolt head facing inboard. Install nut and safety nut with cotter pin.

NOTE: Countersink is located on the inside of the crank.

WJE 401-408, 410-412, 414, 415, 417-419, 421, 423, 861, 863-866, 869, 871-873, 875-881, 883, 886, 887, 892, 893

(9) Connect pushrod to crank. Install bolt with bolt head facing outboard. Install nut and safety nut with cotter pin.

NOTE: Countersink is located on the outside of the crank.

WJE ALL

(10) Adjust transmitter. (Paragraph 4.)

4. Adjustment/Test Flap Position Indicating Transmitter

A. Adjust Transmitter

NOTE: Flap control system (PAGEBLOCK 27-50-00/501) must be properly adjusted before making the following adjustments.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

WARNING: WHEN AIRCRAFT IS ON GROUND, WITH WEIGHT ON WHEELS, BITE TEST OF AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME FLAP/SLAT HANDLE IS MOVED FROM RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

(2) Place flap/slat handle in 11°/T.O. EXT detent.

(3) Using protractor, or flap position markings on lead flap track for determining flap angles, reference readout to 11° for 11° flap.

(4) Flap position markings on lead flap track indicator may be used for determining flap angles. Track indicator at 11° flap shall be 11° (± 0.128) inches (± .25°).

NOTE: The lead flap is flap which has rotated farthest down from UP position.

NOTE: Flap angles are measured perpendicular to hinge line.

(5) Place flap/slat handle in 40°/LAND EXT detent.

(6) Loosen bolt clamping crank to flap position transmitter shaft.

(7) Place flap/slat handle in UP/RET detent, after flaps stabilize, place flap/slat handle in 11°/T.O. EXT detent.

(8) Measure actual angle of each flap within ± 0.25°(± 0.128 inch) of flap track travel, measured along bottom flange of inboard flap track.

(9) With flap/slat handle in 11°/T.O. EXT detent, rotate flap position transmitter shaft until zero reference marks on transmitter shaft and case are in line.

(10) Rotate transmitter shaft aft (reference mark on shaft moving aft) until flap position indicator in flight compartment, reads 11.0°(±0.25°).

(11) Tighten bolt clamping crank to flap position transmitter shaft. Make certain that flap position indicator indicates 11.0°(±0.25°).

(12) Place flap/slat handle in UP/RET detent.

(13) Shut off hydraulic pressure source.

B. Test Transmitter

(1) Make certain flap/slat handle is in UP/RET position.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

WARNING: WHEN AIRCRAFT IS ON GROUND, WITH WEIGHT ON WHEELS, BITE TEST OF AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME FLAP/SLAT HANDLE IS MOVED FROM RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

(3) Place flap/slat handle and Dial A Flap (DAF) dial in following positions and observe flap position indicator for corresponding display.

NOTE: Allow flaps to stabilize at each position.

Table 202

Handle Position	Flap Position Indicator
UP/RET	0° (±2.0°)
0/T.O. EXT	0° (±2.0°)
11/T.O. EXT	11° (±1.0°)
15/T.O. EXT	15° (±1.0°)
28/LAND EXT	28° (±2.0°)
40/LAND EXT	40° (±2.0°)

(a) Place flap/slat control handle in 28° fixed detent.

(b) Without using excessive force, move flap/slat control handle back and forth against forward and aft edges of 28° fixed detent and verify that 26° flap switch remains actuated. If switch does not remain actuated, readjust. (FLAP WARNING SWITCHES - MAINTENANCE PRACTICES, PAGEBLOCK 27-53-01/201)

(c) Without using excessive force against stop, move DAF thumbwheel toward 24° flap position until it reaches mechanical stop. Place flap/slat control handle in DAF detent. FLAP WARNING SWITCHES - MAINTENANCE PRACTICES, PAGEBLOCK 27-53-01/201

Table 203

Dial A Flap (DAF) Position	
24°/T.O. EXT	24° (±1.0°)

(d) Without using excessive force, move flap/slat control handle back and forth against forward and aft edges of DAF detent and verify that 26° flap switch does not actuate. If switch does actuate, readjust. (FLAP WARNING SWITCHES - MAINTENANCE PRACTICES, PAGEBLOCK 27-53-01/201)

(4) Place flap/slat handle in UP/RET position.

(5) Shut off hydraulic pressure source.

(6) Perform test of Stall Warning System. (PAGEBLOCK 34-19-00/201)

SPOILER - DESCRIPTION AND OPERATION

1. General

A. Spoilers are provided on the upper surface of each wing to perform the following functions:

(1) Assist the ailerons in lateral control.

(2) Reduce speed during flight.

(3) Supplement the flaps in increasing drag to spoil lift and increase braking efficiency during the landing roll.

B. The spoiler system consists of the spoiler panels, lateral control mixers, spoiler actuators, control valves, speedbrake control lever, control box, automatic actuator, spoiler switch and phase interlock relay box.

C. The spoiler mechanical system controls the movement of the spoiler panels to supplement the ailerons in lateral control of the airplane, or to act as a speedbrake. When used as an aid to lateral control, the system extends the spoiler panels on one wing to a maximum of approximately 60 degrees from the faired position, while maintaining the panels on the opposite wing in retracted position. When used as a speedbrake, the system extends the panels on both wings simultaneously, up to a maximum of approximately 35 degrees from faired position. If both functions are used at the same time, the panel movement induced for lateral control is added to the panel movement induced for speedbrake function up to a total of 60 degrees.

D. The spoiler automatic system is an electrically controlled, hydraulically actuated system, used to reduce lift and increase drag for more effective braking during the landing roll or rejected takeoff roll. With the speedbrake lever set in the armed position the spoilers will automatically extend when the main landing gear wheels spin up on landing, or the lever may be operated manually to extend the spoilers. With the speedbrake lever armed during takeoff the spoilers will automatically extend when both thrust levers are raised to reverse thrust position. In each case all spoilers on each wing are fully extended simultaneously.

E. On later aircraft, an in-flight spoiler lockout mechanism is installed to prevent manual movement of the speed brake lever in flight when the flaps are extended eight degrees or greater. The auto spoiler actuator provides the primary unlocking input and automatic speed brake lever deployment upon main wheel spin-up at touchdown. Compression of the nose landing gear (NLG) strut provides a secondary mechanical unlocking input. A weight-on-wheels (WOW) unlocking input has been incorporated into the MD-80 in-flight spoiler lockout system to provide manual ground spoiler deployment capability at touchdown in the event the main landing gear (MLG) wheel spin-up unlocking and automatic deployment feature does not function.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

F. The spoiler system consists of the spoiler panels, lateral control mixers, spoiler actuators, control valves, speedbrake control lever, control box, automatic actuator, autospoiler switching unit, speedbrake lever arming switches, spoiler switch, and reverse thrust switches.

WJE 873, 874, 886, 887, 892, 893

G. The spoiler automatic system is an electrically controlled, hydraulically actuated system, used to reduce lift and increase drag for more effective braking during the landing roll. With the speedbrake lever set in the armed position the spoilers will automatically extend when the main landing gear wheels spin up on landing, or the lever may be operated manually to extend the spoilers.

WJE ALL

2. Spoiler Panels

A. There are four flight and two ground spoiler panels, three located on the upper surface of each wing forward of the flaps.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(1) Each flight panel is hinged to the wing rear spar at three points. The center hinge on each panel is the drive hinge, connected to the actuator by mechanical linkage. On aircraft without Service Bulletin 27-337, the drive hinge incorporates an overcenter link, torsion bar, reaction lever, and cam which locks the panel against the wing trailing edge ribs when the panel is in the retracted position.

WJE 873, 874, 886, 887, 892, 893

(2) Each flight panel is hinged to the wing rear spar at three points. The center hinge on each panel is the drive hinge, connected to the actuator by mechanical linkage. On aircraft without Service Bulletin 27-337, the drive hinge incorporates an overcenter link, torsion bar, reaction lever, and cam which locks the spoiler panel against the wing trailing edge when the panel is retracted.

WJE ALL

(3) Each flight panel is hinged to the wing rear at three points. The center hinge on each panel is the drive hinge and is connected to the actuator by mechanical linkage. Only on aircraft with Service Bulletin 27-337 (PAGEBLOCK 27-61-07/201), the drive hinge incorporates only the modified actuator. Hydraulic porting within the actuator locks the spoiler panels against the wing trailing edge when spoiler is retracted.

(4) The inboard spoiler panel is used only in the ground spoiler mode and is locked during all other phases of flight by hydraulic power and by a mechanical overcenter link.

3. Lateral Control Mixers

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

A. There are two lateral control mixers, one located in each main gear wheelwell. The mixers allow the spoiler system to be operated by the speedbrake control lever, by the aileron control wheels, or by both simultaneously. The mixer brackets also serve as common attachment points for cable pulleys and drums of the spoiler system, aileron control system, aileron trim control system, and the flap follow-up system. (Figure 1)

WJE 873, 874, 886, 887, 892, 893

B. There are two lateral control mixers, one located in each main gear wheelwell. The mixers allow the flight spoiler system to be operated by the speedbrake control lever, by the aileron control wheels, or by both simultaneously. The mixer brackets also serve as common attachment points for cable pulleys and drums of the spoiler system, aileron control system, aileron trim control system, and the flap follow-up system. (Figure 1)

WJE ALL

4. Spoiler Actuators

A. The spoiler actuators are mechanically controlled hydraulic components that extend or retract the spoiler panels. Each actuator is a combination control valve and actuating cylinder.

B. Hydraulic pressure, from the left hydraulic system to the inboard flight spoiler actuators is supplied through a pressure reducer valve and a pressure switch. Pressure to the outboard actuators is supplied from the right hydraulic system through a similar reducer valve and pressure switch. The pressure switches are connected electrically to low-pressure warning lights on the annunciator panel in the flight compartment.

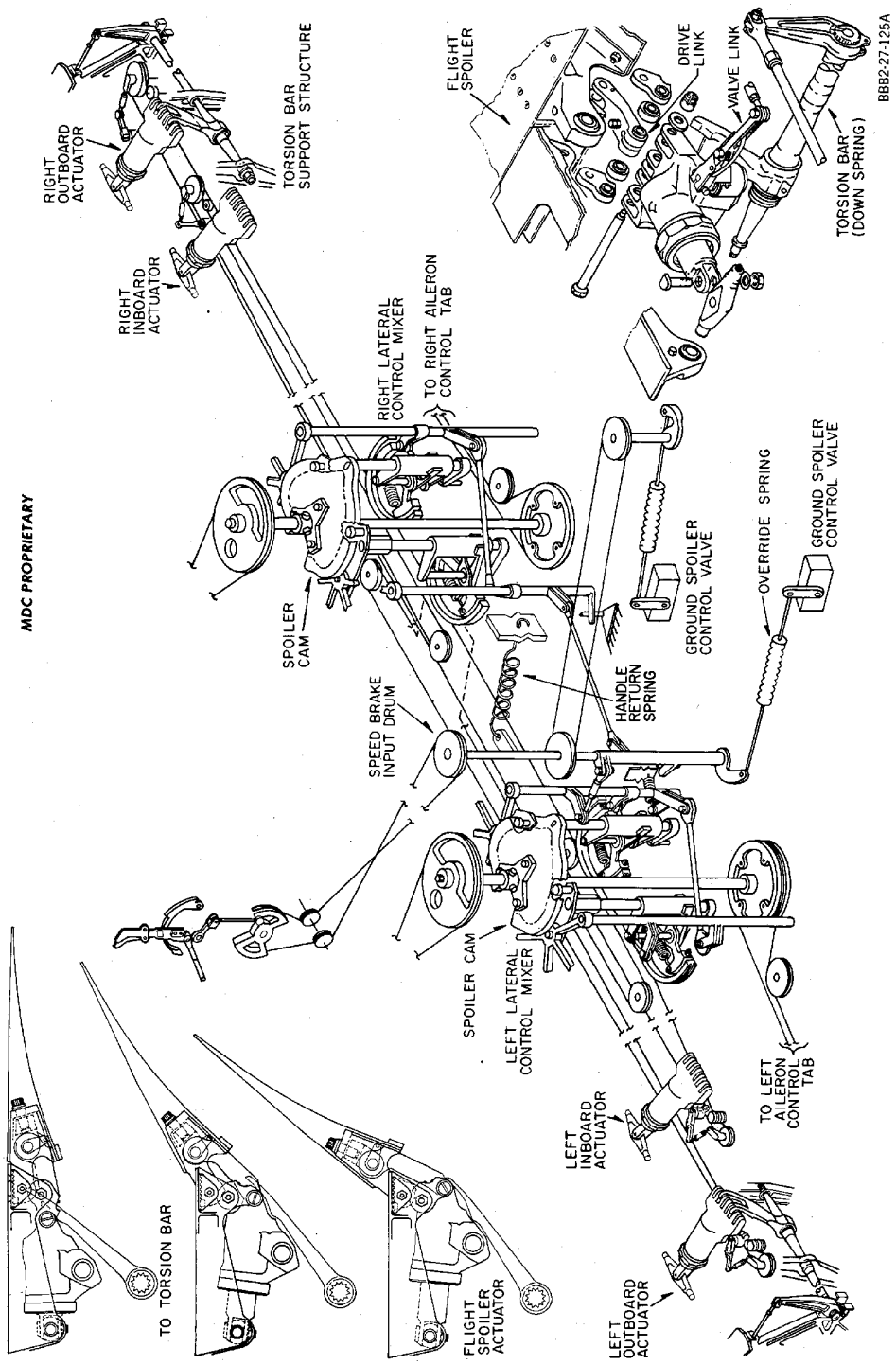
WJE 873, 874, 886, 887, 892, 893

C. The hydraulic pressure to the ground spoiler tandem actuator is supplied from the ground spoiler control valves which are powered by both the left and right hydraulic systems.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

D. The hydraulic pressure to the ground spoiler tandem actuator is supplied from the ground spoiler control valves which are powered by both the left and right hydraulic systems. Actuators will extend and retract the ground spoiler panels with only one valve and/or one hydraulic systems functioning.

WJE ALL



Spoiler Lateral Control
Figure 1/27-60-00-990-801

5. Spoiler Valves

A. There are two pressure reducer valves, one in each main gear wheelwell. The valves reduce hydraulic system pressure from 3000 psi to the 1500 psi (20700. to 10350. kPa) required to operate the flight actuators. The valve in the left wheelwell reduces pressure from the left hydraulic system for the inboard flight actuators. Pressure from the right hydraulic system to the outboard actuators is reduced by the valve in the right wheelwell.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

B. The ground spoiler control valves, one in each main gear wheelwell, is a dual signal input (electrical and mechanical) system. The mechanical input is received from the speedbrake control lever on the cockpit pedestal and the electrical signal from two strut switches, and for the autospoilers, the wheel spin-up sensors. Hydraulic pressure is received from both the left and right systems and then ported to the dual tandem actuators. One valve receiving power from either system will deploy the ground spoiler panels, if required.

WJE 873, 874, 886, 887, 892, 893

C. The ground spoiler control valve, one in each main gear wheelwell, is a dual signal input (electrical and mechanical) system. The mechanical input is received from the speedbrake control lever on the cockpit pedestal and the electrical signal from two strut switches and for the autospoilers, the wheel spin-up sensor. Hydraulic power is received from both the left and right systems and then ported to the dual tandem actuators.

WJE ALL

6. Speedbrake Control Lever

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

A. The speedbrake control lever is installed on the main lever support shaft of the control pedestal. The lever is used to control operation of the spoilers when used as a speedbrake. The lever has an armed position which is used to set the spoiler system for automatic operation in either the landing mode or takeoff mode.

WJE 873, 874, 886, 887, 892, 893

B. The speedbrake control lever is installed on the main lever support shaft of the control pedestal. The lever is used to control operation of the spoilers when used as a speedbrake. The lever may also be set in an armed position so the lever is operated automatically when the spoiler system is actuated, by the landing wheel speed transducers.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

C. To arm the speedbrake lever for takeoff mode the lever must be first squeezed to retract the spoiler actuator than lifted to the armed position. In the land mode the lever may be lifted to the armed position without squeezing the lever.

WJE ALL

D. A crank at the base of the lever is connected by one of two pushrods to a sector in the control pedestal. This sector is connected by cable system to the speedbrake input drum in the left lateral control mixer. A ratchet type latch allows the lever to be locked in the selected position. The second pushrod is connected to a crank on the automatic actuator motor shaft. A lockout cam is installed at upper end of pushrod to position speedbrake control lever in proper operating mode.

7. Spoiler Control Box

A. The spoiler control box is an electronic device, which supplies power to the automatic actuator on receipt of signals from the landing wheel speed transducers. The control box is located in the aft radio rack equipment panel in the electrical/ electronics compartment.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

B. The control box consists of a housing with a removable cover, two circuit boards, and three electrical connectors. The control box is connected electrically to the landing wheel speed transducers and autospoiler switching unit. The third connector allows test equipment to be connected to the control box.

WJE 873, 874, 886, 887, 892, 893

C. The control box consists of a housing with a removable cover, two circuit boards, and three electrical connectors. The control box is connected electrically to the landing wheel speed transducers, phase interlock relay, and ground control relays. The third connector allows test equipment to be connected to the control box.

WJE ALL

8. Spoiler Automatic Actuator

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

A. The spoiler automatic actuator, located in the control pedestal, actuates the spoiler system on receipt of signals from the autospoiler switching unit.

WJE 873, 874, 886, 887, 892, 893

B. The spoiler automatic actuator, located in the control pedestal, actuates the spoiler system on receipt of signals from the spoiler control box or the ground control relays.

WJE ALL

C. The actuator consists of an ac reversible drive motor, gears, an extend limit switch, a retract limit switch, and a two-piece housing. The motor is connected through the gears to an output shaft. A crank on the shaft is connected by pushrod to the speedbrake control lever. When the motor reaches the end of travel, and the limit switches are actuated, power is removed from the motor.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

D. The motor is connected electrically to the autospoiler switching unit. The extend limit switch is connected electrically to the autospoiler switching unit, spoiler control box, and the autothrottle interlock relay. The retract limit switch is connected electrically to the autospoiler switching unit.

WJE ALL

E. The motor is connected electrically through contacts of the phase interlock relay box to the spoiler control box, ground control relays, and landing gear up-limit relays. The extend limit switch is connected electrically to the control box, ground control relays, landing gear up-limit relay No. 1, and spoiler control indication relay. The retract limit switch is connected electrically to the 115-volt ac power supply and landing gear up-limit relay No. 1.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

9. Autospoiler Switching Unit

A. The autospoiler switching unit is an electronic device, which provides the electronic circuitry required to process the input signals and apply the electrical output signal to the autospoiler actuator which drives the speedbrake lever to the full aft position when armed. The unit is located on the aft right radio rack in the electrical/electronics compartment.

B. Autospoiler switching unit input signals come from the spoiler control box, speedbrake lever arm switches, reverse thrust switches, nose gear oleo switches, and main landing gear up switches.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891 (Continued)

C. Autospoiler switching unit contains a monitor circuit which upon detection of a failure, removes all power from the autospoiler actuator and activates the AUTOSPOILER DO NOT USE annunciator on the overhead annunciator panel in the flight compartment. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel will be activated. The monitor circuit can be self tested by means of the test switch on the front of the autospoiler switching unit.

WJE ALL

10. Speedbrake Lever Arming Switches

A. There are three switches, located on the pedestal forward of the speedbrake lever, which are actauted by squeezing the speedbrake lever. Two switches, the left and right, provide a signal to the autospoiler switching unit to retract the automatic spoiler actuator so that the speedbrake lever may be lifted to the armed position for rejected takeoff mode. The third switch is connected electrically to the autobraking control box for takeoff warning circuitry.

11. Spoiler Switch

A. The spoiler switch, located in the control pedestal, is an on-off rotary type switch. Power is supplied to the switch from a 28-volt dc bus. Contacts in the switch are utilized in the takeoff warning circuit.

B. Switch operation is controlled by movement of the speedbrake control lever. A crank on the switch shaft is connected by pushrod to a sector in the control pedestal. Another pushrod connects the sector to the speedbrake control lever.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

12. Reverse Thrust Switches

A. The two reverse thrust switches are located in the control pedestal and are actuated by a cam on the throttle drum when the thrust levers are raised to reverse thrust position for a rejected takeoff.

B. Switch actuation provides a signal to the autospoiler switching unit to extend the automatic spoiler actuator when the speedbrake lever is armed in the takeoff mode.

WJE 873, 874, 886, 887, 892, 893

13. Phase Interlock Relay Box

A. The phase interlock relay box is a protective device, located in the control pedestal above the spoiler automatic actuator. The box contains two interlock relays which prevent power being applied to the actuator motor unless both phases are applied. The box also contains a 10 second time delay relay. If either or both electrical leads to the actuator motor are energized in excess of 10 seconds, system operation is locked out and the auto spoiler do not use light comes on. (On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel comes on.) This prevents the actuator from overheating in the event of a limit switch failure. To reset the system after lockout, the spoiler control 28 vdc circuit breaker must be opened and closed.

WJE ALL

14. Ground Spoiler Maintenance Advisory Light (GND SPOILER INOP)

A. With Service Bulletin 27-214 the ground spoiler maintenance advisory light (GND SPOILER INOP), located on the aft radio rack in the electrical/electronics compartment, provides an indication that one or both inboard ground only spoilers did not deploy when the speedbrake handle traveled to the full 60° ground spoiler position. The light is electrically connected to the spoiler switch, through the proximity switch electronic unit to the spoiler control indication. The light is mechanically latched on and must be pressed to reset the light to off.

B. If maintenance action has been performed that requires movement of the speedbrake handle to the full ground spoiler position without hydraulic power on the airplane the light will come on and latch on, even though there is no discrepancy in the ground spoiler system. The light will also latch on whenever the proximity switch electronic unit is self tested. Reset the light by pressing to off.

15. Operation

A. Lateral Control

(1) When the spoiler system is used as an aid to lateral control, the movement of the two outboard spoiler panels on each wing is controlled by the aileron control wheels in the flight compartment.

(2) When either control wheel is rotated, the aileron cable system rotates the aileron input drum and spoiler cam in each lateral control mixer. The rollers on the cam follower arms follow the channels on the cams and when the controlwheel is rotated approximately 5 degrees from the neutral position, the shape of the cams causes the cam follower arms to move. The cam follower arms pivot the spoiler sectors around the clevis link. Cable systems from the sectors cause the flight spoiler actuator control valves to extend the spoiler panels on the downgoing wing. The panels on the opposite wing are maintained in the retracted position. When the aileron control wheel is rotated with the spoiler panels extended in the speedbrake mode, the panels on the downgoing wing are extended further and the panels on the opposite wing are retracted. The spoiler sectors in the right lateral control mixer control the outboard actuator control valves. The inboard actuator control valves are controlled by the sectors in the left mixer.

(3) Spoiler panel float, due to loss of hydraulic pressure, is prevented by a cam attached to a torsion bar and positioned against rollers on the actuator aft hinge pin. The cam exerts a force against the hinge point so that the drive linkage from the actuator to the spoiler panel is locked in an overcenter position when the panel is retracted.

WJE 873, 874, 886, 887, 892, 893

(4) Flight spoiler panel float, due to loss of hydraulic pressure, is prevented by a cam attached to a torsion bar and positioned against rollers on the actuator aft hinge pin. The cam exerts a force against the hinge point so that the drive linkage from the actuator to the spoiler panel is locked in an overcenter position when the panel is retracted.

WJE ALL

B. Speedbrake Control

(1) When the spoiler system is used as a speedbrake, the movement of the spoiler panels is controlled by the speedbrake control lever on the control pedestal.

(2) When the speedbrake control lever is moved to the extend position, a latch holds the lever in position. The pushrod at the base of the lever moves a sector in the control pedestal and the cable system from the sector rotates the speedbrake input shaft on the left lateral control mixer. A crank on the lower end of the shaft moves pushrods and links to drive both spoiler sectors in each mixer. During speedbrake function, the spoiler sectors and clevis links pivot around the cam follower arms. Movement of the sectors cause the cable system to operate all four spoiler actuator control valves and both outboard spoiler panels on each wing extend simultaneously.

C. Ground Spoiler Control

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(1) The spoiler system can be set to operate automatically or can be operated manually. The system is mechanically armed for automatic operation by raising the speedbrake control lever to the armed position. In the takeoff mode the lever must first be squeezed before the lever can be raised to thearmed position. With the speedbrake lever armed for takeoff, the RTO arming switches are armed, both mode relays, in the spoiler switching unit, are in RTO position, the spoiler automatic actuator is retracted, both time delay relays are energized and electrically lock both mode relays in the RTO position and the spoiler control relays are de-energized. Raise both thrust reverser levers to reverse position, both reverse thrust switches are actuated, both spoiler control relays are energized, spoiler control box is energized, spoiler automatic actuator extends driving the speedbrake lever full aft and mechanically latches in ground spoiler position, all spoilers on each wing should be fully extended. Lower reverse thrust levers to forward idle position, the speedbrake lever should remain latched in ground spoiler position. Manually knockdown speedbrake lever and return lever to retract position. All spoilers should fully retract.

WJE 873, 874, 886, 887, 892, 893

(2) Operation of the spoiler system may be either automatic or manual. When the main gear is retracted, the right gear up-relay in the proximity switch control unit, completes a 115-volt ac circuit to energize the landing gear up-limit relays. When the up-limit relays are energized, a 115-volt ac circuit is completed through the retract limit switch in the automatic actuator and the landing gear up-limit relay contacts, reversing the phase of the actuator motor. As the motor reaches the limit of travel, the limit switch contacts inside the actuator are moved, and the actuator is set in the retract position.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(3) During flight with the landing gear retracted and the speedbrake lever in the unarmed retracted position, both ground control relays are de-energized to flight position, both main gear relays energized to up position, both mode relays electrically locked in land position, both spoiler control relays de-energized, both RTO arm switches not armed, spoiler control box not energized, spoiler automatic actuator retracted. Speedbrake lever can be raised to arm position or can be moved to speedbrake position (30 degrees of spoilers).

(4) With the landing gear extended and speedbrake lever in armed position, both main gear relays are de-energized to not up position, both RTO arm switches are in arm position, both spoiler control relays are energized, spoiler control box is energized, and both mode relays are electrically locked in land position. Upon touchdown, when the main landing gear wheels spin-up, sensors in the wheel speed transducers send signals to the two switching circuits in the spoiler control box, each circuit is triggered by the highest of two signals received from the sensors. When outboard wheels, both inboard wheels, or both wheels on one side spin at approximately 700 rpm the switching circuits are triggered completing the circuit to extend the spoiler automatic actuator which drives the speedbrake lever full aft and latches in ground spoiler position. All spoilers on each wing should be fully extended. If the spoiler automatic actuator did not extend on wheel spin-up, it will extend on nose strut compression (ground control relays in ground position).

WJE 873, 874, 886, 887, 892, 893

(5) When the main landing gear is extended, the right gear up-relay deengerizes the landing gear up-limit relay. This connects the 115-volt ac circuit through the relay contacts and the actuator extend limit switch to the spoiler control box. With the actuator in the retract position and the landing gear extended, the speedbrake control lever can be set in the armed position for automatic operation. No further action takes place until the switching circuits in the control box are triggered, or until the ground control relays are engerized.

WJE 873, 874, 886, 887, 892, 893 (Continued)

(6) The spoiler control box has two switching circuits, each triggered by the highest of two signals received from sensors in the landing wheel speed transducers. These sensors send signals to the control box when the main landing gear wheels spin on contact with the ground. When both outboard wheels, both inboard wheels, or both wheels on one side spin at approximately 700 rpm, the switching circuits are triggered, completing the 115-volt ac circuit to the automatic actuator motor.

(7) The actuator motor rotates the output shaft, causing the pushrod to drive the speedbrake control lever aft. The control lever moves pushrods and a sector, causing the crank on the spoiler switch to rotate the switch shaft, closing the switch contacts. When the actuator motor reaches the end of travel, the extend limit switch contacts are moved, breaking the 115-volt ac circuit to the motor.

(8) Movement of the speedbrake control lever to the aft position causes the spoiler system to extend the spoiler panels.

(9) If the spoiler control box does not receive correct signals from the wheel speed transducers, a 115-volt ac circuit to the automatic actuator motor is completed through contacts of the landing gear up-limit relays and phase interlock relay box, when the ground control relays are energized by compression of the nose gear strut.

(10) Manual operation of spoiler/speedbrake system on aircraft without autobrake may be accomplished by squeezing speedbrake lever grip, moving lever up and aft to detent for speedbrakes, then up again over detent full aft to extend ground spoilers.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(11) Manual operation of the spoiler/speedbrake system on aircraft with auto brake may be accomplished by squeezing speedbrake lever grip, pulling lever aft to detent for speedbrakes, then up over detent full aft to extend ground spoilers.

(12) The spoilers are retracted manually by moving the speedbrake control lever down and forward to the retract position causing the spoiler mechanical system to retract the spoilers.

WJE 873, 874, 886, 887, 892, 893

(13) The spoilers are retracted manually by moving the speedbrake control lever down and forward to the retract position causing the spoiler mechanical system to retract the spoiler panels.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(14) When the spoiler switch is in a position relative to 3 degrees or more of spoiler extension, a portion of the takeoff warning circuit is completed. If both throttles are advanced for takeoff in this condition, the remainder of the takeoff warning circuit is completed and a warning horn is sounded, indicating that the spoilers are not properly positioned.

WJE 873, 874, 892, 893

(15) When the spoiler switch is in a position relative to 3 degrees or more of spoiler extension, a portion of the take-off warning circuit is completed. On aircraft without SB 31-34, if both throttles are advanced for takeoff in this condition, the remainder of the takeoff warning circuit is completed and a warning horn is sounded, indicating that the spoilers are not properly positioned for takeoff.

WJE 886, 887

WJE WJE WJE WJE (16) When the spoiler switch is in a position relative to 3 degrees or more of spoiler extension, a portion of the take-off warning circuit is completed. If either throttle is advanced for takeoff in this condition, the remainder of the takeoff warning circuit is completed and a warning horn is sounded, indicating that the spoilers are not properly positioned for takeoff.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(17) If either the automatic spoiler system or the autobrake system is armed for rejected takeoff and the other is not armed, the takeoff warning horn will sound when both throttles are advanced.

WJE 873, 874, 892, 893

(18) On aircraft with SB 31-34, when the spoiler switch is in a position relative to 3 degrees or more of spoiler extension, a portion of the takeoff warning circuit is completed. If either throttle is advanced for takeoff in this condition, the remainder of the takeoff warning circuit is completed and a warning horn is sounded, indicating that the spoilers are not properly positioned for takeoff.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(19) The autospoiler system contains three separate monitors. The mode relay position monitor operates whenever the position of the two mode relays differs for more than three seconds, the spoiler control box monitor operates, with gear retracted, if either, or both, switching paths close for more than three seconds, indicating a malfunction simulating one or more main gear wheels spinning, or the ten second timer monitor operates whenever the automatic actuator is commanded to another position and the associated actuator limit switch does not go to command position. Any one monitor trip will deactivate the autospoiler system and illuminate the AUTOSPOILER DO NOT USE light in the overhead annunciator panel. (On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel will illuminate.) It is necessary to pull and reset the 115 vac and 28 vdc SPOILER CONTROL circuit breakers to reset the monitors and extinguish the AUTOSPOILER DO NOT USE light. (On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel will extinguish.)

WJE 873, 874, 886, 887, 892, 893

(20) If one of the ground control relays are energized, or if one of the control box switching circuits remain closed, an advisory light on the annunciator panel comes on, and landing gear up-limit relay No. 2 is actuated to prevent electrical power from being applied to the spoiler automatic actuator.

WJE ALL

(21) Spoilers are retracted automatically when go-around is initiated. As the throttles travel forward, a crank on the left throttle forces the speedbrake lever to drop down and spring tension drives the lever to the retract position causing the spoiler mechanical system to retract the spoilers.

D. Spoiler Lockout Mechanism

(1) On aircraft with spoiler lockout installed, the spoiler lockout system has incorporated into it, an unlocking input that activates at MLG touchdown. This is independent of MLG spin-up input and provides availability of manual speed brake lever movement at touchdown prior to lowering of the nose. On aircraft 2016 and subs with SCN 7934 performed, a weight on wheels (WOW) input is provided from the Proximity Switch Electronics Unit (PSEU) for unlocking of the spoiler lockout system. The PSEU provides a 28 VDC signal to an electric solenoid through necessary relays, power and circuit protection components required for its operation. The solenoid is located on the forward side of the cockpit control pedestal. Also, a mechanical four-bar linkage provides the interface to the same unlocking arm operated by the auto spoiler actuator wheel spin-up unlocking input. The arm is independent of each, however, and will react to either input, whichever comes first. Both wheel spin-up and WOW inputs are not required to achieve an unlocking input.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(a) With SCN 7934 incorporated, a mechanical in-flight spoiler lock-out mechanism will prevent manual movement of the speed brake lever in flight when the flaps are extended 8 degrees or greater.

1) The ground spoilers will extend symmetrically when the main gear wheels spin up at touch down or when the nose landing gear strut is compressed.

2) There is an unlocking mechanism in the pedestal with a weight-on-wheels input to allow manual deployment of spoilers when either main landing gear strut is compressed.

NOTE: With SCN 7953 incorporated, the spoiler lock-out mechanism is deactivated which will allow manual movement of the speed brake lever in flight position. Retains automatic deployment of the spoilers when the main gear wheels spin up at touch down or when the nose landing gear strut is compressed. This SCN deletes the effects of SCN 7934.

WJE ALL

(2) As the flaps are extended beyond eight degrees during approach for landing, the spoiler lockout mechanism engages the speed brake lever and prevents its manual deployment until an appropriate aircraft-on-ground input is received. At MLG touchdown, the solenoid receives an unlocking signal from the right MLG WOW sensor (via the PSEU) within the first two inches of MLG strut compression (the full 18 inch compression is not required). The solenoid is energized and disengages the lockout mechanism to allow manual movement of the speed brake lever. A latching relay is incorporated into the circuitry to maintain the WOW unlocking input in the event the aircraft bounces at touchdown. Compression of the NLG strut during landing rollout will activate a ground control relay, which in turn will remove the latching relay's path to ground and de-energize the solenoid. The NLG strut secondary mechanical unlocking input will already be engaged at this point, thus allowing the solenoid to be unpowered for the remainder of the aircraft's ground operations. This will maximize the life of the solenoid. When the aircraft rotates for takeoff on the subsequent flight, a time delay relay prevents the solenoid from energizing for the first ten seconds of flight. By then the aircraft will be airborne and the right MLG strut fully extended.

E. Spoiler Hydraulic System (Figure 2)

(1) The left and right hydraulic systems each contain a spoiler shutoff and system depressurization valve. (PAGEBLOCK 29-00-00/201) When those valves are in the on position, 3000 psi (20700 kPa) hydraulic pressure is directed to the pressure reducer valve in the corresponding flight spoiler hydraulic system.

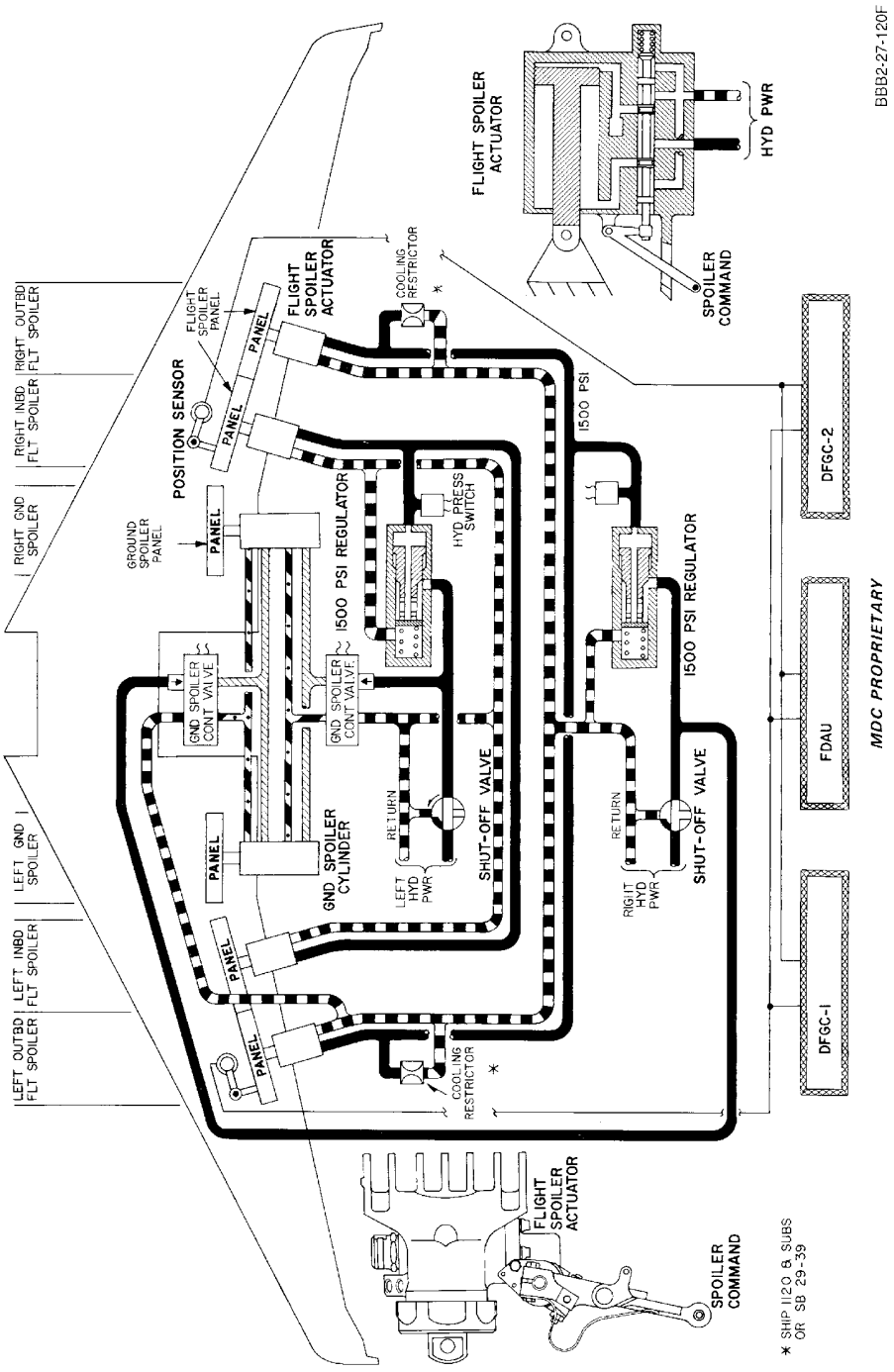
Hydraulic pressure for the inboard flight spoiler actuators is supplied by the left hydraulic system. The outboard actuators are supplied with hydraulic pressure from the right hydraulic system.

(2) When hydraulic pressure is supplied to the reducer valve inlet port, the slide is positioned in the lap assembly to direct pressure to the outlet port. When pressure at the outlet port reaches 1500(±50) psi, (10350(±345) kPa) the force exerted on the slide by the retainer and large spring is overcome, allowing the slide to move and direct excessive pressure to the system return line. When pressure drops below 1500(±50) psi, (10350(±345) kPa), the spring returns the slide to allow pressure buildup to the outlet port.

(3) The reduced pressure is directed from the reducer valve outlet port, through the pressure switch, to the actuator control valve. If pressure from the reducer valve drops below 900(±100) psi, (6210(±690) kPa), the pressure switch is actuated and causes the applicable low-pressure warning light to come on.

(4) The ground spoiler system is powered by both the left and right hydraulic systems. The hydraulic pressure is supplied to each ground control valve and then to each ground spoiler actuating cylinder which extends and retracts the ground spoiler panels.

(5) During ground maintenance, the spoiler hydraulic system may be isolated from the left and right hydraulic power systems by securing the spoiler shutoff and system depressurization valve levers in the off position.



Spoiler Hydraulic Actuation
Figure 2/27-60-00-990-803

SPOILER SYSTEM - TROUBLE SHOOTING

1. General

A. Trouble shooting the mechanical portion of the spoiler system is accomplished initially by determining if the trouble exists in the system during speedbrake function, during lateral control function, or is common to both functions.

B. If trouble shooting the system indicates cable tensions require adjustment, that segment of the system containing the cable must be completely adjusted.

C. If trouble shooting the automatic portion of the spoiler system indicates that components require adjustment or replacement, the system must be tested on completion of adjustment or installation of components.

D. When making electrical checks during trouble shooting procedures, refer to the Wiring Diagram Manual for check points or pin numbers of components to be checked.

2. Equipment and Materials

NOTE: Equivalent substitutes can be used in place of the following listed item.

Table 101

Name and Number	Manufacturer
Multimeter 2000A	Dana

Use these circuit breakers in the trouble shooting table below:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE ALL

3. Trouble Shooting

A. Use the following table to trouble shoot the spoiler system.

Table 102

Possible Causes		Isolation Procedure	Correction
A.	SPEEDBRAKE AND LATERAL CONTROL ARE NOT FUNCTIONING PROPERLY		
1.	Binding in spoiler cable system	(a) Check cable system for fairlead misalignment, seized pulley bearings, binding guard pins, and excessive pulloff at pulleys.	Replace parts as required. Adjust where necessary.
2.	Cable system out of adjustment	(a) Check cable system for improper adjustment on cables.	Adjust as necessary.
3.	Lateral control mixer defective	(a) Check left and right mixer components for misalignment, or binding.	Adjust or replace parts as required.
B.	SPEEDBRAKE IS NOT FUNCTIONING PROPERLY - LATERAL CONTROL IS NORMAL		
1.	Speedbrake cable system binding	(a) Check speedbrake cable system for fairlead misalignment, seized pulley bearings, binding guard pins, and excessive pulloff at pulleys.	Replace parts as required. Adjust where necessary.
2.	Mechanical link- age out of adjustment	(a) Check speedbrake control lever and throttle lever linkage for improper adjustment.	Adjust linkage as required.
3.	Lateral control mixer defective	(a) Check cams, followers, and bungees in left and right mixers for wear, binding, or misalignment.	Adjust or replace parts as required.
C.	LATERAL CONTROL IS NOT FUNCTIONING PROPERLY - SPEEDBRAKE IS NORMAL		
1.	Aileron cable system binding	(a) Check aileron cable system from control wheel to lateral control mixers for fairlead misalignment, seized pulley bearings, binding guard pins, and excessive pulloff at pulleys.	Adjust as required. (AILERON AND TAB - ADJUSTMENT/TEST, PAGEBLOCK 27-10-00/501) Replace worn bearings or parts as required.
2.	Aileron cable system out of adjustment	(a) Check aileron cable system for improper adjustment.	Adjust as required. AILERON AND TAB - ADJUSTMENT/TEST, PAGEBLOCK 27-10-00/501
D.	SPOILER PANELS RETRACT SLOWLY OR DO NOT RETURN TO FULL DOWN POSITION		
1.	Spoiler actuator control valve link binding at pivot point on control arm	(a) Check pivot point bushings for correct as necessary type and length.	Replace parts and remove any evidence of galling.
		(b) Check valve arm leaf spring for distortion and lack of tension. (Spring action should provide positive return to stopped position.)	Replace parts as required.
E.	SPOILER MOVEMENT SLOW OR NOT AT ALL		

Table 102 (Continued)

Possible Causes		Isolation Procedure	Correction
1.	Spoiler actuator or actuator linkage binding	(a) Check actuator and linkage for free movement.	Replace actuator or linkage as required.
F.	AFTER LATERAL CONTROL ROLLOUT CHECK SPOILER DEPLOYED LIGHT REMAINS ON		
1.	One or more flight spoiler panel is not fully retracted	(a) Check lateral control mixer components for binding, cable drums lock wire for clearance with cable guard pins.	Adjust or replace parts as required.
		(b) Check spoiler actuator linkage for freedom of movement or broken parts.	Repair or replace parts as required.
		(c) Cable system out of adjustment.	Adjust cable system.
WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891			
G.	SPEEDBRAKE CONTROL LEVER CANNOT BE ARMED FOR (RTO) REJECTED TAKEOFF		
WJE 873, 874, 886, 887, 892, 893			
G.	SPEEDBRAKE CONTROL LEVER CANNOT BE ARMED DURING FLIGHT		
WJE ALL			
1	Spoiler control circuit breakers open	(a) Check position of circuit breakers.	If open, close circuit breaker. If circuit is known to be faulty, leave breaker open and proceed to step (c).
		(b) Check for correct voltage between output pin and ground.	If voltage is not correct, replace circuit breaker.
		(c) Open spoiler control circuit breakers, and check wiring for open circuits, wire to wire, ground short circuits.	Repair wiring as required.
2.	Mechanical linkage out of adjustment	(a) Check linkage be- tween control lever and automatic actuator for improper adjustment.	Adjust linkage as required.

Table 102 (Continued)

Possible Causes		Isolation Procedure	Correction
WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891			
3.	Automatic actuator not in retract position	(a) Speedbrake lever arming switches not adjusted correctly.	Adjust arming switches. (SPEEDBRAKE CONTROL LEVER ARMING SWITCHES - MAINTENANCE PRACTICES, PAGEBLOCK 27-62-08/201)
		(b) Check left and right arming switch for proper operation.	If not correct, replace arming switches as a unit. (SPEEDBRAKE CONTROL LEVER ARMING SWITCHES - MAINTENANCE PRACTICES, PAGEBLOCK 27-62-08/201)
		(c) Autospoiler switching unit failed internally (AUTO SPOILER DO NOT USE light remains on (on aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel) after opening and closing spoiler control circuit breakers).	Replace auto spoiler unit.
		(d) Ground control relay circuit breaker open.	Close circuit breaker.
		(e) Actuator internal limit switches failed.	Replace actuator.
WJE 873, 874, 886, 887, 892, 893			
3.	Automatic actuator not in retract position	(a) Right main gear up and latched proximity sensor failed.	Test right proximity sensor as required Ref. (PROXIMITY SENSORS - MAINTENANCE PRACTICES, PAGEBLOCK 32-60-05/201)
NOTE: BITE test of proximity switch electronic unit will latch the GND SPOILER INOP light on. Push to reset light and verify light is off.			
		(b) Automatic spoiler actuator retract or extend limit switches failed.	Replace actuator.
		(c) Automatic spoiler actuator retract or extend limit switches failed.	Replace actuator.
WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891			
H.	SPEEDBRAKE CONTROL LEVER CANNOT BE ARMED DURING FLIGHT		

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891 (Continued)

Table 102 (Continued)

Possible Causes		Isolation Procedure	Correction
1.	Spoiler control breaker circuit breakers open	(a) Check position of circuit breakers.	If open, close circuit. If circuit is known to be faulty, leave breaker open and proceed to step (c).
		(b) Check for correct voltage between output pin and ground.	If voltage is not correct replace circuit breaker.
		(c) Open spoiler control circuit breakers, and check wiring for open circuits, wire to wire, ground short circuits.	Repair wiring as required.
2.	Mechanical linkage out of adjustment.	(a) Check linkage between control lever and automatic actuator for improper adjustment.	Adjust linkage as required.
3.	Automatic actuator not in retract position	(a) Left or right main gear up and latched proximity sensor failed.	Test left or right proximity sensor as required. (PROXIMITY SENSORS - MAINTENANCE PRACTICES, PAGEBLOCK 32-60-05/201)
NOTE: BITE test of proximity switch electronic unit will latch the GND SPOILER INOP light on. Push to reset light and verify light is off.			
		(b) Autospoiler switching failed internally.	Replace unit.
		(c) Automatic spoiler actuator retract or extend limit switches failed.	Replace actuator.
I.	SPOILER PANELS DO NOT EXTEND AUTOMATICALLY AFTER TOUCHDOWN AND LANDING ROLL		
WJE 873, 874, 886, 887, 892, 893			
H.	SPOILER PANELS DO NOT EXTEND AUTOMATICALLY AFTER TOUCHDOWN AND LANDING ROLL		
WJE ALL			
1.	No output from spoiler control box		Replace control box.
2.	Faulty wiring	(a) Open spoiler control circuit breakers and check wiring between landing wheel speed transducers and control box for open circuits, wire to wire, and wire to ground short circuits.	Repair wiring as required.
3.	Ground control relay circuit breaker open	(a) Check position of circuit breaker.	If open, close circuit breaker.
		(b) Check for correct voltage between output pin and ground.	If voltage is incorrect, replace breaker.
4.	Left or right main gear proximity sensor failed	(a) Test main gear proximity sensors. (PROXIMITY SENSORS - MAINTENANCE PRACTICES, PAGEBLOCK 32-60-05/201)	Replace proximity sensor or repair wiring as required.

Table 102 (Continued)

Possible Causes		Isolation Procedure	Correction
NOTE: BITE test of proximity switch electronic unit will latch the GND SPOILER INOP light on. Push to reset light and verify light is off.			
5.	Ground control relay inoperative	(a) Check voltage across relay contacts.	If voltage is incorrect, replace relay.
6.	Right or left nose gear oleo switch failed	(a) Right oleo switch check for correct voltage between output pin and ground.	If voltage is incorrect, replace switch.
		(b) Left oleo switch, check for correct voltage between interlock switch output pin and ground. If voltage is incorrect, check continuity of left oleo switch and interlock switch.	If continuity is not correct, replace faulty switch.
WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891			
7.	Autospoiler switching unit not operative (AUTO SPOILER DO NOT USE light is on)	(a) Open and close the spoiler control circuit breakers.	If AUTO SPOILER DO NOT USE light remains on, replace auto spoiler switching unit.
WJE 873, 874, 886, 887, 892, 893			
7.	Defective spoiler control indication relay	(a) Check voltage across relay controls.	If voltage is incorrect, replace relay.
8.	Defective landing gear up limit relay No. 1	(a) Check voltage across relay contacts.	If voltage incorrect, replace relay.
9.	Defective landing gear up limit relay No. 2	(a) Check voltage across relay contacts.	If voltage incorrect, replace relay.
10.	Defective phase interlock relay box	(a) Open spoiler control circuit breaker on upper EPC panel. Disconnect electrical connector P1-244 from phase inter lock relay box in forward end of control pedestal. Disconnect electrical harness from spoiler actuator, and connect P1-244 to actuator. Close spoiler control circuit breaker. If spoiler actuator extends, phase interlock relay box is defective.	Replace phase interlock relay box.
WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891			
J.	INBOARD GROUND ONLY SPOILER PANELS DO NOT EXTEND AUTOMATICALLY AFTER TOUCHDOWN AND LANDING ROLL (OUTBOARD SPOILER PANELS EXTEND NORMALLY)		
WJE 873, 874, 886, 887, 892, 893			
I.	INBOARD GROUND ONLY SPOILER PANELS DO NOT EXTEND AUTOMATICALLY AFTER TOUCHDOWN AND LANDING ROLL (OUTBOARD SPOILER PANELS EXTEND NORMALLY)		

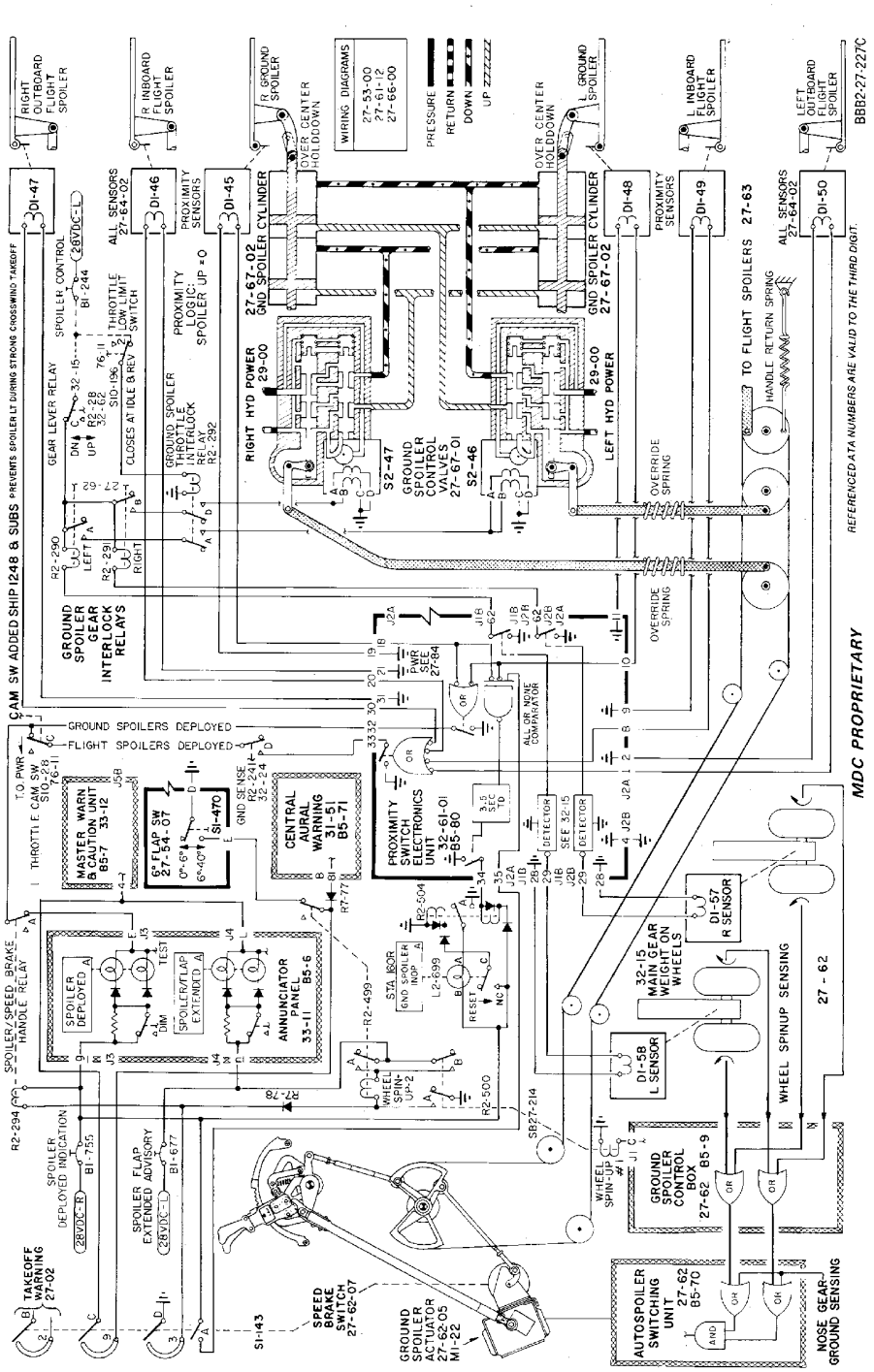
WJE 873, 874, 886, 887, 892, 893 (Continued)

Table 102 (Continued)

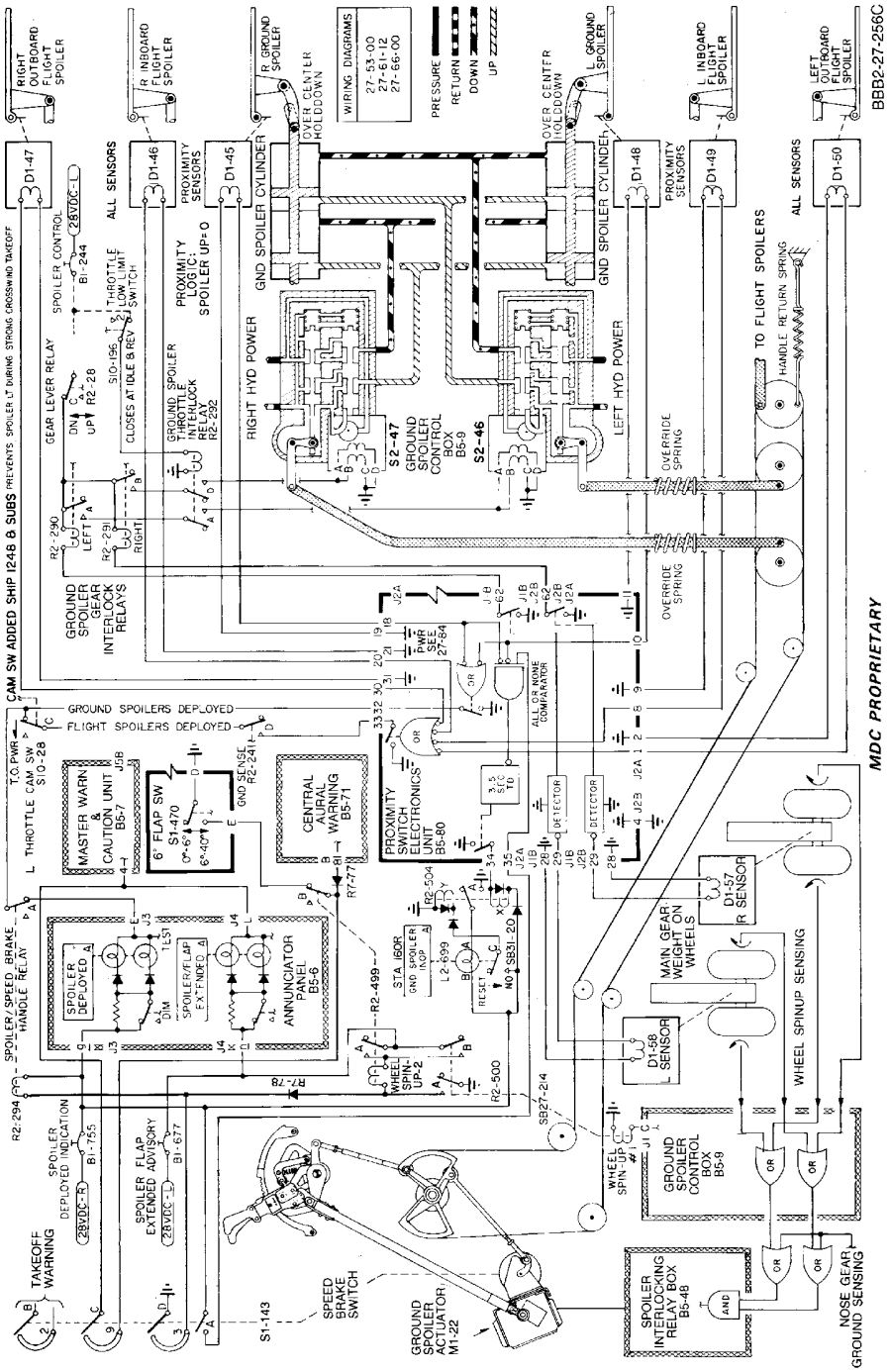
Possible Causes		Isolation Procedure	Correction
WJE ALL			
1.	Spoiler control circuit breakers open	(a) Close circuit breaker, check for correct voltage between output pin and ground.	If voltage is not correct, replace circuit breaker.
		(b) Open spoiler control circuit breaker and wiring for open circuits, and wire to ground shorts.	Repair wiring as required.
2.	Main landing gear (a) weight on wheel (WOW) proximity sensors failed	(a) Test main gear proximity sensors. (PROXIMITY SENSORS - MAINTENANCE PRACTICES, PAGEBLOCK 32-60-05/201)	Replace proximity sensor or repair wiring as required.
NOTE: BITE test of proximity switch electronic unit will latch the GND SPOILER INOP light on. Push to reset light and verify light is off.			
3.	Ground spoiler gear interlock relays inoperative	(a) Check voltage across relay contacts.	If voltage is incorrect, replace relays.
4.	Gear lever relay inoperative	(a) Check voltage across relay contacts.	If voltage is incorrect, replace relay.
5.	Throttle low limit switch open (Throttles at idle)	(a) Throttle low limit out of adjustment.	Adjust low limit switch. If no voltage, replace switch.
		(b) Check voltage between output pin and ground.	If no voltage, replace switch.
6.	Ground spoiler interlock relay inoperative	(a) Check voltage across relay contacts.	If voltage is incorrect, replace relay.
WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891			
K.	GND SPOILER INOP LIGHT IS ON (GROUND SPOILER MAINTENANCE ADVISORY LIGHT)		
WJE 873, 874, 886, 887, 892, 893			
J.	GND SPOILER INOP LIGHT IS ON (GROUND SPOILER MAINTENANCE ADVISORY LIGHT)		
WJE ALL			
NOTE: If, during a maintenance check, the speedbrake lever is either electrically or manually moved to full aft (60° spoilers) position without hydraulic power on the airplane the GND SPOILER INOP light will come on and remain latched on. Push on the light indicator to reset the light off. The GND SPOILER INOP light will also come on and latch whenever the BITE test of the proximity switch electronic unit is performed. Push light indicator to reset the light off.			

Table 102 (Continued)

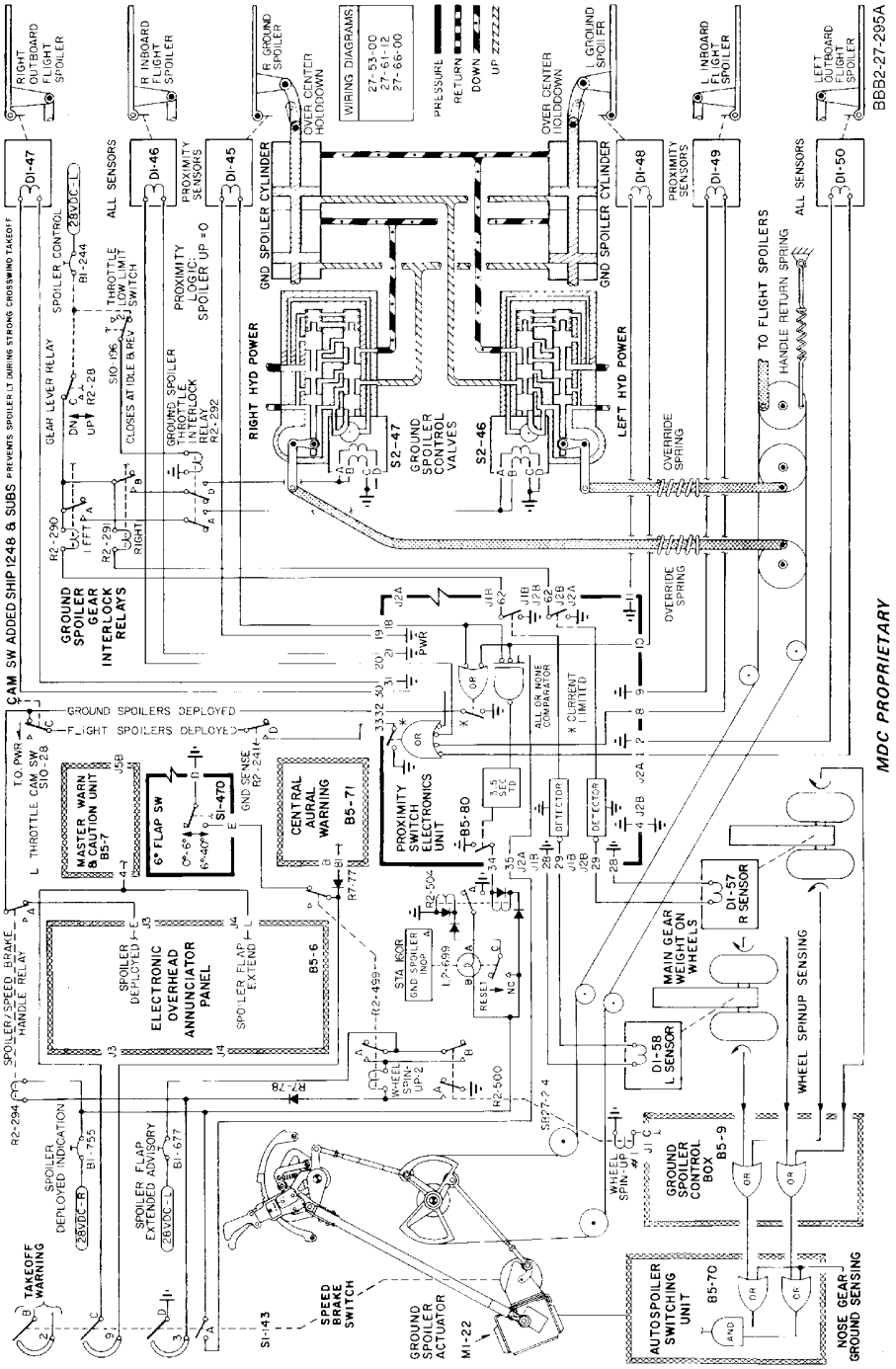
Possible Causes		Isolation Procedure	Correction
1.	GND SPOILER INOP light is on	(a) If light is on due to other maintenance action, push on light indicator to reset light. Verify light is off.	Push on light indicator, verify that light is off.
		(b) Reset light. Per- form test of ground spoilers. (SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 or SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 Config 2)	Visually check that ground spoilers fully extend. If ground spoilers do not extend, troubleshoot system per paragraph I.
		(c) If GND SPOILER INOP light is on after performing step (b), use proximity switch electronic unit and check inboard spoiler proximity sensors.	Replace proximity sensor or repair wiring as required. (SPOILER DEPLOYED SENSORS - MAINTENANCE PRACTICES, PAGEBLOCK 27-61-05/201)



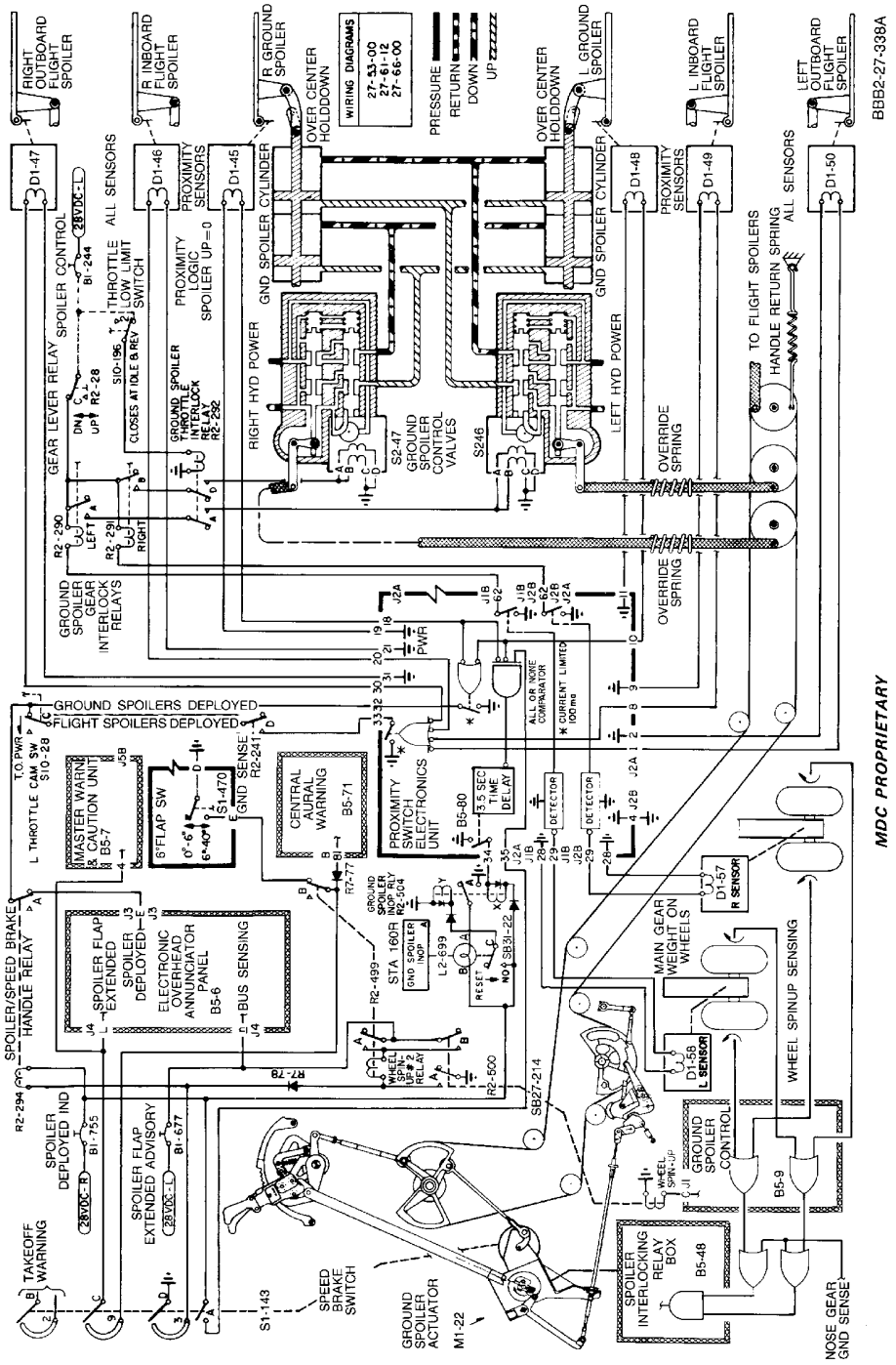
Spoiler Control and Indication
Figure 101/27-60-00-990-806 (Sheet 1 of 5)



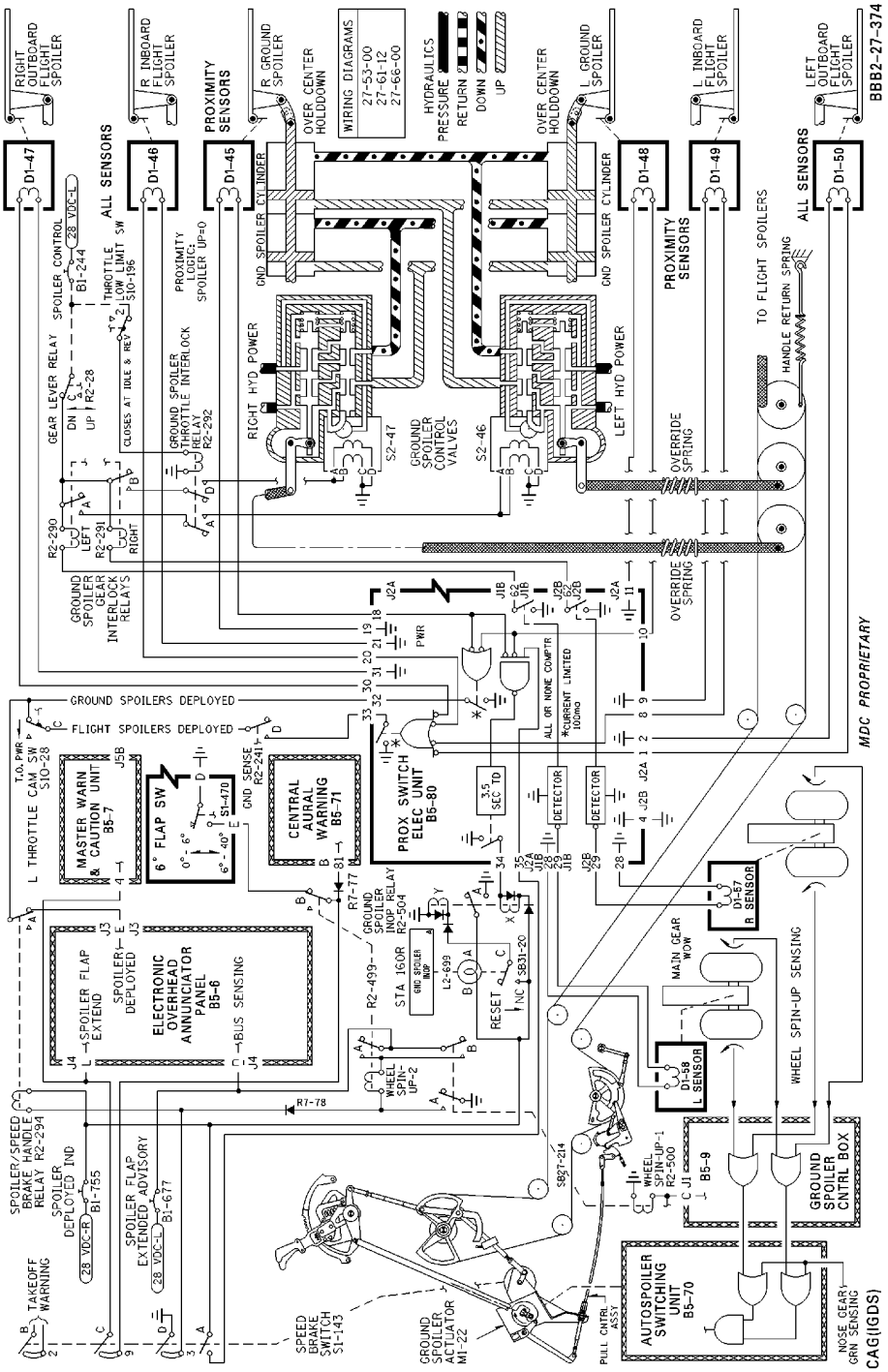
Spoiler Control and Indication
Figure 101/27-60-00-990-806 (Sheet 2 of 5)



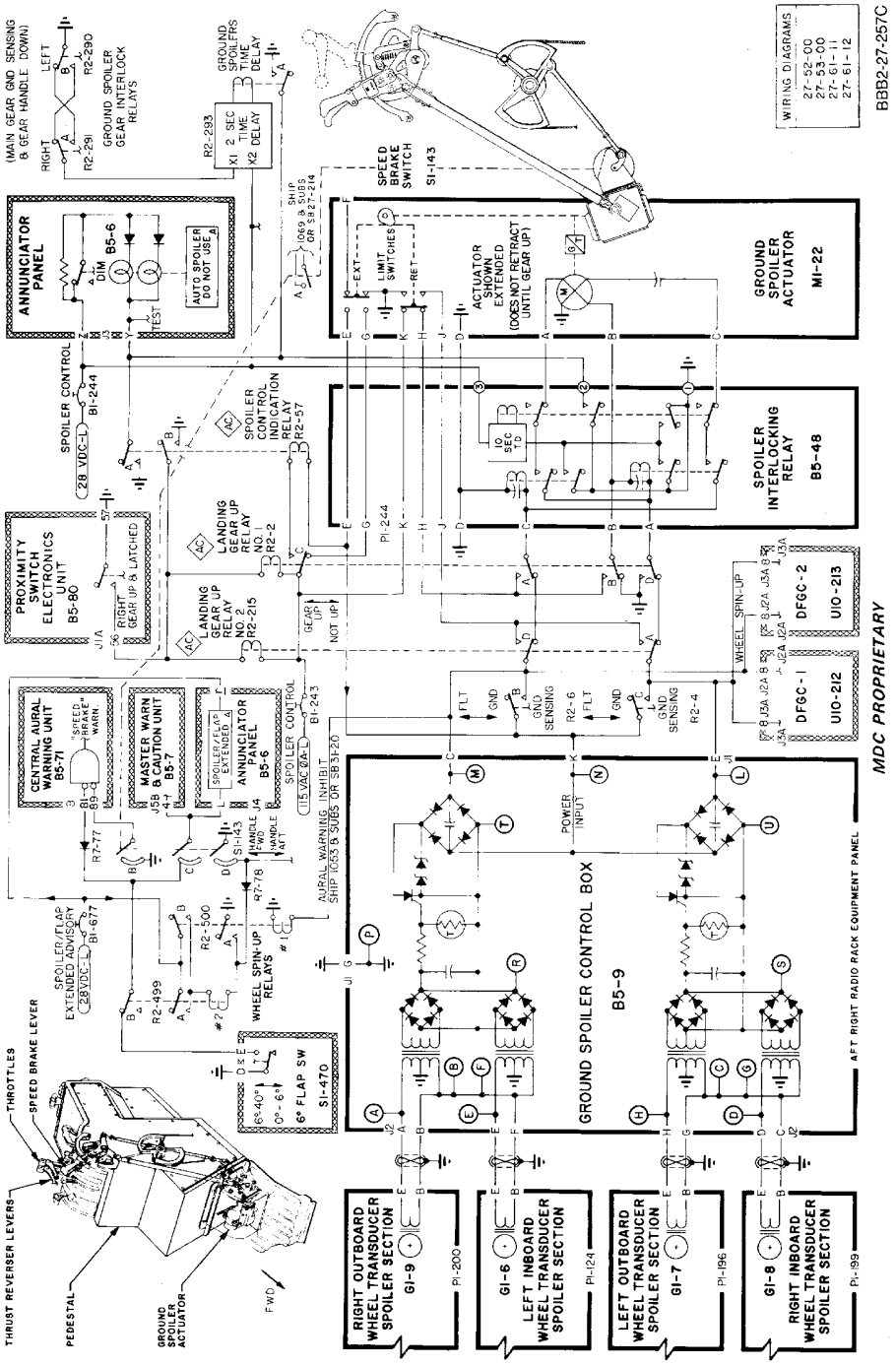
Spoiler Control and Indication
Figure 101/27-60-00-990-806 (Sheet 3 of 5)



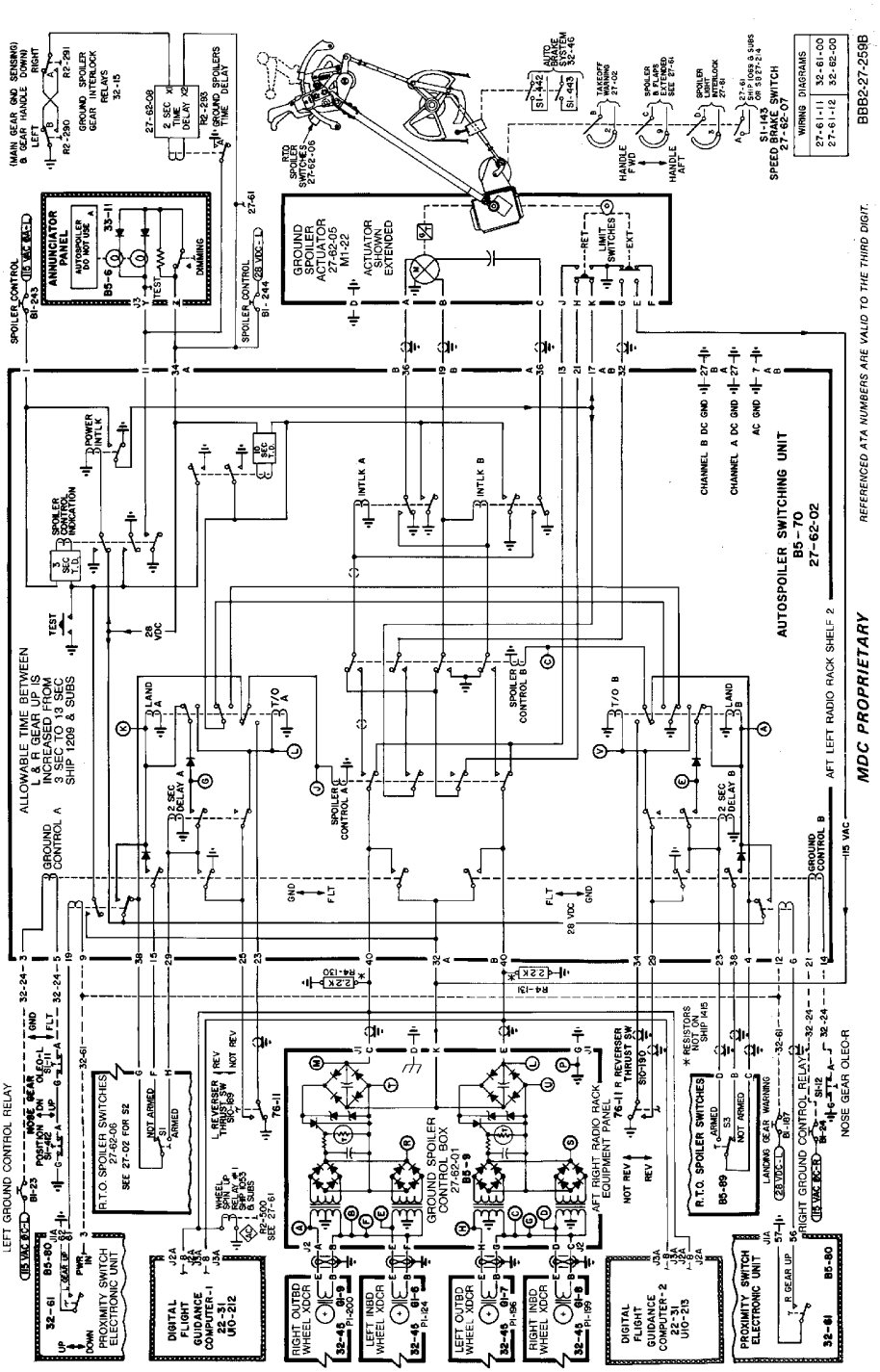
Spoiler Control and Indication
Figure 101/27-60-00-990-806 (Sheet 4 of 5)



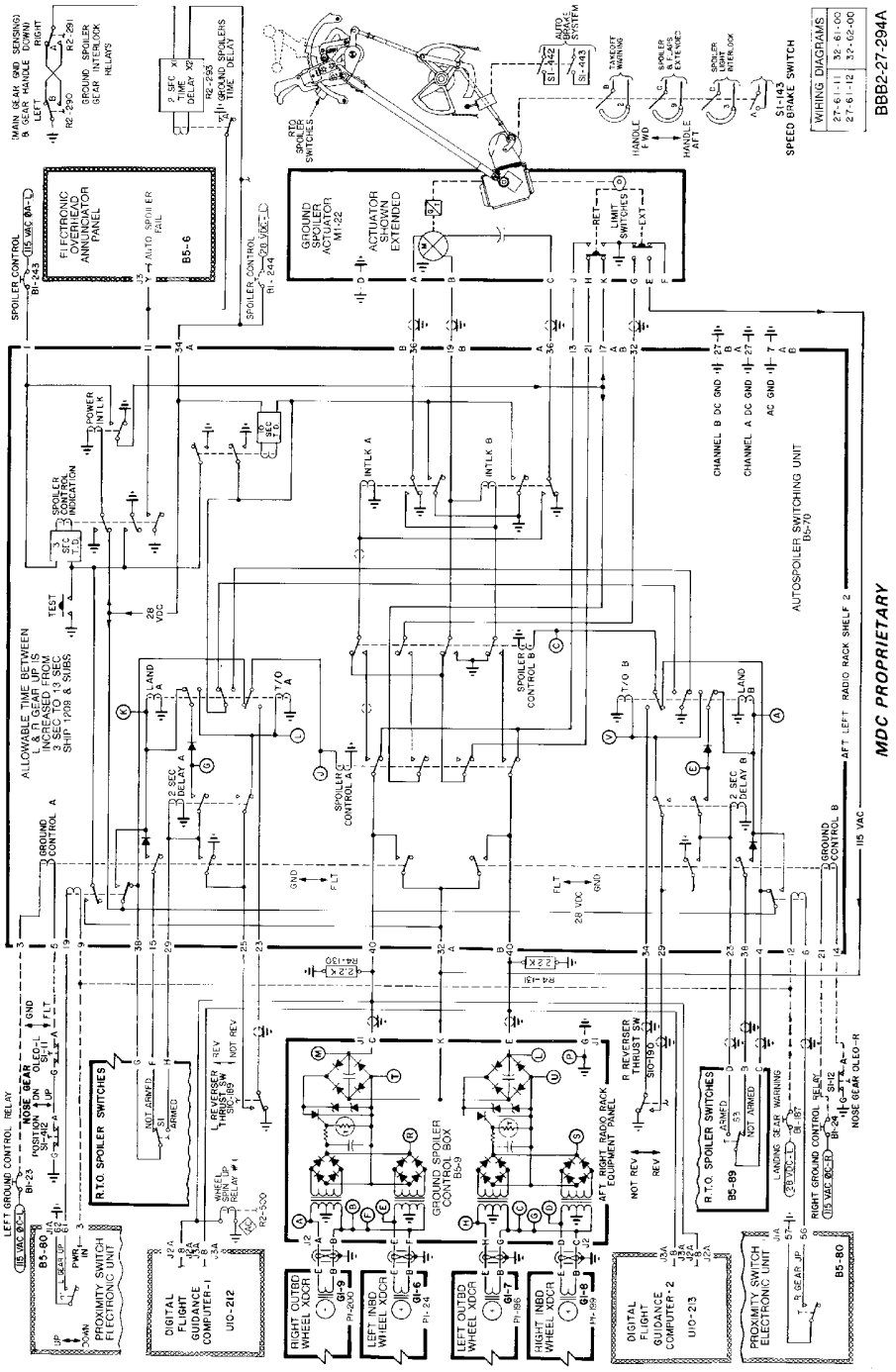
Spoiler Control and Indication
Figure 101/27-60-00-990-806 (Sheet 5 of 5)



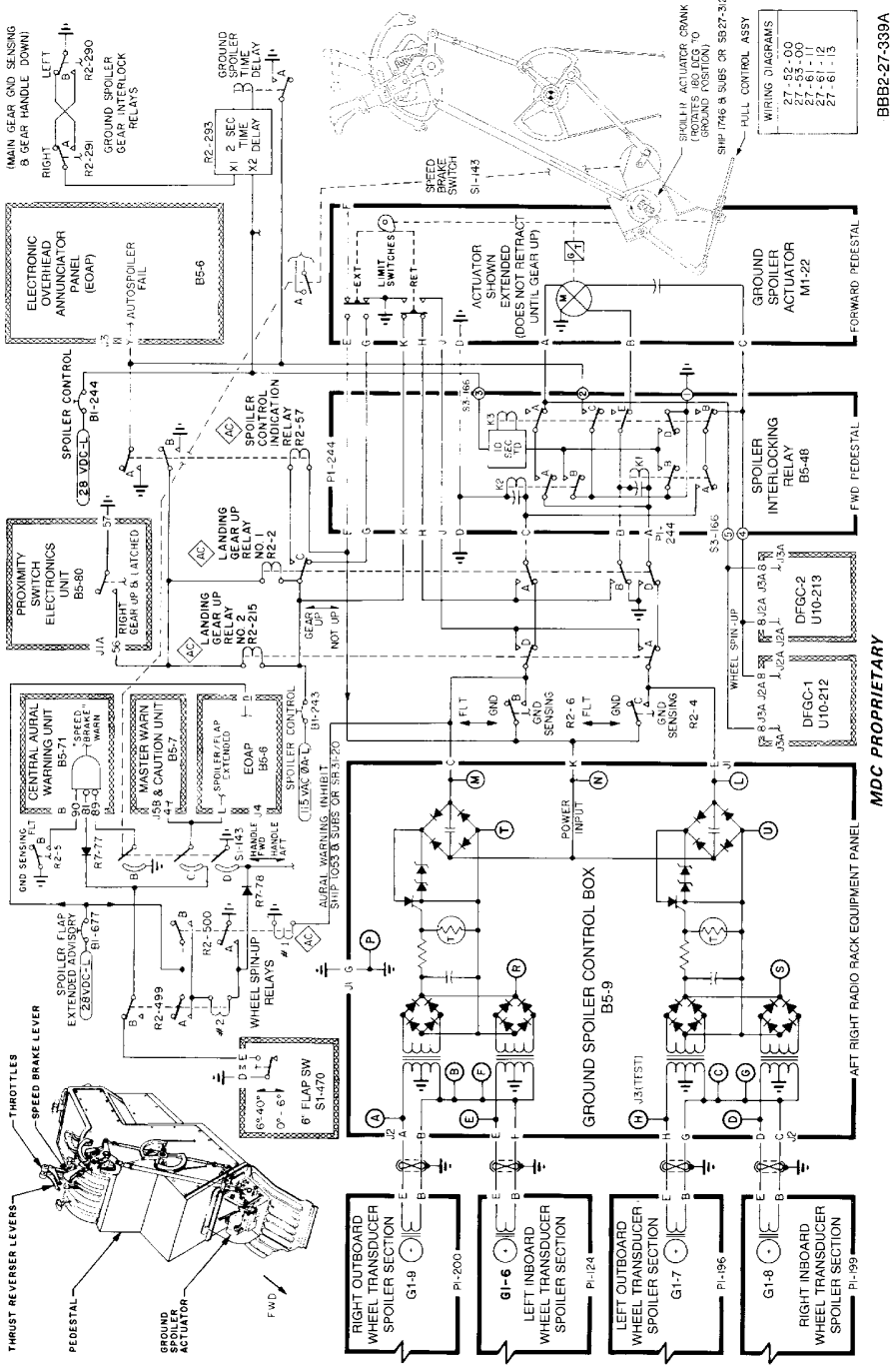
Ground Spoiler Electrical Control
Figure 102/27-60-00-990-807 (Sheet 1 of 4)



Ground Spoiler Electrical Control
Figure 102/27-60-00-990-807 (Sheet 2 of 4)



Ground Spoiler Electrical Control
Figure 102/27-60-00-990-807 (Sheet 3 of 4)



Ground Spoiler Electrical Control
Figure 102/27-60-00-990-807 (Sheet 4 of 4)

SPOILER - ADJUSTMENT/TEST

1. General

A. The procedures outlined in this section are for adjustment and test of the entire spoiler system. Specific segments of the system may be adjusted by following the procedures in the applicable paragraphs. Access to components is given in the text as required.

B. The numbers in parentheses in the following text correspond to callouts in Figure 501 or Figure 502.

C. The numbers and letters enclosed by the hexagon-shaped symbol, shown in the adjustment diagrams, correspond to cable run numbers and segments listed at the end of this section. Each cable run number is posted adjacent to the corresponding cable in the aircraft.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

D. The procedure Paragraph 4.G. is applicable only on aircraft which have an active spoiler in-flight lockout system. This system installation was introduced on later aircraft beginning with Fuselage Number 1606.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

E. On aircraft beginning with Fuselage Number 2016, Weight-On-Wheels Unlocking Input, was added to the lockout mechanism. Each aircraft must be visually checked for the presence of the in-flight spoiler lockout and weight-on-wheels operating components to make a determination of requirements for full rigging and/or functional checks of this system.

F. If single or multiple electrical components in the spoiler in-flight lockout system, such as solenoids, switches or relays are replaced for cause, and system rigging dimensions are not disturbed, a system functional check for validation may be completed rather than a complete rigging check.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(Paragraph 4.G.)

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(ACTIVE IN-FLIGHT SPOILER LOCKOUT SYSTEM - ADJUSTMENT/TEST, PAGEBLOCK 27-60-01/501)

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 501

Name and Number	Manufacturer
Lockwire, NASM20995N32, DPM684*[1]	Not specified
Protractor (5916715–1)	The Boeing Company
Tensiometer	Pacific Scientific Co.
Dual drive motor (0-1200 rpm) (3240-D09-1212)	AERO INFO Inc.
Anti-skid transducer spinner (4916807) (2 required)	The Boeing Company
Rig pin (4-4) 1/4 by 4 5/8 (6.35 x 117.475 mm)	
Rig pin (4-2) 1/4 by 2 5/8 (6.35 x 66.675 mm)	
Target, dummy MLG proximity switch, (2) (4952969)	The Boeing Company
Rig pins (2) (4-6 1/4 by 6 5/8 (6.35 x 168.275 mm)	
Rig pins (2) (4-10 1/4 by 10 5/8 (6.35 x 269.875 mm)	

Table 501 (Continued)

Name and Number	Manufacturer
Rig pin (5-3 5/16 by 3 5/8 (7.937 x 92.075 mm)	
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch), (15.875 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Adjustment/Test Spoilers

A. Adjust Spoiler Speedbrake Controls (Figure 501 or Figure 502)

NOTE: Aileron controls must be properly adjusted (PAGEBLOCK 27-10-00/501) before adjusting spoiler system.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Depressurize spoiler hydraulic system by moving spoiler shutoff and system depressurization valves, located in left and right main gear wheel wells, to off position. Secure valve levers with safety pins.

(3) Disconnect ground sensing pushrod from ground sensing mechanism. (PAGEBLOCK 32-23-01/201)

(4) Place throttle lever (F) in idle position (against aft stop).

(5) Place nose gear oleo switches in flight position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(6) Simulate left and right main gear in up position by simultaneously placing a steel object over the left and right main gear up proximity switches for approximately 2 seconds. Auto-spoiler actuator should be retracted.

NOTE: If proximity switches are not actuated simultaneously the autospoiler do not use light (on aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel) will come on. To turn light off and reset monitor in autospoiler switching unit, open and close 28vdc and 115vac spoiler control circuit breakers.

WJE 873, 874, 886, 887, 892, 893

(7) Actuate right main gear up-limit proximity switch by placing a steel object over switch, auto spoiler actuator should move to retract position. Remove steel object.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(8) Place speedbrake lever (E) in armed retract position (red armed label visible).

(9) Check that rig hole in spoiler switch (J) crank (K) is aligned with rig mark on spoiler switch (J) support. If necessary, adjust pushrod (H) until rig hole in crank is aligned with rig mark (M) on support.

(10) Carefully and slowly move speedbrake lever (E) through its full travel (full forward stop to full aft stop and return). Check that spoiler switch (J) does not contact its internal stops at either extreme of travel. If necessary, adjust pushrod (H) as follows:

NOTE: If resistance is met before either extreme travel of lever is reached, do not force lever as damage to spoiler switch stops may occur.

(a) If stop contacts in forward position, lengthen pushrod (H).

(b) If stop contacts in aft position, shorten pushrod (H).

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893

(11) Place speedbrake lever (E) in armed forward position.

WJE 886, 887

(12) Place speedbrake lever (E) in armed retract position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(13) Adjust pushrod (U) so that there is 0.015 to 0.200 inch, (0.381 to 5.08 mm) clearance between crank (T) and roller in speedbrake lever (E) (at point Y).

(14) Place nose gear oleo switches in ground position, auto spoiler actuator should extend and speedbrake lever (E) should move to full aft position.

(15) With auto spoiler actuator extended and speed brake lever (E) in aft position, adjust pushrod (U) so that aft pin on speed brake lever (E) is beyond secondary latch a minimum of 0.060 inch (1.52 mm).

NOTE: The 0.060 inch (1.52 mm) dimension is measured on top of speed brake cam (W) by noting difference between position of speedbrake lever (E) when it is held by secondary latch and when it is held by auto spoiler actuator.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(16) Check for positive clearance between speedbrake lever (E) and aft end of opening on speedbrake cam (W) when lever (E) is armed and held aft by crank (T).

WJE 873, 874, 886, 887, 892, 893

(17) Check for positive clearance between speedbrake lever (E) and aft position stop on speedbrake cam (W) when lever (E) is armed and held aft by crank (T).

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(18) Manually disarm speedbrake lever (E), lever should return to unarmed retract position. Check that square lugs on outboard sides of lever (E) are fully engaged in forward detent of speedbrake cam (W).

(19) With crank (R) in contact with stop (S), adjust turnbuckles (A) and (B) until tension is between minimum and maximum load per cable tension table for 3/32 inch (2.38 mm) cables 159A, B and 160 A, B. (Figure 503 (Sheet 1))

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893

NOTE: Access to turnbuckle (A) is through forward cargo compartment ceiling panel 5154C, and turnbuckle (B) is through ceiling panel 5156C.

WJE 886, 887

NOTE: Access to turnbuckle (A) is through forward cargo compartment ceiling panel 5193E, and turnbuckle (B) is through ceiling panel 5194E.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(20) Differentially adjust turnbuckles (A) and (B) so that gap of 0.005 to 0.030 inch (0.127 to 0.762 mm) exists between lever (E) and forward stop.

(21) Manually move speedbrake lever (F) through its full cycle a minimum of 5 times. Recheck cable tensions specified in Paragraph 3.A.(19), retension cables if necessary.

NOTE: Final adjustment of cable runs 159A, B and 160A, B is contained in Paragraph 3.A.(19).

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(22) Place speedbrake lever in unarmed retract position (against forward stop).

(23) Check that plungers of all three speedbrake lever arming switches are fully depressed. Squeeze speedbrake lever grip and check that there is clearance between lever cam and switch actuators. Release grip. If necessary adjust arming switches as follows:

(a) Remove cover from switches.

(b) Loosen switch support bolts and position switch support in most fore position on serrated plate.

(c) Place shim, 0.025 to 0.035 inch (0.635 to 0.889 mm) thick (as required), between speedbrake frame and speedbrake lever.

(d) Adjust switch support assembly aft until all three switches actuate. Tighten switch support attach bolts.

NOTE: Plungers of switches must be fully depressed when switches are actuated.

(e) Squeeze speedbrake lever grip, plungers of all three switches must be relaxed when grip is squeezed and must have clearance between speedbrake lever cam and switch actuators. Release grip.

(f) Remove shim from between speedbrake frame and speedbrake lever. Check that plungers of all three switches are fully depressed with lever in forward stop position.

(g) Squeeze speedbrake lever grip. Check that there is clearance between lever cam and switch actuators. Release grip.

(h) Install switch cover.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(24) Safety all turnbuckles with clips.

(25) Place left and right spoiler shutoff and system depressurization valves in on position. Safety levers with safety pins.

(26) Connect ground sensing pushrod to ground sensing mechanism. (PAGEBLOCK 32-23-01/201)

(27) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

(28) Test spoiler speedbrake control system. (Paragraph 3.E.)

B. Adjust Ground Only Spoilers Control (Figure 501 or Figure 502Figure 503) .

NOTE: Spoiler speedbrake controls must be properly adjusted prior to making the following adjustments. (Paragraph 3.A.)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Make certain left and right hydraulic systems are depressurized. (PAGEBLOCK 29-00-00/201)

(3) Make certain speedbrake lever (E) is in retract position.

(4) Install rig pin (5-3) in rig pin hole (R-8) in drum (A).

(5) With crank (R) in contact with stop (S), adjust turnbuckles (D) and (E) until tension is between minimum and maximum load per cable tension table for 3/32 inch (2.38 mm) cables 249A, B and 250A, B (Figure 503 (Sheet 2)).

NOTE: Turnbuckles (D) and (E) are located in right wheelwell; center.

(6) Remove rig pin (5-3) from drum (A).

(7) Remove bolt (C) to disconnect pushrods (B) from both left and right ground spoiler control valves.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(8) Pressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING SPEEDBRAKE LEVER, MAKE CERTAIN THAT AREAS AROUND ALL SPOILERS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(9) Manually move speedbrake lever (E) to extreme aft (60° spoiler) position. Flight spoilers should extend, ground spoilers should remain retracted.

(10) Manually place left ground spoiler control valve lever in the extend position and hold.

(11) Slowly move right ground spoiler control valve lever, in extend direction, until both ground only spoilers just begin to extend. Hold lever in this position.

(12) Adjust pushrod (B) rod end until bolt (C) can be freely installed, then extend pushrod (B) rod end 9(±4) full turns. Install bolt (C). Safety nut with cotter pin.

(13) Release left ground spoiler control valve lever.

(14) Move speedbrake lever (E) to retract position. All spoilers should retract.

(15) Depressurize right hydraulic system, pressurize left hydraulic system.

(16) Move speedbrake lever to full aft (60° spoiler) position. Flight spoilers should extend, ground only spoilers should remain retracted.

(17) Manually move left ground spoiler control valve lever, in extend direction, until both ground only spoilers just extend. Hold lever in this position.

(18) Adjust pushrod (B) rod end until bolt (C) can be freely installed, then extend pushrod (B) rod end 9(±4) full turns. Install bolt (C). Safety nut with cotter pin.

(19) With left hydraulic system pressurized, pressurize right hydraulic system.

(20) Move speedbrake lever (E) to retract position. All spoilers should retract. Move speedbrake lever (E) to full aft (60° spoiler) position. All spoilers (flight and ground only) should be fully extended.

(21) With all spoiler panels fully extended, rotate aileron control wheel to full left wing and then right wing down. Make certain that flight spoilers on opposite side to wing down control wheel deflection move to faired position. Left and right wing ground spoiler panels should not move and should remain deployed. If ground spoiler panels do not remain deployed, extend pushrods "B", in left and right main landing gear wheel wells as required. (Paragraph 3.B.(12))

(22) Return speedbrake lever to retract position.

(23) Shut off hydraulic pressure source.

(24) Safety all turnbuckles with clips.

(25) Remove door safety locks, close main gear inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

(26) Test ground spoiler control. (Paragraph 3.F.)

C. Adjust Lateral Control Mixers (Figure 502 (Sheet 1), View C-C)

NOTE: Spoiler speedbrake controls must be properly adjusted prior to making the following adjustments. (Paragraph 3.A.)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Depressurize spoiler hydraulic system by moving spoiler shutoff and system depressurization valves, located in left and right main gear wheel wells, to off position. Secure valve levers with safety pins.

(3) Make certain that speedbrake control lever (E) is in unarmed retracted position, against forward stop.

(4) Insert rig pin (4-10) in rig pin hole (R-7) in spoiler cam, left and right mixers.

(5) Remove bolt (D), two places, to disconnect pushrods (E) from cranks on speedbrake input shaft in left mixer to allow spring (C) to bring crank (A) in contact with stop (B), left and right mixers.

(6) Adjust pushrod (E), left mixer, until bolt (D) can be freely inserted. Install bolt (D). Tighten pushrod jamnut.

(7) Adjust pushrod (E), right mixer, until bolt (D) can be freely inserted. Install bolt (D). Tighten pushrod jamnut.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(a) Check for play between spoiler output sectors, sector arm assemblies and output drive link assemblies (left and right). Shim as required with laminated washers under stop bolt heads in respective outboard arms to remove all play from spoiler output sectors, arm assemblies and drive link assemblies. (Figure 502 (Sheet 1))

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(8) Remove rig pins (4-10) from left and right mixers.

(9) Return spoiler shutoff and system depressurization valve levers to on position and secure valve levers with safety pins.

(10) Remove door safety locks, close main gear inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

(11) Test lateral control mixers. (Paragraph 3.E.)

D. Adjust Inboard and Outboard Flight Spoiler Controls in Wing (Figure 502 (Sheet 1))

NOTE: Aileron controls (PAGEBLOCK 27-10-00/501), speedbrake controls (Paragraph 3.A.), lateral control mixers (Paragraph 3.B.), spoiler panels (PAGEBLOCK 27-61-01/201), must be properly adjusted prior to adjusting spoiler controls.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(4) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Place spoiler shutoff and system depressurization valves, located in left and right main gear wheel wells, in off position. Secure valve levers with safety pins.

(6) Make certain speedbrake lever (E) is in unarmed retracted position, against forward stop.

(7) Insert rig pins (4-10) in rig pin hole (R-7) in spoiler cam, left and right lateral control mixer.

(8) Adjust turnbuckles (A) and (B) until tension is between minimum and maximum load per cable tension table for 3/32-inch (2.38 mm) cables 11A, B, and 12A, B. (Figure 503 (Sheet 2))

NOTE: Access to turnbuckles (A) and (B) is through wing trailing edge doors 1502C and 1503A.

(9) Differentially adjust turnbuckles (A) and (B) so that rig pin (4-6) can be freely inserted and removed in rig pin hole (R-6) in left inboard control drum (L). Remove rig pin (4-6). (Figure 502 (Sheet 1), View D-D)

(10) Adjust turnbuckles (C) and (D) until tension is between minimum and maximum load per cable tension table for 3/32-inch (2.38 mm) cables 13A, B and 14A, B. (Figure 503 (Sheet 2))

NOTE: Access to turnbuckles (C) and (D) is through wing trailing edge doors 1502C and 1503A.

(11) Differentially adjust turnbuckles (C) and (D) until rig pin (4-6) can be freely inserted and removed in rig pin hole (R-6) in left outboard control drum (L). Remove rig pin (4-6).

(12) Adjust turnbuckles (E) and (F) until tension is between minimum and maximum load per cable tension table for 3/32-inch (2.38 mm) cables 15A, B and 16A, B. (Figure 503 (Sheet 2))

NOTE: Access to turnbuckles (E) and (F) is through wing trailing edge doors 1602C and 1603A.

(13) Differentially adjust turnbuckles (E) and (F) until rig pin (4-6) can be freely inserted and removed in rig pin hole (R-6) in right inboard control drum (L). Remove rig pin (4-6).

(14) Adjust turnbuckles (G) and (H) until tension is between minimum and maximum load per cable tension table for 3/32-inch (2.38 mm) cables 17A, B and 18A, B. (Figure 503 (Sheet 2))

NOTE: Access to turnbuckles (G) and (H) is through wing trailing edge doors 1602C and 1603A.

(15) Differentially adjust turnbuckles (G) and (H) until rig pin (4-6) can be freely inserted and removed in rig pin hole (R-6) in right outboard control drum (L). Remove rig pin (4-6).

(16) Rotate aileron control wheel through full travel a minimum of five times, then recheck cable tensions. Adjust turn-buckles as necessary, steps (8) through (15), to obtain desired cable tension.

(17) Adjust linkage from control drums (L) to spoiler actuators (4 places) as follows:

NOTE: The adjustment is identical for all four actuators.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT FLAP/SLAT HANDLE IS IN THE 40 DEGREE POSITION, AND THAT ALL OTHER CONTROLS ARE IN CORRECT POSITIONS TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR OTHER EQUIPMENT.

(a) Pressurize left or right hydraulic system, as applicable. (PAGEBLOCK 29-00-00/201)

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(b) Insert rig pin (4-6) in rig pin hole (R-6) in control drum (L).

(c) Loosen jamnuts on pushrod (K) and rotate body of pushrod (K) until rig pin (4-2) can be freely inserted and removed in rig pin hole (R-5) in valve arm (N).

(d) Tighten pushrod (K) jamnuts. Safety jamnut to ear of locking device with lockwire.

NOTE: Make certain that ear of locking device is positioned to prevent possible jamming of pushrod on bracket.

(18) Remove rig pins (4-10), (4-6) and (4-2) from left and right lateral control mixers, control drums (L) and valve arm (N).

(19) Safety all turnbuckles with clips.

(20) Check that lockwire installation on spoiler drums. (Figure 504)

(21) Insert rig pins (4-10) in rig pin holes (R-7) in spoiler cam (17), left and right lateral control mixers.

NOTE: Paragraph 3.D.(22) through Paragraph 3.D.(26) adjust spoiler position sensors, located on right inboard flight spoiler and left outboard flight spoiler. Adjustment is identical for left and right position sensors.

(22) Make certain flight spoiler panels are fully retracted (locked in overcenter position).

(23) Remove bolt (AA) from arm (AB). (Figure 502 (Sheet 1), View E-E)

WARNING: SENSOR ROTATION IS LIMITED BY INTERNAL STOPS, USE EXTREME CARE WHEN ROTATING SENSOR TO PREVENT DAMAGING STOPS.

(24) Rotate arm (AB) until sensor internal mechanical ball detent falls into detent position, (null).

(25) Loosen bolt (AC) from clamp (AD), while maintaining arm (AB) in detent position, rotate sensor body until bolt (AA) can be freely inserted in arm (AB) and link (AE). Tighten bolt (AC).

(26) Install nut on bolt (AA) and safety nut with cotter pin.

(27) Remove rig pins (4-10) from spoiler cams, left and right lateral control mixers.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(28) Place spoiler shutoff and system depressurization valve levers to on position and secure valve levers with safety pins.

WJE 873, 874, 886, 887, 892, 893

(29) Return spoiler shutoff and system depressurization valve levers to on position and secure valve levers with safety pins.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(30) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(31) Place flap/slat handle in UP/RET degree detent.

(32) Shut off hydraulic pressure source.

(33) Remove door safety locks, close main gear inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

(34) Check spoiler position sensors. (PAGEBLOCK 22-01-03/201)

(35) Perform return to service (RTS) test. (DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201)

(36) Test spoiler controls. (Paragraph 3.E.)

(37) Test spoiler automatic system. (Paragraph 4.)

E. Test Spoiler Speedbrake Controls

NOTE: During the following test procedures the SPOILER DEPLOYED light, on annunciator panel should come on when any spoiler is extended 10(±2) degrees (0.17(±0.03) rad) or greater. Light should go off with spoilers retracted. The nose gear oleo switches must be in ground mode for light to operate.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Make certain that aileron control wheel is in neutral position (index marks on wheel and control column aligned).

(3) Make certain that both throttle levers are in idle position.

(4) Insert rig pin (4-4) in rig pin hole (R-3) in aileron torque tube, located under flight compartment floor in electrical/electronics compartment.

(5) Disconnect ground sensing mechanism pushrod from sector on nose landing gear strut. (PAGEBLOCK 32-23-01/201)

(6) Place nose gear oleo switches in flight position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(7) Simulate left and right main gear in up position by simultaneously placing a metal object over the left and right main gear up proximity switches for approximately 2 seconds.

NOTE: If proximity switches are not actuated simultaneously the autospoiler do not use light (on aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel) will come on. To turn light off and reset monitor in autospoiler switching unit, open and close 28vdc and 115vac spoiler control circuit breakers.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(8) Actuate right main gear up-limit proximity switch by placing a steel object over switch, auto spoiler actuator should move to retract position. Remove steel object.

(9) Make certain that speedbrake control lever is in retract position (against forward stop with red arm label not visible).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(10) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(11) Check that all spoiler panels are in retracted position.

WARNING: BEFORE MOVING SPEEDBRAKE LEVER, MAKE CERTAIN THAT AREAS AROUND ALL SPOILERS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(12) Move speedbrake lever aft to first detent, then smartly snap lever to EXT position stop (do not slowly drag lever aft).

(a) Check that both flight spoiler panels on each wing are extended 34(±3) degrees (0.59(±0.05) rad) from retracted position. Ground spoiler panels should remain retracted.

(13) Check that mismatch between inboard flight spoiler panels of left and right wings does not exceed 1 degree. Check that mismatch between outboard flight spoiler panels of left and right wings does not exceed 1 degree.

(14) Return speedbrake control lever to full forward (retract) position and make following checks.

(a) Check that flight spoiler panels on each wing retract.

(b) With speedbrake lever in full forward position, check that a gap of 0.005 to 0.030 inch (0.127 to 0.762 mm), exists between speedbrake lever and forward stop.

(c) Check that crank (A) contacts stop (B) in each lateral control mixer.

(15) Place speedbrake control lever in armed position by raising lever vertically until red arm label is visible. Lever should hold in this position. Do not move lever aft; if lever cannot be armed without aft movement, automatic actuator has not set properly or mechanical linkage to actuator is out of adjustment.

(16) Make certain that left throttle is in idle position.

(17) Manually move speedbrake lever to extreme aft (60° spoiler) position, manual latch should hold lever in position. Flight spoilers should be extended 60°(±4°). Both ground only spoilers should be extended.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 880, 881, 883, 884, 891

(18) Move left throttle forward from idle stop. Speedbrake lever should drop down and move to retract position when throttle lever is between 1 3/8 and 2 1/2 inches (34.925 and 63.500 mm) from idle stop. Measured along curved surface of pedestal cover plate from idle stop to aft edge of throttle lever. All spoilers should be retracted.

WJE 401-404, 873-879, 886, 887, 892, 893

(19) Move left throttle forward from idle stop. Speedbrake lever should drop down and move to retract position when throttle lever is between 1 3/8 and 2 inches (34.925 and 50.8 mm) from idle stop, measured along curved surface of pedestal cover plate from idle stop to aft edge of throttle lever. All spoilers should be retracted.

NOTE: Speedbrake lever may not drop down to disarmed position after throttle knockdown.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(20) Move left throttle aft to idle position.

(21) Place speedbrake lever in armed retract position.

(22) Place nose gear oleo switch in ground position. Check that speedbrake control lever moves to full aft position and that all flight spoiler panels are fully extended to 60°(±4°). Both ground only spoilers should also be extended.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-874, 880, 881, 883, 884, 886, 887, 891-893

(23) Move the left throttle forward from idle stop. Speedbrake lever should drop down and move to retract position when throttle lever is between 1 3/8 and 2 1/2 inches (34.925 and 63.500 mm) forward of idle stop. All spoilers should be retracted.

NOTE: Speedbrake lever will not drop down to full disarmed position, when it is in forward (RET) position and auto spoiler actuator is extended (in ground position).

NOTE: If speedbrake lever does not drop down and move to retract position when throttle lever is moved forward to between 1.375 to 2.50 inches (34.93 to 63.5 mm), adjust pushrod (U) to correct. (Figure 501 or Figure 502)

NOTE: Speedbrake lever and auto spoiler actuator operation must meet conditions stated in Paragraph 3.E.(12) through Paragraph 3.E.(17) after adjustment of pushrod (U).

WJE 401-404, 875-879

(24) Move the left throttle forward from idle stop. Speedbrake lever should drop down and move to retract position when throttle lever is between 1 3/8 and 2 inches (34.925 and 50.8 mm) forward of idle stop. All spoilers should be retracted.

NOTE: Speedbrake lever will not drop down to full disarmed position, when it is in forward (RET) position and auto spoiler actuator is extended (in ground position).

NOTE: If speedbrake lever does not drop down and move to retract position when throttle lever is moved forward to between 1.375 to 2.50 inches (34.93 to 63.5 mm), adjust pushrod (U) to correct. (Figure 501 or Figure 502)

NOTE: Speedbrake lever and auto spoiler actuator operation must meet conditions stated in Paragraph 3.E.(12) through Paragraph 3.E.(17) after adjustment of pushrod (U).

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(25) Place left throttle to idle position.

(26) With auto spoiler actuator extended, pull speedbrake lever up, then full aft and up again to latched position, and verify the following:

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(a) Auto spoiler actuator moves to the retract position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(b) Speedbrake lever moves aft along pedestal top surface without binding.

WJE 873, 874, 886, 887, 892, 893

(c) Speedbrake lever remains in full aft and up position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(27) Make certain that speedbrake lever remains in full aft and up latched position.

WJE 873, 874, 886, 887, 892, 893

(28) Place nose gear oleo switch in flight position.

(29) Actuate right main gear up-limit proximity switch by placing steel object over switch, auto spoiler actuator should move to retract position. Remove steel object. Speedbrake lever should remain latched in full aft and up position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(30) Make certain that speedbrake lever remains in full aft and up latched position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(31) Place speedbrake lever in unarmed retract position.

(32) Place left throttle 4(±1/16) inches (101.6(±1.59) mm) forward of idle stop, measured along curved surface of pedestal cover plate. Check that speedbrake lever can be armed (red arm label visible) with throttle in this position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(33) Return left throttle to idle position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(34) Disarm speedbrake lever. Make certain lever is in retracted position.

(35) Remove rig pin (4-4) from aileron torque tube.

WARNING: BEFORE ROTATING AILERON CONTROL WHEELS, MAKE CERTAIN THAT AREAS AROUND LEFT AND RIGHT AILERONS AND SPOILERS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(36) Rotate aileron control wheel clockwise quickly (or rapidly); but with smooth continuous motion, until stop is contacted and make following checks.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

NOTE: Lateral control spoiler split tolerances for Paragraph 3.E.(36) through Paragraph 3.E.(38) are as follows:

WJE 873, 874, 886, 887, 892, 893

NOTE: Lateral control spoiler split tolerances for Paragraph 3.E.(36) through Paragraph 3.E.(39) are as follows:

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

Table 502

SPEEDBRAKES RETRACTED	
Spoiler Position	**Maximum Allowable Split Between Inboard and Outboard Flight Spoilers**
0 - 12 degrees	1 degree (1/4 inch)
13 - 29 degrees	5 degrees (1 1/4 inch)
30 - 60 degrees	No requirement (overtravel range)
NOTE: Allowable splits shown above do not apply when ground only spoilers and flight spoilers are extended all at the same time.	
SPEEDBRAKES EXTENDED	6 degree allowable split at all speedbrake lever positions
GROUND SPOILERS EXTENDED	No requirement

(a) Check that right aileron control tab (inboard) moves trailing edge down.

(b) Check that both flight spoiler panels on right wing are extended to 60(±4) degrees.

(c) Check that left aileron control tab (inboard) moves trailing edge up.

(d) Check that flight spoiler panels on left wing remain retracted within one degree.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(37) Rotate aileron control wheel counterclockwise quickly (or rapidly) but with smooth continuous motion, until stop is contacted and make following checks.

WJE 873, 874, 886, 887, 892, 893

Rotate aileron control wheel counterclockwise slowly until stop is contacted and make following checks.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(a) Check that left aileron control tab (inboard) moves trailing edge down.

(b) Check that both flight spoiler panels on left wing are extended to 60(±4) degrees.

(c) Check that right aileron control tab (inboard) moves trailing edge up.

(d) Check that flight spoiler panels on right wing move to fully retracted position within one degree.

(38) Place aileron control wheel to neutral position and check that all spoiler panels are retracted.

WJE 873, 874, 886, 887, 892, 893

(39) Place both throttles to idle position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(40) Arm the speedbrake control lever and move lever to extreme aft (60° spoiler) position against stop. Leave speedbrake lever in this position.

(41) Rotate aileron control wheel quickly (or rapidly) but with smooth continuous motion, from stop to stop. Check that both flight spoiler panels on left wing move in unison and that panels on right wing move in unison. The down-going flight spoilers may not fully retract. The flight spoilers should operate smoothly.

(42) Place speedbrake control lever to unarmed retract position.

(43) Test ground only spoiler controls. (Paragraph 3.F.)

NOTE: Ground only spoiler controls test must be performed in order to complete spoiler speedbrake test.

F. Test Ground Only Spoiler Controls

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Make certain that main gear door ground maintenance bypass lever is in bypass position (lever extended), main gear doors are opened and door safety locks are installed. (PAGEBLOCK 32-00-00/201)

(2) Make certain that aileron control wheel is in neutral position (index marks on wheel and control column aligned).

(3) Make certain that speedbrake control lever is in unarmed, retract position (against forward stop with red arm label not visible).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(4) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(5) Check that all spoilers panels are in retracted position.

(6) Rotate sector on nose landing gear strut to place nose gear oleo switches in flight position.

(7) Retract autospoiler actuator as follows:

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(a) Simulate left and right main gear in up position by simultaneously placing steel objects over left and right main gear up proximity switches. Remove steel objects after autospoiler actuator retracts.

NOTE: If proximity switches are not actuated simultaneously, “AUTOSPOILER DO NOT USE” light (on aircraft with overhead annunciator panel) or "AUTOSPOILER FAIL" legend (on aircraft with EOAP) will come on. Ignore “AUTOSPOILER DO NOT USE light” or “AUTOSPOILER FAIL” light for this test.

WJE 873, 874, 886, 887, 892, 893

(b) Simulate right main gear in up position by placing steel object over right main gear up proximity switch. Remove steel object after autospoiler actuator retracts.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(c) Open this circuit breaker and install safety tag:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

(d) Rotate sector on nose landing gear strut to place nose gear oleo switches to the ground position

NOTE: The AUTOSPOILER DO NOT USE light (on aircraft with overhead annunciator panel) or AUTOSPOILER FAIL legend (on aircraft with EOAP) will come on. Disregard AUTOSPOILER DO NOT USE light or AUTOSPOILER FAIL light for this test.

(8) Manually move speedbrake lever quickly to EXT position. Flight spoilers should extend and both ground only spoilers should remain retracted. Place speedbrake lever to retract position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893 PRE DC9-27-337

(9) For aircraft with flight spoiler torsion bars do the following:

(a) Move speedbrake lever to EXT position. Flight spoilers should extend.

(b) Shut off left and right hydraulic system pressure source.

(c) Place left and right spoiler shutoff valve levers, located in left and right wheelwells, in bypass position.

(d) Verify that flight spoilers are fully retracted.

(e) Manually place speedbrake lever in full forward RET position.

(f) Place left and right spoiler shutoff valve levers in on position. Safety valve levers with safety pins.

(g) Pressurize left and right hydraulic systems.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(10) Manually move speedbrake lever up and aft to extreme aft (60° spoiler) position. Ground only and all flight spoilers should be fully extended.

(11) Shut off left and right hydraulic systems pressure source.

(12) Place left and right spoiler shutoff valve levers, located in left and right wheelwells, in bypass position.

(13) Verify ground only spoilers do not retract overcenter (should remain partially or fully extended).

(14) Manually place speedbrake lever in full forward RET position.

NOTE: During the following test procedures, the SPOILER DEPLOYED light on annunciator panel should come on when any spoiler is extended 10(±2) degrees (0.18(±0.035) rad) or greater. Light should go off with spoilers retracted. The nose gear oleo switches must be in ground mode for light to operate.

(15) Flight spoiler panels may or may not fully retract, manually move all flight spoiler panels to full retracted position, if necessary. Both ground only spoilers should remain partially or fully extended. SPOILER DEPLOYED light should be ON.

CAUTION: USE EXTREME CARE WHEN PERFORMING SPOILER TEST. HYDRAULIC SYSTEMS MUST NOT BE PRESSURIZED IN ANY MANNER TO PREVENT INJURY TO PERSONNEL.

(16) Manually move left ground only spoiler in retract direction to approximately one inch (25.4 mm) from fully retracted position. SPOILER DEPLOYED light should remain on.

(17) Simultaneously move left ground only spoiler panel in the extend direction and right ground only spoiler panel in the retract direction (may be fully retracted). SPOILER DEPLOYED light should remain on.

(18) While holding right ground only spoiler panel in retracted position, move left ground only spoiler panel to retracted position. SPOILER DEPLOYED light should go off.

(19) Place left and right spoiler shutoff valve levers in on position. Safety valve levers with safety pins.

(20) Pressurize left and right hydraulic systems.

(21) Manually move speedbrake lever to extreme aft (60° spoiler) position. All flight spoilers and ground only spoilers should be fully extended.

(22) Slowly move left throttle lever from idle position in forward thrust direction until both ground only spoilers retract (speedbrake lever should not knockdown). Place left throttle lever to idle position. Both ground only spoilers should fully extend.

WARNING: BEFORE MOVING LANDING GEAR HANDLE, MAKE CERTAIN THAT LANDING GEAR GROUND SAFETY LOCKPINS ARE INSTALLED IN BOTH MAIN GEAR AND NOSE LANDING GEAR.

(23) Place landing gear handle in up position, both ground only spoilers should retract. Place gear handle in down position, both ground only spoilers should fully extend.

(24) Place dummy target over left main gear weight-on-wheels (WOW) proximity sensor (Figure 505), both ground only spoilers should remain extended. Remove target from sensor.

NOTE: If left and right hydraulic pressures are not equal, the ground spoiler panels may slowly retract. This is acceptable. Immediate spoiler panel retraction is not acceptable.

(25) Place dummy target over right main gear (WOW) proximity sensor, both ground only spoilers should remain extended.

NOTE: A smooth, small retraction is allowable.

(26) With right main gear target installed, install dummy target over left main gear (WOW) proximity sensor. Both ground only spoilers should fully retract.

(27) Remove targets from left and right main gear (WOW) proximity sensors, both ground only spoilers should fully extend.

(28) Place speedbrake lever in unarmed retract position. All flight spoilers and ground only spoilers should be fully retracted.

(29) Shut off hydraulic pressure source.

(30) Connect ground sensing mechanism pushrod to sector on nose landing gear strut. (PAGEBLOCK 32-23-01/201)

(31) Remove the safety tag and close this circuit breaker:

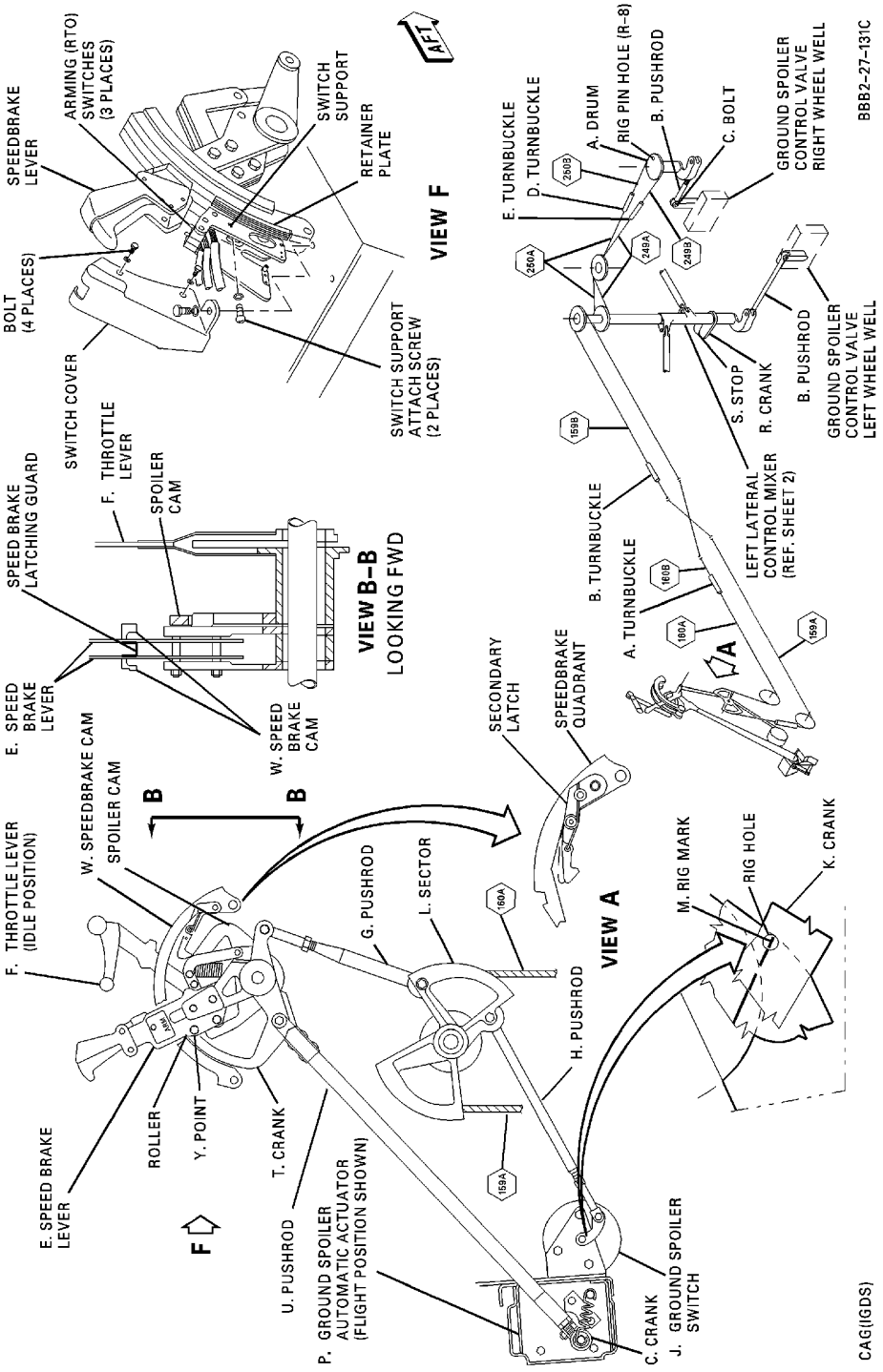
LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

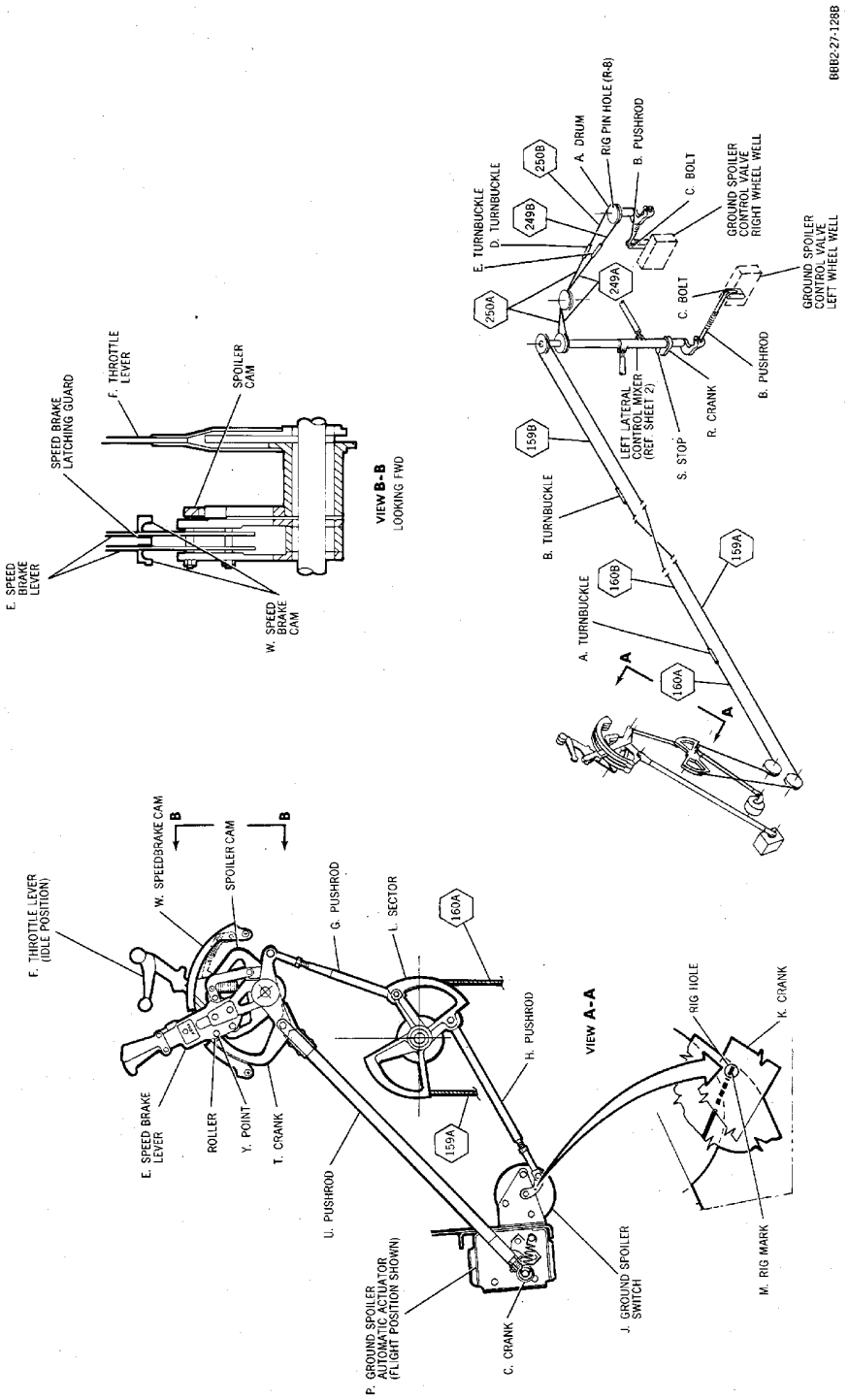
NOTE: If, “AUTOSPOILER DO NOT USE” light (on aircraft with overhead annunciator panel) or "AUTOSPOILER FAIL" legend (on aircraft with EOAP) is on. It is necessary to open and close spoiler control circuit breakers B1-244 and B1-243 to reset the monitors and extinguish lights.

(32) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

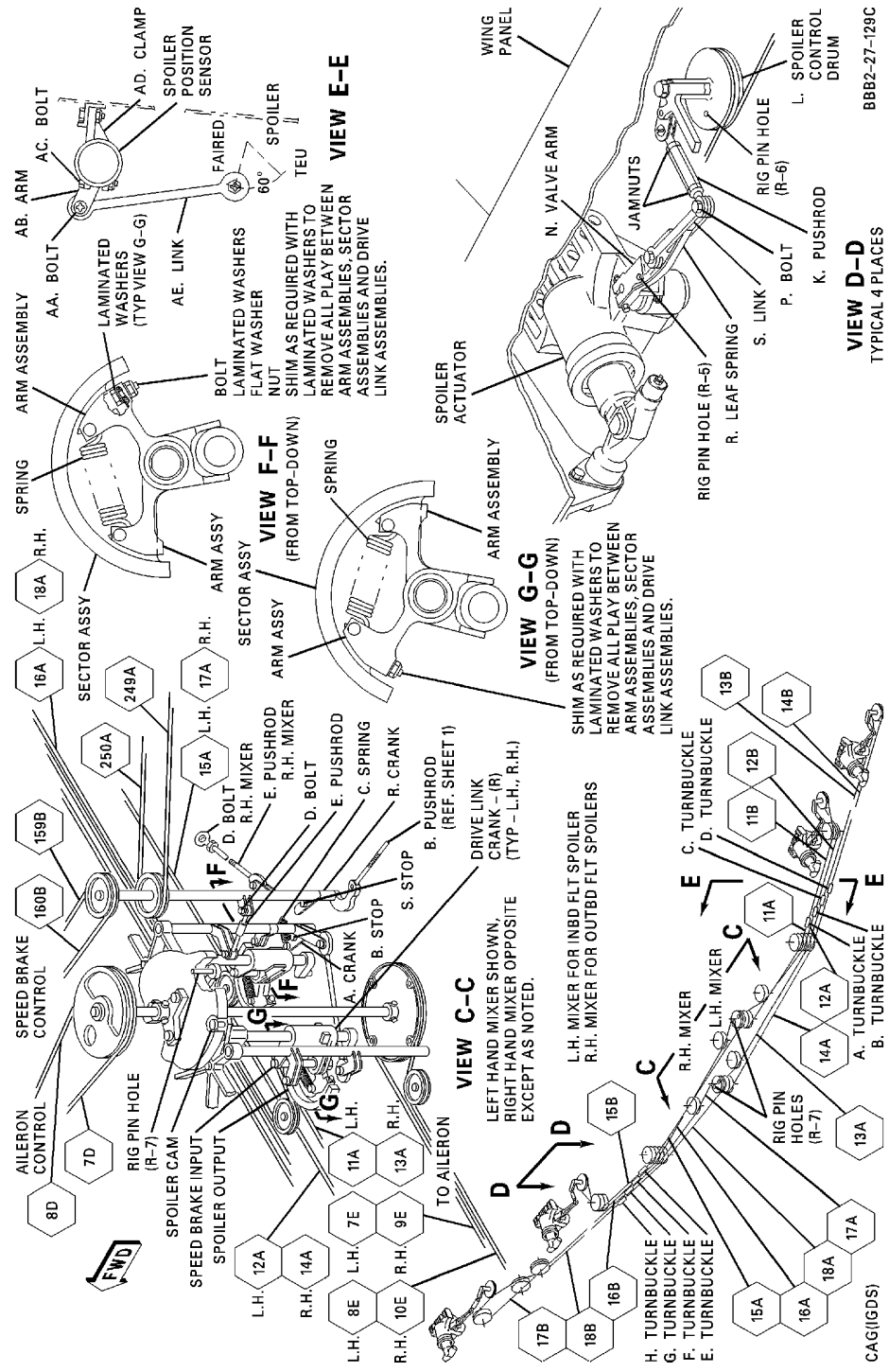
(33) Test spoiler automatic system. (Paragraph 4.)



Spoiler Speedbrake Controls -- Adjustment/Test
Figure 501/27-60-00-990-808 (Sheet 1 of 2)



Spoiler Speedbrake Controls -- Adjustment/Test
Figure 501/27-60-00-990-808 (Sheet 2 of 2)



Spoiler Controls in Wing -- Adjustment/Test
Figure 502/27-60-00-990-809

CABLE TENSION TABLE – 3/32 INCH DIAMETER

TEMP. deg. F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD	TEMP. deg. F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD
– 60	19	13	9	40	67	61	46
– 58	20	14	10	42	68	62	47
– 56	21	15	11	44	69	63	48
– 54	22	16	12	46	70	64	48
– 52	23	17	12	48	71	65	49
– 50	24	18	13	50	72	66	50
– 48	25	19	14	52	73	67	51
– 46	26	20	15	54	74	68	51
– 44	27	21	15	56	75	69	52
– 42	28	22	16	58	76	70	53
– 40	29	23	17	60	77	71	54
– 38	30	24	18	62	78	72	55
– 36	31	25	18	64	79	73	55
– 34	32	26	19	66	80	74	56
– 32	33	27	20	68	81	75	57
– 30	34	28	21	70	82	76	58
– 28	35	29	21	72	83	77	58
– 26	36	30	22	74	84	78	59
– 24	37	31	23	76	85	79	60
– 22	38	32	24	78	86	80	61
– 20	39	33	24	80	87	81	62
– 18	40	34	25	82	88	82	62
– 16	41	35	26	84	89	83	63
– 14	41	35	27	86	90	84	64
– 12	42	36	27	88	91	85	65
– 10	43	37	28	90	92	86	66
– 8	44	38	29	92	93	87	67
– 6	45	39	30	94	95	89	67
– 4	46	40	30	96	96	90	68
– 2	47	41	31	98	97	91	69
0	48	42	32	100	98	92	70
2	49	43	32	102	99	93	71
4	50	44	33	104	100	94	72
6	51	45	34	106	101	95	73
8	52	46	35	108	102	96	73
10	53	47	35	110	104	98	74
12	54	48	36	112	105	99	75
14	55	49	37	114	106	100	76
16	56	50	37	116	107	101	77
18	57	51	38	118	108	102	78
20	57	51	39	120	109	103	79
22	58	52	40	122	111	105	80
24	59	53	40	124	112	106	81
26	60	54	41	126	113	107	82
28	61	55	42	128	114	108	83
30	62	56	43	130	116	110	84
32	63	57	43	132	117	111	85
34	64	58	44	134	118	112	86
36	65	59	45	136	119	113	87
38	66	60	45	138	121	115	88
				140	122	116	89

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-197B

Spoiler Speedbrake Cable Tension Table
Figure 503/27-60-00-990-810 (Sheet 1 of 2)

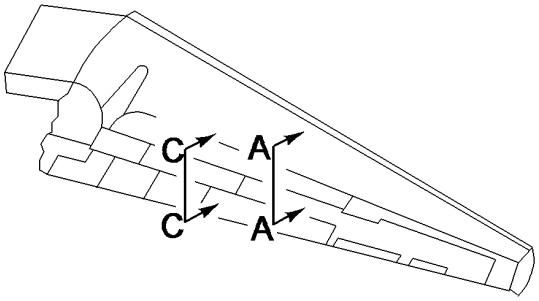
CABLE TENSION TABLE – 3/32 DIAMETER

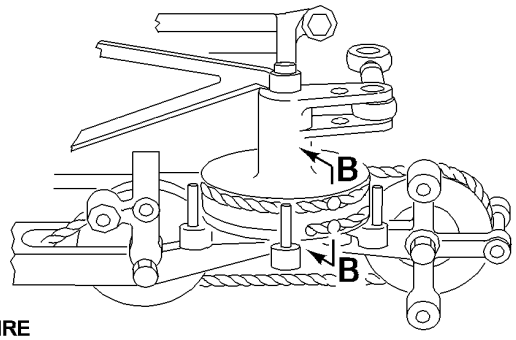
TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD
–60	7	1	0	40	30	24	18
–58	8	2	1	42	31	25	18
–56	8	2	1	44	31	25	19
–54	8	2	1	46	32	26	19
–52	9	3	1	48	33	27	20
–50	9	3	2	50	33	27	20
–48	9	3	2	52	34	28	21
–46	10	4	2	54	34	28	21
–44	10	4	2	56	35	29	22
–42	11	5	3	58	36	30	22
–40	11	5	3	60	36	30	23
–38	11	5	3	62	37	31	23
–36	12	6	4	64	38	32	24
–34	12	6	4	66	38	32	24
–32	12	6	4	68	39	33	25
–30	13	7	5	70	39	33	25
–28	13	7	5	72	40	34	26
–26	14	8	5	74	41	35	26
–24	14	8	6	76	41	35	27
–22	15	9	6	78	42	36	27
–20	15	9	6	80	43	37	28
–18	15	9	7	82	44	38	28
–16	16	10	7	84	44	38	29
–14	16	10	7	86	45	39	29
–12	17	11	8	88	46	40	30
–10	17	11	8	90	46	40	30
–8	18	12	8	92	47	41	31
–6	18	12	9	94	48	42	31
–4	19	13	9	96	48	42	32
–2	19	13	9	98	49	43	33
0	20	14	10	100	50	44	33
2	20	14	10	102	51	45	34
4	21	15	10	104	51	45	34
6	21	15	11	106	52	46	35
8	22	16	11	108	53	47	35
10	22	16	12	110	54	48	36
12	23	17	12	112	54	48	37
14	23	17	12	114	55	49	37
16	24	18	13	116	56	50	38
18	24	18	13	118	57	51	38
20	25	19	14	120	58	52	39
22	25	19	14	122	58	52	40
24	26	20	14	124	59	53	40
26	26	20	15	126	60	54	41
28	27	21	15	128	61	55	41
30	27	21	16	130	62	56	42
32	28	22	16	132	62	56	43
34	28	22	17	134	63	57	43
36	29	23	17	136	64	58	44
38	30	24	17	138	65	59	45
				140	66	60	45

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

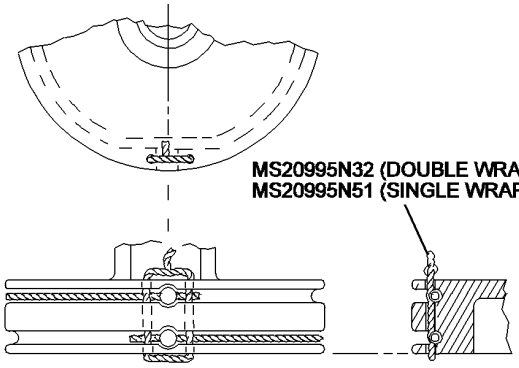
BBB2-27-278A

Spoiler Speedbrake Cable Tension Table
Figure 503/27-60-00-990-810 (Sheet 2 of 2)

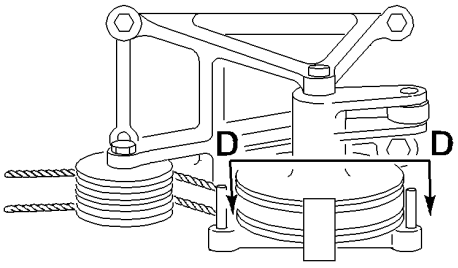




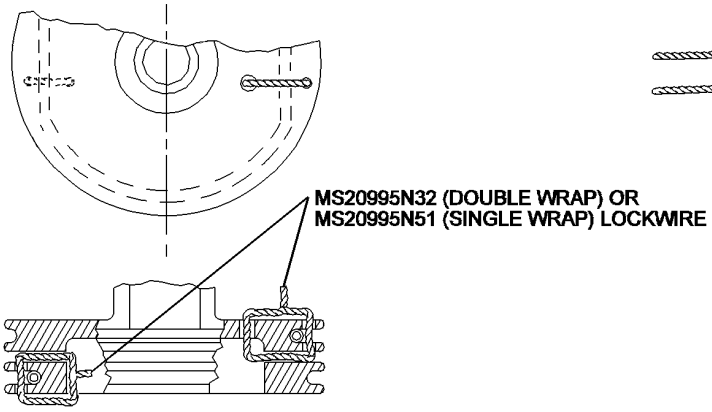
VIEW A-A



VIEW B-B



VIEW C-C



VIEW D-D

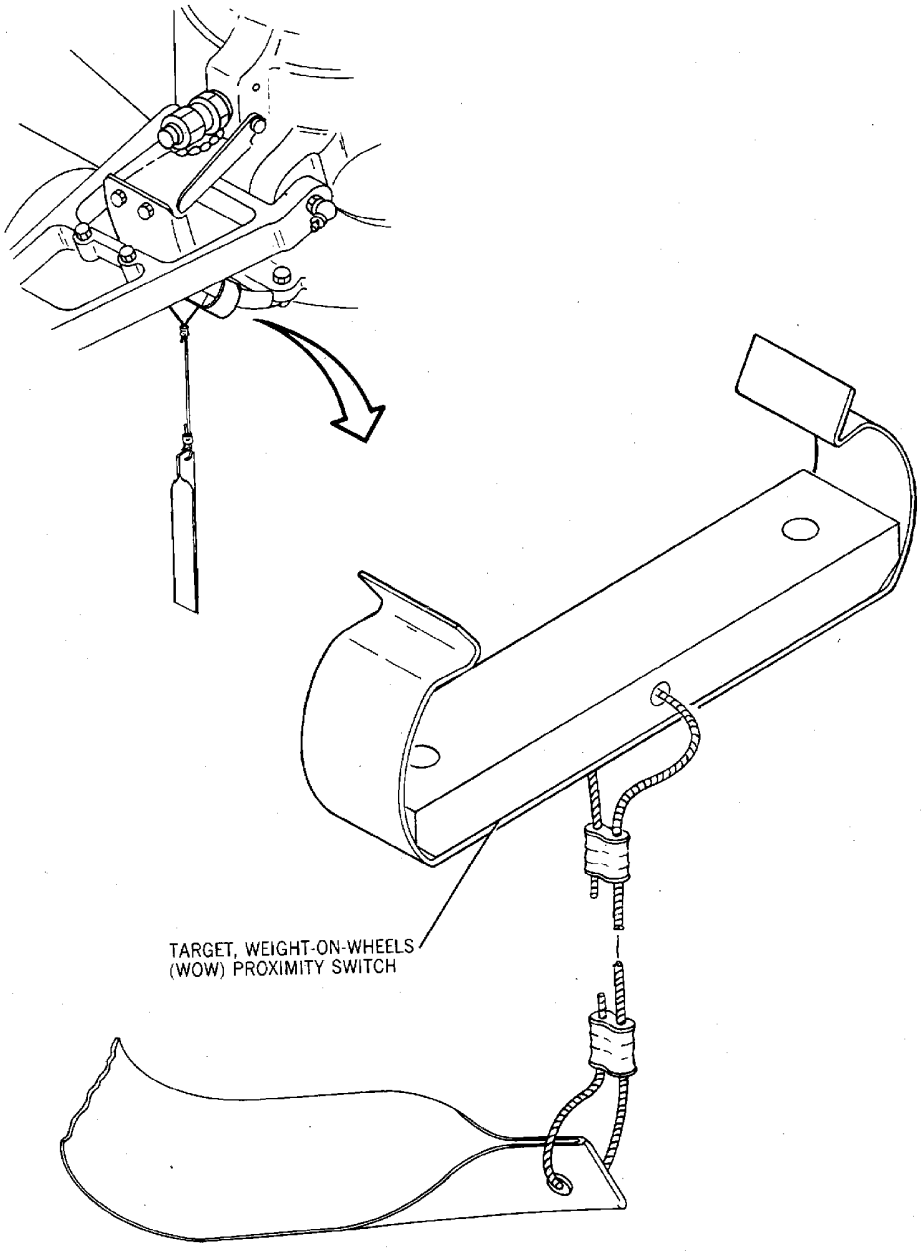
NOTE:

1. INSTALL LOCKWIRE OVER CABLES AS SHOWN.
2. LOCKWIRE INSTALLATION ON LEFT WING IS AS SHOWN IN VIEW D-D.

LOCKWIRE INSTALLATION TYPICAL
FOR BOTH SPOILER CONTROL DRUMS ON
LEFT WING.

BBB2-27-476
S0006535501V2

Lockwire Installation Spoiler Drum
Figure 504/27-60-00-990-811



Target, Weight-on-Wheels (WOW) Proximity Switch
Figure 505/27-60-00-990-812

4. **Test Spoiler Automatic System**

A. Test Wheel Speed Transducers Spin-Up Mode

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(Figure 506)

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(3) Make certain speedbrake lever is in unarmed retract position.

(4) Make certain aircraft is in ground mode (nose gear and main gear struts compressed).

(5) Remove hubcaps from all main gear landing wheels. (PAGEBLOCK 32-40-01/201)

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(6) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING
P	33	B1-244	SPOILER CONTROL

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY

WJE 417, 419, 421, 423, 865, 869, 871, 872 (Continued)

(Continued)

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(7) Install steel objects over right and left main gear up and latched proximity switches to simulate gear up.

NOTE: Steel objects must be placed over up and latch proximity switches within 3 seconds of each other or AUTO SPOILER DO NOT USE (on aircraft with EOAP, "AUTO SPOILER FAIL" legend) light may energize.

WJE 873, 874, 886, 887, 892, 893

(8) Simulate landing gear up.

(a) On aircraft without SB 31-34, "Take-Off Warning", place steel object over right main gear up and latched proximity switch.

(b) On aircraft with SB 31-34, "Take-Off Warning", place steel object over both left and right main gear up and latched proximity switches.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(9) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

WJE 875-879

NOTE: Do not perform Paragraph 4.A.(10) and Paragraph 4.A.(13) on aircraft 107.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(10) Press test switch on WARNING & CAUTION LIGHTS panel and check that AUTO SPOILER DO NOT USE light on annunciator is on.

WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891

(11) On aircraft with EOAP, verify that all "LED's" on overhead annunciator panel illuminate in series during test cycle. No specific message will illuminate.

WJE 401-411, 875-881, 883, 884

(12) On aircraft with EOAP, verify that "AUTO SPOILER FAIL" legend on overhead annunciator panel is on.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(13) Release test switch on WARNING & CAUTION LIGHTS panel, AUTO SPOILER DO NOT USE light on aircraft with EOAP, "AUTO SPOILER FAIL" legend should go off.

NOTE: AUTO SPOILER DO NOT USE light (on aircraft with EOAP, "AUTO SPOILER FAIL" legend) should not illuminate for remainder of tests except as noted.

WJE 873, 874, 886, 887, 892, 893

(14) Release test switch on WARNING & CAUTION LIGHTS panel, AUTO SPOILER DO NOT USE light should go off.

NOTE: AUTO SPOILER DO NOT USE light (on aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel) should not illuminate for remainder of tests except as noted.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(15) Remove the safety tag and close this circuit breaker:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

Auto spoiler actuator should move to retracted position.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(16) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

(17) Place speedbrake lever in armed position by raising lever vertically until red ARM label is visible. Lever should hold in this position.

NOTE: Do not move lever aft. If lever cannot be armed without any aft movement, the automatic actuator has not retracted or mechanical linkage to actuator is out of adjustment.

(18) Using drive motor and transducer spinner, spin the transducers one at a time in the following sequence at 1200 rpm or greater for 2-3 seconds. Speedbrake lever should stay in armed retracted position, AUTO SPOILER DO NOT USE light may come on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel may illuminate.

Table 503

1st - right outboard	4th - left inboard
2nd - right inboard	5th - left outboard
3rd - right outboard (repeat)	6th - left inboard (repeat)
WJE 873, 874, 886, 887, 892, 893	
NOTE: After spinning each transducer check AUTO SPOILER DO NOT USE light. If it is illuminated, reset it by momentarily opening and closing 115vac and 28vdc SPOILER CONTROL circuit breakers.	

WJE 873, 874, 886, 887, 892, 893 (Continued)

Table 503 (Continued)

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891
NOTE: After spinning each transducer check AUTO SPOILER DO NOT USE light or on aircraft with EOAP, "AUTO SPOILER FAIL" legend. If it is illuminated, reset it by momentarily opening and closing 115vac and 28vdc SPOILER CONTROL circuit breakers.

(19) While observing speedbrake lever, simultaneously spin both inboard and outboard transducers of right main gear at gradually increasing rpm for 2-3 seconds. Note rpm value of transducers when auto spoiler actuator moves speedbrake lever to full aft (60° spoiler) position. Rpm value should be 390 rpm minimum to 725 rpm maximum.

WJE 873, 874, 886, 887, 892, 893

(20) While observing speedbrake lever, simultaneously spin both inboard and outboard transducers of right main gear at a gradually increasing rpm. Record the rpm value of transducers when auto spoiler actuator moves speedbrake lever to full aft (60° spoiler) position. The rpm value should be 390 rpm minimum to 725 rpm maximum.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(21) Stop both right transducers.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(22) Manually place speedbrake lever to retract unarmed position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(23) Manually return speedbrake lever retract unarmed position.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(24) Close the following circuit breaker for only 2 seconds, then open the following circuit breaker:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

Auto spoiler actuator should be retracted.

(25) Lift speedbrake lever to armed (red ARM label visible) retracted position.

(26) While observing speedbrake lever, simultaneously spin both inboard and outboard transducers of left main gear at gradually increasing rpm for 2-3 seconds. Record the rpm value of transducers when auto spoiler actuator moves speedbrake lever to full aft (60° spoiler) position. Rpm value should be 390 rpm minimum to 725 rpm maximum.

(27) Stop both left transducers.

(28) Manually place speedbrake lever to unarmed retract position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(29) Remove steel objects from right and left main gear up and latched proximity switches.

WJE 873, 874, 886, 887, 892, 893

(30) Remove steel object from right main gear up and latched proximity switch.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(31) Remove the safety tags and close these circuit breakers:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(32) Remove door safety locks, close inboard doors and place main gear door ground maintenance bypass lever to normal position (lever retracted).

(33) Test spoiler automatic system landing mode. (Paragraph 4.B.)

B. Test Spoiler Automatic System Landing Mode

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(3) Make certain speedbrake lever is in unarmed retract position.

(4) Make certain aircraft is in ground mode (nose gear and main gear struts compressed).

(5) Make certain that both throttle levers are in full aft position.

(6) Make certain reverse thrust levers are in forward thrust position.

WJE 873, 874, 886, 887, 892, 893

(7) Install a steel object over right main gear up and latched proximity switch to simulate gear up.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(8) Open these circuit breakers and install safety tags:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(9) Make sure that these circuit breakers are closed:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING
P	33	B1-244	SPOILER CONTROL

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(10) Install steel objects over right and left main gear up and latched proximity switches to simulate gear up.

NOTE: Steel objects must be placed over up and latch proximity switches within 3 seconds of each other or AUTO SPOILER DO NOT USE light may illuminate. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel may illuminate.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(11) Make certain that AUTO SPOILER DO NOT USE light, located on WARNING & CAUTION LIGHTS panel, is off. On aircraft with EOAP, make certain that "AUTO SPOILER FAIL" legend on overhead annunciator panel is off.

WJE 873, 874, 886, 887, 892, 893

Verify that AUTO SPOILER DO NOT USE light, located on WARNING & CAUTION LIGHTS panel, is off. On aircraft with EOAP, verify that "AUTO SPOILER FAIL" legend on overhead annunciator panel is off.

WJE 415-427, 429, 861-866, 868, 869, 871-874, 886, 887, 891-893

NOTE: If light (or legend) is on, turn light or legend off by momentarily opening and closing the SPOILER CONTROL circuit breakers.

WJE 401-411, 875-881, 883, 884

NOTE: If light is on, turn light off by momentarily opening and closing the SPOILER CONTROL circuit breakers.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(12) Lift speedbrake lever to armed (red ARM label visible) retracted position. Lever should hold in this position.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

(13) Observing AUTO SPOILER DO NOT USE light (on aircraft with EOAP, "AUTO SPOILER FAIL" legend).

Close then open these crcuit breakers:

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

Speedbrake lever should stay armed.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

(a) For autobrake equipped aircraft, the AUTO SPOILER DO NOT USE light remains off during:

Close then open these crcuit breakers:

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 873, 874, 886, 887, 892, 893

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

(b) For non-autobrake equipped aircraft, the AUTO SPOILER DO NOT USE light comes on during:

Close then open this crcuit breaker:

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

(14) Observing AUTO SPOILER DO NOT USE light (on aircraft with EOAP, "AUTO SPOILER FAIL" legend).

Close then open these crcuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY

WJE 417, 419, 421, 423, 865, 869, 871, 872 (Continued)

(Continued)

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

Speedbrake lever should stay armed.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

(a) For autobrake equipped aircraft, the AUTO SPOILER DO NOT USE light remains off during:

Close then open these crcuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 873, 874, 886, 887, 892, 893

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

(b) For non-autobrake equipped aircraft, the AUTO SPOILER DO NOT USE light comes on during:

Close then open this crcuit breaker:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(15) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

(16) Close these circuit breakers:

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 875-881, 883, 884

AUTO SPOILER DO NOT USE light should come on after 10 seconds. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should come on after 10 seconds.

WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891

AUTO SPOILER DO NOT USE light should come on after 13(±3) seconds. On aircraft with EOAP, verify that "AUTO SPOILER FAIL" legend on overhead annunciator panel comes on after 13(±3) seconds.

WJE 873, 874, 886, 887, 892, 893

AUTO SPOILER DO NOT USE light should come on after 10 seconds. On aircraft with EOAP, auto spoiler actuator retracts and "AUTO SPOILER FAIL" legend on overhead annunciator panel comes on after 10 seconds.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(17) Open these circuit breakers and install safety tags:

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY

WJE 417, 419, 421, 423, 865, 869, 871, 872 (Continued)

(Continued)

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

AUTO SPOILER DO NOT USE light should stay on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should remain on.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(18) Simultaneously close the following circuit breakers for only 2 seconds, then open the following circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

AUTO SPOILER DO NOT USE light should stay on, (on aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should stay on); and speedbrake lever should remain armed in retracted position.

(19) Momentarily open and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

AUTO SPOILER DO NOT USE light should go off. On aircraft with EOAP, make certain that "AUTO SPOILER FAIL" legend on overhead annunciator panel should go off.

WJE 873, 874, 886, 887, 892, 893

AUTO SPOILER DO NOT USE light should go off. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should go off.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(20) Remove the safety tags and close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891

AUTO SPOILER DO NOT USE light should come on after 13(±3) seconds. On aircraft with EOAP, verify that "AUTO SPOILER FAIL" legend on overhead annunciator panel comes on after 13(±3) seconds.

WJE 401-411, 873-881, 883, 884, 886, 887, 892, 893

AUTO SPOILER DO NOT USE light should come on after 10 seconds. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel comes on after 10 seconds.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(21) Open these circuit breakers and install safety tags:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY

WJE 417, 419, 421, 423, 865, 869, 871, 872 (Continued)

(Continued)

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

AUTO SPOILER DO NOT USE light should stay on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should stay on.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(22) Momentarily open and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

AUTO SPOILER DO NOT USE light should go off. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should go off.

(23) Simultaneously close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

Speedbrake lever moves to full aft (60° spoiler) position. Auto spoiler actuator extended.

(24) Remove the safety tag and close this circuit breaker:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

WJE 401-411, 873-881, 883, 884, 886, 887, 892, 893

Auto spoiler actuator retracts. AUTO SPOILER DO NOT USE light comes on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel comes on.

WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891

Auto spoiler actuator retracts. AUTO SPOILER DO NOT USE light comes on. On aircraft with EOAP, verify that "AUTO SPOILER FAIL" legend on overhead annunciator panel comes on.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(25) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

WJE 401-411, 873-881, 883, 884, 886, 887, 892, 893

AUTO SPOILER DO NOT USE light remains on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel remains on.

WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891

AUTO SPOILER DO NOT USE light remains on. On aircraft with EOAP, verify that "AUTO SPOILER FAIL" legend on overhead annunciator panel remains on.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(26) Open these circuit breakers and install safety tags:

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

AUTO SPOILER DO NOT USE light remains on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel remains on.

(27) Remove the safety tags and close these circuit breakers:

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

AUTO SPOILER DO NOT USE light remains on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel remains on.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(28) Open these circuit breakers and install safety tags:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

AUTO SPOILER DO NOT USE light remains on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel remains on.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(29) Open these circuit breakers and install safety tags:

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

AUTO SPOILER DO NOT USE light remains on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel remains on.

WJE 873, 874, 886, 887, 892, 893

AUTO SPOILER DO NOT USE light goes OFF. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel goes off.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(30) Open and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

AUTO SPOILER DO NOT USE light goes off. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel goes off.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(31) Manually place speedbrake lever to unarmed retract position.

(32) Remove the safety tags and close these circuit breakers:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 873, 874, 886, 887, 892, 893

(33) Remove steel object from both left and right main gear up and latched proximity switch.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(34) Remove steel objects from right and left main gear up and latched proximity switches.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(35) Remove door safety locks, close inboard doors and place main gear door ground maintenance bypass lever to normal position (lever retracted).

WJE 401-411, 873-881, 883, 884, 886, 887, 892, 893

(36) Test automatic spoiler operation. (Paragraph 4.D.)

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

C. Test Rejected Takeoff (RTO) Mode

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(3) Make certain speedbrake lever is in unarmed retract position.

(4) Make certain aircraft is in ground mode (nose gear and main gear struts compressed).

(5) Make certain that both throttle levers are in full aft position.

(6) Make certain reverse thrust levers are in forward thrust position.

(7) Install steel objects over right and left main gear up and latched proximity switches.

WJE 405-411, 875-881, 883, 884

NOTE: Steel objects must be placed over up and latch proximity switches within 3 seconds (13 seconds on later aircraft) of each other or AUTO SPOILER DO NOT USE light may energize. (On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel may illuminate.)

WJE 401-404, 415-427, 429, 861-866, 868, 869, 871, 872, 891

NOTE: Steel objects must be placed over up and latch proximity switches within 13 seconds of each other or AUTO SPOILER DO NOT USE light may energize. (On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel may illuminate.)

WJE 405-411, 875-881, 883, 884

NOTE: On later aircraft with auto spoiler switching unit P/N 5935212-501 installed, the AUTO SPOILER DO NOT USE light will come on after 13 seconds. (On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel will come on after 13 seconds.)

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(8) Open these circuit breakers and install safety tags:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(9) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING
P	33	B1-244	SPOILER CONTROL

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891 (Continued)

(10) Make certain that AUTO SPOILER DO NOT USE light, located on WARNING & CAUTION LIGHTS panel, is off. On aircraft with EOAP, verify that "AUTO SPOILER FAIL" legend on overhead annunciator panel is off.

NOTE: If light is on, turn light (or legend) off by momentarily opening and closing the SPOILER CONTROL circuit breakers.

(11) Squeeze and lift speedbrake lever to armed position.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(12) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

(13) Simultaneously close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

Speedbrake lever should move to full aft (60° spoiler) position, auto spoiler actuator extended.

NOTE: On ships prior to Fuselage 1062, left speed brake arm switch S1-445, is physically located on right side and right speed brake arm switch S1-446, on left. On Fuselage 1062 and subsequent, switches are located on their respective sides.

WJE 401-404, 415-427, 429, 861-866, 868, 869, 871, 872, 891

(14) Manually actuate for 2 seconds then release left speedbrake arm switch, located forward of speedbrake lever. AUTO SPOILER DO NOT USE light comes on after 13(±3) seconds (on aircraft with EOAP, make certain that "AUTO SPOILER FAIL" legend on overhead annunciator panel comes on after 13(±3) seconds), auto spoiler actuator remains extended.

WJE 405-411, 875-881, 883, 884

(15) Manually actuate for 2 seconds then release left speedbrake arm switch, located forward of speedbrake lever. AUTO SPOILER DO NOT USE light (on aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel) comes on after 10 seconds (13 seconds on later aircraft), auto spoiler actuator remains extended.

NOTE: On later aircraft with auto spoiler switching unit P/N 5935212-501 installed, the AUTO SPOILER DO NOT USE light will come on after 13 seconds. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel will come on after 13 seconds.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(16) Manually actuate for 2 seconds then release right speedbrake arm switch. AUTO SPOILER DO NOT USE light remains on (on aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel remains on), auto spoiler actuator remains extended.

(17) Open and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

AUTO SPOILER DO NOT USE light goes off (on aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel goes off), auto spoiler actuator retracts, and speedbrake lever remains in full aft position.

(18) Manually actuate and hold both left and right speedbrake arm switches. Auto spoiler actuator extends.

NOTE: On ships prior to Fuselage 1062, left speed brake arm switch S1-445, is physically located on right side and right speed brake arm switch S1-446, on left. On Fuselage 1062 and subsequent, switches are located on their respective sides.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891 (Continued)

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(19) Open these circuit breakers then release left speedbrake arm switch.

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

Auto spoiler actuator remains extended, AUTO SPOILER DO NOT USE light remains off. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel remains off.

NOTE: If light is on, turn light (or legend) off by momentarily opening and closing the SPOILER CONTROL circuit breakers.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(20) Open these circuit breakers then release right speedbrake arm switch.

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

Auto spoiler actuator remains extended, AUTO SPOILER DO NOT USE light remains off. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel remains off.

NOTE: If light is on, turn light (or legend) off by momentarily opening and closing the SPOILER CONTROL circuit breakers.

(21) Simultaneously close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(22) Actuate both left and right speedbrake arm switches for 2 seconds and release arm switches. Auto spoiler actuator retracts.

(23) Place left reverse thrust lever in reverse thrust position. Auto spoiler actuator remains retracted.

(24) Place left thrust reverse lever in forward thrust position.

(25) Place right reverse thrust lever in reverse thrust position. Auto spoiler actuator remains retracted.

(26) Place right thrust reverse lever in forward thrust position.

(27) Place both left and right reverse thrust levers in reverse thrust position. Auto spoiler actuator should extend.

(28) Remove steel object from left main gear up proximity switch.

WJE 401-404, 415-427, 429, 861-866, 868, 869, 871, 872, 891

(29) Observing AUTO SPOILER DO NOT USE light (on aircraft with EOAP, "AUTO SPOILER FAIL" legend), close LANDING GEAR WARNING circuit breaker. AUTO SPOILER DO NOT USE light comes on after 13(±3) seconds. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel comes on after 13(±3) seconds.

WJE 405-411, 875-881, 883, 884

(30) Observing AUTO SPOILER DO NOT USE light, close LANDING GEAR WARNING circuit breaker. AUTO SPOILER DO NOT USE light (on aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel) comes on after 10 seconds (13 seconds on later aircraft).

NOTE: On later aircraft with auto spoiler switching unit P/N 5935212-501 installed, the AUTO SPOILER DO NOT USE light will come on after 13 seconds. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel will come on after 13 seconds.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(31) Install steel object over left main gear up proximity switch.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(32) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

AUTO SPOILER DO NOT USE light goes off. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel goes off.

(33) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

WJE 401-404, 415-427, 429, 861-866, 868, 869, 871, 872, 891

Auto spoiler actuator retracts and AUTO SPOILER DO NOT USE light comes on after 3 seconds. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel comes on after 3 seconds.

WJE 405-411, 875-881, 883, 884

Auto spoiler actuator retracts and AUTO SPOILER DO NOT USE light comes on after 3 seconds (13 seconds on later aircraft). On aircraft with EOAP, auto spoiler actuator retracts and "AUTO SPOILER FAIL" legend on overhead annunciator panel comes on after 3 seconds.

NOTE: Steel objects must be placed over up and latch proximity switches within 3 seconds of each other or AUTO SPOILER DO NOT USE light may energize. (On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel may illuminate.)

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(34) Place left and right reverse thrust levers to forward thrust position.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(35) Open these circuit breakers and install safety tags:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(36) Open and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

AUTO SPOILER DO NOT USE light goes off. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel goes off.

(37) Manually return speedbrake lever to unarmed retract position.

(38) Remove steel objects from left and right main gear up proximity switches.

(39) Remove the safety tags and close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			

WJE 417, 419, 421, 423, 865, 869, 871, 872 (Continued)

(Continued)

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	30	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891

K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name

WJE 417, 419, 421, 423, 865, 869, 871, 872

L	30	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891

L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(40) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

(41) Test automatic spoiler operation (Paragraph 4.D.)

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

D. Test Automatic Spoiler Operation

WJE 401-404

Without Service Bulletin 27-312, Deactivation of In-Flight Spoiler Lockout Mechanism

WJE 873, 874, 886, 887, 892, 893

Test Automatic Spoiler Operation (Without Service Bulletin 27-312, Deactivation of In-Flight Spoiler Lockout Mechanism)

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Make certain speedbrake lever is in unarmed retract position.

(3) Make certain aircraft is in ground mode (nose gear and main gear struts compressed).

(4) Make certain that both throttle levers are in full aft position.

(5) Make certain reverse thrust levers are in forward thrust position.

(6) Install steel objects over right and left main gear up and latched proximity switches to simulate gear up.

WJE 401-404, 415-427, 429, 861-866, 868, 869, 871, 872, 891

NOTE: Steel objects must be placed over up and latch proximity switches within 13 seconds of each other or AUTO SPOILER DO NOT USE light may energize. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel may illuminate.

WJE 405-411, 875-881, 883, 884

NOTE: Steel objects must be placed over up and latch proximity switches within 3 seconds (13 seconds on later aircraft) of each other or AUTO SPOILER DO NOT USE light may energize. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel may illuminate.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(7) Open these circuit breakers and install safety tags:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING
P	33	B1-244	SPOILER CONTROL

(8) Make certain that AUTO SPOILER DO NOT USE light, located on WARNING & CAUTION LIGHTS panel, is off. On aircraft with EOAP, make certain that "AUTO SPOILER FAIL" legend on overhead annunciator panel is not illuminated.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

NOTE: If light (or, on aircraft with EOAP, legend) is on, turn light off by momentarily opening and closing the SPOILER CONTROL circuit breakers.

WJE 873, 874, 886, 887, 892, 893

NOTE: If light (or legend) is on, turn light (or legend) off by momentarily opening and closing the SPOILER CONTROL circuit breakers.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(9) Open these circuit breakers and install safety tags:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(10) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

Auto spoiler actuator should be retracted.

(11) Lift speedbrake lever to armed (red ARM label visible) retracted position.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(12) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(13) Check that pilots control wheel is in neutral position, all spoilers should be retracted.

(14) Remove the safety tag and close this circuit breaker:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

AUTO SPOILER DO NOT USE light should come on after 3 seconds. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should come on after 3 seconds.

WJE 873, 874, 886, 887, 892, 893

AUTO SPOILER DO NOT USE light should come on after 3 seconds.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(15) Simultaneously close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

Speedbrake lever moves to full aft (60° spoiler) position, auto spoiler actuator extended. Flight spoilers on each wing are fully extended. Ground only spoilers remain retracted.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(16) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

AUTO SPOILER DO NOT USE light should go off. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should go off.

(17) Remove the safety tag and close this circuit breaker:

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

AUTO SPOILER DO NOT USE light should come on after 3 seconds. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should come on after 3 seconds.

(18) Remove the safety tag and close this circuit breaker:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

Ground only spoilers should be fully extended. AUTO SPOILER DO NOT USE light should be off. On aircraft with EOAP, “AUTO SPOILER FAIL” legend on overhead annunciator panel should be off.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(19) Open these circuit breakers and install safety tags:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

(20) Move left throttle lever all the way forward. Speedbrake lever should drop down and move to full forward (retract) position. All flight spoilers should be fully retracted.

(21) Place left throttle lever to full aft position.

(22) Manually move and lift speedbrake to full aft (60° spoiler) position. All flight spoilers should fully extend. Ground only spoilers should remain retracted.

(23) Manually place speedbrake lever to unarmed retract position. All spoilers should be retracted.

(24) Shut off hydraulic pressure source.

(25) Remove the safety tags and close these circuit breakers:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

(26) Remove steel object from right main gear up and latched proximity switch.

(27) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

E. Functional Check For Deactivated In-Flight Spoiler Lockout Mechanism

WJE 401-411, 873-881, 883, 884, 886, 887, 892, 893

With Service Bulletin 27-312

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

WJE 873-879, 886, 887, 892, 893

(2) Make certain auto spoiler actuator is in flight position. If required, retract actuator (Ref. 27-62-05 or equivalent method--spoiler actuator tester, P/N C652-7910334-PTE7).

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 880, 881, 883, 884, 891

(3) Make certain auto spoiler actuator is in flight position. If required, retract actuator (Ref. 27-62-05 or equivalent method).

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(4) Remove and retain for installation, smoke barrier panel in upper forward portion of E & E compartment for access to in-flight spoiler lockout mechanism (Ref. 6-31-00, door 4510A).

WJE 873-879, 886, 887, 892, 893

(5) For aircraft on ground (not on jacks), disconnect pushrod from ground sense cable sector. Place ground sense mechanism in flight mode by rotating sector to strut extended position.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 880, 881, 883, 884, 891

(6) For aircraft on ground (not on jacks), disconnect ground sense mechanism pushrod from sector. (PAGEBLOCK 32-23-01/201) Place ground sense mechanism in flight mode by rotating sector to strut extended position.

WJE 873-879, 886, 887, 892, 893

(7) For aircraft on jacks, ground sense mechanism will already be in flight mode. No need exists to disconnect pushrod from ground sense cable sector due to extended nose landing gear strut.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 880, 881, 883, 884, 891

(8) For aircraft on jacks, ground sense mechanism will already be in flight mode. No need exists to disconnect pushrod from sector due to extended nose landing gear strut.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(9) Position flap/slat handle to "0" DEG./T.O. EXT DETENT.

(10) Make certain that both throttle levers are in full aft position.

(11) Make certain that reverse thrust levers are in forward thrust position.

(12) Make certain speedbrake lever is in unarmed retract position (red ARM label not visible).

(13) Move speedbrake lever aft to speedbrake EXT (34 degrees) detent. Observe spoiler lockout mechanism through smoke barrier panel opening in E & E compartment while speedbrake lever is moving aft. Make certain there is no interference with sector "AG" during rotation.

(14) Place speedbrake lever forward to retract position. Continue observation of sector "AG" for freedom of movement.

(15) Rotate dial-a-flap thumbwheel to obtain DAF indicator reading of 8 degrees. Place flap/slat handle in DAF moveable detent at 8 degrees. Make certain nothing interferes with sector "AF" during rotation while flap/slat handle is moving aft.

(16) Repeat to make certain that speedbrake lever can still be moved aft to EXT detent with flap/slat handle at 8 degrees.

(17) Place flap/slat handle in 40 DEG/LAND EXT detent. Make certain nothing interferes with sector "AF" during rotation while flap/slat handle is moving aft.

(18) Repeat Paragraph 4.E.(12), Paragraph 4.E.(13), and Paragraph 4.E.(14) to make certain speedbrake lever can still be moved aft to EXT detent with flap/slat handle at 40 degrees.

WJE 873-879, 886, 887, 892, 893

(19) Pull speedbrake lever up into armed position (red ARM label visible). Extend auto spoiler actuator to ground position (Ref. 27-62-05 or equivalent method--spoiler actuator tester, P/N C652-7910334-PTE7).

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 880, 881, 883, 884, 891

(20) Pull speedbrake lever up into armed position (red ARM label visible). Extend auto spoiler actuator to ground position (Ref. 27-62-05 or equivalent method.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(21) Make certain speedbrake lever automatically moves aft to full 60 degrees ground spoiler position.

(22) Observe spoiler lockout mechanism while speedbrake lever is moving aft. Make certain no interference exists with sector "AG" during rotation.

(23) Place speedbrake lever forward to retract, armed position (red ARM label still visible). Make certain sector "AG" rotates freely.

(24) Retract auto spoiler actuator to flight position.

(25) For aircraft on ground (not on jacks), place ground sense mechanism in ground mode by rotating ground sense cable sector back to strut compressed position.

WJE 873, 874, 886, 887, 892, 893

(26) For aircraft on jacks, disconnect ground sensing mechanism pushrod from sector and rotate sector to strut compressed position. (PAGEBLOCK 32-23-01/201)

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(27) For aircraft on ground and on jacks, disconnect ground sensing mechanism pushrod from sector and rotate sector to strut compressed position. (PAGEBLOCK 32-23-01/201)

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(28) Make certain armed speed brake lever can be moved aft to full 60 degree ground spoiler position. Observe spoiler lockout mechanism while speedbrake lever is moving aft and that sector AG operates through it's rotation without interference.

(29) Place speedbrake lever in the forward, retract position (red ARM label not visible). Observe that sector AG operates through its rotation without interference.

WJE 873, 874, 886, 887, 892, 893

(30) Reconnect pushrod to ground sense cable sector.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(31) Connect ground sensing mechanism pushrod to sector on nose landing gear strut. (PAGEBLOCK 32-23-01/201)

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(32) Retract flap/slat handle to UP/RET detent. Observe that sector AF operates through its rotation without interference.

(33) Reinstall smoke barrier panel in upper forward portion of E & E compartment (Ref. MM 6-31-00, door 4510A).

(34) Remove main landing gear door safety locks, close inboard main landing gear doors, and return main gear door ground maintenance bypass lever to normal position (lever retracted).

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

F. Spoiler Deployed, AUTOSPOILER FAIL or AUTOSPOILER DO NOT USE Indication

(1) Make sure electrical power is available and all necessary circuit breakers are closed.

(2) Do an Operational Check of Auto Spoiler Fail Indication.

(a) Gain access to autospoiler switching unit in aft left radio rack shelf 2.

(b) Push TEST switch on autospoiler switching unit.

1) Make sure AUTOSPOILER FAIL alert shows on EOAP or AUTOSPOILER DO NOT USE alert shows on overhead annunciator panel.

(c) Release TEST switch.

1) Make sure AUTOSPOILER FAIL alert goes out on EOAP.

2) Open and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

3) AUTOSPOILER DO NOT USE alert goes out on overhead annunciator panel.

(3) Do an Operational Check of Spoiler Deployed Light.

(a) Make sure aircraft is in ground mode.

(b) Make sure throttles are in idle position.

(c) Make sure spoiler handle is in RET position.

WARNING: BEFORE YOU PRESSURIZE THE HYDRAULIC POWER SYSTEM, MAKE SURE THE NOSE AND MAIN LANDING GEAR LOCKPINS ARE INSTALLED. MAKE SURE THE APPLICABLE CONTROLS ARE IN THE CORRECT POSITION. THIS WILL PREVENT ACCIDENTAL OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS, INJURY TO PERSONS, AND DAMAGE TO EQUIPMENT.

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE CLEAR OF THE AREA. THIS WILL PREVENT INJURY TO PERSONS AND DAMAGE TO THE EQUIPMENT.

(d) Pressurize hydraulic system. (PAGEBLOCK 29-00-00/201)

(e) Rotate control wheel clockwise.

1) Make sure SPOILER DEPLOYED alert shows on EOAP or SPOILER DEPLOYED alert shows on overhead annunciator panel.

(f) Return control wheel to neutral position.

1) Make sure SPOILER DEPLOYED alert goes out on EOAP or SPOILER DEPLOYED alert goes out on overhead annunciator panel.

(g) Rotate control wheel counterclockwise.

1) Make sure SPOILER DEPLOYED alert shows on EOAP or SPOILER DEPLOYED alert shows on overhead annunciator panel.

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891 (Continued)

(h) Return control wheel to neutral position.

1) Make sure SPOILER DEPLOYED alert goes out on EOAP or SPOILER DEPLOYED alert goes out on overhead annunciator panel.

(4) Do an Operational Check of Auto Spoiler System.

(a) ARM autospoiler handle.

WARNING: MAKE SURE LEFT AND RIGHT THRUST REVERSERS ARE CLEAR TO OPERATE. THIS WILL PREVENT INJURY TO PERSONS.

(b) Place both thrust reverser handles in reverse thrust position.

1) Spoiler handle moves aft.

2) Spoilers deploy.

(c) Return thrust levers to forward position.

(d) Push thrust levers forward.

1) Speedbrake handles moves to RET/DISARMED position.

2) Spoilers retract.

(e) Squeeze and lift speed brake handle to ARMED position.

1) Auto spoiler actuator retracts.

(f) DISARM speed brake handle.

(g) Depressurize hydraulic system. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

(h) Return aircraft to required configuration.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

G. Functional Check of Active Spoiler In-Flight Lock-out Mechanism, (with Weight-On-Wheels Unlocking Input)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(2) Make certain auto spoiler actuator is in flight position. If required, retract actuator (Ref. 27-62-05 or equivalent method--spoiler actuator tester, P/N C652-7910334-PTE7).

WJE 873, 874, 886, 887, 892, 893

(3) Make certain auto spoiler actuator is in flight position. If required, retract actuator (Ref. 27-62-05, paragraph 4. or equivalent method).

(4) Remove and retain for re-installation, two access doors, 4201A and 4302A (INTERNAL ACCESS DOORS, SUBJECT 06-31-00, Figure 2) in upper nose landing gear wheel well, and smoke barrier panel 4510A (INTERNAL ACCESS DOORS, SUBJECT 06-31-00, Figure 4) in upper forward portion of E & E compartment for access to auto-spoiler actuator and in-flight spoiler lockout mechanism.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(5) Remove and retain for re-installation, smoke barrier panel in upper forward portion of E & E compartment for access to in-flight spoiler lockout mechanism. (INTERNAL ACCESS DOORS, SUBJECT 06-31-00, door 4510A)

(6) For aircraft on ground, disconnect ground sensing mechanism pushrod from nose landing gear sector. Place ground sense mechanism in flight mode by rotating sector to strut extended position. (PAGEBLOCK 32-23-01/201)

(7) For aircraft on jacks, ground sense mechanism will already be in flight mode. No need exists to disconnect pushrod from sector due to extended nose landing gear strut.

WJE 873, 874, 886, 887, 892, 893

(8) For aircraft on jacks, ground sense mechanism will already be in flight mode. No need exists to disconnect pushrod from ground sense cable sector due to extended nose landing gear strut.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(9) Position flap/slat handle to "0" DEG./T.O. EXT DETENT.

(10) Make certain that both throttle levers are in full aft (IDLE) position.

(11) Make certain that reverse thrust levers are in forward thrust position.

(12) Make certain speedbrake lever is in full forward, unarmed, retract position (red ARM label not visible).

(13) Move speedbrake lever aft to speed brake EXT (34 degrees) detent. Observe spoiler lockout mechanism through smoke barrier panel opening in E & E compartment while speedbrake lever is moving aft. Make certain there is no interference with sector AG during rotation and that mechanism operates smoothly and freely throughout range of travel.

(14) Return speedbrake lever forward to retract, unarmed, position. Continue observation of sector AG for freedom of movement.

(15) Rotate dial-a-flap thumbwheel to obtain a DAF indicator reading of 8 degrees. Place flap/slat handle in DAF moveable detent at 8 degrees. Observe mechanism during operation, make certain nothing interferes with sector AF during rotation while flap/slat handle is moving aft and operation is smooth and free.

(16) Attempt to cycle speed brake control lever, make certain that it cannot be moved aft to first speed brake detent (1/4).

(17) Place flap/slat handle in 40 DEG/LAND EXT detent. Make certain nothing interferes with sector AF during rotation while flap/slat handle is moving aft.

(18) Repeat Paragraph 4.G.(15) to make certain speedbrake lever cannot be moved aft to EXT detent with flap/slat handle at 40 degrees.

(19) For aircraft on ground (not on jacks), place ground sense mechanism in ground mode by rotating ground sense cable sector to strut compressed position.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(20) For aircraft on ground and on jacks, disconnect ground sensing mechanism pushrod from sector on nose landing gear strut. Place ground sense mechanism in ground mode by rotating sector to strut compressed position.

WJE 873, 874, 886, 887, 892, 893

(21) For aircraft on jacks, place ground sense mechanism in ground mode. If not previously accomplished, disconnect ground sensing mechanism pushrod from sector and rotate sector to strut compressed position. (PAGEBLOCK 32-23-01/201)

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(22) Pull speedbrake lever up into armed position (red ARM label visible). Place speedbrake lever in AFT, 60 degree, ground spoiler full extend position.

(23) Observe spoiler lockout mechanism while speedbrake lever is moving aft. Make certain no interference exists with sector AG during rotation.

(24) Return speedbrake lever forward to retract, armed position (red ARM label still visible). Make certain sector AG rotates freely.

(25) For aircraft on ground (not on jacks), place ground sense mechanism in flight mode. Rotate ground sense cable sector to strut extended position.

WJE 873, 874, 886, 887, 892, 893

(26) For aircraft on jacks, make certain that ground sense mechanism is in flight mode. If required, rotate sector to strut extended position.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(27) For aircraft on ground and on jacks, place ground sense mechanism in flight mode. Rotate sector to strut extended position. (PAGEBLOCK 32-23-01/201)

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(28) Extend auto spoiler actuator to ground position. (SPOILER AUTOMATIC ACTUATOR - MAINTENANCE PRACTICES, PAGEBLOCK 27-62-05/201)

(29) Make certain that speed brake lever automatically moves aft to full 60 degree ground spoiler position. Observe spoiler lockout mechanism while speedbrake lever is moving aft and that sector AG operates through cycle without interference.

(30) Place speedbrake lever in the forward, not armed, retract position (red ARM label not visible). Observe that sector AG operates through cycle without interference.

(31) Retract auto spoiler actuator to flight position.

(32) Cover both left and right main landing gear weight-on-wheels (WOW) sensors with simulated targets (if aircraft is on jacks and targets are installed and unshielded, sensors are already covered).

(33) Place landing gear control lever in DOWN position.

(34) Make sure that these circuit breakers are closed:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, ICE PROTECTION LEFT DC BUS

Row	Col	Number	Name
M	31	B1-1009	SPOILER LOCKOUT

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893 (Continued)

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 405-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 405-411, 415, 416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(35) Make certain that applicable circuit power is available through each circuit breaker.

(36) Uncover right main landing gear WOW sensor (remove or shield target if aircraft is on jacks).

(37) Pull speed brake control lever up into armed position (red ARM label visible). Move lever aft to full 60 DEG ground spoiler position.

(38) Return speed brake control lever forward to retract, ARMED position.

(39) Cover right main landing gear WOW sensor with simulated target (if aircraft is on jacks and targets are installed and unshielded, then sensors are already covered).

(40) Make certain that WOW solenoid is still energized and speed brake lever can still be moved aft to full 60 degree ground spoiler position.

NOTE: This function checks operation of WOW latching relay.

(41) Return speed brake control lever to forward, retract ARMED position.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(42) Open this circuit breaker and install safety tag:

LOWER EPC, ICE PROTECTION LEFT DC BUS

Row	Col	Number	Name
M	31	B1-1009	SPOILER LOCKOUT

(43) For aircraft on ground (not on jacks), place ground sense mechanism in ground mode by rotating ground sense cable sector to strut compressed position.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(44) For aircraft on ground and on jacks, place ground sense mechanism in ground mode by rotating sector to strut compressed position. (PAGEBLOCK 32-23-01/201)

WJE 873, 874, 886, 887, 892, 893

(45) For aircraft on jacks, place ground sense mechanism in ground mode by rotating sector to strut compressed position.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(46) Make certain that WOW solenoid has de-energized.

NOTE: This function checks operation of nose landing gear cut-out relay.

(47) Uncover right main landing gear WOW sensor (if aircraft is on jacks shield proximity target, as required).

(48) For aircraft on ground (not on jacks), place ground sense mechanism in flight mode by rotating ground sense cable sector to strut extended position.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(49) For aircraft on ground and on jacks, place ground sense mechanism in flight mode by rotating sector to strut extended position.

WJE 873, 874, 886, 887, 892, 893

(50) For aircraft on jacks, make certain that ground sense mechanism is in flight mode. If required, rotate sector to strut extended position.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(51) Make certain that WOW solenoid energizes at 10(±5) seconds after shift to flight mode.

NOTE: This operation checks function of takeoff time delay relay.

(52) Return speed brake control lever to forward, unarmed (red ARM label not visible) stowed position.

(53) For aircraft on ground (not on jacks), place ground sense mechanism in ground mode by rotating ground sense cable sector to strut compressed position.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(54) For aircraft on ground and on jacks, place ground sense mechanism in ground mode. Rotate sector to strut compressed position.

WJE 873, 874, 886, 887, 892, 893

(55) For aircraft on jacks, make certain that ground sense mechanism is in ground mode. If required, rotate sector to strut compressed position.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(56) Reconnect pushrod to nose landing gear ground sense cable sector (PAGEBLOCK 32-23-01/201).

(57) Retract flap/slat handle to UP/RET detent. Observe that sector AF operates through its rotation without interference.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(58) Reinstall smoke barrier panel in upper forward portion of E & E compartment. (INTERNAL ACCESS DOORS, SUBJECT 06-31-00, door 4510A)

WJE 873, 874, 886, 887, 892, 893

(59) Make certain that all tools and equipment are removed from work area and that work area is clean. Reinstall smoke barrier panel in upper forward portion of E & E compartment. (INTERNAL ACCESS DOORS, SUBJECT 06-31-00, door 4510A) Reinstall access in upper nose landing gear wheel well. (INTERNAL ACCESS DOORS, SUBJECT 06-31-00, doors 4201A and 4302A) (INTERNAL ACCESS DOORS, SUBJECT 06-31-00, Figure 2)

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(60) Remove covers from left and right main landing gear WOW sensors.

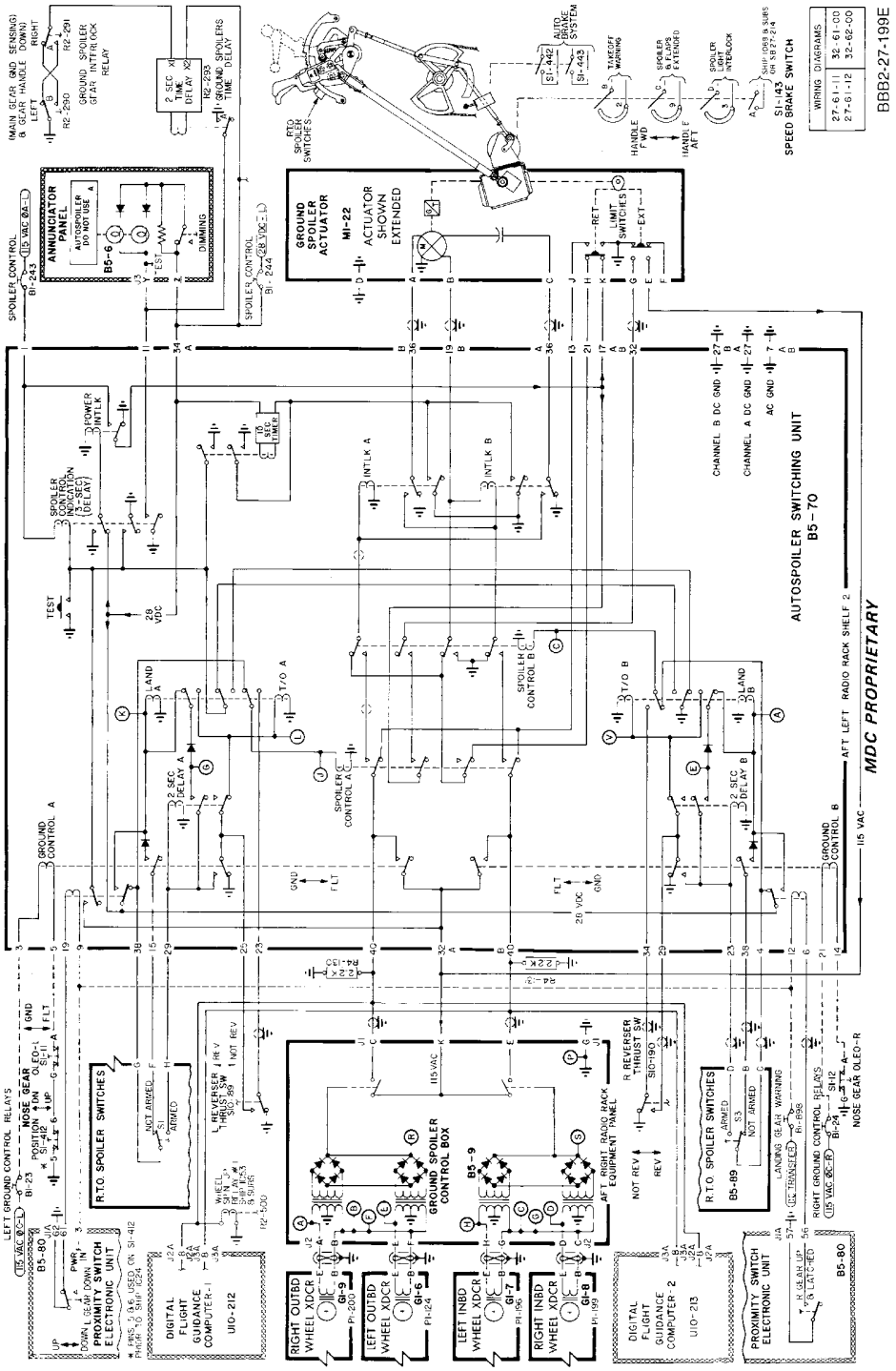
(61) Remove main landing gear door safety locks, close inboard main landing gear doors, and return main gear door ground maintenance bypass lever to normal position (lever retracted).

(62) Remove the safety tag and close this circuit breaker:

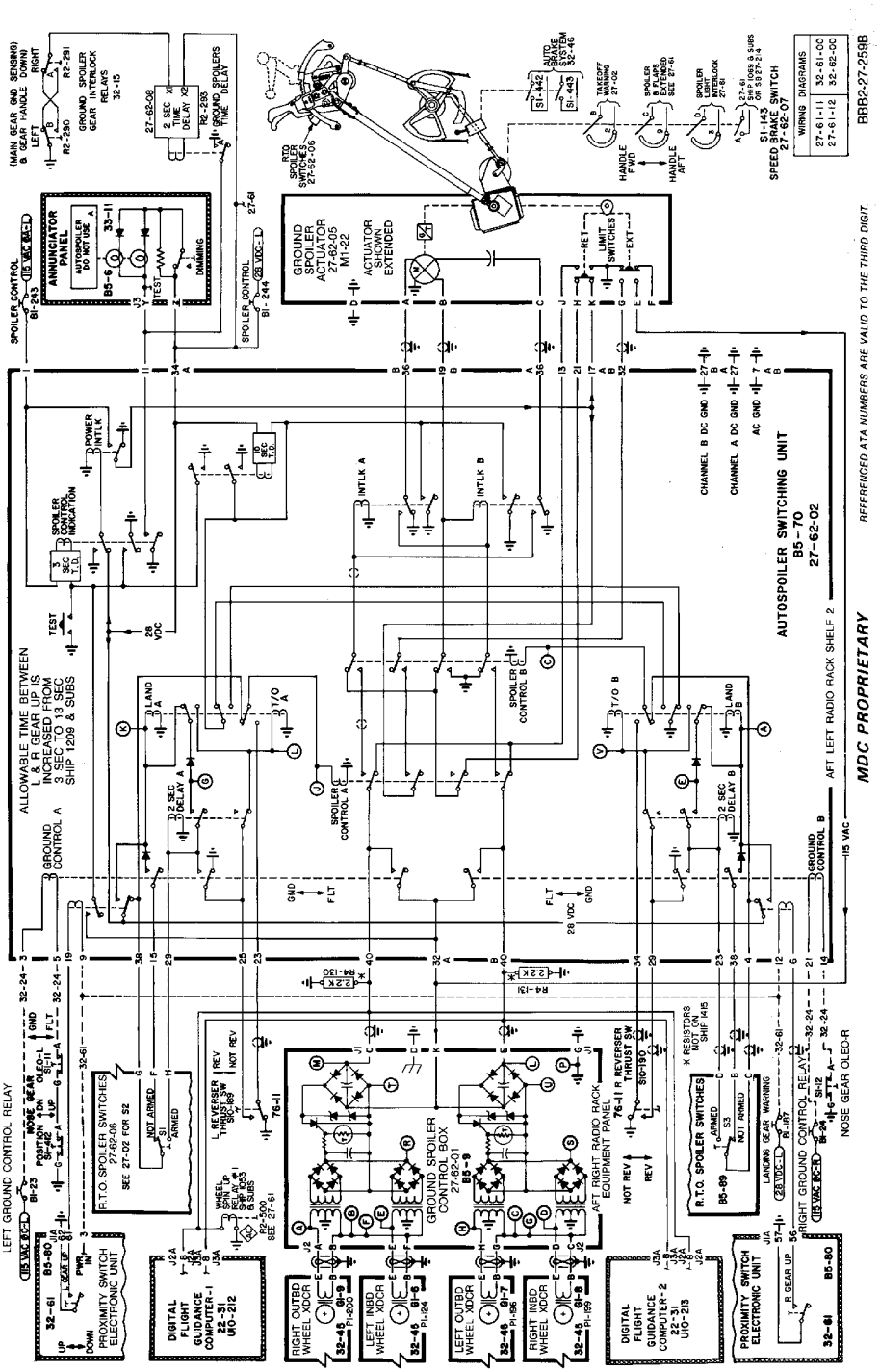
LOWER EPC, ICE PROTECTION LEFT DC BUS

Row	Col	Number	Name
M	31	B1-1009	SPOILER LOCKOUT

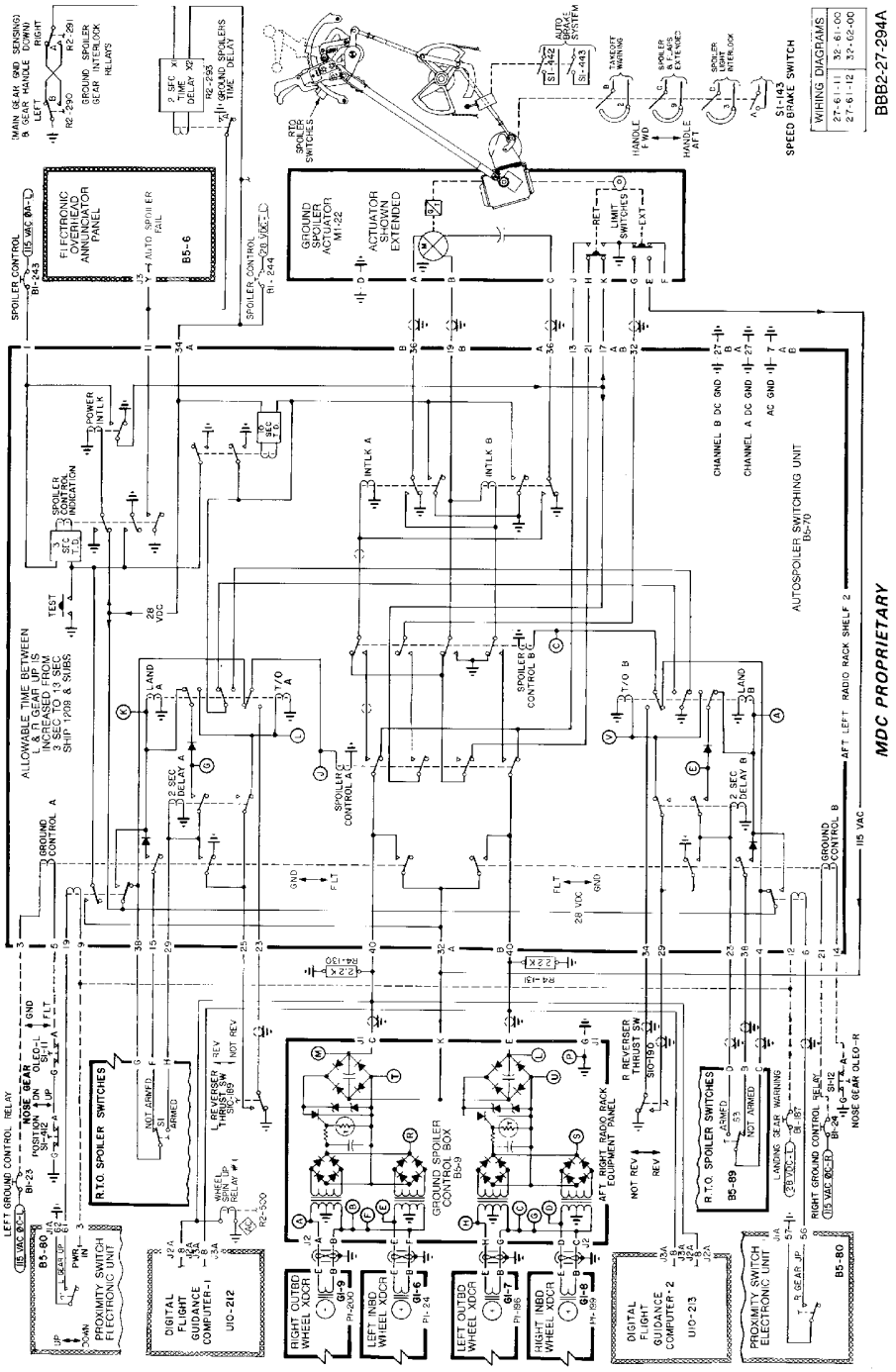
(63) Restore all systems controls, switches, instrument panels to pretest configuration.



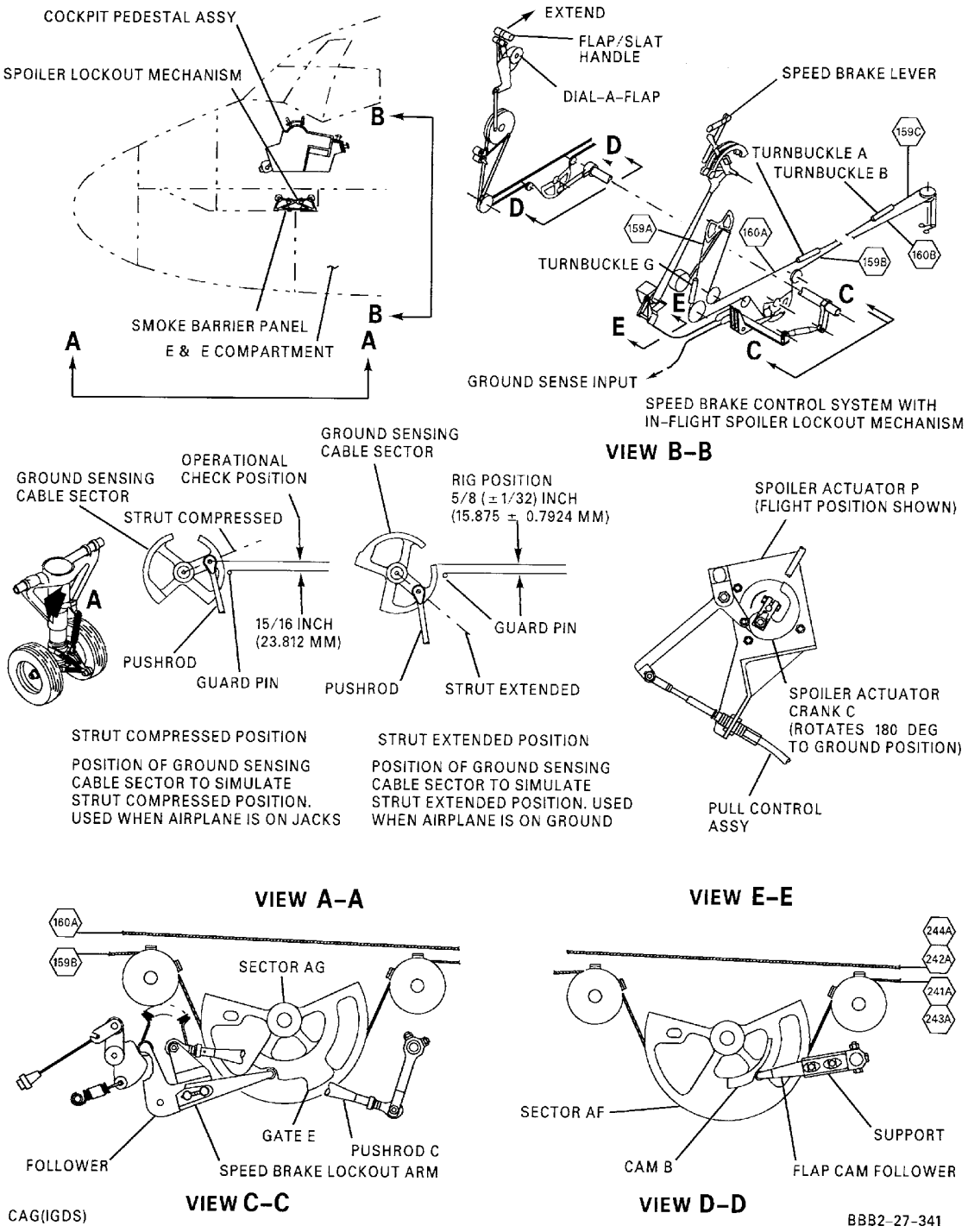
Spoiler Automatic System - Schematic
Figure 506/27-60-00-990-813 (Sheet 1 of 3)



Spoiler Automatic System - Schematic
Figure 506/27-60-00-990-813 (Sheet 2 of 3)



Spoiler Automatic System - Schematic
Figure 506/27-60-00-990-813 (Sheet 3 of 3)



In-Flight Spoiler Lockout Mechanism
Figure 507/27-60-00-990-814

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

5. Cable Assemblies

NOTE: The cable run numbers and segment letters listed below correspond to callouts in hexagonal symbols in Figure 501 or Figure 502.

Table 504

Function	Cable Run Numbers	Segment Letters
Left inboard flight spoiler - up	11 11	A B
Left inboard flight spoiler - down	12 12	A B
Left outboard flight spoiler - up	13 13	A B
Left outboard flight spoiler - down	14 14	A B
Right inboard flight spoiler - up	15 15	A B
Right inboard flight spoiler - down	16 16	A B
Right outboard flight spoiler - up	17 17	A B
Right outboard flight spoiler - down	18 18	A B
Speedbrake - extend	159 159 159	A B C
Speedbrake - retract	160 160	A B
Ground spoilers - extend	250 250	A B
Ground spoilers - retract	249 249	A B

SPOILER - ADJUSTMENT/TEST

1. General

A. The procedures outlined in this section are for adjustment and test of the entire spoiler system. Specific segments of the system may be adjusted by following the procedures in the applicable paragraphs. Access to components is given in the text as required.

B. The numbers in parentheses in the following text correspond to callouts in Figure 501 or Figure 502.

C. The numbers and letters enclosed by the hexagon-shaped symbol, shown in the adjustment diagrams, correspond to cable run numbers and segments listed at the end of this section. Each cable run number is posted adjacent to the corresponding cable in the aircraft.

D. On aircraft beginning with Fuselage Number 2016, Weight-On-Wheels Unlocking Input, was added to the lockout mechanism. Each aircraft must be visually checked for the presence of the in-flight spoiler lockout and weight-on-wheels operating components to make a determination of requirements for full rigging and/or functional checks of this system.

E. If single or multiple electrical components in the spoiler in-flight lockout system, such as solenoids, switches or relays are replaced for cause, and system rigging dimensions are not disturbed, a system functional check for validation may be completed rather than a complete rigging check. (ACTIVE IN-FLIGHT SPOILER LOCKOUT SYSTEM - ADJUSTMENT/TEST, PAGEBLOCK 27-60-01/501)

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 501

Name and Number	Manufacturer
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified
Protractor (5916715–1)	The Boeing Company
Tensiometer	Pacific Scientific Co.
Dual drive motor (0-1200 rpm) (3240-D09-1212)	AERO INFO Inc.
Anti-skid transducer spinner (4916807) (2 required)	The Boeing Company
Rig pin (4-4) 1/4 by 4 5/8 (6.35 x 117.475 mm)	
Rig pin (4-2) 1/4 by 2 5/8 (6.35 x 66.675 mm)	
Target, dummy MLG proximity switch, (2) (4952969)	The Boeing Company
Rig pins (2) (4-6 1/4 by 6 5/8 (6.35 x 168.275 mm)	
Rig pins (2) (4-10 1/4 by 10 5/8 (6.35 x 269.875 mm)	
Rig pin (5-3 5/16 by 3 5/8 (7.937 x 92.075 mm)	
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch), (15.875 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Adjustment/Test Spoilers

A. Adjust Spoiler Speedbrake Controls (Figure 501 or Figure 502)

NOTE: Aileron controls must be properly adjusted before adjusting spoiler system. (PAGEBLOCK 27-10-00/501)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Depressurize spoiler hydraulic system by moving spoiler shutoff and system depressurization valves, located in left and right main gear wheel wells, to off position. Secure valve levers with safety pins.

(3) Disconnect ground sensing pushrod from ground sensing mechanism. (PAGEBLOCK 32-23-01/201)

(4) Place throttle lever (F) in idle position (against aft stop).

(5) Place nose gear oleo switches in flight position.

(6) Simulate left and right main gear in up position by simultaneously placing a steel object over the left and right main gear up proximity switches for approximately 2 seconds. Auto-spoiler actuator should be retracted.

NOTE: If proximity switches are not actuated simultaneously the autospoiler do not use light (on aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel) will come on. To turn light off and reset monitor in autospoiler switching unit, open and close 28vdc and 115vac spoiler control circuit breakers.

(7) Place speedbrake lever (E) in armed retract position (red armed label visible).

(8) Check that rig hole in spoiler switch (J) crank (K) is aligned with rig mark on spoiler switch (J) support. If necessary, adjust pushrod (H) until rig hole in crank is aligned with rig mark (M) on support.

(9) Carefully and slowly move speedbrake lever (E) through its full travel (full forward stop to full aft stop and return). Check that spoiler switch (J) does not contact its internal stops at either extreme of travel. If necessary, adjust pushrod (H) as follows:

NOTE: If resistance is met before either extreme travel of lever is reached, do not force lever as damage to spoiler switch stops may occur.

(a) If stop contacts in forward position, lengthen pushrod (H).

(b) If stop contacts in aft position, shorten pushrod (H).

(10) Place speedbrake lever (E) in armed forward position.

(11) Adjust pushrod (U) so that there is 0.015 to 0.200 inch, (0.381 to 5.08 mm) clearance between crank (T) and roller in speedbrake lever (E) (at point Y).

(12) Place nose gear oleo switches in ground position, auto spoiler actuator should extend and speedbrake lever (E) should move to full aft position.

(13) With auto spoiler actuator extended and speed brake lever (E) in aft position, adjust pushrod (U) so that aft pin on speed brake lever (E) is beyond secondary latch a minimum of 0.060 inch (1.52 mm).

NOTE: The 0.060 inch (1.52 mm) dimension is measured on top of speed brake cam (W) by noting difference between position of speedbrake lever (E) when it is held by secondary latch and when it is held by auto spoiler actuator.

(14) Check for positive clearance between speedbrake lever (E) and aft end of opening on speedbrake cam (W) when lever (E) is armed and held aft by crank (T).

(15) Manually disarm speedbrake lever (E), lever should return to unarmed retract position. Check that square lugs on outboard sides of lever (E) are fully engaged in forward detent of speedbrake cam (W).

(16) With crank (R) in contact with stop (S), adjust turnbuckles (A) and (B) until tension is between minimum and maximum load per cable tension table for 3/32 inch (2.38 mm) cables 159A, B and 160 A, B. (Figure 503 (Sheet 1))

NOTE: Access to turnbuckle (A) is through forward cargo compartment ceiling panel 5154C, and turnbuckle (B) is through ceiling panel 5156C.

(17) Differentially adjust turnbuckles (A) and (B) so that gap of 0.005 to 0.030 inch (0.127 to 0.762 mm) exists between lever (E) and forward stop.

(18) Manually move speedbrake lever (F) through its full cycle a minimum of 5 times. Recheck cable tensions specified in Paragraph 3.A.(16), retension cables if necessary.

NOTE: Final adjustment of cable runs 159A, B and 160A, B is contained in Paragraph 3..

(19) Place speedbrake lever in unarmed retract position (against forward stop).

(20) Check that plungers of all three speedbrake lever arming switches are fully depressed. Squeeze speedbrake lever grip and check that there is clearance between lever cam and switch actuators. Release grip. If necessary adjust arming switches as follows:

(a) Remove cover from switches.

(b) Loosen switch support bolts and position switch support in most fore position on serrated plate.

(c) Place shim, 0.025 to 0.035 inch (0.635 to 0.889 mm) thick (as required), between speedbrake frame and speedbrake lever.

(d) Adjust switch support assembly aft until all three switches actuate. Tighten switch support attach bolts.

NOTE: Plungers of switches must be fully depressed when switches are actuated.

(e) Squeeze speedbrake lever grip, plungers of all three switches must be relaxed when grip is squeezed and must have clearance between speedbrake lever cam and switch actuators. Release grip.

(f) Remove shim from between speedbrake frame and speedbrake lever. Check that plungers of all three switches are fully depressed with lever in forward stop position.

(g) Squeeze speedbrake lever grip. Check that there is clearance between lever cam and switch actuators. Release grip.

(h) Install switch cover.

(21) Safety all turnbuckles with clips.

(22) Place left and right spoiler shutoff and system depressurization valves in on position. Safety levers with safety pins.

(23) Connect ground sensing pushrod to ground sensing mechanism. (PAGEBLOCK 32-23-01/201)

(24) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

(25) Test spoiler speedbrake control system. (Paragraph 3.E.)

B. Adjust Ground Only Spoilers Control (Figure 501 or Figure 502)

NOTE: Spoiler speedbrake controls must be properly adjusted prior to making the following adjustments. (Paragraph 3.A.)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Make certain left and right hydraulic systems are depressurized. (PAGEBLOCK 29-00-00/201)

(3) Make certain speedbrake lever (E) is in retract position.

(4) Install rig pin (5-3) in rig pin hole (R-8) in drum (A).

(5) With crank (R) in contact with stop (S), adjust turnbuckles (D) and (E) until tension is between minimum and maximum load per cable tension table for 3/32 inch (2.38 mm) cables 249A, B and 250A, B. (Figure 503 (Sheet 2))

NOTE: Turnbuckles (D) and (E) are located in right wheelwell; center.

(6) Remove rig pin (5-3) from drum (A).

(7) Remove bolt (C) to disconnect pushrods (B) from both left and right ground spoiler control valves.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(8) Pressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING SPEEDBRAKE LEVER, MAKE CERTAIN THAT AREAS AROUND ALL SPOILERS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(9) Manually move speedbrake lever (E) to extreme aft (60° spoiler) position. Flight spoilers should extend, ground spoilers should remain retracted.

(10) Manually place left ground spoiler control valve lever in the extend position and hold.

(11) Slowly move right ground spoiler control valve lever, in extend direction, until both ground only spoilers just begin to extend. Hold lever in this position.

(12) Adjust pushrod (B) rod end until bolt (C) can be freely installed, then extend pushrod (B) rod end 9(±4) full turns. Install bolt (C). Safety nut with cotter pin.

(13) Release left ground spoiler control valve lever.

(14) Move speedbrake lever (E) to retract position. All spoilers should retract.

(15) Depressurize right hydraulic system, pressurize left hydraulic system.

(16) Move speedbrake lever to full aft (60° spoiler) position. Flight spoilers should extend, ground only spoilers should remain retracted.

(17) Manually move left ground spoiler control valve lever, in extend direction, until both ground only spoilers just extend. Hold lever in this position.

(18) Adjust pushrod (B) rod end until bolt (C) can be freely installed, then extend pushrod (B) rod end 9(±4) full turns. Install bolt (C). Safety nut with cotter pin.

(19) With left hydraulic system pressurized, pressurize right hydraulic system.

(20) Move speedbrake lever (E) to retract position. All spoilers should retract. Move speedbrake lever (E) to full aft (60° spoiler) position. All spoilers (flight and ground only) should be fully extended.

(21) With all spoiler panels fully extended, rotate aileron control wheel to full left wing and then right wing down. Make certain that flight spoilers on opposite side to wing down control wheel deflection move to faired position. Left and right wing ground spoiler panels should not move and should remain deployed. If ground spoiler panels do not remain deployed, extend pushrods "B", in left and right main landing gear wheel wells as required. (Paragraph 3.B.(12))

(22) Return speedbrake lever to retract position.

(23) Shut off hydraulic pressure source.

(24) Safety all turnbuckles with clips.

(25) Remove door safety locks, close main gear inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

(26) Test ground spoiler control. (Paragraph 3.F.)

C. Adjust Lateral Control Mixers (Figure 502 (Sheet 1), View C-C)

NOTE: Spoiler speedbrake controls must be properly adjusted prior to making the following adjustments. (Paragraph 3.A.)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Depressurize spoiler hydraulic system by moving spoiler shutoff and system depressurization valves, located in left and right main gear wheel wells, to off position. Secure valve levers with safety pins.

(3) Make certain that speedbrake control lever (E) is in unarmed retracted position, against forward stop.

(4) Insert rig pin (4-10) in rig pin hole (R-7) in spoiler cam, left and right mixers.

(5) Remove bolt (D), two places, to disconnect pushrods (E) from cranks on speedbrake input shaft in left mixer to allow spring (C) to bring crank (A) in contact with stop (B), left and right mixers.

(6) Adjust pushrod (E), left mixer, until bolt (D) can be freely inserted. Install bolt (D). Tighten pushrod jamnut.

(7) Adjust pushrod (E), right mixer, until bolt (D) can be freely inserted. Install bolt (D). Tighten pushrod jamnut.

(a) Check for play between spoiler output sectors, sector arm assemblies and output drive link assemblies (left and right). Shim as required with laminated washers under stop bolt heads in respective outboard arms to remove all play from spoiler output sectors, arm assemblies and drive link assemblies. (Figure 502 (Sheet 1))

(8) Remove rig pins (4-10) from left and right mixers.

(9) Return spoiler shutoff and system depressurization valve levers to on position and secure valve levers with safety pins.

(10) Remove door safety locks, close main gear inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

(11) Test lateral control mixers. (Paragraph 3.E.)

D. Adjust Inboard and Outboard Flight Spoiler Controls in Wing (Figure 502 (Sheet 1))

NOTE: Aileron controls (PAGEBLOCK 27-10-00/501), speedbrake controls (Paragraph 3.A.), lateral control mixers (Paragraph 3.B.), spoiler panels (PAGEBLOCK 27-61-01/201), must be properly adjusted prior to adjusting spoiler controls.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

WARNING: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(4) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Place spoiler shutoff and system depressurization valves, located in left and right main gear wheel wells, in off position. Secure valve levers with safety pins.

(6) Make certain speedbrake lever (E) is in unarmed retracted position, against forward stop.

(7) Insert rig pins (4-10) in rig pin hole (R-7) in spoiler cam, left and right lateral control mixer.

(8) Adjust turnbuckles (A) and (B) until tension is between minimum and maximum load per cable tension table for 3/32-inch (2.38 mm) cables 11A, B, and 12A, B. (Figure 503 (Sheet 2))

NOTE: Access to turnbuckles (A) and (B) is through wing trailing edge doors 1502C and 1503A.

(9) Differentially adjust turnbuckles (A) and (B) so that rig pin (4-6) can be freely inserted and removed in rig pin hole (R-6) in left inboard control drum (L). Remove rig pin (4-6). (Figure 502 (Sheet 1), View D-D)

(10) Adjust turnbuckles (C) and (D) until tension is between minimum and maximum load per cable tension table for 3/32-inch (2.38 mm) cables 13A, B and 14A, B. (Figure 503 (Sheet 2))

NOTE: Access to turnbuckles (C) and (D) is through wing trailing edge doors 1502C and 1503A.

(11) Differentially adjust turnbuckles (C) and (D) until rig pin (4-6) can be freely inserted and removed in rig pin hole (R-6) in left outboard control drum (L). Remove rig pin (4-6).

(12) Adjust turnbuckles (E) and (F) until tension is between minimum and maximum load per cable tension table for 3/32-inch (2.38 mm) cables 15A, B and 16A, B. (Figure 503 (Sheet 2))

NOTE: Access to turnbuckles (E) and (F) is through wing trailing edge doors 1602C and 1603A.

(13) Differentially adjust turnbuckles (E) and (F) until rig pin (4-6) can be freely inserted and removed in rig pin hole (R-6) in right inboard control drum (L). Remove rig pin (4-6).

(14) Adjust turnbuckles (G) and (H) until tension is between minimum and maximum load per cable tension table for 3/32-inch (2.38 mm) cables 17A, B and 18A, B. (Figure 503 (Sheet 2))

NOTE: Access to turnbuckles (G) and (H) is through wing trailing edge doors 1602C and 1603A.

(15) Differentially adjust turnbuckles (G) and (H) until rig pin (4-6) can be freely inserted and removed in rig pin hole (R-6) in right outboard control drum (L). Remove rig pin (4-6).

(16) Rotate aileron control wheel through full travel a minimum of five times, then recheck cable tensions. Adjust turn-buckles as necessary, steps (8) through (15), to obtain desired cable tension.

(17) Adjust linkage from control drums (L) to spoiler actuators (4 places) as follows:

NOTE: The adjustment is identical for all four actuators.

(a) Insert rig pin (4-6) in rig pin hole (R-6) in control drum (L).

(b) Loosen jamnuts on pushrod (K) and rotate body of pushrod (K) until rig pin (4-2) can be freely inserted and removed in rig pin hole (R-5) in valve arm (N).

(c) Tighten pushrod (K) jamnuts. Safety jamnut to ear of locking device (.032 (0.812 mm) corrosion-resistant steel lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Make certain that ear of locking device is positioned to prevent possible jamming of pushrod on bracket.

(18) Remove rig pins (4-10), (4-6) and (4-2) from left and right lateral control mixers, control drums (L) and valve arm (N).

(19) Safety all turnbuckles with clips.

(20) Check that lockwire installation on spoiler drums. (Figure 504)

(21) Insert rig pins (4-10) in rig pin holes (R-7) in spoiler cam (17), left and right lateral control mixers.

NOTE: Paragraph 3.D.(22) through Paragraph 3.D.(26) adjust spoiler position sensors, located on right inboard flight spoiler and left outboard flight spoiler. Adjustment is identical for left and right position sensors.

(22) Make certain flight spoiler panels are fully retracted (locked in overcenter position).

(23) Remove bolt (AA) from arm (AB). (Figure 502 (Sheet 1), View E-E)

WARNING: SENSOR ROTATION IS LIMITED BY INTERNAL STOPS, USE EXTREME CARE WHEN ROTATING SENSOR TO PREVENT DAMAGING STOPS.

(24) Rotate arm (AB) until sensor internal mechanical ball detent falls into detent position, (null).

(25) Loosen bolt (AC) from clamp (AD), while maintaining arm (AB) in detent position, rotate sensor body until bolt (AA) can be freely inserted in arm (AB) and link (AE). Tighten bolt (AC).

(26) Install nut on bolt (AA) and safety nut with cotter pin.

(27) Remove rig pins (4-10) from spoiler cams, left and right lateral control mixers.

(28) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(29) Place flap/slat handle in UP/RET degree detent.

(30) Shut off hydraulic pressure source.

(31) Remove door safety locks, close main gear inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

(32) Check spoiler position sensors. (PAGEBLOCK 22-01-03/201)

(33) Perform return to service (RTS) test. (DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 1 or DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 4)

(34) Test spoiler speedbrake controls. (Paragraph 3.E.)

(35) Test spoiler automatic system. (Paragraph 4.)

E. Test Spoiler Speedbrake Controls

NOTE: During the following test procedures the SPOILER DEPLOYED light, on annunciator panel should come on when any spoiler is extended 10(±2) degrees (0.17(±0.03) rad) or greater. Light should go off with spoilers retracted. The nose gear oleo switches must be in ground mode for light to operate.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Make certain that aileron control wheel is in neutral position (index marks on wheel and control column aligned).

(3) Make certain that both throttle levers are in idle position.

(4) Insert rig pin (4-4) in rig pin hole (R-3) in aileron torque tube, located under flight compartment floor in electrical/electronics compartment.

(5) Disconnect ground sensing mechanism pushrod from sector on nose landing gear strut. (PAGEBLOCK 32-23-01/201)

(6) Place nose gear oleo switches in flight position.

(7) Actuate right main gear up-limit proximity switch by placing a steel object over switch, auto spoiler actuator should move to retract position. Remove steel object.

(8) Make certain that speedbrake control lever is in retract position (against forward stop with red arm label not visible).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(9) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(10) Check that all spoiler panels are in retracted position.

WARNING: BEFORE MOVING SPEEDBRAKE LEVER, MAKE CERTAIN THAT AREAS AROUND ALL SPOILERS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(11) Move speedbrake lever aft to first detent, then smartly snap lever to EXT position stop (do not slowly drag lever aft).

(a) Check that both flight spoiler panels on each wing are extended 34(±3) degrees (0.59(±0.05) rad) from retracted position. Ground spoiler panels should remain retracted.

(12) Check that mismatch between inboard flight spoiler panels of left and right wings does not exceed 1 degree. Check that mismatch between outboard flight spoiler panels of left and right wings does not exceed 1 degree.

(13) Return speedbrake control lever to full forward (retract) position and make following checks.

(a) Check that flight spoiler panels on each wing retract.

(b) With speedbrake lever in full forward position, check that a gap of 0.005 to 0.030 inch (0.127 to 0.762 mm), exists between speedbrake lever and forward stop.

(c) Check that crank (A) contacts stop (B) in each lateral control mixer.

(14) Place speedbrake control lever in armed position by raising lever vertically until red arm label is visible. Lever should hold in this position. Do not move lever aft; if lever cannot be armed without aft movement, automatic actuator has not set properly or mechanical linkage to actuator is out of adjustment.

(15) Make certain that left throttle is in idle position.

(16) Manually move speedbrake lever to extreme aft (60° spoiler) position, manual latch should hold lever in position. Flight spoilers should be extended 60°(±4°). (Ground only spoilers should be retracted.)

(17) Return left throttle to idle position.

(18) Place speedbrake lever in armed retract position.

(19) Place nose gear oleo switch in ground position. Check that speedbrake control lever moves to full aft position and that all flight spoiler panels are fully extended to 60°(±4°). Both ground only spoilers should also be extended.

(20) Place left throttle to idle position.

(21) With auto spoiler actuator extended, pull speedbrake lever up, then full aft and up again to latched position, and verify the following:

(a) Speedbrake lever moves aft along pedestal top surface without binding.

(22) Make certain that speedbrake lever remains in full aft and up latched position.

(23) Make certain that speedbrake lever remains in full aft and up latched position.

(24) Place speedbrake lever in unarmed retract position.

(25) Disarm speedbrake lever. Make certain lever is in retracted position.

(26) Remove rig pin (4-4) from aileron torque tube.

WARNING: BEFORE ROTATING AILERON CONTROL WHEELS, MAKE CERTAIN THAT AREAS AROUND LEFT AND RIGHT AILERONS AND SPOILERS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(27) Rotate aileron control wheel clockwise quickly (or rapidly); but with smooth continuous motion, until stop is contacted and make following checks.

NOTE: Lateral control spoiler split tolerances for Paragraph 3.E.(27) through Paragraph 3.E.(29) are as follows:

Table 502

SPEEDBRAKES RETRACTED	
Spoiler Position	**Maximum Allowable Split Between Inboard and Outboard Flight Spoilers**
0 - 12 degrees	1 degree (1/4 inch)
13 - 29 degrees	5 degrees (1 1/4 inch)
30 - 60 degrees	No requirement (overtravel range)
NOTE: Allowable splits shown above do not apply when ground only spoilers and flight spoilers are extended all at the same time.	
SPEEDBRAKES EXTENDED	6 degree allowable split at all speedbrake lever positions
GROUND SPOILERS EXTENDED	No requirement

(a) Check that right aileron control tab (inboard) moves trailing edge down.

(b) Check that both flight spoiler panels on right wing are extended to 60(±4) degrees.

(c) Check that left aileron control tab (inboard) moves trailing edge up.

(d) Check that flight spoiler panels on left wing remain retracted within one degree.

(28) Rotate aileron control wheel counterclockwise quickly (or rapidly); but with smooth continuous motion, until stop is contacted and make following checks.

(a) Check that left aileron control tab (inboard) moves trailing edge down.

(b) Check that both flight spoiler panels on left wing are extended to 60(±4) degrees.

(c) Check that right aileron control tab (inboard) moves trailing edge up.

(d) Check that flight spoiler panels on right wing move to fully retracted position within one degree.

(29) Return aileron control wheel to neutral position and check that all spoiler panels are retracted.

(30) Arm the speedbrake control lever and move lever to extreme aft (60° spoiler) position against stop. Leave speedbrake lever in this position.

(31) Rotate aileron control wheel quickly (or rapidly); but with smooth continuous motion, from stop to stop. Check that both flight spoiler panels on left wing move in unison and that panels on right wing move in unison. The down-going flight spoilers may not fully retract. The flight spoilers should operate smoothly.

(32) Return speedbrake control lever to unarmed retract position.

(33) Test ground only spoiler controls. (Paragraph 3.F.)

NOTE: Ground only spoiler controls test must be performed in order to complete spoiler speedbrake test.

F. Test Ground Only Spoiler Controls

NOTE: During the following test procedures the SPOILER DEPLOYED light, on annunciator panel should come on when any spoiler is extended 10(±2) degrees (0.18(±0.035) rad) or greater. Light should go off with spoilers retracted. The nose gear oleo switches must be in ground mode for light to operate.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Make certain that main gear door ground maintenance bypass lever is in bypass position (lever extended), main gear doors are opened and door safety locks are installed. (PAGEBLOCK 32-00-00/201)

(2) Make certain that aileron control wheel is in neutral position (index marks on wheel and control column aligned).

(3) Make certain that speedbrake control lever is in unarmed, retract position (against forward stop with red arm label not visible).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(4) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(5) Check that all spoiler panels are in retracted position.

(6) If autospoiler actuator is not extended, place nose gear oleo switches in ground position, auto-spoiler actuator should move to extend position.

(7) Manually move speedbrake lever up and aft to EXT position. Both ground only spoilers should remain retracted. Place speedbrake lever to retract position.

(8) Manually move speedbrake lever up and aft to extreme aft (60° spoiler) position. Ground only and all flight spoilers should fully extend. Place speedbrake lever to retract position. All spoiler panels should be retracted. SPOILER DEPLOYED light should remain off.

(9) Shut off left and right hydraulic systems pressure source.

(10) Manually place speedbrake lever in full forward RET position.

(11) Flight spoiler panels may or may not fully retract, manually move all flight spoiler panels to full retracted position, if necessary. Both ground only spoilers should remain partially or fully extended. SPOILER DEPLOYED light should be ON.

(12) Simultaneously move left ground only spoiler panel in the extend direction and right ground only spoiler panel in the retract direction (may be fully retracted). SPOILER DEPLOYED light should remain on.

(13) While holding right ground only spoiler panel in retracted position, move left ground only spoiler panel to retracted position. SPOILER DEPLOYED light should go off.

(14) Place left and right spoiler shutoff valve levers in on position. Safety valve levers with safety pins.

(15) With all spoiler panels fully extended, rotate aileron control wheel to full left wing and then right wing down. Make certain that flight spoilers on opposite side to wing down control wheel deflection move to faired position. Left and right wing ground spoiler panels should not move and should remain deployed.

(16) Slowly move left throttle lever from idle position in forward thrust direction until both ground only spoilers retract (speedbrake lever should not knockdown). Place left throttle lever to idle position. Both ground only spoilers should fully extend.

WARNING: BEFORE MOVING LANDING GEAR HANDLE, MAKE CERTAIN THAT LANDING GEAR GROUND SAFETY LOCKPINS ARE INSTALLED IN BOTH MAIN GEAR AND NOSE LANDING GEAR.

(17) Place landing gear handle in up position, both ground only spoilers should retract. Place gear handle in down position, both ground only spoilers should fully extend.

(18) Place dummy target over left main gear weight-on-wheels (WOW) proximity sensor , both ground only spoilers should remain extended. Remove target from sensor. Both ground only spoilers should remain extended. (Figure 505)

NOTE: If left and right hydraulic pressures are not equal, the ground spoiler panels may slowly retract when performing Paragraph 3.F.(18) and Paragraph 3.F.(19). This is acceptable. Immediate spoiler panel retraction is not acceptable.

NOTE: A smooth, small retraction is allowable.

(19) Place dummy target over right main gear (WOW) proximity sensor, both ground only spoilers should remain extended.

NOTE: A smooth, small retraction is allowable.

(20) With right main gear target installed, install dummy target over left main gear (WOW) proximity sensor. Both ground only spoilers should fully retract.

(21) Remove targets from left and right main gear (WOW) proximity sensors, both ground only spoilers should fully extend.

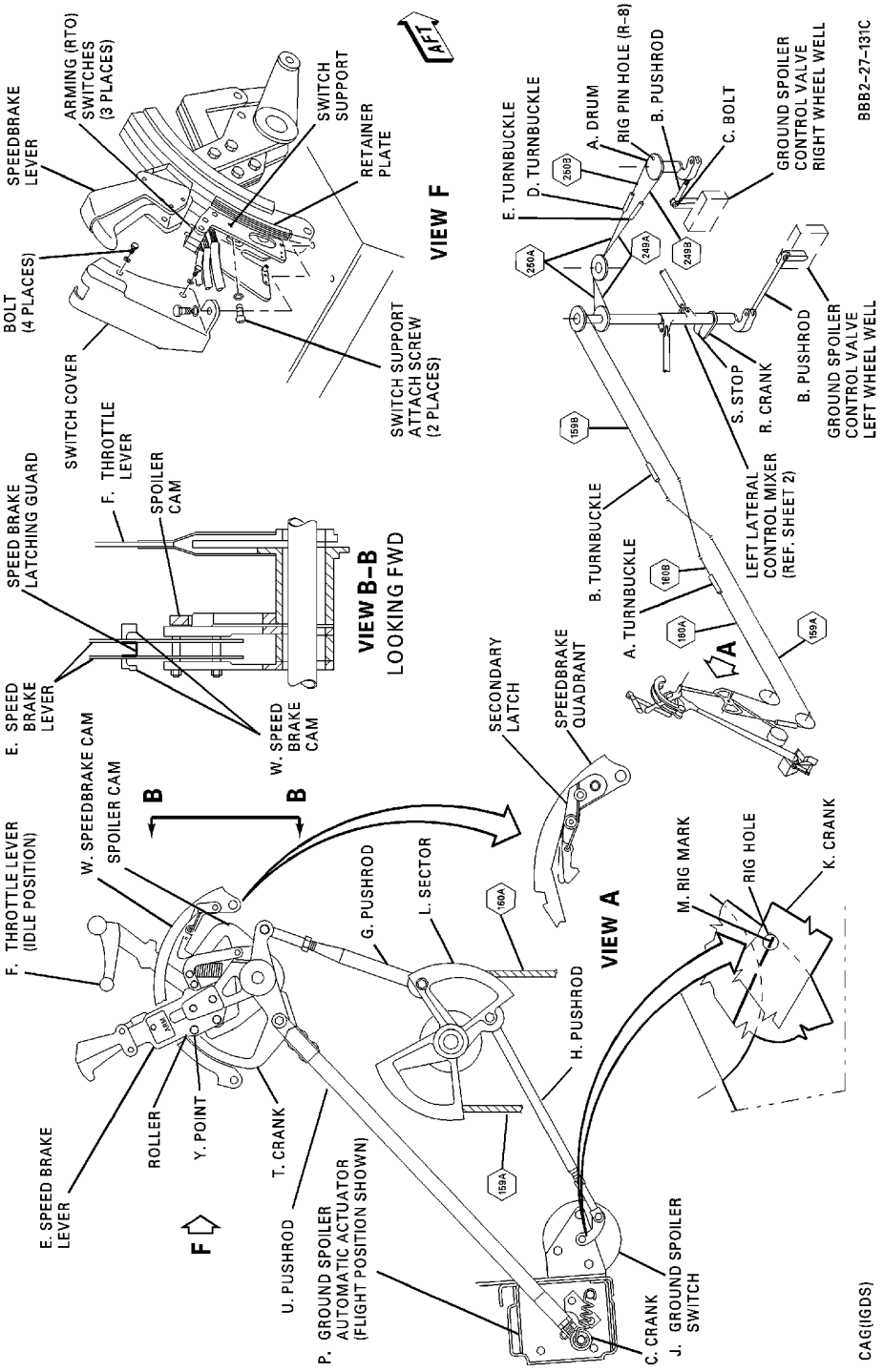
(22) Place speedbrake lever in unarmed retract position. All flight spoilers and ground only spoilers should be fully retracted.

(23) Shut off hydraulic pressure source.

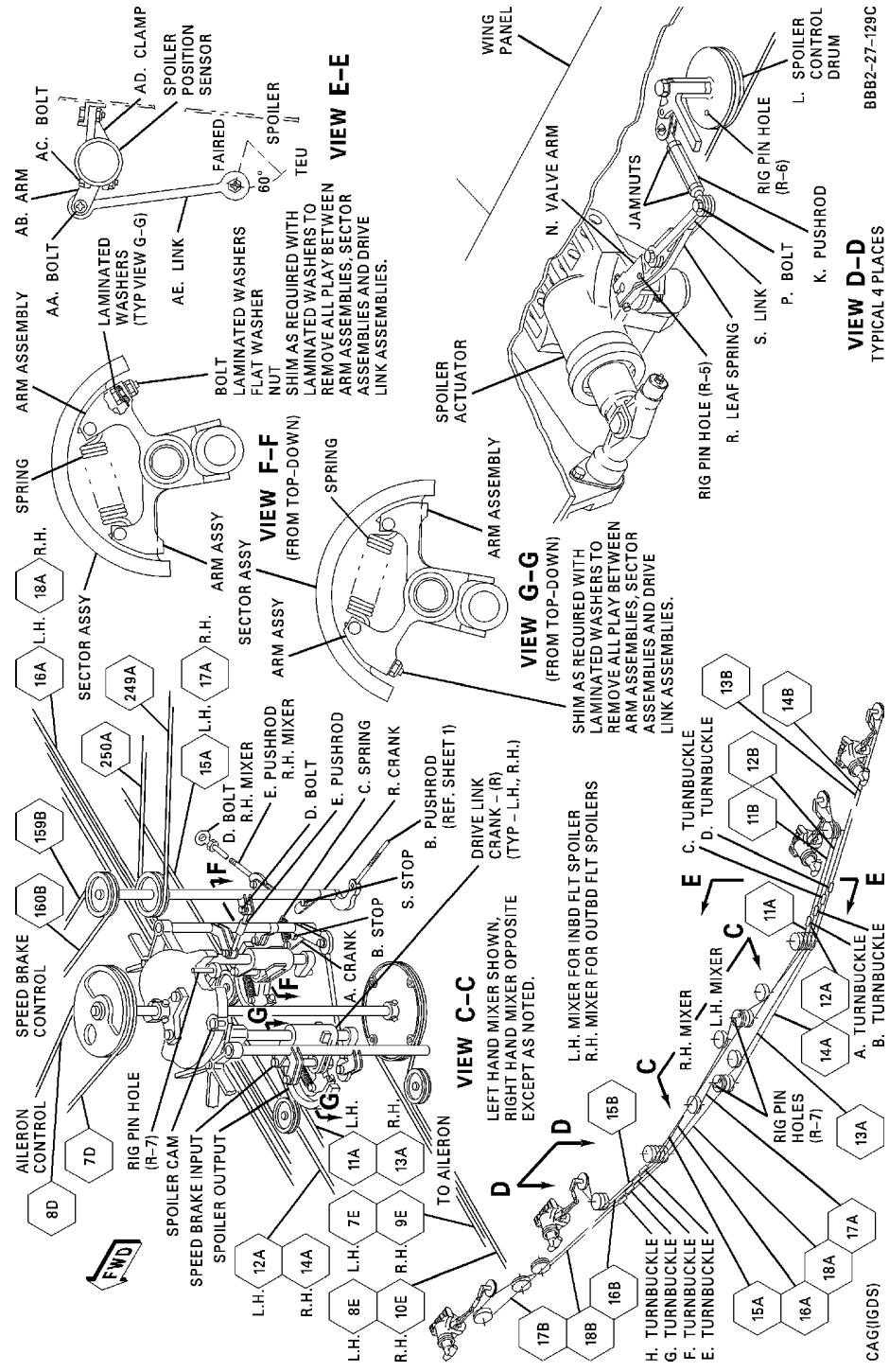
(24) If previously disconnected, connect ground sensing mechanism pushrod to sector on nose landing gear strut. (PAGEBLOCK 32-23-01/201)

(25) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

(26) Test spoiler automatic system. (Paragraph 4.)



Spoiler Speedbrake Controls -- Adjustment/Test
Figure 501/27-60-00-990-820



Spoiler Controls in Wing -- Adjustment/Test
Figure 502/27-60-00-990-821

CABLE TENSION TABLE – 3/32 INCH DIAMETER

TEMP. deg. F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD	TEMP. deg. F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD
– 60	19	13	9	40	67	61	46
– 58	20	14	10	42	68	62	47
– 56	21	15	11	44	69	63	48
– 54	22	16	12	46	70	64	48
– 52	23	17	12	48	71	65	49
– 50	24	18	13	50	72	66	50
– 48	25	19	14	52	73	67	51
– 46	26	20	15	54	74	68	51
– 44	27	21	15	56	75	69	52
– 42	28	22	16	58	76	70	53
– 40	29	23	17	60	77	71	54
– 38	30	24	18	62	78	72	55
– 36	31	25	18	64	79	73	55
– 34	32	26	19	66	80	74	56
– 32	33	27	20	68	81	75	57
– 30	34	28	21	70	82	76	58
– 28	35	29	21	72	83	77	58
– 26	36	30	22	74	84	78	59
– 24	37	31	23	76	85	79	60
– 22	38	32	24	78	86	80	61
– 20	39	33	24	80	87	81	62
– 18	40	34	25	82	88	82	62
– 16	41	35	26	84	89	83	63
– 14	41	35	27	86	90	84	64
– 12	42	36	27	88	91	85	65
– 10	43	37	28	90	92	86	66
– 8	44	38	29	92	93	87	67
– 6	45	39	30	94	95	89	67
– 4	46	40	30	96	96	90	68
– 2	47	41	31	98	97	91	69
0	48	42	32	100	98	92	70
2	49	43	32	102	99	93	71
4	50	44	33	104	100	94	72
6	51	45	34	106	101	95	73
8	52	46	35	108	102	96	73
10	53	47	35	110	104	98	74
12	54	48	36	112	105	99	75
14	55	49	37	114	106	100	76
16	56	50	37	116	107	101	77
18	57	51	38	118	108	102	78
20	57	51	39	120	109	103	79
22	58	52	40	122	111	105	80
24	59	53	40	124	112	106	81
26	60	54	41	126	113	107	82
28	61	55	42	128	114	108	83
30	62	56	43	130	116	110	84
32	63	57	43	132	117	111	85
34	64	58	44	134	118	112	86
36	65	59	45	136	119	113	87
38	66	60	45	138	121	115	88
				140	122	116	89

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-197B

Spoiler Speedbrake Cable Tension Table
Figure 503/27-60-00-990-822 (Sheet 1 of 2)

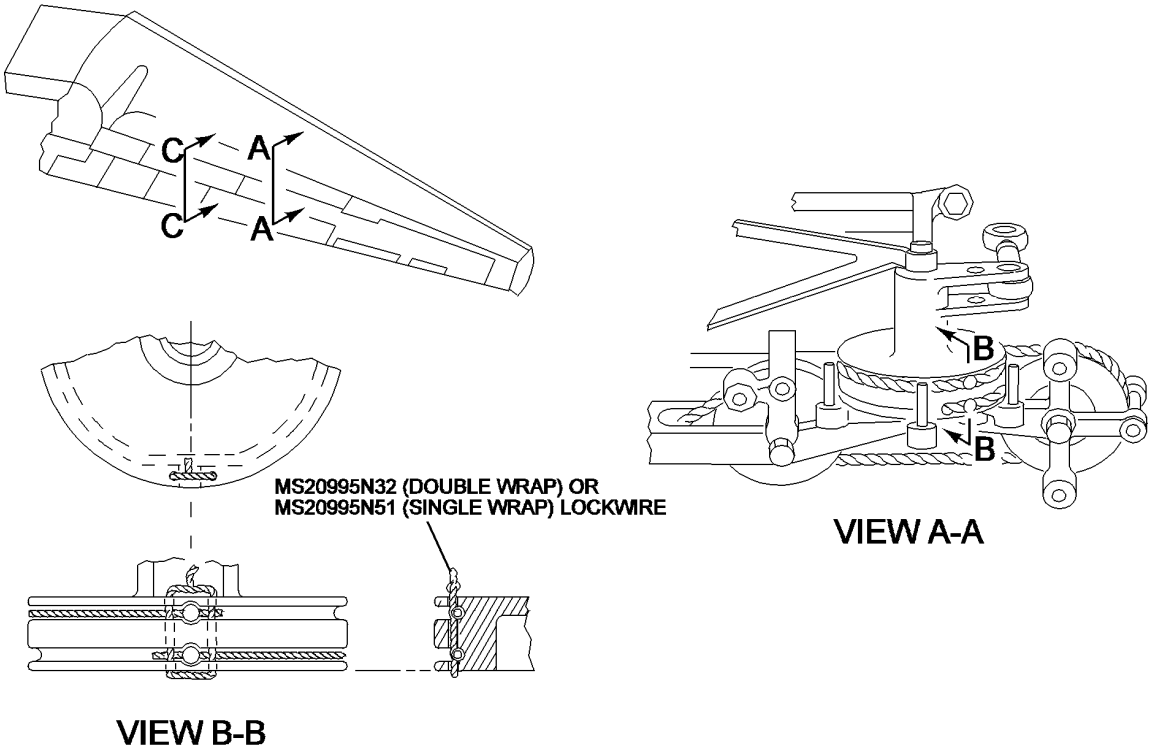
CABLE TENSION TABLE – 3/32 DIAMETER

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD
–60	7	1	0	40	30	24	18
–58	8	2	1	42	31	25	18
–56	8	2	1	44	31	25	19
–54	8	2	1	46	32	26	19
–52	9	3	1	48	33	27	20
–50	9	3	2	50	33	27	20
–48	9	3	2	52	34	28	21
–46	10	4	2	54	34	28	21
–44	10	4	2	56	35	29	22
–42	11	5	3	58	36	30	22
–40	11	5	3	60	36	30	23
–38	11	5	3	62	37	31	23
–36	12	6	4	64	38	32	24
–34	12	6	4	66	38	32	24
–32	12	6	4	68	39	33	25
–30	13	7	5	70	39	33	25
–28	13	7	5	72	40	34	26
–26	14	8	5	74	41	35	26
–24	14	8	6	76	41	35	27
–22	15	9	6	78	42	36	27
–20	15	9	6	80	43	37	28
–18	15	9	7	82	44	38	28
–16	16	10	7	84	44	38	29
–14	16	10	7	86	45	39	29
–12	17	11	8	88	46	40	30
–10	17	11	8	90	46	40	30
–8	18	12	8	92	47	41	31
–6	18	12	9	94	48	42	31
–4	19	13	9	96	48	42	32
–2	19	13	9	98	49	43	33
0	20	14	10	100	50	44	33
2	20	14	10	102	51	45	34
4	21	15	10	104	51	45	34
6	21	15	11	106	52	46	35
8	22	16	11	108	53	47	35
10	22	16	12	110	54	48	36
12	23	17	12	112	54	48	37
14	23	17	12	114	55	49	37
16	24	18	13	116	56	50	38
18	24	18	13	118	57	51	38
20	25	19	14	120	58	52	39
22	25	19	14	122	58	52	40
24	26	20	14	124	59	53	40
26	26	20	15	126	60	54	41
28	27	21	15	128	61	55	41
30	27	21	16	130	62	56	42
32	28	22	16	132	62	56	43
34	28	22	17	134	63	57	43
36	29	23	17	136	64	58	44
38	30	24	17	138	65	59	45
				140	66	60	45

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-278A

Spoiler Speedbrake Cable Tension Table
Figure 503/27-60-00-990-822 (Sheet 2 of 2)



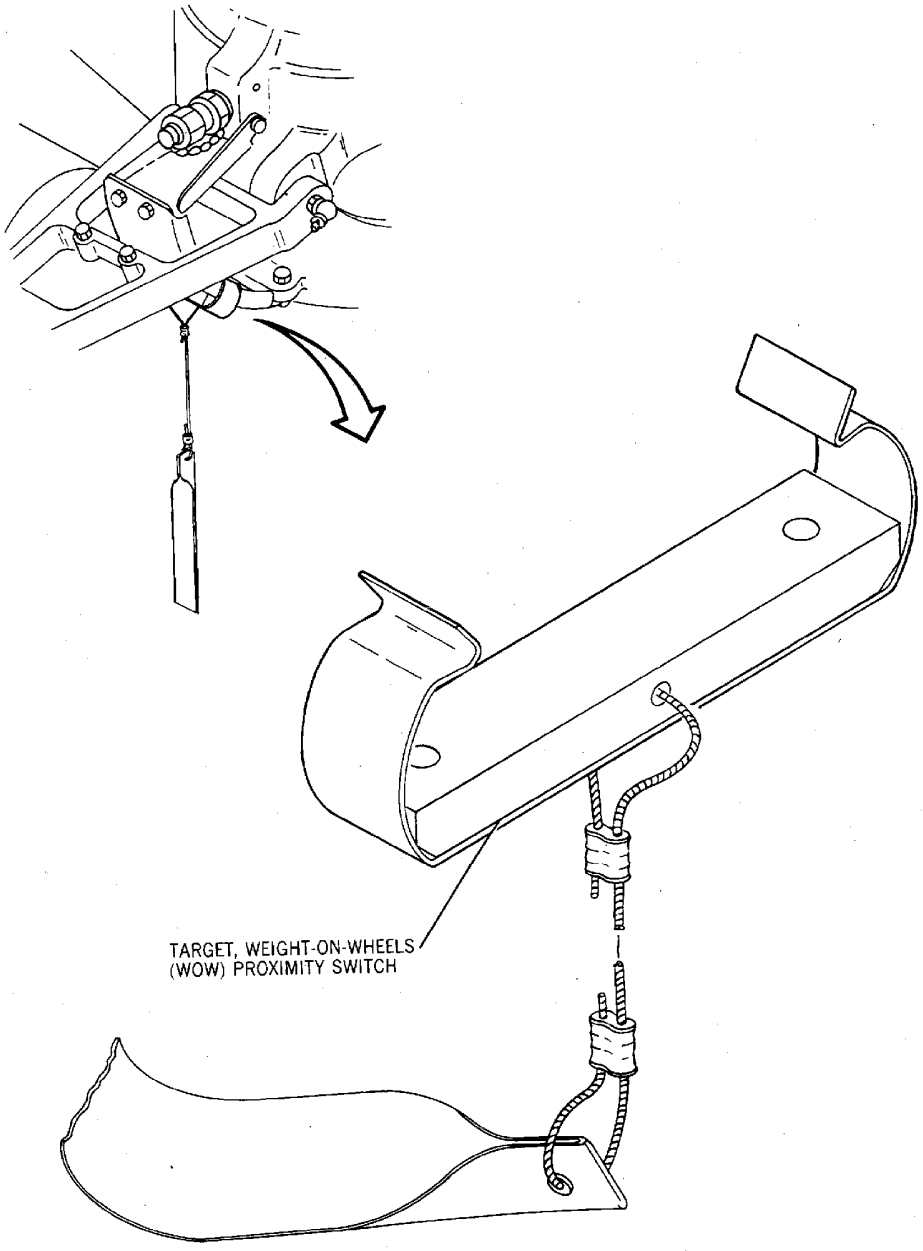
NOTE:

1. INSTALL LOCKWIRE OVER CABLES AS SHOWN.
2. LOCKWIRE INSTALLATION ON LEFT WING IS AS SHOWN IN VIEW D-D.

LOCKWIRE INSTALLATION TYPICAL FOR BOTH SPOILER CONTROL DRUMS ON LEFT WING.

BBB2-27-476
S0006535501V2

Lockwire Installation Spoiler Drum
Figure 504/27-60-00-990-823



Target, Weight-on-Wheels (WOW) Proximity Switch
Figure 505/27-60-00-990-824

4. Test Spoiler Automatic System

A. Test Wheel Speed Transducers Spin-Up Mode (Figure 506)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(3) Make certain speedbrake lever is in unarmed retract position.

(4) Make certain aircraft is in ground mode (nose gear and main gear struts compressed).

(5) Remove hubcaps from all main gear landing wheels. (PAGEBLOCK 32-40-01/201)

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(6) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING
P	33	B1-244	SPOILER CONTROL

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

(7) Install steel objects over right and left main gear up and latched proximity switches to simulate gear up.

NOTE: Steel objects must be placed over up and latch proximity switches within 3 seconds of each other or AUTO SPOILER DO NOT USE (on aircraft with EOAP, "AUTO SPOILER FAIL" legend) light may energize.

(8) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(9) Press test switch on WARNING & CAUTION LIGHTS panel and check that AUTO SPOILER DO NOT USE light on annunciator is on. On aircraft with EOAP, verify that "AUTO SPOILER FAIL" legend on overhead annunciator panel is on.

(10) Release test switch on WARNING & CAUTION LIGHTS panel, AUTO SPOILER DO NOT USE light on aircraft with EOAP, "AUTO SPOILER FAIL" legend should go off.

NOTE: AUTO SPOILER DO NOT USE light (on aircraft with EOAP, "AUTO SPOILER FAIL" legend) should not illuminate for remainder of tests except as noted.

(11) Remove the safety tag and close this circuit breaker:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

Auto spoiler actuator should move to retracted position.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(12) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

(13) Place speedbrake lever in armed position by raising lever vertically until red ARM label is visible. Lever should hold in this position.

NOTE: Do not move lever aft. If lever cannot be armed without any aft movement, the automatic actuator has not retracted or mechanical linkage to actuator is out of adjustment.

(14) Using drive motor and transducer spinner, spin the transducers one at a time in the following sequence at 1200 rpm or greater for 2-3 seconds. Speedbrake lever should stay in armed retracted position, AUTO SPOILER DO NOT USE light may come on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel may illuminate.

Table 503

1st - right outboard	4th - left inboard
2nd - right inboard	5th - left outboard
3rd - right outboard (repeat)	6th - left inboard (repeat)

Table 503 (Continued)

NOTE: After spinning each transducer check AUTO SPOILER DO NOT USE light or on aircraft with EOAP, "AUTO SPOILER FAIL" legend. If it is illuminated, reset it by momentarily opening and closing 115vac and 28vdc SPOILER CONTROL circuit breakers.

(15) While observing speedbrake lever, simultaneously spin both inboard and outboard transducers of right main gear at gradually increasing rpm for 2-3 seconds. Note rpm value of transducers when auto spoiler actuator moves speedbrake lever to full aft (60° spoiler) position. Rpm value should be 390 rpm minimum to 725 rpm maximum.

(16) Stop both right transducers.

(17) Manually place speedbrake lever to retract unarmed position.

(18) Manually return speedbrake lever retract unarmed position.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(19) Close the following circuit breaker for only 2 seconds, then open the following circuit breaker:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

Auto spoiler actuator should be retracted.

(20) Lift speedbrake lever to armed (red ARM label visible) retracted position.

(21) While observing speedbrake lever, simultaneously spin both inboard and outboard transducers of left main gear at gradually increasing rpm for 2-3 seconds. Note rpm value of transducers when auto spoiler actuator moves speedbrake lever to full aft (60° spoiler) position. Rpm value should be 390 rpm minimum to 725 rpm maximum.

(22) Stop both left transducers.

(23) Manually return speedbrake lever retract unarmed position.

(24) Remove steel objects from right and left main gear up and latched proximity switches.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

(25) Remove the safety tags and close these circuit breakers:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

(26) Remove door safety locks, close inboard doors and place main gear door ground maintenance bypass lever to normal position (lever retracted).

(27) Test spoiler automatic system landing mode. (Paragraph 4.B.)

B. Test Spoiler Automatic System Landing Mode

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(3) Make certain speedbrake lever is in unarmed retract position.

(4) Make certain aircraft is in ground mode (nose gear and main gear struts compressed).

(5) Make certain that both throttle levers are in full aft position.

(6) Make certain reverse thrust levers are in forward thrust position.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(7) Open these circuit breakers and install safety tags:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

(8) Make sure that these circuit breakers are closed:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING
P	33	B1-244	SPOILER CONTROL

(9) Install steel objects over right and left main gear up and latched proximity switches to simulate gear up.

NOTE: Steel objects must be placed over up and latch proximity switches within 3 seconds of each other or AUTO SPOILER DO NOT USE light may illuminate. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel may illuminate.

(10) Make certain that AUTO SPOILER DO NOT USE light, located on WARNING & CAUTION LIGHTS panel, is off. On aircraft with EOAP, make certain that "AUTO SPOILER FAIL" legend on overhead annunciator panel is off.

NOTE: If light is on, turn light off by momentarily opening and closing the SPOILER CONTROL circuit breakers.

(11) Lift speedbrake lever to armed (red ARM label visible) retracted position. Lever should hold in this position.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

(12) Observing AUTO SPOILER DO NOT USE light (on aircraft with EOAP, "AUTO SPOILER FAIL" legend).

Close and open this circuit breaker:

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

Speedbrake lever should stay armed.

(a) For autobrake equipped aircraft, the AUTO SPOILER DO NOT USE light remains off during the momentarily close and open of the RIGHT GROUND CONTROL RELAY circuit breaker.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

(13) Observing AUTO SPOILER DO NOT USE light (on aircraft with EOAP, "AUTO SPOILER FAIL" legend).

Close and open this circuit breaker:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

Speedbrake lever should stay armed.

(a) For autobrake equipped aircraft, the AUTO SPOILER DO NOT USE light remains off during the momentarily close and open of the LEFT GROUND CONTROL RELAY circuit breaker.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(14) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

(15) Close this circuit breaker:

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

AUTO SPOILER DO NOT USE light should come on after 10 seconds. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should come on after 10 seconds.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(16) Open this circuit breaker and install safety tag:

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

AUTO SPOILER DO NOT USE light should stay on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should remain on.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(17) Simultaneously close the following circuit breakers for only 2 seconds, then open the following circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

AUTO SPOILER DO NOT USE light should stay on, (on aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should stay on); and speedbrake lever should remain armed in retracted position.

(18) Momentarily open and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

AUTO SPOILER DO NOT USE light should go off. On aircraft with EOAP, make certain that "AUTO SPOILER FAIL" legend on overhead annunciator panel should go off.

(19) Remove the safety tag and close this circuit breaker:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

AUTO SPOILER DO NOT USE light should come on after 10 seconds. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel comes on after 10 seconds.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(20) Open this circuit breaker and install safety tag:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

AUTO SPOILER DO NOT USE light should stay on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should stay on.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(21) Momentarily open and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

AUTO SPOILER DO NOT USE light should go off. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should go off.

(22) Simultaneously close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

Speedbrake lever moves to full aft (60° spoiler) position. Auto spoiler actuator extended.

(23) Remove the safety tag and close this circuit breaker:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

Auto spoiler actuator retracts. AUTO SPOILER DO NOT USE light comes on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel comes on.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(24) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

AUTO SPOILER DO NOT USE light remains on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel remains on.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(25) Open this circuit breaker and install safety tag:

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

(26) Remove the safety tag and close this circuit breaker:

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

AUTO SPOILER DO NOT USE light remains on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel remains on.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(27) Open this circuit breaker and install safety tag:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

AUTO SPOILER DO NOT USE light remains on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel remains on.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(28) Open this circuit breaker and install safety tag:

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

AUTO SPOILER DO NOT USE light remains on. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel remains on.

(29) Momentarily open and close 28vdc and 115vac SPOILER CONTROL circuit breakers. AUTO SPOILER DO NOT USE light goes off. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel goes off.

(30) Manually place speedbrake lever to unarmed retract position.

(31) Remove the safety tags and close these circuit breakers:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

(32) Remove steel object from right main gear up and latched proximity switch.

(33) Remove steel objects from right and left main gear up and latched proximity switches.

(34) Remove door safety locks, close inboard doors and place main gear door ground maintenance bypass lever to normal position (lever retracted).

(35) Test automatic spoiler operation. (Paragraph 4.D.)

C. Test Rejected Takeoff (RTO) Mode

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(3) Make certain speedbrake lever is in unarmed retract position.

(4) Make certain aircraft is in ground mode (nose gear and main gear struts compressed).

(5) Make certain that both throttle levers are in full aft position.

(6) Make certain reverse thrust levers are in forward thrust position.

(7) Install steel objects over right and left main gear up and latched proximity switches.

NOTE: Steel objects must be placed over up and latch proximity switches within 13 seconds of each other or AUTO SPOILER DO NOT USE light may energize. (On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel may illuminate.)

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(8) Open these circuit breakers and install safety tags:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

(9) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING
P	33	B1-244	SPOILER CONTROL

(10) Make certain that AUTO SPOILER DO NOT USE light, located on WARNING & CAUTION LIGHTS panel, is off. On aircraft with EOAP, verify that "AUTO SPOILER FAIL" legend on overhead annunciator panel is off.

NOTE: If light is on, turn light (or legend) off by momentarily opening and closing the SPOILER CONTROL circuit breakers.

(11) Squeeze and lift speedbrake lever to armed position.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(12) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

(13) Simultaneously close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

Speedbrake lever should move to full aft (60° spoiler) position, auto spoiler actuator extended.

NOTE: On ships prior to Fuselage 1062, left speed brake arm switch S1-445, is physically located on right side and right speed brake arm switch S1-446, on left. On Fuselage 1062 and subsequent, switches are located on their respective sides.

(14) Manually actuate for 2 seconds then release left speedbrake arm switch, located forward of speedbrake lever. AUTO SPOILER DO NOT USE light comes on after 13(±3) seconds (on aircraft with EOAP, make certain that "AUTO SPOILER FAIL" legend on overhead annunciator panel comes on after 13(±3) seconds), auto spoiler actuator remains extended.

(15) Manually actuate for 2 seconds then release right speedbrake arm switch. AUTO SPOILER DO NOT USE light remains on (on aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel remains on), auto spoiler actuator remains extended.

(16) Open and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

AUTO SPOILER DO NOT USE light goes off (on aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel goes off), auto spoiler actuator retracts, and speedbrake lever remains in full aft position.

(17) Manually actuate and hold both left and right speedbrake arm switches. Auto spoiler actuator extends.

NOTE: On ships prior to Fuselage 1062, left speed brake arm switch S1-445, is physically located on right side and right speed brake arm switch S1-446, on left. On Fuselage 1062 and subsequent, switches are located on their respective sides.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(18) Open this circuit breaker then release left speedbrake arm switch.

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

Auto spoiler actuator remains extended, AUTO SPOILER DO NOT USE light remains off. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel remains off.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(19) Open this circuit breaker then release right speedbrake arm switch.

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

Auto spoiler actuator remains extended, AUTO SPOILER DO NOT USE light remains off. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel remains off.

(20) Simultaneously close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

(21) Actuate both left and right speedbrake arm switches for 2 seconds and release arm switches. Auto spoiler actuator retracts.

(22) Place left reverse thrust lever in reverse thrust position. Auto spoiler actuator remains retracted.

(23) Place left thrust reverse lever in forward thrust position.

(24) Place right reverse thrust lever in reverse thrust position. Auto spoiler actuator remains retracted.

(25) Place right thrust reverse lever in forward thrust position.

(26) Place both left and right reverse thrust levers in reverse thrust position. Auto spoiler actuator should extend.

(27) Remove steel object from left main gear up proximity switch.

(28) Observing AUTO SPOILER DO NOT USE light (on aircraft with EOAP, "AUTO SPOILER FAIL" legend), close LANDING GEAR WARNING circuit breaker. AUTO SPOILER DO NOT USE light comes on after 13(±3) seconds. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel comes on after 13(±3) seconds.

(29) Install steel object over left main gear up proximity switch.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(30) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

AUTO SPOILER DO NOT USE light goes off. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel goes off.

(31) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

Auto spoiler actuator retracts and AUTO SPOILER DO NOT USE light comes on after 10 seconds. On aircraft with EOAP, auto spoiler actuator retracts and "AUTO SPOILER FAIL" legend on overhead annunciator panel comes on after 10 seconds.

(32) Place left and right reverse thrust levers to forward thrust position.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(33) Open these circuit breakers and install safety tags:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

(34) Open and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

AUTO SPOILER DO NOT USE light goes off. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel goes off.

(35) Manually return speedbrake lever to unarmed retract position.

(36) Remove steel objects from left and right main gear up proximity switches.

(37) Remove the safety tags and close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

(38) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

(39) Test automatic spoiler operation. (Paragraph 4.D.)

D. Test Automatic Spoiler Operation (Without Service Bulletin 27-312, Deactivation of In-Flight Spoiler Lockout Mechanism)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Make certain speedbrake lever is in unarmed retract position.

(3) Make certain aircraft is in ground mode (nose gear and main gear struts compressed).

(4) Make certain that both throttle levers are in full aft position.

(5) Make certain reverse thrust levers are in forward thrust position.

(6) Install steel objects over right and left main gear up and latched proximity switches to simulate gear up.

NOTE: Steel objects must be placed over up and latch proximity switches within 13 seconds of each other or AUTO SPOILER DO NOT USE light may energize. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel may illuminate.

WARNING: NORMAL ELECTRICAL POWER TO VARIOUS SYSTEMS MAY BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. IF GROUND CONTROL RELAY CIRCUIT BREAKERS ARE TO BE OPENED WHILE PERFORMING PROCEDURES, MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(7) Open these circuit breakers and install safety tags:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING
P	33	B1-244	SPOILER CONTROL

(8) Make certain that AUTO SPOILER DO NOT USE light, located on WARNING & CAUTION LIGHTS panel, is off. On aircraft with EOAP, make certain that "AUTO SPOILER FAIL" legend on overhead annunciator panel is not illuminated.

NOTE: If light (or, on aircraft with EOAP, legend) is on, turn light off by momentarily opening and closing the SPOILER CONTROL circuit breakers.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(9) Open these circuit breakers and install safety tags:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(10) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

Auto spoiler actuator should be retracted.

(11) Lift speedbrake lever to armed (red ARM label visible) retracted position.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(12) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(13) Check that pilots control wheel is in neutral position, all spoilers should be retracted.

(14) Remove the safety tag and close this circuit breaker:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

AUTO SPOILER DO NOT USE light should come on after 3 seconds. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should come on after 3 seconds.

(15) Simultaneously close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
L	33	B1-24	RIGHT GROUND CONTROL RELAY

Speedbrake lever moves to full aft (60° spoiler) position, auto spoiler actuator extended. Flight spoilers on each wing are fully extended. Ground only spoilers remain retracted.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(16) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

AUTO SPOILER DO NOT USE light should go off. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should go off.

(17) Remove the safety tag and close this circuit breaker:

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

AUTO SPOILER DO NOT USE light should come on after 3 seconds. On aircraft with EOAP, "AUTO SPOILER FAIL" legend on overhead annunciator panel should come on after 3 seconds.

(18) Remove the safety tag and close this circuit breaker:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

Ground only spoilers should be fully extended. AUTO SPOILER DO NOT USE light should be off. On aircraft with EOAP, “AUTO SPOILER FAIL” legend on overhead annunciator panel should be off.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(19) Open these circuit breakers and install safety tags:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

(20) Move left throttle lever all the way forward. Speedbrake lever should drop down and move to full forward (retract) position. All flight spoilers should be fully retracted.

(21) Place left throttle lever to full aft position.

(22) Manually move and lift speedbrake to full aft (60° spoiler) position. All flight spoilers should fully extend. Ground only spoilers should remain retracted.

(23) Manually place speedbrake lever to unarmed retract position. All spoilers should be retracted.

(24) Shut off hydraulic pressure source.

(25) Remove the safety tags and close these circuit breakers:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

(26) Remove steel object from left and right main landing gear up and latched proximity switch.

(27) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

E. Functional Check For Deactivated In-Flight Spoiler Lockout Mechanism (With Service Bulletin 27-312)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Make certain auto spoiler actuator is in flight position. If required, retract actuator (Ref. 27-62-05 or equivalent method).

(3) Remove and retain for installation, smoke barrier panel in upper forward portion of E & E compartment for access to in-flight spoiler lockout mechanism (Ref. 6-31-00, door 4510A).

(4) For aircraft on ground (not on jacks), disconnect ground sense mechanism pushrod from sector. (PAGEBLOCK 32-23-01/201) Place ground sense mechanism in flight mode by rotating sector to strut extended position.

(5) For aircraft on jacks, ground sense mechanism will already be in flight mode. No need exists to disconnect pushrod from sector due to extended nose landing gear strut.

(6) Position flap/slat handle to "0" DEG./T.O. EXT DETENT.

(7) Make certain that both throttle levers are in full aft position.

(8) Make certain that reverse thrust levers are in forward thrust position.

(9) Make certain speedbrake lever is in unarmed retract position (red ARM label not visible).

(10) Move speedbrake lever aft to speedbrake EXT (34 degrees) detent. Observe spoiler lockout mechanism through smoke barrier panel opening in E & E compartment while speedbrake lever is moving aft. Make certain there is no interference with sector "AG" during rotation.

(11) Place speedbrake lever forward to retract position. Continue observation of sector "AG" for freedom of movement.

(12) Rotate dial-a-flap thumbwheel to obtain DAF indicator reading of 8 degrees. Place flap/slat handle in DAF moveable detent at 8 degrees. Make certain nothing interferes with sector "AF" during rotation while flap/slat handle is moving aft.

(13) Repeat to make certain that speedbrake lever can still be moved aft to EXT detent with flap/slat handle at 8 degrees.

(14) Place flap/slat handle in 40 DEG/LAND EXT detent. Make certain nothing interferes with sector "AF" during rotation while flap/slat handle is moving aft.

(15) Repeat Paragraph 4.E.(9), through Paragraph 4.E.(11) to make certain speedbrake lever can still be moved aft to EXT detent with flap/slat handle at 40 degrees.

(16) Pull speedbrake lever up into armed position (red ARM label visible). Extend auto spoiler actuator to ground position (Ref. 27-62-05 or equivalent method.

(17) Make certain speedbrake lever automatically moves aft to full 60 degrees ground spoiler position.

(18) Observe spoiler lockout mechanism while speedbrake lever is moving aft. Make certain no interference exists with sector "AG" during rotation.

(19) Place speedbrake lever forward to retract, armed position (red ARM label still visible). Make certain sector "AG" rotates freely.

(20) Retract auto spoiler actuator to flight position.

(21) For aircraft on ground (not on jacks), place ground sense mechanism in ground mode by rotating ground sense cable sector back to strut compressed position.

(22) For aircraft on ground and on jacks, disconnect ground sensing mechanism pushrod from sector and rotate sector to strut compressed position. (PAGEBLOCK 32-23-01/201)

(23) Make certain armed speed brake lever can be moved aft to full 60 degree ground spoiler position. Observe spoiler lockout mechanism while speedbrake lever is moving aft and that sector AG operates through it's rotation without interference.

(24) Place speedbrake lever in the forward, retract position (red ARM label not visible). Observe that sector AG operates through its rotation without interference.

(25) Connect ground sensing mechanism pushrod to sector on nose landing gear strut. (PAGEBLOCK 32-23-01/201)

(26) Retract flap/slat handle to UP/RET detent. Observe that sector AF operates through its rotation without interference.

(27) Reinstall smoke barrier panel in upper forward portion of E & E compartment (Ref. MM 6-31-00, door 4510A).

(28) Remove main landing gear door safety locks, close inboard main landing gear doors, and return main gear door ground maintenance bypass lever to normal position (lever retracted).

F. Spoiler Deployed, AUTOSPOILER FAIL or AUTOSPOILER DO NOT USE Indication

(1) Make sure electrical power is available and all necessary circuit breakers are closed.

(2) Do an Operational Check of Auto Spoiler Fail Indication.

(a) Gain access to autospoiler switching unit in aft left radio rack shelf 2.

(b) Push TEST switch on autospoiler switching unit.

1) Make sure AUTOSPOILER FAIL alert shows on EOAP or AUTOSPOILER DO NOT USE alert shows on overhead annunciator panel.

(c) Release TEST switch.

1) Make sure AUTOSPOILER FAIL alert goes out on EOAP.

2) Open and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

3) AUTOSPOILER DO NOT USE alert goes out on overhead annunciator panel.

(3) Do an Operational Check of Spoiler Deployed Light.

(a) Make sure aircraft is in ground mode.

(b) Make sure throttles are in idle position.

(c) Make sure spoiler handle is in RET position.

WARNING: BEFORE YOU PRESSURIZE THE HYDRAULIC POWER SYSTEM, MAKE SURE THE NOSE AND MAIN LANDING GEAR LOCKPINS ARE INSTALLED. MAKE SURE THE APPLICABLE CONTROLS ARE IN THE CORRECT POSITION. THIS WILL PREVENT ACCIDENTAL OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS, INJURY TO PERSONS, AND DAMAGE TO EQUIPMENT.

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE CLEAR OF THE AREA. THIS WILL PREVENT INJURY TO PERSONS AND DAMAGE TO THE EQUIPMENT.

(d) Pressurize hydraulic system. (PAGEBLOCK 29-00-00/201)

(e) Rotate control wheel clockwise.

1) Make sure SPOILER DEPLOYED alert shows on EOAP or SPOILER DEPLOYED alert shows on overhead annunciator panel.

(f) Return control wheel to neutral position.

1) Make sure SPOILER DEPLOYED alert goes out on EOAP or SPOILER DEPLOYED alert goes out on overhead annunciator panel.

(g) Rotate control wheel counterclockwise.

1) Make sure SPOILER DEPLOYED alert shows on EOAP or SPOILER DEPLOYED alert shows on overhead annunciator panel.

(h) Return control wheel to neutral position.

1) Make sure SPOILER DEPLOYED alert goes out on EOAP or SPOILER DEPLOYED alert goes out on overhead annunciator panel.

(4) Do an Operational Check of Auto Spoiler System.

(a) ARM autospoiler handle.

WARNING: MAKE SURE LEFT AND RIGHT THRUST REVERSERS ARE CLEAR TO OPERATE. THIS WILL PREVENT INJURY TO PERSONS.

(b) Place both thrust reverser handles in reverse thrust position.

1) Spoiler handle moves aft.

2) Spoilers deploy.

(c) Return thrust levers to forward position.

(d) Push thrust levers forward.

1) Speedbrake handles moves to RET/DISARMED position.

2) Spoilers retract.

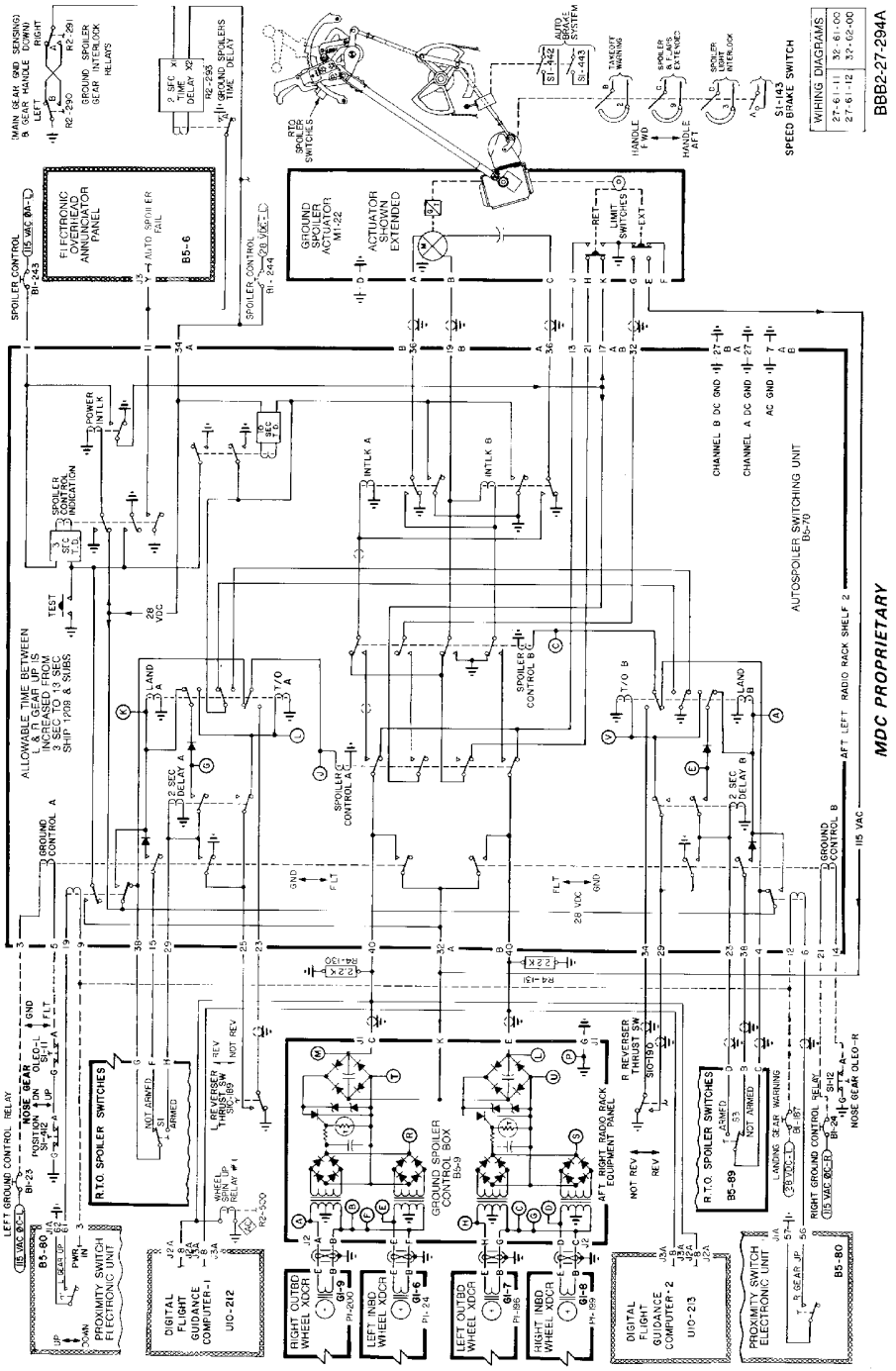
(e) Squeeze and lift speed brake handle to ARMED position.

1) Auto spoiler actuator retracts.

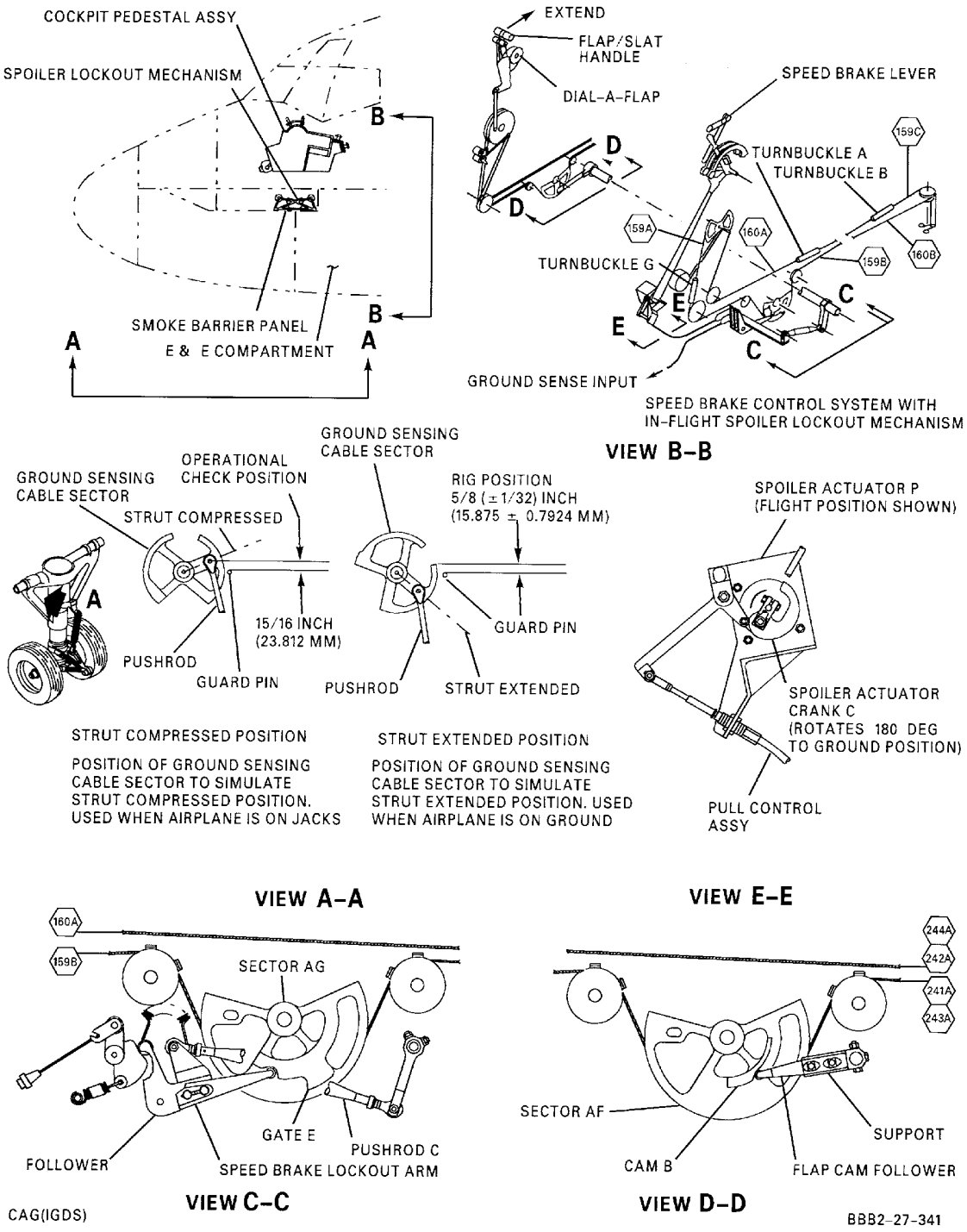
(f) DISARM speed brake handle.

(g) Depressurize hydraulic system. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

(h) Return aircraft to required configuration.



Spoiler Automatic System - Schematic
Figure 506/27-60-00-990-825



In-Flight Spoiler Lockout Mechanism
Figure 507/27-60-00-990-826

SPOILER - ADJUSTMENT/TEST

1. General

A. This procedure contains MSG-3 task card data.

TASK 27-60-00-710-801

2. Operational Check of the Spoiler Flap Extend Indication

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
24-00-00 P/B 001	GENERAL - DESCRIPTION AND OPERATION
24-40-00 P/B 001	EXTERNAL POWER - DESCRIPTION AND OPERATION
29-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES

B. Tools/Equipment

NOTE: When more than one tool part number is listed under the same "Reference" number, the tools shown are alternates to each other within the same airplane series. Tool part numbers that are replaced or non-procurable are preceded by "Opt:", which stands for Optional.

Reference	Description
SPL-868	Target - MLG Proximity Switch **MD80-81, -82, -83, -88** Part #: 4952969-1 Supplier: 88277

C. Prepare for the Operational Check of the Spoiler Flap Extend Indication

SUBTASK 27-60-00-861-001

WARNING: MAKE SURE TO KEEP PERSONNEL CLEAR OF FLIGHT CONTROL SURFACES IF HYDRAULIC POWER IS APPLIED.

(1) Energize the aircraft electrical power system. (GENERAL - DESCRIPTION AND OPERATION, PAGEBLOCK 24-00-00/001)

(2) Pressurize both hydraulic systems. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

D. Operational Check of the Spoiler Flap Extend Indication

SUBTASK 27-60-00-710-001

(1) Do an operational check of the spoiler flap extend indication.

(a) Place the speedbrake control lever in retract position (against forward stop with red arm label not visible).

(b) Place the flap/slat lever in UP/RET detent.

SUBTASK 27-60-00-865-001

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			

WJE 417, 419, 421, 423, 865, 869, 871, 872 (Continued)

(Continued)

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	30	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893

K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE ALL

WJE 401-404, 875-879, 886, 887

(a) Place the MLG proximity switch target, SPL-868 over the right main gear up and latched proximity switch to simulate gear up.

WJE 405-412, 414-427, 429, 861-866, 868, 869, 871-874, 880, 881, 883, 884, 891-893

(b) Place the MLG proximity switch target, SPL-868steel object over left and right main gear up and latched proximity switches to simulate gear up.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 877, 880, 881, 883, 884, 891

(c) Release speedbrake handle grip.

WJE ALL

(d) Move the flap/slat control lever to the 40° detent.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871, 872, 876, 878, 879, 891

1) The SPEED BRAKE EXTENDED indication, on overhead panel, should stay off over full range of flap travel. Aural warning should not sound.

WJE 401-411, 873, 874, 880, 881, 883, 884, 892, 893

2) The SPOILER/FLAP EXTENDED light should stay OFF over full range of flap travel. The aural warning should not sound.

WJE 877, 886, 887

3) The SPOILER/ FLAP EXTENDED light should stay off over full range of flap travel.

WJE ALL

(e) Rotate the DAF thumbwheel to set DAF indicator dial at 5°.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871, 872, 876, 878, 879, 891

WJE 401-404, 415-427, 429, 861-866, 868, 869, 871, 872, 876, 878, 879, 891

(f) Move flap/slat control lever to up detent and then to DAF 5-degree detent and place speedbrake control lever in first detent. SPEED BRAKE EXTENDED indication, on overhead panel, should remain off. Aural warning should not sound.

WJE **WJE 412, 414**

WJE Move flap/slat control lever to up detent and then to DAF 5-degree detent and place
WJE speedbrake control lever in first detent. SPOILER/FLAP EXTENDED light should remain
WJE off. Aural warning should not sound.

WJE 401-411, 873, 874, 880, 881, 883, 884, 892, 893

(g) Move flap/slat control lever to up detent and then to DAF 5-degree detent and place speedbrake control lever in first detent. SPOILER/FLAP EXTENDED light should remain off. Aural warning should not sound.

WJE 886, 887

(h) Move flap/slat control lever to up detent and then to DAF 5-degree detent and place speedbrake control lever in first detent. SPOILER/FLAP EXTENDED light should remain off.

WJE 401-412, 414, 873-876, 878-881, 883, 884, 892, 893

(i) Move flap/slat control lever to 11-degree detent. SPOILER/FLAP EXTENDED light should come on and warning horn and voice SPEEDBRAKES should be sounding and remain on for flap settings from 11-degrees to 40-degrees.

WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891

(j) Move flap/slat control lever to 11-degree detent. SPEED BRAKE EXTENDED indication, on overhead panel, should come on and warning horn and voice Speed Brakes should be sounding and remain on for flap settings from 11-degrees to 40-degrees.

WJE 877, 886, 887

(k) Move flap/slat control lever to 11-degree detent. SPOILER/ FLAP EXTENDED light should come on and remain on for flap settings from 11-degrees to 40-degrees.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-874, 876, 878-881, 883, 884, 886, 887, 891-893

WJE 401-412, 414, 873, 874, 876, 878-881, 883, 884, 886, 887, 892, 893

(l) Move flap/slat control lever to up/ret detent and place speedbrake control lever in retract position. SPOILER/FLAP EXTENDED light should go off and aural warning should silence.

WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891

Move flap/slat control lever to up/ret detent and place speedbrake control lever in retract position. SPEED BRAKE EXTENDED indication should go off and aural warning should silence.

WJE 877

(m) Move flap/slat control lever to up/ret detent and place speedbrake control lever in retract position. SPOILER/FLAP EXTENDED light should go off.

WJE ALL

E. Job Close-up

SUBTASK 27-60-00-865-002

(1) Remove the safety tags and close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-404, 875-879, 886, 887

(2) Remove the MLG proximity switch target, SPL-868 from the right main gear up and latched proximity switch.

WJE 405-412, 414-427, 429, 861-866, 868, 869, 871-874, 880, 881, 883, 884, 891-893

(3) Remove steel object from left and right main gear up and latched proximity switches.

WJE ALL

SUBTASK 27-60-00-865-003

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(a) Wait 30 seconds for the auto spoiler DO NOT USE light to reset.

(5) Close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

SUBTASK 27-60-00-863-001

(6) Depressurize both hydraulic systems. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

SUBTASK 27-60-00-862-003

(7) De-energize the aircraft electrical power system. (EXTERNAL POWER - DESCRIPTION AND OPERATION, PAGEBLOCK 24-40-00/001)

SUBTASK 27-60-00-942-003

(8) Remove all the tools and equipment from the work area. Make sure the area is clean.

——— END OF TASK ———

TASK 27-60-00-710-802

3. Operational Check of the Spoiler Deployed, Autospoiler Fail, or Autospoiler Do Not Use Function

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
24-00-00 P/B 001	GENERAL - DESCRIPTION AND OPERATION

(Continued)

Reference	Title
24-40-00 P/B 001	EXTERNAL POWER - DESCRIPTION AND OPERATION
29-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES

B. Tools/Equipment

NOTE: When more than one tool part number is listed under the same "Reference" number, the tools shown are alternates to each other within the same airplane series. Tool part numbers that are replaced or non-procurable are preceded by "Opt:", which stands for Optional.

Reference	Description
SPL-868	Target - MLG Proximity Switch **MD80-81, -82, -83, -88** Part #: 4952969-1 Supplier: 88277

C. Prepare for the Operational Check of the Spoiler Deployed, Autospoiler Fail, or Autospoiler Do Not Use Function

SUBTASK 27-60-00-865-004

(1) Energize the aircraft electrical power system. (GENERAL - DESCRIPTION AND OPERATION, PAGEBLOCK 24-00-00/001)

D. Operational Check of the Spoiler Deployed, Autospoiler Fail, or Autospoiler Do Not Use Function

SUBTASK 27-60-00-710-002

(1) Do an operational check of the spoiler deployed light (airplanes with or without autobrakes).

WARNING: MAKE SURE ALL PERSONS AND EQUIPMENT ARE CLEAR OF THE FLIGHT CONTROLS SURFACES, THE THRUST REVERSERS, AND THE LANDING GEAR. THESE COMPONENTS CAN MOVE SUDDENLY WHEN YOU SUPPLY HYDRAULIC POWER. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(a) Make sure the aircraft is in the ground mode.

(b) Make sure throttles are in idle position.

(c) Make sure spoiler handle is in RET position.

(d) Pressurize hydraulic systems. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

(e) Rotate control wheel clockwise.

1) Make sure SPOILER DEPLOYED alert shows on the EOAP or on the overhead annunciator panel.

(f) Return control wheel to neutral position.

1) Make sure SPOILER DEPLOYED alert goes out on the EOAP or on overhead annunciator panel.

(g) Rotate control wheel counterclockwise.

1) Make sure SPOILER DEPLOYED alert shows on the EOAP or on the overhead annunciator panel.

(h) Return control wheel to neutral.

1) Make sure SPOILER DEPLOYED alert goes out on the EOAP or on the overhead annunciator panel.

SUBTASK 27-60-00-710-003

(2) Do an operational check of the autospoiler fail indication (airplanes with autobrakes).

(a) Gain access to the autospoiler switching unit.

(b) Press the TEST switch on from the autospoiler switching unit.

1) Make sure AUTOSPOILER FAIL alert shows on the EOAP or AUTOSPOILER DO NOT USE alert on overhead annunciator panel.

(c) Release the test switch.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(d) Open these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

1) Make sure AUTOSPOILER FAIL alert goes out on the EOAP or AUTOSPOILER DO NOT USE alert on the overhead annunciator panel.

SUBTASK 27-60-00-710-004

(3) Do an operational check of the autospoiler fail indication (airplanes without autobrakes).

(a) Set the following circuit breakers as indicated:

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(b) Open these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893 (Continued)

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE ALL

(c) Close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING
P	33	B1-244	SPOILER CONTROL

(d) Set the landing gear control handle to the down position.

(e) Ensure both throttle levers are in the full aft position.

(f) Verify both reverse thrust levers are in the forward thrust position.

(g) Set the spoiler control actuator to the retract position.

(4) Verify that the AUTOSPOILER FAIL light is off.

(5) Install the MLG proximity switch target, SPL-868 over the right gear up proximity switch.

(a) This action simulates both main gear in the up position. Autospoiler actuator should be in the retract position.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(6) Open these circuit breakers:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR LOCK PINS ARE INSTALLED TO PREVENT INADVERTENT OPERATION OF LANDING GEAR. USE OF FLAP/SLAT HANDLE MAY CAUSE FLAPS, SLATS, AND SPOILERS TO RETRACT OR EXTEND. MAKE CERTAIN THAT ENGINE 1 AND ENGINE 3 FAN REVERSER COWL HALVES ARE CLOSED AND CLEAR CONTROL SURFACE AREA OF ALL PERSONNEL AND EQUIPMENT BEFORE PERFORMING TEST PROCEDURES USING FLAP/SLAT HANDLE.

(7) Arm the speed brake handle in the full forward position and verify that handle stays armed.

(8) Provide hydraulic pressure to the spoilers. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

(a) All spoilers should remain in the faired position.

(9) Close this circuit breaker:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

(a) The AUTOSPOILER FAIL light should come on after approximately 3 seconds.

(b) Close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE ALL

1) Simultaneously close the left and right ground control circuit breaker.

a) The speed brake handle should drive to the full aft position, the spoiler control actuator should extend and the flight spoilers should deploy.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

2) Open this circuit breaker and install safety tag:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

a) The AUTOSPOILER FAIL light should go out.

3) Close this circuit breaker:

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

a) The AUTOSPOILER FAIL light should come on after approximately 3 seconds.

4) Close this circuit breaker:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

a) The ground spoilers should deploy and the AUTOSPOILER FAIL light should go out.

E. Job Close-up

SUBTASK 27-60-00-864-002

(1) Depressurize hydraulic systems. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

SUBTASK 27-60-00-942-004

(2) Remove all the tools and equipment from the work area. Make sure the area is clean.

SUBTASK 27-60-00-942-005

(3) Remove the MLG proximity switch target, SPL-868.

SUBTASK 27-60-00-862-001

(4) De-energize the aircraft electrical power system. (EXTERNAL POWER - DESCRIPTION AND OPERATION, PAGEBLOCK 24-40-00/001)

——— END OF TASK ———

WJE 410, 875-879 POST MD80-27A359

TASK 27-60-00-710-803

4. Operational Check of the Spoiler Lockout Unlocking Function

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
27-60-00 P/B 501	SPOILER - ADJUSTMENT/TEST

B. Operational Check of the Spoiler Lockout Unlocking Function

SUBTASK 27-60-00-710-008

(1) Do the Operational Check. (SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501)

——— END OF TASK ———

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

TASK 27-60-00-710-804

5. Operational Check of the Autospoiler System (RTO Function Only)

NOTE: This procedure is a scheduled maintenance task.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891 (Continued)

A. References

Reference	Title
24-00-00 P/B 001	GENERAL - DESCRIPTION AND OPERATION
24-40-00 P/B 001	EXTERNAL POWER - DESCRIPTION AND OPERATION
29-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES

B. Prepare for the Operational Check of the Autospoiler System (RTO Function Only)

SUBTASK 27-60-00-861-002

(1) Energize the aircraft electrical power system. (GENERAL - DESCRIPTION AND OPERATION, PAGEBLOCK 24-00-00/001)

(2) Pressurize the hydraulic systems. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

C. Operational Check of the Autospoiler System (RTO Function Only)

SUBTASK 27-60-00-710-007

WARNING: MAKE SURE LEFT AND RIGHT THRUST REVERSERS ARE CLEAR TO OPERATE. THIS WILL PREVENT INJURY TO PERSONS.

(1) Do the operational check of the autospoiler system (RTO function only).

(a) ARM autospoiler handle.

(b) Place both thrust reverser handles in the reverse thrust position.

1) Spoiler handle moves aft.

2) Spoilers deploy.

(c) Return thrust levers to forward thrust position.

(d) Push thrust levers forward.

1) Speedbrake handle moves to RET/DISARMED position.

2) Spoilers retract.

NOTE: Speedbrake lever may not drop down to disarmed position after throttle knockdown.

(e) Squeeze and lift speed brake handle to ARMED position.

1) Auto spoiler actuator retracts.

(f) DISARM speed brakes handle.

D. Job Close-up

SUBTASK 27-60-00-864-001

(1) Depressurize hydraulic systems. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

SUBTASK 27-60-00-942-006

(2) Remove all the tools and equipment from the work area. Make sure the area is clean.

SUBTASK 27-60-00-862-002

(3) De-energize the aircraft electrical power system. (EXTERNAL POWER - DESCRIPTION AND OPERATION, PAGEBLOCK 24-40-00/001)

END OF TASK

ACTIVE IN-FLIGHT SPOILER LOCKOUT SYSTEM - ADJUSTMENT/TEST

1. General

A. This procedure is applicable only on later aircraft which have an Active In-Flight Spoiler Lockout System (AISLS) (Ref. Fuselage Numbers 1606 and subsequent). Specific segments of the system may be adjusted by following the procedures in the applicable paragraphs. Access to components is given in the text as required.

B. An ACTIVE lockout mechanism can be identified by the presence of solenoid AT (weight-on-wheels solenoid - not incorporated on earlier in-flight spoiler lockout system installations) (Ref. Fuselage Numbers 2016 and subsequent) (Figure 512), roller D (Figure 506) and roller A (Figure 507). These components are NOT installed on deactivated systems.

C. The spoiler automatic actuator is located in the forward lower section of the control cabin center control pedestal. A pushrod connects the spoiler automatic actuator control arm to the speedbrake control lever. Access to the actuator is through the nose landing gear wheel well, upper, through access doors 4201A, 4302A and 4510A (Ref. 6-31-00, Figure 2 and Figure 4). Removal of the actuator cover panel and the left side cover panel from flight deck center control pedestal is also required. Removal of flight crew seats may also be required for access.

D. The numbers and letters enclosed by the hexagon-shaped symbol, shown in the adjustment diagrams, correspond to cable run numbers and segments. Each cable run number is posted adjacent to the corresponding cable in the aircraft.

E. This procedure should be used when a complete rig check of the Active In-Flight Spoiler Lockout System is required.

F. This procedure is written to an aircraft on the ground. No jacking required, or intended, unless otherwise indicated during rigging and functional checks.

G. If single or multiple electrical components in this system, such as solenoids, switches or relays are replaced for cause, and system rigging dimensions are not disturbed, a system functional check for validation may be completed rather than a complete rigging check. (SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 or SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 Config 2, Paragraph 4.E.)

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 501

Name and Number	Manufacturer
Rig pin (6-4) 3/8 by 4 5/8 (9.53 X 117.445 mm)	
Target, dummy MLG proximity switch, (2) (4952969)	The Boeing Company
Rig pin 2 (5-3) 5/16 by 3 5/8 (7.937 X 92.075 mm)	
Tag, "DO NOT OPERATE"	
Lockwire, NASM20995N32, DPM 684*[1]	Not specified
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch) (15.875 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Adjustment/Test Speedbrake Control System With Active In-Flight Spoiler Lockout

NOTE: The flap system (PAGEBLOCK 27-50-00/501) and the ground shift system (PAGEBLOCK 32-23-01/201) must be properly adjusted prior to adjusting speed brake/in-flight spoiler lockout control.

A. Adjust Auto Spoiler Actuator System

(1) Make certain that landing gear safety lock pins are installed. (PAGEBLOCK 32-00-00/201)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(2) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize spoiler hydraulic system by placing spoiler shutoff and system depressurization valves, located in left and right main gear wheel wells, to off position. Secure valve levers with safety pins.

(4) Disconnect ground sensing pushrod from ground sensing mechanism. (Figure 501, View A-A) Place nose landing gear ground shift mechanism in flight position.

(5) Place "DO NOT OPERATE" tags on aileron control wheels, landing gear control handle, auxiliary hydraulic pump controls and horizontal stabilizer controls.

(6) Place throttle levers in idle position (against aft stop).

(7) Place speed brake lever E forward in retract (RET) position. (Figure 502)

(8) Make certain that auto spoiler actuator is retracted to flight position. (Figure 503)

(9) With flap/slat handle H (Figure 504) in UP/RET position, rotate thumbwheel T to obtain dial-a-flap (DAF) indicator reading of 8 DEG. (Figure 505)

(10) Place flap/slat handle in DAF moveable detent at 8 DEG.

B. Adjust Spoiler In-Flight Lockout Mechanism

(1) Disconnect bolt W on flap input pushrod C. (Figure 506)

(2) Adjust bolts L so that roller A may be held in fillet radius between lower level and ramp of cam B on sector AF. (Figure 507)

(3) Retract flap/slat handle to 0 DEG/T.O. EXT detent.

(4) Roller A must be completely on upper level of cam B when held against cam surface. (Figure 507)

(a) If roller A is not in this position, readjust bolts L until requirements of this procedure are met. Paragraph 3.B.(2) through Paragraph 3.B.(4).

(5) Return flap/slat handle to DAF moveable detent at 8 DEG.

(6) With crank R in contact with stop S (Figure 508), adjust tension on cables 159A, B, C and 160A, B with turnbuckles A, B, and C per cable tension table. (Figure 509)(Figure 510)

(7) Differentially adjust turnbuckles A and B (Figure 509) to obtain gap of 0.005-0.030 inch (0.127-0.762 mm) between speed brake lever E and forward end of slot. (Figure 502)

(8) Differentially adjust turnbuckles B and C (Figure 509) until rig pin 6-4 can be freely inserted and removed from rig pin hole R-14 in sector AG. (Figure 506)

(9) Make certain that 0.005-0.030 inch (0.127-0.762 mm) gap is maintained between lever E and forward end of slot, and crank R remains in contact with stop S.

C. Adjust Ground Shift/In-Flight Lockout and Actuator Mechanism

(1) Make certain that nose landing gear ground shift mechanism remains in flight mode. (Figure 501, View A-A)

(2) Adjust jam nuts T at ground shift drum (Figure 511) and at auto spoiler actuator (Figure 503) to obtain 4.12 (+/- 0.12) inches dimension with pull control assemblies in both locations as shown (measuring from center of rod-end bolt hole to cable housing, as shown).

(3) Disconnect bolt X at ground shift drum (Figure 511), and bolt Z at auto spoiler actuator. (Figure 503)

(4) With flap/slat handle in DAF moveable detent at 8 DEG, adjust rod end AA at ground shift drum (Figure 511) until roller G contacts fillet radius between lower level and ramp of cam F. (Figure 506)

(a) Install bolt X and tighten jam nuts BB and T as required at ground shift drum. (Figure 511)

(5) Remove Bolt S, loosen set screw V, and insert rig pin 5-3 in rig pin hole R-15 through bell crank AP. (Figure 512)

(6) Adjust clevis AS in plunger of solenoid AT to obtain 0.38 (+0.06/-0.00) inch (9.652 (+1.524/-0.00) mm) dimension. (Figure 512) Secure set screw V.

(7) With auto spoiler actuator in flight position, hold roller AZ against spoiler actuator crank C and make certain that roller AK is contacting surface AJ of arm AH. (Figure 503)

(a) Adjust rod AN to obtain free fit of bolt S. (Figure 512)

(8) Install bolt S. Tighten and lockwire jam nut J, and tighten jam nut K. Remove rig pin 5-3 from rig pin hole R-15. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201) (Figure 512)

(9) With flap/slat handle in DAF moveable detent at 8 DEG, adjust rod end AA at auto spoiler actuator (Figure 503) until roller P contacts lower level and ramp of cam N. (Figure 506)

(a) Install bolt Z and tighten jam nuts BB and T (Figure 503), as required, at auto spoiler actuator.

NOTE: Due to combined effects of coarse half-turn adjustment increments of rod ends AA and parts manufactured to opposite tolerance extremes, it may not be possible to achieve a simultaneous contact of rollers G and P precisely in the fillet radius of cams F and N in Paragraph 3.C.(4) and/or Paragraph 3.C.(9). This is acceptable at this point of the procedure. The steps that follow will functionally determine if any rigging readjustment per Paragraph 3.C.(4) and/or Paragraph 3.C.(9).

(10) With rollers G and P on lower levels of cams F and N, (Paragraph 3.C.(4) and Paragraph 3.C.(9).) (Figure 506), make certain that gap of 0.005-0.015 inch (8.127-0.381 mm) exists between roller D and surface R on gate E.

(11) If gap is not attained (Paragraph 3.C.(10)), differentially adjust turnbuckles B and C until gap is obtained. (Figure 509)

(12) Recheck and make certain that 0.005-0.030 inch (0.127-0.762 mm) gap and crank R/stop S contact requirements are maintained. (Figure 508, View A-A) (Paragraph 3.B.(6)) through (Paragraph 3.B.(9))

(13) This adjustment may cause misalignment of rig pin hole R-14, which is acceptable at this point in procedure.

(14) No readjustment is required to enable reinsertion of rig pin 6-4.

(15) With flap/slat handle in DAF moveable detent at 8 DEG, adjust bolts M to obtain gap of 0.090+/-0.050 inch (2.286+/ -1.27 mm) between roller D and gate E. (Figure 506)

(16) Adjust rod end CC on flap input pushrod C until roller A is in contact with cam B. (Figure 506) (Figure 507)

(17) Tighten jam nut DD, and install bolt W. (Figure 506)

(18) Place flap/slat handle to 0 DEG/T.O. EXT detent.

(19) Make certain that speed brake lever E can be moved aft to speed brake EXT (34 DEG) detent.

(20) Return speed brake lever forward to retract position.

(21) If lever cannot be moved aft, repeat (Paragraph 3.B.(1)) through (Paragraph 3.B.(5)) , (Paragraph 3.C.(10)) through (Paragraph 3.C.(17)) (readjust bolts M) until requirements are met.

(a) Repeat check of lever, as required. (Paragraph 3.C.(18) through Paragraph 3.C.(21))

(22) Place flap/slat handle in DAF moveable detent at 8 DEG.

(23) Make certain that speed brake lever E cannot be moved aft to first speed brake detent (1/4).

(24) Place flap/slat handle in 40 DEG/LAND EXT fixed detent.

(25) Place nose gear ground shift mechanism in ground mode. (Figure 511)

(26) Make certain that speed brake lever E can be pulled up into armed position (red ARM label visible) and moved aft to full 60 DEG ground spoiler position.

(27) Return speed brake lever forward to retract armed position (red ARM label still visible).

(28) Place ground shift mechanism to flight mode. (Figure 501, View A-A)

(29) If lever E did not reach full 60 DEG ground spoiler position, or if roller D did not clear outermost surface of gate E during rotation of sector AG, repeat Paragraph 3.C.(4) and Paragraph 3.C.(10) through Paragraph 3.C.(17) , (readjust bolts M, as required). Repeat Paragraph 3.C.(24) through Paragraph 3.C.(28).

WARNING: DO NOT OPERATE ACTUATOR ELECTRICALLY WITH NORMAL SPEEDBRAKE/ SPOILER CONTROLS UNTIL AFTER RIGGING ADJUSTMENTS HAVE BEEN COMPLETED. THE CONTROL SYSTEM WILL QUICKLY DRIVE ACTUATOR FULL TRAVEL EXTEND/RETRACT. DAMAGE TO SYSTEM COMPONENTS MAY OCCUR.

(30) With flap/slat handle still in 40 DEG/LAND EXT fixed detent, slowly extend auto spoiler actuator to ground position in incremental steps. (Figure 503)

(a) The actuator may be operated manually. (SPOILER AUTOMATIC ACTUATOR - MAINTENANCE PRACTICES, PAGEBLOCK 27-62-05/201, Page 206, paragraph 4.) Due to actuator clutch torque, a tool (local manufacture) may be required for rotation of actuator to check roller to cam clearances.

NOTE: Approximately 200 inch-pounds (22.4 N·m) of torque on actuator control arm is required to slip clutch mechanism in actuator.

NOTE: Differences in shape of operating cam on actuators modified for in-flight spoiler lockout mechanism installation and actuators for non-lockout mechanism installations may affect ability to fit tool to actuator cams.

NOTE: Use short intermittent manual operation of spoiler actuator to move auto spoiler actuator toward extend position in smallest incremental steps possible. The intent is to rotate actuator as slowly as possible should roller D not clear gate E during initial rotation of auto spoiler actuator crank C.

(31) Visually check that roller D does not contact gate E during initial rotation of auto spoiler actuator crank C. (Figure 506)

(32) Make certain that speed brake lever E is driven aft to full 60 DEG ground spoiler position when actuator reaches ground position.

(33) Return speed brake lever forward to retract, unarmed (red ARM label not visible) position.

(34) Retract auto spoiler actuator to flight position. (Figure 503)

NOTE: To retract the auto spoiler actuator to the flight position, manually position spoiler automatic actuator to flight mode. (Paragraph 3.C.(30) or SPOILER AUTOMATIC ACTUATOR - MAINTENANCE PRACTICES, PAGEBLOCK 27-62-05/201, Page 206, paragraph 4)

(35) If all requirements have been met, retract flap/slat handle to UP/RET position, place nose gear ground shift mechanism in ground mode. (Figure 501, View A-A)

(36) If lever E did not reach full 60 DEG ground spoiler position, or if roller D did not clear outermost surface of gate E during rotation of sector AG, repeat Paragraph 3.C.(9) through Paragraph 3.C.(17) , (readjust bolts M, as required). Repeat Paragraph 3.C.(30) through Paragraph 3.C.(35).

(37) Reconnect nose landing gear ground sensing pushrod to ground sensing sector. (Figure 501, View A-A)

(38) Place spoiler shutoff and system depressurization valves, located in left and right main landing gear wheel wells, to on (or open) position. Secure valves with safety pins.

WARNING: MAKE SURE THE LANDING GEAR LOCKPINS ARE INSTALLED AND THE APPLICABLE CONTROLS ARE IN THE CORRECT POSITION. THIS WILL PREVENT ACCIDENTAL OPERATION OF THE LANDING GEAR AND FLIGHT CONTROL SURFACES. INCORRECT PROCEDURES CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

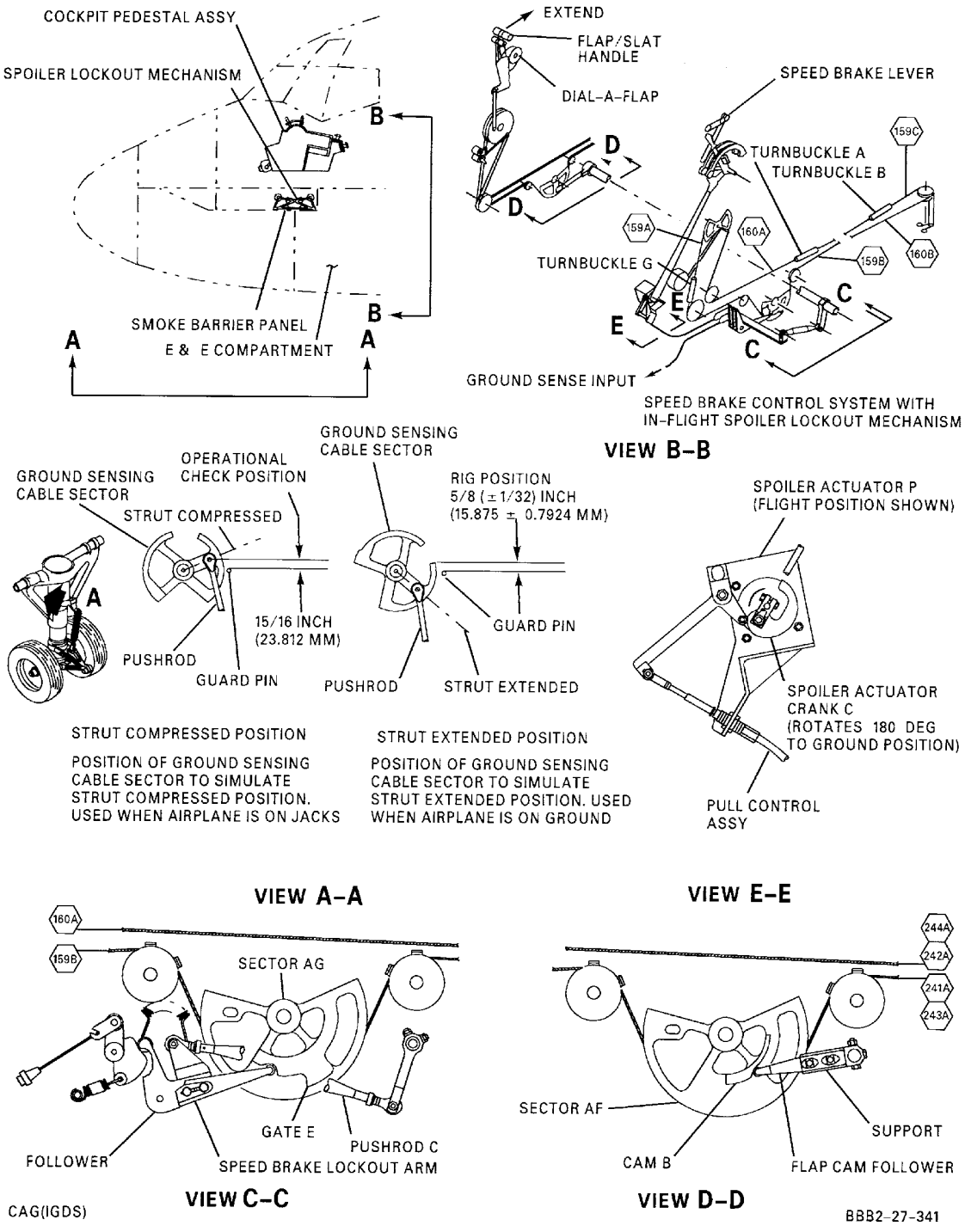
(39) Remove main landing gear door ground safety locks. Place main landing door ground maintenance bypass lever in closed (normal) position (lever stowed). Close left and right main landing gear doors. (PAGEBLOCK 32-00-00/201)

(40) Remove "DO NOT OPERATE" tags from spoiler/speedbrake handle, aileron control wheels, flap/slat handle, landing gear control handle, auxiliary hydraulic pump controls and horizontal stabilizer controls.

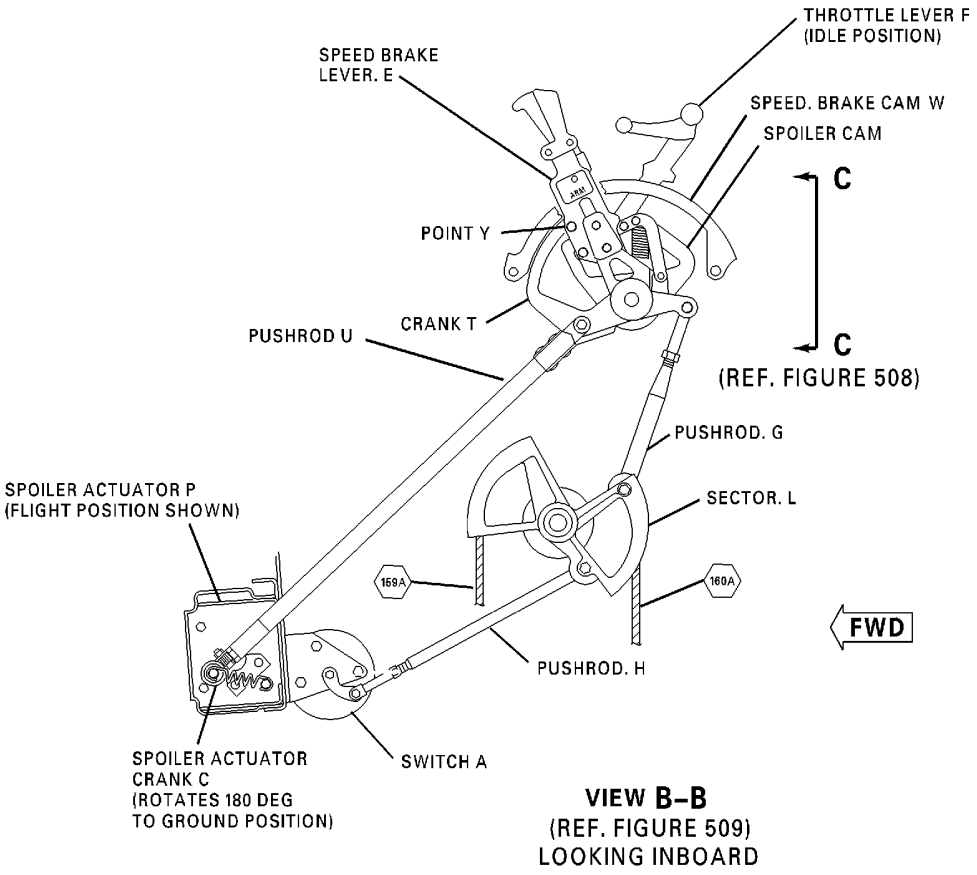
(41) Make certain that all tools, test equipment, cleaning materials or any other foreign material is removed from work areas involved in this procedure. Make certain that work areas are clean. Make certain that all components/systems are restored to the normal (pre-maintenance) condition.

(42) Reinstall auto spoiler actuator cover panel and left side cover panel on flight deck center control pedestal. Reinstall flight crew seats, as required.

(43) Reinstall access doors 4201A, 4302A and 4510A in nose landing gear wheel well. (INTERNAL ACCESS DOORS, SUBJECT 06-31-00)



Speed Brake/Auto Spoiler Actuator/In-Flight Lockout Control Details - Adjustment
Figure 501/27-60-01-990-801

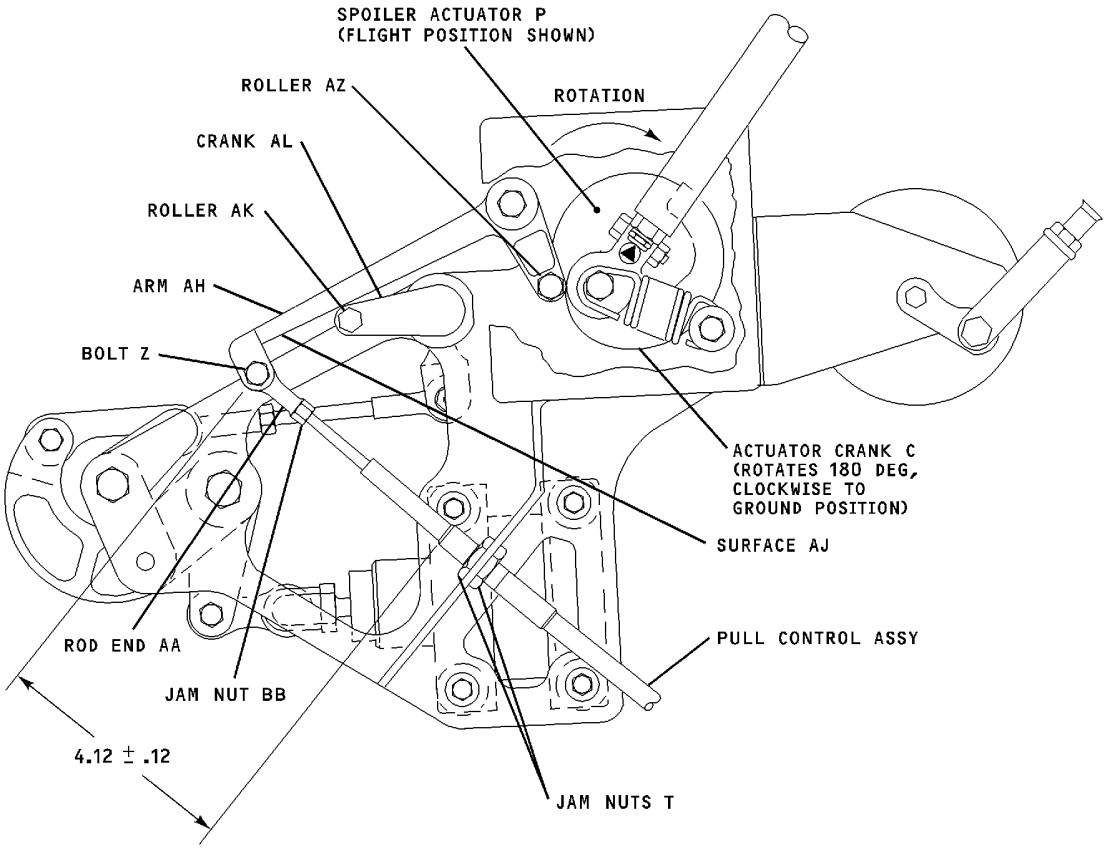


SPEED BRAKE CONTROL DETAILS

CAG(IGDS)

BBB2–27–413A

Spoiler/Speedbrake Controls - Adjustment
Figure 502/27-60-01-990-802

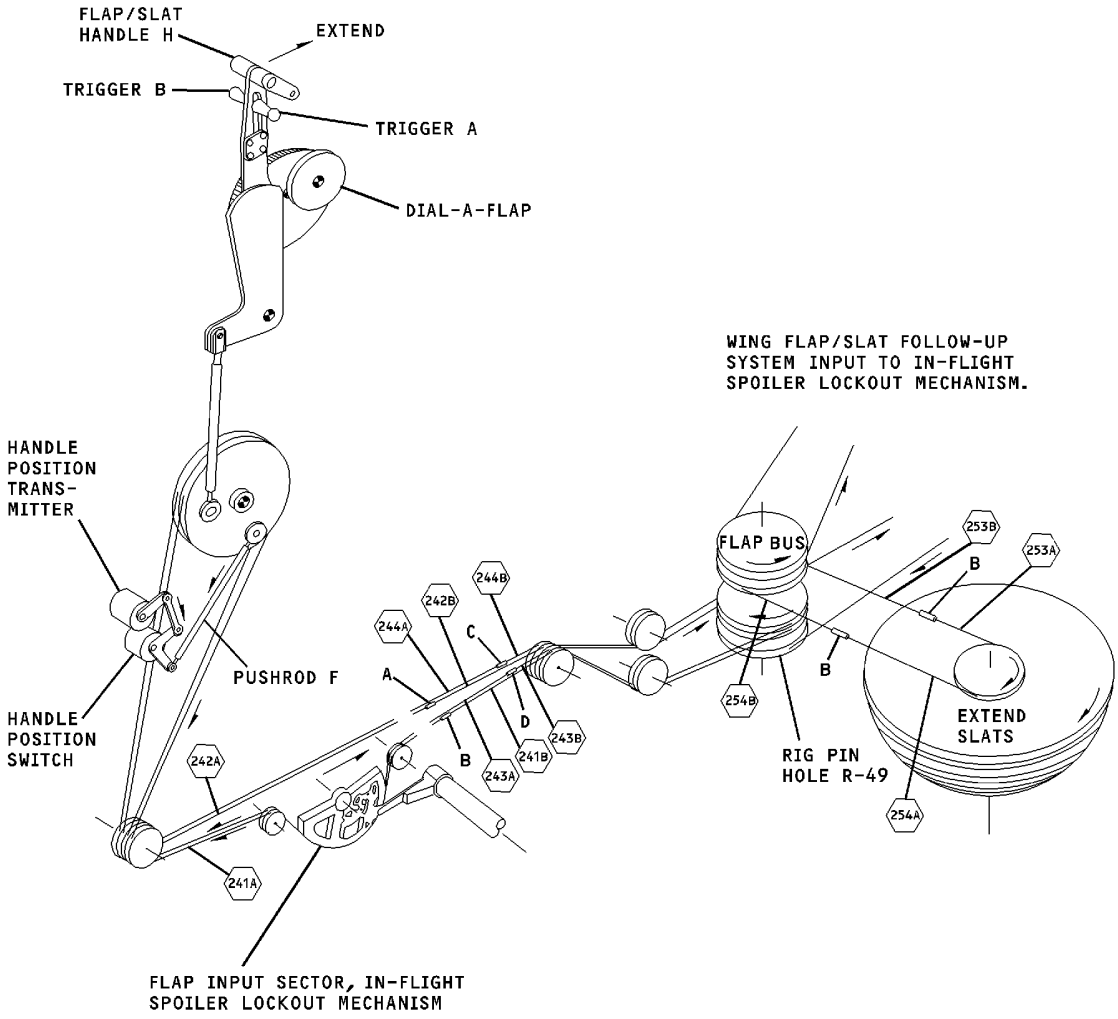


VIEW H-H
(REF. FIGURE 509)

AUTO SPOILER ACTUATOR WITH LOCKOUT
WITH WEIGHT-ON-WHEEL INPUT

CAG(IGDS) BBB2-27-414A

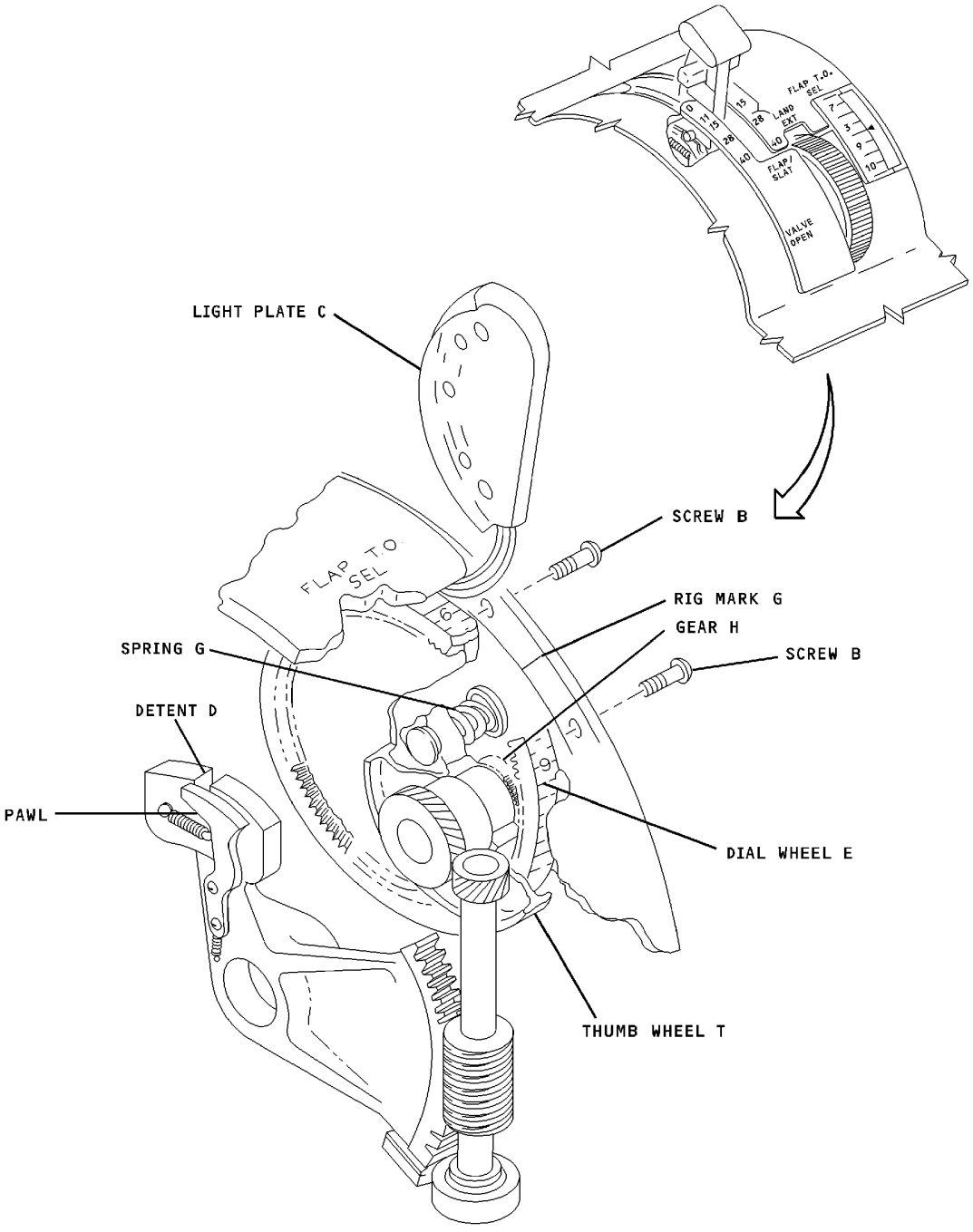
Auto Spoiler Actuator with Lockout and Weight-On-Wheel Input - Adjustment
Figure 503/27-60-01-990-803



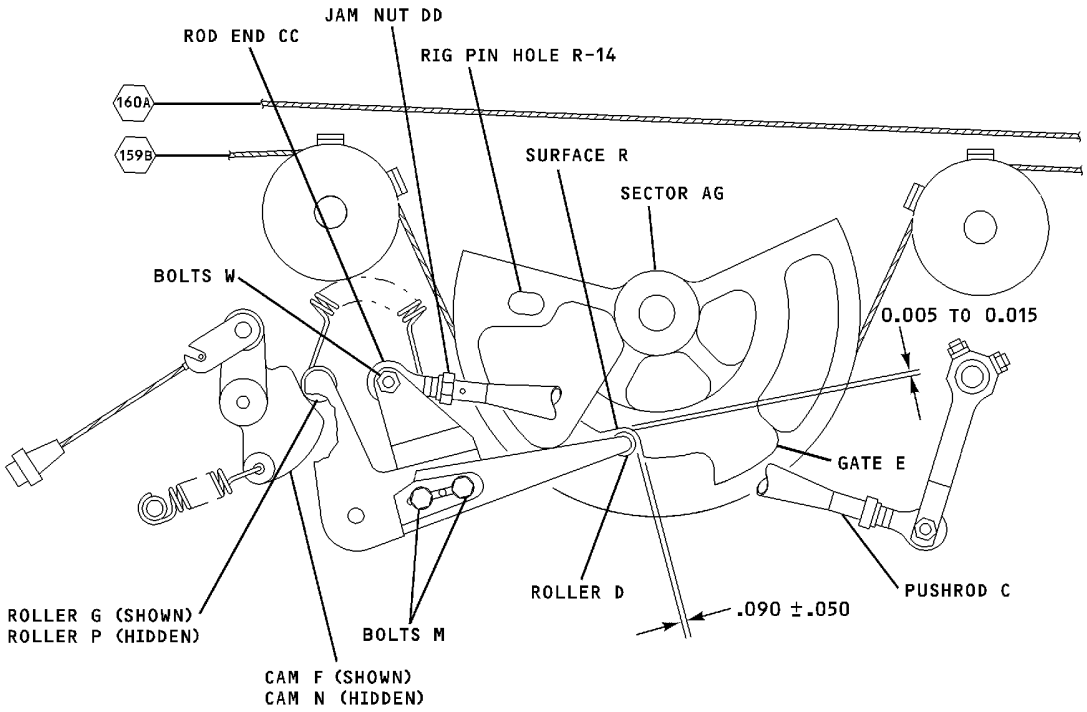
WING FLAP AND FOLLOW-UP SYSTEM FOR AIRCRAFT
EQUIPPED WITH IN-FLIGHT SPOILER LOCKOUT MECHANISM

CAG(IGDS) BBB2-27-435

Wing Flap and Follow-up Control for Spoiler In-Flight Lockout
Figure 504/27-60-01-990-805



Dial-A-Flap Control - Adjustment
Figure 505/27-60-01-990-806

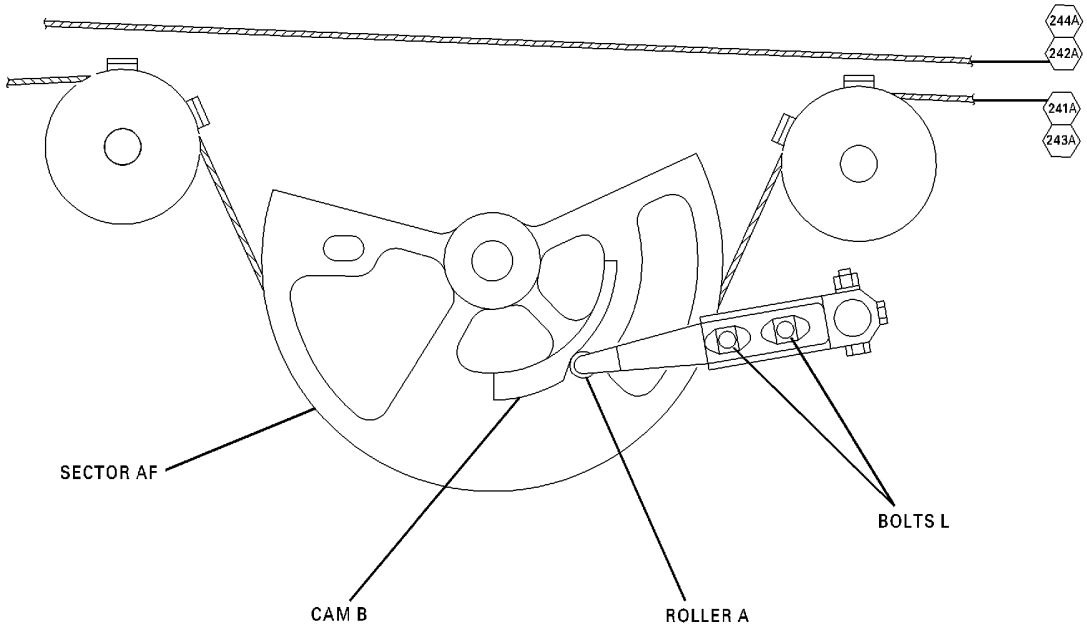


VIEW D-D
(REF. FIGURE 509)

CAG(IGDS)

BBB2-27-436

Sector AG In-Flight Spoiler Control - Adjustment
Figure 506/27-60-01-990-807

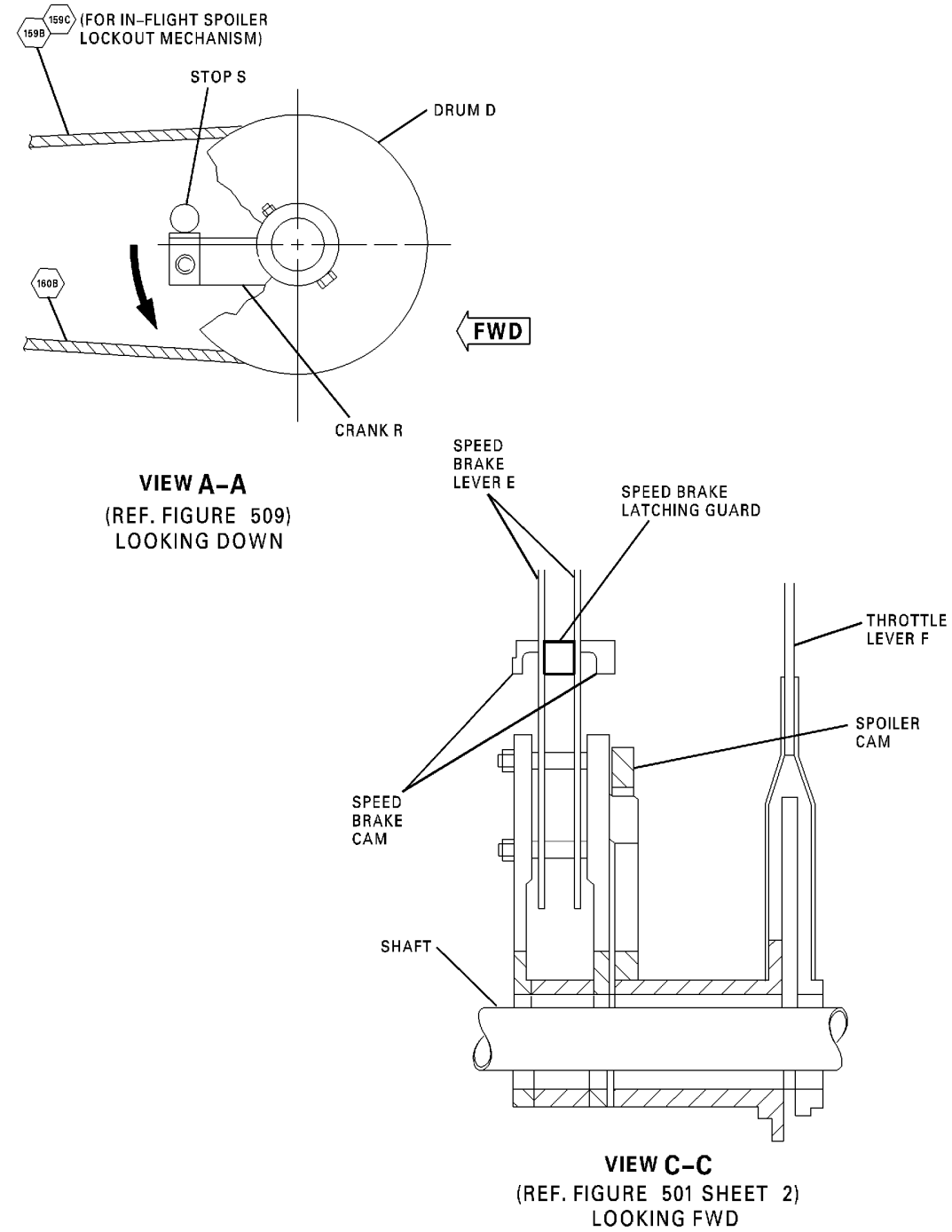


VIEW E–E
(REF. FIGURE 509)

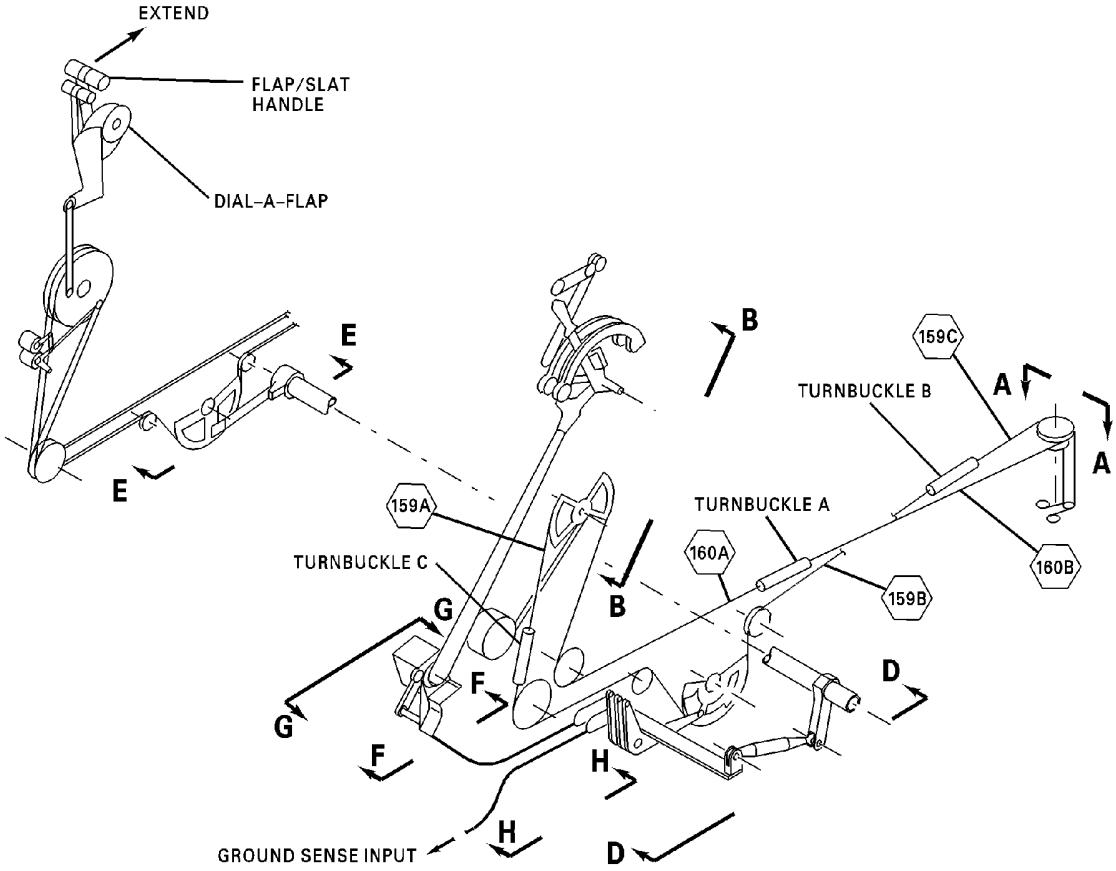
CAG(IGDS)

BBB2–27–419A

Sector AF, In-Flight Spoiler Control - Adjustment
Figure 507/27-60-01-990-808



Speed Brake Control Details - Adjustment
Figure 508/27-60-01-990-809



SPEED BRAKE CONTROL SYSTEM WITH
IN-FLIGHT SPOILER LOCKOUT MECHANISM

CAG(IGDS)

BBB2-27-424A

Speed Brake Control with In-Flight Spoiler Lockout - Adjustment
Figure 509/27-60-01-990-810

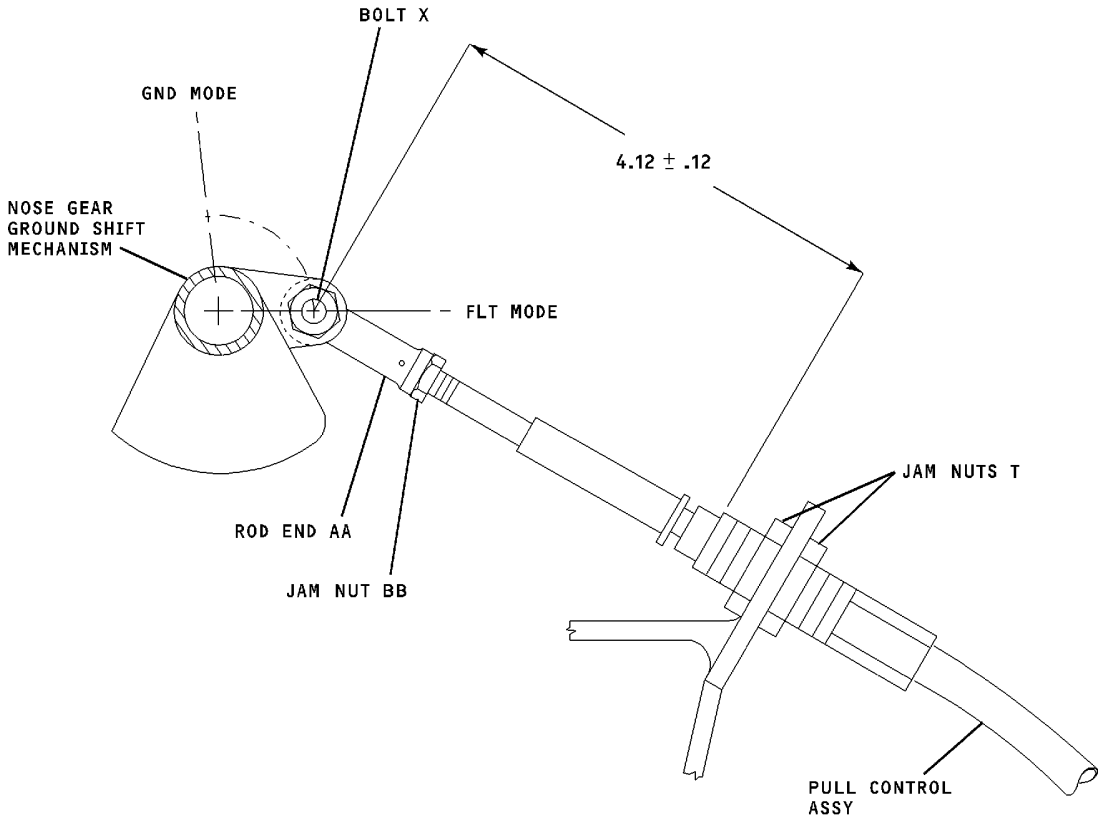
CABLE TENSION TABLE – SPEED BRAKE/FLAP INPUT TO ELEVATOR SERVO

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV.LOAD
–60	19	13	9	40	67	61	46
–58	20	14	10	42	68	62	47
–56	21	15	11	44	69	63	48
–54	22	16	12	46	70	64	48
–52	23	17	12	48	71	65	49
–50	24	18	13	50	72	66	50
–48	25	19	14	52	73	67	51
–46	26	20	15	54	74	68	51
–44	27	21	15	56	75	69	52
–42	28	22	16	58	76	70	53
–40	29	23	17	60	77	71	54
–38	30	24	18	62	78	72	55
–36	31	25	18	64	79	73	55
–34	32	26	19	66	80	74	56
–32	33	27	20	68	81	75	57
–30	34	28	21	70	82	76	58
–28	35	29	21	72	83	77	58
–26	36	30	22	74	84	78	59
–24	37	31	23	76	85	79	60
–22	38	32	24	78	86	80	61
–20	39	33	24	80	87	81	62
–18	40	34	25	82	88	82	62
–16	41	35	26	84	89	83	63
–14	41	35	27	86	90	84	64
–12	42	36	27	88	91	85	65
–10	43	37	28	90	92	86	66
–8	44	38	29	92	93	87	67
–6	45	39	30	94	95	89	67
–4	46	40	30	96	96	90	68
–2	47	41	31	98	97	91	69
0	48	42	32	100	98	92	70
2	49	43	32	102	99	93	71
4	50	44	33	104	100	94	72
6	51	45	34	106	101	95	73
8	52	46	35	108	102	96	73
10	53	47	35	110	104	98	74
12	54	48	36	112	105	99	75
14	55	49	37	114	106	100	76
16	56	50	37	116	107	101	77
18	57	51	38	118	108	102	78
20	57	51	39	120	109	103	79
22	58	52	40	122	111	105	80
24	59	53	40	124	112	106	81
26	60	54	41	126	113	107	82
28	61	55	42	128	114	108	83
30	62	56	43	130	116	110	84
32	63	57	43	132	117	111	85
34	64	58	44	134	118	112	86
36	65	59	45	136	119	113	87
38	66	60	45	138	121	115	88
				140	122	116	89

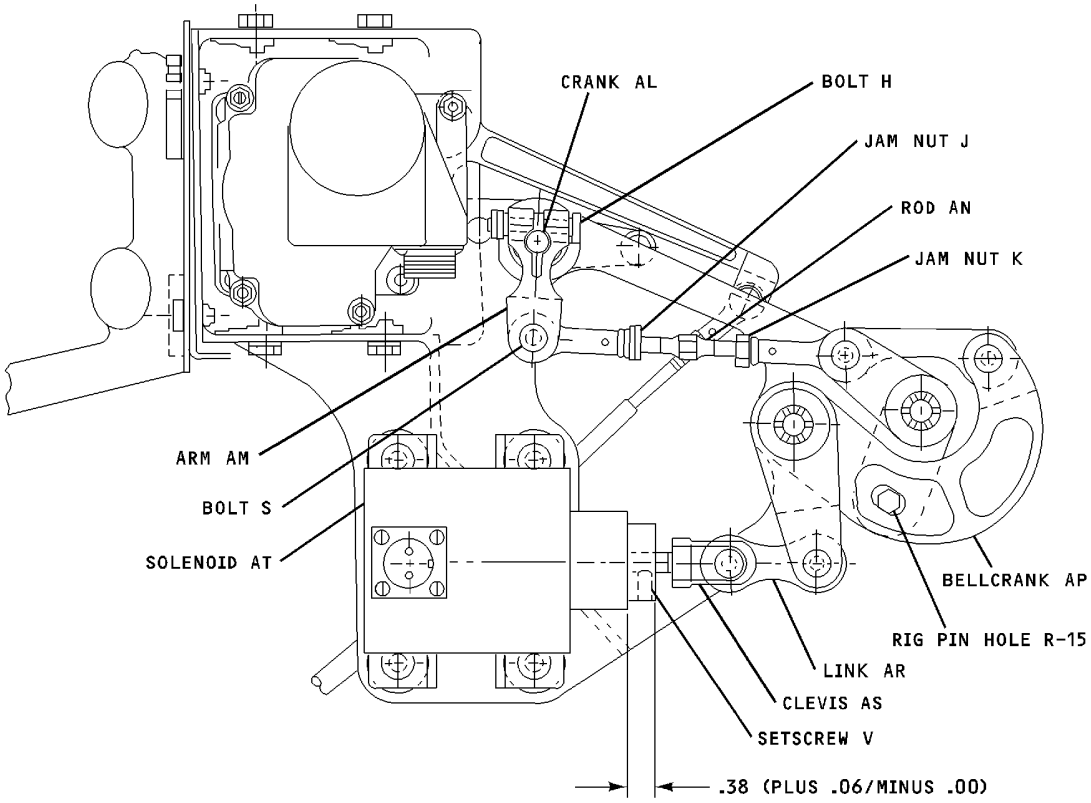
NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-281A

Cable Tension Table - Speed Brake/Spoiler/Flap Input
Figure 510/27-60-01-990-811



Ground Sense Mechanism - Adjustment
Figure 511/27-60-01-990-812



VIEW G-G
(REF. FIGURE 509)
AUTO SPOILER ACTUATOR WITH LOCKOUT
AND WEIGHT-ON-WHEEL INPUT

CAG(IGDS) BBB2-27-439

Spoiler Lockout with Weight-On-Wheel Input - Adjustment
Figure 512/27-60-01-990-813

DEACTIVATED IN-FLIGHT SPOILER LOCKOUT SYSTEM - ADJUSTMENT/TEST

1. General

A. This procedure is applicable only on later aircraft which have a Deactivated In-Flight Spoiler Lockout System (DISLS) (Ref. Fuselage Numbers 1606 and subsequent). Specific segments of the system may be adjusted by following the procedures in the applicable paragraphs. Access to components is given in the text as required.

B. A DEACTIVATED lockout mechanism can be identified by the removal of the weight-on-wheels solenoid which is on the ACTIVATED lockout mechanism. The speed brake lockout arm and flap cam follower are removed for the DEACTIVATED lockout mechanism. (Figure 501)

C. The spoiler automatic actuator is located in the forward lower section of the control cabin center control pedestal. A pushrod connects the spoiler automatic actuator control arm to the speedbrake control lever. Access to the actuator is through the nose landing gear wheel well, upper, through access doors 4201A, 4302A, and 4510A (Ref. 6-31-00, Figure 2 and Figure 4). Removal of the actuator cover panel and the left side cover panel from flight deck center control pedestal is also required. Removal of flight crew seats may also be required for access.

D. The numbers and letters enclosed by the hexagon-shaped symbol, shown in the adjustment diagrams, correspond to cable run numbers and segments. Each cable run number is posted adjacent to the corresponding cable in the aircraft.

E. This procedure should be used when a complete rig check of the Deactivated In-Flight Spoiler Lockout System is required.

F. This procedure is written to an aircraft on the ground. No jacking required, or intended, unless otherwise indicated during rigging and functional checks.

G. If single or multiple electrical components in this system, such as solenoids, switches or relays are replaced for cause, and system rigging dimensions are not disturbed, a system functional check for validation may be completed rather than a complete rigging check. (SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 or SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 Config 2)

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 501

Name and Number	Manufacturer
Rig pin (6-4) 3/8 by 4 5/8 (9.53 X 117.445 mm)	
Target, dummy MLG proximity switch, (2) (4952969)	The Boeing Company
Rig pin 2 (5-3) 5/16 by 3 5/8 (7.937 X 92.075 mm)	
Tag, "DO NOT OPERATE"	
Lockwire, NASM20995N32, DPM 684	Not specified
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch) (15.875 mm).	

3. Adjustment/Test Speedbrake Control System With Deactivated In-Flight Spoiler Lockout

NOTE: The flap system (PAGEBLOCK 27-50-00/501) and the ground shift system (PAGEBLOCK 32-23-01/201) must be properly adjusted prior to adjusting speed brake/in-flight spoiler lockout control.

NOTE: The ground shift mechanism must be completely rigged prior to speed brake control rigging.

A. Speed Brake Control with Deactivated Spoiler Lockout Adjustment

(1) Make certain that landing gear safety lock pins are installed. (PAGEBLOCK 32-00-00/201)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(2) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize spoiler hydraulic system by placing spoiler shutoff and system depressurization valves, located in left and right main gear wheel wells, to off position. Secure valve levers with safety pins.

(4) Place "DO NOT OPERATE" tags on aileron control wheels, landing gear control handle, auxiliary hydraulic pump controls and horizontal stabilizer controls.

(5) Place throttle levers in idle position (against aft stop).

(6) Place speed brake lever E forward in the retract (RET) position. (Figure 502)

(a) Make sure that the auto spoiler actuator is retracted to the flight position (Figure 503).

(b) Place the nose gear ground shift mechanism in the flight mode (Figure 504).

(7) With the crank R in contact with stop S, rig cables 159A,B,C and 160A,B with turnbuckles A, B, and C with the tension tables. (Figure 505, View A-A) (Figure 506) (Figure 507)

(a) Differentially adjust turnbuckles A and B to obtain a gap of 0.005 in. (0.127 mm) to 0.030 in. (0.762 mm) between speedbrake lever E and forward end of slot.

(b) Then, differentially adjust turnbuckles B and C until the rig pin 6-4 can be freely inserted and removed from the rig pin hole R-14 in sector AG (Figure 508).

(c) Make sure that the 0.005 in. (0.127 mm) to 0.030 in. (0.762 mm) gap is maintained between the lever E and the forward end of slot, and crank R remains in contact with stop S.

(8) Adjust jam nuts T at the ground shift drum and at the auto spoiler actuator to obtain a 4.12 in. (104.65 mm)±0.12 in. (3.05 mm) dimension with the pull control assembly in both locations (Figure 509) (Figure 503)

(a) Then disconnect bolt X at the ground shift drum and bolt Z at the auto spoiler actuator.

(9) Adjust rod end AA at the ground shift drum until roller G contacts the fillet radius between the lower level and ramp of cam F (Figure 508)

(a) Install bolt X and secure jam nuts BB and T (Ref Figure 509) as required at the ground shift drum (Figure 509).

(10) Adjust the rod end AA at the auto spoiler actuator until the roller P contacts the lower level and ramp of cam N (Figure 503) (Figure 508).

(a) Install the bolt Z and secure the jam nuts BB and T as required at the auto spoiler actuator.

NOTE: Due to combined effects of coarse half-turn adjustment increments of rod ends AA and parts manufactured to opposite tolerance extremes, it may not be possible to achieve simultaneous contact of rollers Gand P precisely in the fillet radius of the cams F and N in the previous steps. This is acceptable at this point of the procedure.

(11) Place spoiler shutoff and system depressurization valves, located in left and right main landing gear wheel wells, to on (or open) position. Secure valves with safety pins.

WARNING: MAKE SURE THE LANDING GEAR LOCKPINS ARE INSTALLED AND THE APPLICABLE CONTROLS ARE CORRECTLY SET. THIS WILL PREVENT THE ACCIDENTAL OPERATION OF THE LANDING GEAR AND THE FLIGHT CONTROL SYSTEMS. ACCIDENTAL OPERATION CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(12) Remove main landing gear door ground safety locks. Place main landing door ground maintenance bypass lever in closed (normal) position (lever stowed). Close left and right main landing gear doors. (PAGEBLOCK 32-00-00/201)

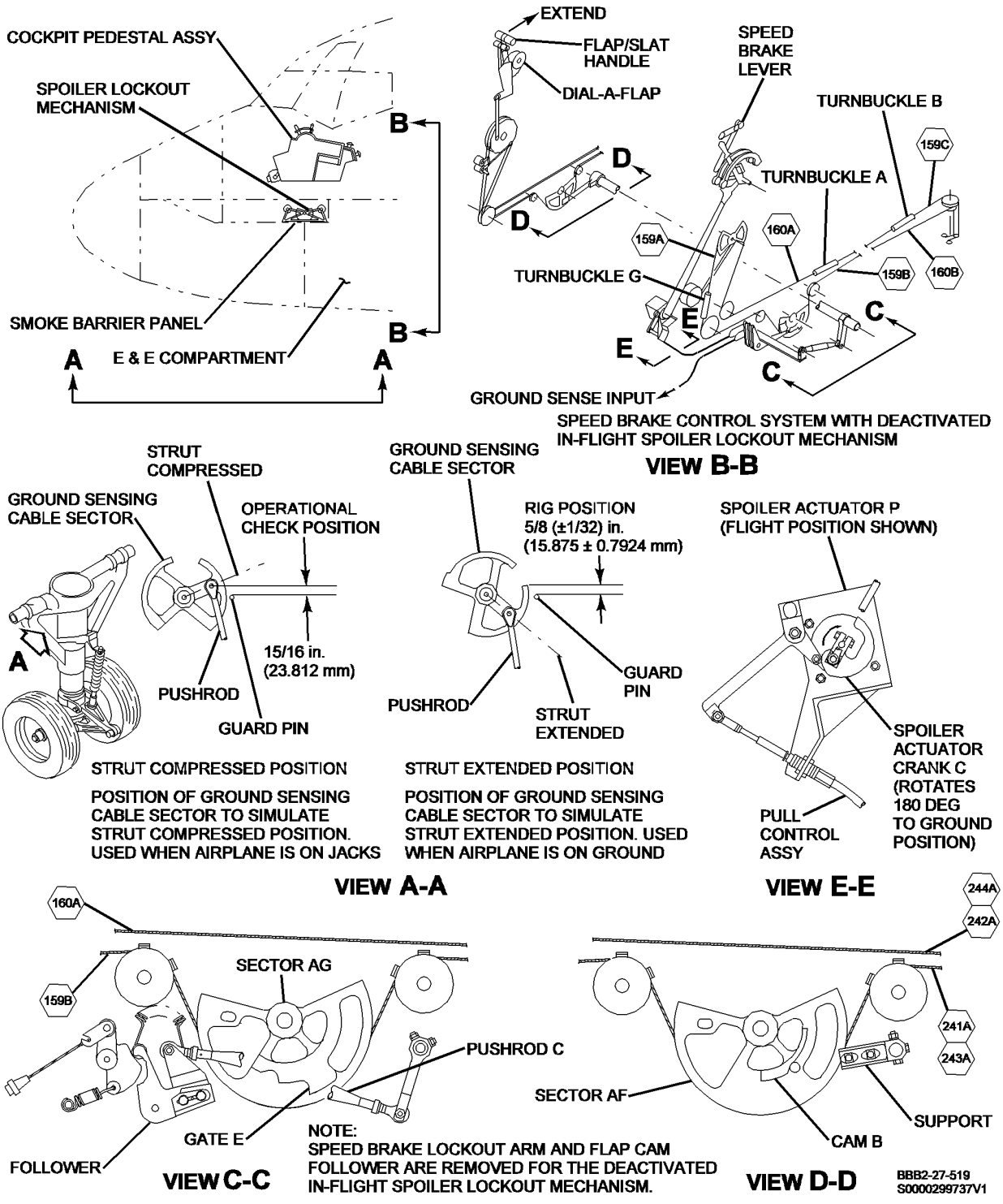
(13) Remove "DO NOT OPERATE" tags from spoiler/speedbrake handle, aileron control wheels, flap/slat handle, landing gear control handle, auxiliary hydraulic pump controls and horizontal stabilizer controls.

(14) Make certain that all tools, test equipment, cleaning materials or any other foreign material is removed from work areas involved in this procedure. Make certain that work areas are clean. Make certain that all components/systems are restored to the normal (pre-maintenance) condition.

(15) Reinstall auto spoiler actuator cover panel and left side cover panel on flight deck center control pedestal. Reinstall flight crew seats, as required.

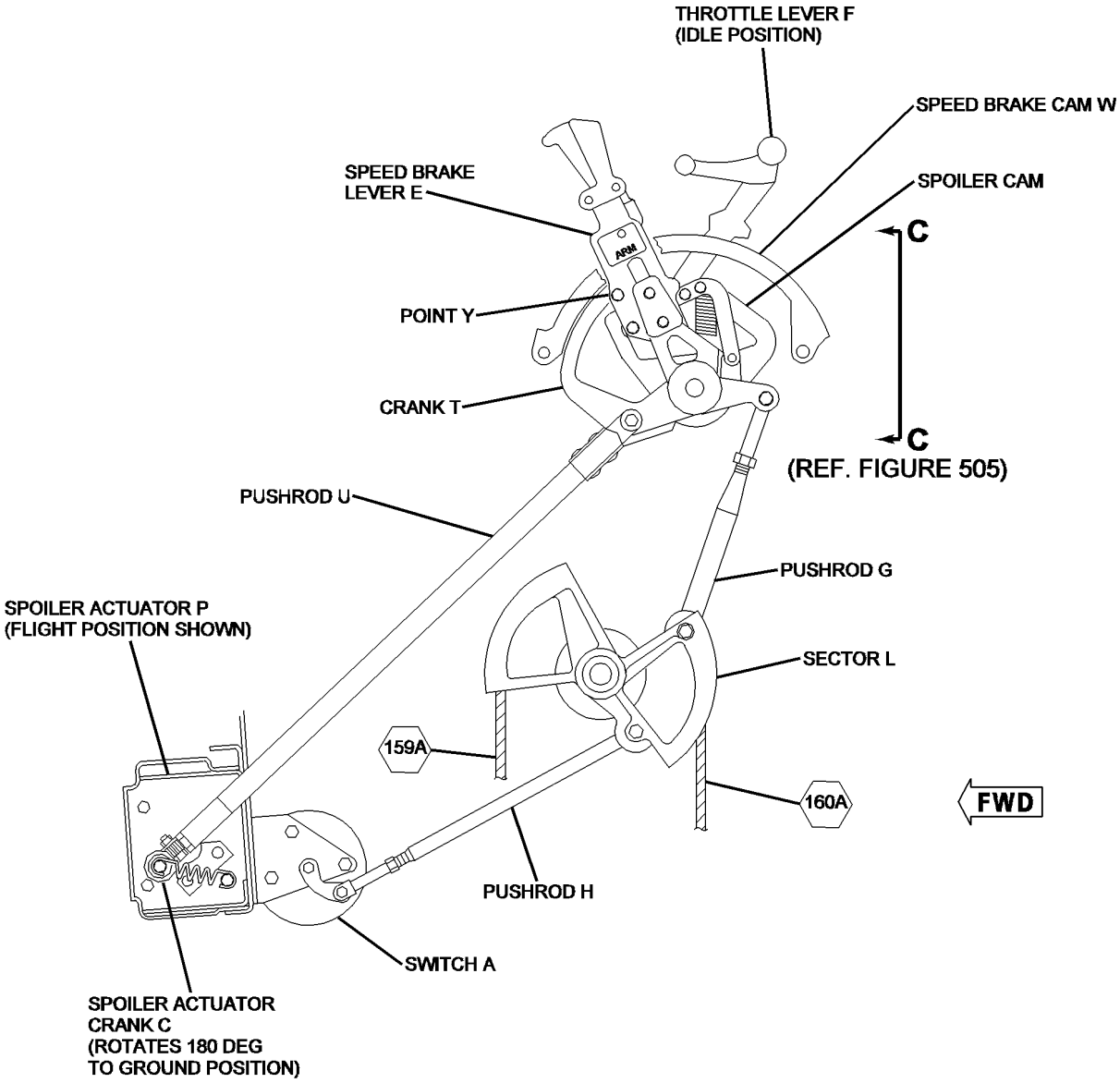
(16) Reinstall access doors 4201A, 4302A and 4510A in nose landing gear wheel well. (INTERNAL ACCESS DOORS, SUBJECT 06-31-00)

(17) Do the Functional Check for the Deactivated In-Flight Spoiler Lockout Mechanism (Ref. paragraph 4.).



Deactivated In-Flight Spoiler Lockout - Adjustment/Test
Figure 501/27-60-02-990-801

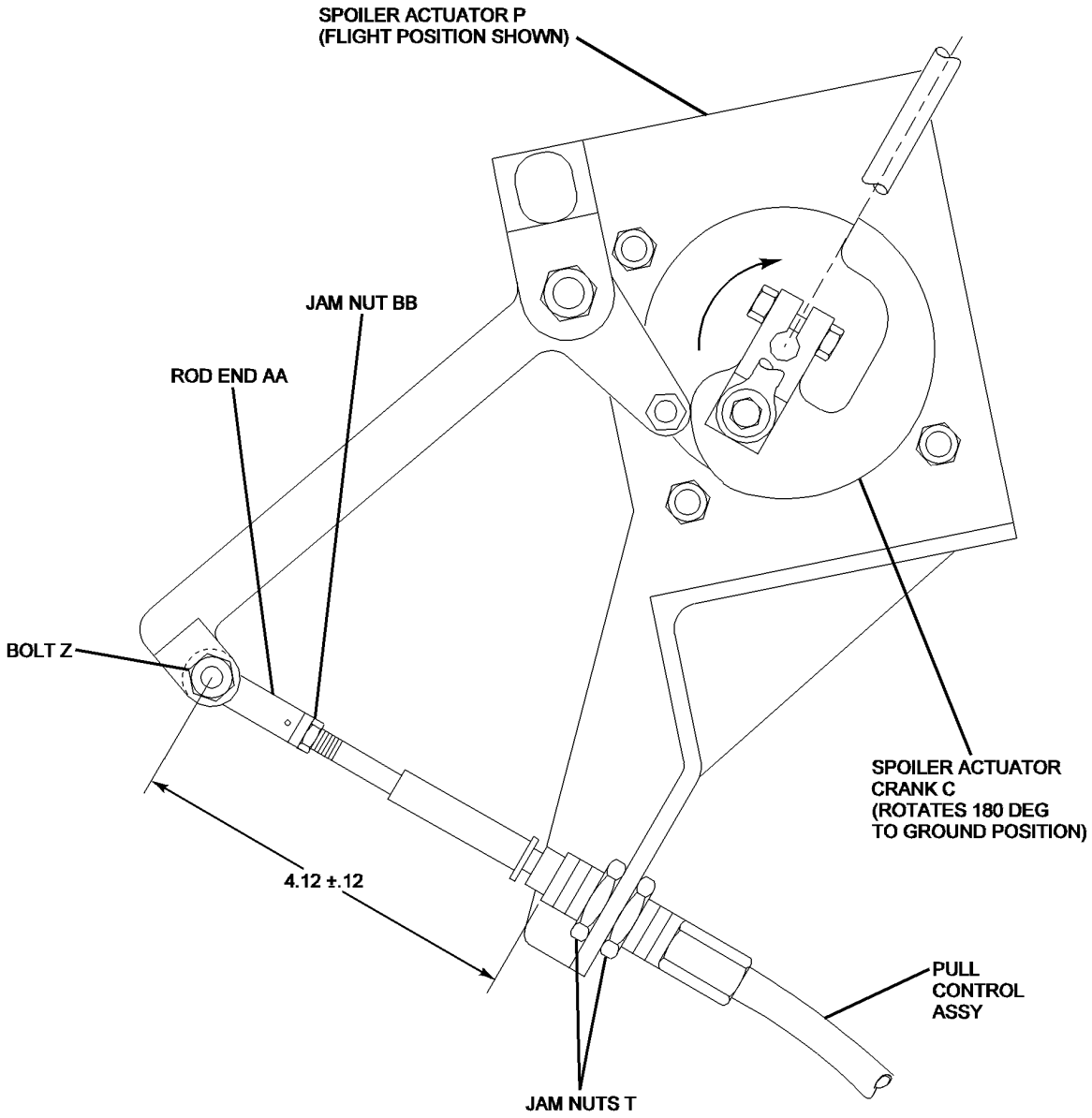
EFFECTIVITY
WJE 401-404, 406-408, 411, 412, 414, 417, 419, 421, 423, 865, 869, 871, 872, 886, 887



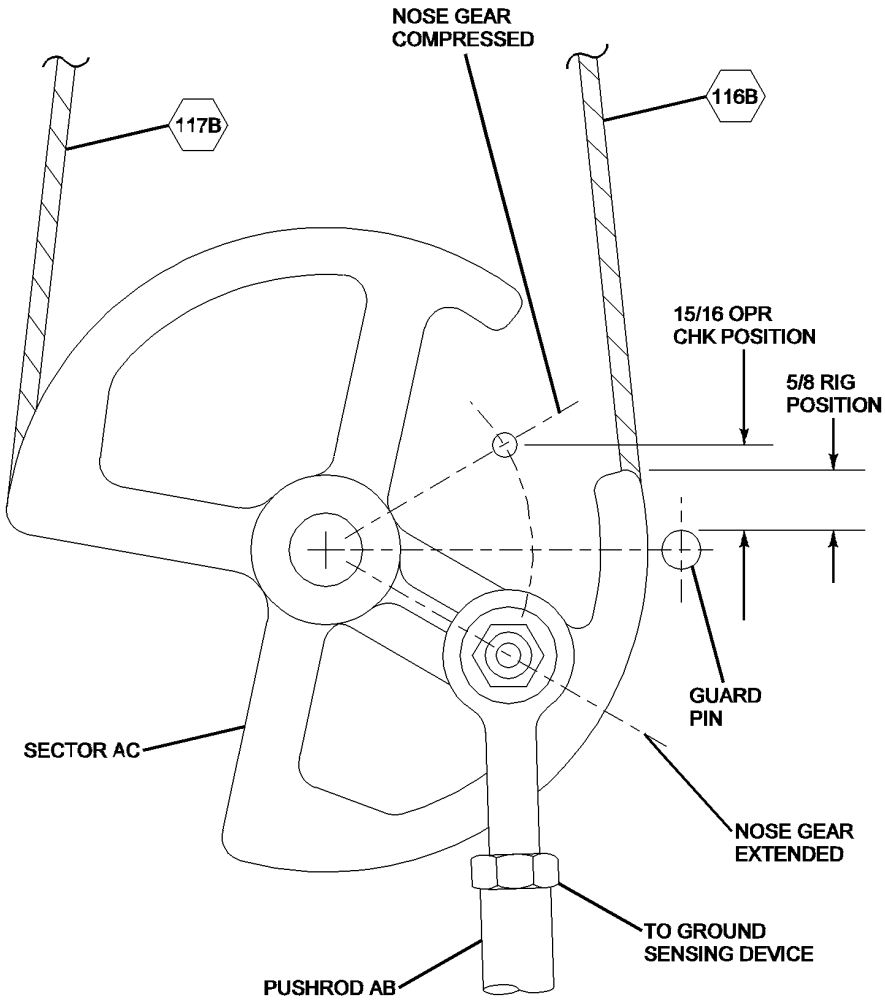
SPEED BRAKE CONTROL DETAILS
LOOKING INBOARD

BBB2-27-520
S0000299742V1

Speed Brake Control Details - Adjustment/Test
Figure 502/27-60-02-990-802



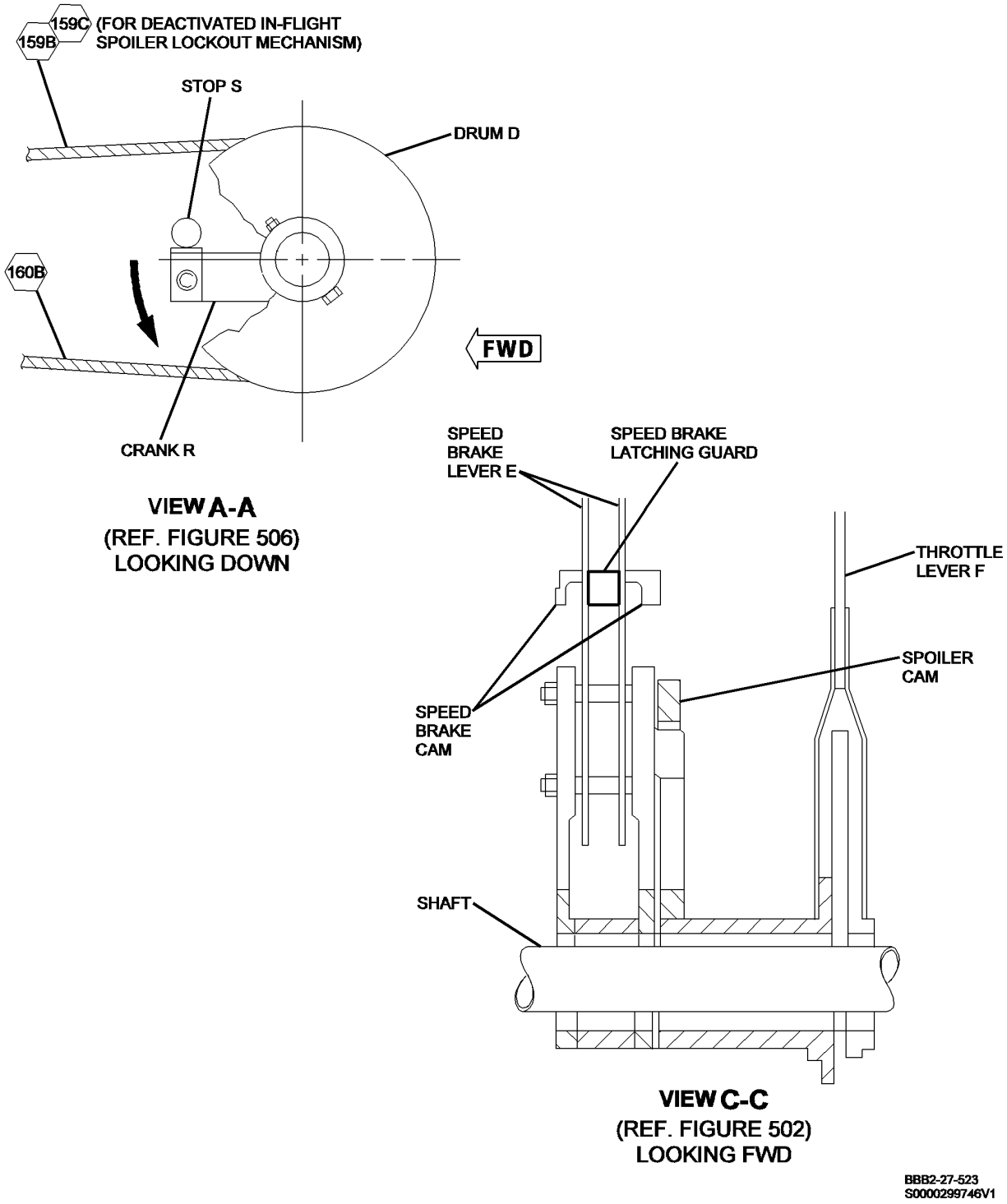
Spoiler Actuator - Adjustment/Test
Figure 503/27-60-02-990-803



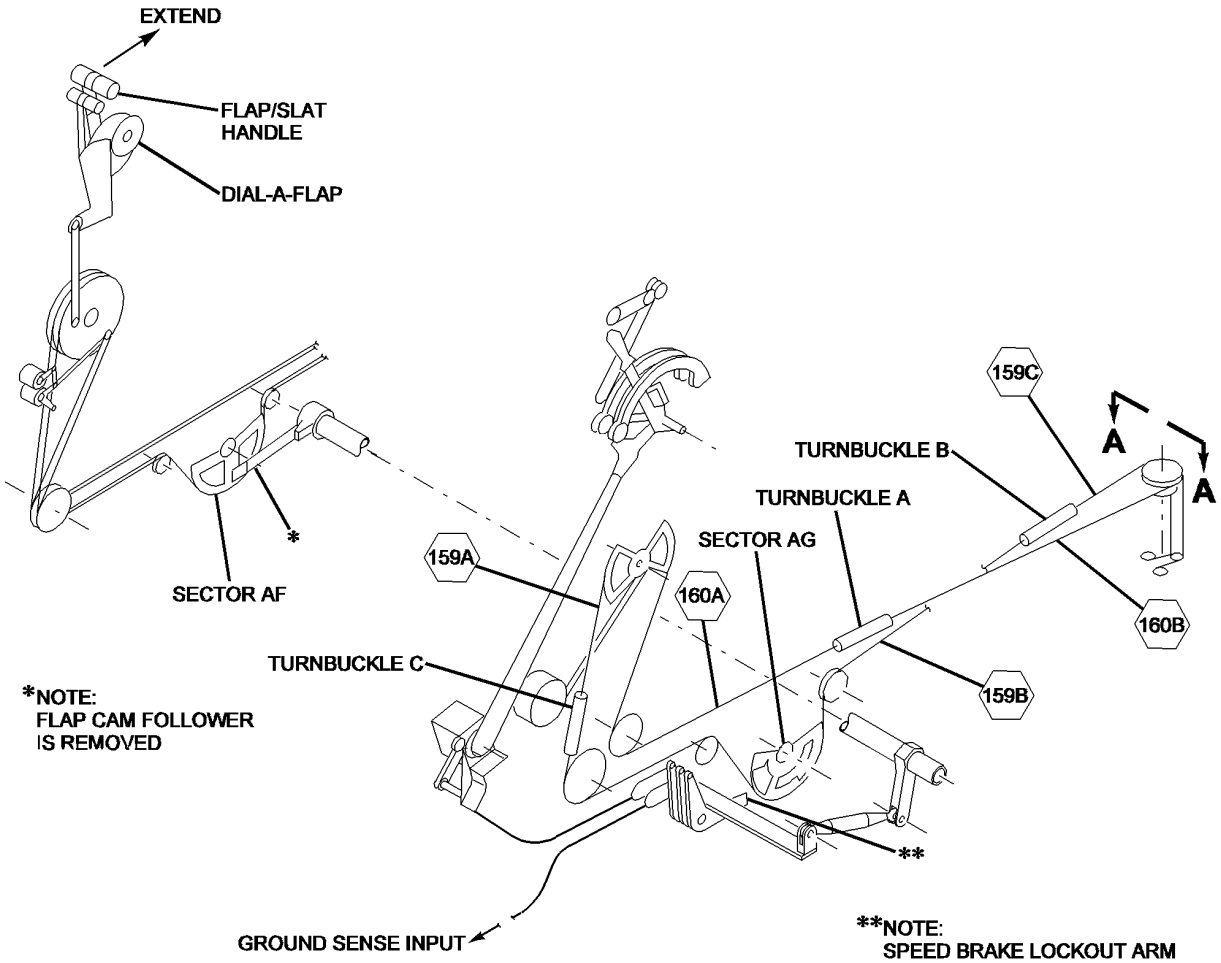
VIEW LOOKING FWD

BBB2-27-522
S0000299744V1

Ground Shift Mechanism - Adjustment/Test
Figure 504/27-60-02-990-804



Speed Brake and Drum Views - Adjustment/Test
Figure 505/27-60-02-990-805



SPEED BRAKE CONTROL SYSTEM WITH DEACTIVATED
IN-FLIGHT SPOILER LOCKOUT MECHANISM

BBB2-27-524
S0000299756V1

Turnbuckles in Speed Control System - Adjustment/Test
Figure 506/27-60-02-990-806

EFFECTIVITY
WJE 401-404, 406-408, 411, 412, 414, 417, 419, 421, 423, 865, 869, 871, 872, 886, 887

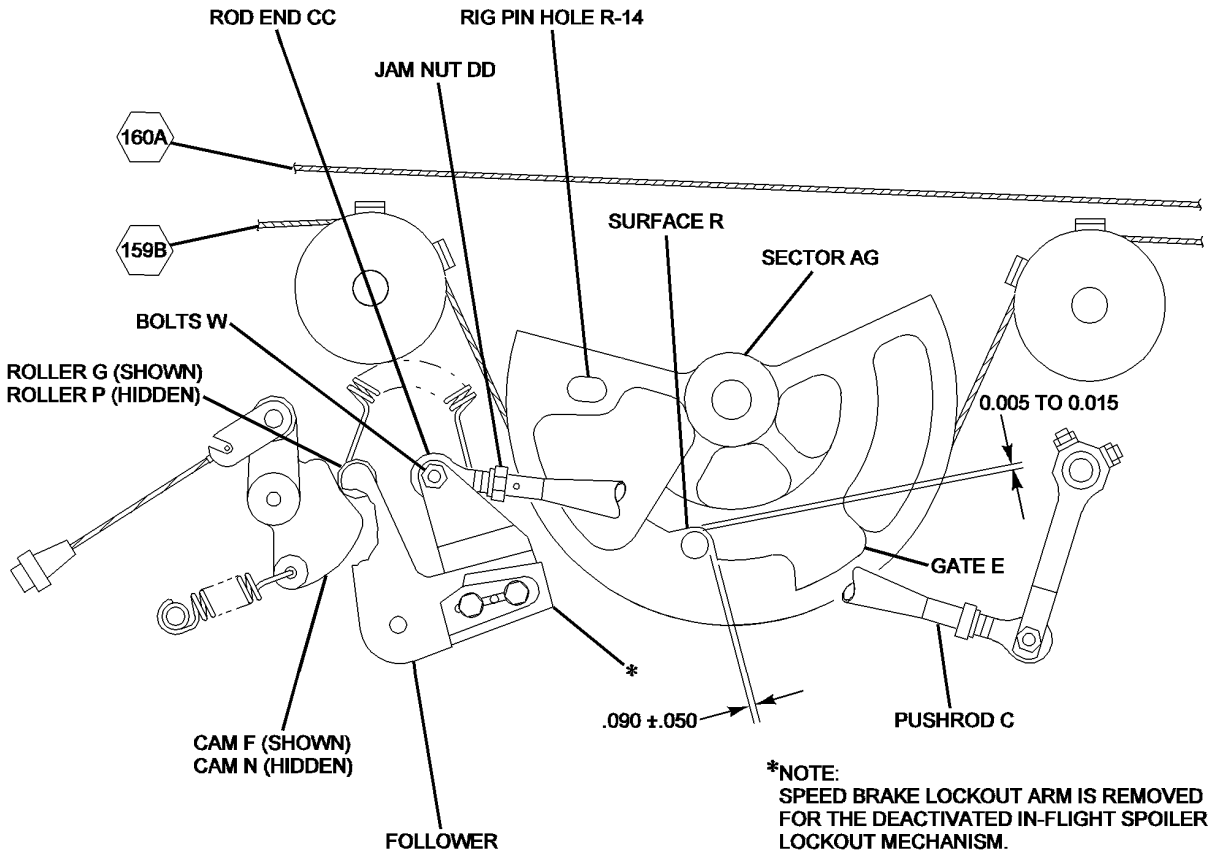
CABLE TENSION TABLE - SPEED BRAKE/FLAP INPUT TO ELEVATOR SERVO

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
-60	19	13	9	40	67	61	46
-58	20	14	10	42	68	62	47
-56	21	15	11	44	69	63	48
-54	22	16	12	46	70	64	48
-52	23	17	12	48	71	65	49
-50	24	18	13	50	72	66	50
-48	25	19	14	52	73	67	51
-46	26	20	15	54	74	68	51
-44	27	21	15	56	75	69	52
-42	28	22	16	58	76	70	53
-40	29	23	17	60	77	71	54
-38	30	24	18	62	78	72	55
-36	31	25	18	64	79	73	55
-34	32	26	19	66	80	74	56
-32	33	27	20	68	81	75	57
-30	34	28	21	70	82	76	58
-28	35	29	21	72	83	77	58
-26	36	30	22	74	84	78	59
-24	37	31	23	76	85	79	60
-22	38	32	24	78	86	80	61
-20	39	33	24	80	87	81	62
-18	40	34	25	82	88	82	62
-16	41	35	26	84	89	83	63
-14	41	35	27	86	90	84	64
-12	42	36	27	88	91	85	65
-10	43	37	28	90	92	86	66
-8	44	38	29	92	93	87	67
-6	45	39	30	94	95	89	67
-4	46	40	30	96	96	90	68
-2	47	41	31	98	97	91	69
0	48	42	32	100	98	92	70
2	49	43	32	102	99	93	71
4	50	44	33	104	100	94	72
6	51	45	34	106	101	95	73
8	52	46	35	108	102	96	73
10	53	47	35	110	104	98	74
12	54	48	36	112	105	99	75
14	55	49	37	114	106	100	76
16	56	50	37	116	107	101	77
18	57	51	38	118	108	102	78
20	57	51	39	120	109	103	79
22	58	52	40	122	111	105	80
24	59	53	40	124	112	106	81
26	60	54	41	126	113	107	82
28	61	55	42	128	114	108	83
30	62	56	43	130	116	110	84
32	63	57	43	132	117	111	85
34	64	58	44	134	118	112	86
36	65	59	45	136	119	113	87
38	66	60	45	138	121	115	88
				140	122	116	89

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

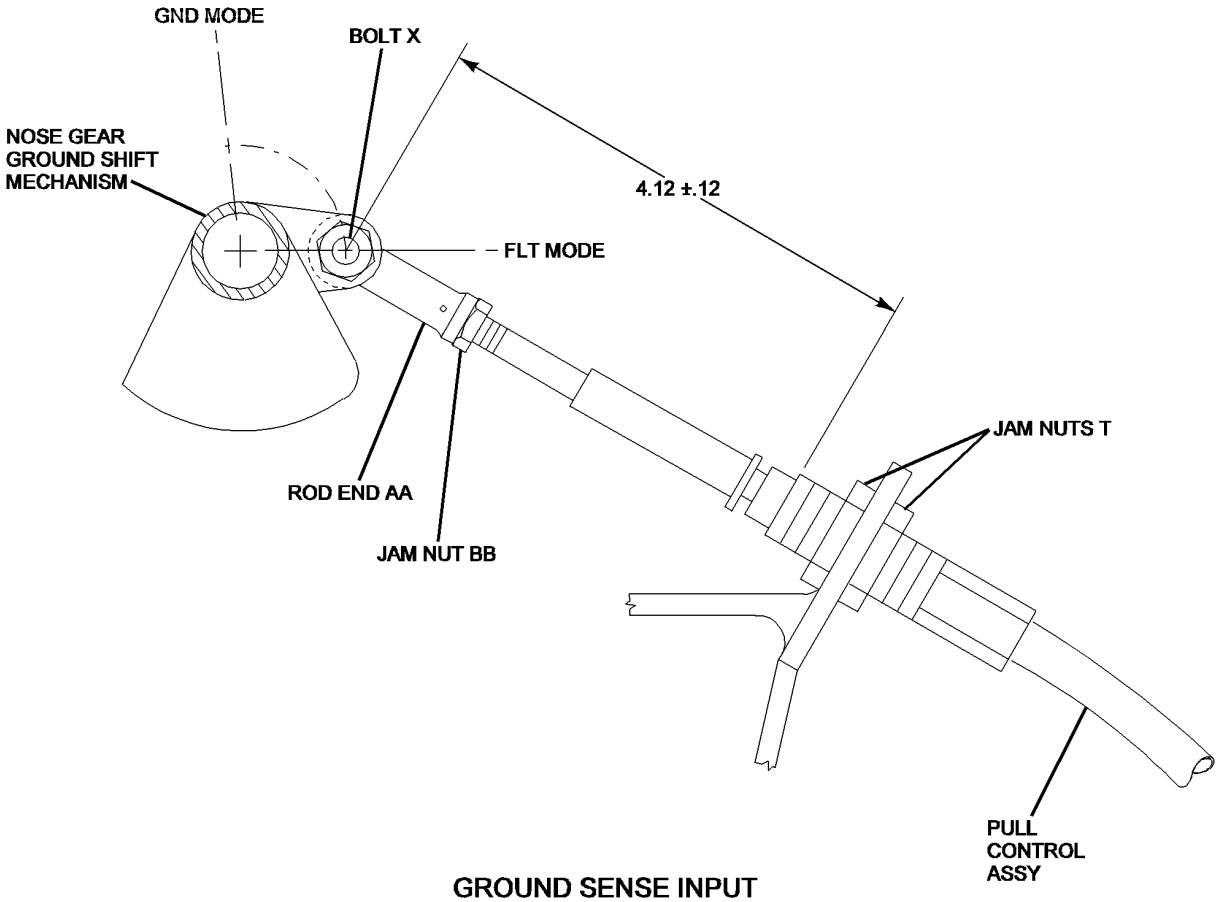
BBB2-27-525
S0000299757V1

Cable Tension Table for Deactivated Spoiler Lockout - Adjustment/Test
Figure 507/27-60-02-990-807



BBB2-27-526
S0000299760V1

Sector AG With Deactivated Spoiler Lockout Arm - Adjustment/Test
Figure 508/27-60-02-990-808



GROUND SENSE INPUT

BBB2-27-527
S0000299762V1

Ground Sense Input - Adjustment/Test
Figure 509/27-60-02-990-809

4. Functional Check for Deactivated In-Flight Spoiler Lockout Mechanism

A. Perform the functional check of the deactivated in-flight spoiler lockout mechanism as follows:

(1) Make sure that the auto spoiler actuator is in the flight position. (Figure 503)

(a) If necessary, retract the auto spoiler actuator (SPOILER AUTOMATIC ACTUATOR - MAINTENANCE PRACTICES, PAGEBLOCK 27-62-05/201).

(2) For aircraft on the ground (not on jacks), disconnect the pushrod from the ground sense cable sector, and place the ground sense mechanism in the flight mode by rotating the sector to the strut extended position. (Figure 501, View A-A) For aircraft on jacks, the ground sense mechanism will already be in the flight mode, with no need to disconnect the pushrod, due to the extended nose strut.

(3) Place the flap/slat handle in the 0 DEG/T.O. EXT detent. (Figure 506)

(4) With the speed brake lever unarmed (red ARM label not visible), make sure that it can be moved aft to the speed brake EXT (34 degrees) detent. (Figure 506)

(a) Observe the spoiler lockout mechanism through the smoke barrier panel opening in the E&E compartment while the speed brake lever is moving aft.

(b) Make sure that nothing interferes with the sector AG, during its rotation. (Figure 508)

(c) Return the speed brake lever forward to the retract position. Make sure that there is free rotation of the sector AG again.

(5) Rotate the dial-a-flap thumbwheel to obtain a DAF indicator reading of eight degrees.

(a) Place the flap/slat handle in the DAF moveable detent at eight degrees.

(b) Make sure that nothing interferes with the sector AF, during its rotation while the flap/slat handle is moving aft. (Figure 501, View D-D)

(6) Do again the step (4) to make sure that the speed brake lever can still be moved aft to the EXT detent with the flap/slat handle at eight degrees.

(7) Place the flap/slat handle in the 40 DEG/LAND EXT detent.

(a) Make sure that nothing interferes with sector AF, during it rotation while the flap/slat handle is moving aft. (Figure 501, View D-D)

(8) Do again the step (4) to make sure that the speed brake lever can still be moved aft to the EXT detent with the flap/slat handle at 40 degrees.

(9) Pull the speed brake lever up into the armed position (red ARM label visible).

(a) Extend the auto spoiler actuator to the ground position (SPOILER AUTOMATIC ACTUATOR - MAINTENANCE PRACTICES, PAGEBLOCK 27-62-05/201).

(b) Make sure that the speed brake lever automatically moves aft to the full 60 degree ground spoiler position.

(c) Observe the spoiler lockout mechanism while the speed brake lever is moving aft.

(d) Make sure that nothing interferes with the sector AG, during its rotation. (Figure 508)

(10) Return the speed brake lever forward to the retract, armed position (red ARM label still visible), again making sure that there is free rotation of sector AG.

(11) Retract the auto spoiler actuator to the flight position. (Figure 503)

(12) For aircraft on the ground (not on jacks), place the ground sense mechanism in the ground mode by rotating the ground sense cable sector back to the strut compressed position. For aircraft on jacks, disconnect the pushrod from the ground sense cable sector and rotate the sector to the strut compressed position. (Figure 501, View A-A)

(13) Make sure that the armed speed brake lever can be moved aft to the full 60 degree ground spoiler position.

(a) Observe the spoiler lockout mechanism while the speed brake lever is moving aft.

(b) Make sure that nothing interferes with the sector AG, during its rotation. (Figure 508)

(c) Return the speed brake lever forward to the retract, unarmed (red ARM label not visible) position, again making sure that there is free rotation of the Sector AG.

(14) Reconnect the pushrod to the ground sense cable sector. (Figure 501, View A-A)

(15) Retract the flap/slat handle to the UP/RET detent while observing and making sure that there is free rotation of the sector AF. (Figure 501, View D-D)

(16) Reinstall the smoke barrier panel 5927034-91 in the upper forward portion of the E&E compartment at door 4510A (INTERNAL ACCESS DOORS, SUBJECT 06-31-00, Figure 4).

AUTO SPOILER DO NOT USE LIGHT - TROUBLE SHOOTING

1. General

A. Trouble shooting provided in this section consists of a logic tree system designed to more readily isolate and identify system functional anomalies in the electronic system status indication portion rather than a columnar chart trouble shooting aid. It will become more helpful in finding, isolating and correcting faults in the auto spoiler "DO NOT USE" warning circuitry. The fault isolation flowcharts on the following pages will aid in isolating the more prevalent failure indications in this system failure annunciations.

B. The basic causes of a faulty system operation are, generally, faulty aircraft wiring, faulty line replaceable units (LRU's) or out of rig cable systems and/or components.

C. By using the basic check procedures indicated by the logic charts and accompanying notes contained in this section, quick basic isolation and correction of the indicated system problem can be accomplished.

D. When making electrical checks during trouble shooting procedures, refer to Wiring Diagram Manual appropriate sections for check points or pin numbers of components or LRU's to be checked.

E. Auto spoiler system components and location are as follows:

Table 101

Component	Location
Spoiler/speed brake control lever	Control pedestal, flight compartment
Ground, auto spoiler actuator	Control pedestal, flight compartment
Auto spoiler switching unit	Aft left radio rack, shelf 2

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed item:

Table 102

Name and Number	Manufacturer
Multimeter (2000A)	Dana

3. Fault Isolation, Auto Spoiler System

WARNING: IF HYDRAULIC AND ELECTRICAL POWER ARE REQUIRED DURING CHECK, MAKE CERTAIN FLAPS, SPOILERS, AILERONS AND SLAT SURFACES ARE CLEAR OF PERSONNEL AND EQUIPMENT PRIOR TO ENERGIZING SYSTEMS.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

A. Pilot Report: "Auto Spoiler Do Not Use (ASDNU) Light Illuminated After Takeoff"

(1) Auto spoiler "DO NOT USE" (ASDNU) light illumination can be caused by malfunctioning wheel brake de-spin actuator, before proceeding to fault isolation chart perform following:

(a) Perform visual check of wheel brake de-spin actuators and related mechanism. If visual check does not reveal any defects, perform operational check of wheel brake de-spin actuators. (PAGEBLOCK 32-42-10/201)

(b) If wheel brake de-spin actuators perform satisfactorily, proceed to fault isolation chart. (Paragraph 3.B. and Paragraph 3.C.)

B. Fault Isolation Preparation

(1) Apply electrical power to the aircraft as required.

(2) Place speedbrake handle in the "ARM" position.

(3) Open and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(5) Remove auto spoiler switching unit.

(6) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

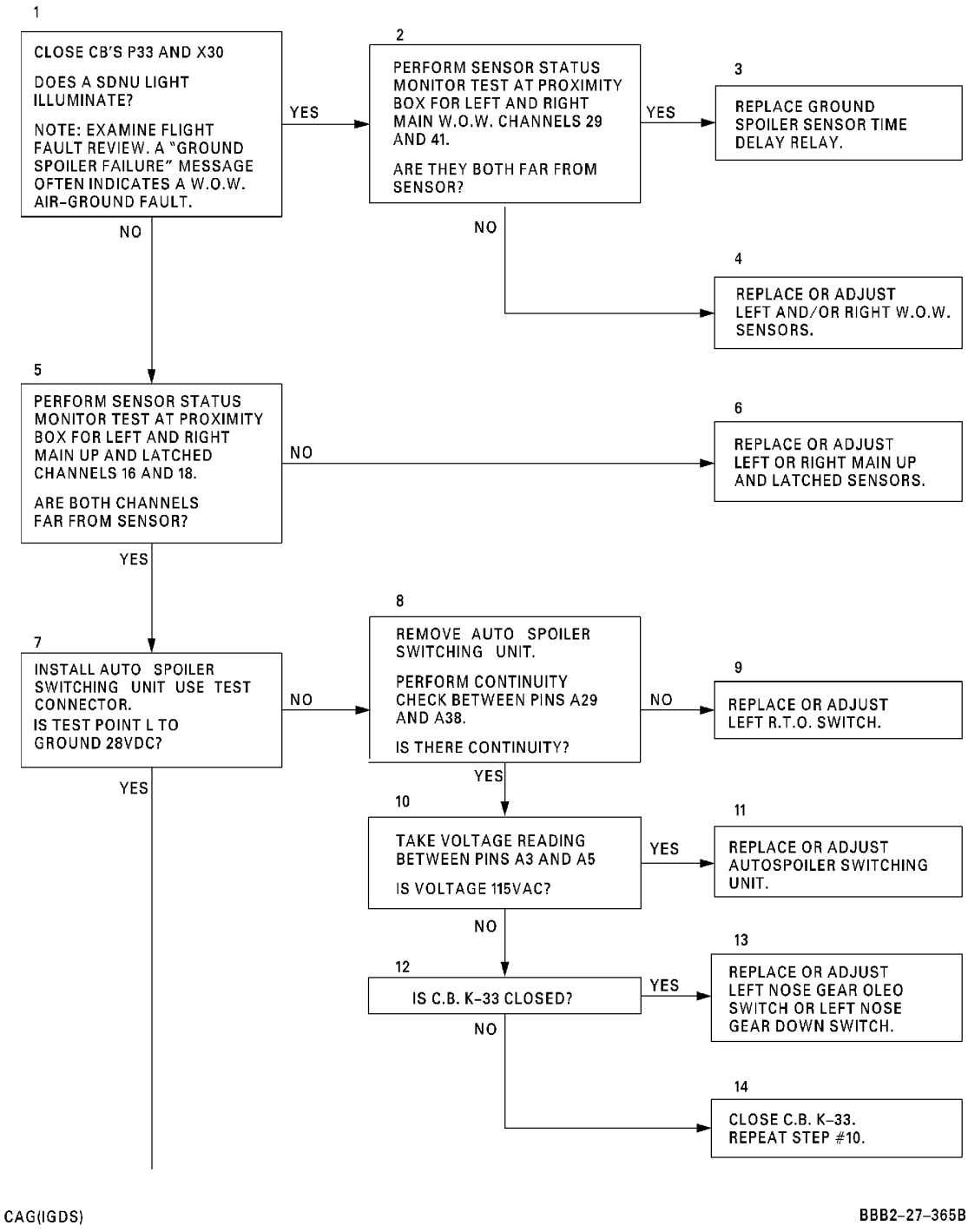
Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

C. Fault Isolate Auto Spoiler System

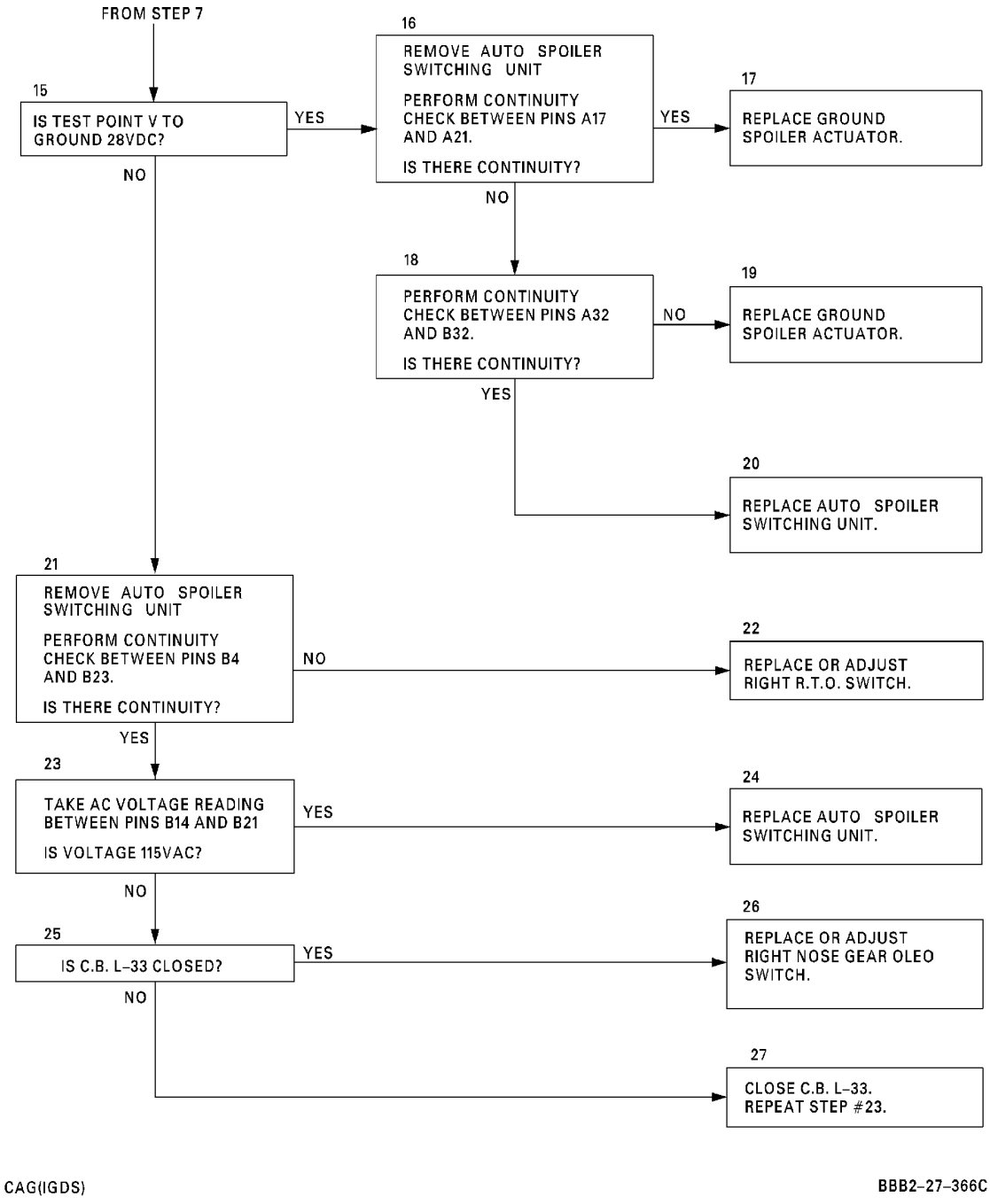
(1) Auto spoiler Do Not Use light (ASDNU) illuminated after takeoff.

(a) Isolate system circuit and/or component fault and correct as necessary. (Figure 101)

(2) At conclusion of trouble shooting procedure and any required corrective action has been completed, perform Return to Service (RTS) test. (DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201)



Auto Spoiler "Do Not Use" Light Fault Isolation Logic Diagram
Figure 101/27-61-00-990-801 (Sheet 1 of 2)



Auto Spoiler "Do Not Use" Light Fault Isolation Logic Diagram
Figure 101/27-61-00-990-801 (Sheet 2 of 2)

FLIGHT SPOILER PANEL - MAINTENANCE PRACTICES

1. General

A. Two flight spoiler panels are located on the trailing edge of each wing. Each panel weighs approximately 21 lb (10 kg).

B. Hydraulic pressure to the inboard flight spoiler actuators is supplied by the left hydraulic system and may be shut off by the spoiler shutoff and system depressurization valve in the left main gear wheelwell. The outboard actuators are supplied by the right hydraulic system and the spoiler shutoff valve is located in the right wheelwell.

C. Removal and installation procedures are identical for the four flight spoiler panels, except as noted. The numbers in parentheses in the following text correspond to callouts in Figure 201.

D. Access to spoiler panels is through wing lower trailing edge access doors with flap/slats extended.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

Name and Number	Manufacturer
High-temperature antiseize (C5-A) (DPM 377)	Loctite Rocky Hill, CT
Torque Wrench (0 in-lb (0 N·m)-500 in-lb (56 N·m))	
Adapter (4712451)	The Boeing Company
Protractor (5916715)	The Boeing Company
Door safety locks (3936851-1 or -501 as applicable (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	The Boeing Company
Lockwire, NASM20995N32, DPM 684*[1]	Not specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Spoiler Panel

A. Remove Panel

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(4) Depressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: TO PREVENT POSSIBLE INJURY TO PERSONNEL OR DAMAGE TO AIRCRAFT, DO NOT ATTEMPT REMOVAL OF ANY PART OF TORSION BAR ASSEMBLY WITHOUT RELIEVING PRELOAD. SPOILER PANELS MUST BE RETRACTED WHEN RELIEVING PRELOAD.

WARNING: FAILURE TO RELIEVE PRELOAD COULD CAUSE SERIOUS INJURY TO PERSONNEL OR STRUCTURAL DAMAGE TO AIRCRAFT.

(5) If removing left outboard or right inboard spoiler, disconnect position sensor link at spoiler panel.

(6) Rotate reaction bolt (14) to relieve tension.

(7) Disconnect clevis from reaction lever (15).

(8) Remove bolt connecting lower end of reaction lever to bracket.

(9) Remove bolt connecting pushrod to actuator valve link.

(10) Remove bolt connecting hydraulic line positioning linkage to spoiler panel.

(11) Partially pressurize left or right hydraulic system, as applicable, using appropriate hand hydraulic pump in wheelwell.

WARNING: BEFORE APPLYING HYDRAULIC PRESSURE TO ACTUATOR, MAKE CERTAIN AREAS AROUND SPOILER ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(12) Using actuator valve link as control lever, carefully raise spoiler panel sufficiently to permit cam arm to clear idler link and rotate downward.

(13) Using actuator valve link as control lever, raise spoiler panel to fully extended position.

(14) Depressurize hydraulic systems.

(15) Remove bolt (1) to disconnect drive fitting (2) from hinge fitting (3). Retain shims (4) from between fittings. Discard washer under head of bolt (1).

(16) Remove screw (5) from hinge fitting (3).

(17) Remove splice bar from lower surface of panel. Lower drive fitting (2) and link (6) through opening in panel lower surface.

(18) Remove nut from bolt (7) and loosen bolt to free hinge keeper bracket (8) from one end of pin (9).

(19) Remove pin (9) from hinge fitting (3) and opposite hinge keeper bracket.

(20) Remove bolts (10) and (11) for outboard panel, or bolts (11) and (12) for inboard panel. Remove panel.

B. Install Panel

(1) Make certain hydraulic systems are depressurized.

(2) Make certain flap/slats are extended.

(3) Make certain door safety locks are installed on main gear inboard door actuating cylinder's piston rod.

(4) Place panel in position and install bolts (10) and (11), or bolts (11) and (12) as applicable, making certain that bolts (11) and (12) are installed with heads inboard, and bolt (10) has head outboard. Tighten nuts to torque of 72 ±12 in-lb (8 ±1 N·m). Safety nuts with cotter pins.

(5) Install pin (9) through hinge fitting (3) and slot of hinge keeper bracket.

(6) Position hinge keeper bracket (8) on opposite end of pin (9) and secure bracket with bolt (7). Tighten nut to torque of 285 ±15 in-lb (32 ±2 N·m). Safety nut with cotter pin.

(7) Position drive fitting (2) in hinge fitting (3) and install bolt (1). Do not install shims (4) at this time.

NOTE: Lubricate bolt on threads and under head with anti-seize compound prior to installation.

(8) Install screw (5) through hinge fitting (3) and slot in drive fitting (2). Apply sufficient torque to screw (5) to provide snug fit between drive fitting (2) and hinge fitting (3).

NOTE: Lubricate bolt on threads and under head with anti-seize compound prior to installation.

(9) Partially pressurize hydraulic system using hand hydraulic pump in wheelwell.

(10) Using actuator valve link as control lever, carefully lower spoiler panel while holding cam arm in position to engage cam rollers.

(11) Install bolt connecting hydraulic line positioning linkage to spoiler panel.

(12) Install bolt connecting lower end of reaction lever to bracket.

(13) Temporarily connect clevis to reaction lever (15).

(14) Install bolt connecting pushrod to actuator valve link.

(15) If installing left outboard or right inboard spoiler, connect position sensor link to spoiler panel.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(16) Pressurize right or left hydraulic system, as applicable.(PAGEBLOCK 29-00-00/201)

WARNING: BEFORE APPLYING HYDRAULIC PRESSURE TO ACTUATOR, MAKE CERTAIN AREAS AROUND SPOILERS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(17) Restrain drive fitting (2) to prevent rotation and apply hydraulic pressure to retract side of actuating cylinder.

(18) Tighten bolt (1) until panel trailing edge does not deviate more than ⅛ in. (3 mm) above, or 0.000 in. (0.000 mm) below a straight line (string or straightedge) extending along panel trailing edge.

(19) Measure and record gap between drive fitting (2) and hinge fitting (3).

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(20) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(21) Remove bolt (1) and add shims (4), as required, between hinge fitting and drive fitting to fill gap as recorded in step (18). Restrain drive fitting (2) to prevent rotation and install and, using adapter (4712451), tighten bolt (1). Use new pli-washer under head of bolt (1). Safety bolthead with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(22) Check that panel trailing edge is within limits established in Paragraph 3.B.(18). If these limits are not met, repeat Paragraph 3.B.(16) through Paragraph 3.B.(21).

(23) Torque nut on screw (5) to 160 ±20 in-lb (18 ±2 N·m).

(24) Install splice bar on lower surface of panel.

CAUTION: MAKE CERTAIN THAT REACTION LEVER DOES NOT BEAR AGAINST LOWER BRACKET IF SPOILER PANEL IS PARTIALLY RAISED TO OBTAIN CLEARANCE TO CONNECT REACTION BOLT CLEVIS TO REACTION LEVER. SUFFICIENT DOWNWARD PRESSURE CAN BE DEVELOPED TO CAUSE LOWER BRACKET TO BREAK WHILE RAISING PANEL WHEN CLEVIS IS NOT CONNECTED.

(25) Disconnect clevis from the reaction lever (15). Do the adjustment of the torsion bar. (PAGEBLOCK 27-61-02/201)

(26) Lubricate hinge fittings and links. (PAGEBLOCK 12-21-02/301)

(27) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

4. Adjustment/Test Flight Spoiler Panel

A. Test Panel Movement

(1) Make certain speedbrake control lever is in retract position (against forward stop with red arm label not visible).

(2) Make certain aileron control wheel is in neutral position (index marks on wheel and control column aligned).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(3) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(4) With panel in retracted position, place protractor on panel and wing in line with drive (center) hinge. Note position of protractor pointer in degrees.

WARNING: BEFORE EXTENDING SPOILER PANELS, MAKE CERTAIN AREAS AROUND PANELS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(5) Rotate each aileron control wheel, in turn, quickly (or rapidly), but with smooth continuous motion, (clockwise to extend panels on right wing, or counterclockwise to extend panels on left wing) until stops on both control wheels contact. Check the following:

(a) Both flight spoiler panels on wing move in unison, and panel movement is smooth.

(b) Both panels are extended 60 (±4) degrees from position noted in Paragraph 4.A.(4).

(c) Test spoiler deployed sensors. (PAGEBLOCK 27-61-05/201)

(6) Return aileron control wheel to neutral position, and check that panels are aligned with wing trailing edge. Maximum deviation at any point along spoiler trailing edge must not exceed ⅛ in. (3 mm) above or 0.000 in. (0.000 mm) below straight line. (Determine deviation by use of string or straightedge extended along entire trailing edge of spoiler.)

(7) Shut off hydraulic pressure source.

(8) Check panel clearances. (Paragraph 5.)

(9) Check spoiler position sensor. (PAGEBLOCK 22-01-03/201)

(10) Perform Return to Service (RTS) test. (DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 1 or DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 3 or DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 6 or DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 4 or DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 5 or DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 10 or DFGS STATUS/TEST (STP) PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-05/201 Config 11)

5. Check Spoiler Panel

A. Check Panel Clearances (Figure 202)

NOTE: All checks are made with panels in retracted position.

(1) Check that clearance between outboard flight spoiler panel and wing panel at trailing edge is 9/32 in. (7 mm) minimum to 13/32 in. (10 mm) maximum and clearance at leading edge is 5/32 in. (4 mm) minimum to 11/32 in. (9 mm) maximum.

(2) Check that clearance between outboard flight spoiler panel and inboard flight spoiler panel at trailing edge is ½ in. (13 mm) minimum to ⅝ in. (16 mm) maximum and clearance at leading edge is 9/32 in. (7 mm) minimum to 15/32 in. (12 mm) maximum.

(3) Check that clearance between inboard flight spoiler panel and structure at trailing edge is 3/16 in. (5 mm) minimum to ⅜ in. (10 mm) maximum and clearance at leading edge is ⅛ in. (3 mm) minimum to ¼ in. (6 mm) maximum.

(4) Check that clearance between ground spoiler panel and structure at trailing edge is ⅛ in. (3 mm) minimum to 5/16 in. (8 mm) maximum and clearance at leading edge is ⅛ in. (3 mm) minimum to ¼ in. (6 mm) maximum.

(5) Check that clearance between leading edge of all spoiler panels and trailing edge of wing surface is 1/16 in. (2 mm) minimum to 3/16 in. (5 mm) maximum.

(6) Check that mismatch between flight spoiler panel trailing edges does not exceed 3/32 in. (2 mm).

(7) Check that mismatch between outboard flight spoiler panel trailing edge and wing does not exceed 3/16 in. (5 mm) maximum.

(8) Check that clearance between flap fixed vane and all spoiler panels throughout full flap travel as follows: (Figure 203 (Sheet 1))

(a) Without spacer and without 5962689 spoiler FOD plate:

1) 0.250 inch minimum to all fixed structure and spoiler during maximum travel fore and aft, with spoilers down and rigged.

(b) Without spacer and with 5962689 spoiler FOD plate:

1) 0.215 inch minimum to all fixed structure and spoiler during maximum travel fore and aft, with spoilers down and rigged.

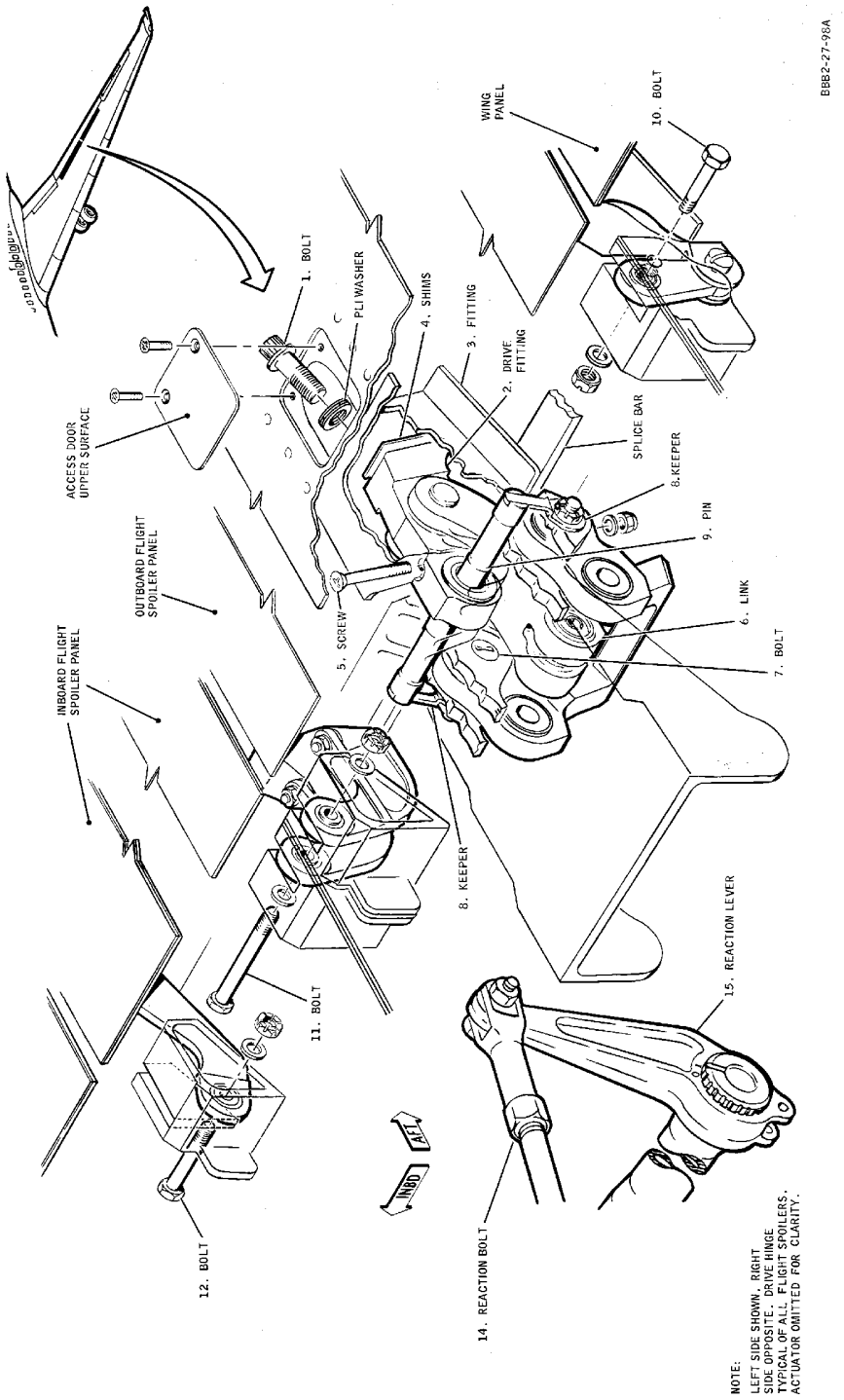
(c) With spacer and without 5962689 spoiler FOD plate:

1) 0.312 inch minimum to all fixed structure and spoiler during maximum travel fore and aft, with spoilers down and rigged provided 0.031 inch gap exists between 5925125–1 spacer and vane.

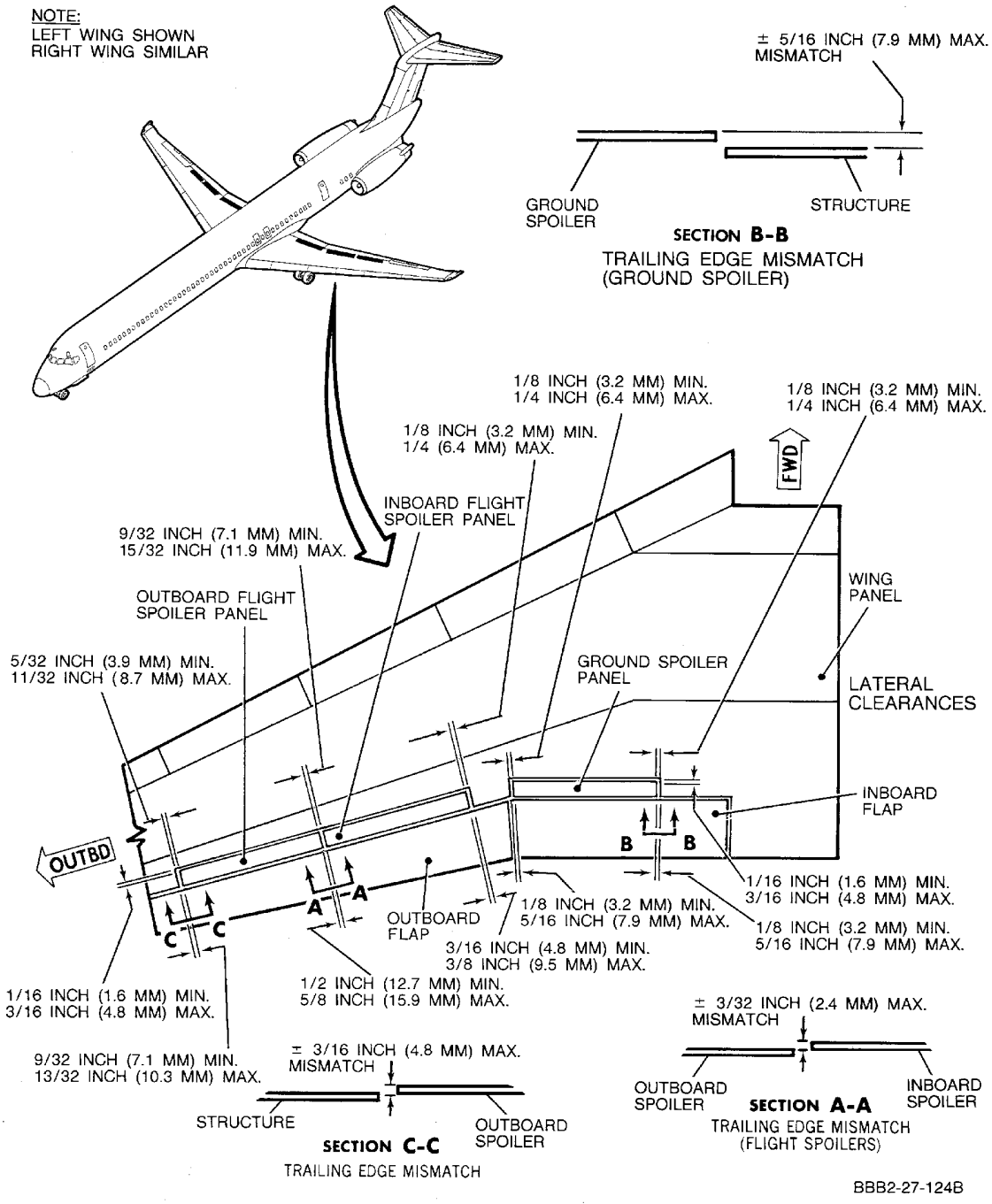
(d) With spacer and with 5962689 spoiler FOD plate:

1) 0.278 inch minimum to all fixed structure and spoiler during maximum travel fore and aft, with spoilers down and rigged provided 0.031 inch gap exists between 5925125-1 spacer and vane.

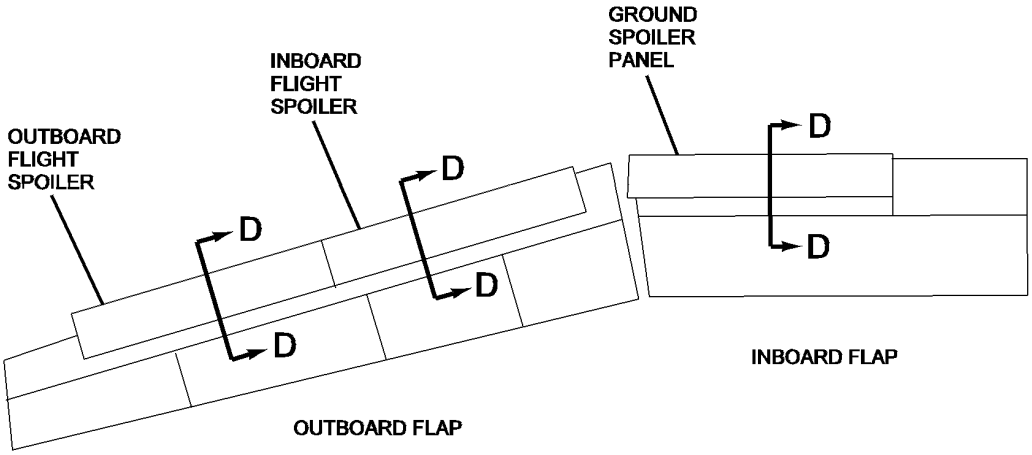
(9) Check that mismatch between ground spoiler panel and wing trailing edge is ± 5/16 in. (8 mm) maximum.

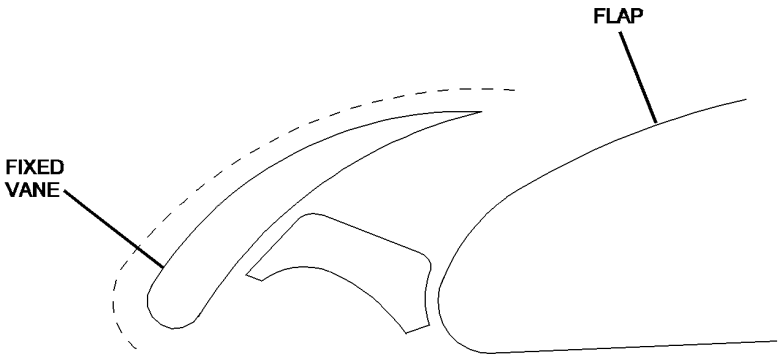


Flight Spoiler Panel -- Removal/Installation
Figure 201/27-61-01-990-801



Flight Spoiler Panel Clearances
Figure 202/27-61-01-990-802





SECTION D-D

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Flight and Ground Spoiler Clearances
Figure 203/27-61-01-990-804

FLIGHT SPOILER ACTUATOR WITH TORSION BAR - MAINTENANCE PRACTICES

1. General

A. There are four flight spoiler actuators located in the wing rear spar flap well, one forward of each spoiler panel. Removal/Installation and Adjustment/Test procedures are identical for all four flight actuators. Each actuator has a control valve, bench-adjusted by a setscrew which should not be altered.

B. Data presented in this Chapter-Section-Subject applies only to aircraft without Service Bulletin 27-337. This bulletin installs a modified flight spoiler actuator and deletes the spoiler torsion bars.

C. Access to actuator and linkage is through the wing lower trailing edge access doors with flap/slats extended. Perform work in the vicinity of spoiler panels through access doors and spoilers retracted.

D. Hydraulic pressure to the inboard flight actuator on each wing is shut off by the spoiler shutoff and system depressurization valve in the left main gear wheelwell. Hydraulic pressure to the outboard actuator on each wing is shut off by the spoiler shutoff and system depressurization valve in the right main gear wheelwell.

E. The numbers in parenthesis in the following text correspond to callouts in Figure 201.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

Name and Number	Manufacturer
Protractor (5916715)	Douglas Aircraft Co
Rig pin (4-2) 1/4 by 2 5/8 (6.35 x 66.675 mm)	The Boeing Company
Rig pin (4-6) 1/4 by 6 5/8 (6.35 x 168.275 mm)	The Boeing Company
NOTE: Rig Pin sizes are in inches (diameter x length; length = grip plus 5/8 inch, (15.875 mm).	
Door safety locks (3936851-1, or -501 as applicable) GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201Ref.	The Boeing Company
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified
Silicone rubber Seal, RTV-88 RTV-9910 catalyst (DMS QPL 1799)	General Electric Co. Waterford, NY
Primer, silicone 1200 (DPM 3202)	Dow Corning Corp. Midland, MI
Compound, modified fluorosilicone, groove injection #94-031 (DPM 5940)	Dow Corning Corp. Midland, MI

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Flight Spoiler Actuator

A. Remove Actuator

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Place flap/slat handle in 40 degree detent.

(4) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Disconnect hydraulic line clamps (1) from bracket (2).

(6) Disconnect hydraulic lines (3) from fittings (4) in actuator ports.

(7) Disconnect control pushrod (5) from control valve link (6).

WARNING: FAILURE TO RELIEVE TENSION OF TORSION BAR COULD RESULT IN INJURY TO PERSONNEL.

(8) Rotate reaction bolt (7) to relieve tension.

(9) Disconnect reaction bolt clevis (7) from reaction lever (8).

(10) Remove bolt from lower end of reaction lever (8).

(11) Remove nut (9) from forward attach pin (10). Do not remove pin at this time.

(12) Remove grease fitting from clamp end of pin (11). Retain grease fitting.

(13) Loosen clamp bolt and remove clamp from pin (11).

(14) Support actuator and remove aft hinge pin (11) to disconnect actuator body (12) from drive link (13) and idler links (14). Remove cam rollers from actuator and secure washers and unstaked bearings in drive link and idler links to prevent loss.

(15) If removing outboard flight spoiler actuator, perform the following:

(a) Remove nut from small end of torsion bar. Retain and record quantity and location of spacers. (PAGEBLOCK 27-61-06/201)

(b) Push torsion bar inboard until splines disengage from reaction lever. Rotate cam aft.

(16) Remove forward attach pin (10) to disconnect actuator piston from trunnion (15). Remove actuator, taking care not to damage hydraulic lines.

(17) Remove bracket (2) and, if required, hydraulic fittings (4) from actuator ports. Plug open ports.

B. Install Actuator

(1) Make certain hydraulic systems are depressurized.

(2) Make certain flaps/slats are extended.

(3) Make certain door safety locks are installed on main gear inboard door actuating cylinder piston rod.

(4) If required, install hydraulic fittings (4) in actuator ports, using new O-rings.

(5) Attach bracket (2) to hydraulic fittings.

(6) Extend actuator piston, and install forward attach pin (10) to connect piston to trunnion (15), taking care not to damage hydraulic lines. To allow installation of cam against cam rollers when aft hinge pin (11) is installed, make certain that flat side on head of pin is seated properly against flat surface on piston (16) and torsion bar cam is below actuator.

(7) Position cam rollers (20), cam roller bushings (21), drive link (13), idler link (14), and washers (19) in actuator aft hinge and insert aft hinge pin (11). Make certain that cutaway edge of pin is seated properly against flat surface on actuator body. Make certain that flanges of cam roller bushings are installed on aft hinge pin away from drive link so that cam rollers are aligned with cam (forks).

NOTE: Install washers (19) on both sides of left idler link lug only (left and right wing).

NOTE: Make certain that unstaked bearings are installed in drive link and idler links.

NOTE: The idler link (14) must be installed with its tie bar oriented forward, toward the flight spoiler actuator. See side view of the idler link. (Figure 201, View D and View C). It is critical that the idler link be installed as shown.

(8) If installing outboard flight spoiler actuator, perform the following:

(a) Remove all sealant and other foreign material from torsion bar, cam, reaction arm (if required) and all splines prior to installation of torsion bar and cam and (if required) reaction arm.

NOTE: All splines must be thoroughly clean, dry and free of all old sealant, dirt, oil, grease, etc. prior to beginning assembly.

WARNING: SILICONE PRIMER IS AN AGENT THAT IS FLAMMABLE, POISONOUS, AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS LISTED BELOW WHEN SILICONE PRIMER IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET SILICONE PRIMER IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(WARNING PRECEDES)

CAUTION: MAKE CERTAIN THAT NO VOIDS EXIST IN COMPOUND PRIOR TO ASSEMBLY. SUCH VOIDS MAY ENTRAP MOISTURE, THEREBY CONTRIBUTING TO POSSIBLE CORROSION OF TORSION BAR.

(b) Apply 1200 silicone primer to entire length of splines on torsion bar, cam and (if required) reaction arm. Make certain that coverage is complete, with no voids in material. Allow to thoroughly air dry before proceeding.

WARNING: MODIFIED FLUOROSILICONE COMPOUND IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN MODIFIED FLUOROSILICONE COMPOUND IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET MODIFIED FLUOROSILICONE COMPOUND IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

CAUTION: MAKE CERTAIN THAT NO VOIDS EXIST IN COMPOUND PRIOR TO ASSEMBLY. SUCH VOIDS MAY ENTRAP MOISTURE, THEREBY CONTRIBUTING TO POSSIBLE CORROSION OF TORSION BAR.

(9) Coat entire length of splines on reaction arm and torsion bar with modified flourosilicone compound.

(10) Place torsion bar splines into reaction arm with alignment groove aligned with "O" mark. (Figure 202)

(11) Engage splines on torsion bar into reaction lever with alignment groove aligned with "O" mark. (Figure 202)

(12) Remove excess flourosilicone compound from reaction arm and splined area.

(13) Install spacers, washer and nut on small end of shaft. Spacers must be installed in same quantity and location as recorded in Paragraph 3.A.(15).

NOTE: Add or remove spacers, as required, to center torsion bar cam arm on mating bearings. Make certain that no interference exists between cam arm lugs and actuator lugs or spoiler fitting.

(14) Torque nut on small end of shaft to 50 inch pounds (5.65 N·m). Back off nut to nearest aligned slot and insert cotter pin.

WARNING: SILICONE SEALANT IS AN AGENT THAT IS POISONOUS, CARCINOGENIC, CORROSIVE, AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN SILICONE SEALANT IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET SILICONE SEALANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE DUST OR GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

CAUTION: MAKE CERTAIN THAT NO VOIDS EXIST IN SPLINE FILLET SEAL COMPOUND. SUCH VOIDS MAY ALLOW ENTRY OF MOISTURE INTO SPLINED JOINT, THEREBY CONTRIBUTING TO POSSIBLE CORROSION OF TORSION BAR.

(15) Apply a fillet of sealant compound on both sides of cam and reaction arms to torsion bar spline junctions. Fillet must extend beyond edge of splines on cam and reaction arms and sufficiently along torsion bar to make a complete seal.

(16) Manually engage cam face against cam roller. Check that both fingers on cam arm are in contact with cam rollers by trying to spin cam rollers.

(17) Install clamp on pin (11) and tighten clamp bolt.

(18) Install grease fitting on pin (11).

(19) Install nut (9) on forward hinge pin (10). Tighten to a torque of 100 in-lb (11.30 N·m) to 140 in-lb (15.82 N·m).

(20) Connect control pushrod (5) to control valve link (6).

(21) Connect hydraulic lines (3) to fittings (4) in actuator ports.

(22) Clamp hydraulic lines to bracket (2).

(23) Adjust torsion bar as follows:

(a) Make certain spoiler panels have been preloaded. (PAGEBLOCK 27-61-01/201)

(b) Make certain that speedbrake control lever is in retract position.

(c) Make certain that aileron control wheel is in neutral position (index marks on wheel and control column aligned).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT CONTROLS ARE IN CORRECT POSITIONS TO PREVENT INADVERTENT OPERATION OF SYSTEMS OR EQUIPMENT.

(d) Pressurize spoiler hydraulic system. (PAGEBLOCK 29-00-00/201)

(e) Make certain that groove on torsion bar is aligned with index groove on cam.

(f) Make certain that index groove on end of torsion bar is aligned with serration (marked 1 for inboard flight actuator, or marked 0 for outboard actuator) on reaction lever.

(g) Install bolt at lower end of reaction lever (8).

WJE 412, 414

(h) Rotate reaction bolt (7) to obtain dimension of 0.343(±0.015) inch (8.712(±0.381) mm) between head of bolt and clevis. (Figure 203, View B)

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

Rotate reaction bolt (7) to obtain dimension of 0.343(±0.015) inch (8.712(±0.381) mm) between head of bolt and clevis.

WJE ALL

(i) Manually engage cam face against cam rollers on actuator aft hinge pin and adjust reaction bolt in structural barrel nut until clevis attach hole aligns with hole in reaction lever within 0.021 inch, (0.533 mm). Maintain dimension obtained in Paragraph 3.B.(23)(h) during adjustment.

WJE 412, 414

NOTE: On some aircraft the reaction bolt may run out of the barrel nut during adjustment procedure above (too short). In the case of indexing of both, the reaction arm and cam must each be changed by one tooth in forward direction. With this correction, the distance between clevis attach hole and barrel nut is reduced by 4.6 mm.

WJE ALL

CAUTION: MAKE CERTAIN REACTION LEVER DOES NOT BEAR AGAINST LOWER BRACKET IF SPOILER PANEL IS PARTIALLY RAISED TO OBTAIN CLEARANCE TO CONNECT REACTION BOLT CLEVIS TO REACTION LEVER. SUFFICIENT DOWNWARD PRESSURE CAN BE DEVELOPED TO CAUSE LOWER BRACKET TO BREAK WHILE RAISING SPOILER PANEL WHEN CLEVIS IS NOT CONNECTED.

(j) Connect clevis to reaction lever (8).

(k) Tighten reaction bolt against clevis and safety bolt to clevis attach bolt with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(24) Lubricate actuator fittings as applicable. (PAGEBLOCK 12-21-02/301)

(25) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

(26) Adjustment/Test spoiler actuator. (Paragraph 4.)

4. Adjustment/Test Spoiler Actuator

A. Adjust Actuator Linkage (Figure 203)

(1) Make certain that aileron control wheels are in neutral position (index marks on wheel and control column aligned).

(2) Make certain that speedbrake control lever is in retract position (against forward stop with red arm label not visible).

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(3) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR CONTROL LEVER IS IN DOWN POSITION, THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED, AND THAT ALL OTHER CONTROLS ARE IN CORRECT POSITIONS TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR OTHER EQUIPMENT.

(4) Pressurize left or right hydraulic system, as applicable. (PAGEBLOCK 29-00-00/201)

(5) Insert rig pin (4-6) in rig pin hole (R-6) in control drum.

(6) Loosen jamnuts on pushrod (5).

CAUTION: MAKE CERTAIN THAT LEAF SPRING HOLDS VALVE LINK IN FIRM CONTACT WITH STOP ON VALVE ARM WHEN RIG PIN (4-2) AND RIG PIN (4-6) ARE INSTALLED AND AFTER PUSHROD IS ADJUSTED.

(7) Rotate body of pushrod until rig pin (4-2) can be easily inserted in rig pin hole (R-5) in valve arm. Tighten jamnuts on pushrod and safety nuts with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(8) Remove rig pin (4-2) from valve arm.

(9) Remove rig pin (4-6) from control drum.

(10) Test actuator (Paragraph 4.B.)

B. Test Actuator

(1) Make certain that speedbrake control lever is in retract position (against forward stop with red arm label not visible).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR CONTROL LEVER IS IN DOWN POSITION, THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED, AND THAT ALL OTHER CONTROLS ARE IN CORRECT POSITIONS TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR OTHER EQUIPMENT.

(2) Pressurize left or right hydraulic system, as applicable. (PAGEBLOCK 29-00-00/201)

(3) Place protractor on spoiler panel and wing in line with drive (center) hinge, and note degrees shown by protractor pointer. Remove protractor from wing and panel.

WARNING: BEFORE ROTATING AILERON CONTROL WHEEL, MAKE CERTAIN THAT AREAS AROUND AILERONS AND SPOILER PANELS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(4) Rotate aileron control wheel quickly (or rapidly), but with smooth continuous motion (clockwise to test actuator on right wing, or counterclockwise to test actuator on left wing) until stops contact.

(a) Check that panel movement (spoiler lift-off) does not occur before control wheel is rotated 1/8 inch (3.18 mm) minimum travel from neutral as measured at control column and wheel index marks located on inboard side of left and right control wheels. (Figure 204, View B)

(b) Place protractor on spoiler panel and wing in line with drive hinge and check that panel in extended 60(±4) degrees above position noted in Paragraph 4.B.(3). Remove protractor from wing and panel.

(c) Check hydraulic lines to spoiler actuator for interference with torsion bar or wing structure.

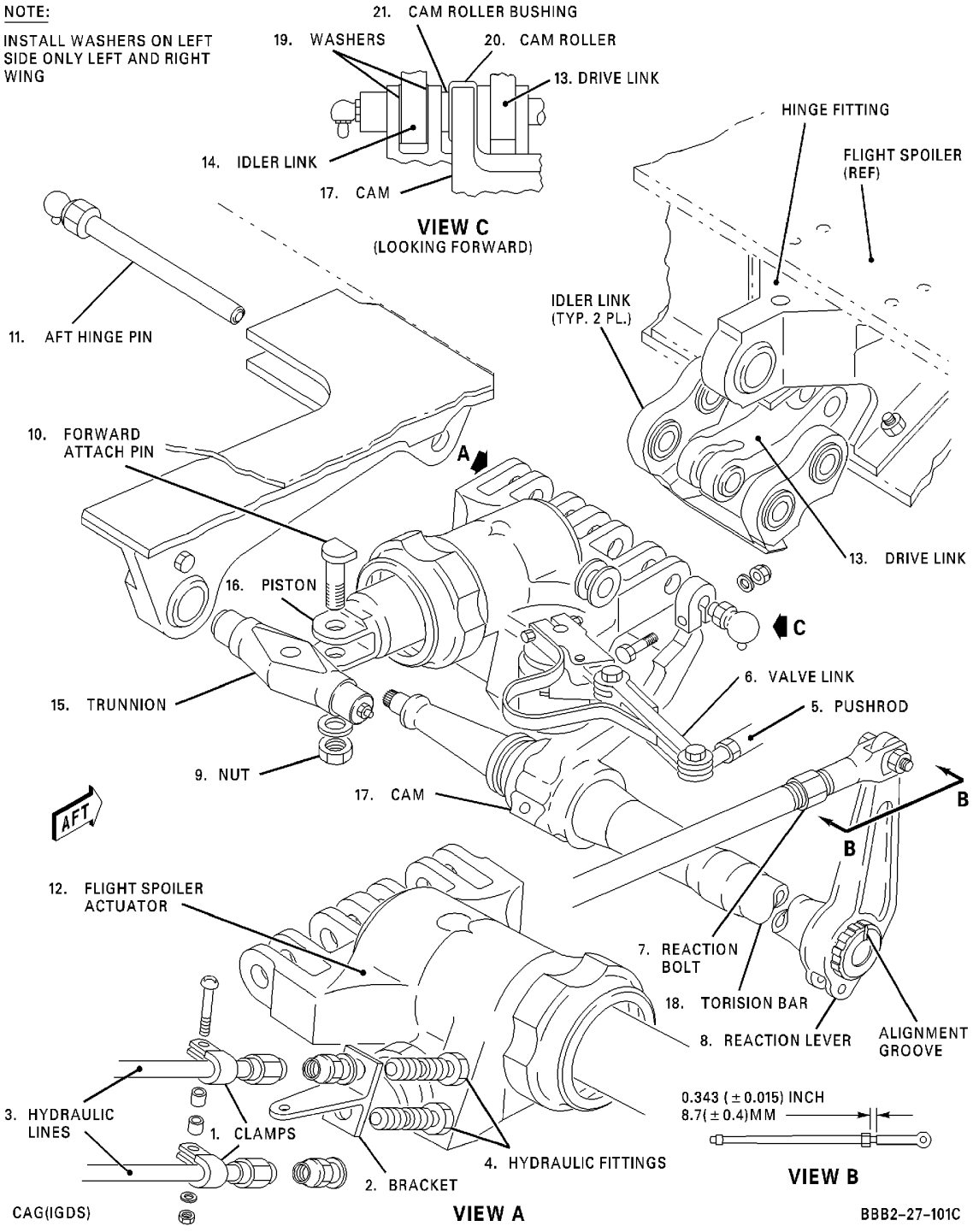
(5) Return aileron control wheel to neutral position, and check that spoiler panel is returned to retracted position, with drive link overcenter in locked position.

(6) Check hydraulic lines to spoiler actuator for interference with torsion bar or wing structure.

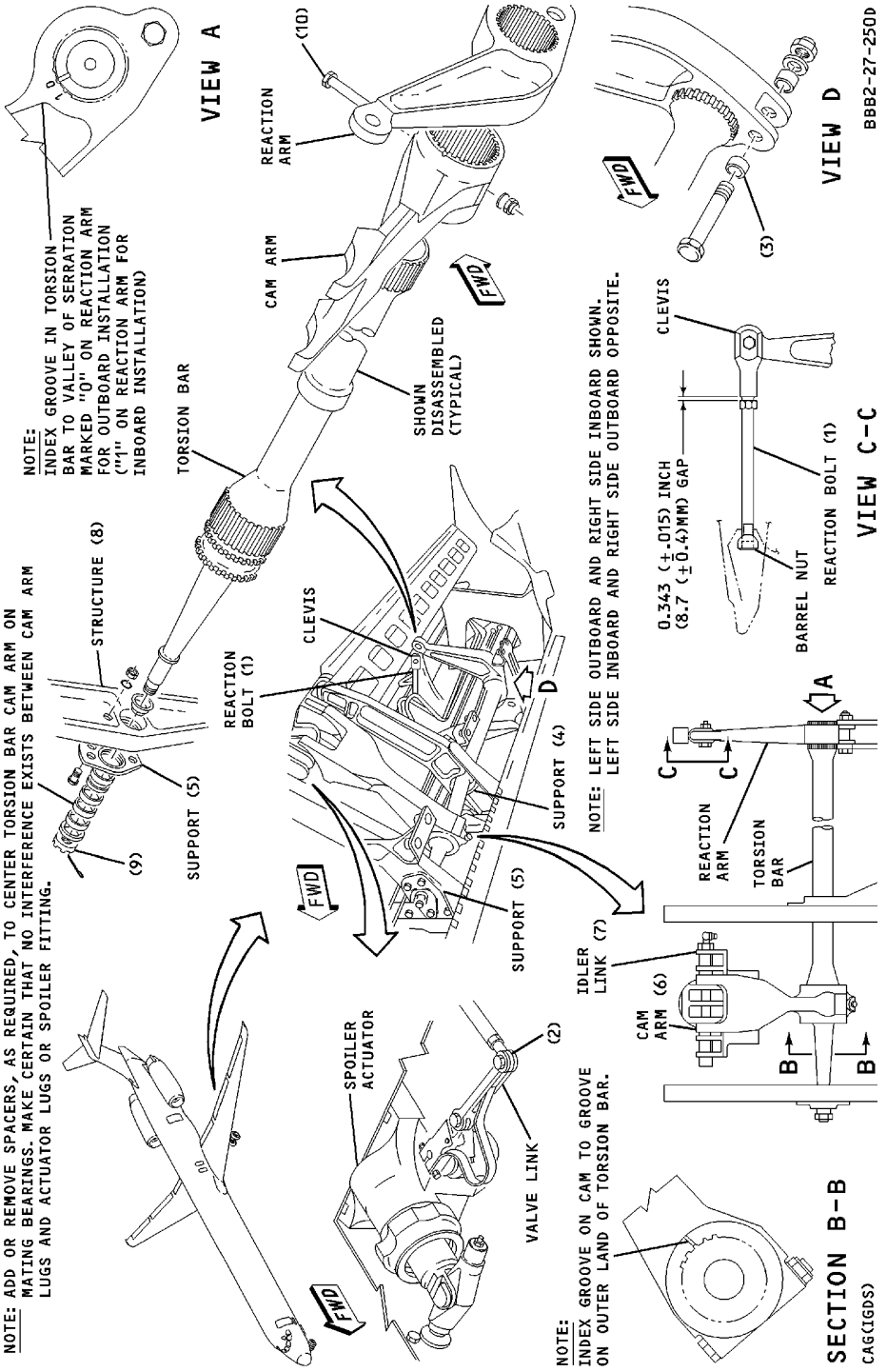
(7) Check actuator hydraulic connections for sign of leakage.

(8) Shut off hydraulic pressure source.

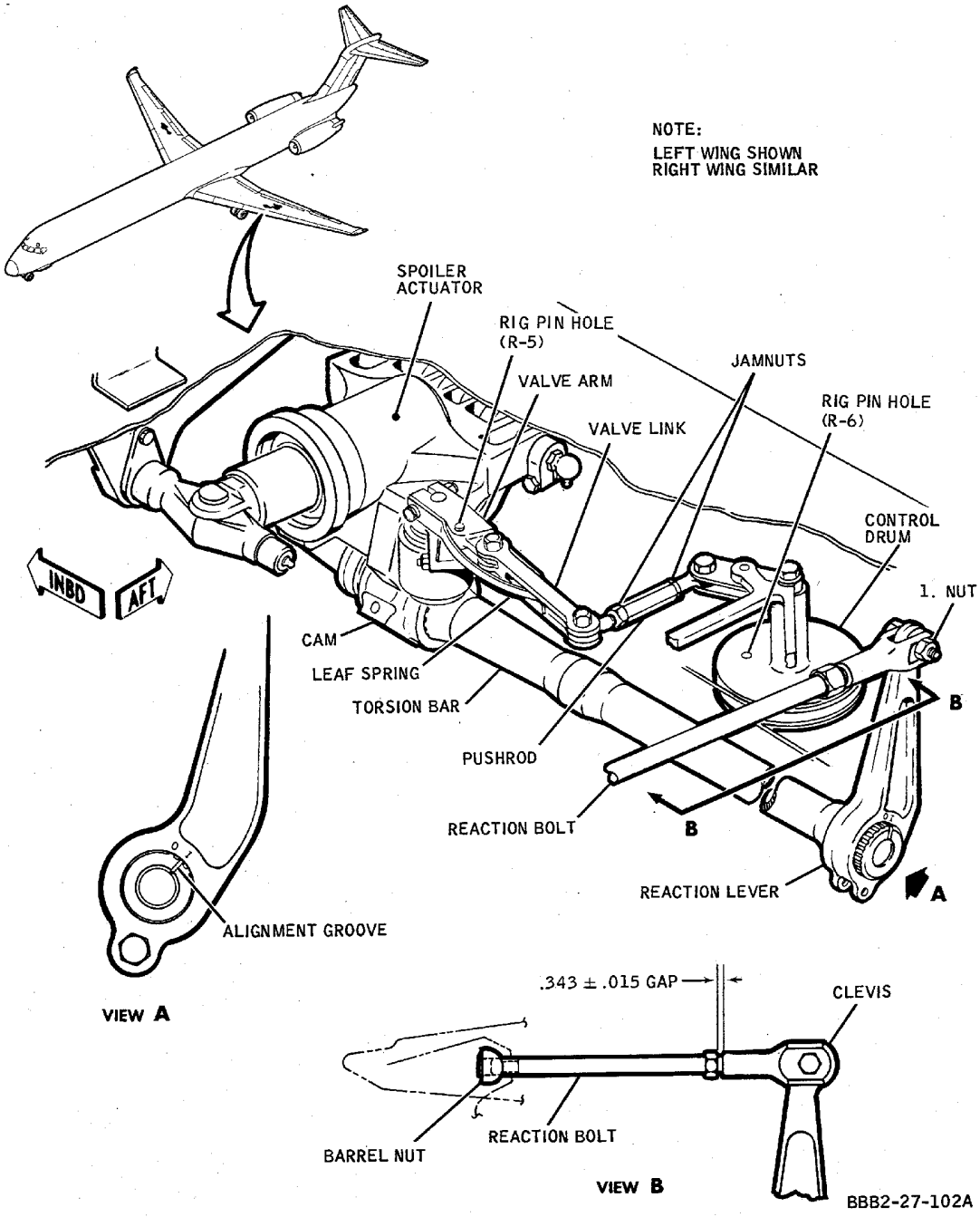
(9) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



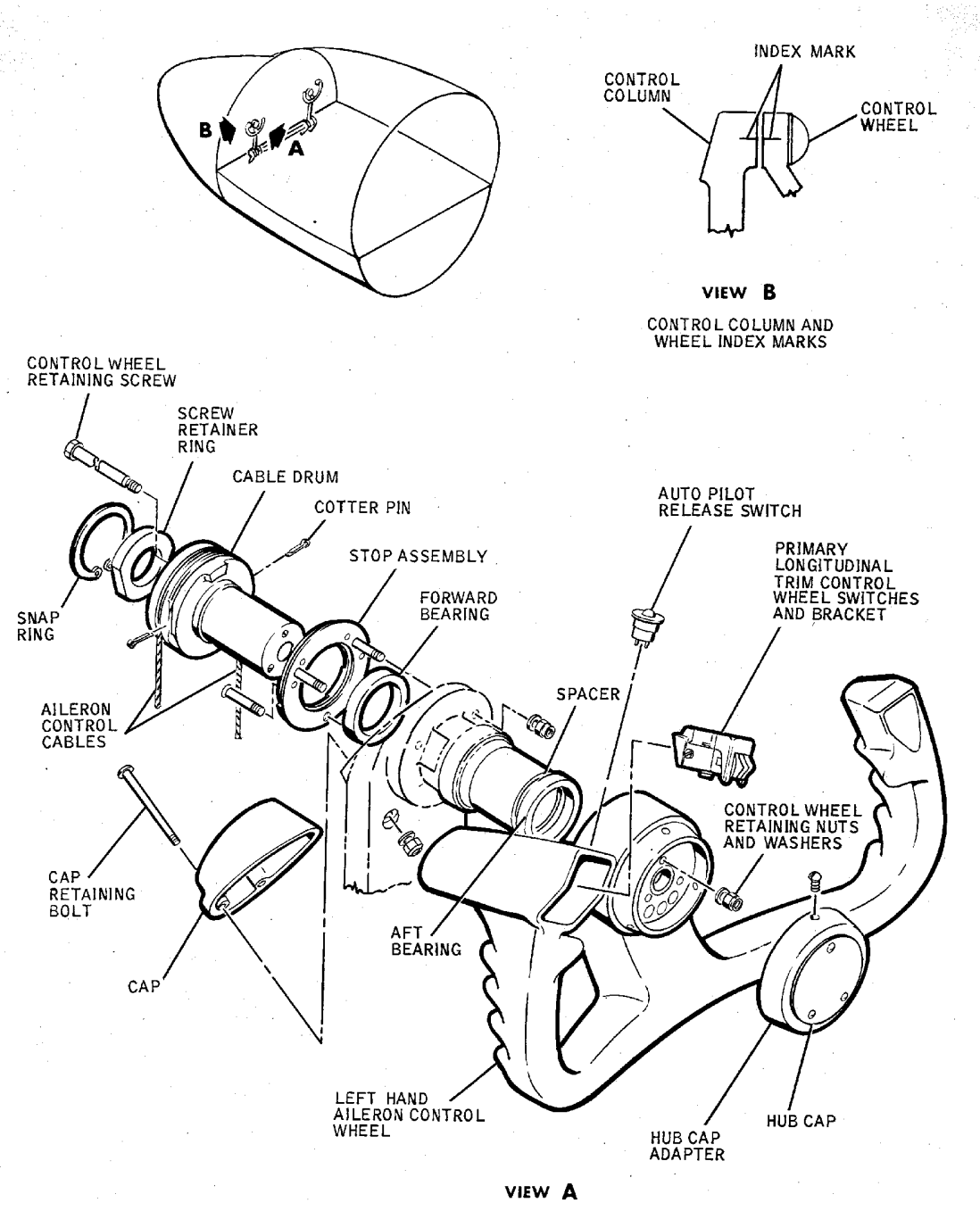
Flight Spoiler Actuator -- Removal/Installation
Figure 201/27-61-02-990-801



Spoiler Torsion Bar
Figure 202/27-61-02-990-802



Flight Spoiler Actuator -- Adjustment/Test
Figure 203/27-61-02-990-803



Flight Spoiler Actuator -- Adjustment/Test
Figure 204/27-61-02-990-804

SPOILER PRESSURE REDUCER VALVE - MAINTENANCE PRACTICES

1. General

A. There are two flight spoiler pressure reducer valves, one located in each main gear wheelwell near the fuselage center-line. The valve in the left wheelwell is mounted below and forward of the ground spoiler control valve. The valve in the right wheelwell is mounted below the hydraulic system accumulator.

B. Hydraulic pressure to the flight spoiler pressure reducer valves is shut off by the spoiler shutoff and system depressurization valve, located in the same wheelwell.

C. Removal and installation procedures are identical for the left and right pressure reducer valves.

2. Equipment and Materials

NOTE: Equivalent substitute may be used instead of the following listed item.

Table 201

Name and Number	Manufacturer
Door safety locks (3936851-1, or -501 as applicable. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co.

3. Removal/Installation Flight Spoiler Pressure Reducer Valve

A. Remove Valve

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(2) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(3) Disconnect hydraulic lines from fittings in valve ports. Cap or plug open lines and fittings.

(4) Remove valve from bracket.

(5) If required remove hydraulic fittings from valve ports and discard O-rings. Plug open ports.

B. Install Valve

(1) Make certain flight spoiler hydraulic systems are depressurized.

(2) Make certain door safety locks are installed on main gear inboard door actuating cylinder piston rod.

(3) If required, install hydraulic fittings in valve ports using new O-rings.

(4) Install valve on bracket in wheelwell. (Figure 201)

(5) Connect hydraulic lines to fittings in valve ports.

(6) Return spoiler shutoff and system depressurization valve to on position, and secure valve lever with safety pin.

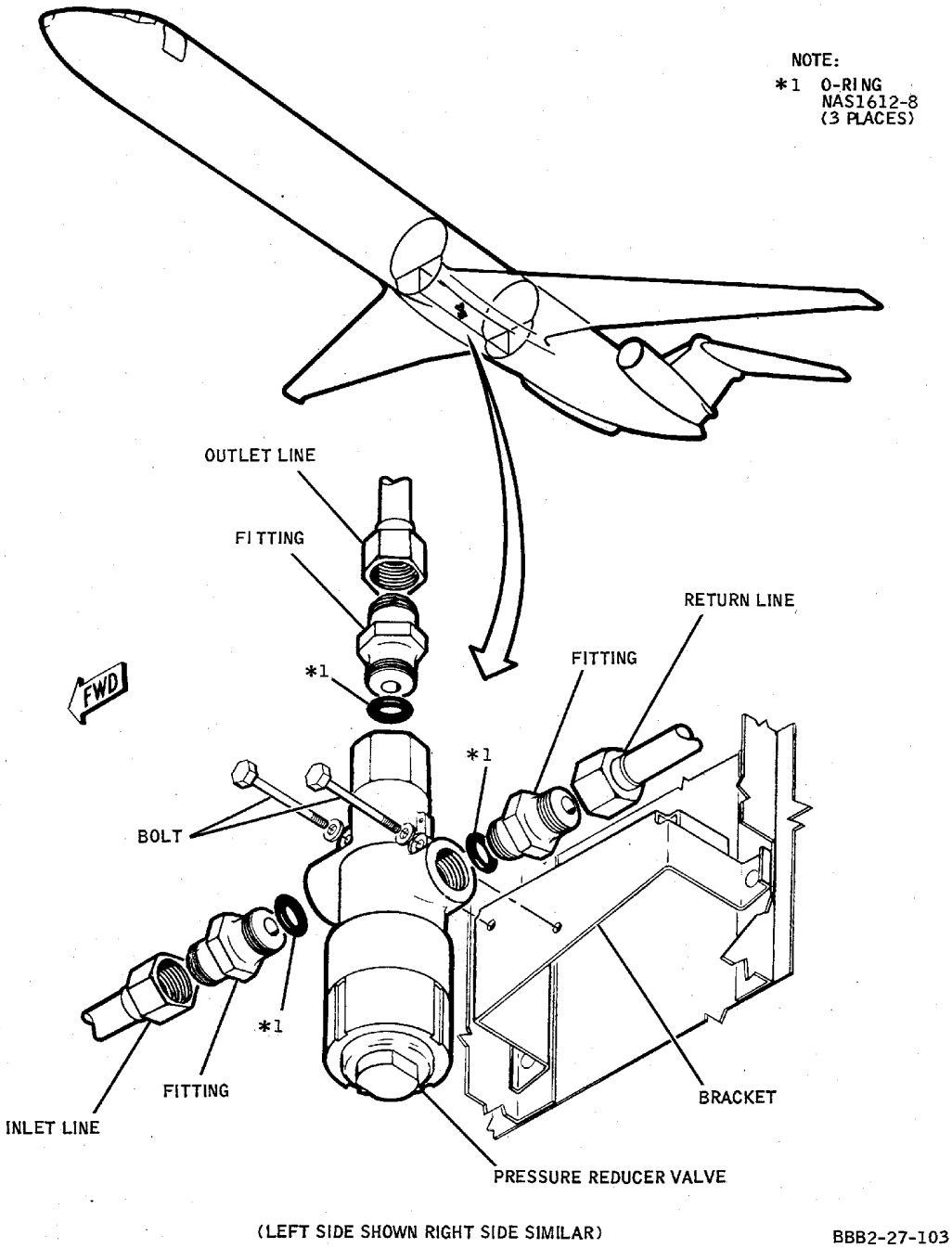
WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(7) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(8) Check reducer valve and connections visually for leakage.

(9) Shut off hydraulic pressure source.

(10) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Flight Spoiler Pressure Reducer Valve -- Removal/Installation
Figure 201/27-61-03-990-801

LATERAL CONTROL MIXER - REMOVAL/INSTALLATION

1. General

A. There are two lateral control mixers, one located in the forward inboard corner of each main gear well.

B. Rig pin designations and sizes are listed in GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201. The numbers in parentheses in the following text correspond to callouts in Figure 401, Figure 402, and Figure 403.

C. Access to components and turnbuckles is as follows:

Table 401

COMPONENTS	ACCESS
Spoiler shutoff and system depressurization valve	Left and right main gear wheel wells
Aileron torque tube	Electrical/electronics compartment
Aileron sectors	Wing rear spar access doors
Spoiler control drums	Wing rear spar with flaps extended.
Aileron input drums	Passenger compartment floor panels directly above mixers
Turnbuckles (1), (2), (5) and (6)	Forward lower cargo compartment ceiling panels
Turnbuckles (3), (4), (7) and (8)	Wing rear spar with flaps extended
Turnbuckles (8)	Left and right main gear wheel wells
Turnbuckles (9)	Right main gear wheelwell

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 402

Name and Number	Manufacturer
Rig Pin (4-4) 1/4 by 4 5/8 (6.35 x 117.475 mm)	Douglas Aircraft Co.
Rig Pin (8-7) 1/2 by 7 5/8 (12.7 x 193.675 mm)	Douglas Aircraft Co.
Rig Pin (2)(4-6) 1/4 by 6 5/8 (6.35 x 168.275 mm)	Douglas Aircraft Co.
Door safety locks (3936851-1 or -501 as applicable. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co.
Lockwire, NASM20995N32, DPM684*[1]	Not specified
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch), (15.875 mm).	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Lateral Control Mixers

A. Remove Left Mixer (Figure 402).

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

(2) Make certain aileron control wheels are in neutral position (index marks on wheel and control column aligned).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS. MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(3) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(4) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(5) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(6) Insert rig pin (4-4) in rig pin hole (R-3) in aileron torque tube.

(7) Loosen turnbuckles (1) in left aileron system to relieve cable tension.

(8) Loosen turnbuckles (2) to relieve tension on speedbrake cables.

(9) Insert rig pin (8-7) in rig pin hole (R-4) through aileron sectors in left wing.

(10) Loosen turnbuckles (3) in left wing to relieve tension on aileron cables.

(11) Insert rig pins (4-6) in rig pin holes (R-6) in inboard spoiler control drums in each wing.

(12) Loosen turnbuckles (4) in left and right wings to relieve tension on spoiler cables.

(13) Disconnect cables from aileron input drum (10). Tag cables to prevent crossing during installation.

(14) Remove drum (10) from shaft.

(15) Disconnect cables from aileron output drum (11) and spoiler sectors (12). Tag cables to prevent crossing during installation.

(16) Deleted.

(17) Deleted.

(18) Remove bolt (17) and disconnect spring and link assembly (13) from speedbrake shaft.

(19) Loosen turnbuckles (9) to relieve tension on ground spoiler cables to lower pulley on speedbrake shaft. (Figure 401)

(20) Remove bolt through upper speedbrake pulley and shaft. Do not remove pulley from shaft. (Figure 402)

(21) Remove bolt through lower speedbrake pulley and speedbrake shaft.

(22) Remove bolt (30) through spring lever (29) and speedbrake shaft.

(23) Remove bolts (15) from pushrods (16) at lower end of speedbrake shaft, (2 places).

(24) Remove bolt connecting bungee (28) to cam (27) at lower end of speedbrake shaft.

(25) Remove bolt through cam and speedbrake shaft and remove cam (27).

(26) While sliding upper and lower speedbrake pulleys and spring lever downward on speedbrake shaft, carefully raise speedbrake shaft enough to remove lower end from control mixer bracket.

NOTE: Do not damage cables above wheelwell ceiling panel when raising speedbrake shaft upward through cables.

(27) Remove bolts (19), spacers (20) and (21), and washers (22). Carefully pull aileron shaft upward clear of mixer bracket (23), aileron output drum (11), spoiler cam (24) and sealed bracket in ceiling of wheelwell.

NOTE: During removal of spacer (20) note and record number and arrangement of washers (22) between spacer and mixer bracket.

(28) Remove six bolts (25) and remove mixer from wheelwell.

(29) Cover sealed bracket openings to prevent entry of dirt or other foreign matter to seal and bearing.

B. Install Left Mixer

(1) Make certain contacting surfaces of aileron shaft and sealed brackets are free of grit or other foreign matter.

(2) Make certain left and right hydraulic systems are depressurized.

(3) Make certain door safety locks are installed on main gear inboard door actuating cylinder piston rod.

(4) Make certain flap/slats are extended.

(5) Position mixer in wheelwell against structural brackets.

(6) Install bolts (25) to secure mixer to structural brackets making certain sealed bracket opening and aileron shaft hole in bracket are aligned.

(7) Carefully insert aileron shaft through sealed bracket in wheelwell ceiling panel. Make certain bearing and seal remain properly seated in sealed bracket.

(8) Carefully guide aileron shaft through spoiler cam (24), aileron output drum (11), spacer (21), washers (22) and mixer bracket. Use sufficient washers (22) between spacer (21) and mixer bracket so that bottoms of cam rollers project into spoiler cam slot 1/32 (±1/32) inch (.792(±.792) mm) in neutral position and 1/32 (±1/16) inch (.792(±1.587 mm) in other than neutral position.

(9) Install bolts (19) through spoiler cam drum and bolts (19) in aileron output drum.

(10) Install washers (22) as noted in Paragraph 3.A.(21) , and spacer (20). Install bolt (19) in bottom of aileron shaft. Check that gap between washers and bottom of mixer bracket is .015/.030 inch, (0.381/0.762 mm). If necessary, add or remove shim washers to obtain gap.

(11) While sliding lower speedbrake pulley and spring lever upward on speedbrake shaft, carefully lower speedbrake shaft through hole in control mixer bracket to the installed position. (Figure 402)

(12) Position cam (27) on lower end of speedbrake shaft (26) and install attach bolt.

(13) Position upper speedbrake pulley at top of speedbrake shaft and install attach bolt.

(14) Position lower speedbrake pulley (below wheelwell ceiling panel) and install attach bolt.

(15) Position bungee (28) in cam at lower end of shaft and install attach bolt safety nut with cotter pin.

(16) Position spring lever (29) on speedbrake shaft (26) and install attach bolt.

(17) Connect spring to link assembly (18), and spring lever on speed brake shaft with bolt (17). Safety nuts with cotter pins.

(18) Connect pushrods (16) to speed brake shaft (2 places) with bolts (15). Safety nuts with cotter pins.

(19) Connect aileron cables to drum (10), and safety cable ball ends with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(20) Connect spoiler cables to spoiler sectors (12), making certain that cables are routed properly through mixer bracket. Safety cable ball ends with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(21) Connect aileron cables to aileron output drum (11), making certain that cables are routed properly through mixer bracket

(22) Adjust and test aileron control system, from aileron torque tube to mixer and from mixer to control tab sector. (PAGEBLOCK 27-10-00/501)

(23) Adjust and test flight spoiler system. (SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 or SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 Config 2)

(24) Adjust and test ground only spoilers control system. (SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 or SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 Config 2)

(25) Check that rig pins (4-4) (8-7) and (4-6) have been removed.

(26) Check for security of all turnbuckles and attachments. Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

C. Remove Right Mixer (Figure 403)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(4) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Make certain aileron control wheels are in neutral position (index marks on wheel and control column aligned).

(6) Insert rig pin (4-4) in rig pin hole (R-3) in aileron torque tube. (Figure 401)

(7) Loosen turnbuckles (1) in right aileron system to relieve cable tension.

(8) Loosen turnbuckles (6) to relieve tension on aileron trim cables.

(9) Insert rig pin (8-7) in rig pin hole (R-4) through aileron sectors in right wing.

(10) Loosen turnbuckles (3) in right wing to relieve tension on aileron cables.

(11) Loosen turnbuckles (7) to relieve tension on aileron trim cables in wing.

(12) Insert rig pins (4-6) in rig pin holes (R-6) in outboard spoiler control drum in each wing.

(13) Loosen turnbuckles (8) in left and right wings to relieve tension on spoiler cables.

(14) Disconnect cables from aileron input drum (31). Tag cables to prevent crossing during installation.

(15) Remove input drum (31) from shaft.

(16) Disconnect cables from aileron output drum (32) and spoiler sectors (33). Tag cables to prevent crossing during installation.

(17) Remove bolt (35) and disconnect pushrod (36) from spoiler crank.

(18) Remove aileron trim pulleys and brackets (45) from mixer bracket.

(19) Loosen turnbuckles (5) to relieve tension on alternate landing gear cables.

(20) Remove cage bracket (37) from mixer bracket.

(21) Remove alternate landing gear pulley and bracket (38) from mixer bracket. Secure pulley bracket and cables clear of mixer.

(22) Remove bolts (40), spacers (41) and (43), and washers (42). Carefully pull aileron shaft upward clear of mixer bracket (46), aileron output drum (32), spoiler cam (47) and sealed bracket.

NOTE: During removal of spacer (43) note and record number and arrangement of washers (42) between spacer and mixer bracket.

(23) Remove six bolts (44) and remove mixer from wheelwell.

(24) Cover sealed bracket openings to prevent entry of dirt or other foreign matter to bearing and seal.

D. Install Right Mixer

(1) Make certain contacting surfaces of aileron shaft and sealed brackets are free of grit or other foreign matter.

(2) Make certain doorkeepers are installed on main gear inboard door actuating cylinder piston rod.

(3) Make certain flap/slats are extended.

(4) Make certain left and right hydraulic systems are depressurized.

(5) Position mixer in wheelwell against structural brackets.

(6) Install six bolts (44) to secure mixer to structural brackets, making certain sealed brackets opening and aileron shaft hole in bracket are aligned.

(7) Carefully insert aileron shaft through sealed bracket in wheelwell ceiling panel, making certain bearing and seal remain properly seated in sealed bracket.

(8) Carefully guide aileron shaft through spoiler cam (47), aileron output drum (32), spacer (41), washers (42) and mixer bracket (46). Use sufficient washers (42) between spacer (43) and mixer bracket so that bottoms of cam rollers project into cam slot 1/32 (±1/32) inch (.792(±.792) mm) in neutral position and 1/32 (±1/16) inch (.792(±1.587 mm) in other than neutral position.

(9) Install bolts (40) through spoiler cam drum and bolts (40) in aileron output drum.

(10) Install washers (42) as noted in Paragraph 3.C.(22) and spacer (43). Install bolt (40) in bottom of aileron shaft. Check that gap between washers and bottom of mixer bracket is .015/.030 inch, (0.381/0.762 mm). If necessary, add or remove shim washers to obtain gap.

(11) Install aileron input drum (31) on aileron shaft with cable ball ends sockets aft.

(12) Install aileron trim mounting bracket on mixer.

(13) Connect aileron cables to drum (31) on aileron shaft and connect cables to aileron output drum (32).

(14) Connect spoiler cables to sectors (33), making certain that cables are routed properly through mixer bracket. Safety cable ball ends with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(15) Connect pushrod (36) to spoiler crank with bolt (35). Safety nut with cotter pin.

(16) Install alternate landing gear pulley, cables, pulley bracket (38) and cage bracket (37) on mixer.

(17) Install aileron trim pulleys (45) on mixer bracket.

(18) Adjust and test flight spoiler system. (SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 or SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 Config 2)

(19) Adjust and test aileron control system, from aileron torque tube to mixer, and from mixer to control tab sector. (PAGEBLOCK 27-10-00/501)

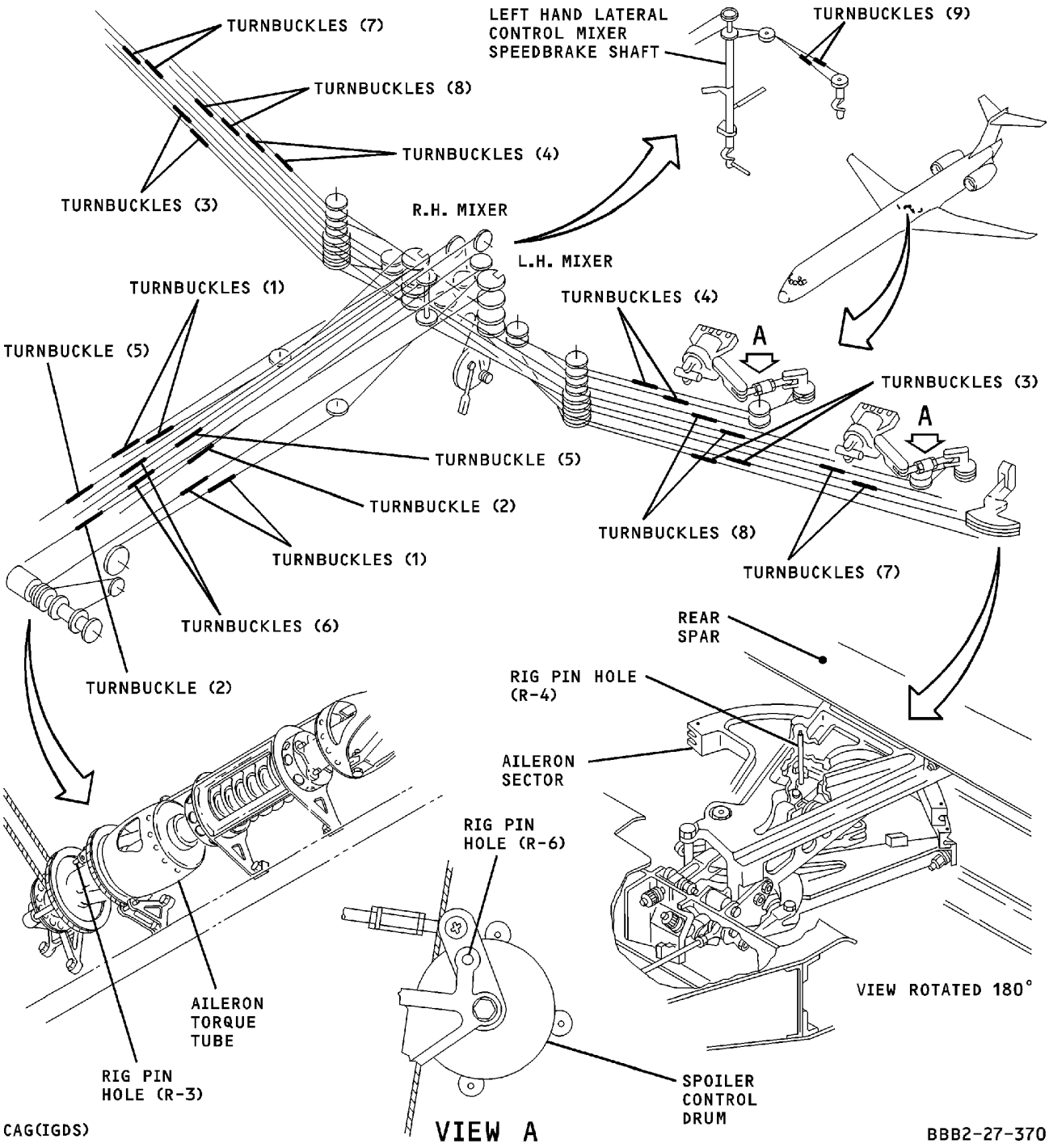
(20) Adjust and test aileron trim control system. (PAGEBLOCK 27-10-00/501)

(21) Adjust alternate landing gear cable system. (PAGEBLOCK 32-31-02/201)

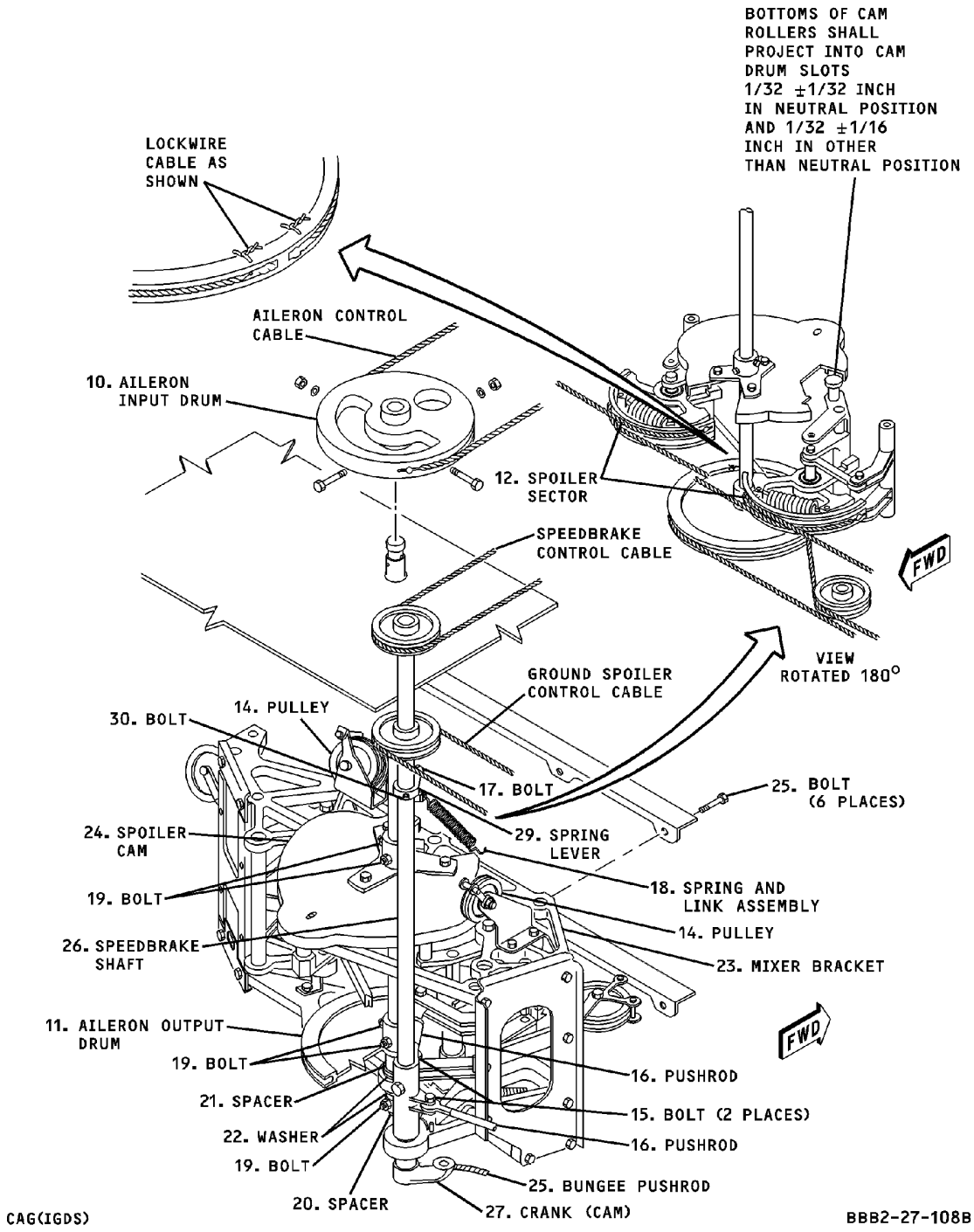
(22) Check that rig pins (4-4) (8-7) and (4-6) have been removed.

(23) Check for security and safety of all turnbuckles and attachments.

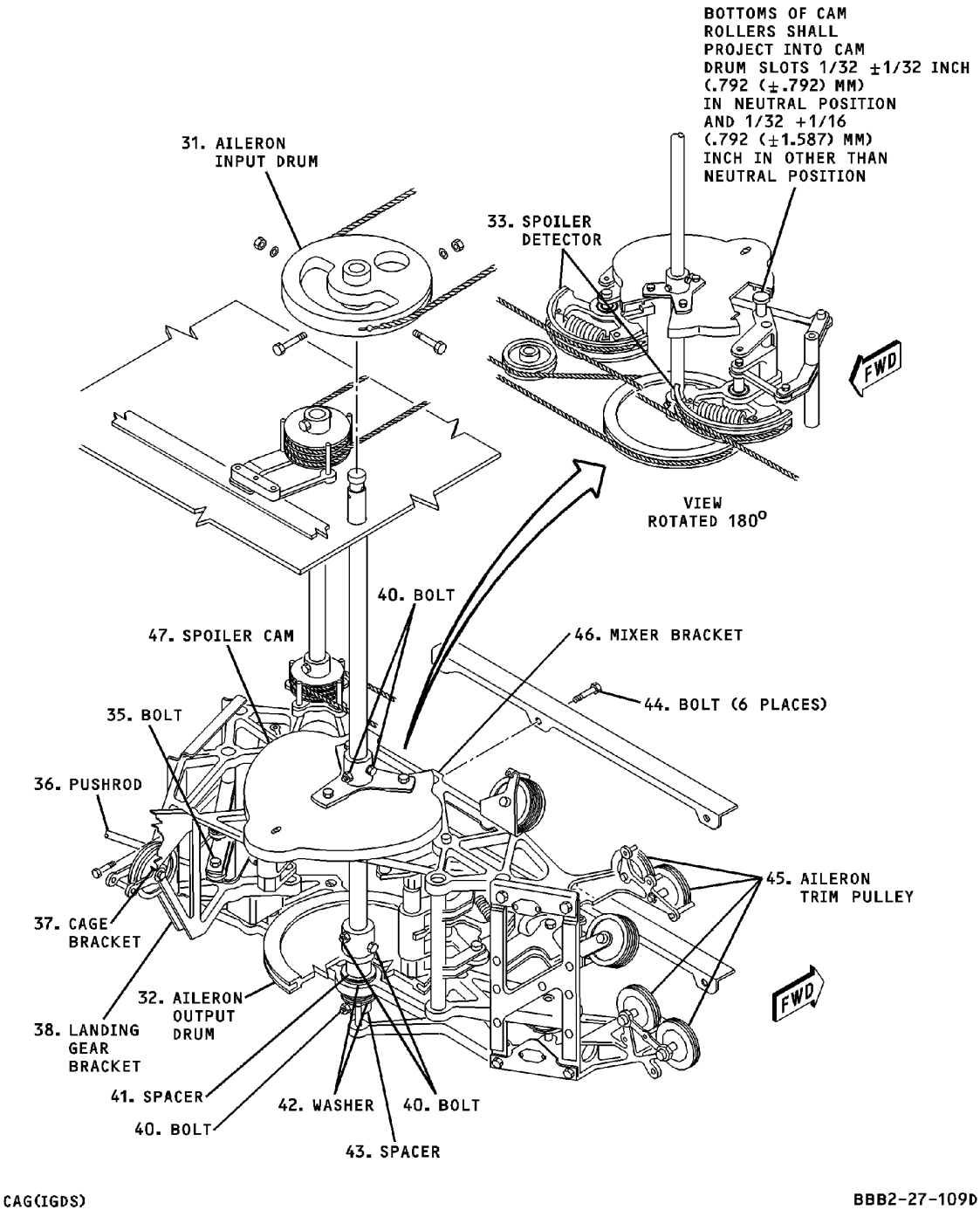
(24) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Lateral Control Mixer -- Removal/Installation
Figure 401/27-61-04-990-801



LH Lateral Control Mixer -- Removal/Installation
Figure 402/27-61-04-990-803



RH Lateral Control Mixer -- Removal/Installation
Figure 403/27-61-04-990-804

SPOILER DEPLOYED SENSORS - MAINTENANCE PRACTICES

1. General

A. The six spoiler deployed sensors are mounted on a bracket at the wing adjacent to each inboard hinge point of the four flight spoilers and at the outboard hinge point of the two ground spoilers. The sensors are activated by targets attached to the spoiler leading edge.

B. The sensors are accessible through the wing lower trailing edge access doors 1501C, 1502C, 1503A, left wing; 1601C, 1602C, 1603C, 1603A, right wing, with the flaps extended.

C. Removal and installation procedures are identical for all six spoiler deployed sensors.

D. A BITE test of the Proximity Sensor System can be performed at any time to determine if Proximity Switch Electronics Unit (PSEU) and Proximity Sensors are functioning properly. (PAGEBLOCK 32-60-00/101)

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
MLG door safety locks 3936851-1, or -501 as applicable. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co.
Spoiler locks 391309-1 or -501 collar	Boeing Aircraft Co.
Protractor	

3. Removal/Installation Spoiler Deployed Sensor

A. Remove Sensor

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Place flap/slat handle in 40° detent.

(3) Pull the speed brake lever up and aft to the full EXT position to fully deploy all spoilers. Install spoiler lock on each actuator.

(4) Shut off hydraulic pressure source.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(5) Open these circuit breakers and install safety tags:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	31	B1-755	SPOILER DEPLOYED IND
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

(6) Open wing lower trailing edge access doors.

(7) Disconnect sensor wires at splice.

(8) Remove sensor from mounting bracket.

NOTE: Note number and thickness of shims between sensor and mounting bracket.

B. Install Sensor

(1) Make certain left and right hydraulic systems are depressurized.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	31	B1-755	SPOILER DEPLOYED IND
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

(3) Connect sensor wires at splice. (Ref. Wiring Diagram Manual 20-10-03, Page 201)

(4) Install sensor on mounting bracket.

NOTE: Install shims between sensor and mounting bracket as noted in Paragraph 3.A.(8) during removal.

WJE 420, 422, 424, 429, 891

(5) With spoiler panels retracted, check that gap between proximity sensor face and target is 0.015 inch (0.381 mm) minimum. Figure 201

WJE 401-412, 414-419, 421, 423, 425-427, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 892, 893

(6) With spoiler panels retracted, check that gap between proximity sensor face and target is in tolerance. (Figure 202 or Figure 203), Dimensions A and B, as applicable.

WJE ALL

(7) Remove the safety tags and close these circuit breakers:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	31	B1-755	SPOILER DEPLOYED IND
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(8) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(9) Remove each spoiler lock. After all locks are removed, put the speed brake lever in the RET positon to stow the spoilers.

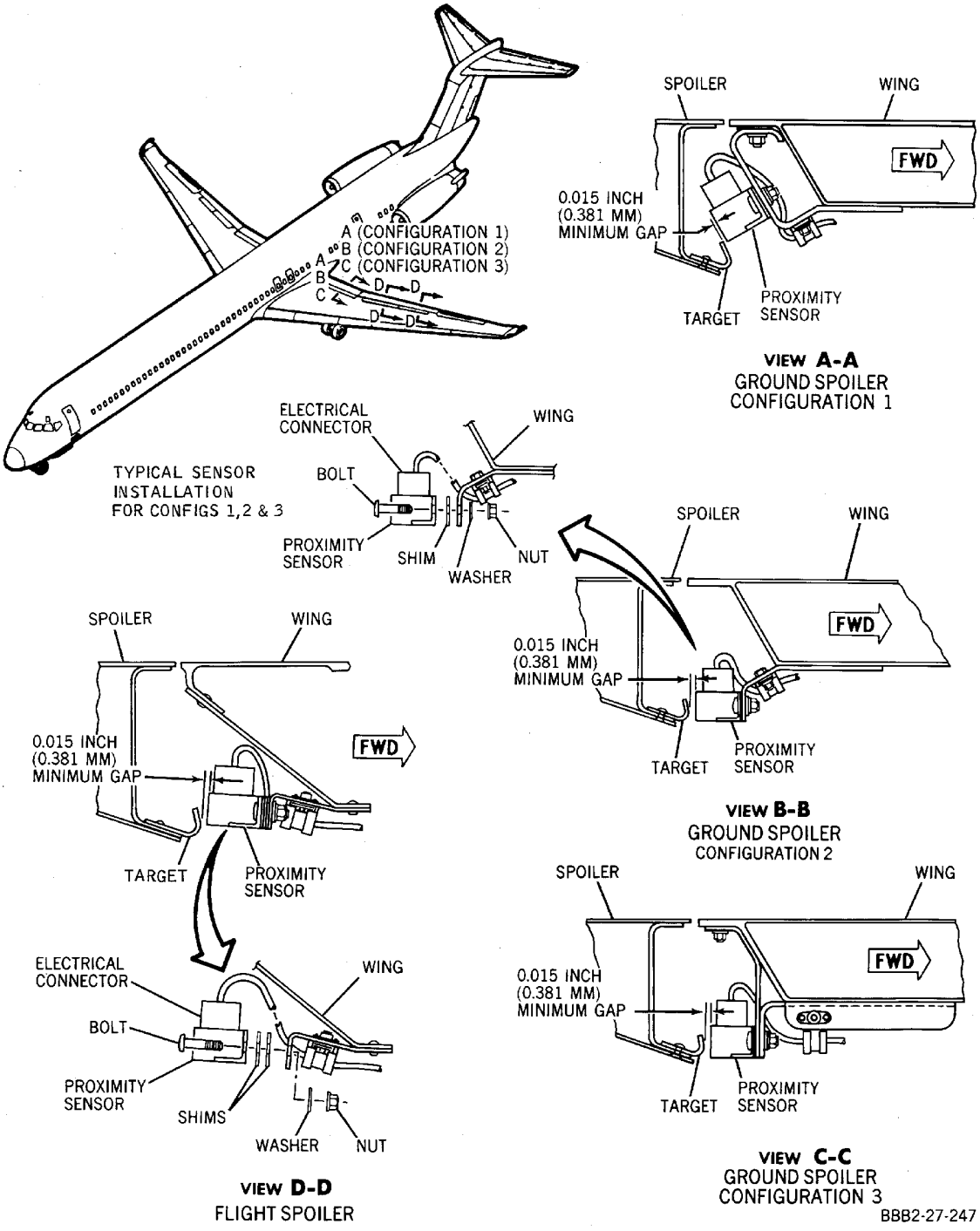
WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(10) Place flap/slat handle in RET detent.

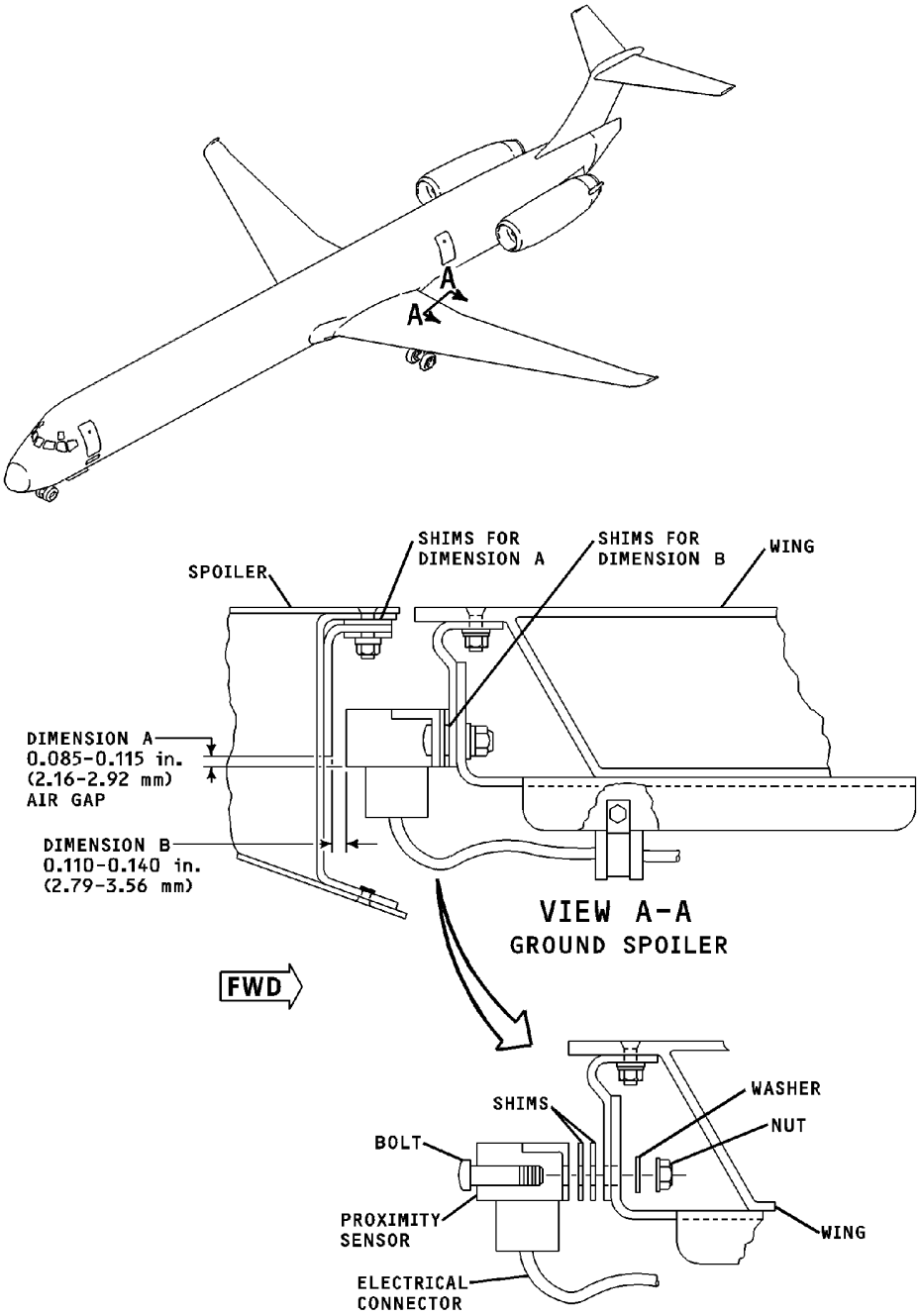
(11) Shut off hydraulic pressure source.

(12) Close wing lower access doors.

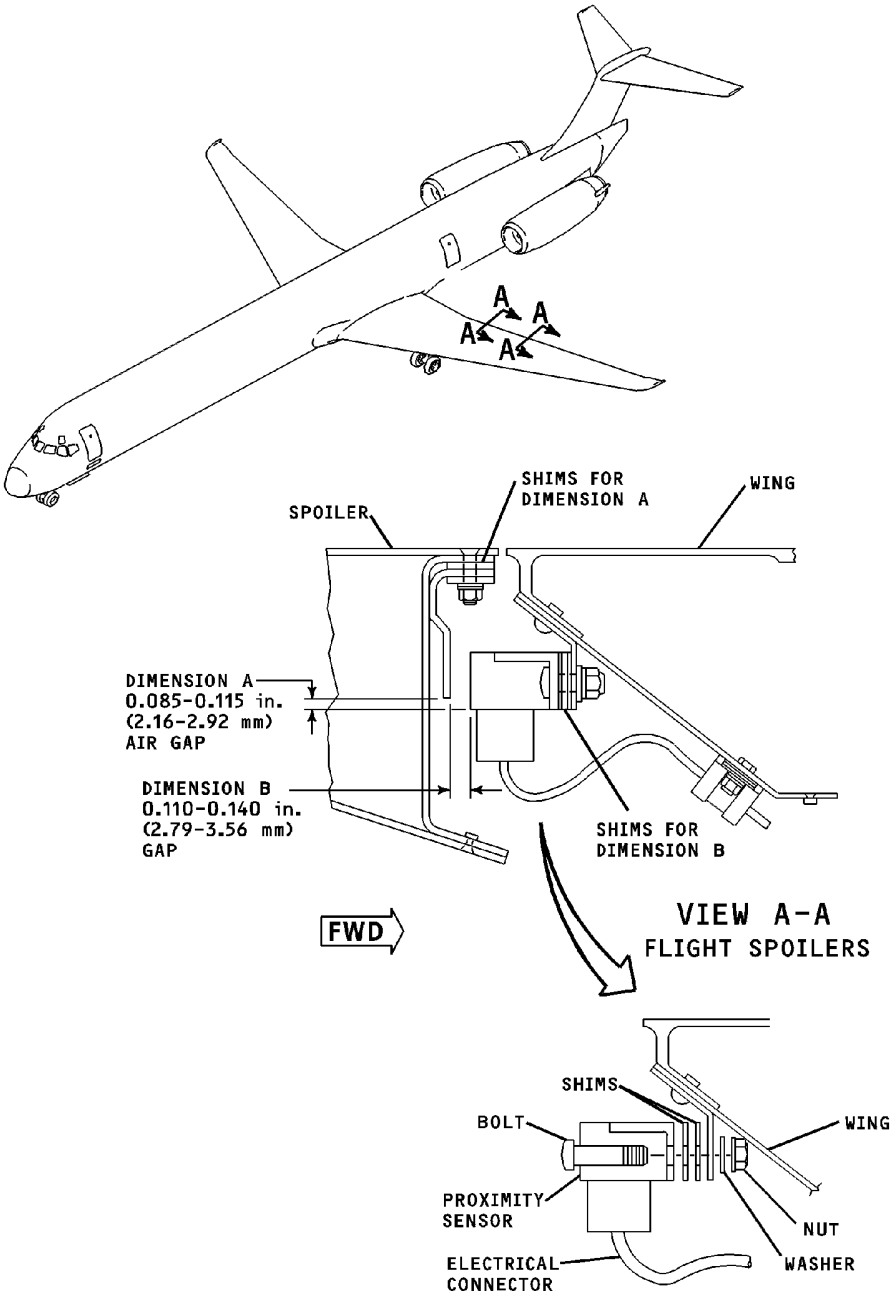
(13) Test sensor (Paragraph 4.)



Spoiler Deployed Sensors
Figure 201/27-61-05-990-801



Ground Spoiler Deployed Sensors
Figure 202/27-61-05-990-802



Flight Spoiler Deployed Sensors
Figure 203/27-61-05-990-803

4. **Adjustment/Test Spoiler Deployed Sensors**

A. Test Sensor

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Make certain speedbrake handle is in RET position.

(3) Make certain that aircraft is in ground mode (nose and main gear struts compressed).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(4) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(5) Place left hand spoiler system shutoff valve, located in main gear wheelwell, to OFF position.

WJE 401-412, 414-419, 421, 423, 425-427, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 892, 893

NOTE: When performing Paragraph 4.A.(6) through Paragraph 4.A.(14) if SPOILER DEPLOYED light does not come on within specified tolerances, shim sensor as required until light (or legend) comes on within tolerances. Maintain a minimum gap of 0.110-0.140 inch (2.79-3.56 mm) between sensor face and target. (Paragraph 3.B.(4) and Paragraph 3.B.(6))

WJE 420, 422, 424, 429, 891

NOTE: When performing Paragraph 4.A.(6) through Paragraph 4.A.(14) if SPOILER DEPLOYED light does not come on within specified tolerances, shim sensor as required until light comes on (or legend illuminates) within tolerances. Maintain a minimum gap of 0.015 inch (0.381 mm) between sensor face and target. (Paragraph 3.B.(4) and Paragraph 3.B.(5))

WJE ALL

(6) Position protractor on right outboard flight spoiler panel.

WARNING: BEFORE MOVING AILERON CONTROL WHEEL AND SPEEDBRAKE HANDLE, MAKE CERTAIN THAT AREAS AROUND SPOILERS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(7) Rotate aileron control wheel quickly (or rapidly) clockwise, but with smooth continuous motion approximately 90 degrees. Check that SPOILER DEPLOYED light on annunciator panel, comes on when right outboard flight spoiler is extended 8 to 12 degrees. Place control wheel to neutral, SPOILER DEPLOYED light should go off.

(8) Remove protractor and position protractor on left outboard flight spoiler panel.

(9) Rotate aileron control wheel quickly (or rapidly) counter-clockwise, but with smooth continuous motion approximately 90 degrees. Check that SPOILER DEPLOYED light comes on when left outboard flight spoiler is extended 8 to 12 degrees. Place control wheel to neutral, SPOILER DEPLOYED light should go off.

(10) Remove protractor. Place left hand spoiler system shutoff valve in ON position. Place right hand spoiler system shutoff valve in OFF position.

(11) Position protractor on right inboard flight spoiler panel.

(12) Rotate aileron control wheel quickly (or rapidly) clockwise, but with smooth continuous motion approximately 90 degrees. Check that SPOILER DEPLOYED light comes on when right inboard flight spoiler is extended 8 to 12 degrees. Place control wheel to neutral, SPOILER DEPLOYED light should go off.

(13) Remove protractor and position protractor on left inboard flight spoiler panel.

(14) Rotate aileron control wheel quickly (or rapidly) counter-clockwise, but with smooth continuous motion approximately 90 degrees. Check that SPOILER DEPLOYED light comes on when left inboard flight spoiler is extended 8 to 12 degrees. Place control wheel to neutral, SPOILER DEPLOYED light should go off.

(15) Remove protractor.

(16) Place right hand spoiler system shutoff valve in ON position.

(17) Manually move and lift speedbrake handle to full aft extended position (60° spoiler position) all spoilers should be extended and SPOILER DEPLOYED light should be off.

(18) Place left and right spoiler system shutoff valves in OFF position.

(19) Depressurize left and right hydraulic system.

(20) All flight spoilers should fully retract, both ground only spoilers should remain partially extended. SPOILER DEPLOYED light should remain off.

(21) Manually place speedbrake handle in retract position.

(22) Flight spoiler panels may or may not fully retract, manually move all flight spoiler panels to full retracted position, if necessary. Both ground only spoilers should remain partially or fully extended. SPOILER DEPLOYED light should be ON.

CAUTION: USE EXTREME CARE WHEN PERFORMING PARAGRAPH 4.A.(23), PARAGRAPH 4.A.(24), AND PARAGRAPH 4.A.(25). HYDRAULIC SYSTEMS MUST NOT BE PRESSURIZED IN ANY MANNER TO PREVENT INJURY TO PERSONNEL.

(23) Manually move left ground only spoiler panel in the retract direction to approximately one inch (25.4 mm) from fully retracted position. SPOILER DEPLOYED light should remain on.

(24) Manually move left ground only spoiler panel in extend direction and right ground only spoiler panel in retract direction (may be fully retracted). SPOILER DEPLOYED light should remain on.

(25) While holding right ground only spoiler panel in retracted position, move left ground only spoiler panel to retracted position. SPOILER DEPLOYED light should go off.

(26) Pressurize left and right hydraulic systems.

(27) Place left and right spoiler system shutoff valves in ON position. Safety valve levers with safety pins.

(28) All flight spoilers and ground only spoilers should be fully retracted. SPOILER DEPLOYED light should be off.

NOTE: With SB 27-257 incorporated, complete Paragraph 4.A.(28)(a) through Paragraph 4.A.(28)(f)) to check SPOILER DEPLOYED LIGHT inhibit system.

(a) Place both throttles 2 1/8 inches (52.98 mm) forward of idle stop, as measured along curved top of pedestal from idle stop to aft edge of throttle lever.

(b) Rotate aileron control wheel quickly (or rapidly) clockwise, but with smooth continuous motion approximately 90 degrees. SPOILER DEPLOYED light should remain OFF.

(c) Return control wheel to neutral.

(d) Rotate aileron control wheel quickly (or rapidly) counterclockwise, but with smooth continuous motion approximately 90 degrees. SPOILER DEPLOYED light should remain OFF.

(e) Return control wheel to neutral.

(f) Place both throttle levers to idle position.

(29) Shut off hydraulic systems pressure source.

(30) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).

SPOILER TORSION BAR - MAINTENANCE PRACTICES

1. General

A. There are four torsion bars installed in each aircraft, two in each wing. One for each inboard flight spoiler and one for each outboard flight spoiler.

B. Torsion bars are installed only on aircraft without Service Bulletin 27-337, which installs modified flight spoiler actuators and deletes spoiler torsion bars.

C. Removal and installation instructions are the same for all four torsion bars except as noted. Numbers in parentheses in the following text corresponds to callouts in Figure 201.

D. Access to spoiler torsion bars is through lower surface of wing in rear spar area. Flaps must be fully extended and bute doors lowered to the hanging position.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

	Name and Number	Manufacturer
	WJE ALL PRE DC9-27-337	
	Spoiler lock (with torsion bar) 3916794-1	Boeing Co.
	WJE ALL POST DC9-27-337	
	Spoiler lock (with or without torsion bar) 3981309-1 or -501	Boeing Co.
	WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893	
	Silicone seal, RTV 9910-Catalyst RTV 88 Sealant DMS QPL 1799 or	General Electric Co. Waterford, NY or City of Industry, CA
	Silicon seal, DC 90-006 with catalyst 90-006-2 DMS QPL 1799, Rev. C	Dow Corning Corp. Midland, MI
WJE	**WJE 405-411, 884**	
WJE WJE WJE WJE	Sealant, PR 1422B-2 with accelerator (DMS 2082)	Products Research and Chemical Corp. Div. of Courtaulds Aerospace Glendale, CA

WJE 405-411, 884 (Continued)

Table 201 (Continued)

	Name and Number	Manufacturer
WJE	Silicone seal, RTV 9910*- catalyst RTV 88 - Seal (DMS QPL 1799)	General Electric Co. Waterford, NY or City of Industry, CA
WJE	**WJE ALL**	
	Torque wrench (0 to 100 inch pounds range)	
	Compound, modified fluorosilicone, groove injection #94-031 (DPM 5940)	Dow Corning Corp. Midland, MI
	WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893	
	Primer, silicone 1200 (DPM 3202)	Dow Corning Corp. Midland, MI
WJE	**WJE 405-411, 884**	
WJE	Compound, groove injection, D40*	Mastinox
WJE	**WJE ALL**	
	Lockwire, NASM20995N32, DPM684*[1]	Not specified
WJE	**WJE 405-411, 884**	
WJE	NOTE: *RTV9910/88 compound not compatible with Mastinox.	
WJE	**WJE ALL**	

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Spoiler Torsion Bar

A. Remove Torsion Bar

WARNING: TO PREVENT POSSIBLE INJURY TO PERSONNEL OR DAMAGE TO AIRCRAFT, DO NOT ATTEMPT REMOVAL OF ANY PART OF TORSION BAR ASSEMBLY WITHOUT RELIEVING PRELOAD. SPOILER PANELS MUST BE RETRACTED WHEN RELIEVING PRELOAD.

(1) Remove attach screws from Bent Up Trailing Edge (bute) doors and allow bute doors to hang down. (BENT UP TRAILING EDGE PANELS - MAINTENANCE PRACTICES, PAGEBLOCK 57-20-03/201)

(2) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: FAILURE TO RELIEVE PRELOAD COULD CAUSE SERIOUS INJURY TO PERSONNEL OR STRUCTURAL DAMAGE TO AIRCRAFT.

(3) Remove lockwire and rotate reaction bolt (1) to relieve preload before removing clevis bolt.

(4) Remove bolt connecting clevis to reaction arm.

(5) Remove bolt connecting pushrod to hydraulic spoiler actuator valve link (2).

(6) Remove bolt (3) connecting lower end of reaction arm to structure.

(7) Remove nut (9), washer and spacers from small end of torsion bar. Note and record quantity and location of spacers. Retain hardware.

(8) Remove attachments from support (5). Note and record position and location of shims. Retain hardware.

(9) Remove and retain support (4) and attaching hardware.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT ALL CONTROLS ARE IN THE CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR EQUIPMENT.

(10) Partially pressurize left or right hydraulic system, as applicable, using appropriate hand hydraulic pump located in wheel well.

WARNING: BEFORE APPLYING HYDRAULIC PRESSURE, MAKE CERTAIN AREAS AROUND SPOILERS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(11) Using spoiler actuator valve link as control lever, carefully raise spoiler panel sufficiently to permit torsion bar cam arm (6) to clear idler link (7) and rotate cam arm downward.

WARNING: DO NOT OPERATE FLAPS WITH SPOILER LOCK INSTALLED OR DAMAGE TO FLAPS/SPOILERS MAY OCCUR.

(12) Raise spoiler panel to full extend and install spoiler lock.

WJE 405-411, 880, 881, 883, 884

(13) Using plastic scraper, remove silicone seal from both sides of reaction arm and cam.

NOTE: RTV 9910/88 compound not compatible with Mastinox.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

(14) Using plastic scraper, remove sealant from both sides of reaction arm, cam, and torsion bar.

WJE ALL

(15) Move torsion bar inboard or outboard, as applicable, and slide reaction arm off large end of bar. Retain reaction arm.

(16) Lower large end of shaft to clear structure at support assembly (4) location.

(17) Move torsion bar inboard or outboard, as applicable, to remove small end of bar from hole in structure (8).

(18) Slide support assembly (4) off large end of torsion bar. Retain support assembly.

(19) Remove bolt (10) from lower end of cam and remove cam from torsion bar. Retain cam.

B. Install Torsion Bar

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

(1) Remove all sealant and other foreign material from torsion bar, cam (6), reaction arm and all splines prior to installation of torsion bar, cam (6) and reaction arm.

NOTE: All splines must be thoroughly clean, dry and free of all old sealant, dirt, oil, grease, etc. prior to beginning assembly.

WJE 405-411, 880, 881, 883, 884

(2) Make certain all sealant has been removed from torsion bar, cam (6), and reaction arm and all splines prior to installation of torsion bar.

NOTE: All splines must be thoroughly clean, dry and free of all old sealant, dirt, oil, grease, etc. prior to beginning assembly.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

WARNING: SILICONE PRIMER IS AN AGENT THAT IS FLAMMABLE, POISONOUS, AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS LISTED BELOW WHEN SILICONE PRIMER IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET SILICONE PRIMER IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

(3) Apply 1200 silicone primer to entire length of splines on torsion bar, cam and reaction arm. Make certain that coverage is complete, with no voids in material. Allow to thoroughly air dry before proceeding.

WARNING: FLUOROSILICONE SEALANT ADHESIVE IS AN AGENT THAT IS POISONOUS, CARCINOGENIC, A SENSITIZER, AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN FLUOROSILICONE SEALANT ADHESIVE IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET FLUOROSILICONE SEALANT ADHESIVE IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS MSDS FOR:

- MORE PRECAUTIONARY DATA.
- APPROVED SAFETY EQUIPMENT.
- EMERGENCY MEDICAL AID.
- TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

CAUTION: MAKE CERTAIN NO VOIDS EXIST IN COMPOUND PRIOR TO ASSEMBLY. SUCH VOIDS MAY ENTRAP MOISTURE, THEREBY CONTRIBUTING TO POSSIBLE CORROSION OF TORSION BAR.

(4) Coat entire length of splines on cam and torsion bar with modified fluorosilicone compound.

WJE 405-411, 880, 881, 883, 884

CAUTION: MAKE CERTAIN NO VOIDS EXIST IN COMPOUND PRIOR TO ASSEMBLY. SUCH VOIDS MAY ENTRAP MOISTURE, THEREBY CONTRIBUTING TO POSSIBLE CORROSION OF TORSION BAR.

(5) Coat entire length of splines on cam and torsion bar with groove injection compound, in accordance with company procedure.

NOTE: RTV 9910/88 Silicon Compound not compatible with Mastinox D40.

WJE ALL

(6) Position index groove on outer land of torsion bar to index groove on cam (6).

(7) Install cam (6) on torsion bar and tighten bolt (10) at lower end of cam. (Figure 201)

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

(8) Remove excess fluorosilicone compound from cam (6) and splined area.

WJE 405-411, 880, 881, 883, 884

(9) Remove excess groove injection compound from cam (6) and splined area.

WJE ALL

(10) Install torsion bar by inserting small end first through hole in structure (8).

(11) Slide support assembly (4) over large end of bar facing frame.

(12) Raise large end of torsion bar upward and insert bar in slot on aft side of frame at support assembly (4) location.

(13) Move torsion bar inboard or outboard as applicable, to clear large end of bar from structure.

(14) Position reaction arm in location of installation.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

WARNING: FLUOROSILICONE SEALANT ADHESIVE IS AN AGENT THAT IS POISONOUS, CARCINOGENIC, A SENSITIZER, AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN FLUOROSILICONE SEALANT ADHESIVE IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET FLUOROSILICONE SEALANT ADHESIVE IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS MSDS FOR:

- MORE PRECAUTIONARY DATA.
- APPROVED SAFETY EQUIPMENT.
- EMERGENCY MEDICAL AID.
- TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893 (Continued)

(WARNING PRECEDES)

CAUTION: MAKE CERTAIN NO VOIDS EXIST IN COMPOUND PRIOR TO ASSEMBLY. SUCH VOIDS MAY ENTRAP MOISTURE, THEREBY CONTRIBUTING TO POSSIBLE CORROSION OF TORSION BAR.

(15) Coat entire length of splines on reaction arm and torsion bar with modified fluorosilicone compound.

NOTE: All splines must be thoroughly clean, dry and free of all old sealant, dirt, oil, grease, etc. prior to beginning assembly.

WJE 405-411, 880, 881, 883, 884

(16) Coat entire length of splines on reaction arm and torsion bar with groove injection compound, in accordance with company procedure.

NOTE: All splines must be thoroughly clean, dry and free of all old sealant, dirt, oil, grease, etc. prior to beginning assembly.

NOTE: RTV 9910/88 Silicon Compound not compatible with Mastinox D40.

WJE ALL

(17) Position index groove on torsion bar to the letter on reaction arm corresponding with position torsion bar is to be installed in aircraft, (I=inboard spoiler, O=outboard spoiler).

(18) Carefully slide torsion bar into splines of reaction arm.

(19) Remove excess fluorosilicone compound from reaction arm and splined area.

(20) Position support assembly (5) on frame and install shims and attaching hardware. Make certain quantity and location of shims are the same as recorded in Paragraph 3.A.(8)

(21) Install spacers, washer and nut on small end of shaft. Spacers must be installed in same quantity and location as recorded in Paragraph 3.A.(7).

NOTE: Add or remove spacers, as required, to center torsion bar cam arm on mating bearings. Make certain that no interference exists between cam arm lugs and actuator lugs or spoiler fitting.

(22) Torque nut on small end of shaft to 50 inch pounds (5.65 N·m). Back nut off to nearest slot and safety with cotter pin.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT ALL CONTROLS ARE IN THE CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR EQUIPMENT.

(23) Partially pressurize left or right hydraulic system as applicable using appropriate hand hydraulic pump located in wheel well.

(24) Using actuator valve link (2) as control lever, move spoilers to full extend and remove spoiler lock.

(25) Using actuator valve link (2) as control lever, carefully lower spoiler panel to retract position while rotating cam arm (6) on torsion bar upward into position against cam rollers.

(26) Install bolt (3) at lower end of reaction arm.

(27) Make certain that speedbrake control lever is in retract position (against forward stop with red arm label not visible).

(28) Make certain that aileron control wheels are in neutral (index mark on wheel and control column aligned).

(29) Using spoiler actuator valve link (2) as control lever, retract spoilers. Make certain they press firmly against stops.

(30) Rotate reaction bolt (1) to obtain dimension of 0.343(±0.015) (8.73(±0.38) mm) inch between head of bolt and clevis. (Figure 202, View B)

(31) Manually hold cam face against cam rollers and adjust reaction bolt (1) in structural barrel nut until clevis attach hole aligns with hole in reaction arm within 0.021 inch (0.53 mm). Maintain dimension obtained in Paragraph 3.B.(30).

(32) Install bolt connecting clevis to reaction arm.

(33) Tighten reaction bolt (1) against clevis and safety reaction bolt with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

(34) Seal bolt (10) with silicone sealant.

WJE 405-411, 880, 881, 883, 884

(35) Seal bolt (10) with edge fillet sealant.

NOTE: RTV 9910/88 compound not compatible with Mastinox.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

WARNING: ADHESIVE/SILICONE SEALANT IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN ADHESIVE/SILICONE SEALANT IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET SILICONE SEALANT ADHESIVE IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS MSDS FOR:

- MORE PRECAUTIONARY DATA.
- APPROVED SAFETY EQUIPMENT.
- EMERGENCY MEDICAL AID.
- TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(36) Apply a fillet of sealant compound on both sides of cam and reaction arms to torsion bar spline junctions. Fillet must extend beyond edge of splines on cam and reaction arms and sufficiently along torsion bar to make a complete seal.

WJE 405-411, 880, 881, 883, 884

WARNING: INTEGRAL FUEL TANKS SEALING COMPOUND (POLYSULFIDE SEALANT B1/2 AND B2) IS AN AGENT THAT IS POISONOUS AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN INTEGRAL FUEL TANKS SEALING COMPOUND IS USED.

- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET INTEGRAL FUEL TANKS SEALING COMPOUND IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: ADHESIVE/SILICONE SEALANT IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN ADHESIVE/SILICONE SEALANT IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET SILICONE SEALANT ADHESIVE IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS MSDS FOR:

- MORE PRECAUTIONARY DATA.
- APPROVED SAFETY EQUIPMENT.
- EMERGENCY MEDICAL AID.
- TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

CAUTION: MAKE CERTAIN THAT NO VOIDS EXIST IN SPLINE FILLET SEAL COMPOUND. SUCH VOIDS MAY ALLOW ENTRY OF MOISTURE INTO SPLINED JOINT, THEREBY CONTRIBUTING TO POSSIBLE CORROSION OF TORSION BAR.

(37) Apply a fillet of sealant compound, in accordance with company procedure, on both sides of cam and reaction arms to torsion bar spline junctions. Fillet must extend beyond edge of splines on cam and reaction arms and sufficiently along torsion bar to make a complete seal.

NOTE: RTV 9910/88 Silicon Compound not compatible with Mastinox D40.

WJE ALL

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT ALL CONTROLS ARE IN THE CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR EQUIPMENT.

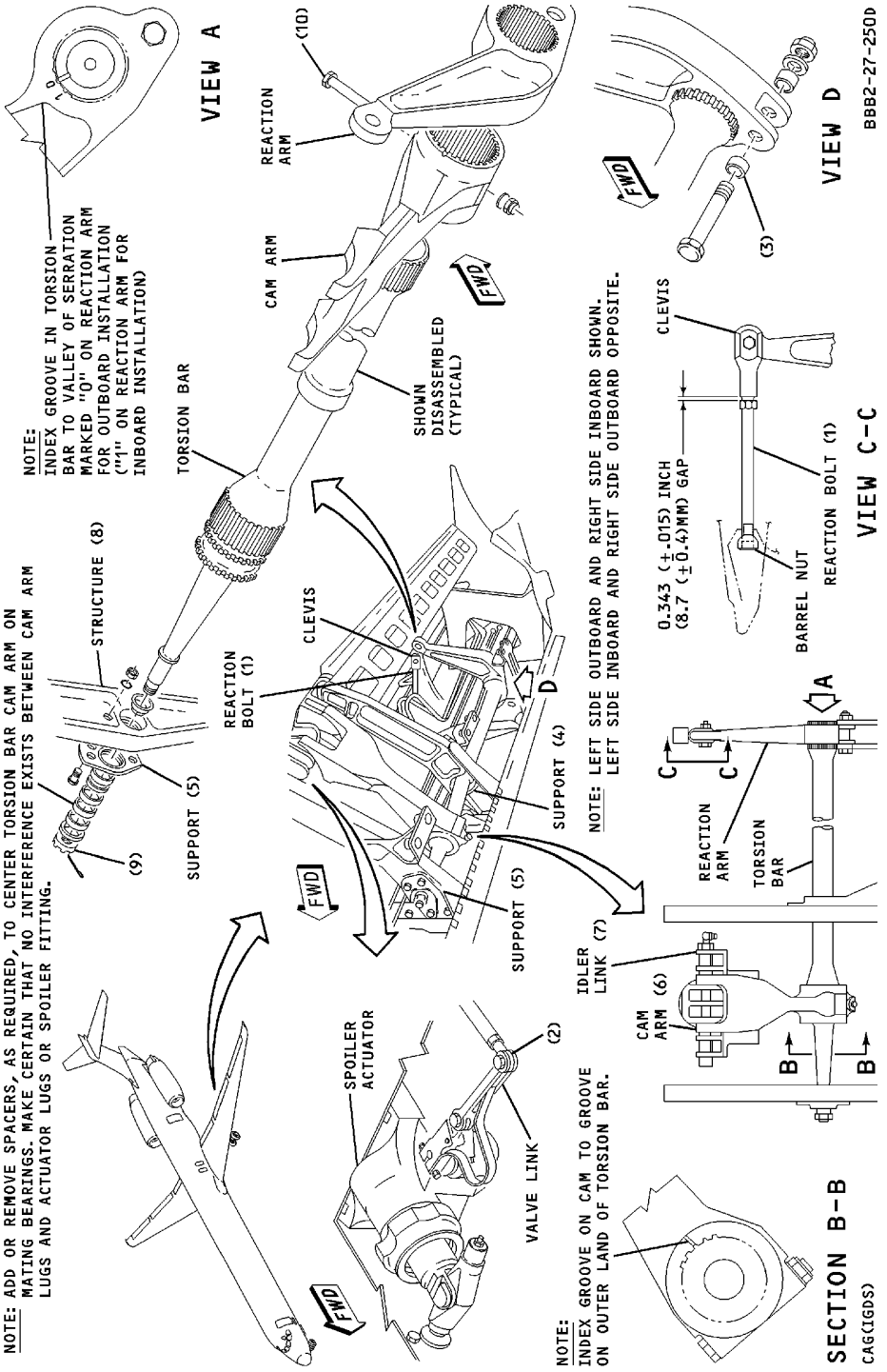
(38) Partially pressurize left or right hydraulic system as applicable, using appropriate hand hydraulic pump located in wheel well.

WARNING: BEFORE APPLYING HYDRAULIC PRESSURE, MAKE CERTAIN AREAS AROUND SPOILERS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

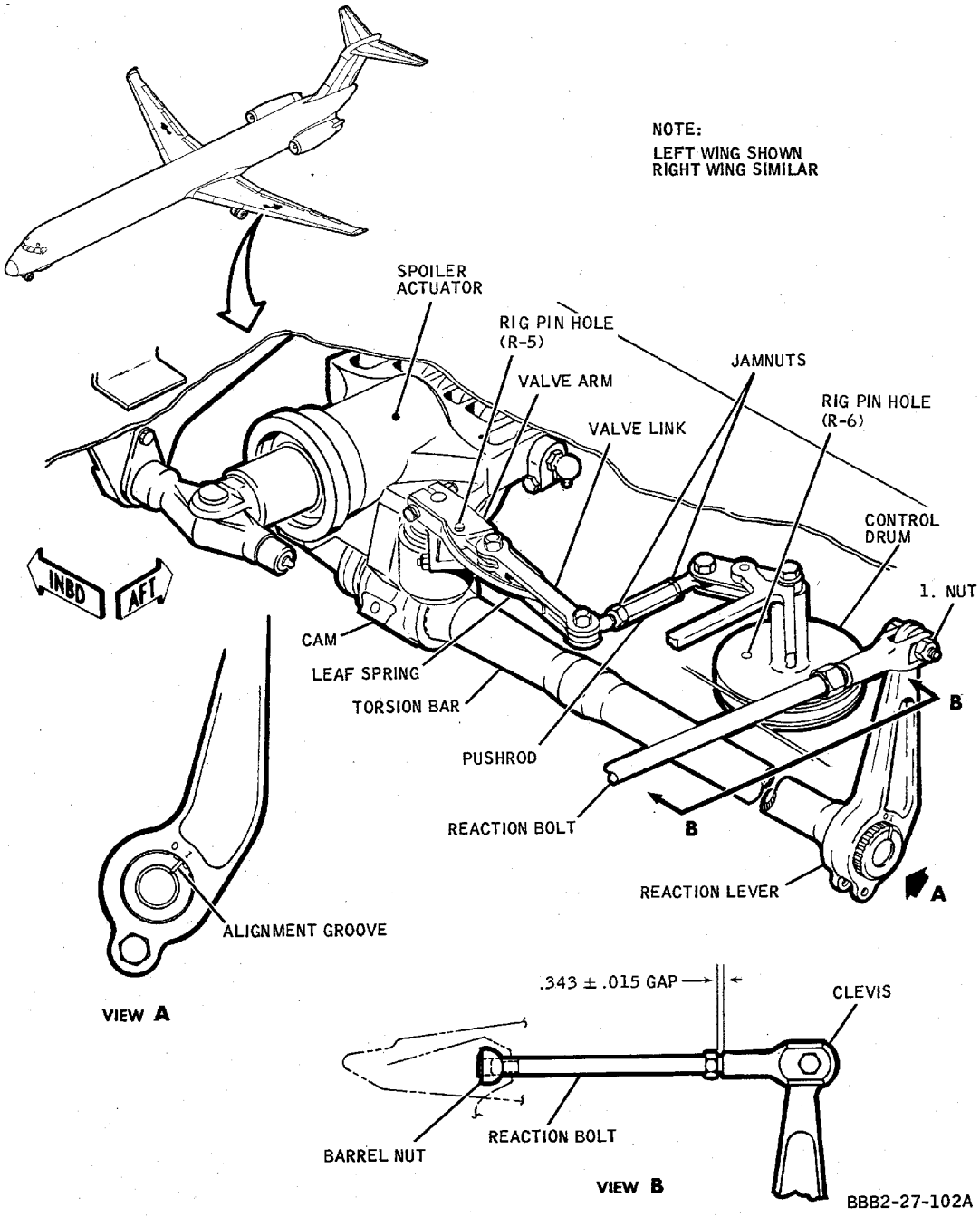
(39) Using spoiler actuator valve link (2) as control lever, extend and retract spoiler several times while observing torsion bar assembly to see that system is functioning properly.

(40) Install bolt connecting pushrod to hydraulic spoiler actuator valve link (2).

(41) Raise bute doors to faired position and install attach screws.



Spoiler Torsion Bar -- Removal/Installation
Figure 201/27-61-06-990-801



Flight Spoiler Actuator -- Removal/Installation
Figure 202/27-61-06-990-802

FLIGHT SPOILER ACTUATOR WITHOUT TORSION BAR - MAINTENANCE PRACTICES

1. General

A. These instructions apply only to aircraft with Service Bulletin 27-337 which installs new modified flight spoiler actuators and deletes the flight spoiler torsion bars.

B. There are four flight spoiler actuators located in the wing rear spar flap well, one forward of each spoiler panel. Removal/Installation and Adjustment/Test procedures are identical for all four flight actuators. Each actuator has a control valve, bench-adjusted by a setscrew which should not be altered.

C. Access to actuator and linkage is through the wing lower trailing edge access doors with flap/slats extended. Perform work in the vicinity of spoiler panels through access doors and spoilers retracted.

D. Hydraulic pressure to the inboard flight actuator on each wing is shut off by the spoiler shutoff and system depressurization valve in the left main gear wheelwell. Hydraulic pressure to the outboard actuator on each wing is shut off by the spoiler shutoff and system depressurization valve in the right main gear wheelwell.

E. The numbers in parenthesis in the following text correspond to callouts in Figure 201.

F. During ground operation of MD-80 aircraft spoilers with non torsion bar spoiler actuator systems (Fuselage Numbers 2187 and Subsequent, with Service Bulletin No. 27-337 incorporated), spoiler chatter (vibration) and/or only partial deployment may occur. This occurs when all spoilers are commanded to extend position and there is not enough hydraulic flow capability for smooth operation. This low flow condition exists when both hydraulic systems are being supplied by only one hydraulic pump through the Power Transfer Unit (PTU); (i.e.; one Engine Driven Hydraulic Pump and PTU operating, or the Electrically Driven Auxiliary Hydraulic Pump and PTU operating). This is a ground operation only condition and does not affect the in-flight spoiler operation.

(1) If spoiler chatter and/or only partial deployment occurs during ground operation, perform a functional test of system. (Paragraph 5.)

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

Name and Number	Manufacturer
Protractor (5916715)	Douglas Aircraft Co.
Rig pin (4-2) 1/4 by 2 5/8 (6.35 x 66.675 mm)	Douglas Aircraft Co.
Rig pin (4-6) 1/4 by 6 5/8 (6.35 x 168.275 mm)	Douglas Aircraft Co.
NOTE: Rig Pin sizes are in inches (diameter x length; length = grip plus 5/8 inch, (15.875 mm).	
Door safety locks (3936851-1, or -501 as applicable) (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co.
Silicone rubber Seal, RTV-88 RTV-9910 catalyst (DMS QPL 1799)	General Electric Co. Waterford, NY

Table 201 (Continued)

Name and Number	Manufacturer
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. **Removal/Installation Flight Spoiler Actuator**

A. Remove Actuator

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZE SEPARATELY.

(4) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Disconnect hydraulic line clamps (1) from bracket (2).

(6) Disconnect hydraulic lines (3) from fittings (4) in actuator ports.

(7) Disconnect control pushrod (5) from control valve link (10).

(8) Remove nut (11) and washer (12) from forward attach pin (13). Do not remove pin at this time.

(9) Loosen clamp bolt (16) and remove clamp (17) from pin (18).

(10) Support actuator (19) and remove aft hinge pin (18) to disconnect actuator body from drive link (20) and idler links (21).

(11) Remove stops (22) from actuator and secure washers and unstaked bearings in drive link and idler links to prevent loss.

(12) Remove forward attach pin (13) to disconnect actuator piston (23) from trunnion (24). Remove actuator, taking care not to damage hydraulic lines.

(13) Remove bracket (2) and, if required, hydraulic fittings (4) from actuator ports. Plug open ports.

B. Install Actuator

(1) Make certain hydraulic systems are depressurized.

(2) Make certain flaps/slats are extended.

(3) Make certain door safety locks are installed on main gear inboard door actuating cylinder piston rod.

(4) If required, install hydraulic fittings (4) in actuator ports, using new O-rings.

(5) Attach bracket (2) to hydraulic fittings.

(6) Extend actuator piston (23) and install forward attach pin (13) to connect piston to trunnion (24), taking care not to damage hydraulic lines.

(7) Position stops (22) drive link (20), idler link (21), and washers (25) in actuator aft hinge and insert aft hinge pin (18). Make certain that cutaway edge of pin is seated properly against flat surface on actuator body.

NOTE: Install washers (25) on both sides of left idler link lug only (left and right wing).

NOTE: Make certain that unstaked bearings are installed in drive link and idler links.

(8) Install clamp (17) on pin (18) and tighten clamp bolt (16).

(9) Install nut (11) and washer (12) on forward hinge pin (13).

(10) Connect control pushrod (5) to control valve link (10).

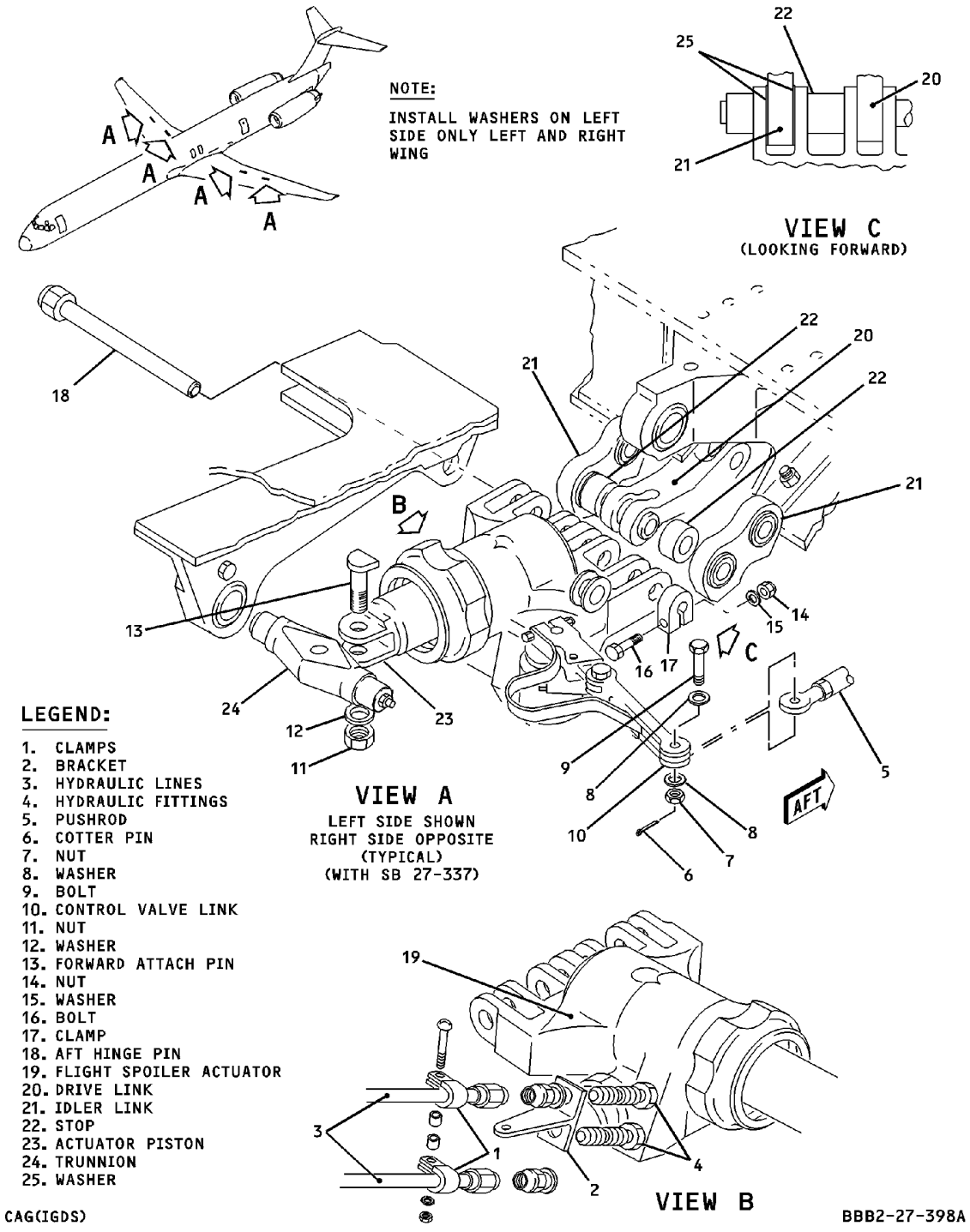
(11) Connect hydraulic lines (3) to fittings (4) in actuator ports.

(12) Clamp hydraulic lines to bracket (2).

(13) Lubricate actuator fittings as applicable. (PAGEBLOCK 12-21-02/301)

(14) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

(15) Adjustment/Test spoiler actuator (Paragraph 4.)



Flight Spoiler Actuator -- Removal/Installation Figure 201
Figure 201/27-61-07-990-801

4. Adjustment/Test Spoiler Actuator

A. Adjust Actuator Linkage (Figure 202)

(1) Make certain that aileron control wheels are in neutral position (index marks on wheel and control column aligned).

(2) Make certain that speedbrake control lever is in retract position (against forward stop with red arm label not visible).

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(3) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR CONTROL LEVER IS IN DOWN POSITION, THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED, AND THAT ALL OTHER CONTROLS ARE IN CORRECT POSITIONS TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR OTHER EQUIPMENT.

(4) Pressurize left or right hydraulic system, as applicable. (PAGEBLOCK 29-00-00/201)

(5) Insert rig pin (4-6) in rig pin hole (R-6) in control drum.

(6) Loosen jamnuts on pushrod (5).

CAUTION: MAKE CERTAIN THAT LEAF SPRING HOLDS VALVE LINK IN FIRM CONTACT WITH STOP ON VALVE ARM WHEN RIG PIN (4-2) AND RIG PIN (4-6) ARE INSTALLED AND AFTER PUSHROD IS ADJUSTED.

(7) Rotate body of pushrod until rig pin (4-2) can be easily inserted in rig pin hole (R-5) in valve arm. Tighten jamnuts on pushrod and safety nuts with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(8) Remove rig pin (4-2) from valve arm.

(9) Remove rig pin (4-6) from control drum.

(10) Test actuator. (Paragraph 4.B.)

B. Test Actuator

(1) Make certain that speedbrake control lever is in retract position (against forward stop with red arm label not visible).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR CONTROL LEVER IS IN DOWN POSITION, THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED, AND THAT ALL OTHER CONTROLS ARE IN CORRECT POSITIONS TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR OTHER EQUIPMENT.

(2) Pressurize left or right hydraulic system, as applicable. (PAGEBLOCK 29-00-00/201)

(3) Place protractor on spoiler panel and wing in line with drive (center) hinge, and note degrees shown by protractor pointer. Remove protractor from wing and panel.

WARNING: BEFORE ROTATING AILERON CONTROL WHEEL, MAKE CERTAIN THAT AREAS AROUND AILERONS AND SPOILER PANELS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(4) Rotate aileron control wheel quickly (or rapidly), but with smooth continuous motion (clockwise to test actuator on right wing, or counterclockwise to test actuator on left wing) until stops contact.

(a) Check that panel movement (spoiler lift-off) does not occur before control wheel is rotated 1/8 inch (3.18 mm) minimum travel from neutral as measured at control column and wheel index marks located on inboard side of left and right control wheels. (Figure 203, View B)

(b) Place protractor on spoiler panel and wing in line with drive hinge and check that panel in extended 60(±4) degrees above position noted in Paragraph 4.B.(3). Remove protractor from wing and panel.

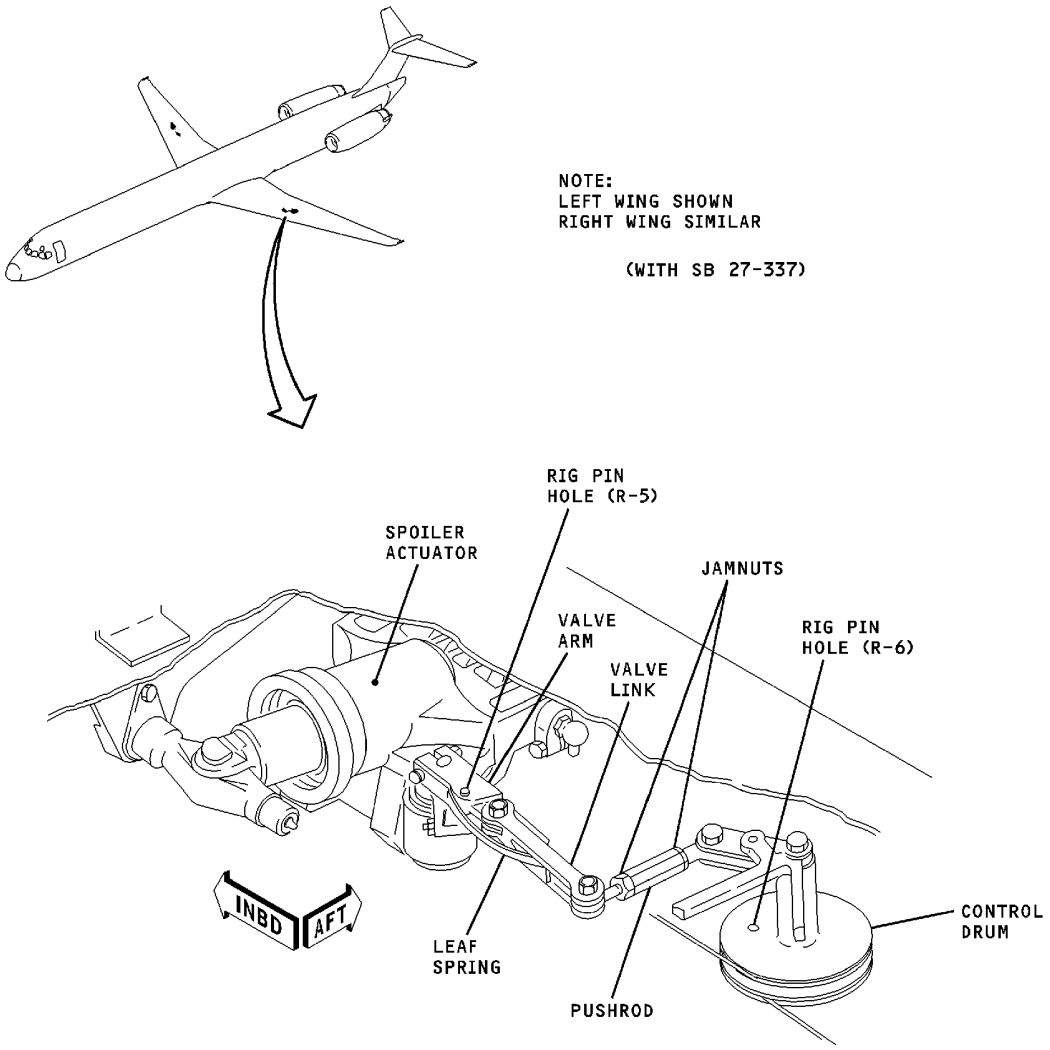
(5) Return aileron control wheel to neutral position, and check that spoiler panel is returned to retracted position.

(6) Check hydraulic lines to spoiler actuator for interference with actuator assembly, spoiler structure or wing structure.

(7) Check actuator hydraulic connections for any evidence of leakage.

(8) Shut off hydraulic pressure source.

(9) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Flight Spoiler Actuator -- Adjustment/Test
Figure 202/27-61-07-990-802

5. Functional Test -- Spoiler Actuator Chatter

A. Test Spoiler System for Chatter

(1) Place aileron control wheels in neutral position (index marks on wheel and control column aligned). (Figure 203)

(2) Place speedbrake control lever in retract position (against forward stop with red arm label not visible).

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(3) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR CONTROL LEVER IS IN DOWN POSITION, THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED, AND THAT ALL OTHER CONTROLS ARE IN CORRECT POSITIONS TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR OTHER EQUIPMENT.

(4) Pressurize left and right hydraulic system with only the Auxiliary Hydraulic Pump and PTU. (PAGEBLOCK 29-00-00/201)

(5) Rotate aileron control wheel quickly (or rapidly), but with smooth continuous motion until stops contact, (clockwise for right wing and counterclockwise for left wing).

(6) Check that flight spoilers on each respective wing deploy fully, without chatter.

(7) If spoilers fully deploy and without chatter, aircraft is acceptable for dispatch.

(8) If spoilers do not fully deploy and chattering is observed, corrective action is required before flight.

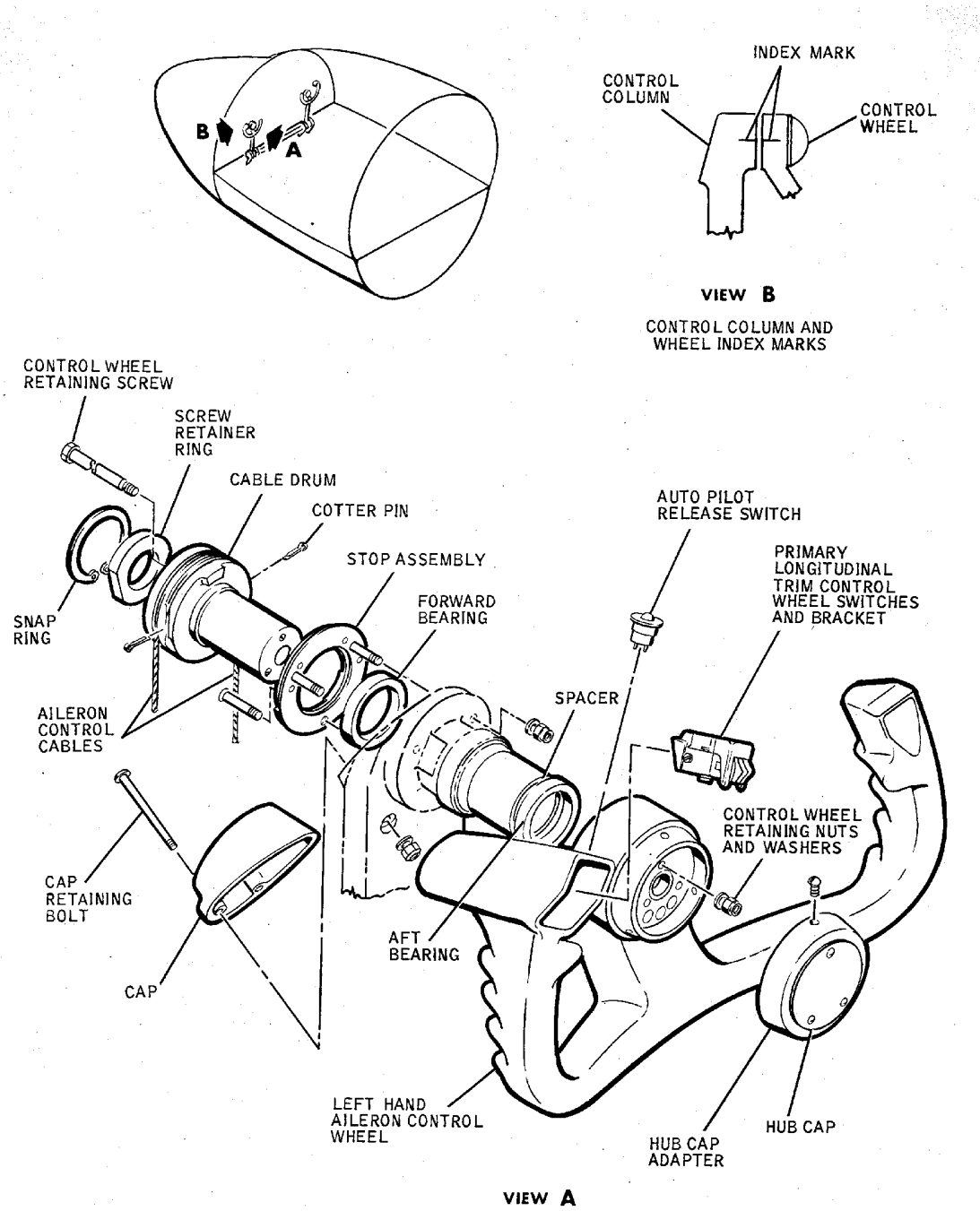
(a) Check left and right hydraulic system fluid supply reservoirs for fluid quantity level. Bleed and fill system reservoirs until all traces of air have been eliminated from system as/if required. (PAGEBLOCK 12-13-01/301)

(b) Check auxiliary hydraulic pump and PTU for proper functioning. (MAIN - TROUBLE SHOOTING, PAGEBLOCK 29-10-00/101)

(9) After corrective action is completed, repeat Paragraph 5.A.(4) through Paragraph 5.A.(7).

(10) Shut off hydraulic pressure source and depressurize left and right hydraulic system.

(11) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Flight Spoiler Actuator -- Adjustment/Test
Figure 203/27-61-07-990-803

FLIGHT SPOILER IDLER LINK ASSEMBLY - REMOVAL/INSTALLATION

1. General

A. There are four flight spoiler idler link assemblies installed on the aircraft. Two each in the left and right wings. They are connected to the flight spoiler actuators.

B. Access to the idler links is through the wing lower trailing edge access doors with flap/slats extended. Perform work in the vicinity of spoiler panels through access doors with the corresponding spoilers extended.

C. Hydraulic pressure to the inboard flight actuator on each wing is shut off by the spoiler shutoff and system depressurization valve in the left main gear wheelwell. Hydraulic pressure to the outboard actuator on each wing is shut off by the spoiler shutoff and system depressurization valve in the right main gear wheelwell.

D. The numbers in parenthesis in the following text correspond to callouts in Figure 401.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 401

Name and Number	Manufacturer
Torque wrench 0 to 300 in/lb (0 to 33.9 N·m)	Commercially available
WJE ALL POST DC9-27-337	
Spoiler lock (with or without torsion bars) 3981309-1 or -501	The Boeing Company
WJE ALL PRE DC9-27-337	
Spoiler lock (with torsion bars) 3916794-1	The Boeing Company
WJE ALL	
DO NOT OPERATE tags	Commercially available
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Flight Spoiler Idler Link Assembly

A. Remove Idler Link Assembly (4) (Figure 401)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

(4) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(5) Attach DO NOT OPERATE tags to TRANS and AUX hydraulic pump switches.

(6) Remove attach screws from bute doors and allow bute doors to hang down.

WARNING: FAILURE TO RELIEVE TORSION BAR PRELOAD COULD CAUSE SERIOUS INJURY TO PERSONNEL OR STRUCTURAL DAMAGE TO AIRCRAFT.

(7) Remove lockwire and rotate reaction bolt (1) to relieve preload before removing clevis bolt.

(8) Remove bolt connecting clevis to reaction arm.

(9) Remove bolt (2) connecting pushrod to hydraulic spoiler actuator valve link.

(10) Remove bolt (3) connecting lower end of reaction arm to structure.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF SYSTEMS OR EQUIPMENT.

(11) Partially pressurize left or right hydraulic system, as applicable, using appropriate hand hydraulic pump located in wheelwell.

WARNING: DO NOT OPERATE FLAPS WITH SPOILER LOCK INSTALLED OR DAMAGE TO FLAPS/SPOILERS MAY OCCUR.

(12) Using actuator valve link as control lever, carefully raise spoiler panel to full extend and install spoiler lock.

(13) Put spoiler bypass valve to OFF position and reinstall safety pin.

(14) Remove center spoiler hinge pin (14).

NOTE: The center spoiler hinge pin (14) is removed to provide clearance for the removal of the idler link (4).

(15) Remove cotter pin (5), nut (6), washer (7), keeper (12), bolt (8) and washers (13) on left and right sides of idler link (4). Retain hardware, except cotter pin, for installation.

(16) Remove grease fitting from clamp end of pin (9). Retain grease fitting.

(17) Loosen clamp bolt and remove clamp from pin (9).

(18) Support actuator and remove pin (9) to disconnect actuator body (10) from drive link (11) and idler link (4). Remove cam rollers from actuator and secure washers (13) and unstaked bearings in drive link and idler links to prevent loss.

(19) Remove idler link assembly (4).

B. Install Idler Link Assembly (4) (Figure 401)

(1) Make certain door safety locks are installed on main gear inboard door actuating cylinder piston rod.

(2) Make certain flaps/slats are extended.

(3) Make certain hydraulic systems are depressurized.

(4) Hold idler link assembly (4) in place.

(5) On right side, insert bolt (8) through idler link (4), install keeper (12), washer (7) and nut (6). Torque nut (6) to 270-300 in/lb (30.5-33.9 N·m) and install cotter pin (5).

(6) On left side, position washers (13), insert bolt (8) through idler link (4) and install keeper (12), washer (7) and nut (6). Torque nut (6) to 270-300 in/lb (30.5-33.9 N·m) and install cotter pin (5).

(7) Install the center spoiler hinge pin (14).

(8) Position cam rollers, cam roller bushings, drive link (11) and idler link (4), and washers (13) in actuator aft hinge and insert pin (9). Make certain that cutaway edge of pin is seated properly against flat surface on actuator body. Make certain that flanges of cam roller bushings are installed on pin away from drive link so that cam rollers are aligned with cam (forks).

NOTE: Install washers (13) on both sides of left idler link lug only (left and right wing).

NOTE: Make certain that unstaked bearings are installed in drive link and idler links.

NOTE: The idler link (4) must be installed with its tie bar oriented toward the flight spoiler actuator. See side view of the idler link. It is critical that the idler link be installed as shown.

(9) Put spoiler bypass valve to ON position and reinstall safety pin.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF SYSTEMS OR EQUIPMENT.

(10) Partially pressurize left or right hydraulic system, as applicable, using appropriate hand hydraulic pump located in wheelwell.

(11) Using actuator valve link as control lever, move spoilers to full extend and remove spoiler lock.

(12) Using actuator valve link as control lever, carefully lower spoiler panel to retract position while holding cam arm on torsion bar upward into position against cam rollers.

(13) Install bolt (3) at lower end of reaction arm.

(14) Make certain that speedbrake control lever is in retract position (against forward stop with red arm label not visible).

(15) Make certain that aileron control wheels are in neutral (index mark of wheel and control column aligned).

(16) Using spoiler actuator valve link as control lever, retract spoilers. Make certain they press firmly against stops.

(17) Rotate reaction bolt (1) to obtain dimension of 0.343 (±0.015) inch (8.73 (±0.38) mm) between head of bolt and clevis.

(18) Manually hold cam face against cam rollers and adjust reaction bolt (1) in structural barrel nut until clevis attach hole aligns with hole in reaction arm within 0.021 inch (0.53 mm). Maintain dimension obtained in Paragraph 3.B.(17).

(19) Install bolt connecting clevis to reaction arm.

(20) Tighten reaction bolt (1) against clevis and safety reaction bolt with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF SYSTEMS OR EQUIPMENT.

(21) Partially pressurize left or right hydraulic system, as applicable, using appropriate hand hydraulic pump located in wheelwell.

WARNING: BEFORE MOVING SPOILER, MAKE CERTAIN AREAS AROUND SPOILERS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

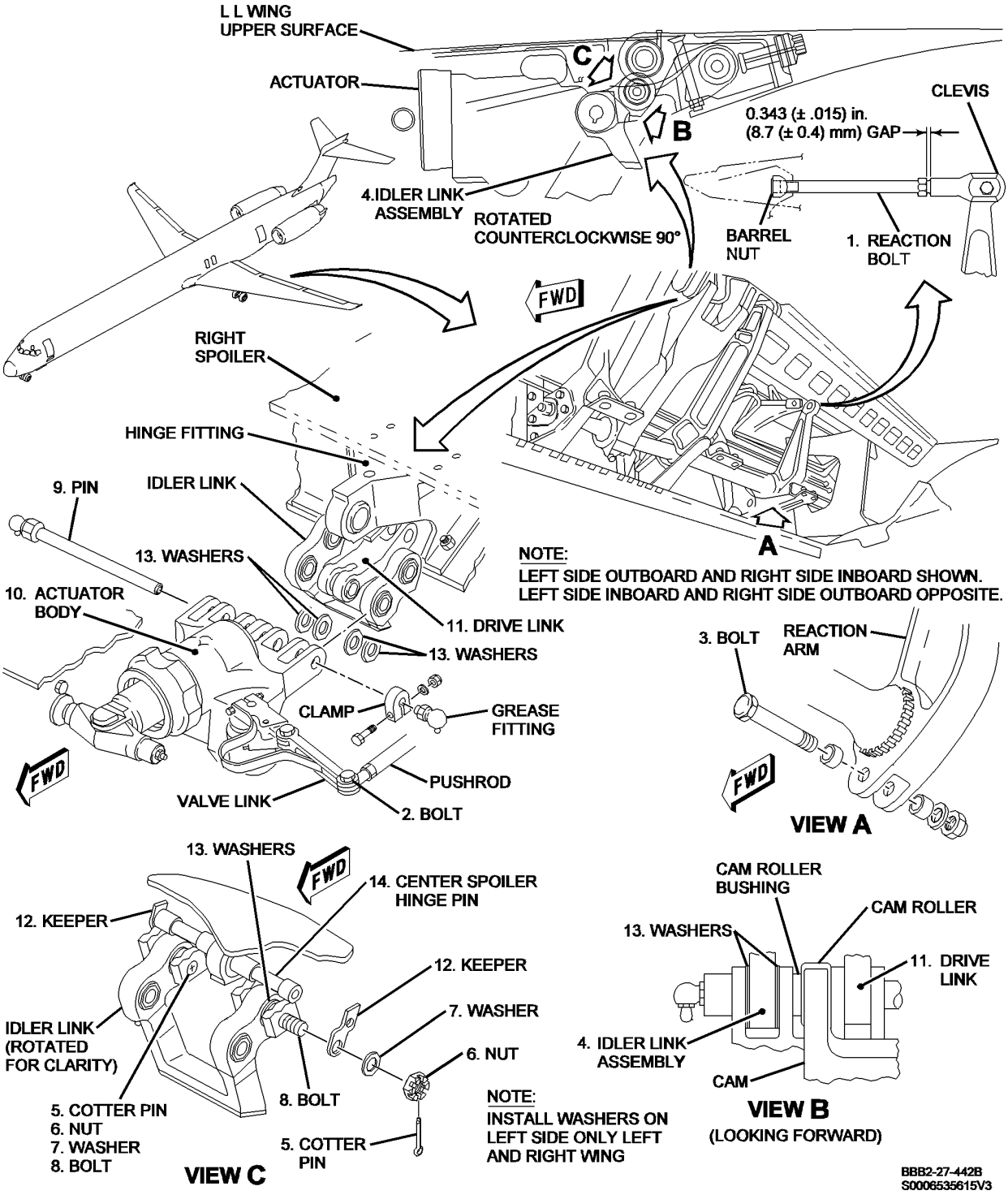
(22) Using spoiler actuator valve link as control lever, extend and retract spoiler several times while observing torsion bar assembly to see that system is functioning properly.

(23) Install bolt (2) connecting pushrod to hydraulic spoiler actuator valve link.

(24) Lubricate flight spoilers. (PAGEBLOCK 12-21-02/301, service chart item No. 2, 4 and 5 of Figure 304)

(25) Raise bute doors to faired position and install attach screws.

(26) Do the adjustment/test of the flight spoiler panel. (FLIGHT SPOILER PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 27-61-01/201, Paragraph 4)



Flight Spoiler Idler Link Assembly - Removal/Installation
Figure 401/27-61-08-990-801

GROUND SPOILER PANEL - MAINTENANCE PRACTICES

1. General

A. A ground spoiler panel is installed on the trailing edge of each wing, inboard of the flight spoiler panels.

B. Removal and installation procedures are identical for left and right ground spoiler panels. Access to panel hinge points is through wing trailing edge lower access doors with flaps/slats extended.

C. The numbers in parentheses in the following text correspond to callouts in Figure 201.

2. Equipment and Materials

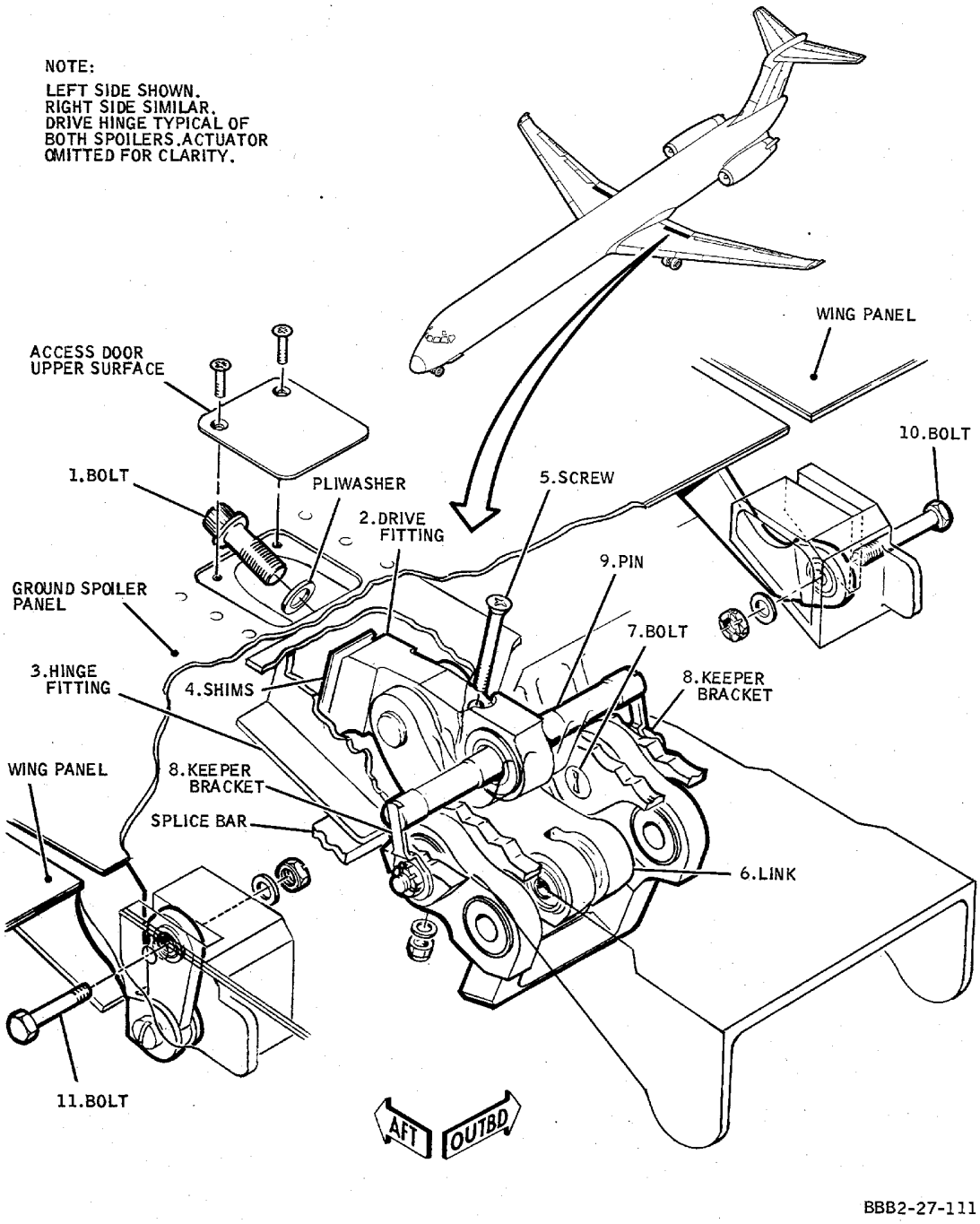
NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

Name and Number	Manufacturer
Torque wrench (0-500 inch pounds) (0. to 56.0 N·m)	
General purpose antiseize (TTA-580)	
Protractor (5916715)	Douglas Aircraft Co.
Door safety locks (3936851-1, or -501 as applicable (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co.
Adapter (4712451)	Douglas Aircraft Co.
Lockwire, NASM20995N32, DPM 684*[1]	Not specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.



Ground Spoiler Panel -- Removal/Installation
Figure 201/27-62-01-990-801

3. **Removal/Installation Ground Spoiler Panel**

A. Remove Panel

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(4) Depressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Remove bolt (1) to disconnect drive fitting (2) from hinge fitting (3). Retain shims (4) from between fittings. Discard washer under head of bolt (1).

(6) Remove screw (5) from hinge fitting (3).

(7) Remove splice bar from lower surface of panel. Lower drive fitting (2) and link (6) through opening in panel lower surface.

(8) Remove nut from bolt (7) and loosen bolt to free hinge keeper bracket (8) from one end of pin (9).

(9) Remove pin (9) from hinge fitting (3) and opposite hinge keeper bracket.

(10) Manually raise spoiler panel to fully extended position.

(11) Remove bolts (10) and (11) to disconnect spoiler hinges from wing fittings. Remove panel.

(12) If removal of crank assembly and link due to wear, refer to paragraph 5. for removal/installation.

B. Install Panel

(1) Make certain hydraulic systems are depressurized.

(2) Make certain flap/slats are extended.

(3) Make certain door safety locks are installed on main gear inboard door actuating cylinder piston rod.

(4) Place panel in position and install bolt (11) in inboard hinge with head of bolt facing inboard.

(5) Install bolt (10) in outboard hinge with head of bolt facing outboard.

(6) Tighten nuts on bolts (10) and (11) to torque of 60-80 inch-pounds (6.72 to 8.96 N·m). Safety nuts with cotter pin.

(7) Install pin (9) through hinge fitting (3) and slat of hinge keeper bracket.

(8) Position hinge keeper bracket (8) on opposite end of pin (9) and secure bracket with bolt (7). Tighten nut to torque of 100 inch-pounds (11.2 N·m). Back off one castellation and safety nut with cotter pin.

(9) Position drive fitting (2) in hinge fitting (3) and install bolt (1). Do not install shims (4) at this time.

(10) Install screw (5) through hinge fitting (3) and slot in drive fitting (2). Apply sufficient torque to screw (5) to provide snug fit between drive fitting (2) and hinge fitting (3).

NOTE: Lubricate bolt on threads and under head with anti-seize compound prior to installation.

(11) Pressurize right and left hydraulic system, as applicable. (PAGEBLOCK 29-00-00/201)

(12) Restrain drive fitting (2) to prevent rotation and apply hydraulic pressure to retract side of actuating cylinder.

(13) Tighten bolt (1) until panel trailing edge does not deviate more than 3/32 inch (2.382 mm) above, or 1/16 inch (1.587 mm) below a straight line (string or straight-edge) extending along panel trailing edge.

(14) Measure and record gap between drive fitting (2) and hinge fitting (3).

(15) Depressurize hydraulic system. (PAGEBLOCK 29-00-00/201)

(16) Remove bolt (1) and add shims (4), as required, between hinge fitting and drive fitting to fill gap as recorded in Paragraph 3.B.(14). Restrain drive fitting (2) to prevent rotation and install and, using adapter (4712451), tighten bolt (1). Use new pli washer under head of bolt (1). Safety bolthead with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(17) Check that panel trailing edge is within limits established in Paragraph 3.B.(13). If these limits are not met, repeat Paragraph 3.B.(11) through Paragraph 3.B.(15).

(18) Torque nut on screw (5) to torque of 140-180 inch-pounds, (15.68 to 20.16 N·m).

(19) Install splice bar on lower surface of panel.

(20) Lubricate hinge fittings and links. (PAGEBLOCK 12-21-02/301)

(21) Place speedbrake control lever in retract position (against forward stop with red arm label not visible).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(22) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE EXTENDING SPOILER PANELS, MAKE CERTAIN AREAS AROUND LEFT AND RIGHT SPOILER PANELS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(23) Place speedbrake control lever in extend position by pulling lever up, aft, and up again. Check that ground spoiler panel on each wing extends.

NOTE: Activation of the ground spoilers with the speed-brake control lever and the left hand hydraulic system pressurized will also extend the inboard flight spoiler panels.

(24) Return speedbrake control lever to retract position. Check that all spoiler panels retract fully.

(25) Extend and retract spoiler panels several times. Check actuating cylinder and control valve hydraulic line fittings for leakage.

(26) Return speedbrake control lever to retract position (against forward stop with red arm label not visible).

(27) Return flap/slat handle to UP/RET position.

(28) Shut off hydraulic pressure source.

(29) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

(30) Check clearances of ground spoiler panel.

(31) Test spoiler deployed sensors. (PAGEBLOCK 27-61-05/201)

4. Check Ground Spoiler Panel

A. Check Panel Clearances (Figure 202)

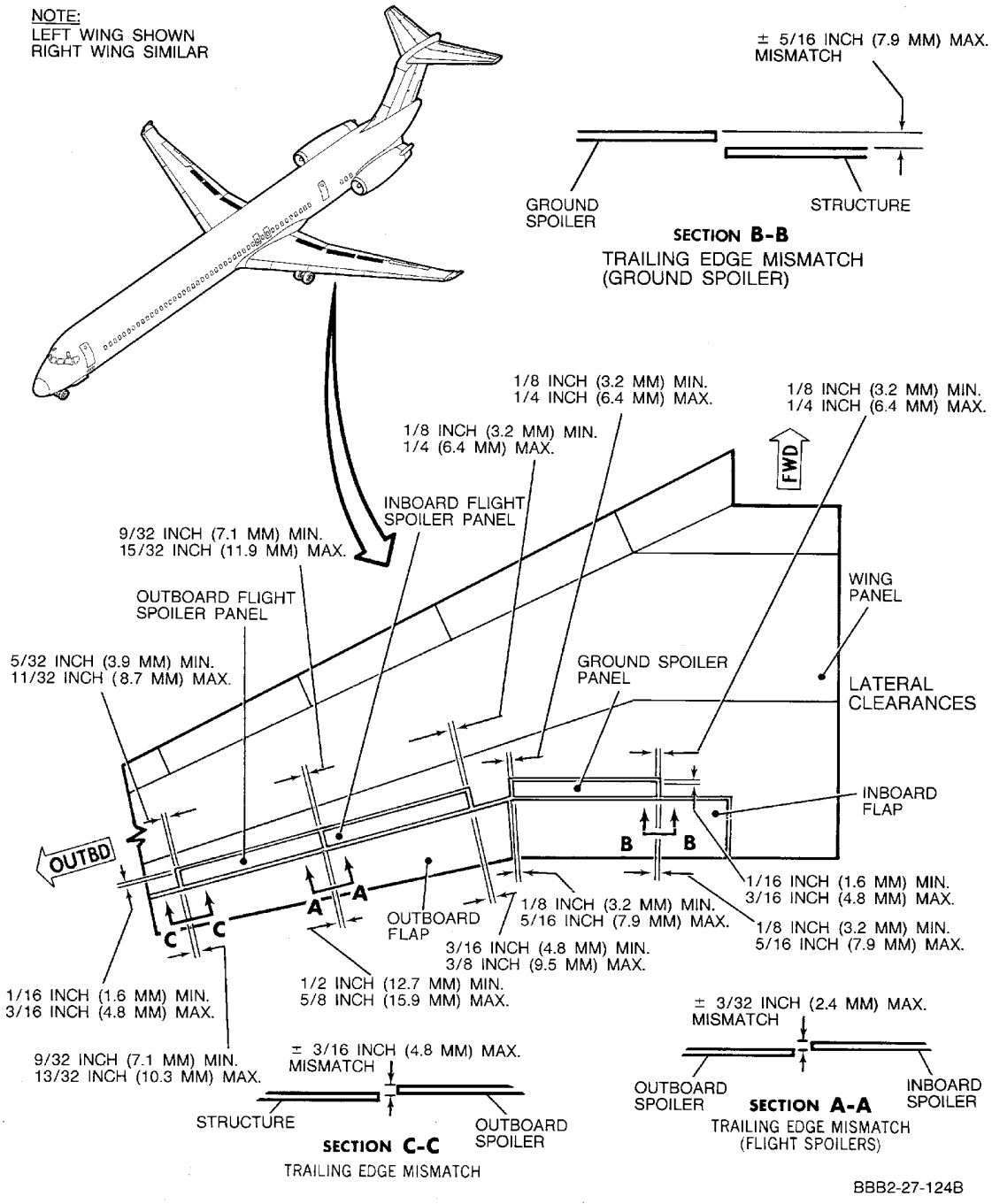
(1) Check that clearance between ground spoiler panel and adjacent outboard wing panel at trailing edge is 1/8 inch, (3.175 mm) minimum to 5/16 inch (7.937 mm) maximum, and clearance at leading edge is 1/8 inch (3.175 mm) minimum to 1/4 inch (6.35 mm) maximum.

(2) Check that clearance between ground spoiler panel inboard leading edge and adjacent wing panel is 1/8 inch (3.175 mm) minimum to 1/4 inch (6.35 mm) maximum and trailing edge is 1/8 inch (3.175 mm) minimum to 5/16 inch (7.937 mm) maximum.

(3) Check that mismatch between ground spoiler panel and wing trailing edge is 5/16 inch (7.937 mm) maximum.

(4) Check clearance between ground spoiler panel and flap vane. (PAGEBLOCK 27-51-01/601)

(5) Check that clearance between leading edge of all ground spoiler panels and trailing edge of wing surface is 1/16 inch (1.587 mm) to 3/16 inch (6.35 mm) maximum.



Ground Spoiler Panel Clearances
Figure 202/27-62-01-990-802

5. Removal/Installation Ground Spoiler Crank Assembly

NOTE: This removal/installation of the ground spoiler crank assembly is written to check the wear of the crank assembly and link. This will prevent ground spoiler over extending during flight and causing an undesired roll.

A. Remove Crank Assembly and Link (Figure 203) as follows:

(1) Remove ground spoiler panel per Paragraph 3.A..

(2) Remove A and B nuts, cotter pins, and washers from A and B bolts on crank.

(3) Remove A and B bolts from A and B keepers and crank.

(4) Remove C nut, cotter pin, bolt and washers and crank and link.

(5) Remove screw, washer and pin from link and fitting assembly.

(6) Check A, B, and C bolts and link for wear. Replace these items with new link and bolts if worn.

(7) Check bushings and bearings for wear on link and crank. Replace crank and link if necessary.

B. Install Crank Assembly and Link (Figure 203) as follows:

(1) Install link with pin, washer, and screw on fitting assembly.

(2) Install crank with C bolt, nut, and washer on link.

(3) Install A and B bolts on crank and through A and B keepers.

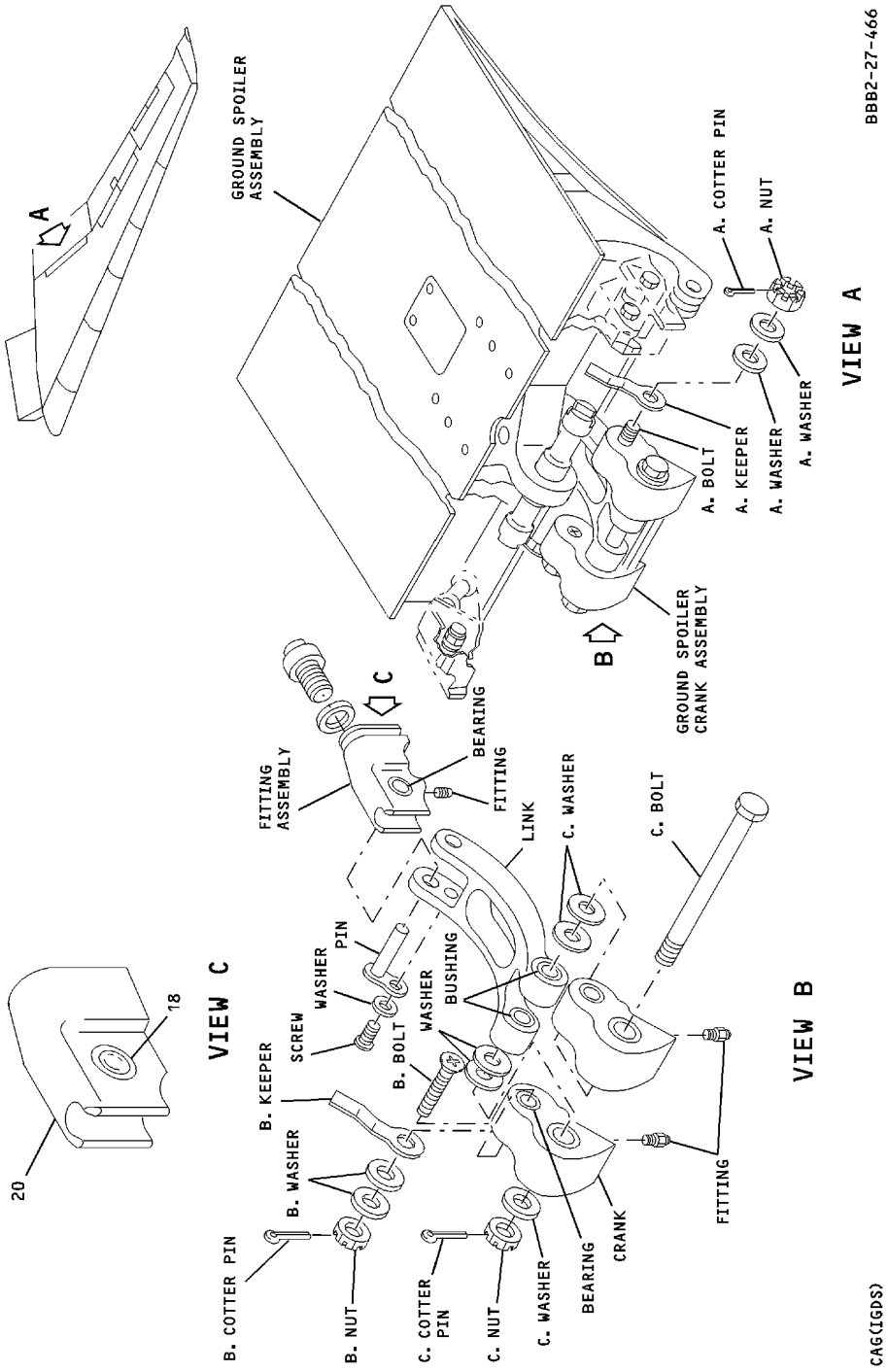
(4) Attach A and B washers and nuts to A and B bolts.

(5) Torque C bolt finger tight only and install C cotter pin.

(6) Torque A and B bolts to 100 inch-pounds (11.25 N·m) and back off one castellation and install A and B cotter pins.

(7) Install ground spoiler panel per Paragraph 3.B..

(8) Check ground spoiler panel per Paragraph 4..



Ground Spoiler Crank and Link - Removal/Installation
Figure 203/27-62-01-990-804

GROUND SPOILER ACTUATING CYLINDER - MAINTENANCE PRACTICES

1. General

A. There are two ground spoiler actuating cylinders, one in each wing flap well forward of the ground spoiler panel center hinge. Access is through the wing lower trailing edge access doors with the flap/slats extended.

B. Removal and installation procedures are identical for the left and right ground spoiler actuating cylinders.

C. The numbers in parentheses in the following test correspond to callouts in Figure 201.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 201

Name and Number	Manufacturer
Door safety locks (3936851-1, or -501 as applicable. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co.
Lockwire, NASM20995N51, DPM684*[1]	Not specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Ground Spoiler Actuating Cylinder

A. Remove Actuating Cylinder

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(4) Depressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Disconnect hydraulic lines (2) from fittings in cylinder ports. Cap or plug open lines and fittings.

(6) Manually raise panel trailing edge until aft attach bolt (3) is aligned with access hole in structure.

(7) Remove aft attach bolt to disconnect piston rod (4) from actuating crank (5).

(8) Remove forward attach bolt (6) and lower cylinder carefully until clear of hydraulic lines.

(9) If required, remove fittings from cylinder ports, discard O-rings (1), and plug ports.

B. Install Actuating Cylinder

(1) Make certain hydraulic systems are depressurized.

(2) Make certain flap/slats are extended.

(3) Make certain speedbrake control lever is in retract position (against forward stop with red arm label not visible).

(4) If required, install hydraulic fittings (7) in cylinder ports, using new O-rings (1).

(5) Position cylinder, and install forward attach bolt (6). Install washer under nut and torque to 30 inch-pounds, (3.36 N·m), then back off to first cotter pin position and safety nut with cotter pin. Safety bolthead with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(6) Raise panel trailing edge manually to align piston rod (4) and actuating crank (5) attach holes with access hole in structure. Install aft attach bolt (3), tighten nut fingertight and safety with cotter pin.

NOTE: To provide clearance from the anti-rotation lug, install bolt (3) with bolt head outboard for left side installation and bolt head inboard for right side installation.

(7) Connect hydraulic lines (2) to fitting in cylinder ports.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(8) Pressurize left hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE EXTENDING SPOILER PANELS, MAKE CERTAIN AREAS AROUND LEFT AND RIGHT SPOILER PANELS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(9) Move speedbrake control lever to extend position by pulling lever up, aft, and up again. Check that ground spoiler panel extends on each wing.

NOTE: Actuation of the ground spoilers with the speedbrake control lever and the left hand hydraulic system pressurized, will also extend the inboard flight spoiler panels on each wing.

(10) Move control lever to retract position. Check that all spoiler panels retract.

(11) Extend and retract ground spoiler panels several times. Check actuating cylinder for leakage.

(12) Return speedbrake control lever to retract position (against forward stop with red arm label not visible). Check that all spoiler panels retract fully.

(13) Depressurize left hydraulic system.

(14) Pressurize right hydraulic system.

(15) Move speedbrake control lever to extend position by pulling lever up, aft, and up again. Check that ground spoiler panels extend on each wing.

NOTE: Activation of the ground spoilers with the speed-brake control lever and the right hand hydraulic system pressurized, will also extend the outboard flight spoilers.

(16) Return speedbrake control lever to retract position. Check that all spoilers retract fully.

(17) Extend and retract spoiler panels several times. Check for leakage at actuating cylinder.

(18) Return speedbrake control lever to retract position (against forward stop with red arm label not visible).

(19) Pressurize left hydraulic system.

(20) Move speedbrake control lever to extend position by pulling lever up, aft, and up again. Check that ground spoilers extend on each wing.

NOTE: Activation of the ground spoilers with speedbrake control lever, with the left and right hydraulic systems pressurized, will extend the ground and flight spoilers on each wing.

(21) Return speedbrake control lever to retract position. Check that all spoilers retract fully.

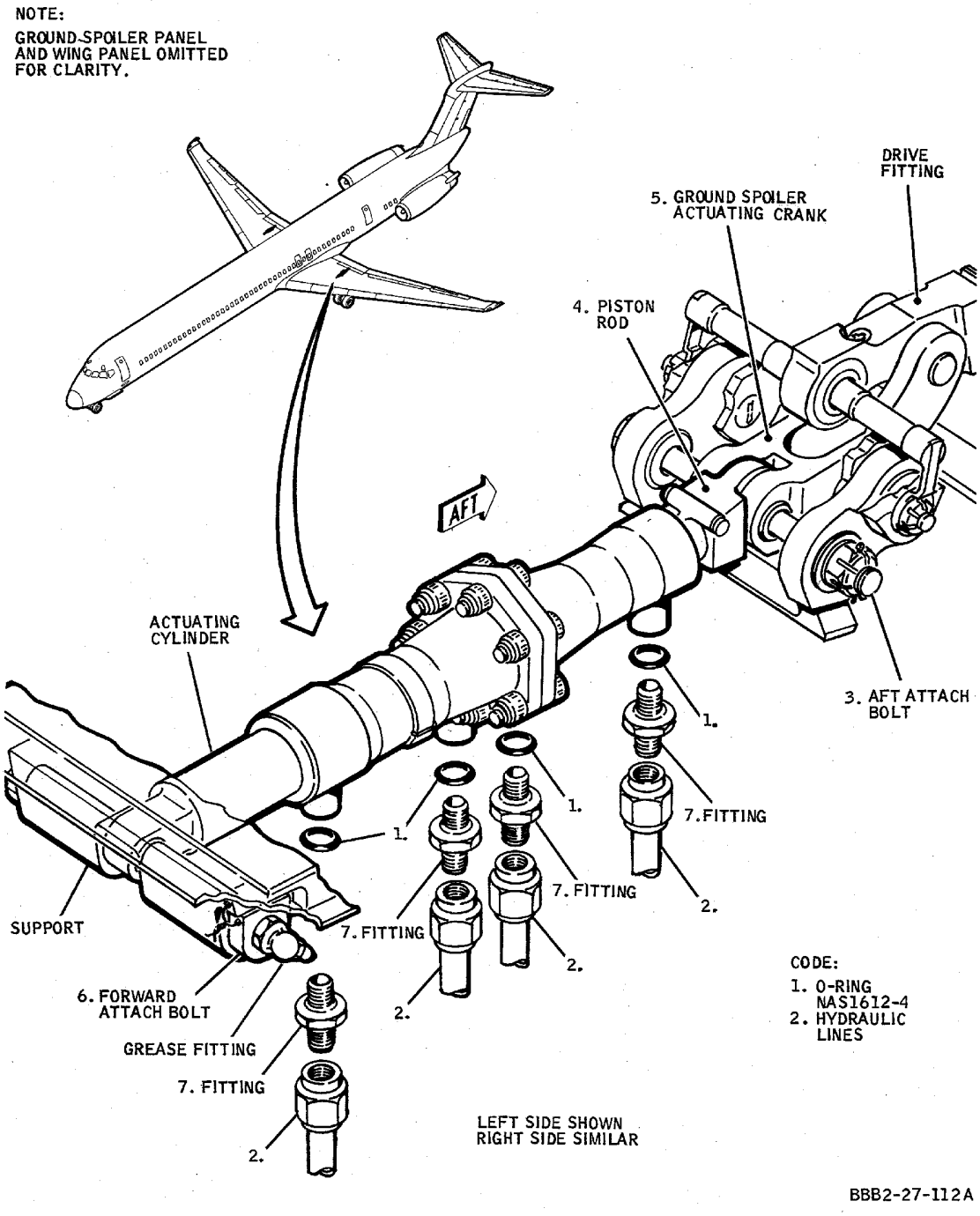
(22) Extend and retract spoiler panels several times. Check actuating cylinder and control valve hydraulic line fittings for leakage.

(23) Return flap/slat handle to UP/RET position.

(24) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

(25) Shut off hydraulic pressure source.

NOTE: If necessary, adjust ground spoiler control valve. (SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 or SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 Config 2)



Ground Spoiler Actuating Cylinder -- Removal/Installation
Figure 201/27-62-02-990-801

SPOILER SWITCH - MAINTENANCE PRACTICES

1. General

A. The spoiler switch is located inside the control pedestal on the forward frame.

B. The switch is accessible through the left and right side covers of the control pedestal. The electrical wire clamp bracket is accessible through the right side of the pedestal. (Figure 201)

2. Removal/Installation Spoiler Switch

A. Remove Switch

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(2) Remove crank from switch shaft.

(3) Remove switch from bracket.

(4) Remove wire clamp from clamp bracket on pedestal frame.

(5) Slide neoprene boot from switch to expose terminals.

(6) Disconnect electrical wires from terminals, and tag wires to provide identification for installation.

(7) Remove neoprene boot from wires.

B. Install Switch

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

CAUTION: SLIDE NEOPRENE BOOT CAREFULLY OVER SWITCH TERMINALS TO PREVENT DAMAGE TO TERMINALS.

(2) Thread electrical wires through neoprene boot, and connect wires to switch terminals. Make certain all wires are connected properly. (Ref. Wiring Diagram Manual)

(3) Align slots in neoprene boot with switch terminals, and install boot on switch.

(4) Install switch on bracket.

(5) Install crank on switch shaft with centerline on crank bearing aligned with indicator on switch shaft. Safety nut with cotter pin.

(6) Install wire clamp on bracket on pedestal frame.

(7) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

WJE 401-412, 414, 875-881, 883, 884

(8) Squeeze and lift speedbrake lever to armed retract position. Spoiler automatic actuator should be retracted.

WJE 873, 874, 886, 887, 892, 893

(9) Place nosegear oleo switch in flight position. Simultaneously simulate both main gear in up position by placing a steel object over uplock proximity switch for approximately 2-10 seconds. Auto spoiler actuator should retract.

WJE 401-412, 414, 875-881, 883, 884

(10) With throttle lever at idle position (against aft stop) and speedbrake control lever in armed retract position, adjust pushrod, if required, until rig hole on crank aligns with rig mark on bracket. (Figure 201)

WJE 873, 874, 886, 887, 892, 893

(11) Place throttle lever at idle position (against aft stop).

(12) Place speedbrake control lever in armed retract position.

(13) Check that rig on crank aligns with rig mark on bracket, if required, adjust pushrod.

WJE 401-412, 414, 875-881, 883, 884

WARNING: SPOILER SWITCH MAY BE DAMAGED IF STOPS ARE ALLOWED TO CONTACT BY OPERATION OF SPEEDBRAKE LEVER.

(14) Move speedbrake lever slowly through its full travel (from forward stop to aft stop on cam). Check that spoiler switch does not contact its stops at either extreme of travel.

WJE 873, 874, 886, 887, 892, 893

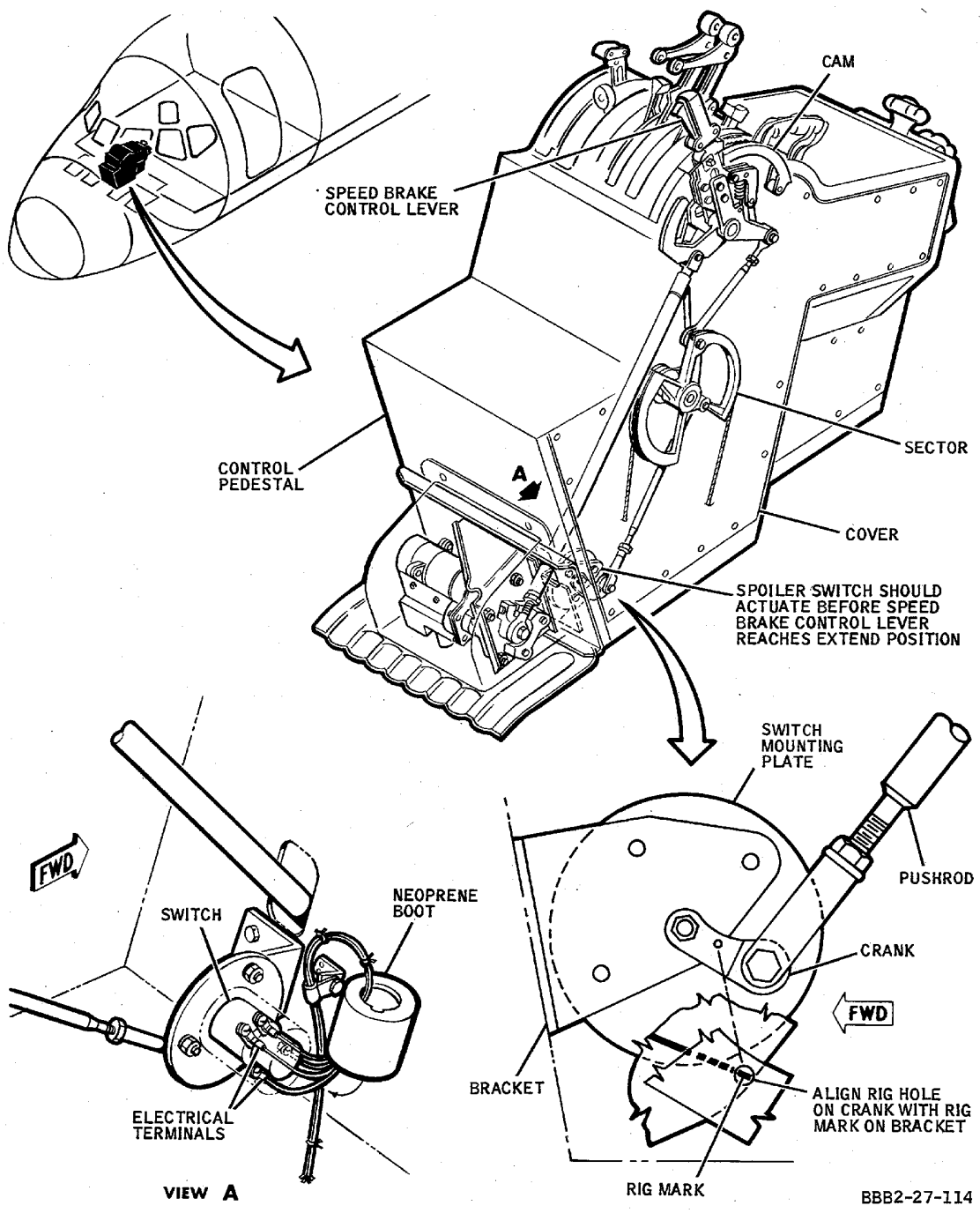
WARNING: SPOILER SWITCH MAY BE DAMAGED IF STOPS ARE ALLOWED TO CONTACT BY OPERATION OF SPEEDBRAKE LEVER.

(15) Set speedbrake control lever in armed position by raising lever vertically until red arm label is visible; move lever slowly through its full travel (from forward stop to aft stop on cam). Check that spoiler switch does not contact its stops at either extreme of travel.

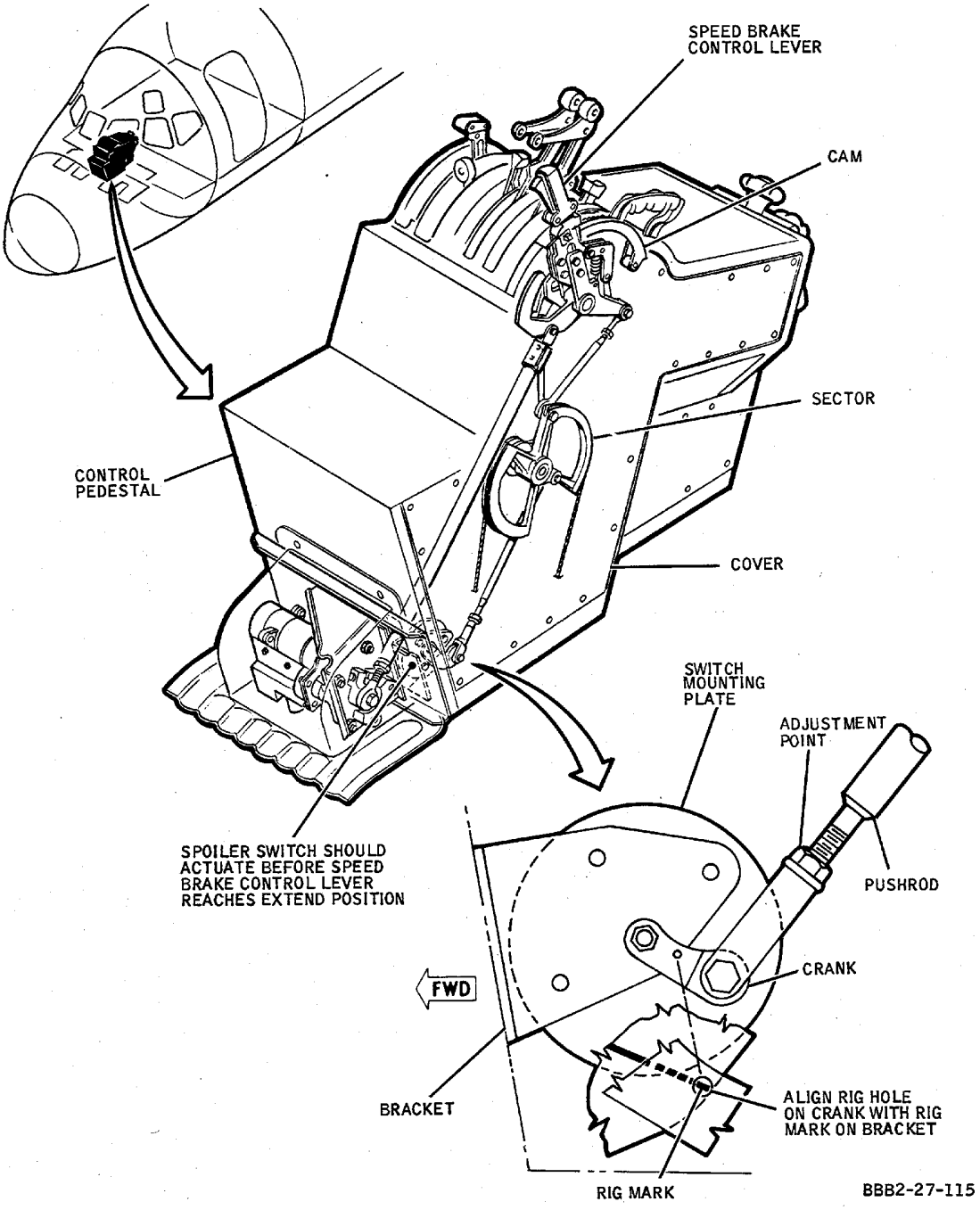
WJE 401-412, 414, 873-881, 883, 884, 886, 887, 892, 893

(16) Knock down speedbrake lever to unarmed position. Spoiler actuator should extend.

(17) Test spoiler switch. (Paragraph 3.)



Spoiler Switch -- Removal/Installation
Figure 201/27-62-03-990-801 (Sheet 1 of 2)



Spoiler Switch -- Removal/Installation
Figure 201/27-62-03-990-801 (Sheet 2 of 2)

3. **Adjustment/Test Spoiler Switch**

A. Test Operation of Switch

NOTE: Main landing gear must be down and locked, and nosegear strut compressed to perform the following test.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT ALL CONTROLS ARE IN THE CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR EQUIPMENT.

(1) Pressurize both hydraulic systems. (PAGEBLOCK 29-00-00/201)

(2) Make certain left throttle lever is in idle position (against aft stop).

(3) Place both nosegear oleo switches in flight position.

(4) Place both nosegear oleo switches in flight position. Simultaneously simulate both main gear in up position by placing a steel object over uplock proximity switch for 2-10 seconds.

WJE 401-412, 414, 875-881, 883, 884

(5) Simulate left and right gear in up position by simultaneously placing a metal object over the left and right gear up proximity switches for approximately 2 seconds.

NOTE: If proximity switches are not actuated simultaneously, the autospoiler DO NOT USE light (on aircraft with EOAP, AUTO SPOILER FAIL legend on overhead annunciator panel) will come on. To turn the light off and reset the monitor in autospoiler switching unit, open the two spoiler control CB's, 28 VDC (P33) and 115 VAC (X30), and then close them.

WJE 401-412, 414, 873-881, 883, 884, 886, 887, 892, 893

(6) Place speedbrake control lever in armed position by raising lever vertically until red arm label is visible. Lever should remain in this position.

WJE 401-412, 414, 875-881, 883, 884

(7) Squeeze and lift speedbrake lever to armed retract position. Spoiler automatic actuator should be retracted.

WJE 401-412, 414, 873-881, 883, 884, 886, 887, 892, 893

WARNING: BEFORE EXTENDING SPOILER PANELS, MAKE CERTAIN THAT AREAS AROUND LEFT AND RIGHT SPOILER PANELS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(8) Place both nosegear oleo switches in ground position. Speedbrake control lever should move aft against stop. Spoiler panels should fully extend.

(9) Move left throttle lever forward from idle position stop. Speedbrake control lever should drop down and move to retract position before throttle lever reaches 2 3/4 inches, (69.85 mm) (as measured along curved top of pedestal coverplate from idle stop to aft edge of throttle lever).

(10) Operate alternate longitudinal trim control levers to move horizontal stabilizer within takeoff range (longitudinal trim indicator pointer within range of green illuminated band on indicator scale).

WJE 401-412, 414, 875-881, 883, 884

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(11) Set flap dial on TAKEOFF CONDTN calculator to 24 degrees, place flap/slat handle in 28/EXT detent.

WJE 873, 874, 886, 887, 892, 893

(12) Position both throttle levers 2 1/8 inches (53.975 mm) forward of aft (idle) stop, measured along curved top of pedestal coverplate.

WJE 401-412, 414, 875-881, 883, 884

(13) With left throttle at idle position right throttle lever 2 1/8 inches (53.98 mm) forward of aft (idle) stop, measured along curved top of pedestal coverplate. Takeoff warning horn should sound.

WJE 401-412, 414, 873-881, 883, 884, 886, 887, 892, 893

(14) Move speedbrake control lever 5/16 (±1/8) inch (7.937(±3.175) mm) aft of retract position, measured along top of pedestal coverplate. Takeoff warning horn should sound, and spoiler panels should extend partially.

WJE 401-412, 414, 875-881, 883, 884

(15) Push right throttle full forward, warning horn should continue to sound.

WJE 401-412, 414, 873-881, 883, 884, 886, 887, 892, 893

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(16) Open this circuit breaker and install safety tag:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-412, 414, 875-881, 883, 884

(17) Warning horn should sound.

WJE 401-412, 414, 873-881, 883, 884, 886, 887, 892, 893

(18) Remove the safety tag and close this circuit breaker:

UPPER EPC, L AC BUS

Row	Col	Number	Name
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-412, 414, 875-881, 883, 884

(19) Warning horn should sound.

WJE 401-412, 414, 873-881, 883, 884, 886, 887, 892, 893

(20) Return speedbrake control lever to retract position. Warning horn should silence, and spoiler panels should return to faired position.

(21) Return both throttle levers to idle position.

WJE 401-412, 414, 875-881, 883, 884

(22) Place flap/slat handle in UP/RET detent.

WJE 401-412, 414, 873-881, 883, 884, 886, 887, 892, 893

(23) Shut off hydraulic pressure source.

SPOILER SWITCH - MAINTENANCE PRACTICES

1. General

A. The spoiler switch is located inside the control pedestal on the forward frame.

B. The switch is accessible through the left and right side covers of the control pedestal. The electrical wire clamp bracket is accessible through the right side of the pedestal. (Figure 201)

2. Removal/Installation Spoiler Switch

A. Remove Switch

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(2) Remove crank from switch shaft.

(3) Remove switch from bracket.

(4) Remove wire clamp from clamp bracket on pedestal frame.

(5) Slide neoprene boot from switch to expose terminals.

(6) Disconnect electrical wires from terminals, and tag wires to provide identification for installation.

(7) Remove neoprene boot from wires.

B. Install Switch

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

CAUTION: SLIDE NEOPRENE BOOT CAREFULLY OVER SWITCH TERMINALS TO PREVENT DAMAGE TO TERMINALS.

(2) Thread electrical wires through neoprene boot, and connect wires to switch terminals. Make certain all wires are connected properly. (Ref. Wiring Diagram Manual)

(3) Align slots in neoprene boot with switch terminals, and install boot on switch.

(4) Install switch on bracket.

(5) Install crank on switch shaft with centerline on crank bearing aligned with indicator on switch shaft. Safety nut with cotter pin.

(6) Install wire clamp on bracket on pedestal frame.

(7) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(8) Squeeze and lift speedbrake lever to armed retract position. Spoiler automatic actuator should be retracted.

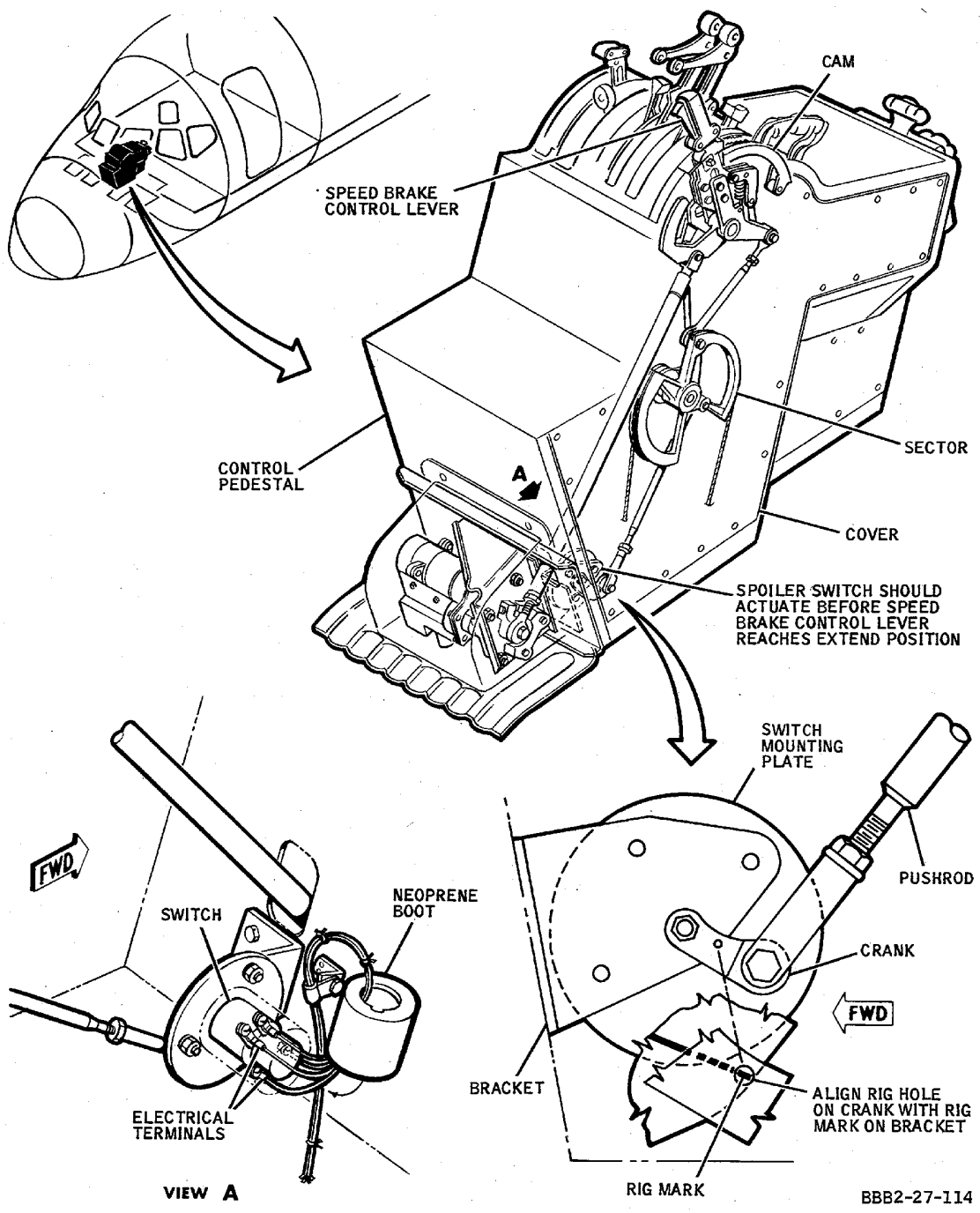
(9) With throttle lever at idle position (against aft stop) and speedbrake control lever in armed retract position, adjust pushrod, if required, until rig hole on crank aligns with rig mark on bracket. (Figure 201)

WARNING: SPOILER SWITCH MAY BE DAMAGED IF STOPS ARE ALLOWED TO CONTACT BY OPERATION OF SPEEDBRAKE LEVER.

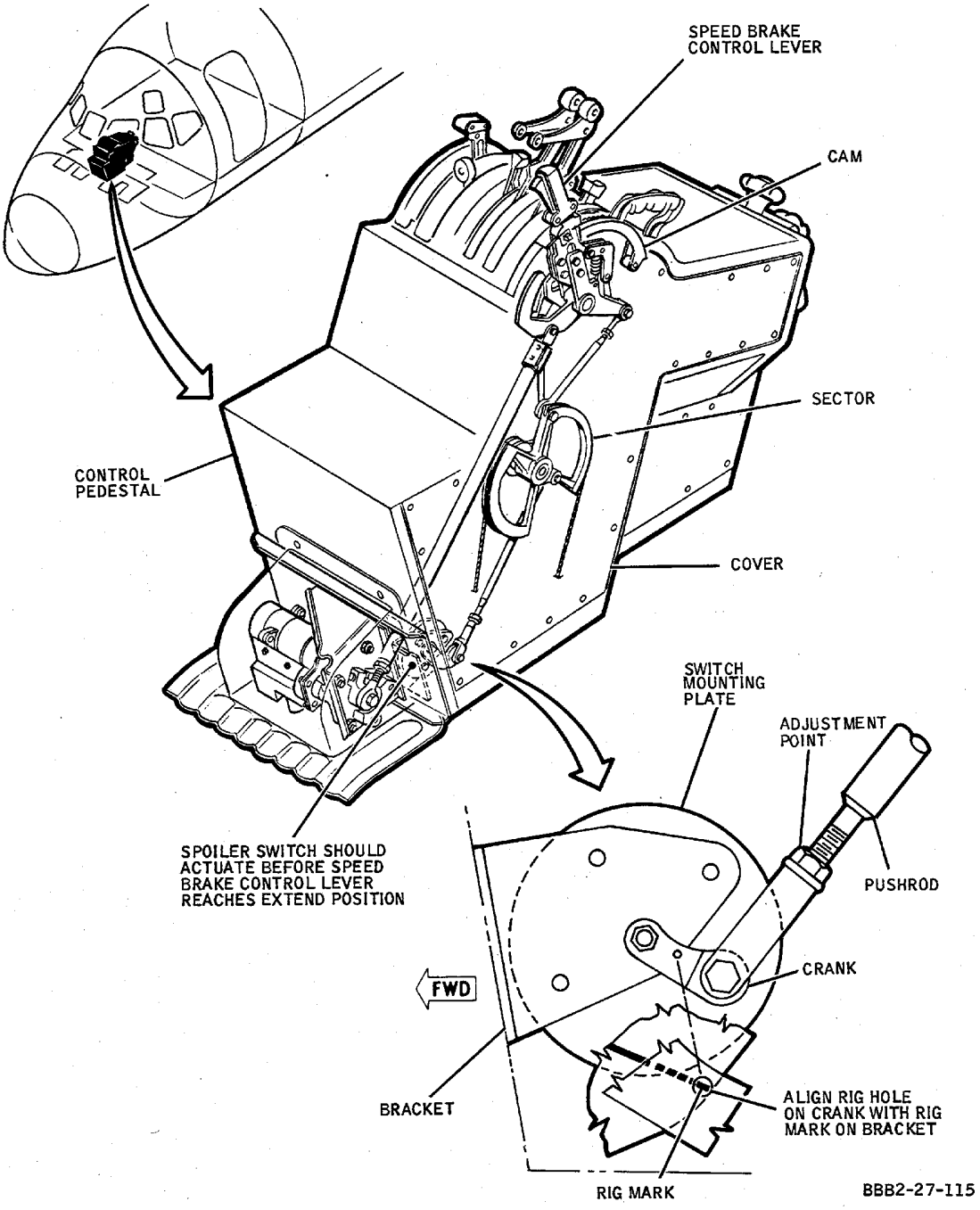
(10) Move speedbrake lever slowly through its full travel (from forward stop to aft stop on cam). Check that spoiler switch does not contact its stops at either extreme of travel.

(11) Knock down speedbrake lever to unarmed position. Spoiler actuator should extend.

(12) Test spoiler switch. (Paragraph 3.)



Spoiler Switch -- Removal/Installation
Figure 201/27-62-03-990-802 (Sheet 1 of 2)



Spoiler Switch -- Removal/Installation
Figure 201/27-62-03-990-802 (Sheet 2 of 2)

3. **Adjustment/Test Spoiler Switch**

A. Test Operation of Switch

NOTE: Main landing gear must be down and locked, and nosegear strut compressed to perform the following test.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT ALL CONTROLS ARE IN THE CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR EQUIPMENT.

(1) Pressurize both hydraulic systems. (PAGEBLOCK 29-00-00/201)

(2) Make certain left throttle lever is in idle position (against aft stop).

(3) Place both nosegear oleo switches in flight position.

(4) Place both nosegear oleo switches in flight position. Simultaneously simulate both main gear in up position by placing a steel object over uplock proximity switch for 2-10 seconds.

(5) Simulate left and right gear in up position by simultaneously placing a metal object over the left and right gear up proximity switches for approximately 2 seconds.

NOTE: If proximity switches are not actuated simultaneously, the autospoiler DO NOT USE light (on aircraft with EOAP, AUTO SPOILER FAIL legend on overhead annunciator panel) will come on. To turn the light off and reset the monitor in autospoiler switching unit, open the two spoiler control CB's, 28 VDC (P33) and 115 VAC (X30), and then close them.

(6) Squeeze and lift speedbrake lever to armed retract position. Spoiler automatic actuator should be retracted.

WARNING: BEFORE EXTENDING SPOILER PANELS, MAKE CERTAIN THAT AREAS AROUND LEFT AND RIGHT SPOILER PANELS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(7) Place both nosegear oleo switches in ground position. Speedbrake control lever should move aft against stop. Spoiler panels should fully extend.

(8) Move left throttle lever forward from idle position stop. Speedbrake control lever should drop down and move to retract position before throttle lever reaches 2 3/4 inches, (69.85 mm) (as measured along curved top of pedestal coverplate from idle stop to aft edge of throttle lever).

(9) Operate alternate longitudinal trim control levers to move horizontal stabilizer within takeoff range (longitudinal trim indicator pointer within range of green illuminated band on indicator scale).

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(10) Set flap dial on TAKEOFF CONDTN calculator to 24 degrees, place flap/slat handle in 28/EXT detent.

(11) Position both throttle levers 2 1/8 inches (53.975 mm) forward of aft (idle) stop, measured along curved top of pedestal coverplate.

(12) Move speedbrake control lever 5/16 (±1/8) inch (7.937(±3.175) mm) aft of retract position, measured along top of pedestal coverplate. Takeoff warning horn should sound, and spoiler panels should extend partially.

(13) Move speedbrake control lever to full aft position against stop. Warning horn should continue to sound, and spoiler panels should extend fully.

(14) Return speedbrake control lever to retract position. Warning horn should silence, and spoiler panels should return to faired position.

(15) Return both throttle levers to idle position.

(16) Place flap/slat handle in UP/RET detent.

(17) Shut off hydraulic pressure source.

GROUND SPOILER CONTROL VALVE - MAINTENANCE PRACTICES

1. General

A. There are two ground spoiler control valves that function simultaneously to operate both ground spoilers. Valves are controlled individually by MLG wheel spin-up signal and MLG strut compression.

B. The valves are located in the left and right wheelwells. The valve in the left wheel is located above and aft of the flight spoiler pressure reducer valve. The second unit is located above and forward of the flight spoiler pressure reducer valve in the right wheelwell.

C. Removal and installation procedures are the same for both ground spoiler control valves.

D. Solenoid valve may be removed and replaced without removing ground spoiler control valve.

2. Equipment and Materials

NOTE: Equivalent substitute may be used instead of the following listed item.

Table 201

Name and Number	Manufacturer
Door safety locks (3936851-1, or -501 as applicable. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co.
Torque wrench (0-100 inch-pounds) (0-8.5 N·m)	

3. Removal/Installation Ground Spoiler Control Valve

A. Remove Valve

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(2) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(3) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(4) Disconnect electrical connector from control valve solenoid.

(5) Disconnect hydraulic lines from fittings in valve ports.

(6) Remove bolt connecting valve lever to bungee pushrod.

(7) Remove valve attach bolts and remove valve.

(8) If required, remove fittings from control valve ports; discard O-rings.

B. Install Valve

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(2) Make certain door safety locks are installed on main gear inboard door actuating cylinder piston rod.

(3) Make certain left and right hydraulic systems are depressurized.

(4) If required, install fittings in ports of control valve using new O-rings.

(5) Install valve attach bolts.

(6) Install bolt connecting valve lever to bungee pushrod.

(7) Connect hydraulic lines to fittings in control valve ports.

(8) Connect electrical connector to control valve solenoid.

(9) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(10) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

NOTE: If necessary, adjust ground spoiler control valve. (SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 or SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 Config 2, paragraph 3.B)

WARNING: BEFORE EXTENDING SPOILER PANELS, MAKE CERTAIN AREAS AROUND LEFT AND RIGHT SPOILER PANELS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(11) Move speedbrake control lever to extend position by pulling lever up, aft, and up again. Check that ground spoiler panel on each wing extends.

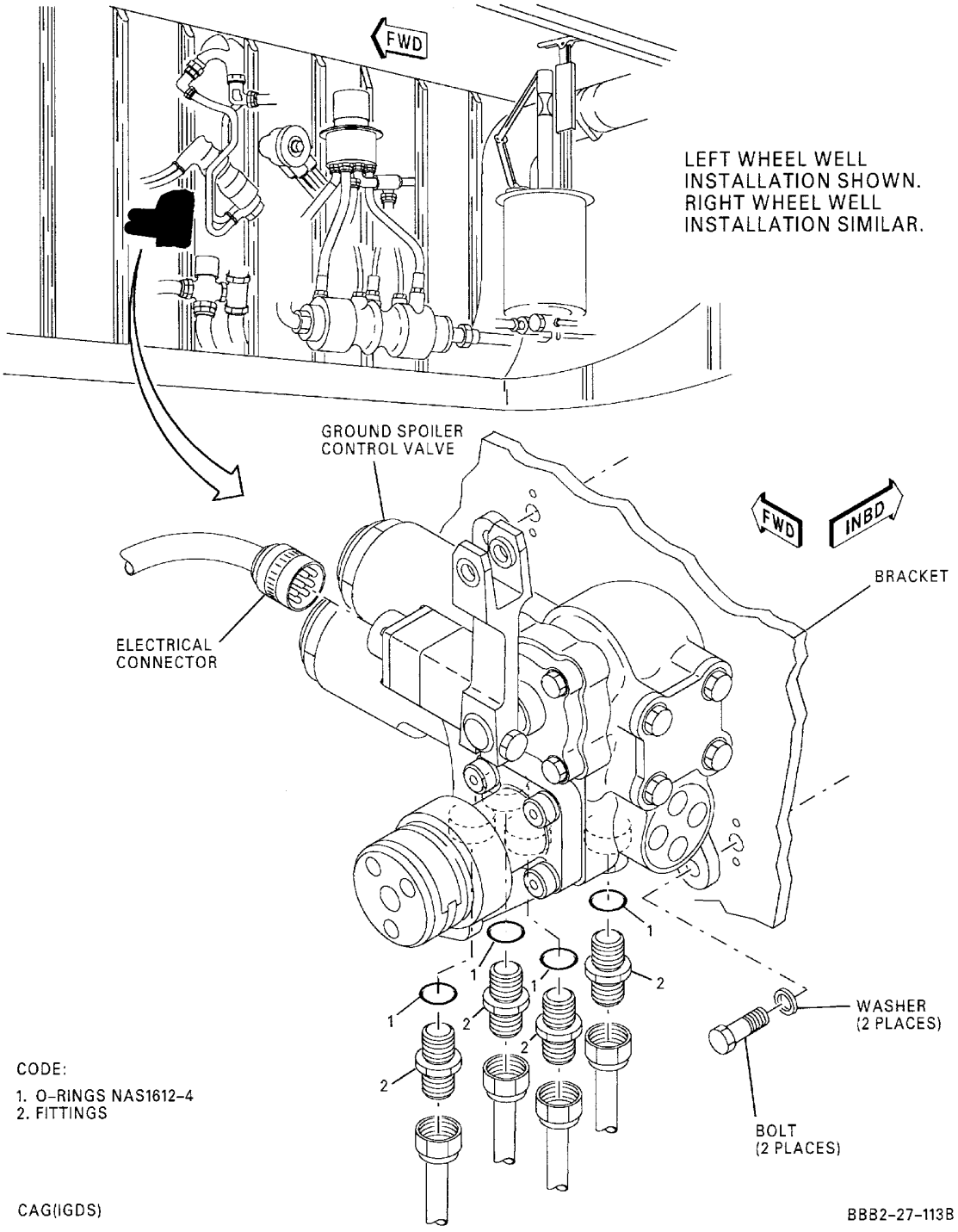
NOTE: If left hydraulic system ground spoiler control valve was installed, activation of the ground spoilers with the speedbrake control lever will extend the inboard flight spoiler panels. If right ground spoiler control valve was installed, the outboard flight spoiler panels will extend.

(12) Return speedbrake control lever to retract position. Check that all spoiler panels retract fully.

(13) Extend and retract spoiler panels several times. Check control valve hydraulic line fittings for leakage.

(14) Shut off hydraulic pressure source.

(15) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Ground Spoiler Control Valve -- Removal/Installation
Figure 201/27-62-04-990-801

4. **Approved Repairs Ground Spoiler Control Valve**

A. Remove Solenoid Valve

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELLWELLS.

CAUTION: CLEANLINESS AND CAREFUL HANDLING OF ALL PARTS IS MANDATORY. MAINTENANCE MUST BE PERFORMED IN A CLEAN ATMOSPHERE SINCE PARTICLES OF DUST OR LINT CAN CAUSE MALFUNCTION AFTER ASSEMBLY.

CAUTION: IF UNIT CANNOT BE ASSEMBLED WITHIN 24 HOURS ALL PARTS MUST BE PROTECTED AGAINST CORROSION.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(2) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(3) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(4) Remove screws, washers, and solenoid valve from ground spoiler control valve.

(5) Remove O-rings and packings from solenoid valve. Discard rings and packings.

B. Install Solenoid Valve

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(2) Make certain door safety locks are installed on main gear inboard door actuating cylinder piston rod.

(3) Make certain left and right hydraulic systems are depressurized.

(4) Install new O-rings and packing on solenoid valve.

(5) Position solenoid valve on ground spoiler control valve, and install washers and screws, torque screws 57 to 63 inch-pounds (6.38 to 7.06 N·m).

(6) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(7) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE EXTENDING SPOILER PANELS, MAKE CERTAIN AREAS AROUND LEFT AND RIGHT SPOILER PANELS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(8) Move speedbrake control lever to extend position by pulling lever up, aft, and up again. Check that ground spoiler panel on each wing extends.

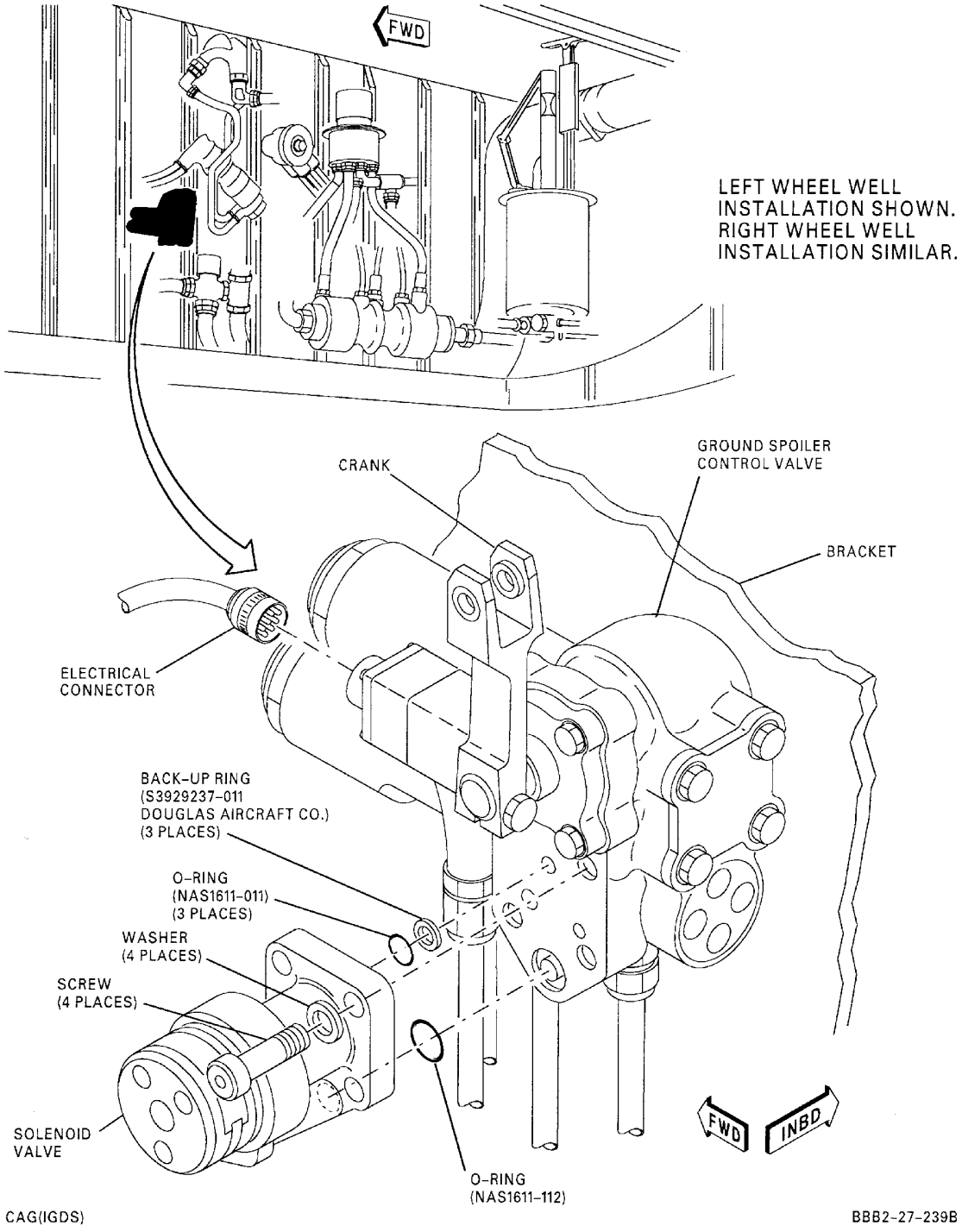
NOTE: If left hydraulic system only, is pressurized, activation of the ground spoilers with the speedbrake control lever will extend the inboard flight spoiler panels. If right hydraulic system only, is pressurized, the outboard flight spoiler panels will extend.

(9) Return speedbrake control lever to retract position. Check that all spoiler panels retract fully.

(10) Extend and retract spoiler panels several times. Check control valve hydraulic line fittings for leakage.

(11) Shut off hydraulic pressure source.

(12) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Ground Spoiler Solenoid Valve -- Removal/Installation
Figure 202/27-62-04-990-802

SPOILER AUTOMATIC ACTUATOR - MAINTENANCE PRACTICES

1. General

A. The spoiler automatic actuator is located in the forward lower section of the control cabin center control pedestal. A pushrod connects the spoiler automatic actuator control arm to the speedbrake control lever. Access to the actuator is through the nose landing gear wheel well, upper, aft, through access doors 4201A and 4302A .(INTERNAL ACCESS DOORS, SUBJECT 06-31-00, Figure 2) Removal of the actuator cover panel and the left side cover panel from control cabin center control pedestal is also required.

B. If continued flight is necessary with the spoiler automatic actuator inoperative, make certain that the actuator is in flight mode. Instructions for positioning the spoiler automatic actuator to flight mode are contained in (Paragraph 5.).

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
Door safety locks (3936851-1 or -501) as applicable (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co.

3. Removal/Installation Spoiler Automatic Actuator

A. Remove Actuator

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks (PAGEBLOCK 32-00-00/201).

(2) Depressurize spoiler hydraulic systems by securing spoiler shutoff and system depressurization valve levers, located in main gear wheelwells, in the off position.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(3) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(4) Remove cover protecting control arm and actuator shaft connector.

(5) Disconnect electrical connector from actuator.

(6) Remove spring from retaining bolts.

(7) Disconnect pushrod from control arm on actuator shaft.

(8) Remove bracket and actuator from control pedestal.

(9) Remove control arm from actuator shaft.

(10) Remove bracket from actuator.

B. Install Actuator

(1) Make certain spoiler shutoff valves are in off position.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(3) Make certain door safety locks are installed on main gear inboard door actuating cylinder piston rod.

(4) Clean contacting surfaces on bracket and actuator to ensure a good electrical bond.

(5) Install actuator on bracket so electrical receptacle will face downward when actuator is installed in pedestal.

(6) Install control arm on actuator shaft, aligning indicator on shaft with center of slot in arm, to nearest serration.

(7) Clean contacting surfaces of bracket and pedestal to ensure a good electrical bond.

(8) Install bracket and actuator in control pedestal.

(9) Connect electrical connector to actuator and secure pushrod clear of control arm on actuator shaft.

(10) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

WJE 873, 874, 886, 887, 892, 893

(11) Reset spoiler actuator as follows: Place nosegear oleo switch in flight position. Simultaneously simulate both main gear in up position by placing steel object over the uplock switch for approximately 2-10 seconds.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(12) Squeeze and lift speedbrake lever to armed retract position. Spoiler automatic actuator should be retracted.

WJE ALL

(13) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(14) Adjust actuator pushrod to obtain 0.015-0.200 inch (0.38-50.8 mm) clearance between actuator crank and roller in speedbrake lever.

(15) Install spring behind bolt head retaining pushrod to control arm and behind bolt head to lower right corner of bracket assembly.

(16) Install nut onto bolt connecting pushrod with control arm. Safety nut with cotter pin.

(17) Install cover over control arm and actuator shaft connectors.

WJE 873, 874, 886, 887, 892, 893

(18) Place spoiler shutoff and system depressurization valve levers to on position and secure valve levers with safety pins.

WJE ALL

(19) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(20) Return spoiler shutoff and system depressurization valve to on position. Secure levers with safety pins.

WJE 873, 874, 886, 887, 892, 893

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(21) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(22) Make certain left throttle is in idle position (against aft stop).

NOTE: Main landing gear must be down and locked and nosegear strut compressed to perform the following test.

(23) Place nosegear oleo switch in flight position. Simultaneously simulate both main gear in up position by placing a steel object over uplock proximity switches for approximately 2 seconds.

(24) Place speedbrake control lever in armed position by raising lever vertically until red arm label is visible. Lever should remain in this position.

WJE 873, 874, 886, 887, 892, 893 (Continued)

WARNING: BEFORE OPERATING SPOILER PANELS, MAKE CERTAIN AREAS AROUND SPOILER PANELS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(25) Place both nosegear oleo switches in ground position. Automatic actuator should move speedbrake control lever to full aft position against stop. All spoiler panels should extend fully.

(26) Move throttle lever forward. Speedbrake control lever should drop down and move forward to retract position. All spoiler panels should return to fully retracted position. Return throttle lever to idle position.

(27) Shut off hydraulic pressure source.

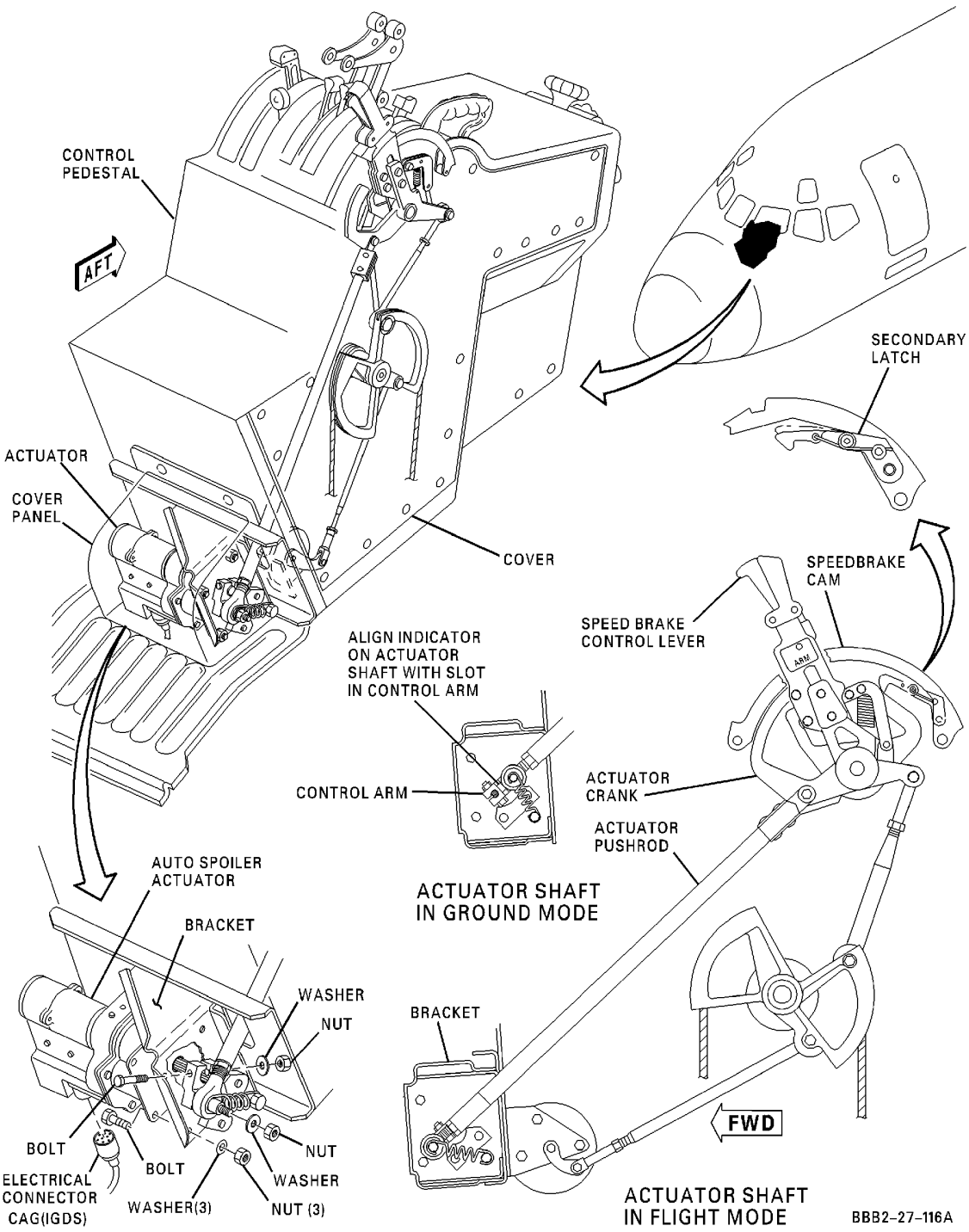
WJE ALL

(28) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position (PAGEBLOCK 32-00-00/201).

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(29) Adjustment/test spoiler automatic actuator. (Paragraph 4.)

WJE ALL



Spoiler Automatic Actuator -- Removal/Installation
Figure 201/27-62-05-990-801

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

4. Adjustment/Test Spoiler Automatic Actuator

A. Test Actuator

NOTE: Main landing gear must be down and locked, and nosegear strut compressed to perform the following test.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in by-pass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

WARNING: BEFORE PRESSURING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(3) Make certain left throttle is in idle (against aft stop).

(4) Squeeze and lift speedbrake lever to armed retract position. Spoiler automatic actuator should be retracted.

WARNING: BEFORE OPERATING SPOILER PANELS, MAKE CERTAIN AREAS AROUND SPOILER PANELS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

WARNING: BEFORE OPERATING REVERSE THRUST LEVERS, MAKE CERTAIN AREAS AROUND THRUST REVERSER DOORS ON BOTH ENGINES ARE CLEAR OF EQUIPMENT AND PERSONNEL.

(5) Place both left and right reverse thrust levers in reverse thrust position. Actuator should extend, driving speedbrake handle aft. Ground and flight spoilers deploy.

(6) Return both left and right reverse thrust levers to forward thrust position.

(7) Check that speedbrake lever and spoiler automatic actuator operation meets conditions as follows: (Figure 202)

(a) With auto spoiler actuator extended and speed brake lever (E) in aft position, adjust pushrod (U) so that aft pin on speed brake lever (E) is beyond secondary latch a minimum of 0.060 inch (1.52 mm).

NOTE: The 0.060 inch (1.52 mm) dimension is measured on top of speed brake cam (W) by noting difference between position of speedbrake lever (E) when it is held by secondary latch and when it is held by auto spoiler actuator.

(b) Check for positive clearance between speedbrake lever (E) and aft end of opening on speedbrake cam (W) when lever (E) is armed and held aft by crank (T).

(c) Manually disarm speedbrake lever (E), lever should return to unarmed retract position. Check that square lugs on outboard sides of lever (E) are fully engaged in forward detent of speedbrake cam (W).

(8) Raise speedbrake lever, move aft, and raise again. Lever should remain in the full aft (extended) position.

(9) Advance throttle levers to takeoff position. Speedbrake handle should drop down and move forward to retract position. All spoiler panels should return to fully retracted position.

NOTE: Speedbrake lever may not drop down to disarmed positon after throttle knockdown.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891 (Continued)

(10) Place throttle levers to idle position.

(11) Make certain aircraft is in ground mode (nose gear and main gear struts compressed).

WARNING: NORMAL ELECTRICAL POWER SUPPLY TO VARIOUS SYSTEMS WILL BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. MAKE CERTAIN THAT SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITIONS TO PREVENT INADVERTENT OPERATION OR SHUTDOWN OF EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(12) Open these circuit breakers and install safety tags:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(13) Simultaneously install steel targets over left and right gear up proximity sensors. Actuator should retract. When actuator reaches full retract position, speedbrake handle will drop down into retract detent.

NOTE: Speedbrake lever may not drop down to disarmed position after throttle knockdown.

(14) Remove both steel targets simultaneously.

(15) Squeeze and lift speedbrake lever to armed retract position.

NOTE: Actuator should be retracted. If lever cannot be armed, the actuator did not retract in Paragraph 4.A.(13).

(16) Remove the safety tags and close these circuit breakers:

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891 (Continued)

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

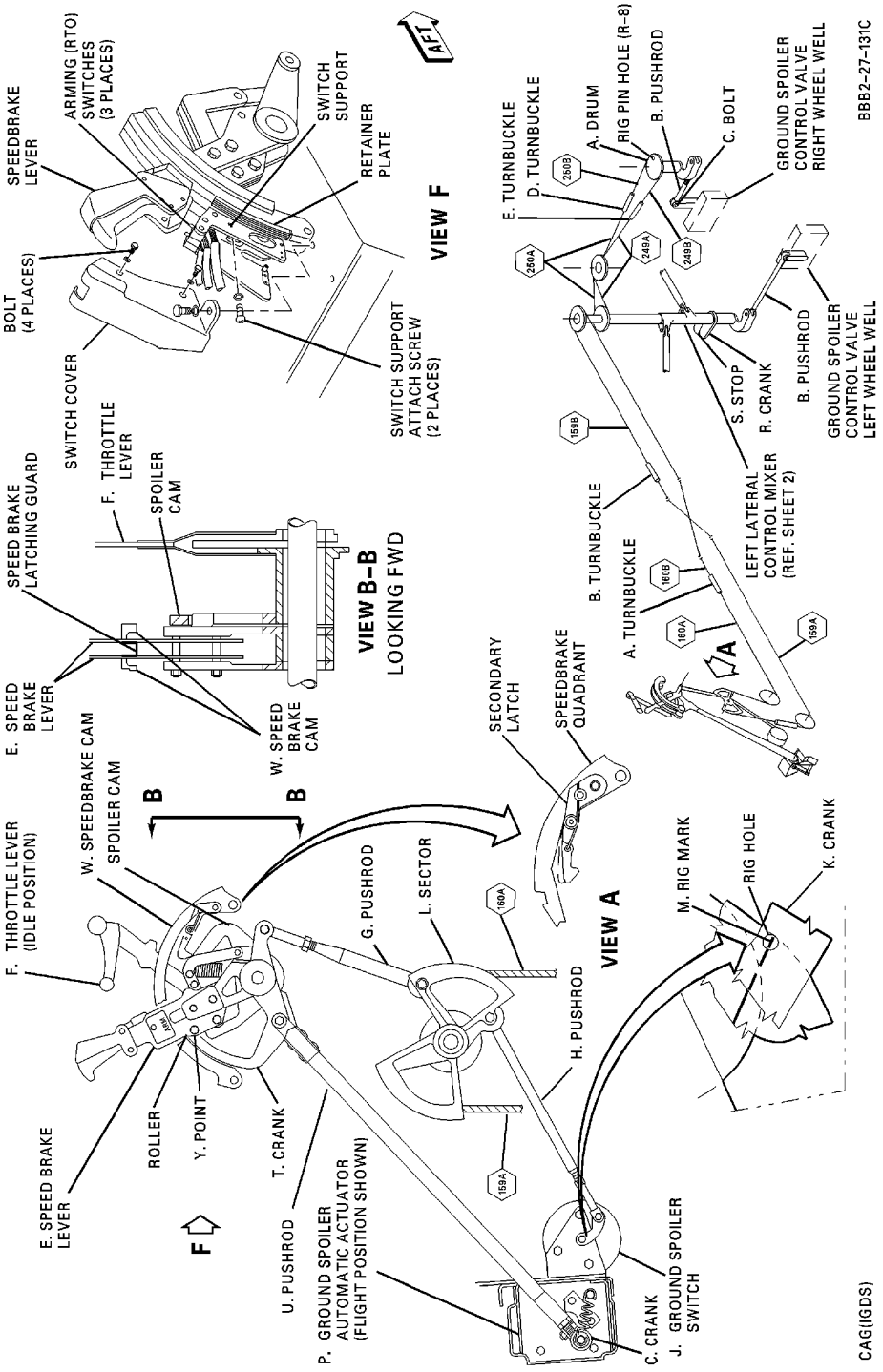
Speedbrake handle should drive aft, and ground and flight spoilers should deploy.

(17) Move throttle lever forward. Speedbrake control lever should drop down and move forward to retract position. All spoiler panels should return to fully retracted position.

(18) Place throttle lever to idle position.

(19) Shut off hydraulic pressure source.

(20) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Spoiler Speedbrake Controls -- Adjustment/Test
Figure 202/27-62-05-990-802

WJE ALL

5. Manually Positioning Inoperative Spoiler Automatic Actuator to Flight Mode

A. Positioning Procedure

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(1) Make certain left and right hydraulic systems are depressurized. (PAGEBLOCK 29-00-00/201)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(3) Remove electrical connector from actuator and securely tape to adjacent structure.

(4) Disconnect actuator control arm from pushrod.

(5) Place speedbrake control lever in full aft position.

(6) Manually rotate actuator control arm to flight mode position against phenolic stop.

NOTE: Approximately 200 inch-pounds (22.4 N·m) of torque on actuator control arm is required to slip clutch mechanism in actuator.

(7) Connect actuator control arm to pushrod.

(8) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(9) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: MAKE CERTAIN AREAS AROUND SPOILER PANELS ARE CLEAR OF PERSONNEL AND EQUIPMENT BEFORE ACTUATING SPOILERS.

(10) Perform operational check of speedbrake control lever latching mechanism by placing lever in each latch position and observing spoiler panels for corresponding position.

(11) Shut off hydraulic pressure source, retract all spoiler panels and depressurize left and right hydraulic systems.

(12) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

(13) Close nose landing gear wheel well forward accessory compartment access doors 4201A and 4302A. (INTERNAL ACCESS DOORS, SUBJECT 06-31-00, Figure 2)

WHEEL SPEED TRANSDUCER - MAINTENANCE PRACTICES

1. General

A. There are four antiskid/auto spoiler wheel speed transducers. The following test verifies that resistance and voltage of the auto spoiler portion of the transducers are within limits.

B. The main gear must be extended to perform this procedure.

C. Transducers are located in the main gear axles. The spoiler control box is located in the aft right radio rack equipment panel in the electrical/electronics compartment.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
Multimeter (Model 2000A)	Dana
Resistor (150(±1) ohm 1/2 watt)	
Voltmeter (True RMS)	
Dual Drive motor (0-1200 RPM) (3240-D09-1212)	Aero Info Inc.
Anti-skid transducer skinner (4916807) (2 required)	Douglas Aircraft Co.

3. Adjustment/Test Wheel Speed Transducer

A. Test Wheel Speed Transducer

(1) Disconnect PL-209 plug from ground spoiler control box.

(2) Measure resistance between pins of PL-209 as listed below. Readings should be within 10 to 30 ohms.

(a) Pins A and B (right outboard transducer)

(b) Pins C and D (right inboard transducer)

(c) Pins E and F (left inboard transducer)

(d) Pins G and H (left outboard transducer)

(3) Connect 150 (±1) ohm, 1/2 watt resistor and true RMS voltmeter across pins of PL-209 plug as listed below.

(a) Pins A and B (right outboard transducer)

(b) Pins C and D (right inboard transducer)

(c) Pins E and F (left inboard transducer)

(d) Pins G and H (left outboard transducer)

(4) Remove hub caps.

(5) Using drive motor, spin right outboard transducer at 900(±10) rpm. True RMS voltage across pins A and B should be minimum of 3.86 volts.

(6) Spin right inboard transducer at 900(±10) rpm. True RMS voltage across pins C and D should be minimum of 3.86 volts.

(7) Spin left inboard transducer at 900(±10) rpm. True RMS voltage across pins E and F should be minimum of 3.86 volts.

(8) Spin left outboard transducer at 900 (±10) rpm. True RMS voltage across pins G and H should be minimum of 3.86 volts.

(9) Connect PL-209 plug to ground spoiler control box.

(10) Install hub caps.

SPOILER CONTROL BOX - MAINTENANCE PRACTICES

1. General

A. The spoiler control box is an electronic switching device which supplies power to drive the spoiler automatic actuator, on receipt of signals from the wheel speed transducers. The control box is a rack mounted component located in the aft right radio rack equipment panel in the electrical/electronics compartment.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

Table 201

Name and Number	Manufacturer
Anti-skid/Spoiler test set (5916819-503 or -505)	Douglas Aircraft Co.
Door safety locks (3936851-1 or -501) as applicable. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co.

WJE ALL

3. Removal/Installation Spoiler Control Box

A. Remove Control Box

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(2) Depressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: NORMAL ELECTRICAL POWER SUPPLY TO VARIOUS SYSTEMS WILL BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPEN. MAKE CERTAIN THAT ESSENTIAL SERVICES ARE NOT INTERRUPTED. MAKE CERTAIN THAT SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITIONS TO PREVENT INADVERTENT OPERATION OF EQUIPMENT WHEN CIRCUIT BREAKERS ARE CLOSED AGAIN.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(3) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE ALL

(4) Unscrew knurled holddown nuts at front end of mounting rack.

(5) Carefully remove control unit from rack.

B. Install Control Box

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893 (Continued)

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE ALL

(2) Carefully install control unit on electrical rack, making certain control unit is securely seated in rack.

(3) Tighten knurled holddown nuts at front end of mounting rack.

(4) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE ALL

(5) Remove door safety locks, close inboard doors and place main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

(6) Adjust/Test spoiler control box. (Paragraph 4.)

4. Adjustment/Test Spoiler Control Box

A. Test Spoiler Control Box

CAUTION: NORMAL ELECTRICAL POWER SUPPLY TO VARIOUS SYSTEMS WILL BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPEN. MAKE CERTAIN THAT SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITIONS TO PREVENT INADVERTENT OPERATION OF EQUIPMENT.

(1) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE ALL

(2) Connect test set cable from electrical connector (P-4) on test set to test connector (J-3) on spoiler control box. Connect external ground wire to aircraft structure.

(3) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(4) Pressurize left and right hydraulic system (PAGEBLOCK 29-00-00/201).

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

CAUTION: DO NOT MOVE SPEEDBRAKE LEVER AFT.

(5) Simulate both right and left main gear in up position by placing a steel object over uplock proximity switch for approximately 2 to 10 seconds. Power indicating light on test set should illuminate.

WJE 873, 874, 886, 887, 892, 893

CAUTION: DO NOT MOVE SPEEDBRAKE LEVER AFT.

(6) Place speedbrake lever in arm position.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(7) Squeeze and lift speedbrake lever to armed retract position. Spoiler automatic actuator should be retracted.

WJE ALL

(8) Position switches on test set as follows:

(a) S-1 to transducer simulate

(b) S-2 to off

(c) S-3 to left outboard

(d) S-4 to DC-9

(e) S-5 to 0.

NOTE: Position of switch S-3 is immaterial.

WARNING: WHILE PERFORMING CONTROL BOX TESTS, MAKE CERTAIN AREAS AROUND LEFT AND RIGHT SPOILER PANELS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

CAUTION: DUE TO POSSIBLE ACTUATOR OVERHEATING WITH ONLY ONE CHANNEL EXCITED, DO NOT KEEP A OR B INDICATING LIGHT ON FOR MORE THAN 10 SECONDS WHEN PERFORMING STEPS 7 THROUGH 10.

(9) Place test set switch S-2 in left inboard position; phase A indicating light should come on. If phase B indicating light comes on, replace control box.

(10) Place switch S-2 in right outboard position; phase A indicating light should be on. If phase B indicating light comes on, replace control box.

(11) Place switch S-2 in left outboard position; phase B indicating light should come on. If phase A indicating light comes on, replace control box.

(12) Place switch S-2 in right inboard position; Phase B indicating light should be on. If phase A indicating light comes on, replace control box.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(13) Place spoiler control DC circuit breaker to OFF and then to ON position.

NOTE: Place speedbrake control lever to retract position within 10 seconds.

WJE 873, 874, 886, 887, 892, 893

(14) Place spoiler control DC circuit breaker to OFF and then to ON position.

NOTE: Place switch S-2 in left/right outboard position within 10 seconds.

WJE 873, 874, 886, 887, 892, 893 (Continued)

(15) Place switch S-2 in left/right outboard position; phases A and B indicating lights should come on momentarily, then go off; power indicating light should go off, and speedbrake lever should move aft.

NOTE: If phases A and B indicating lights come on but spoilers do not extend, the malfunction is not in the spoiler control box but in the external circuitry.

WJE ALL

(16) Place speedbrake control lever to retract position; all spoiler panels should return to the faired position.

(17) Place switch S-2 in off position.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(18) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(19) Disconnect test cable from electrical connector on test set and external ground wire from structure.

(20) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY

WJE 417, 419, 421, 423, 865, 869, 871, 872 (Continued)

(Continued)

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE ALL

(21) Shut off hydraulic pressure source.

SPEEDBRAKE CONTROL LEVER ARMING SWITCHES - MAINTENANCE PRACTICES

1. General

A. There are three speedbrake arming switches mounted on a support attached to the speedbrake cam forward of the speedbrake lever. All three switches are actuated by squeezing the speedbrake lever. Two switches, the left and right when actuated, retract the autospoiler actuator so that the speedbrake lever may be lifted to the armed position for rejected takeoff. The center switch is electrically connected to the takeoff warning circuit.

B. The switch support is mounted on a serrated retainer plate attached to the speedbrake lever frame. The attaching holes in the support are elongated so that the support may be moved fore or aft for switch actuation adjustment.

C. The switches support assembly, wiring and electrical connector are removed as a unit from the airplane. The electrical connector is located in the upper forward pedestal.

2. Removal/Installation Speedbrake Lever Arming Switches

A. Remove Switches

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL
P	35	B1-487	STALL WARNING AND AUTO SLAT-1

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 880, 881, 883, 884, 891

P	36	B1-550	STALL WARNING FAILURE ADVISORY

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

R	35	B1-26	STALL WARNING AND AUTO SLAT-2

(2) Remove cover from switches.

(3) Remove dust cover from forward upper pedestal.

(4) Disconnect electrical connector.

(5) Remove support attaching bolts and remove switch support assembly from retainer plate.

(6) Carefully remove electrical connector, wiring and switch support assembly from pedestal.

B. Install Switches

(1) Position switch support assembly in most forward position on serrated retainer and loosely install support attach bolts.

(2) Thread electrical connector and wiring through pedestal and install connector on receptacle.

(3) Place spoiler/speedbrake lever to full forward, unarmed, and retract position.

NOTE: On the forward pedestal (looking down) there is a notched position that the spoiler speedbrake lever goes into due to cam surface below that is not visible.

(a) Autospoiler actuator should be in extended (ground condition) position.

(b) Adjust switch support assembly aft until all three switches actuate.

(c) Tighten switch support attach bolts.

NOTE: Plungers of switches must be fully depressed when switches are actuated.

(4) Squeeze speedbrake lever grip. Plungers of all three switches must be relaxed when grip is squeezed and must have clearance between speedbrake lever cam and switch actuators. Release grip.

(5) Check that plungers of all three switches are fully depressed with lever in forward stop position.

(6) Squeeze speedbrake lever grip. Check that there is clearance between lever cam and switch actuators. Release grip.

(7) Install switch cover.

(8) Tie or clamp wire bundle as required.

(9) Install dust cover on forward upper pedestal.

(10) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL
P	35	B1-487	STALL WARNING AND AUTO SLAT-1

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 880, 881, 883, 884, 891

P	36	B1-550	STALL WARNING FAILURE ADVISORY

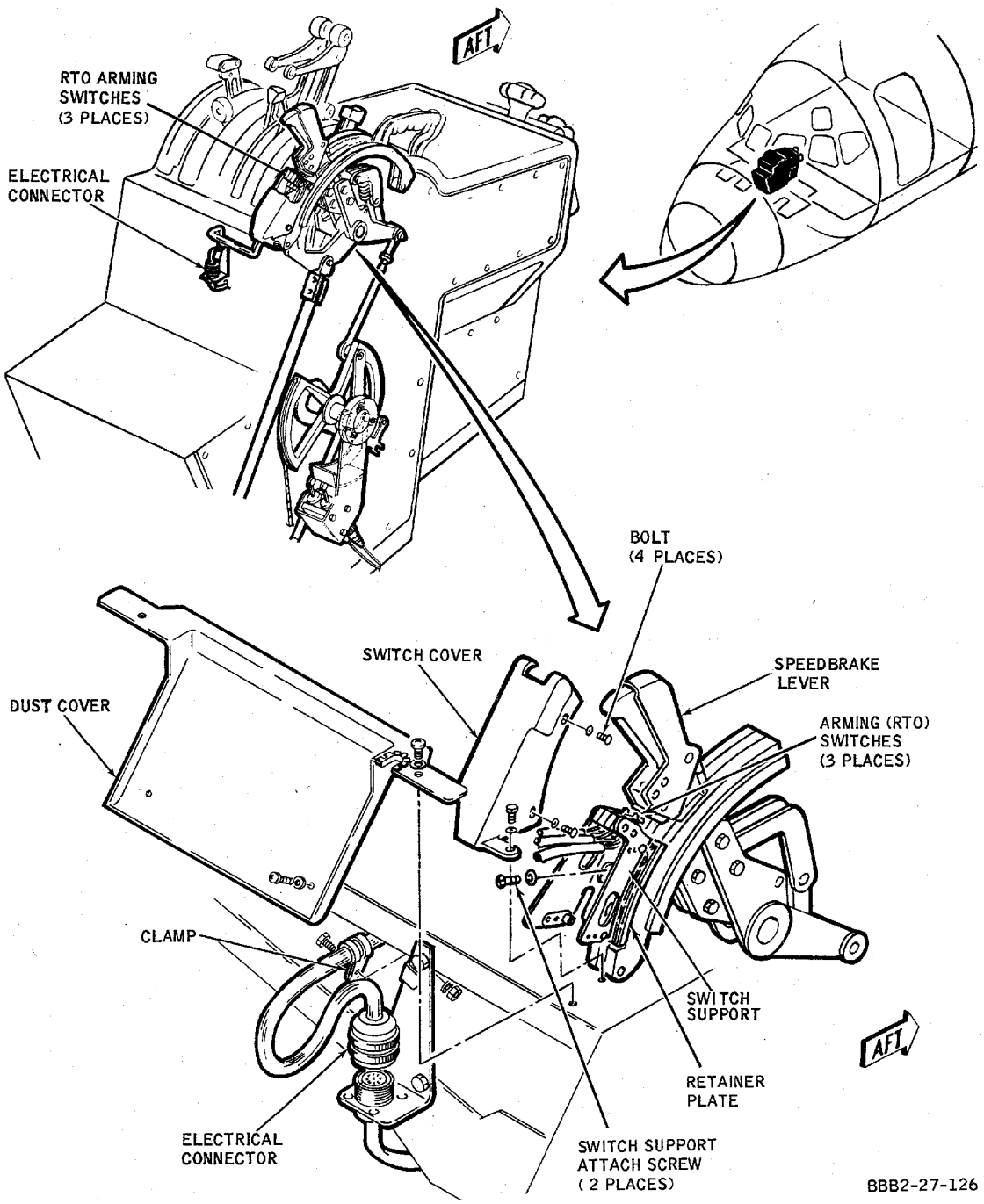
LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

R	35	B1-26	STALL WARNING AND AUTO SLAT-2

(11) Test speedbrake control lever arming switches.



Speedbrake Control Lever Arming Switches - Removal/Installation
Figure 201/27-62-08-990-801

3. **Adjustment/Test Speedbrake Control Lever Arming Switches**

A. Test Speedbrake Control Lever Arming Switches

WARNING: BEFORE PRESSURING HYDRAULIC SYSTEMS, MAKE CERTAIN LANDING GEAR CONTROL LEVER IS IN DOWN POSITION AND LANDING GEAR GROUND LOCK PINS ARE INSTALLED. MAKE CERTAIN ALL OTHER CONTROLS ARE CORRECT POSITIONS TO PREVENT INADVERTENT OPERATION OF CONTROL SURFACES OR OTHER EQUIPMENT.

(1) Pressurize right and left hydraulic systems. (PAGEBLOCK 29-00-00/201)

(2) Squeeze and lift speedbrake lever to armed retract position. Spoiler automatic actuator should be retracted.

(3) Manually knockdown speedbrake lever to disarmed position. Spoiler automatic actuator should be extended.

WARNING: BEFORE MOVING FLAP/SLAT LEVERS, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(4) Place flap/slat levers in 15 degree position.

(5) Make certain both throttle levers are at idle position.

(6) Place anti-skid switch, on overhead panel, in ARM position.

(7) Place ABS selector in T.O. position.

(8) Place automatic brake (ABS) selector, on side of control pedestal, in ARM position.

(9) Move throttles 2-1/8 inch (53.98 mm) minimum forward of idle position, takeoff warning horn should sound.

(10) Squeeze speedbrake lever, takeoff warning horn should stop sounding.

(11) Lift speedbrake lever to armed retract position, takeoff warning horn should remain silent.

(12) Place ABS selector in OFF position, takeoff warning horn should sound.

(13) Knockdown speedbrake lever to disarmed position, takeoff warning horn should stop sounding.

(14) Return both throttles to idle position.

(15) Place anti-skid switch in OFF position.

(16) Place flap/slat levers in up/ret position.

(17) Shut off hydraulic power source.

AUTO SPOILER SWITCHING UNIT - MAINTENANCE PRACTICES

1. General

A. The autospoiler switching unit is an electronic device, which provides the electronic circuitry required to process the input signals and apply the electrical output signal to the autospoiler actuator which drives the speedbrake lever to the full aft position when armed. The unit is located on the aft right radio rack in the electrical/electronics compartment.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
Anti-skid/Spoiler test set (5916819-503 or -505)	Douglas Aircraft Co.
Door safety locks (3936851-1 or -501) as applicable. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co.

3. Removal/Installation Auto Spoiler Switching Unit

A. Remove Switching Unit

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(1) Depressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: NORMAL ELECTRICAL POWER SUPPLY TO VARIOUS SYSTEMS WILL BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPEN. MAKE CERTAIN THAT ESSENTIAL SERVICES ARE NOT INTERRUPTED. MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITIONS TO PREVENT INADVERTENT OPERATION OF EQUIPMENT WHEN CIRCUIT BREAKERS ARE CLOSED AGAIN.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING
P	33	B1-244	SPOILER CONTROL

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(3) Unscrew knurled holddown nuts at front end of mounting rack and swing down.

(4) Carefully pull switching unit out of rack.

B. Install Switching Unit

(1) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING
P	33	B1-244	SPOILER CONTROL

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(2) Check switching unit and mounting rack electrical connectors for loose, broken, or dirty connector pins.

(3) Carefully slide switching unit into mounting rack, making certain switching unit electrical connector mates with rack electrical connector properly.

(4) Rotate holddown up and engage with lugs on switching unit and tighten knurled holddown nuts.

(5) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING
P	33	B1-244	SPOILER CONTROL

UPPER EPC, L AC BUS

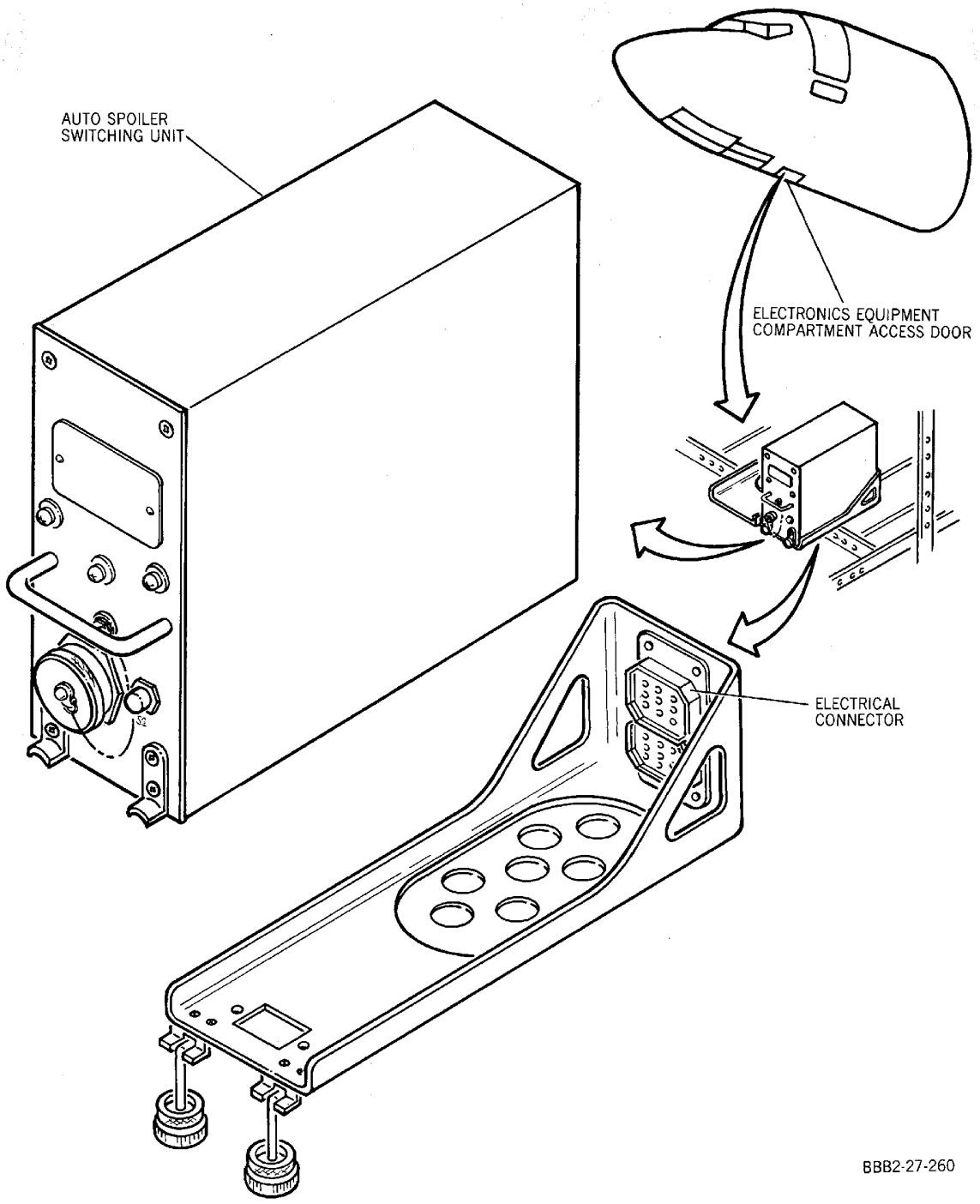
Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(6) Adjust/Test auto spoiler switching unit. (Paragraph 4.)



Auto Spoiler Switching Unit -- Removal/Installation
Figure 201/27-62-09-990-801

4. **Adjustment/Test Auto Spoiler Switching Unit**

A. Test Auto Spoiler Switching Unit

CAUTION: NORMAL ELECTRICAL POWER SUPPLY TO VARIOUS SYSTEMS WILL BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPEN. MAKE CERTAIN THAT ESSENTIAL SERVICES ARE NOT INTERRUPTED. MAKE CERTAIN SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITIONS TO PREVENT INADVERTENT OPERATION OF EQUIPMENT WHEN CIRCUIT BREAKERS ARE CLOSED AGAIN.

(1) Make sure that these circuit breakers are closed:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING
P	33	B1-244	SPOILER CONTROL

UPPER EPC, L AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
K	33	B1-23	LEFT GROUND CONTROL RELAY

UPPER EPC, R AC BUS

Row	Col	Number	Name
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 875-881, 883, 884, 891			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

CAUTION: THE USE OF HYDRAULIC SYSTEM PRESSURE IS OPTIONAL. IF HYDRAULIC SYSTEM IS PRESSURIZED, KEEP PERSONNEL OR EQUIPMENT CLEAR OF ALL SPOILERS AT ALL TIMES.

(2) If hydraulic pressure is desired, pressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

NOTE: Spoiler operations with hydraulic system pressurized, will be indicated in parentheses ( ).

(3) Make certain speedbrake lever is in unarmed retract position.

(4) Make certain that both throttle levers are in full aft position.

(5) Make certain reverse thrust levers are in forward thrust position.

(6) Squeeze and lift speedbrake lever to armed (red ARM label visible) retract position. Auto spoiler actuator retracts (spoilers retract).

(7) Place both left and right reverse thrust levers in reverse thrust position. Auto spoiler actuator extends and speedbrake handle moves aft (spoilers extend).

(8) Return left and right reverse thrust levers to forward thrust position.

(9) Push down on speedbrake handle. Speedbrake handle moves to full forward position.

(10) Squeeze and lift speedbrake handle to armed (red ARM label visible) retract position. Auto spoiler actuator retracts (spoilers retract).

(11) Place speedbrake in unarmed retract position.

(12) If applicable, shut off hydraulic pressure source.

AUTO SPOILER ACTUATOR PHASE INTERLOCK RELAY - REMOVAL/INSTALLATION

1. General

A. The auto spoiler actuator phase interlock relay box is installed on the forward face of the control cabin center control pedestal, above the autospoiler actuator.

B. Access to the phase interlock relay box is through the nose landing gear wheel well and access panel number 4501A (electrical/electronic equipment compartment).

C. This removal/installation procedure is applicable only to those aircraft without Specification Change Notice No. 6522, Automatic Braking System, installed.

2. Removal/Installation Auto Spoiler Phase Interlock Relay

A. Remove Auto Spoiler Phase Interlock Relay (Figure 401)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

WARNING: MAKE CERTAIN THAT LANDING GEAR CONTROL LEVER IS IN DOWN POSITION, ALL LANDING GEAR GROUND LOCKPINS ARE INSTALLED, AND MAIN GEAR DOORKEEPERS ARE INSTALLED. THIS WILL HELP PREVENT INJURY TO PERSONS AND DAMAGE TO THE AIRCRAFT.

(2) Gain access to relay. With nose landing gear doors open and landing gear lockpins installed, open access panel number 4501A overhead in nose landing gear wheel well.

(a) Remove electrical connector, P1-244 from relay.

(b) Remove wire harness from auto spoiler actuator.

(c) Remove wires from terminal strip S3-166 on relay.

(d) Remove 4 attaching bolts from relay.

(e) Remove relay from pedestal.

B. Install Auto Spoiler Phase Interlock Relay

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

(2) Install relay on pedestal.

(a) Install 4 attaching bolts in relay box.

(b) Place wires from terminal strip S3-166 on relay.

(c) Install wire harness on auto spoiler actuator.

(d) Install electrical connector, P1-244 on relay.

(3) Close access panel number 4501A.

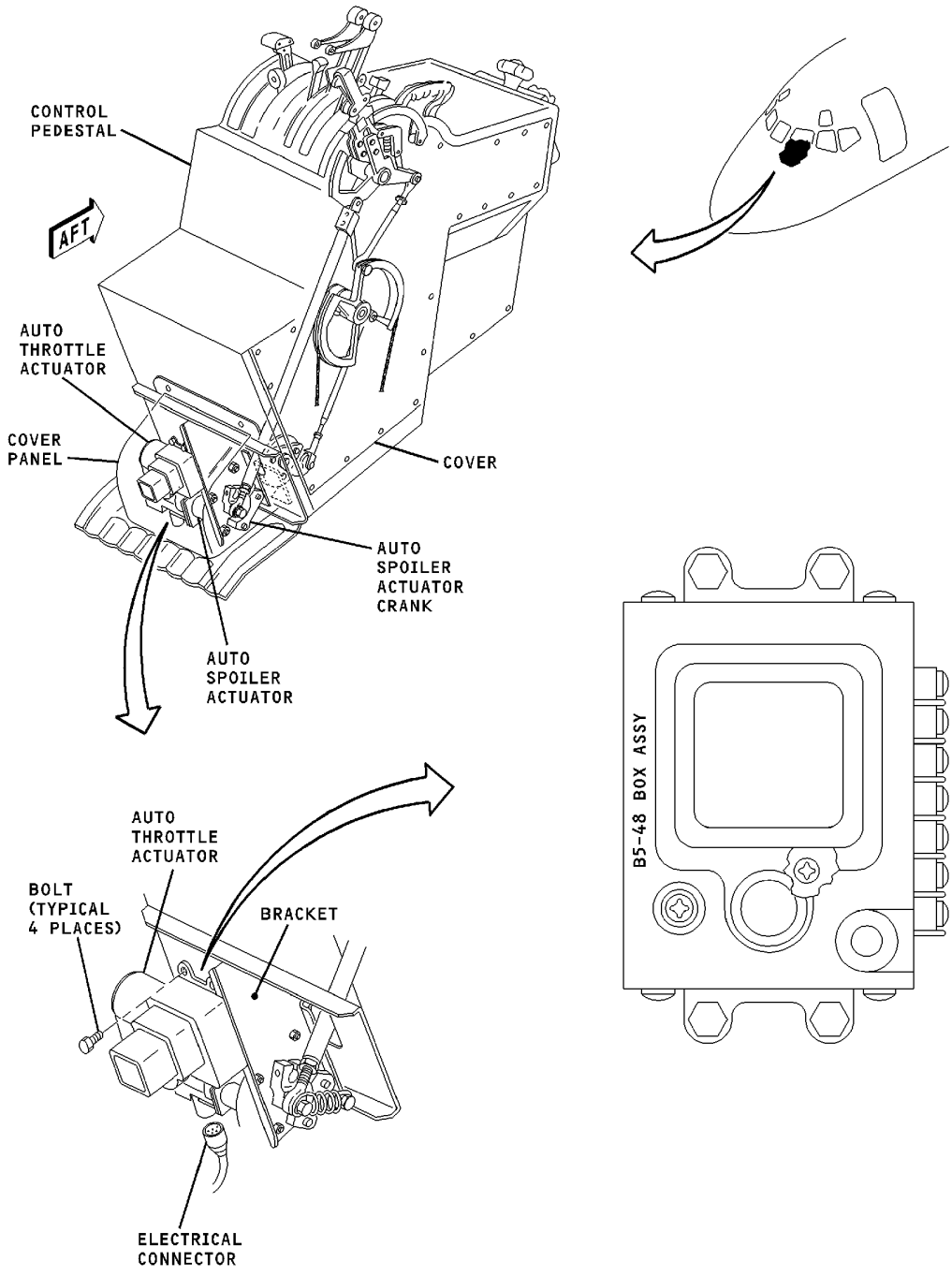
(4) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL



Auto Spoiler Actuator Phase Interlocking Relay -- Removal/Installation
Figure 401/27-62-10-990-801

SPEED BRAKE LEVER - REMOVAL/INSTALLATION

1. General

A. These procedures provide instructions for Removal/Installation of the Speed Brake Control Lever located in the cockpit center control pedestal.

B. During all removal steps, extreme care must be taken to note the orientation, positions, and quantities of parts removed. Taking this precaution will help prevent introduction of riding conditions into pedestal during reassembly.

C. Precautions should be taken to prevent dropped parts from falling into cockpit floor opening beneath pedestal where they are very difficult to retrieve. One method is to place pieces of cloth into lower pedestal area to block off floor opening. All such material must be removed before pedestal close-up.

D. A shaft removal tool must be fabricated to facilitate partial removal of pedestal lever shaft. A measured drawing of this tool can be found in Figure 403. . The tool's smaller pilot is for use in lever (upper) shaft and larger pilot is for use in lower section shaft.

E. The pedestal automatic ground spoiler actuator should be in extended (ground) position.

F. These procedures will only work if a pedestal lever shaft requiring a separate bushing on the left end of the shaft is installed in pedestal.

2. Speed Brake Lever - Remove

A. Remove Speed Brake Lever

(1) Place left and right thrust reverser control valves in dump position and install safety pins.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

CAPTS, CENTER PANEL & PEDESTAL CBP

Row	Col	Number	Name
		B1-310	PANEL WHITE INTEGRAL LTS - PEDESTAL
		B1-311	PANEL WHITE INTEGRAL LTS - PEDESTAL

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, DC AIR CONDITIONING & MISCELLANEOUS

Row	Col	Number	Name
U	22	B1-757	CABIN PRESSURE CONTROL-1
W	22	B1-759	CABIN PRESSURE CONTROL-2

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL
P	38	B1-832	CAWS, SSRS-1, LDG GR, T/O, A/P, SP BK, CAB ALT

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
R	33	B1-229	RUDDER CONTROL MANUAL ADVISORY
WJE ALL			

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	2	B1-756	CABIN PRESSURE CONTROL-1

UPPER EPC, AIR CONDITIONING - RIGHT AC BUS

Row	Col	Number	Name
J	2	B1-758	CABIN PRESSURE CONTROL-2

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	18	B10-332	AUTO THROTTLE-1

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	18	B10-365	AUTO THROTTLE-1
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, LIGHTS - LEFT AC BUS

Row	Col	Number	Name
K	19	B1-309	INTEGRAL LIGHTS PEDESTAL

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	6	B10-333	AUTO THROTTLE-2
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	6	B10-366	AUTO THROTTLE -2
G	24	B10-194	STAB MOTION INDICATOR

(3) Remove Captain's and First Officer's seats to provide access to pedestal. (CAPTAIN'S AND FIRST OFFICER'S SEATS - MAINTENANCE PRACTICES, PAGEBLOCK 25-13-01/201)

(4) Remove electronic equipment units or space covers as required from left side, aft pedestal to provide access to aft speed brake lever quadrant and cams attachment hardware. Retain for re-installation.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(5) Remove speed brake arming switch assembly cover (auto brake equipped aircraft only) and dust shield located at center of forward pedestal. (PAGEBLOCK 27-62-08/201)

(6) Remove speed brake arming switch assembly and serrated retainer plate from speed brake lever quadrant and cams. Secure switch assembly away from work area. Wiring need not be removed from pedestal. (SPEEDBRAKE CONTROL LEVER ARMING SWITCHES - MAINTENANCE PRACTICES, PAGEBLOCK 27-62-08/201)

WJE ALL

(7) Remove left forward, right forward, and flap module pedestal side covers.

(8) Remove light plates:

(a) LONG TRIM indicator plate located on left side of speed brake lever.

(b) Center plate located on right side of speed brake lever. To remove plate, first remove knobs from rudder hydraulic power, alternate longitudinal trim, and fuel shutoff levers.

(9) Remove NLG IND trim plate and filler strip at forward edge of aft pedestal.

(10) Remove takeoff warning calculator. (HORIZONTAL STABILIZER POSITION INDICATOR MODULE - MAINTENANCE PRACTICES, PAGEBLOCK 27-40-12/201) Use care not to move ends of attaching bolts past flush with outside surface of left side pedestal frame. This will help prevent loss of washers and spacers located inside pedestal. Note location of any shim washers between calculator and pedestal frame for replacement on reinstallation of calculator.

CAUTION: RELIEVE TENSION ON CONTROL CABLES IN CENTER CONTROL PEDESTAL.

CAUTION: IF ANY CABLE RUNS MUST BE DISCONNECTED AT TURNBUCKLES, CABLE BLOCKS MUST BE INSTALLED ON CABLES AT FAIRLEADS, FEED-THRUS, STRUCTURAL FRAMES/BEAMS AND/OR BULKHEADS TO PREVENT SLACK IN RESPECTIVE CABLE RUNS.

CAUTION: THE ENDS OF ALL DISCONNECTED CABLES MUST BE SECURED TO AVOID DAMAGE TO CABLE STRANDS AND/OR AIRCRAFT SYSTEMS/STRUCTURAL COMPONENTS.

(11) Loosen turnbuckles on following cables.

NOTE: It should not be necessary to completely disconnect turnbuckles to relieve cable tension sufficiently to relieve pressure on pedestal frame.

Table 401

Cable Run	Function Maintenance Manual Reference
25A	Rudder power shutoff - On (RUDDER AND TAB - ADJUSTMENT/TEST, PAGEBLOCK 27-20-00/501)
26A	Rudder power shutoff - Off (RUDDER AND TAB - ADJUSTMENT/TEST, PAGEBLOCK 27-20-00/501)
55A	Left engine fuel shutoff - Off (FUEL SHUTOFF SYSTEM - ADJUSTMENT/TEST, PAGEBLOCK 76-12-00/501)

Table 401 (Continued)

Cable Run	Function Maintenance Manual Reference
56A	Left engine fuel shutoff - On (FUEL SHUTOFF SYSTEM - ADJUSTMENT/TEST, PAGEBLOCK 76-12-00/501)
125A	Horizontal stabilizer motor control - Nose up (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501)
126A	Horizontal stabilizer motor control - Nose down (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501)
127A	Horizontal stabilizer brake override switch - Nose up (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501)
128A	Horizontal stabilizer brake override switch - Nose down (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501)
131A	Horizontal stabilizer position indicator - Nose up (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501)
132A	Horizontal stabilizer position indicator - Nose down (HORIZONTAL STABILIZER - ADJUSTMENT/TEST, PAGEBLOCK 27-40-00/501)

(12) Remove two screws (9) fastening dial-a-flap indicating dial (12) and carefully move bottom of dial outward a small distance away from pedestal lever shaft nut (7). (Figure 402, Sheet 2)Accomplishment of this step will help prevent damage of plastic dial as lever shaft and nut are driven to the right, beginning in Paragraph 2.A.(16).

(13) One at a time, move takeoff warning calculator attachment bolts toward center of pedestal. Be prepared to catch washers and cable guard spacers, located between plastic shields, as they are released by bolts. Note location and quantity of washers and spacers for reinstallation.

(14) Remove bolt securing left end of pedestal lever shaft.

(15) Mark bushing on left end of pedestal lever shaft in such a manner that it can be reinstalled with exact same orientation as when removed. Insert drift or other suitable tool into left end of lever shaft and lift shaft slightly. Remove bushing from end of shaft. Lower shaft and remove tool.

CAUTION: PEDESTAL LEVER SHAFT WILL BE MOVED OFF OF LEFT SIDE OF PEDESTAL FRAME WHEN DRIVING SHAFT OUT.

CAUTION: TAKE CARE TO PREVENT EXERTION OF EXCESSIVE DOWNWARD FORCE ON SHAFT. THIS COULD RESULT IN DAMAGE TO FLAP MODULE FRAME.

(16) With smaller pilot of shaft removal tool (Paragraph 1.D.) inserted into left end of pedestal lever shaft, slowly drive shaft by gently striking tool with soft-faced hammer. Drive shaft until it is clear of takeoff warning calculator longitudinal trim position indicator crank. Watch for spacer(s) located immediately inboard of crank. Remove tool, crank, and spacer(s).

(17) Drive pedestal lever shaft until it is clear of left horizontal stabilizer trim control lever (motor control). Watch for spacer located immediately inboard of lever. Remove tool and spacer. Disconnect cables and remove lever. Attach label to each cable identifying its run number--125 (forward) and 126 (aft). Secure cable ends away from work area in such a manner that provides a small amount of tension on cable runs. Tension need only be sufficient to prevent cable runs from becoming slack and fouling with structure.

(18) Remove left side plastic shield.

(19) Drive pedestal lever shaft until it is clear of right horizontal stabilizer trim control lever (brake override switch). Watch for spacer located immediately inboard of lever (spacer may not be installed). Remove tool and spacer (if installed). Disconnect cables and remove lever. Attach label to each cable identifying its run number--127 (forward) and 128 (aft). Secure cable ends away from work area as noted in Paragraph 2.A.(17).

(20) Drive pedestal lever shaft until it is clear of horizontal stabilizer trim position indicator. Watch for spacer(s) located immediately inboard of indicator. Remove tool and spacer(s). Disconnect cables and remove indicator. Attach label to each cable identifying its run number--132 (forward) and 131 (aft). Secure cable ends away from work area as noted in Paragraph 2.A.(17).

(21) Remove right side plastic shield.

(22) Remove pedestal automatic ground spoiler actuator pushrod. Remove hardware attaching lower end of pushrod to control arm on automatic ground spoiler actuator. (SPOILER AUTOMATIC ACTUATOR - MAINTENANCE PRACTICES, PAGEBLOCK 27-62-05/201)Remove hardware attaching upper end of pushrod to ground spoiler crank in speed brake lever. Carefully allow crank to fall to its downward position when disconnected from pushrod.

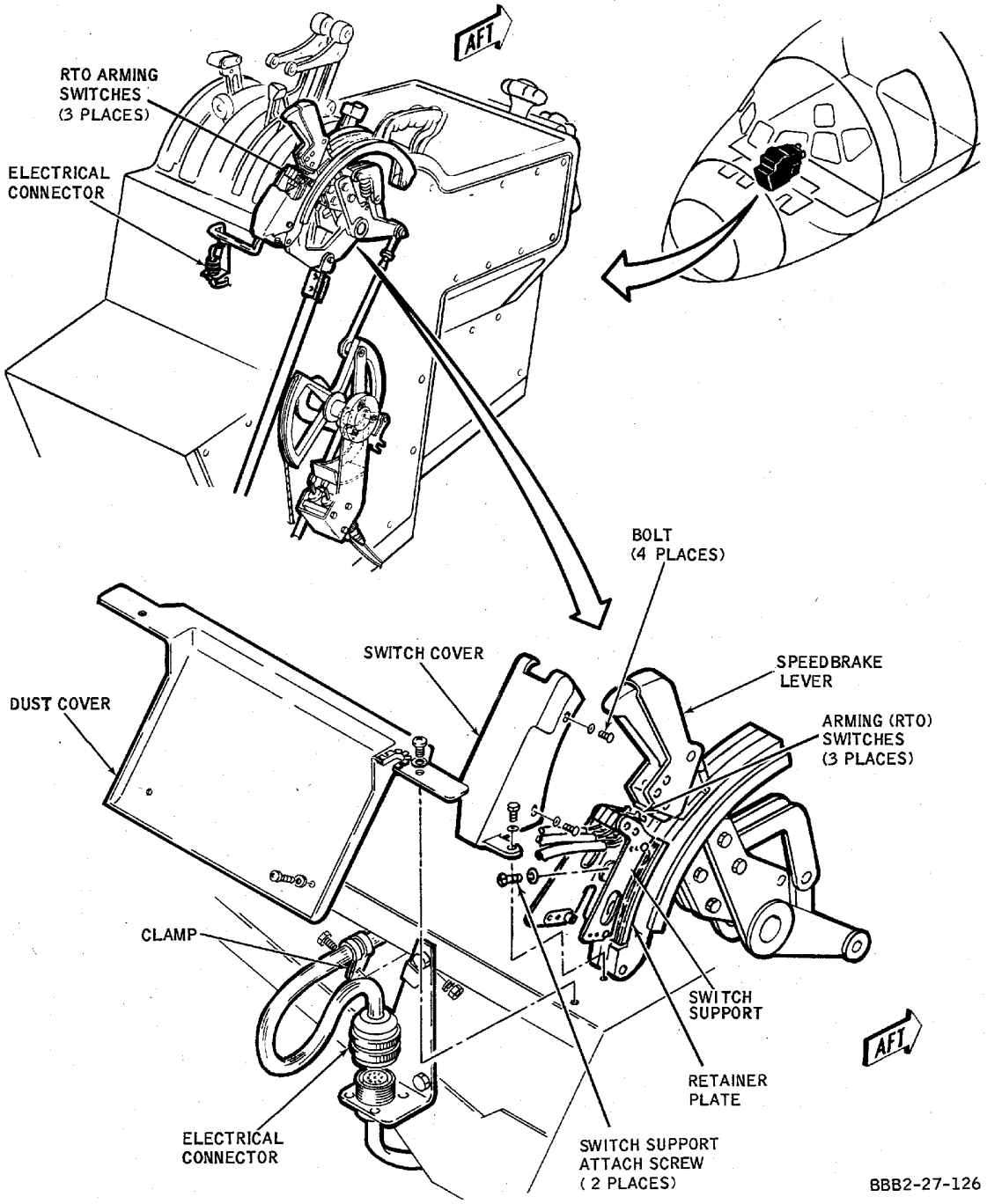
(23) Remove nuts and washers from flush-head bolts attaching speed brake lever quadrant and cams to pedestal upper frame. To facilitate quadrant and cam removal, arm speed brake lever by pulling up. Remove aft attaching bolt. Move forward attaching bolt as far as possible outboard (Forward bolt cannot be completely removed). Watch for spacers installed in upper pedestal frame adjacent to right side speed brake lever cam. Remove right side speed brake lever cam then quadrant followed by left side cam.

(24) Remove hardware attaching speed brake lever pushrod from aft side of speed brake lever. Speed brake lever must be moved slightly outboard on pedestal lever shaft to allow removal of bolt attaching pushrod to lever. Move pushrod aft to clear speed brake lever.

(25) Push speed brake lever down into its unarmed position. Rotate ground spoiler crank in speed brake lever until it passes through lever as far as possible. With smaller pilot of shaft removal tool inserted into left end of pedestal lever shaft, carefully move speed brake lever outboard onto tool. While making sure spacer(s) located immediately inboard of speed brake lever remains on shaft, withdraw lever and tool as one unit.

(26) Note number and position of shim washers between ground spoiler crank and legs of speed brake lever. Remove lever from shaft removal tool. Remove crank and shim washers from lever.

(27) If serviceable, remove and retain left side (not staked) shaft bearing from speed brake lever.



Speedbrake Control Lever -- Removal/Installation
Figure 401/27-62-11-990-801

3. Speed Brake Lever - Install

A. Install Speed Brake Lever

(1) Install a serviceable shaft bearing into left leg of speed brake lever. Leave bearing slightly outboard in lever to provide space for ground spoiler crank and shim washers.

(2) Install ground spoiler crank and shim washers into speed brake lever. Position shims as noted in Paragraph 2.A.(26) of speed brake lever removal procedure. Check for proper crank position within lever as follows:

(a) Install lever onto shaft removal tool. (Paragraph 1.D.)

(b) Move shaft bearing in left leg of speed brake lever inboard until clearance between bearings, shim washers, and crank is removed.

(c) With speed brake lever in its unarmed position, rotate ground spoiler crank through lever. Make sure that crank passes through approximate center of opening in lever and that crank does not ride against inside of lever.

(d) Correct any riding condition between ground spoiler crank and speed brake lever by repositioning shim washers as required to center crank in lever. Total number of shims installed in lever should be same as removed in Paragraph 2.A.(26) of speed brake lever removal procedure.

(3) Install speed brake lever on shaft removal tool. End of tool with smaller pilot should extend from right side of speed brake lever. With lever in its unarmed position, rotate ground spoiler crank until it passes through lever as far as possible. Make sure spacer(s) located on pedestal lever shaft immediately inboard of speed brake lever is in place, then install lever and tool into pedestal as one unit. With smaller pilot of shaft removal tool inserted into left end of pedestal lever shaft, carefully move speed brake lever inboard onto shaft. Carefully allow ground spoiler crank to fall to its downward position.

(4) Attach speed brake lever pushrod to aft side of speed brake lever. Bend cotter pin around nut instead of over end of bolt to ensure sufficient clearance with plastic shield installed in Paragraph 3.A.(7).

(5) Pull speed brake lever up into its armed position. Install speed brake quadrant and cams. Make sure that spacers remain in upper pedestal frame when quadrant and cam attach bolts are moved into place to install nuts and washers.

(6) Install pedestal automatic ground spoiler actuator pushrod. Push speed brake lever down into its unarmed position. Attach pushrod to control arm on automatic ground spoiler actuator SPOILER AUTOMATIC ACTUATOR - MAINTENANCE PRACTICES, PAGEBLOCK 27-62-05/201and to ground spoiler crank in speed brake lever.

(7) Install right side plastic shield.

CAUTION: IF ANY CABLE RUNS HAVE BEEN DISCONNECTED AT TURNBUCKLES, CABLE BLOCKS INSTALLED MUST BE REMOVED FROM CABLES AT FAIRLEADS, FEED-THRUS, STRUCTURAL FRAMES/BEAMS AND/OR BULKHEADS PRIOR TO ATTACHING TO PILOT CONTROLS.

CAUTION: SECURITY RESTRAINTS MUST BE REMOVED FROM THE ENDS OF ALL DISCONNECTED CABLES PRIOR TO ATTACHING TO PILOT CONTROLS.

(8) Attach cable runs 132 (forward) and 131 (aft) to horizontal stabilizer trim position indicator. Install spacer(s) onto pedestal lever shaft. Align bearing in indicator with end of shaft. Slowly drive shaft to left by gently striking shaft with a soft-faced hammer. While driving shaft, restrain indicator, and other components mounted on shaft, by maintaining hand pressure against indicator toward center of pedestal. This will help prevent components from spreading out on shaft, which could prevent installation of components mounted on far left end of shaft. Drive shaft until it protrudes short distance from left side of indicator.

(9) Attach cable runs 127 (forward) and 128 (aft) to right horizontal stabilizer trim control lever (brake override switch). Install spacer (if removed in Paragraph 2.A.(19) of speed brake lever removal procedure) onto pedestal lever shaft. Align bearings in control lever with end of shaft. Restrain control lever as noted in Paragraph 3.A.(8) and drive shaft until it protrudes a short distance from left side of lever.

(10) Install left side plastic shield.

(11) Attach cable runs 125 (forward) and 126 (aft) to left horizontal stabilizer trim control lever (motor control). Install spacer onto pedestal lever shaft. Align bearings in control lever with end of shaft. Restrain control lever as noted in Paragraph 3.A.(8) and drive shaft until flush with left side of lever.

(12) Align takeoff warning calculator longitudinal position indicator crank and spacer(s) with end of pedestal lever shaft and drive shaft until flush with left side of crank.

(13) Insert drift or other suitable tool into left end of pedestal lever shaft. Lift shaft sufficiently to clear left side pedestal frame. Drive shaft until bolt hole in left end of shaft is aligned with corresponding bolt hole in pedestal frame. Lower shaft and remove tool.

(14) Install bushing on tool used in Paragraph 2.A.(13) , in proper orientation for installation onto pedestal lever shaft. Insert tool into left end of shaft and lift shaft sufficiently to slide bushing from tool onto end of shaft. Lower shaft and remove tool.

(15) Using 3/16 inch diameter pin punch or similar tool, align bolt holes in bushing, pedestal lever shaft, and left side pedestal frame. Install bolt to secure left end of shaft.

(16) Install takeoff warning calculator attachment bolts, washers, and cable guard spacers through plastic shields and into left side pedestal frame as removed in Paragraph 2.A.(13) of speed brake lever removal procedure.

(17) Position dial-a-flap indicating dial (12) and install attaching screws (9). (Figure 402, Sheet 2)

(18) Tension cables loosened in (Paragraph 2.A.(11)) of speed brake lever removal procedure. Check for proper function of each system affected. Check for proper function of speed brake controls. (SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 or SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 Config 2)

(19) Install takeoff warning calculator. (HORIZONTAL STABILIZER POSITION INDICATOR MODULE - MAINTENANCE PRACTICES, PAGEBLOCK 27-40-12/201)

(20) Install NLG IND trim plate and filler strip at forward edge of aft pedestal.

(21) Install light plates:

(a) LONG TRIM indicator plate located on left side of speed brake lever.

(b) Center plate located on right side of speed brake lever. After installing plate, install knobs on rudder hydraulic power, alternate longitudinal trim, and fuel shutoff levers.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(22) Install serrated retainer plate and speed brake arming switches. (SPEEDBRAKE CONTROL LEVER ARMING SWITCHES - MAINTENANCE PRACTICES, PAGEBLOCK 27-62-08/201)

WJE ALL

(23) Remove any materials placed in pedestal area to catch dropped parts and perform thorough inspection of pedestal. Check for such discrepancies as improperly routed cables, foreign objects, and riding conditions during movement of affected levers and mechanisms.

(24) Install left forward, right forward, and flap module pedestal side covers.

(25) Install dust shield located at center of forward pedestal and speed brake arm switch assembly cover (switch cover for auto brake equipped aircraft only).

(26) Install electronic equipment units or space covers as removed in Paragraph 2.A.(4) of speed brake lever removal procedure.

(27) Install Captain's and First Officr's seats. (CAPTAIN'S AND FIRST OFFICER'S SEATS - MAINTENANCE PRACTICES, PAGEBLOCK 25-13-01/201)

(28) Remove the safety tags and close these circuit breakers:

CAPTS, CENTER PANEL & PEDESTAL CBP

Row	Col	Number	Name
		B1-310	PANEL WHITE INTEGRAL LTS - PEDESTAL
		B1-311	PANEL WHITE INTEGRAL LTS - PEDESTAL

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, DC AIR CONDITIONING & MISCELLANEOUS

Row	Col	Number	Name
U	22	B1-757	CABIN PRESSURE CONTROL-1
W	22	B1-759	CABIN PRESSURE CONTROL-2

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL
P	38	B1-832	CAWS, SSRS-1, LDG GR, T/O, A/P, SP BK, CAB ALT

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
R	33	B1-229	RUDDER CONTROL MANUAL ADVISORY

(Continued)

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name

WJE ALL

UPPER EPC, AIR CONDITIONING - LEFT AC BUS

Row	Col	Number	Name
H	2	B1-756	CABIN PRESSURE CONTROL-1

UPPER EPC, AIR CONDITIONING - RIGHT AC BUS

Row	Col	Number	Name
J	2	B1-758	CABIN PRESSURE CONTROL-2

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
D	18	B10-332	AUTO THROTTLE-1

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	18	B10-365	AUTO THROTTLE-1
G	22	B10-90	PRIMARY LONGITUDINAL TRIM CONTROL
G	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, LIGHTS - LEFT AC BUS

Row	Col	Number	Name
K	19	B1-309	INTEGRAL LIGHTS PEDESTAL

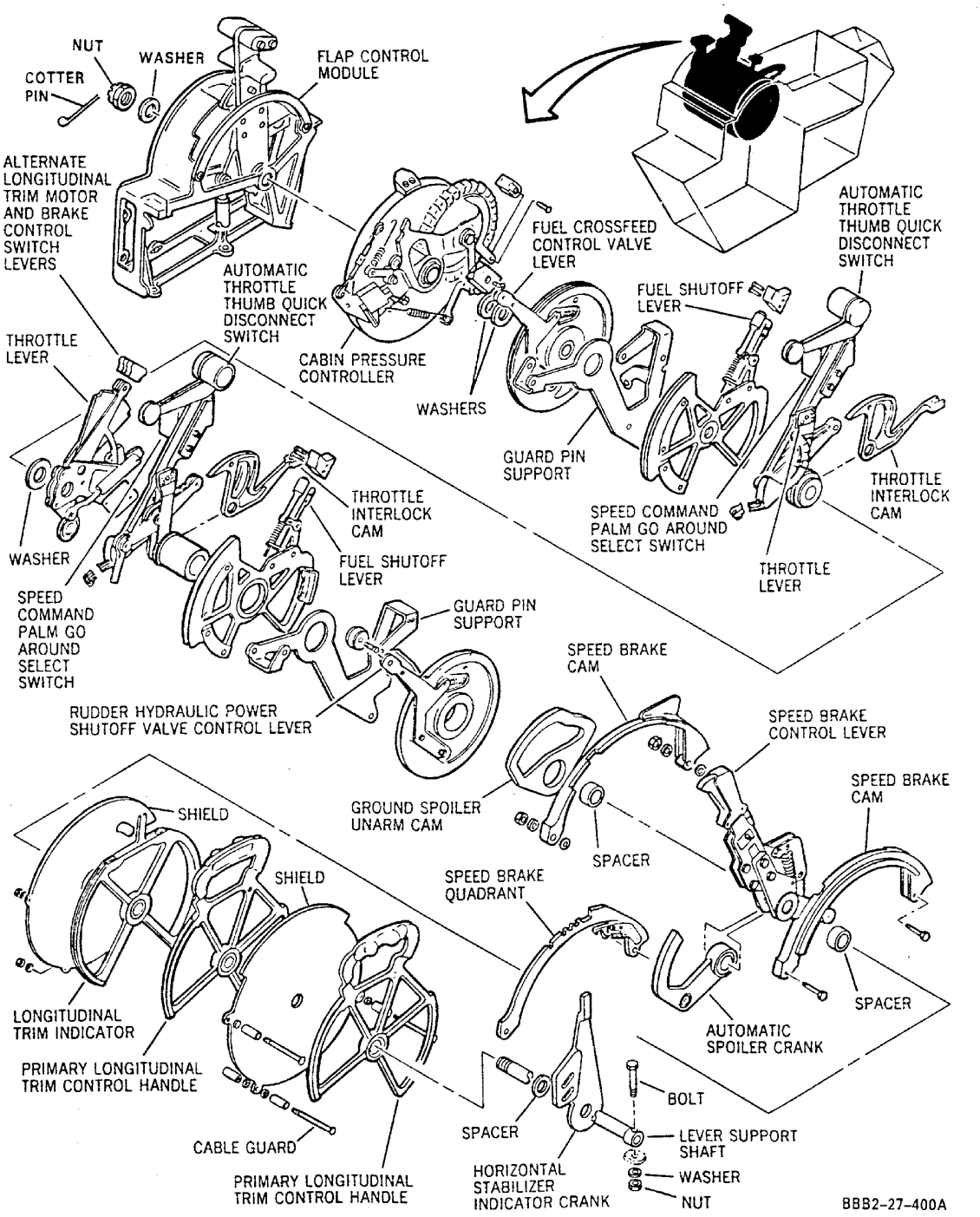
UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
D	6	B10-333	AUTO THROTTLE-2
D	9	B10-62	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE A
D	10	B10-61	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE B
D	11	B10-60	AUTOPILOT & ALTERNATE LONGITUDINAL TRIM PHASE C

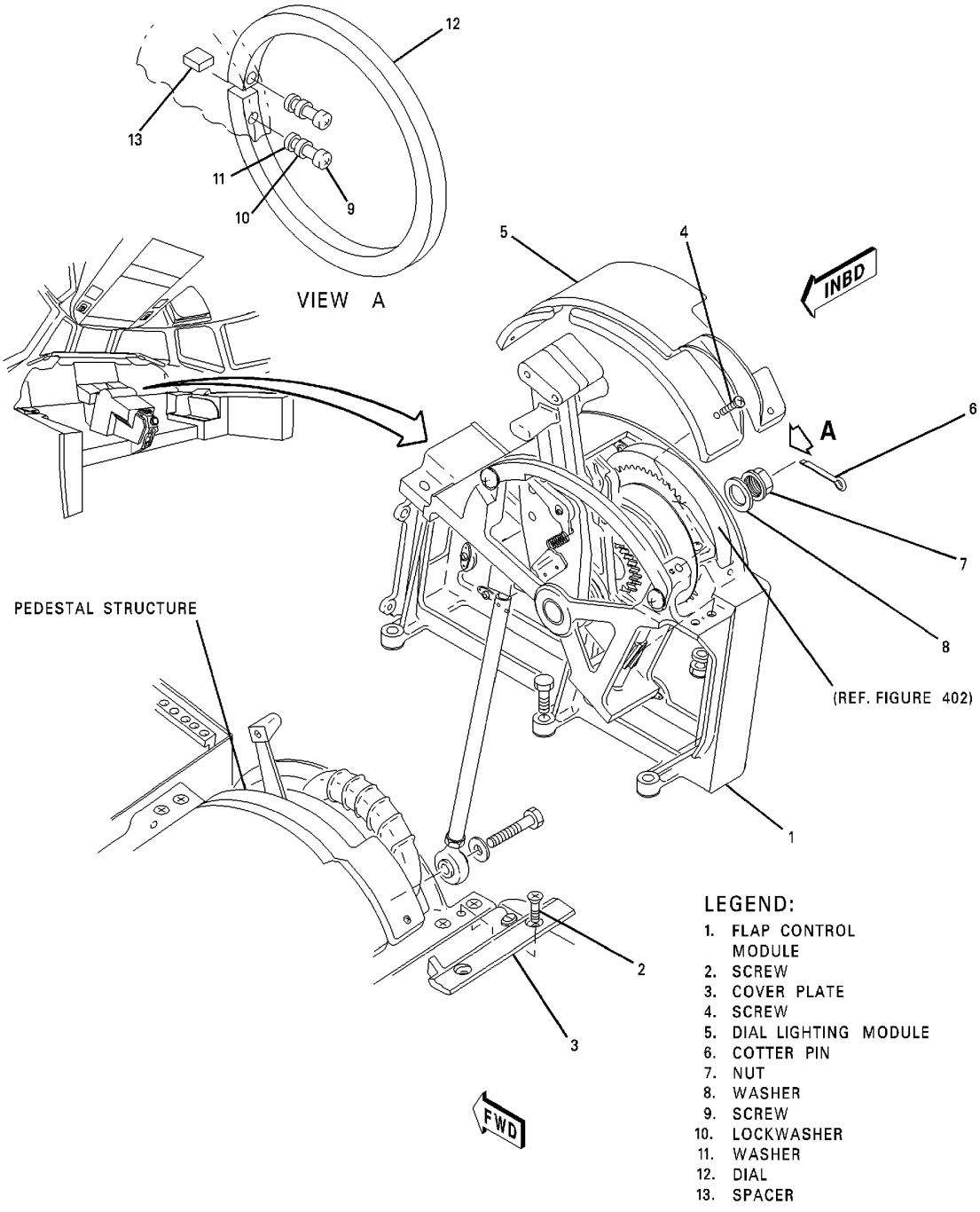
UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
E	6	B10-366	AUTO THROTTLE -2
G	24	B10-194	STAB MOTION INDICATOR

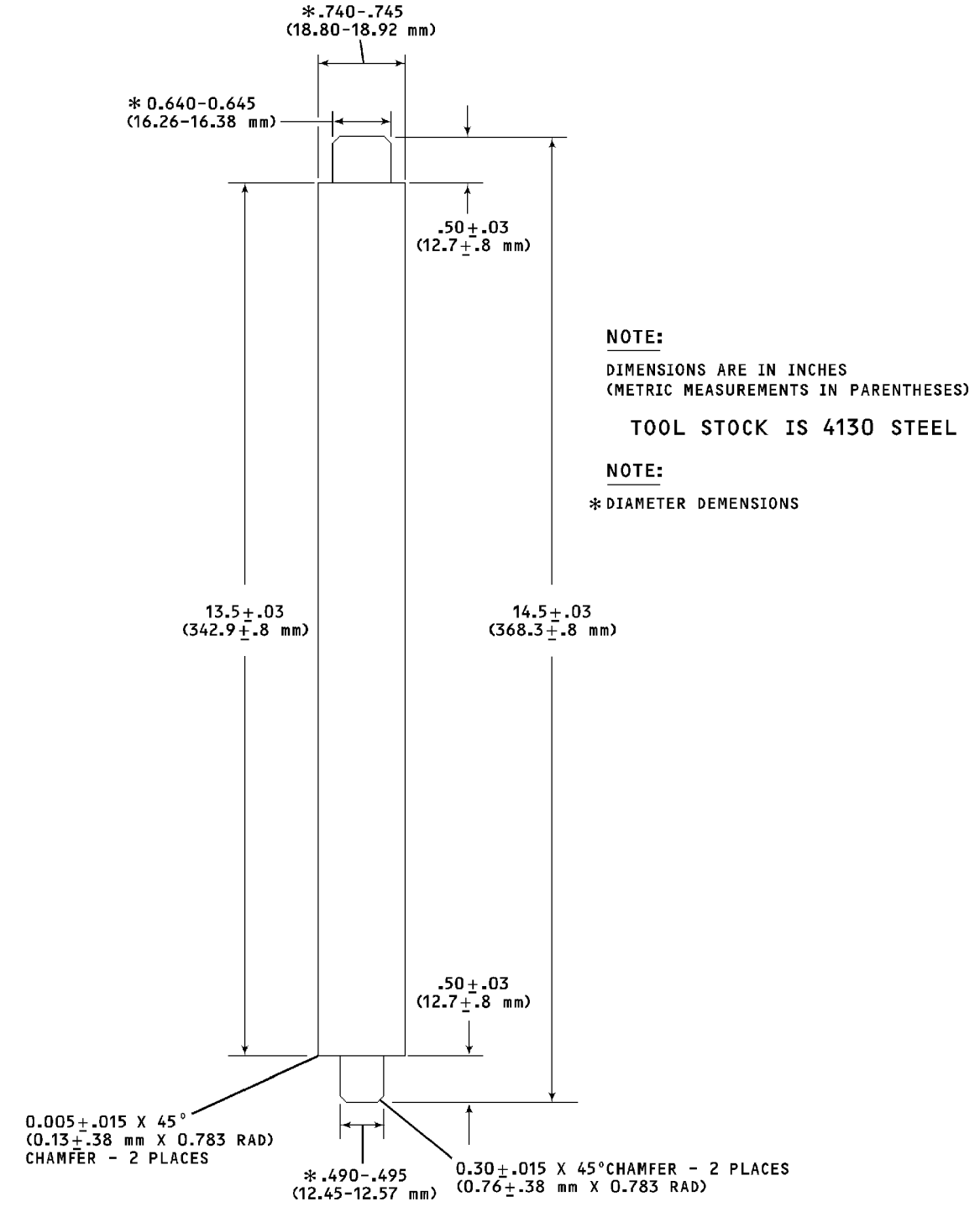
(29) Make certain that position of thrust reverser control levers corresponds with position of thrust reverser doors. Remove and stow safety pins from left and right thrust reverser control valves. Close and latch access doors.



Speed Brake Lever -- Removal/Installation
Figure 402/27-62-11-990-802 (Sheet 1 of 2)



Speed Brake Lever -- Removal/Installation
Figure 402/27-62-11-990-802 (Sheet 2 of 2)



Shaft Removal/Installation Tool
Figure 403/27-62-11-990-803

PUSHROD, GROUND SPOILER OVERRIDE -- ADJUSTMENT/TEST

1. General

A. This procedure has the operational test instructions for the ground spoiler override pushrod.

B. There are two override pushrods. One for the left ground spoiler and one for the right ground spoiler. The pushrods are located, respectively, in the left and right main landing gear wheel wells, adjacent to the ground spoiler control valve.

C. The procedures are the same for each left and right spoiler override pushrod.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 501

Name and Number	Manufacturer
Door safety locks (39368511, or -501 as applicable. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)	Douglas Aircraft Co.
Landing gear ground safety lock pins	Douglas Aircraft Co.
Gauge, push-pull 719-10MRP	
Tag, Safety Warning "DO NOT OPERATE"	

3. Adjustment/Test, Pushrod, Ground Spoiler Override

A. Preparation for Test

(1) Make certain airplane is electrically grounded.

(2) Place chocks in position at main gear wheels.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(3) Open these circuit breakers and install safety tags:

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(4) Make certain that landing gear ground safety lock pins are installed for maintenance.

(5) If necessary, make certain that aircraft electrical power is energized. (PAGEBLOCK 24-00-00/401)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(6) Place main gear door ground maintenance bypass lever in BYPASS position (lever extended) (located on right side fuselage forward of MLG door), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

B. Perform Test, Pushrod, Ground Spoiler Override

Table 502

STEP	OPERATION	VISUAL INSPECTION
1	Move the speed brake handle to the full RET position against the forward stop and install a "DO NOT OPERATE" tag on the speed brake handle.	The speed brake handle is at the full RET position and the "DO NOT OPERATE" tag is attached.
2	Move the spoiler shutoff valve in the left and right wheel wells to the OFF position and secure levers with safety pins.	The spoiler shutoff valves are secured in the OFF position and safety pins installed.
3	Remove and discard the cotter pin (2). Remove the nut (3), washer (4) and bolt (5) and disconnect the override pushrod (1) from the left and right ground spoiler control valves.	The override pushrod (1) is disconnected from the left and right ground spoiler control valves.
4	Compress the left override pushrod (1) three times to check for freedom of movement.	The left override pushrod moves a minimum of 1.0 in. (25.4 mm) from neutral.
5	Check the left override pushrod spring rate by compressing the free rod end until pushrod movement is indicated.	The spring load is approximately 9.0 lb (4.1 kg).
6	Compress the right override pushrod (1) three times to check for freedom of movement.	The right override pushrod moves a minimum of 1.0 in. (25.4 mm) from neutral.
7	Check the right override pushrod spring rate by compressing the free rod end until pushrod movement is indicated.	The spring load is approximately 9.0 lb (4.1 kg).
8	Position the left and right override pushrods to the ground spoiler control valves. Install the bolt (5), washer (4) and nut (3). Safety the nut with cotter pin (3).	The left and right override pushrods (1) are installed and secured to the ground spoiler control valves.
9	Move the spoiler shutoff valve in the left and right wheel wells to the ON position and secure levers with safety pins.	The spoiler shutoff valves are secured in the ON position.

4. Close-up - Test, Pushrod, Ground Spoiler Override

A. Restore all systems controls, switches, instrument panels and work areas to pretest configuration.

(1) Remove "DO NOT OPERATE" tag from speed brake handle.

B. Remove all tools and equipment from work areas. Make certain that work areas are clean.

C. Remove the safety tags and close these circuit breakers:

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

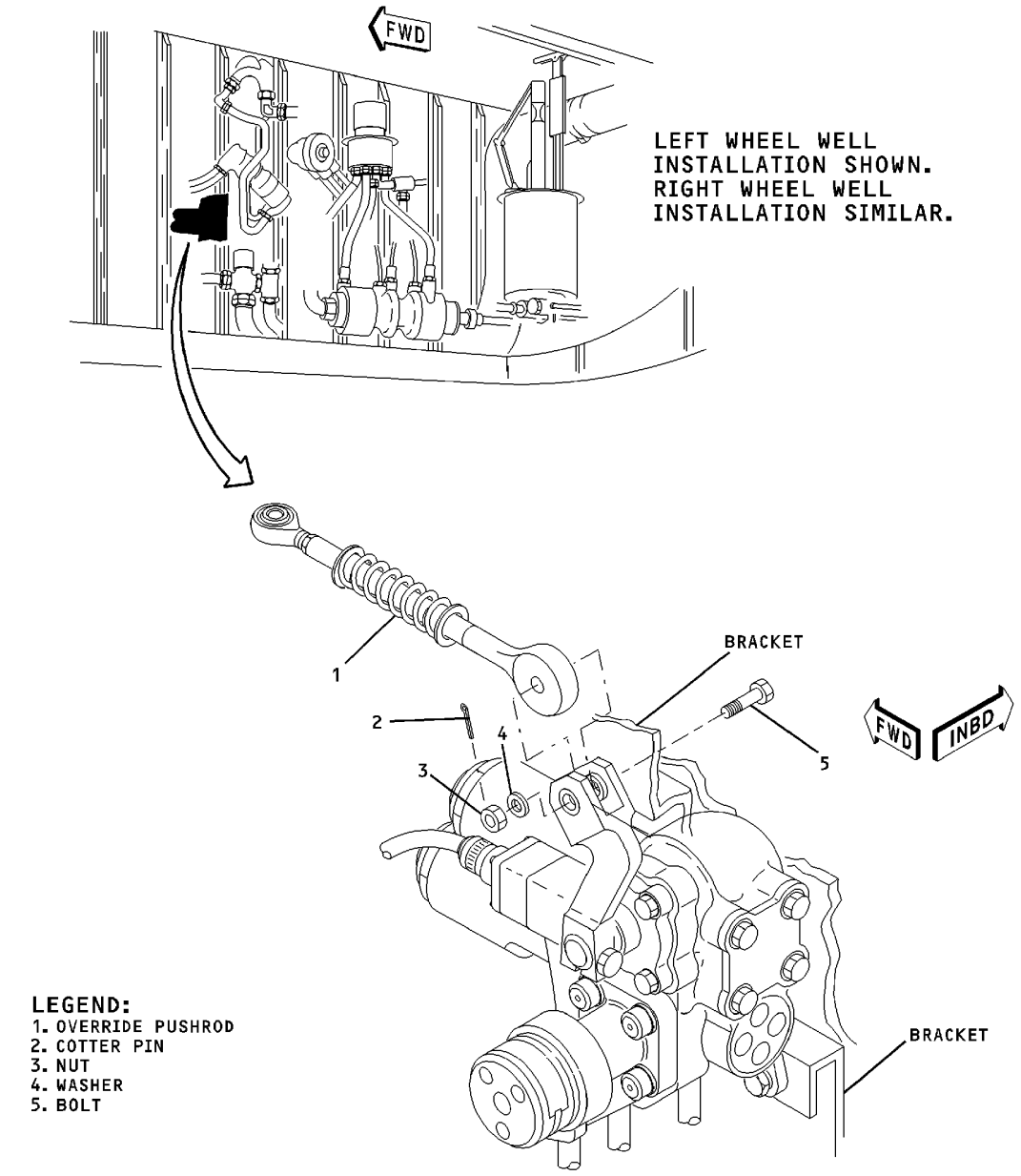
UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

D. Pressurize applicable hydraulic system. (PAGEBLOCK 29-00-00/201)

E. Remove landing gear door ground safety locks, close inboard main landing gear doors, and return main gear door ground maintenance bypass lever to normal position (lever retracted). (PAGEBLOCK 32-00-00/201)

F. Depressurize applicable hydraulic system. (PAGEBLOCK 29-00-00/201)



Pushrod, Ground Spoiler Override -- Adjustment/Test
Figure 501/27-62-13-990-801

PUSHROD, GROUND SPOILER OVERRIDE - ADJUSTMENT/TEST

1. General

A. This procedure contains MSG-3 task card data.

TASK 27-62-13-710-801

2. Operational Check of the Ground Spoiler Override Pushrod

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
24-00-00 P/B 001	GENERAL - DESCRIPTION AND OPERATION
29-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES
32-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES

B. Tools/Equipment

Reference	Description
STD-858	Tag - DO NOT OPERATE

C. Prepare for the Operational Check of the Ground Spoiler Override Pushrod

SUBTASK 27-62-13-861-001

(1) Make certain airplane is electrically grounded.

(2) Place chocks in position at main gear wheels.

(3) Install DO NOT OPERATE tag, STD-858 tag on speed brake handle.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open these circuit breakers and install safety tags:

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(5) Make certain that landing gear ground safety lock pins are installed for maintenance.

(6) Energize the aircraft electrical power system. (GENERAL - DESCRIPTION AND OPERATION, PAGEBLOCK 24-00-00/001)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(7) Place main gear door ground maintenance bypass lever in BYPASS position (lever extended) (located on right side fuselage forward of MLG door), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

D. Operational Check of the Ground Spoiler Override Pushrod

SUBTASK 27-62-13-710-001

(1) Do an operational check of the ground spoiler override pushrod. (Figure 501)

Table 501

STEP	OPERATION	VISUAL INSPECTION
1	Move the speed brake handle to the full RET position against the forward stop and install a "DO NOT OPERATE" tag on the speed brake handle.	The speed brake handle is at the full RET position and the "DO NOT OPERATE" tag is attached.
2	Move the spoiler shutoff valve in the left and right wheel wells to the OFF position and secure levers with safety pins.	The spoiler shutoff valves are secured in the OFF position and safety pins installed.
3	Remove and discard the cotter pin (2). Remove the nut (3), washer (4) and bolt (5) and disconnect the override pushrod (1) from the left and right ground spoiler control valves.	The override pushrod (1) is disconnected from the left and right ground spoiler control valves.
4	Compress the left override pushrod (1) three times to check for freedom of movement.	The left override pushrod moves a minimum of 1.0 in. (25.4 mm) from neutral.
5	Check the left override pushrod spring rate by compressing the free rod end until pushrod movement is indicated.	The spring load is approximately 9.0 lb (4.1 kg).
6	Compress the right override pushrod (1) three times to check for freedom of movement.	The right override pushrod moves a minimum of 1.0 in. (25.4 mm) from neutral.
7	Check the right override pushrod spring rate by compressing the free rod end until pushrod movement is indicated.	The spring load is approximately 9.0 lb (4.1 kg).
8	Position the left and right override pushrods to the ground spoiler control valves. Install the bolt (5), washer (4) and nut (3). Safety the nut with cotter pin (3).	The left and right override pushrods (1) are installed and secured to the ground spoiler control valves.
9	Move the spoiler shutoff valve in the left and right wheel wells to the ON position and secure levers with safety pins.	The spoiler shutoff valves are secured in the ON position.

E. Job Close-up

SUBTASK 27-62-13-942-001

(1) Remove DO NOT OPERATE tag, STD-858 tag from speed brake handle.

(2) Remove all tools and equipment from work areas. Make certain that work areas are clean.

(3) Remove the safety tags and close these circuit breakers:

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

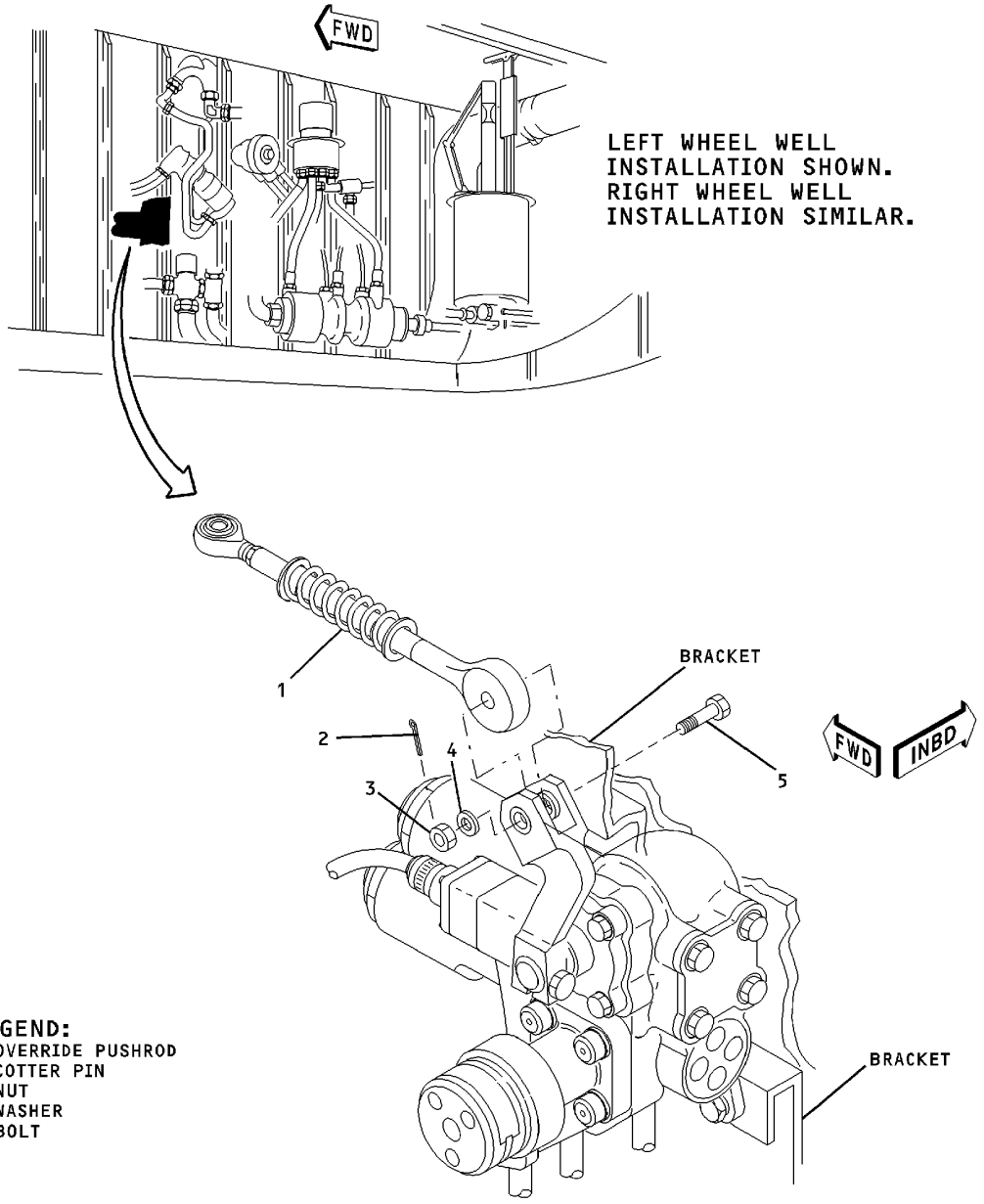
WARNING: MAKE SURE TO KEEP PERSONNEL CLEAR OF FLIGHT CONTROL SURFACES IF HYDRAULIC POWER IS APPLIED.

(4) Pressurize applicable hydraulic system. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

(5) Remove landing gear door ground safety locks, close inboard main landing gear doors, and return main gear door ground maintenance bypass lever to normal position (lever retracted). (PAGEBLOCK 32-00-00/201)

(6) Depressurize applicable hydraulic system. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

END OF TASK



Pushrod, Ground Spoiler Override -- Adjustment/Test
Figure 501/27-62-13-990-802

LIFT AUGMENTING - DESCRIPTION AND OPERATION

1. General

A. The wing leading edge slats are lift augmenting surfaces that are used in conjunction with the flaps. The slats are partially extended at flap takeoff angles to give a combination of high lift and low drag and are fully extended at the landing approach to provide maximum lift. The slat system consists of the leading edge slats and five subsystems: slat mechanical controls, slat hydraulic actuation, slat mechanical actuation, slat position indicating, and auto slat extend system.

2. Leading Edge Slats

A. There are six slats on the leading edge of each wing, numbered 0 through 5 from inboard to outboard. Each slat is supported by tracks that ride along rollers located in the wing leading edge. There are 15 slat tracks: seven drive tracks, five idler tracks, and three common-idler tracks. The drive track on each slat is connected to the slat mechanical actuation cable system. The idler tracks, used to support and guide the slats, are located in the inboard ends of slats 0, 1 and 2 and the outboard ends of slats 1 and 5. The common-idler tracks are similar to the idler tracks except they are used to support two adjacent slats. Stops are provided on all idler and drive tracks to prevent slat overtravel in the retract direction. The drive tracks also have stops to prevent overtravel in the extend direction.

3. Slat Mechanical Control

A. Description

(1) The slat mechanical controls consist of the flap/slat control handle, cable systems, and mechanical linkages that control the slat hydraulic actuation components from the flight compartment.

(2) Mechanical control of the slats is from the flap/slat control handle mounted on the pilots' control pedestal in the flight compartment. A single non-adjustable push-rod extends down from the handle to a dual groove cable drum mounted within the pedestal. Two closed loop cable systems route down from the drum to a point below the floor and then aft to the wing front spar. The cables terminate at a dual groove input cable drum within the flap and slat sequence mechanism. The mechanism is mounted at the upper edge of the wing front spar just to the right of the aircraft centerline. Mounted on a common pivot shaft with the input cable drum and located one above and one below the input drum are two override clappers. The lower clapper rotates a flap command cable drum driving a closed loop cable system to the flap control valve summing linkage. The upper override drives a crank which repositions a dwell linkage. The pushrod output of the dwell linkage drives the slat command sequence mechanism. A third cable drum, the spiral groove flap interlock drum, is mounted on the same pivot shaft as the override clappers and the input cable drum. The flap interlock drum is driven by the single closed loop flap gate cable system. Flap gate cables are connected to the flap buss cables in the right hand wheel well. Routing of flap gate cables is up thru pressure seals near the aircraft centerline and then forward above the wing structure to the spiral groove flap interlock drum. The drum contains a spiral shaped cam groove which drives a roller attached to an idler crank. Output of the idler crank is thru a single acting bungee push rod which drives a hook to engage the pilot command linkage portion of the slat command sequence mechanism. Engagement occurs when the flaps are down 3.5 degrees or more and the slats are in mid-sealed position. Once the pilot command linkage has been engaged only the auto slat electric actuators can position the slat control valve.

(3) Two auto slat actuators are mounted within the flap and slat sequence mechanism. They operate in parallel to drive an either-or mechanism. The actuators are mounted to the flap and slat sequence mechanism truss and their outputs straddle a pivot shaft. This arrangement requires one actuator to extend and the other to retract when the slats operate in the range of mid-sealed to extended. The output end of each actuator is attached to a crank. As the actuators operate towards slats extend, the cranks are in contact with a third crank, on the common pivot shaft, and they rotate the third crank towards slat extend. Operation of the actuators in the slats retract direction causes the actuator cranks to rotate the third crank by pulling on dual preloaded tension springs (two springs to each actuator crank). The either-or mechanism, therefore, always has a positive drive in the slats extend direction when either one or both actuators move to extend slats. Rotation of the either-or mechanism is transmitted by a tang on the third crank to an override clapper. The override clapper is driven by a crank which is spline connected to the common pivot shaft for the actuator cranks. The common pivot shaft acts as a torque tube to transmit motion to a crank riveted to the top of the tube. The top crank drives a set of links which are attached by means of a pushrod to the forward end of the summing link of the slat control valve. The summing link is supported and pivoted by a pair of arms extending from a vertically pivoted crank. A second arm extending from the vertical crank is connected to the slat hydraulic control valve by means of a pushrod. A pushrod attached to the aft end of the summing link extends to the slat follow-up cable drum. This drum is mounted on the common pivot shaft for the dual groove input cable drum, flap command cable drum, and spiral groove flap interlock drum. A single closed loop cable system is routed inboard from the slat follow-up cable drum to the slat drive drum in the slat drive mechanism assembly.

B. Operation

(1) Extension and retraction of the slats is controlled by the flap/slat control handle on the pilots' control pedestal. The slats have three positions, retracted, mid-sealed and extended.

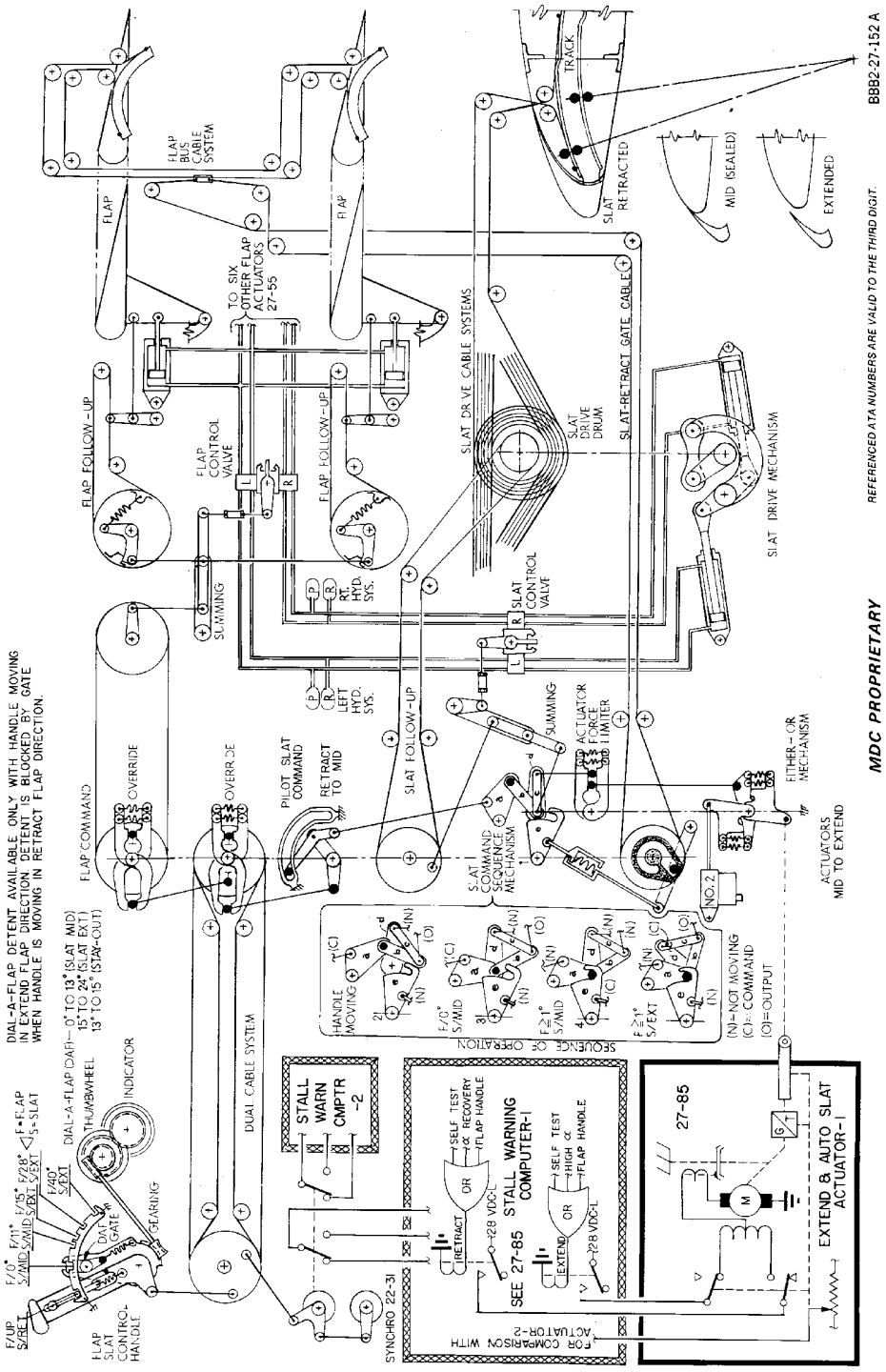
(2) Movement of the flap/slat handle drives a pushrod to rotate a cable drum in the lower portion of the center pedestal. Two closed loop cable systems transmit handle motion to a cable drum within the flap and slat sequence mechanism. As the drum rotates it turns two dual spring loaded override clappers. One clapper drives a cable drum and closed loop cable system to the flap control valve summing linkage.

(3) The flap control valve is fully ported to flaps up hydraulic pressure when the flap/slat handle is in the UP/RET position. The valve is at null with the handle in the 0/MID position. This arrangement allows the slats to be extended to the MID-SEALED position with a maximum of 1.5° movement of the flaps. The dual springs in the override clappers provide redundancy should one spring fail. The override clappers allow flaps to be controlled should the slat controls jam and vice versa. The overrides also allow the flap/slat handle to be placed in the desired position detent without waiting for the control surfaces to catch up to handle position. Opening of the clappers is limited to allow imposition of 200 pounds (90.72 Kg) at the flap and slat control valve slide should either slide become jammed by a chip. The output of the second clapper drives a dwell mechanism. The function of the dwell mechanism is to allow movement of the flap/slat handle beyond the 0°/MID detent without additional manual input to the slat control valve. The output of the dwell mechanism rotates the slat command sequence mechanism linkage which in turn drives the slat summing linkage to reposition the slat control valve. The slat control valve is a dual valve with a single mechanical input. One side of the valve is supplied with hydraulic fluid from the left hydraulic system. The remaining side of the valve is supplied by the right hydraulic system. Fluid from the control valve is ported to two single hydraulic actuators in the slat drive mechanism. The left hydraulic system drives one actuator and the right hydraulic system drives the second actuator. Movement of the hydraulic actuators rotates the slat drive drum which transmits motion to both the slat cable systems and the single closed loop slat follow-up cable system. Motion of the slat follow-up cable system rotates a cable drum which is mounted in the flap and slat sequence mechanism. A pushrod output from the cable drum repositions the slat summing linkage to null the slat control valve and stop the flow of hydraulic fluid to the slat actuators.

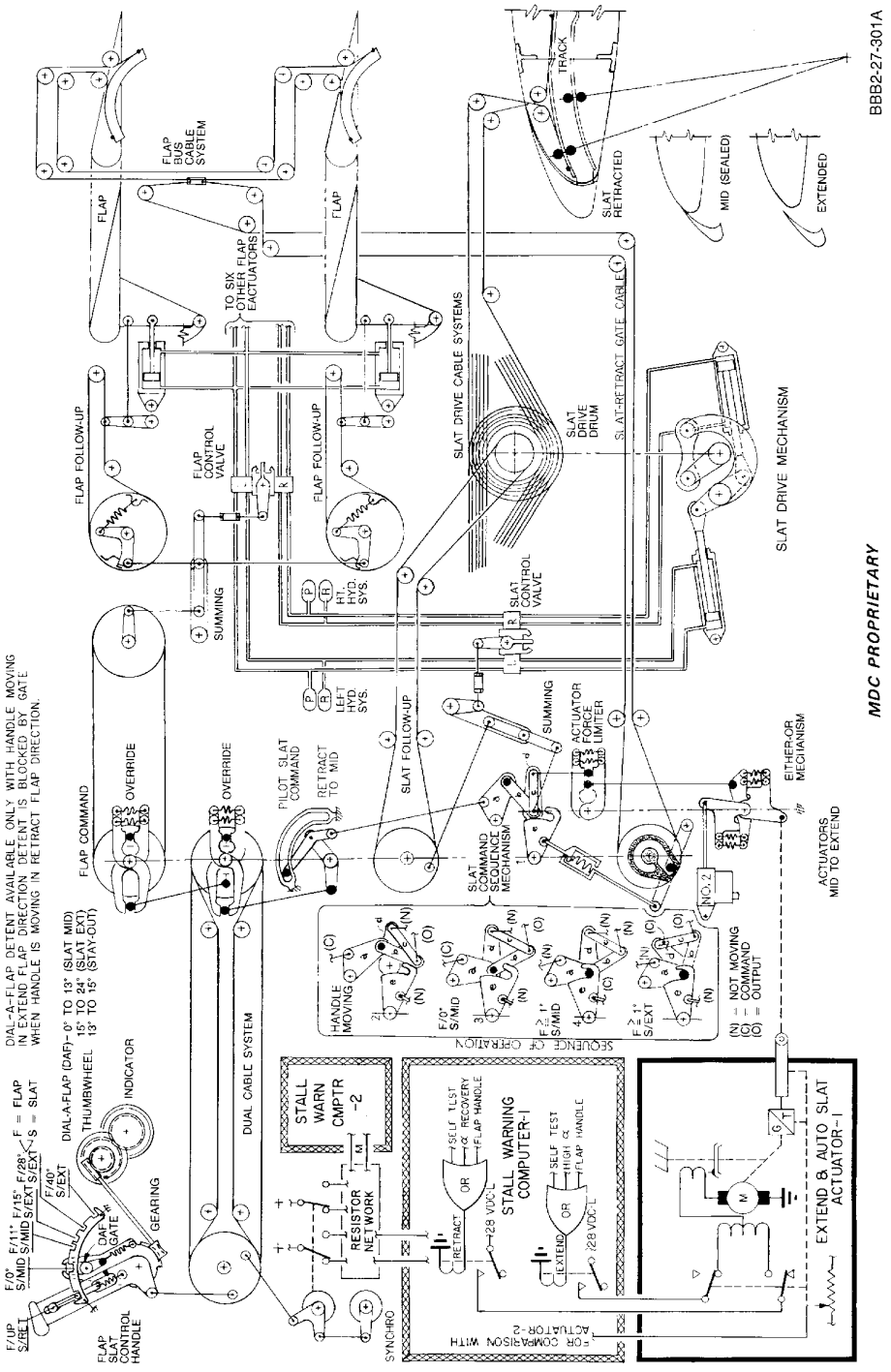
(4) Movement of the flap/slat handle from the 0/T.O. EXT detent to the 11°/T.O. EXT detent causes the flaps to be driven to the 11° down position while the dwell mechanism maintains the slats in their mid-sealed position. As the flap bus cable system travels with the flaps, it drives a single closed loop flap gate cable system which rotates the spiral groove flap interlock drum assembly. The drum assembly is mounted in the flap and slat sequence mechanism assembly. A spiral groove within the drum assembly positions a roller cantilevered from a crank. As the drum rotates the roller is driven by the shape of the spiral groove. This arrangement allows programming of the crank motion. The output end of the crank drives a single acting bungee pushrod. The pushrod moves a hook pivoted on the support bracket to engage the flap/slat handle driven portion of the slat command sequence mechanism. Engagement occurs between 0.5° and 3.5° down flap. After engagement the spiral groove allows drum rotation without further motion of the hook. after engagement of the flap/slat handle driven portion of the slat command sequence mechanism, the slats cannot be retracted to less than the mid-sealed position until the flaps have retracted to at least the 2° down position. Should the spiral groove flap interlock drum assembly ever rotate towards the engaged position before the slat command sequence mechanism is in position for engagement, the single acting bungee pushrod will compress allowing the linkage to rotate until the hook can engage the mechanism linkage. The bungee rod is single acting to insure that the hook will always pull free and allow slat retraction.

(5) Positioning of the slats from mid-sealed to full extension is achieved through operation of either or both of two parallel electric jackscrew actuators. Movement of the flap/slat control handle rotates a dual groove cable drum in the pedestal. Rotation of the cable drum drives a non-adjustable pushrod which positions a single rotary switch containing 5 micro switches. The same pushrod also positions a synchro. Two of the micro switches are used in the flap/slat position indication system. The synchro provides a flap position signal to the speed command system. Two of the remaining switches of the rotary switch provide 28 volt DC signals to the two stall warning computers. The output of the stall warning computers drive two electric jackscrew actuators to position the slats in response to pilot commands from the cockpit handle and auto slat commands from the stall warning computers.

(6) Extension or retraction of the electric actuators causes rotation of an either-or mechanism. The mechanism linkage provides a positive drive in the slats extend direction when either one or both actuators operate in the slats extend direction. Redundant springs provide the load path when the actuators operate to retract the slats to mid-sealed position. Rotation of the either-or mechanism is transmitted to the slat valve summing linkage by means of a non-adjustable pushrod. The summing linkage repositions the slat control valve via an adjustable pushrod.



Slat Mechanical Controls -- Schematic
Figure 1/27-80-00-990-801 (Sheet 1 of 2)



Slat Mechanical Controls -- Schematic
Figure 1/27-80-00-990-801 (Sheet 2 of 2)

4. **Slat Hydraulic Actuation**

A. Description

(1) The slat hydraulic actuation components are powered by two independent hydraulic systems. The systems are completely separated within the control valves so that, in the event of pressure loss in one system, the remaining system will operate the slats. The hydraulic actuation components consist of one slat control valve, and two slat cylinders.

WJE 409, 884

(2) The slat control valve, located on the wing front spar, adjacent to the sequence mechanism, meters hydraulic pressure to the slat cylinders. The control valve is a dual valve, consisting of two slide valves, in a common housing, mechanically interconnected for simultaneous operation. Each slide valve has a pressure inlet port, a return port and pressure outlet port. The inlet and return ports on one slide valve are connected to the left hydraulic system, and the inlet and return ports on the second slide valve are connected to the right hydraulic system. Two-way flow restrictors in the outlet (extend) ports on earlier aircraft, or (in the extend lines on later aircraft), and inlet (retract) ports limit the operating speed of the slat cylinders.

WJE 401-408, 410-412, 414-427, 429, 861-866, 868, 869, 871-881, 883, 886, 887, 891-893

(3) The slat control valve, located on the wing front spar, adjacent to the sequence mechanism, meters hydraulic pressure to the slat cylinders. The control valve is a dual valve, consisting of two slide valves, in a common housing, mechanically interconnected for simultaneous operation. Each slide valve has a pressure inlet port, a return port and pressure outlet port. The inlet and return ports on one slide valve are connected to the left hydraulic system, and the inlet and return ports on the second slide valve are connected to the right hydraulic system. Two-way flow restrictors in the outlet (extend) lines and inlet (retract) ports limit the operating speed of the slat cylinders.

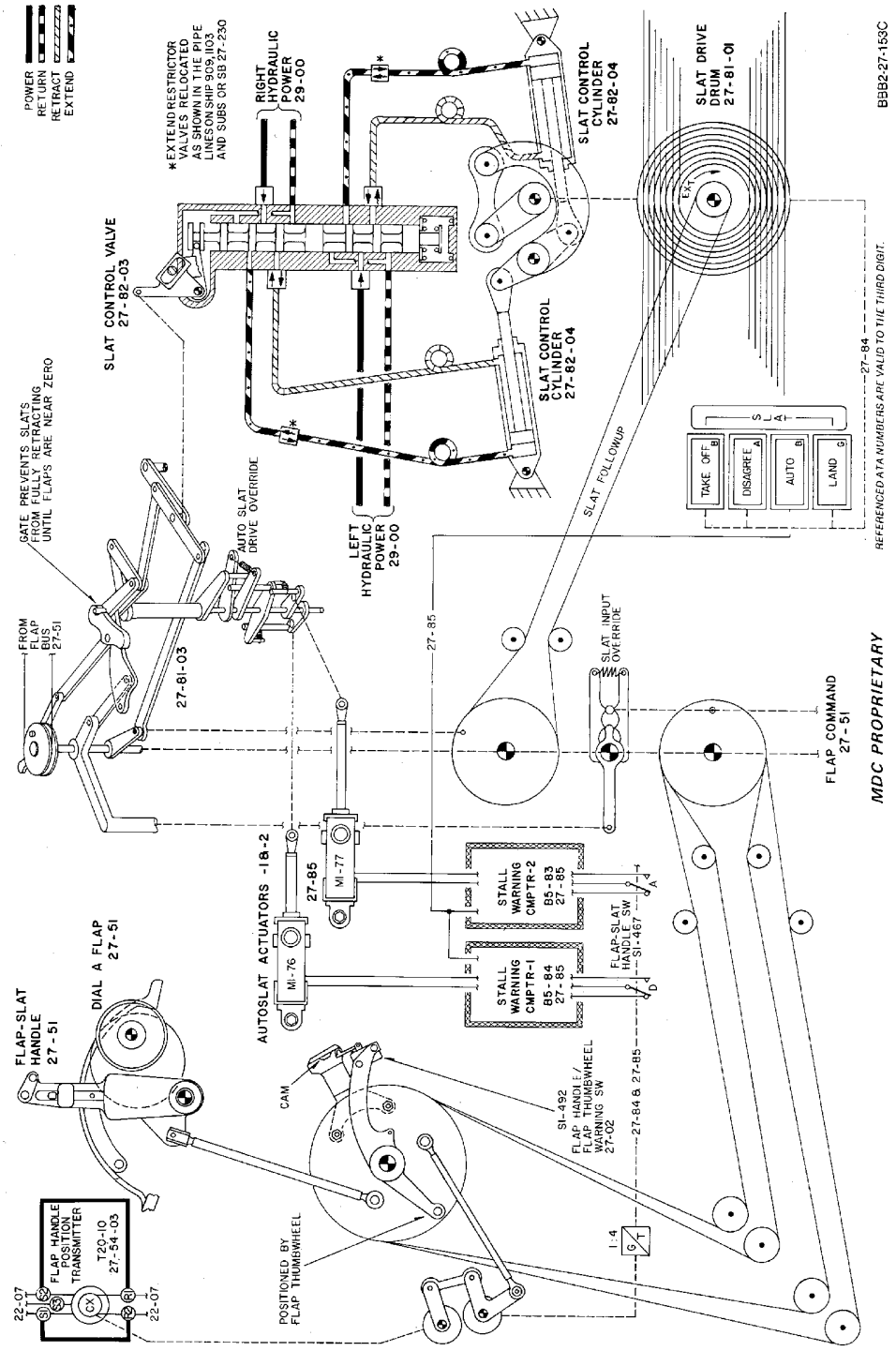
WJE ALL

(4) The slat cylinders are two-way hydraulic cylinder used to rotate the drive mechanisms that mechanically actuate the slats. Two cylinders are mounted on the drive mechanism. Each cylinder has a barrel, piston, and piston rod end. The barrel has a retract port on one end and an extend port on the opposite end. A clevis on each cylinder barrel is attached to the drive mechanism bracket. The piston rod ends are connected to the drive mechanism shaft.

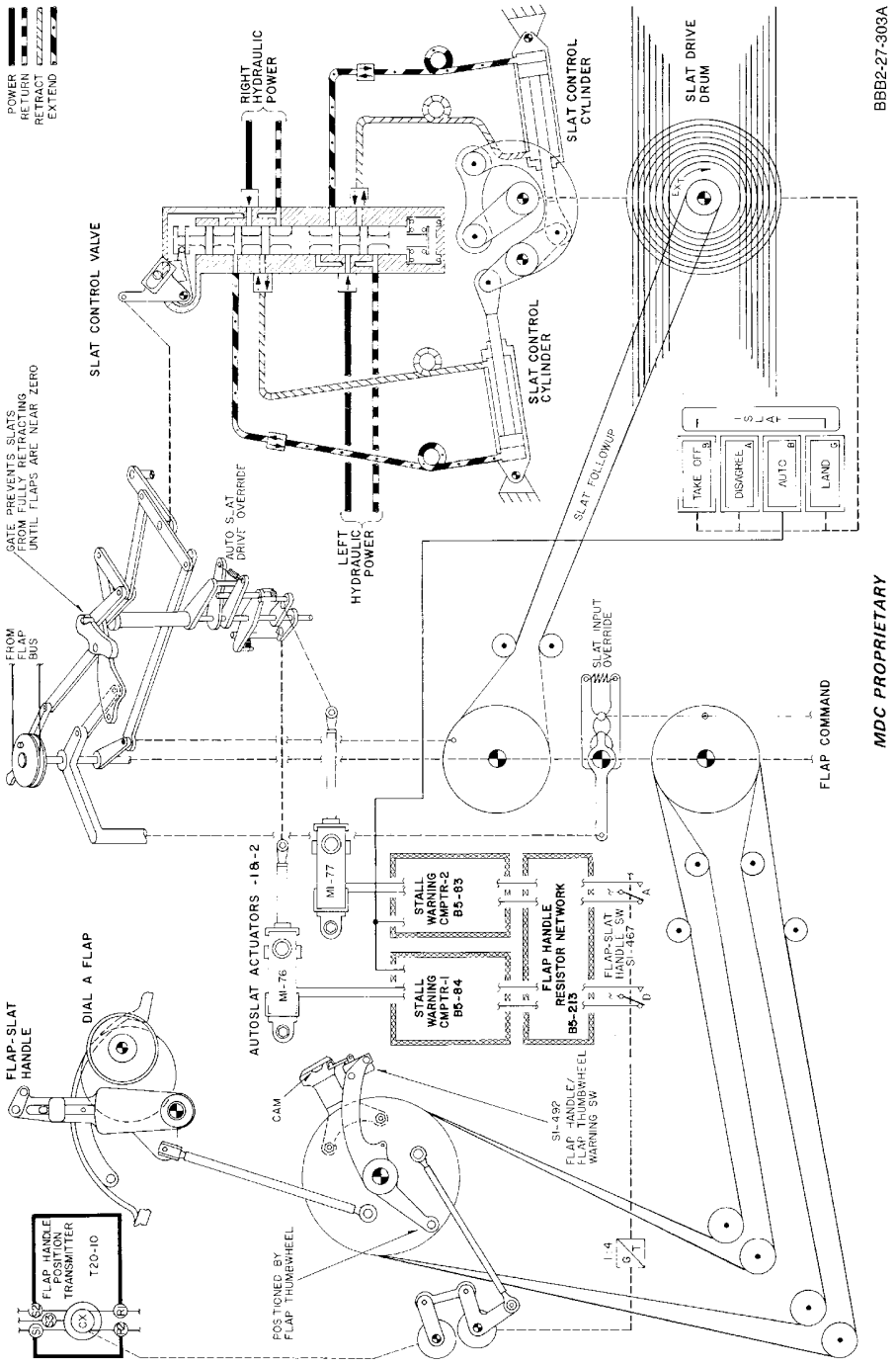
B. Operation

(1) When the flap/slat handle is operated to extend the slats, the spool in the control valve is positioned to meter hydraulic pressure from the corresponding hydraulic system to the extend ports on the slat cylinders. Flow out of cylinders retract ports is ported to return. When the slats reach a position corresponding to flap/slat control handle position, the followup and summing linkage position the control valve spools to halt further slat travel. To retract the slats, system pressure is ported to the retract port of the cylinder and flow out of the extend port is ported to return.

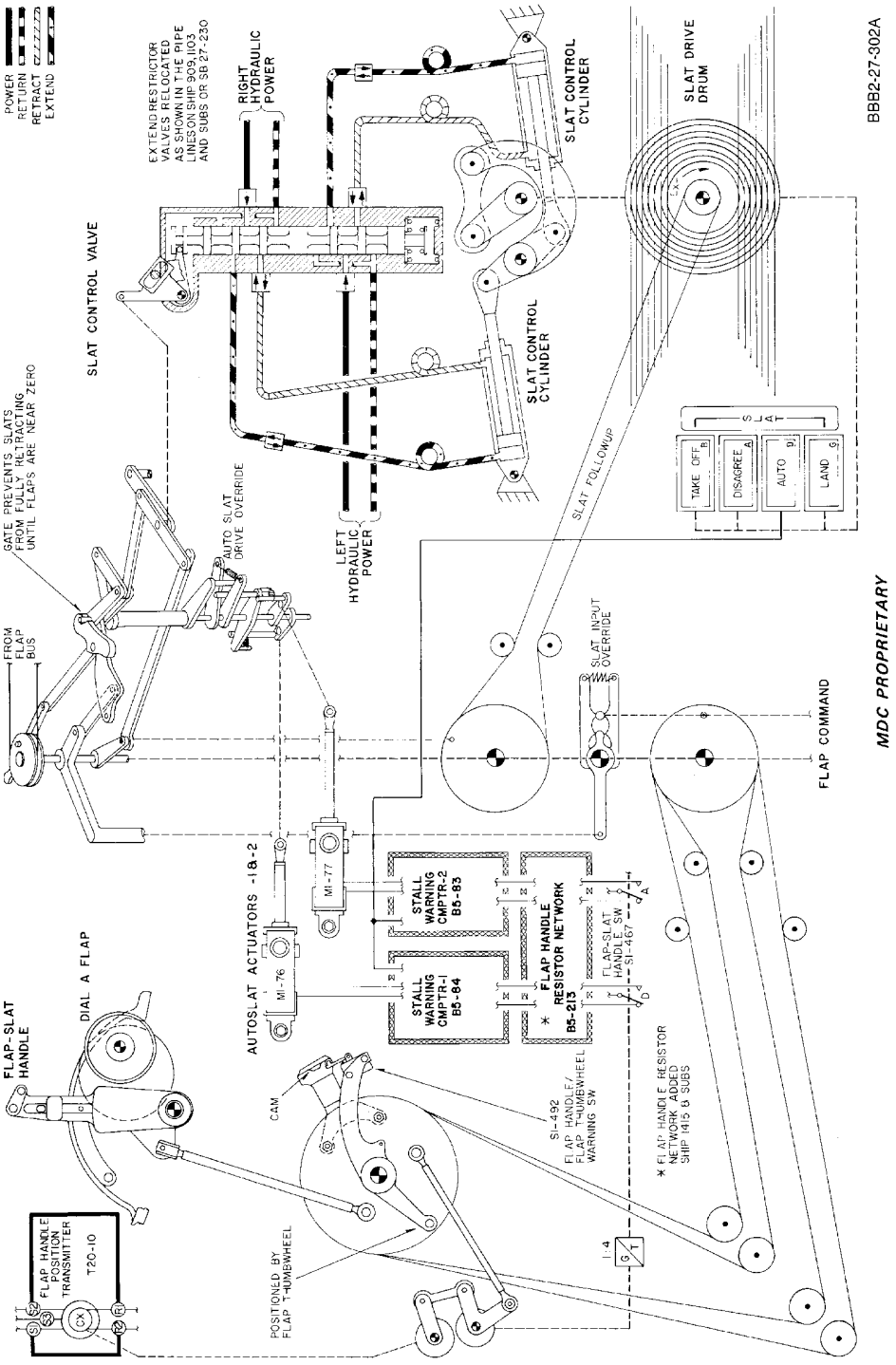
(2) Check valves in the control valve inlet ports will prevent the slats from blowing back in the event of a failure of the hydraulic system.



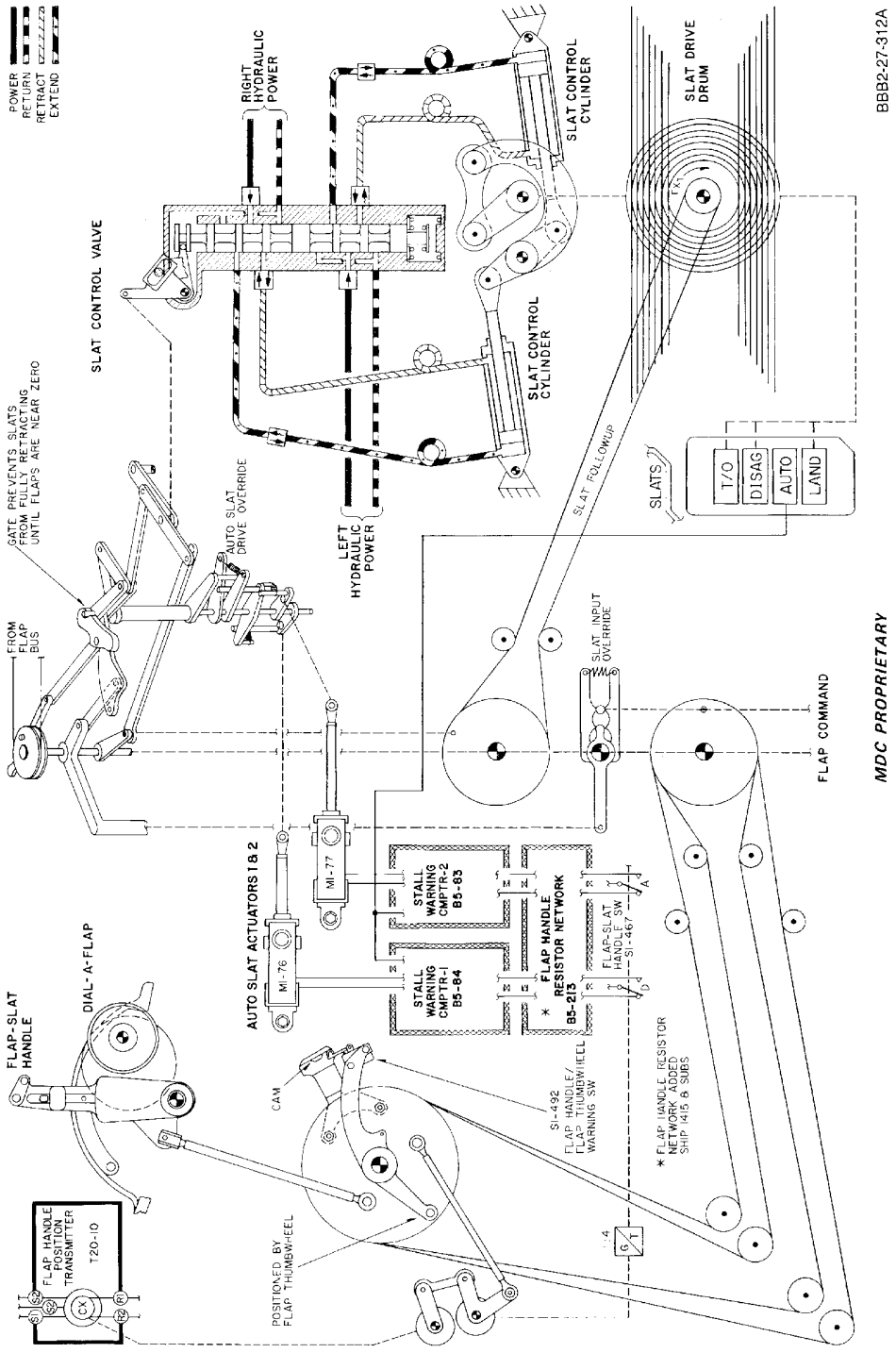
Slat Control Hydraulic System -- Schematic
Figure 2/27-80-00-990-802 (Sheet 1 of 5)



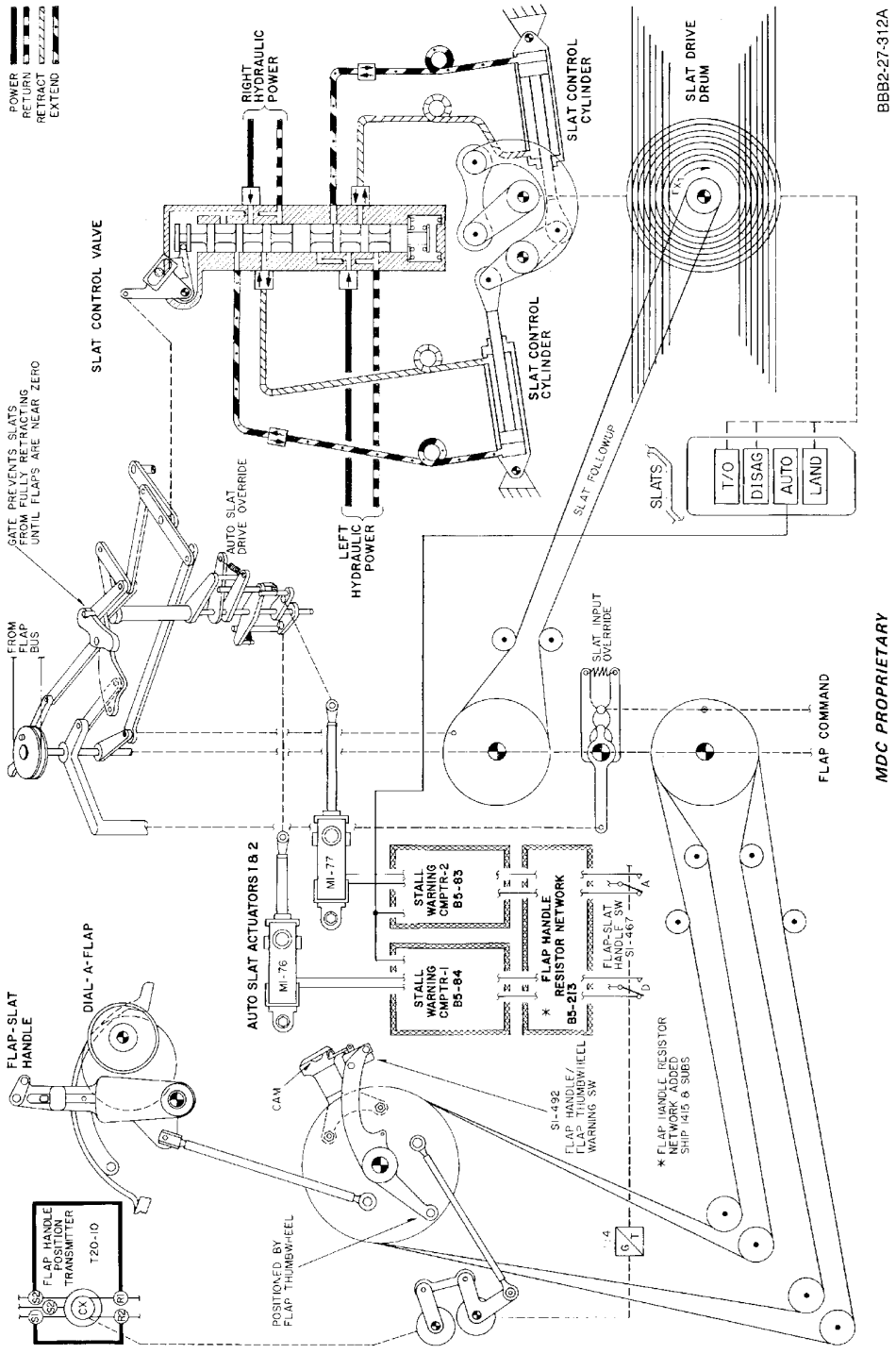
Slat Control Hydraulic System -- Schematic
Figure 2/27-80-00-990-802 (Sheet 2 of 5)



Slat Control Hydraulic System -- Schematic
Figure 2/27-80-00-990-802 (Sheet 3 of 5)



Slat Control Hydraulic System -- Schematic
Figure 2/27-80-00-990-802 (Sheet 4 of 5)



Slat Control Hydraulic System -- Schematic
Figure 2/27-80-00-990-802 (Sheet 5 of 5)

5. Slat Mechanical Actuation

A. Description

(1) Slat mechanical actuation components consist of the slat drive mechanism, cable systems, and mechanical linkages that are driven by the slat hydraulic actuation components to extend or retract the slats.

(2) The drive mechanism is mounted on the wing front spar at the aircraft centerline. The drive mechanism consists of two brackets, two rails, a cylinder drive shaft, a drive drum shaft, a drive drum, and a pivot mount. The two brackets are located between the rails, one at each end, to form a frame. The slat cylinders are located between the rails, with the cylinder barrels attached to the brackets. The cylinder piston rod ends are connected to lugs on the drive shaft, which is mounted in bearings in the rails. A semicircular arm splined to the drive shaft is connected by a drive link and arm to the drum shaft, which is also mounted in bearings in the rail. The drum shaft is bolted to the slat drive drum, which is in turn cantilevered from a bracket mounted to structure.

(3) The slat drive cable drum contains twelve grooves from which six closed cable loops are routed to the left wing slats and six to the right wing slats. Five of the six closed loop cable system to each wing terminate on slats zero through four drive tracks. The cable system to slat five terminates in a drum on the wing front spar, two closed loop cable systems, from the drum, terminate at the inboard and outboard drive tracks for slat five.

(4) A second small cable drum attached to the shaft rotating the slat cable drum drives a closed loop cable system which provides a followup signal to the slat sequence mechanism.

B. Operation

(1) When hydraulic pressure is applied to the slat cylinders on the slat drive mechanism, the cylinder piston rods rotate the drive shaft, causing the mechanical linkage to rotate the slat drive drum. The drum drives the cable systems, which pull the corresponding slat drive tracks along the roller supports to move the slats in the direction selected by the control handle. Stops on the tracks prevent over-travel of the slats.

6. Flap/Slat Position Indicating

A. Description

(1) The flap/slat indicating system provides indication in the flight compartment when the flap/slats are in the takeoff position or landing position, or when any slat position does not agree with the flap/slat handle position. The system consists of eight slat position sensors and their targets, a 26° flap proximity sensor, flap/slat handle position switches, three indicating lights, and a portion of the proximity switch electronics unit.

(2) The slat position sensors are electronic proximity sensors that sense the proximity of ferro-magnetic targets. Dual sensors, located on the slat cable drive drum sense the slat position at retracted, mid and extend and the transition between positions. Two sensors on each wing, located adjacent to slats 1 and 3 drive tracks, sense slat track position and are processed to indicate a retract or not retract condition. Each sensor is connected electrically to the proximity switch electronics unit. A retract signal from any one or more of the four wing sensors overrides the slat drive drum sensor logic and forces the proximity switch electronics unit slat output to the retract condition.

(3) The 26° flap proximity sensor is located on the flap bus input drum to the elevator servo force limiter in the forward cargo compartment and is connected electrically to the proximity switch electronics unit. The sensor senses flap position at less or greater than 26°.

(4) The flap/slat handle switches, located in the right side of the pilots control pedestal, is a rotary switch connected electrically to the proximity switch electronics unit. The switches sense the combined position of the flaps and slats when the flap/slat handle is at UP/RET (slats retracted, flaps up), handle in T.O. (slats in mid position, flaps less than 14°) and handle in EXT (slats extended, flaps greater than 14°).

(5) The proximity switch electronics unit, located on the radio rack, provides the logic to control the slat position indicating lights, in the flight compartment, from the inputs received from the left and right slat sensors, 26° flap proximity sensor and the flap/slat handle switches.

B. Operation

(1) When the flap/slat handle is placed in takeoff or land positions a pushrod on the flap/slat cable drum actuates the flap/slat handle switches to provide control handle position input to the proximity switch electronics unit. As the flaps and slats reach the selected position, the proximity sensors are actuated by the proximity of the ferro-magnetic targets to provide flap and slat position to the proximity switch electronic unit.

(2) Proximity switch electronics unit logic to the indicator lights is as follows:

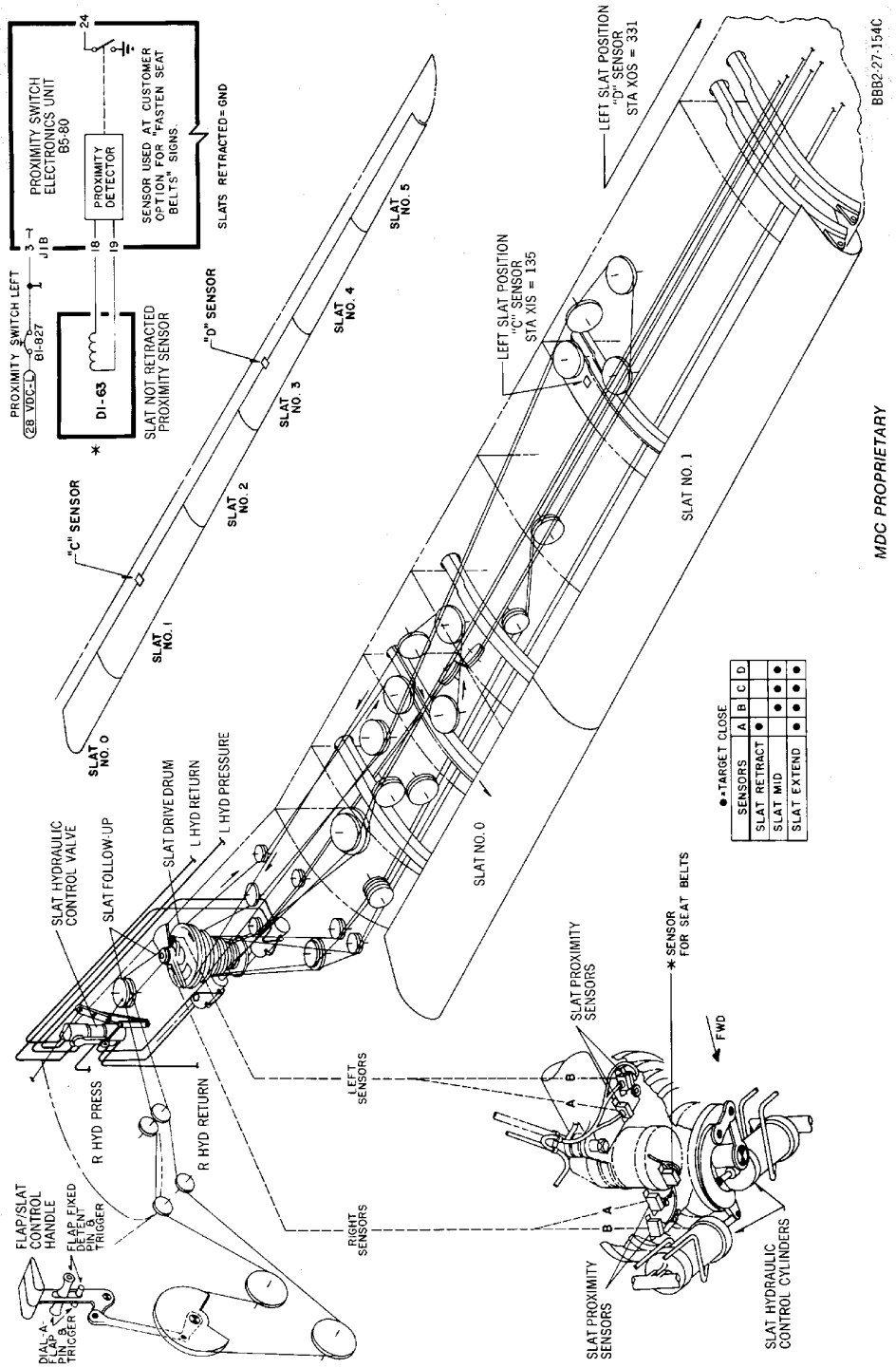
(a) No lights on - Slats in retract, flaps less than 26° and handle in retract.

(b) SLAT TAKEOFF light on - (1) Slats in MID, flaps less than 26° and handle in MID, or (2) Slat in extend, flaps less than 26° and handle in extend.

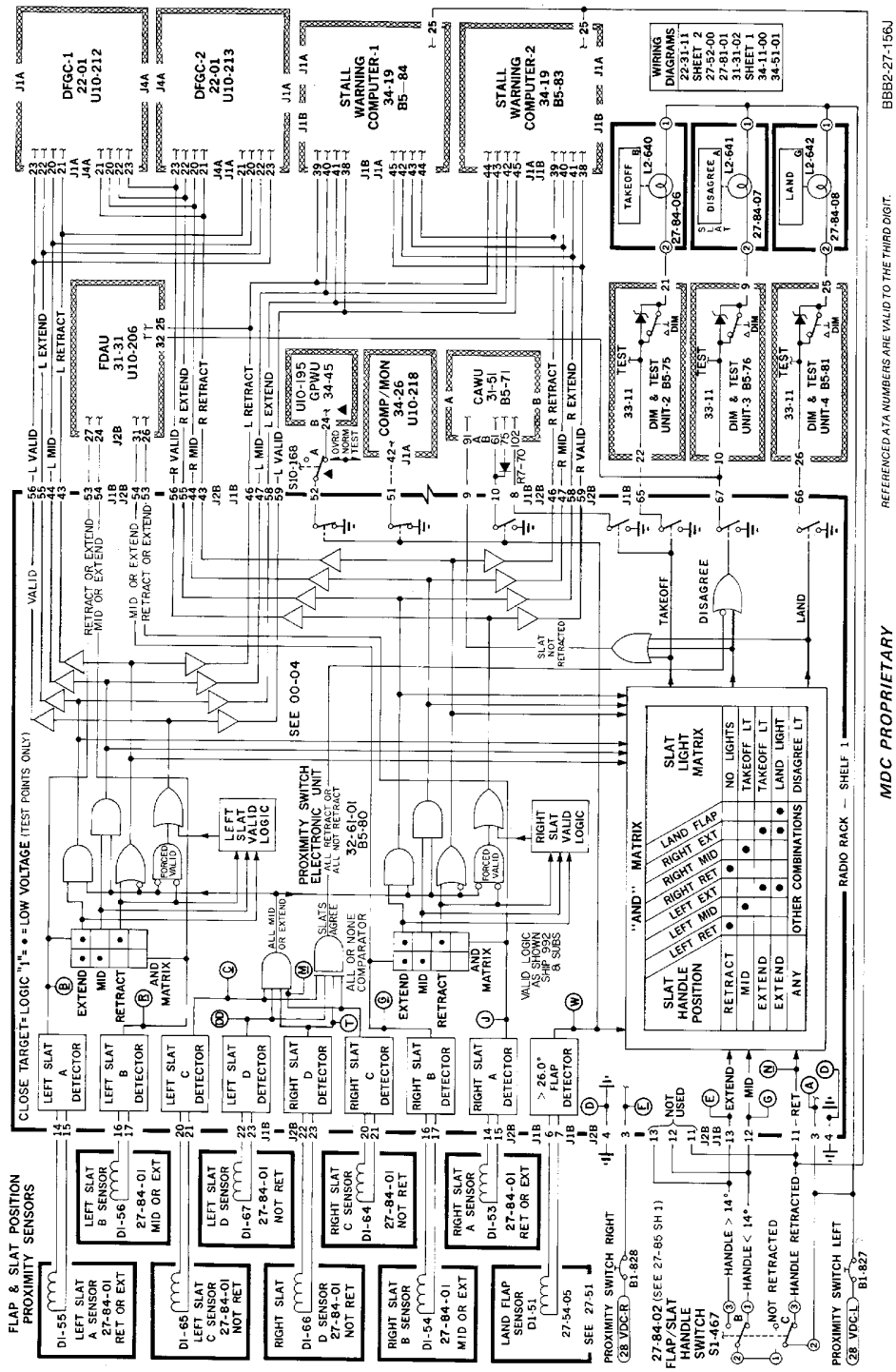
(c) SLAT LAND light on - Slats in extend, flaps greater than 26° and handle in extend.

(d) SLAT DISAGREE light on - Whenever conditions of (a), (b) and (c) are not met.

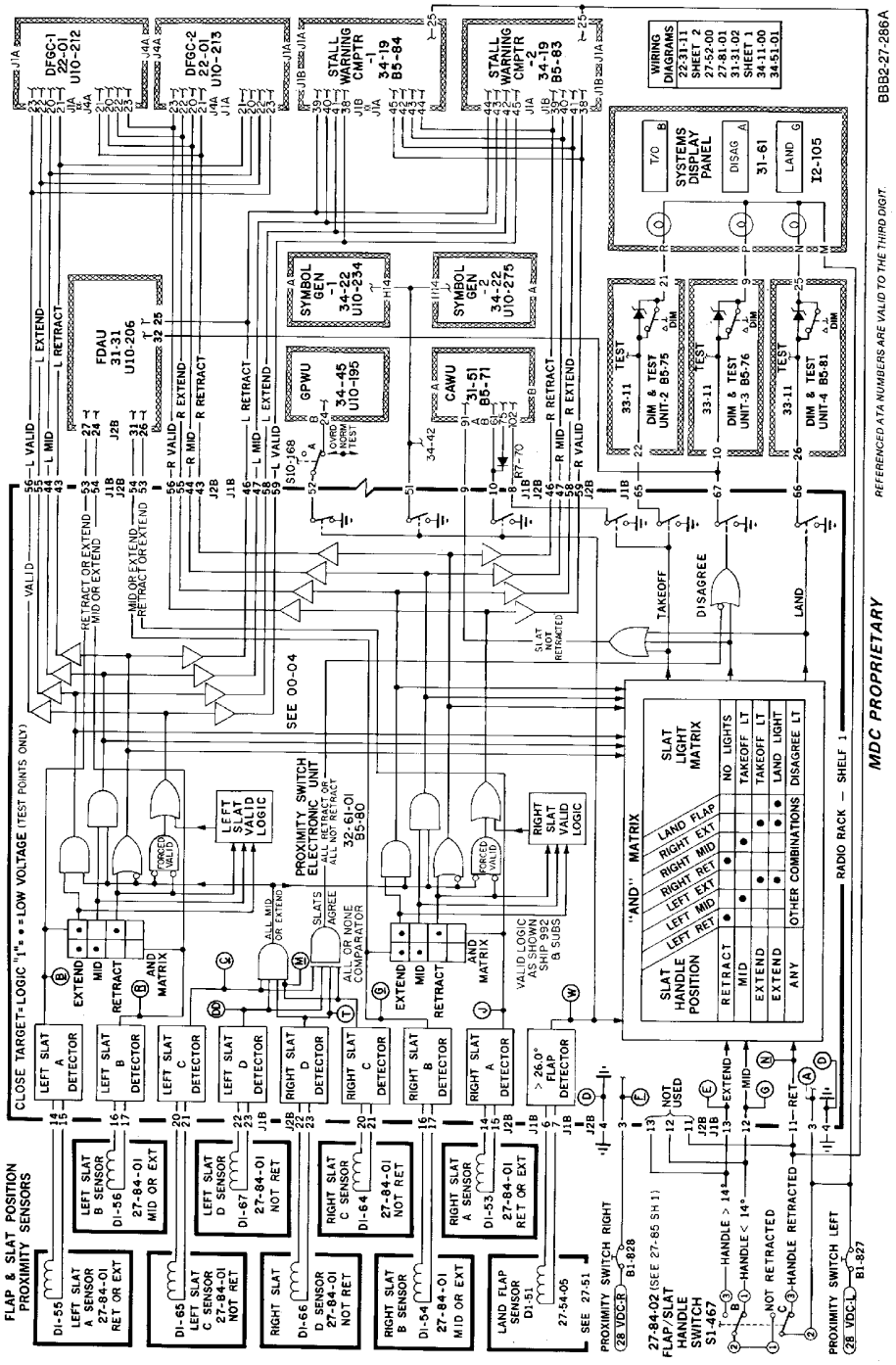
NOTE: The SLAT DISAGREE light comes on during flap/slat transition from one position to another position. However, during transition to full retract, SLAT DISAGREE light may go out before slats reach full retract position.



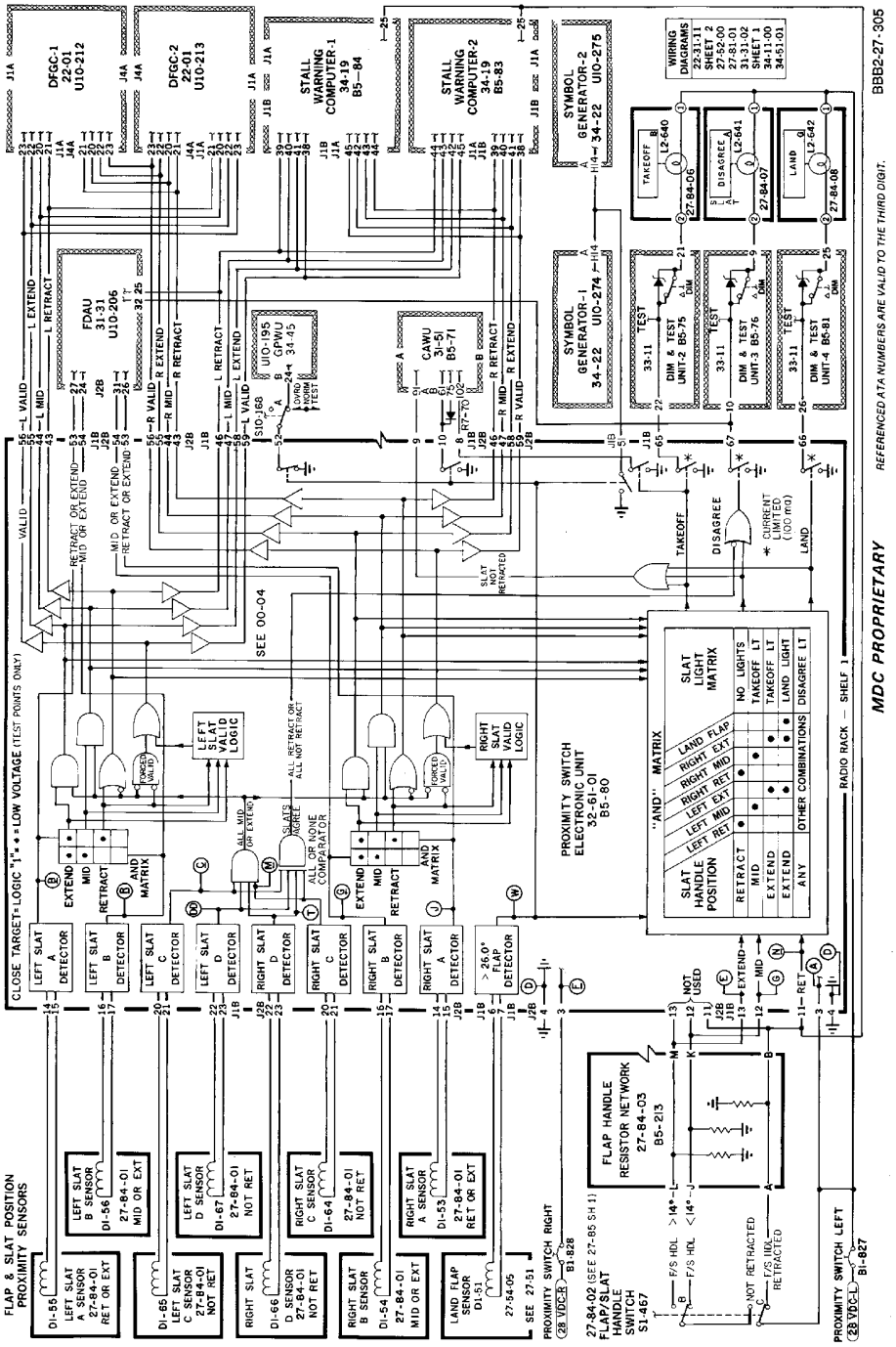
Slat Mechanical Actuation -- Schematic
Figure 3/27-80-00-990-803



Flap and Slat Position Indicating -- Schematic
Figure 4/27-80-00-990-804 (Sheet 1 of 3)



Flap and Slat Position Indicating -- Schematic
Figure 4/27-80-00-990-804 (Sheet 2 of 3)



Flap and Slat Position Indicating -- Schematic
Figure 4/27-80-00-990-804 (Sheet 3 of 3)

7. Auto Slat Extend System

A. Description

(1) The auto slat extend system extends the slats from the MID position only to the extend position when the airplane approaches a stall condition. The system consists of portions of the stall warning computers 1 and 2, two electro-mechanical actuators, flap/slat handle position switches, inputs from the proximity switch electronic unit, inputs from the central air data computers 1 and 2 and indicating lights in the flight compartment.

(2) The two electro-mechanical actuators position the slats from the mid-sealed position to the full extend position through mechanical linkage to the slat control valve. Both or either actuators will extend the slats. The actuators are driven by the output of the stall warning computers to position the slats in response to commands from the flap/slat handle and auto slat commands from the stall warning computers.

(3) The flap/slat handle position switches provide signals to the two stall warning computers to indicate that the flap/slat handle is positioned below and/or above 14°. The switches also initiate BITE when the flap/slat handle is placed in 0°/T.O. from UP/RET position.

(4) The proximity switch electronics unit provide inputs to the stall warning computers for slat position and weight on wheels (WOW) sensors on main gear.

(5) The central air data computers provide airspeed information to the stall warning computers to inhibit auto slats at high speed.

(6) The AUTO SLAT EXTEND light, located on the center instrument panel, comes on whenever the slats are extended automatically. The AUTO SLAT FAIL light, located on the overhead annunciator panel, comes on when an auto slat failure is detected by either or both stall warning computers.

B. Operation

(1) After liftoff, if the airplane approaches a stall condition logic within the auto slat portion of the stall warning computers provide independent left and right outputs to extend the auto slat actuators from the MID position only to EXT position. Each stall warning computer receives airspeed and valid airspeed signals from the central air data computers. When the airspeed is less than 240 knots (the fully extended slat limit speed) and the weight on wheels (WOW) squat switch, on main gear, is extended the stall warning computers will generate an auto slat extend (ASE) command approximately one second prior to the MID stick shaker trip alpha. An ASE command from either stall warning computer will extend both actuators and the position of each actuator is fed back to its respective computer by means of a potentiometer on the actuator output. Extension and retraction of the actuators is limited by internal limit switches. Each computer monitors the crossfeed (or opposite) computers ASE command and feedback.

(2) Each stall warning computer generates an auto slat retract (ASR) command (28 VDC) based on:

(a) Alpha (Angle-of-Attack Position) is less than the AUTO SLAT ALPHA by a fixed delta alpha of approximately 3 degrees local (alpha measured at the Angle-of Attack vane).

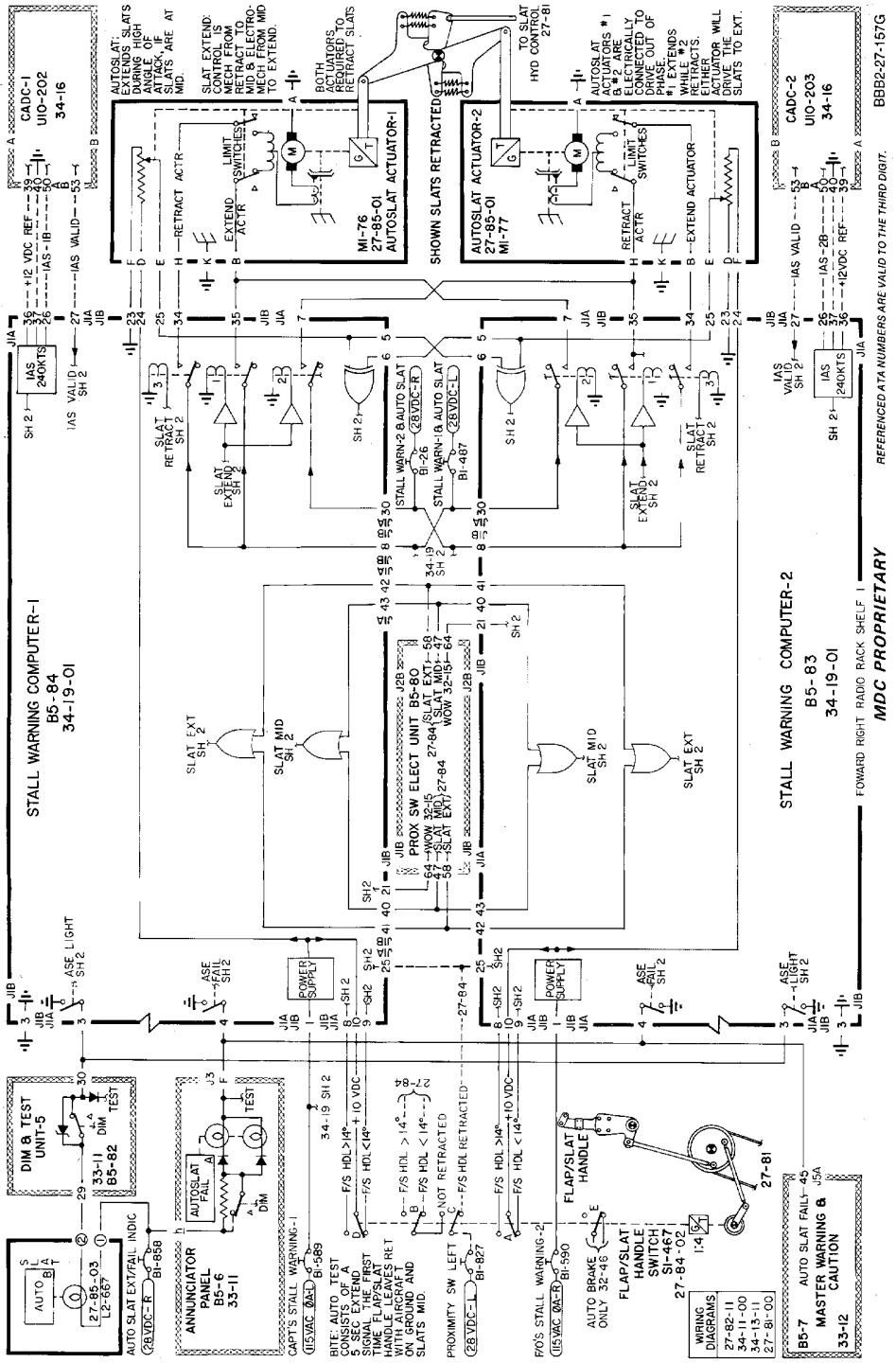
(b) Slats have extended.

(c) The FLAP/SLAT handle is in the corresponding MID SLAT range (less than 14 degrees flap).

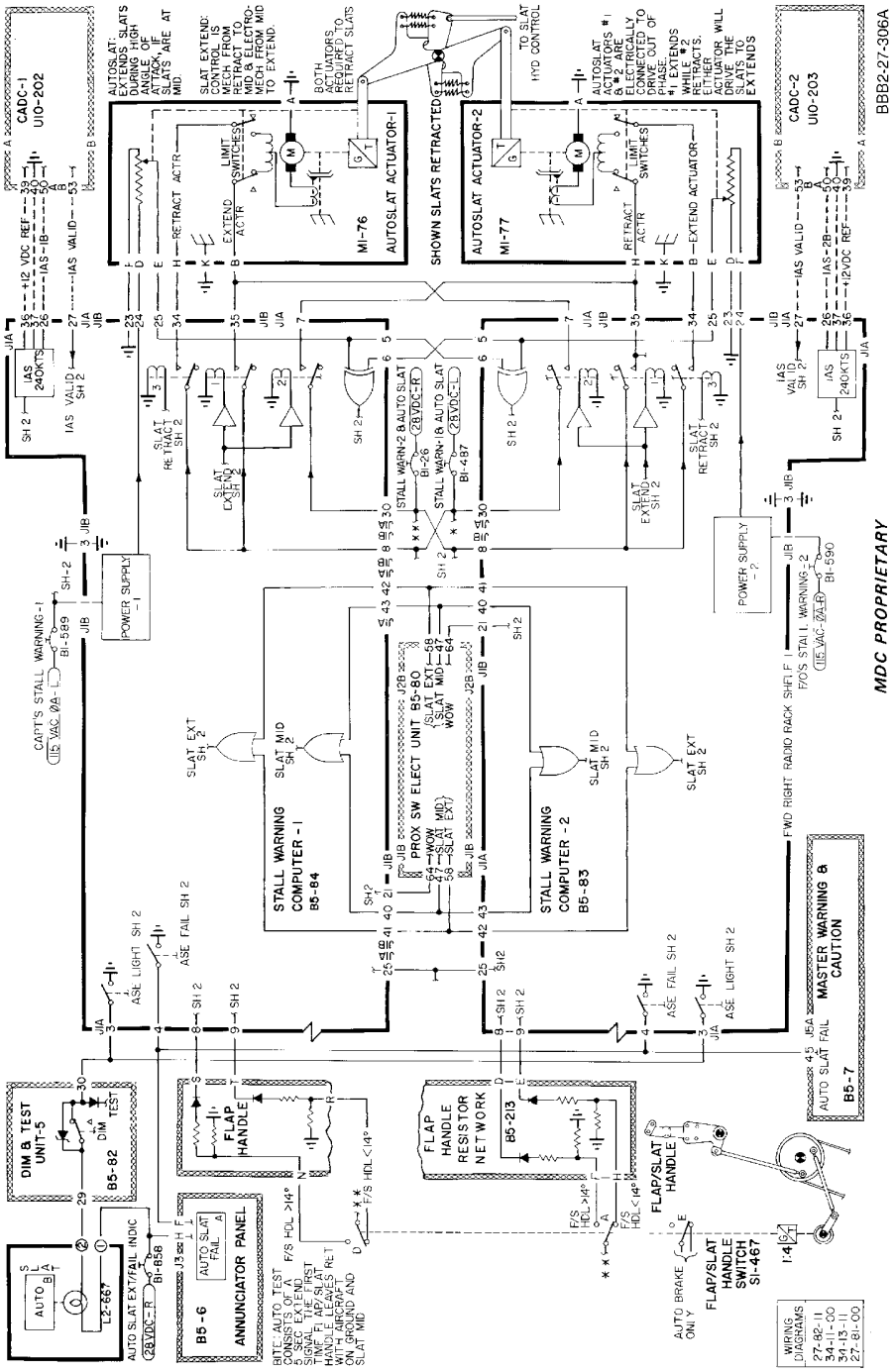
(d) There is no AUTO SLAT EXTEND (ASE) command from the opposite system and no AUTO SLAT FAIL light.

(3) The auto slat extend system tests (BITE) itself automatically, while on the ground, BITE is initiated when the flap/slat handle is moved from the UP/RET detent to 0/T.O. EXT position. Slats will move from full up to MID, TAKEOFF light will come on momentarily, slats will continue to move to LAND EXT position, remain at LAND EXT for approximately five seconds, then return to MID, TAKEOFF light will come on. While at LAND EXT the AUTO SLAT EXTEND and SLAT DISAGREE lights will come on momentarily and then turn off if the test is valid. If the flap/slat handle has been placed to EXT (flaps greater than 14°) the slats would be extended by BITE and remain extended. An invalid test will illuminate and latch the AUTO SLAT FAIL light. A latched AUTO SLAT FAIL light may be re-set by cycling the flap/slat handle to UP/RET. Subsequent scheduling of flap/slat takeoff would re-run the BITE.

(4) The AUTO SLAT EXTEND light comes on whenever the slats are extended automatically and goes off when slats retract to MID position. The AUTO SLAT FAIL light will come on 3 seconds after failures are detected in flight or on the ground except during BITE when delay is 1/2 second.

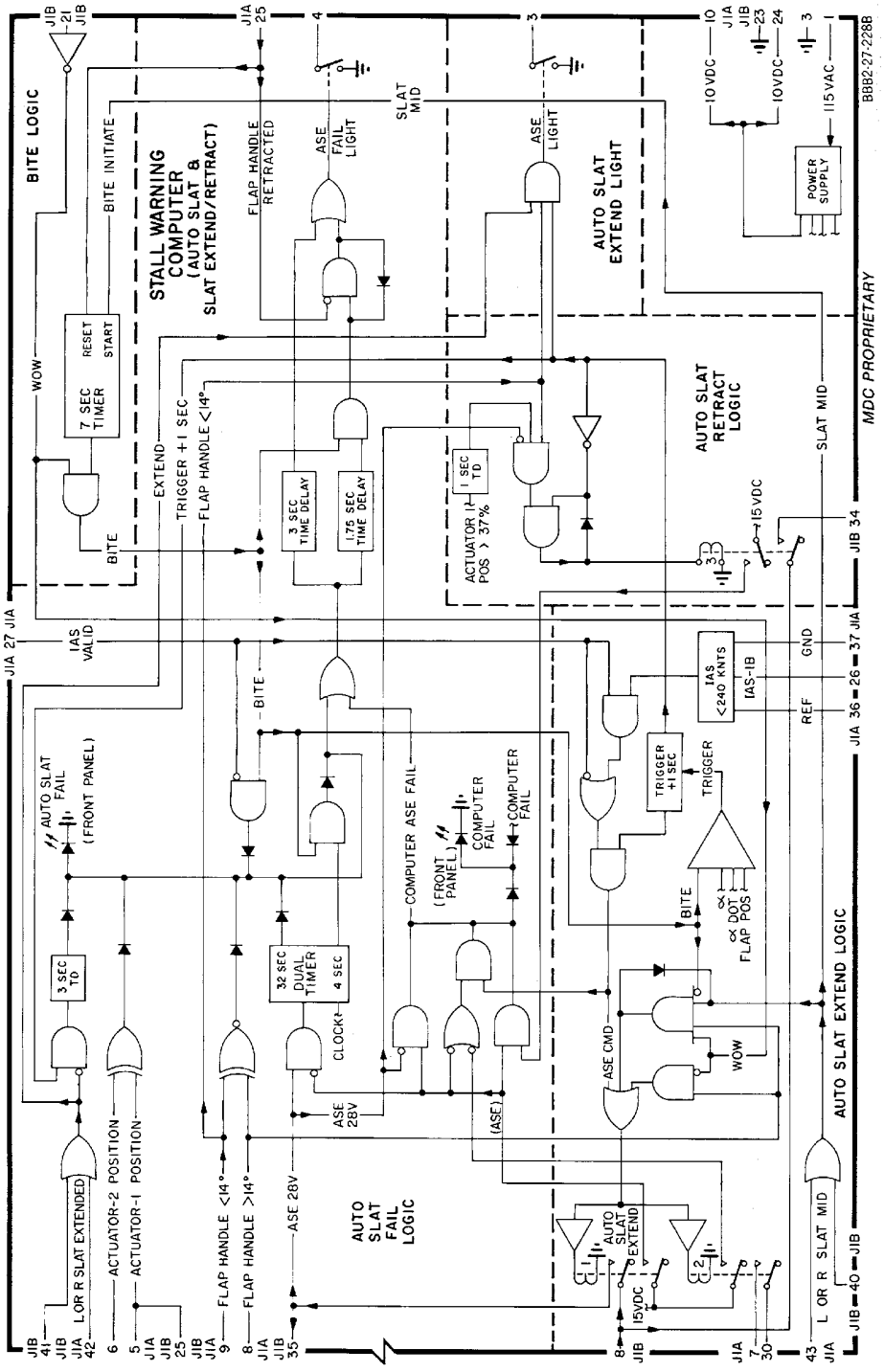


Auto Slat Extend System -- Schematic
Figure 5/27-80-00-990-805 (Sheet 1 of 2)

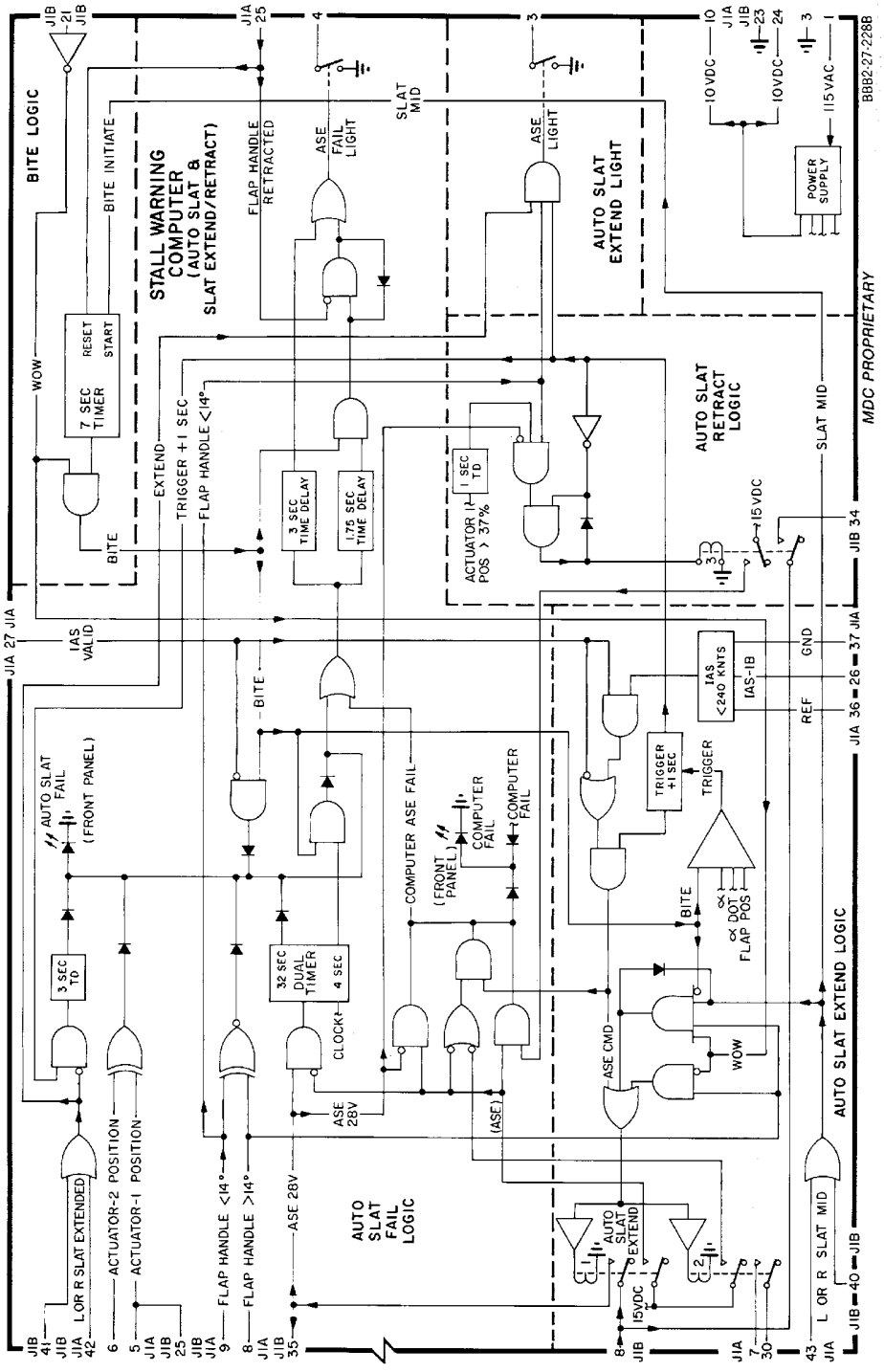


Auto Slat Extend System -- Schematic
Figure 5/27-80-00-990-805 (Sheet 2 of 2)

EFFECTIVITY
WJE 401-408, 410-412, 414, 415, 417-419, 421, 423, 861-866, 869, 871-881, 883, 886, 887, 892, 893



Auto Slat Extend System -- Schematic
Figure 6/27-80-00-990-816



Stall Warning Computer (Auto Slat and Slat Extend)
Figure 7/27-80-00-990-817

WJE

FAULT ISOLATION TEST LIFT AUGMENTING SLATS-TROUBLESHOOTING

WJE

1. General

WJE A. The MD-80 Slat Position Indicating System Fault Isolation Test Unit monitors the eight slat position proximity sensors and three-position flap handle switch in the slat advisory system for erroneous slat disagree lights. Incorrect logic among the slat position sensors and the flap handle switch that could cause an erroneous cockpit slat disagree indication will be registered as a fault on the test unit, and the sensor and flap handle switch positions that caused the fault will be retained in the unit's memory. The location of the fault is viewed on the test unit and can be isolated to the specific part of the slat indicating system that caused the slat disagree light, thereby minimizing troubleshooting.

WJE B. Position signals (RETRACT, MID, OR EXTEND) from the flap handle switch are compared to the signals (CLOSE or FAR) from the A and B slat drive drum position sensors, and the C and D wing slat position sensors. The unit continuously monitors the logic of the slat position indicating system and retains in memory all switch and sensor states in the event of a logic discrepancy which results in an erroneous cockpit slat disagree light.

WJE (1) Within the fault, a fault results from a cockpit slat disagree light longer than 10 seconds, or a 5 or more second logic discrepancy between corresponding left and right slat sensors, or a longer than .5 second flap handle switch open or short.

WJE C. In the event of a fault within the slat position indicating system the test until “SLAT DISAGREE” FAULT (S) IN MEMORY light comes on and the position of the flap handle switch and the eight slat sensors is retained in memory until manually reset. Two faults can be recorded in memory. If two faults are recorded, each fault can be alternately displayed by repeatedly pressing the DISPLAY FAULT (S) button. A ni-cad battery within the unit maintains microprocessor memory and allows for fault display if aircraft power is removed from the unit.

WJE D. The test has two display modes:

WJE (1) CONTINUOUS DISPLAY on:

WJE (a) In this mode, the unit monitors and continuously displays the slat sensor positions (CLOSE or FAR), and the flap handle switch position regardless of detected faults. The state of the slat position indication system is continuously monitored on a real-time basis, while the unit is armed for fault detection.

WJE (b) Detected faults can be subsequently displayed if CONTINUOUS DISPLAY is turned off.

WJE (c) Two faults will be retained in memory with CONTINUOUS DISPLAY on.

WJE (2) CONTINUOUS DISPLAY off:

WJE (a) This mode monitors the logic of the slat position indicating system, and detects and displays flap handle switch and sensor positions that resulted in an erroneously-commanded slat disagree light.

WJE (b) When a fault is detected, the unit stops displaying continuously, and displays the slat sensor and flap handle switch positions at the time the fault was detected.

WJE (c) Only one fault will be retained in memory with CONTINUOUS DISPLAY off.

WJE E. Through either mode, “slat disagree” faults can be detected, and isolation to the flap handle switch or the specific sensor which caused the fault is accomplished by comparing the normal slat sensor display pattern in the upper right corner of the unit with the slat sensor lights.

WJE (1) If a fault is detected in the flap handle switch, more than 1 flap handle switch light will come on, or no flap handle lights will come on, depending upon its failure mode: shorted or open.

WJE F. SELF-TEST: The test unit lights can be checked by pushing and holding the CONTINUOUS DISPLAY ON/OFF button for at least two seconds. All test unit lights should come on when activated.

WJE **2. Test Slat Indicating System Using Test Unit**

WJE A. Test Preparation

WJE (1) Connect test unit to J3 connection on front of Proximity Switch Electronics Unit (prox box).

WJE (2) Press button on front of test unit to turn CONTINUOUS DISPLAY light on.

WJE (3) If “SLAT DISAGREE FAULT(S) IN MEMORY light is on, push MEMORY RESET button twice within two seconds to clear slat disagree faults in memory. “SLAT DISAGREE” FAULT(S) IN MEMORY light should be OFF.

WJE (4) If “SLAT DISAGREE FAULT(S) IN MEMORY light comes on, turn off CONTINUOUS DISPLAY mode to display recorded faults. This will display the slat sensor and flap handle switch positions when the fault was detected that could result in an erroneous cockpit slat disagree indication.

WJE NOTE: It is suggested that if the unit is being monitored by the operator during the tests, CONTINUOUS DISPLAY should be on.

WJE NOTE: The following procedure is accomplished in conjunction with MD-80 MM 27–80–06, “Adjustment/Test Slat Advisory Sensors” and 27–80–07, Adjustment/Test Flap/Slat position Switches. Warnings and cautions in Maintenance Manual apply to this procedure, but are not included herein.

WJE B. Test Sensors and Flap Handle Switch

WJE (1) Pressurize left and right hydraulic systems.

WJE (2) Move flap/slat handle to UP/RET detent.

WJE NOTE: Test unit sensor indicator lights are ON when sensors are CLOSE, and OFF when sensors are FAR.

WJE (a) Test unit should indicate flap handle is in RETRACT and A sensors are CLOSE.

WJE (3) Move flap/slat handle from UP/RET to 0 deg./T.O. EXT detent and check the following:

WJE (a) Slats should extend to the mid position, continue to full extend and remain at full extend for approximately 5 seconds then return to the mid position.

WJE (b) AUTO SLAT EXTEND and SLAT DISAGREE lights should come on for approximately 5 seconds, then go off.

WJE (c) Test unit should show the following:

WJE 1) Flap handle movement from RETRACT to MID.

WJE 2) A sensors move to FAR.

WJE 3) B, C and D sensors are CLOSE.

WJE 4) A sensors are FAR until slats reach full extend at which time they are CLOSE, then return to FAR when slats return to the mid position.

WJE 5) “SLAT DISAGREE” FAULT(S) IN MEMORY light should not come on.

WJE (d) Corresponding left and right sensors should actuate within 1/2 second of each other.

WJE NOTE: For aircraft fuselages 1150 and prior, and S/B 27–245 not accomplished, corresponding C and D sensors should move to CLOSE or FAR within 1/2 second of each other. For aircraft fuselages 1151 and subs, or S/B 27–245, incorporated, corresponding C and D sensors should move to CLOSE or FAR within 2 seconds of each other. For aircraft fuselages 1151 and subs, or S/B 27–245 incorporated, corresponding C and D sensors should move to CLOSE or FAR within 2 seconds of each other.

WJE (4) Move flap/slat handle to 11 deg/T.O. EXT. detent. No changes in slat indicating system should be noted.

WJE (5) Move flap/slat handle to 15 deg./T.O.EXT detent and check the following:

WJE (a) Slate move from mid to fully extended position.

WJE (b) SLAT DISAGREE light should be on while slats are in transit.

WJE (c) SLAT TAKEOFF light remains on.

WJE (d) Test unit should show the following:

WJE 1) Flap handle movement from MID to EXTEND

WJE 2) A sensors move to CLOSE.

WJE 3) B,C and D sensors remain CLOSE.

WJE 4) “SLAT DISAGREE” FAULT(S) IN MEMORY light should not come on.

WJE (6) Move flap/slat handle to 28 deg./LAND detent. SLAT TAKEOFF light should go off and SLAT LAND light should come on when flaps are near 26.5 degrees.

WJE (7) Move flap/slat handle to 40 deg./LAND detent. No changes in slat indicating system should be noted.

WJE (8) Move flap/slat handle to 0 deg./T.O. EXT detent and check the following:

WJE (a) Slats move from extend to mid position.

WJE (b) SLAT DISAGREE light should be on while slats are in transit.

WJE (c) SLAT TAKEOFF light comes on.

WJE (d) Test unit should show the following:

WJE 1) Flap handle movement from EXTEND to MID.

WJE 2) A sensors move to FAR.

WJE 3) B, C and D sensor remain CLOSE.

WJE 4) “SLAT DISAGREE” FAULT(S) IN MEMORY light should not come on.

WJE (9) Move flap/slat to UP/RET detent and check the following:

WJE (a) Slats move from mid to retract position.

WJE (b) SLAT DISAGREE light should be on while slats are in transit.

WJE (c) SLAT TAKEOFF light should go off.

WJE (d) Test unit should show the following:

WJE 1) Flap handle movement from MID to RETRACT.

WJE 2) A sensors move to CLOSE.

WJE 3) B, C and D sensors move to FAR.

WJE 4) “SLAT DISAGREE” FAULT(S) IN MEMORY light should not come on.

WJE (e) For aircraft fuselages 1150 and prior, and S/B 27–245 not accomplished, corresponding C and D sensors should move to FAR within 1/2 second of each other. For aircraft fuselages 1151 and subs, or S/B 27–245 incorporated, corresponding C and D sensor lights should move to FAR within 2 seconds of each other.

WJE C. Adjust Flap Handle Switch

WJE (1) Using Dial-A-Flap thumbwheel, set DAF indicator to read 11.

WJE (2) Move flap/slat handle to 11/T.O. EXT detent.

WJE (3) Lift inboard trigger on flap/slat handle (releasing fixed 11/T.O. EXT detent) and adjust DAF thumbwheel to increase DAF reading to 14, which is in the yellow DO NOT USE band, and at the word “NOT”.

NOTE: Dial-A-Flap thumbwheel should be used in the down, or increasing flap angle position for correct adjustment.

(4) Adjust switch pushrod (ref. MD-80 MM 27–80–07, page 202) to cause test unit to show flap handle movement from MID to EXTEND as close to 14 degrees as possible using Dial-A-Flap thumbwheel.

(5) Place flap/slat handle in UP/RET detent.

D. Test Flap Handle Switch

(1) Set Dial-A-Flap thumbwheel to read 13 (edge of yellow band)

(2) Move flap/slat handle until it engages DAF movable detent and check the following:

(a) Slats should fully extend and return to the mid position.

(b) Test unit should show flap handle movement from RETRACT to MID.

(3) Using DAF thumbwheel, slowly rotate dial towards 14 (word 'NOT”) and check the following:

(a) Slats should not extend.

(b) Test unit should not show flap handle movement (should indicate MID)

(4) Move flap/slat handle to 15 deg./T.O. EXT detent and check the following:

(a) Slats move from mid to extend position.

(b) Test unit should show flap handle movement from MID to EXTEND.

(5) Lift outboard trigger on flap/slat handle and set DAF to read 20. Release outboard trigger. Slowly rotate dial towards 14. Check the following:

(a) Dial-A-Flap movable detent should engage flap/slat handle at 15 degrees and slats should not move.

(b) Test unit should not show any flap handle movement.

(6) Move flap/slat handle to UP/RET detent. Test unit should show flap handle at RETRACT.

(7) Shut off hydraulic pressure source.

(8) Slowly move flap/slat handle toward 0 deg./T.O. EXT, just to the point where test unit shows flap handle movement to MID.

(9) Move the flap handle back and forth with short strokes to cause the RETRACT and MID lights on the test unit to alternately come on and go off several times, and check the following:

(a) Test unit should show flap handle movement between RETRACT and MID, and at least one of these two lights should be on at all times. At no point during this test both the RETRACT and MID lights be off. A flickering RETRACT light, or both lights off indicates a faulty flap handle switch.

(b) Test unit “SLAT DISAGREE” FAULT(S) IN MEMORY light should not come on.

(10) Move flap/slat handle to UP/RET detent.

(11) Remove test unit from aircraft.

3. MD-80 Slat Disagree Fault Isolation Test Set-Basic Operation

A. Connect test unit to Proximity Switch Electronics Unit (prox box).Figure 101

B. Turn CONTINUOUS DISPLAY light on.

C. Pressurize left and right hydraulic systems.

WJE D. Push MEMORY SELECT RESET button twice within two seconds to clear slat disagree faults in memory."SLAT DISAGREE" FAULT(S) IN MEMORY light should be off.

WJE E. If at any time during the following test the "SLAT DISAGREE" FAULT(S) IN MEMORY light comes on., turn off CONTINUOUS DISPLAY mode to display recorded faults. This will display the slat sensor and flap handle switch positions when the fault was detected that could result in an erroneous cockpit slat disagree indication.

WJE F. Test Slat Sensors and Flap Handle Switch:

WJE (1) Test unit should indicate flap handle is in RETRACT and A sensors are CLOSE.

WJE (2) Move flap/slat handle from UP/RET to 0 deg./T.O. EXT detent and check test unit for the following:

WJE (a) Flap handle movement from RETRACT to MID.

WJE (b) A sensors move to FAR.

WJE (c) B, C and D sensor are CLOSE.

WJE (d) A sensors are FAR until slats reach full extend at which time they are CLOSE, then return to FAR when slats return to mid position.

WJE (3) Move flap/slat handle to 15 deg./T.O. EXT detent and check test unit for the following:

WJE (a) Flap handle movement from MID to EXTEND.

WJE (b) A sensors move to CLOSE.

WJE (c) B, C and D sensors remain CLOSE.

WJE (4) Move flap/slat handle to 0 deg./T.O. EXT detent and check test for the following:

WJE (a) Flap handle movement from EXTEND to MID.

WJE (b) A sensors move to FAR.

WJE (c) B, C and D sensors remain CLOSE.

WJE (5) Move flap/slat handle to UP/RET detent and check test unit for the following:

WJE (a) Flap handle movement from MID to RETRACT.

WJE (b) A sensors move to CLOSE.

WJE (c) B, C and D sensors move to FAR.

WJE G. Test Flap Handle Switch:

WJE (1) Set Dial-A-Flap thumbwheel to read 13 (edge of yellow band).

WJE (2) Move flap/slat handle until it engages DAF movable detent and check test unit for flap handle movement from RETRACT to MID.

WJE (3) Using DAF thumbwheel, slowly rotate dial towards 14 (word "NOT") and check test unit for no flap handle movement (should still indicate MID).

WJE (4) Move flap/slat handle to 15 deg./T.O. EXT detent and check test unit for flap handle movement from MID to EXTEND.

WJE (5) Move flap/slat handle to UP/RET detent. Test unit should show flap handle RETRACT.

WJE (6) Shut off hydraulic pressure source.

WJE (7) Slowly move flap/slat handle toward 0 deg./T.O. EXT, just to the point where test unit shows flap handle movement to MID.

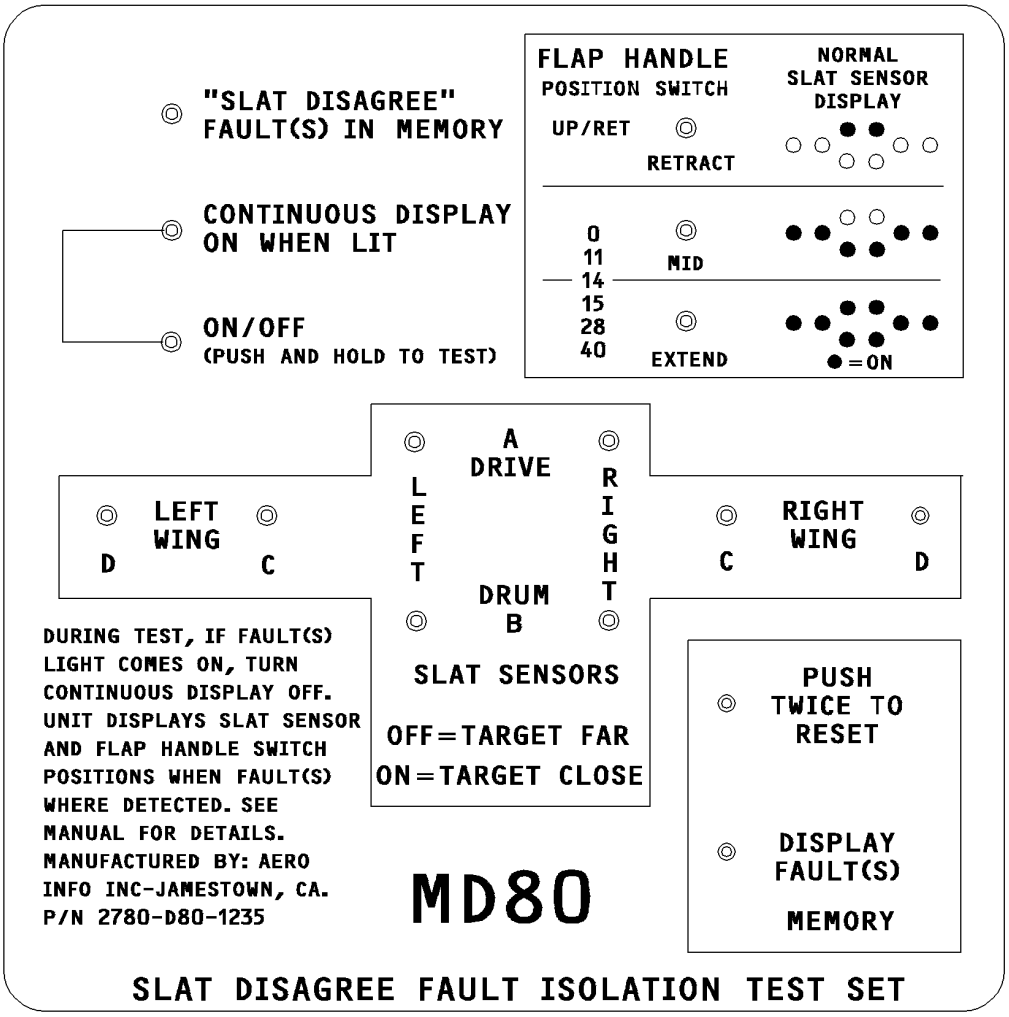
WJE (8) Move the flap handle back and forth with short strokes to cause the RETRACT and MID lights on the test unit to alternately come on and go off several times, and check the following:

WJE (9) Test unit should show flap handle movement between RETRACT and MID, and one of these two lights should be on at all times. At no point during this test should both the RETRACT and MID lights be off.

WJE (10) Move flap/slat handle to UP/RET detent

WJE (11) Remove test unit from aircraft.

WJE



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SLAT DISAGREE FAULT ISOLATION TEST SET
Figure 101/27-80-00-990-819

LIFT AUGMENTING SLATS - TROUBLE SHOOTING

1. General

A. Trouble shooting provided in this section consists of basic procedures for isolating and correcting a faulty lift augmenting slat system.

B. The basic causes of a faulty system operation are, generally, faulty aircraft wiring, faulty line replaceable units (LRU's) or out of rig cable system and/or components.

C. By using the basic check procedures, coordinated with the system schematics contained in this section, quick basic isolation and correction of the problem can be accomplished.

D. When making electrical checks during trouble shooting procedures, refer to Wiring Diagram Manual for check points or pin numbers of components or LRU's to be checked.

E. Lift augmenting slats control system components and location are as follows:

Table 101

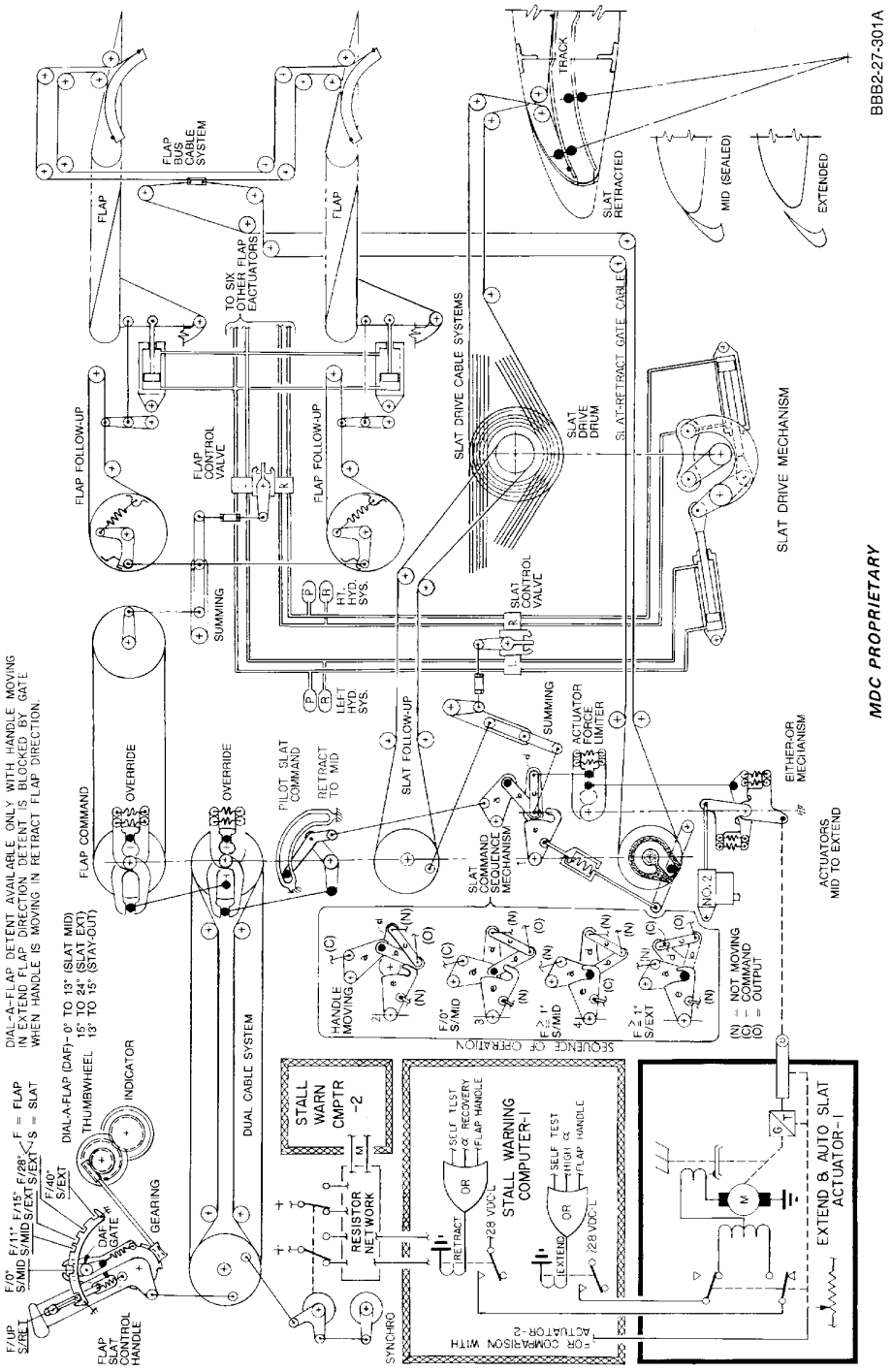
Component	Location
Flap/slat handle	Control pedestal flight compartment
Flap/slat sequence mechanism	Center wing front spar
Electro-mechanical actuators	Center wing front spar (flap/slat sequence mechanism)
Slat drive actuators	Center wing front spar (slat drive mechanism)
Slat control valve	Center wing front spar
Slat position proximity sensors	Two on each wing (adjacent to 1 and 3 slat drive tracks) (four located on slat drive drum support)
Flap/slat handle position switches	Control pedestal, in flight compartment, lower right side
Slat position indicator lights	Center instrument panel, adjacent to flap position indicator.
AUTO SLAT FAIL light (or legend)	Overhead annunciator panel
Proximity switch electronics unit	Electrical/electronics compartment

2. Equipment and Materials

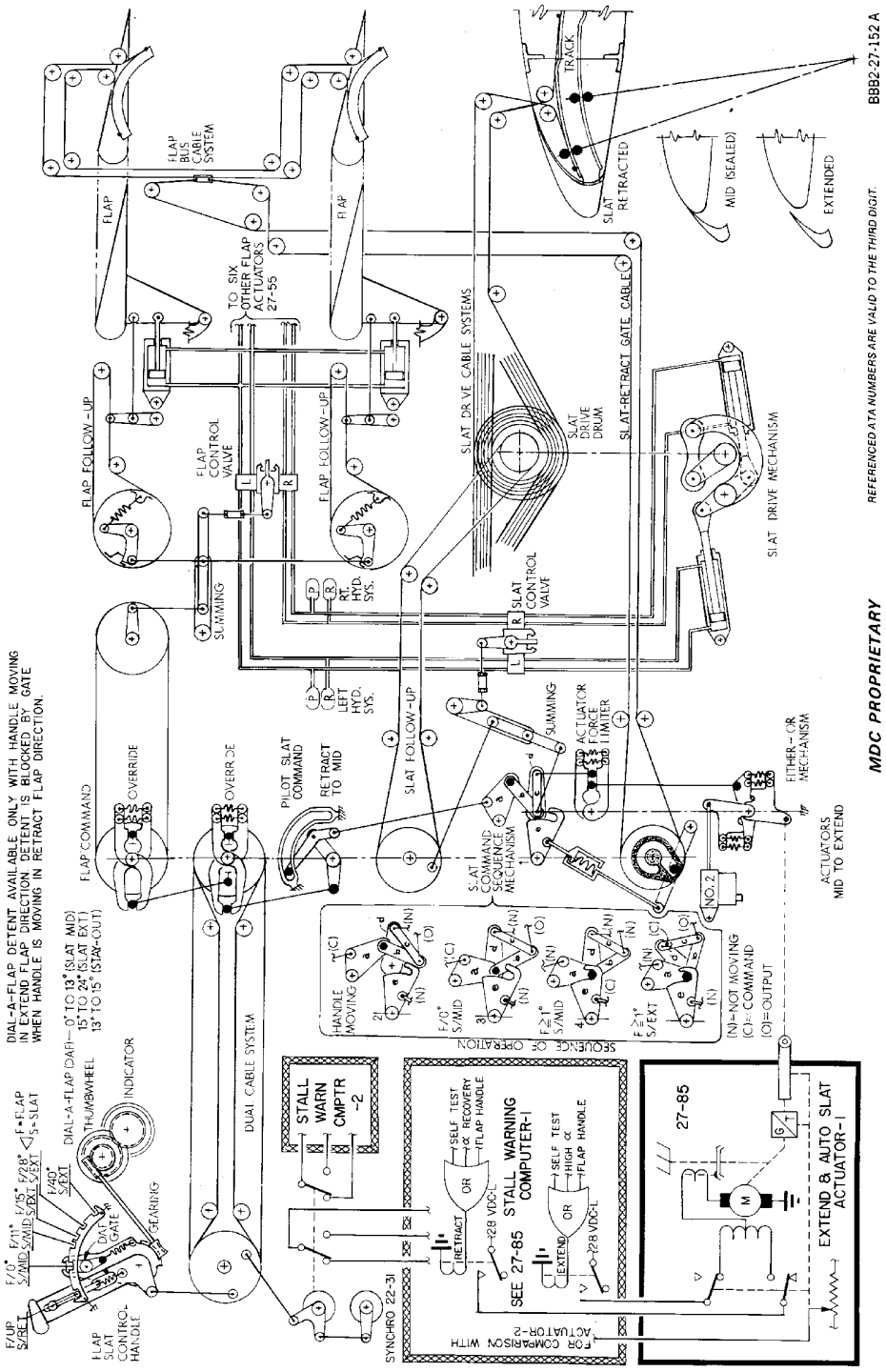
NOTE: Equivalent substitutes may be used instead of the following listed item.

Table 102

Name and Number	Manufacturer
Multimeter (2000A)	Dana



Flap/Slat Control and Actuation
Figure 101/27-80-00-990-818 (Sheet 1 of 2)



Flap/Slat Control and Actuation
Figure 101/27-80-00-990-818 (Sheet 2 of 2)

3. Trouble Shooting Lift Augmenting Slat System

WARNING: IF HYDRAULIC AND ELECTRICAL POWER IS REQUIRED DURING CHECK, MAKE CERTAIN FLAP AND SLAT SURFACES ARE CLEAR OF PERSONNEL AND EQUIPMENT.

WARNING: WHEN AIRCRAFT IS ON THE GROUND, WITH WEIGHT ON WHEELS, BITE TEST OF AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME FLAP/SLAT HANDLE IS MOVED FROM RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

A. Trouble shooting lift augmenting slat system as follows:

Table 103

Possible Causes		Isolation Procedure	Correction
A.	SLATS DO NOT RESPOND TO CONTROL HANDLE MOVEMENT		
(1)	Broken or jammed cables or pulleys	Check control cables	Repair or replace, as necessary.
(2)	Missing or broken linkage or attach bolts	Check command linkage in sequence mechanism	Replace parts, as required.
(3)	Defective slat control valve	Check control valve	Replace valve.
(4)	Slat drive mechanism failure	Check drive mechanism	Repair or replace, as necessary
(5)	Sequence mechanism failure	Check for open dwell linkage, override linkage, either-or mechanism, and open or jammed summing linkage, actuator force limiter, or seized linkage bearings and missing attach bolts, jammed flap gate hook.	Repair or replace, as necessary.
(6)	Insufficient hydraulic pressure	Check hydraulic pressure	Pressurize hydraulic system (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)
B.	FLAP/SLAT CONTROL HANDLE CANNOT BE MOVED		
(1)	Trigger linkage or handle jammed	Check linkage and handle for obstruction	Remove obstruction
(2)	Jammed control cables or pulleys	Check control cables and pulleys	Repair or replace, as necessary.
C.	HIGH FLAP/SLAT CONTROL HANDLE OPERATING FORCES		
(1)	Excessive rigging tension on control cables	Check control cable rig tension	Adjust control cables.
(2)	Broken pulleys or fairleads	Check pulleys and fairleads	Replace worn or defective parts.

Table 103 (Continued)

Possible Causes		Isolation Procedure	Correction
(3)	Foreign objects fouling control mechanism	Check control systems for obstructions	Remove obstructions.
(4)	Excessive friction in slat control valve	Check control valve for proper operation	Replace control valve.
D.	SLATS WILL NOT EXTEND BEYOND MID-SEALED POSITION		
(1)	Flap/slat handle position switch failure	Check position switch	Adjust or replace switch
(2)	Sequence mechanism failure	Check either-or mechanism for failed clapper crank, actuator rod ends for proper attachment	Replace or repair, as necessary.
(3)	Both stall warning computers failed	Check stall warning computers (STALL WARNING SYSTEM - MAINTENANCE PRACTICES, PAGEBLOCK 34-19-00/201)	Repair or replace, as necessary.
(4)	Both auto slat actuators failed	Check acutators for proper operation	Repair or replace, as necessary.
E.	SLATS WILL NOT RETRACT BEYOND MID-SEALED POSITION		
(1)	Sequence mechanism's flap gate system failure	Check for open or jammed flap gate linkage or spiral groove	Replace or repair, as necessary.
		Check flap gate cable system for proper adjustment, broken or jammed cable	Adjust or replace cable, as required.
F.	SLATS WILL NOT STOP AT MID-SEALED POSITION		
(1)	Slat followup cable failure	Check followup cables for breakage, pulleys damage and security	Replace or repair, as necessary.
(2)	Failed summing linkage in sequence mechanism	Check linkage for damage and security	Replace or repair, as necessary.
(3)	Flap/slat handle position switch failure	Check switch for proper adjustment and operation	Adjust or replace, as necessary.
(4)	Stall warning computer failure	Check computer (STALL WARNING SYSTEM - MAINTENANCE PRACTICES, PAGEBLOCK 34-19-00/201)	Repair or replace, as necessary.
(5)	Auto slat actuator failure	Check actuator for proper operation	Repair or replace, as necessary
G.	SLATS WILL NOT RETRACT FROM EXTENED POSITION TO MID-SEALED POSITION		
(1)	Flap/slat handle position switch shorted, jammed, or broken	Check slat handle position switch	Repair or replace, as necessary.
(2)	Stall warning computer failure	Check stall warning computer (STALL WARNING SYSTEM - MAINTENANCE PRACTICES, PAGEBLOCK 34-19-00/201)	Replace computer

Table 103 (Continued)

Possible Causes		Isolation Procedure	Correction
(3)	Auto slat actuator failure	Check actuators	Repair or replace, as necessary.
H.	SLATS WILL NOT FULLY RETRACT FROM EXTENDED POSITION		
(1)	Sequence mechanism failure	Check damage linkage, seized bearings, missing attach bolts	Repair or replace, as necessary.
(2)	Jammed or broken control cables or pulleys	Check control cables and pulleys	Repair or replace, as necessary.
(3)	Slat drive mechanism failure	Check drive mechanism	Repair or replace, as necessary.
I.	SLATS EXTENSION AND RETRACTION ROUGH OR ERRATIC		
(1)	Broken or jammed cables	Check control and followup cables. Check slat cable system from drive cable drum to slat drive tracks	Repair or replace, as necessary
(2)	Broken cable pulley or pulley bracket	Check cable pulleys and brackets	Replace parts as necessary.
(3)	Low cable tension	Check cable tension	Tension cables to correct load.
(4)	Asymmetic cable tension between left and right wing	Check cable tension between left and right wing for differences	Symmetrically tension slat cables.
(5)	Slat track or rollers binding	Check tracks and track rollers for free operation	Repair or replace, as necessary
(6)	Slat drive mechanism failure	Check drive mechanism for proper operation	Repair or replace, as necessary
(7)	Failure of slat interconnect pins or bolts connection between slat and tracks	Check bolts and pins for proper engagement and security	Replace parts as necessary.
J.	SLAT DISAGREE LIGHT ON AT ALL FLAP/SLAT POSITIONS		
(1)	A or B proximity sensors faulty or improperly adjusted. Figure 103	Check status test panel flight fault review for "slat position 1 and 2 failure" or "slat position comp. failure". (DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201)	
		If this condition exists, check A or B proximity sensors, using proximity switch electronics unit self test for sensor status monitor test as follows:	Adjust sensor and/or replace as necessary (LIFT AUGMENTING SLATS - REMOVAL/INSTALLATION, PAGEBLOCK 27-80-01/401) (SENSORS SLAT ADVISORY - MAINTENANCE PRACTICES, PAGEBLOCK 27-80-06/201)

Table 103 (Continued)

Possible Causes		Isolation Procedure	Correction
(a)		On proximity switch electronics unit, place MODE selector switch to MONITOR position.	
(b)		Using thumbwheels, dial in channel select number for specific sensor being tested.	
NOTE: Test button need not be pressed, because sensor status test is automatic.			
(c)		Check FAULT CODE window to determine sensor status.	
NOTE: The FAULT CODE window indicates either the far or close position of the sensor, and whether or not the sensor and its wiring pass or fail the self test.			
(d)	FAR	Perform steps (b) and (c) on sensor being tested at each of the following slat positions:	

POSITION OF SENSORS AT RETRACT

	A	B	C	D
FAR		X	X	X
CLOSE	X			

POSITION OF SENSORS AT MID

	A	B	C	D
FAR	X			
CLOSE		X	X	X

POSITION OF SENSORS AT EXTEND

	A	B	C	D
FAR				
CLOSE	X	X	X	X

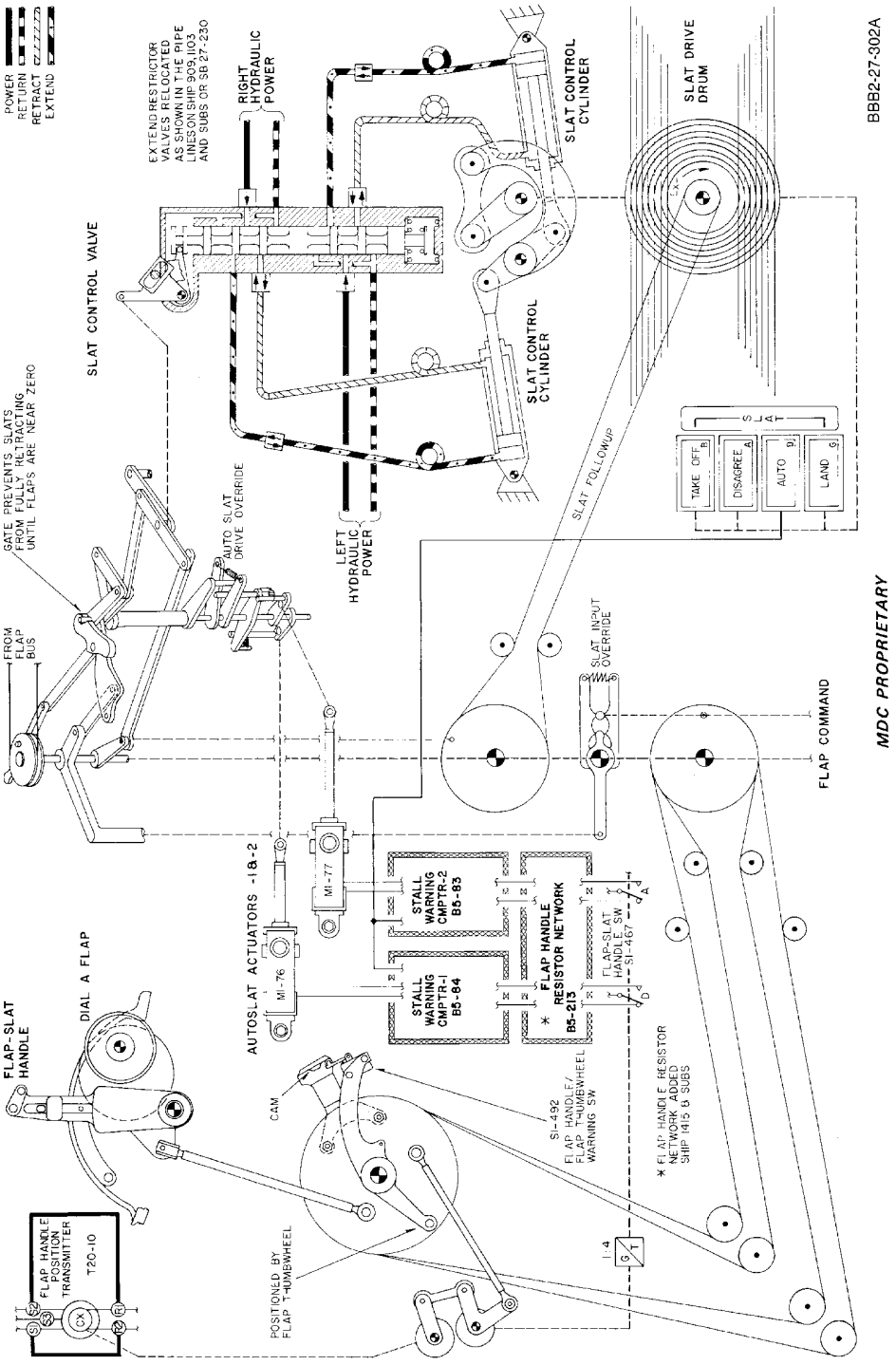
NOTE: Improper gap adjustment will not cause sensor to fail the self test, but may only cause the close/far reading to be improper.			
(2)	Flap/slat handle switch faulty or improperly adjusted	Check flap/slat handle switch for continuity and proper adjustment	Adjust or re place as necessary (FLAP/SLAT HANDLE POSITION SWITCHES AND TRANSMITTER - MAINTENANCE PRACTICES, PAGEBLOCK 27-80-07/201)
NOTE: Stall warning computer is not directly responsible for SLAT DISAGREE light.			

Table 103 (Continued)

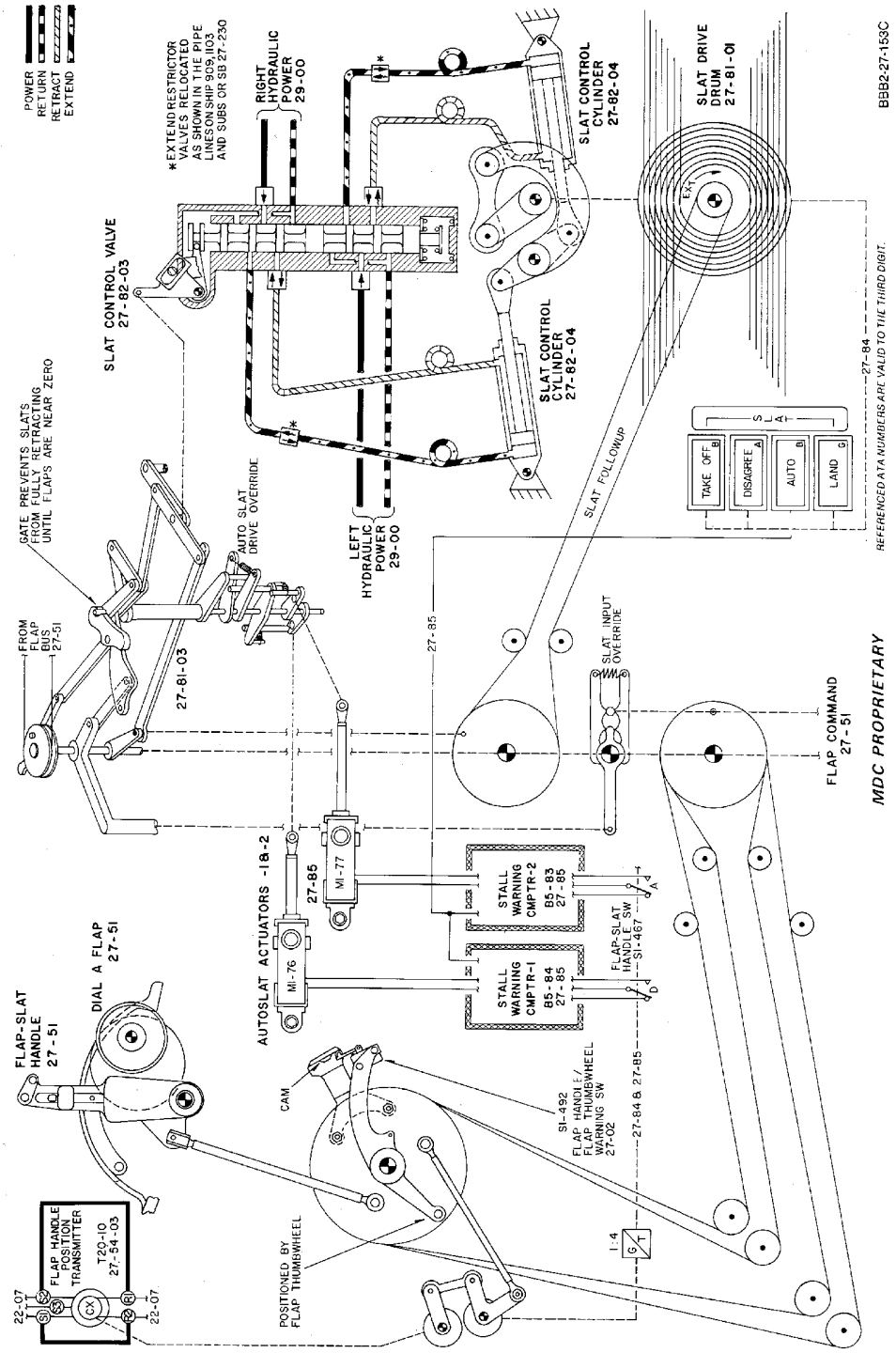
Possible Causes		Isolation Procedure	Correction
NOTE: The flap/slat handle switch provides an output to both the proximity switching unit and the stall warning computer. Although, these outputs are not the same, both outputs are switched by the flap/ slat handle switch at the same time (14 degrees (0.244 rad)). Therefore, adjusting the switching point of the flap/slat handle switch, at the stall warning computer or at the proximity box, will have the same effect. (FLAP/SLAT HANDLE POSITION SWITCHES AND TRANSMITTER - MAINTENANCE PRACTICES, PAGEBLOCK 27-80-07/201, paragraph 3.A.(5))			
(3)	C or D proximity sensors faulty or improperly adjusted (Figure 103)	Perform isolation procedures per step J.(1) on C and D sensors	Adjust sensors or replace as necessary (LIFT AUGMENTING SLATS - REMOVAL/INSTALLATION, PAGEBLOCK 27-80-01/401) (SENSORS SLAT ADVISORY - MAINTENANCE PRACTICES, PAGEBLOCK 27-80-06/201)
	SENSORS ACCESS PANEL LOCATION		
	Sensor C Sensor D	1164C left 1123C left	1243C right 1257C right
NOTE: Target gap for C and D proximity sensors on later production aircraft are not adjustable.			
(4)	Disagree light cannot be duplicated on ground test		
NOTE: When the brake pressure transducer becomes cold soaked after extended flight operations at high altitude, a slat disagree light may illuminate. The cause of this anomaly is due to a failure in the output filter of the brake pressure transducer. This allows a 2000 Hz square wave signal to ride on the low level DC signal to the FDAU. The induction of this 2000 Hz square wave signal into the signal wires from the wing proximity sensor to the PSEU can cause the PSEU to sense the wrong state for a wing proximity sensor or sensors. If this occurs, the slat disagree light will illuminate. If it is suspected that a brake pressure transducer may be the cause of the intermittent slat disagree light, as noted above, then a check of the FDAU data may isolate and confirm a bad brake pressure transducer via erratic readings.			
NOTE: Generally, if the disagree light only occurs during inflight operations, the C and D proximity sensors may be losing their effectiveness. Therefore, the slight increase in target gap, due to wing loads, may be causing the problem.			
		A flight test is suggested to monitor status of the proximity sensors during flight loads. The following procedures apply:	Adjust sensors or replace as necessary (LIFT AUGMENTING SLATS - REMOVAL/INSTALLATION, PAGEBLOCK 27-80-01/401) (SENSORS SLAT ADVISORY - MAINTENANCE PRACTICES, PAGEBLOCK 27-80-06/201)
(a)		Perform isolation procedures per paragraph J.(1), steps (a) through (d) while inflight (retract and mid positions only).	

Table 103 (Continued)

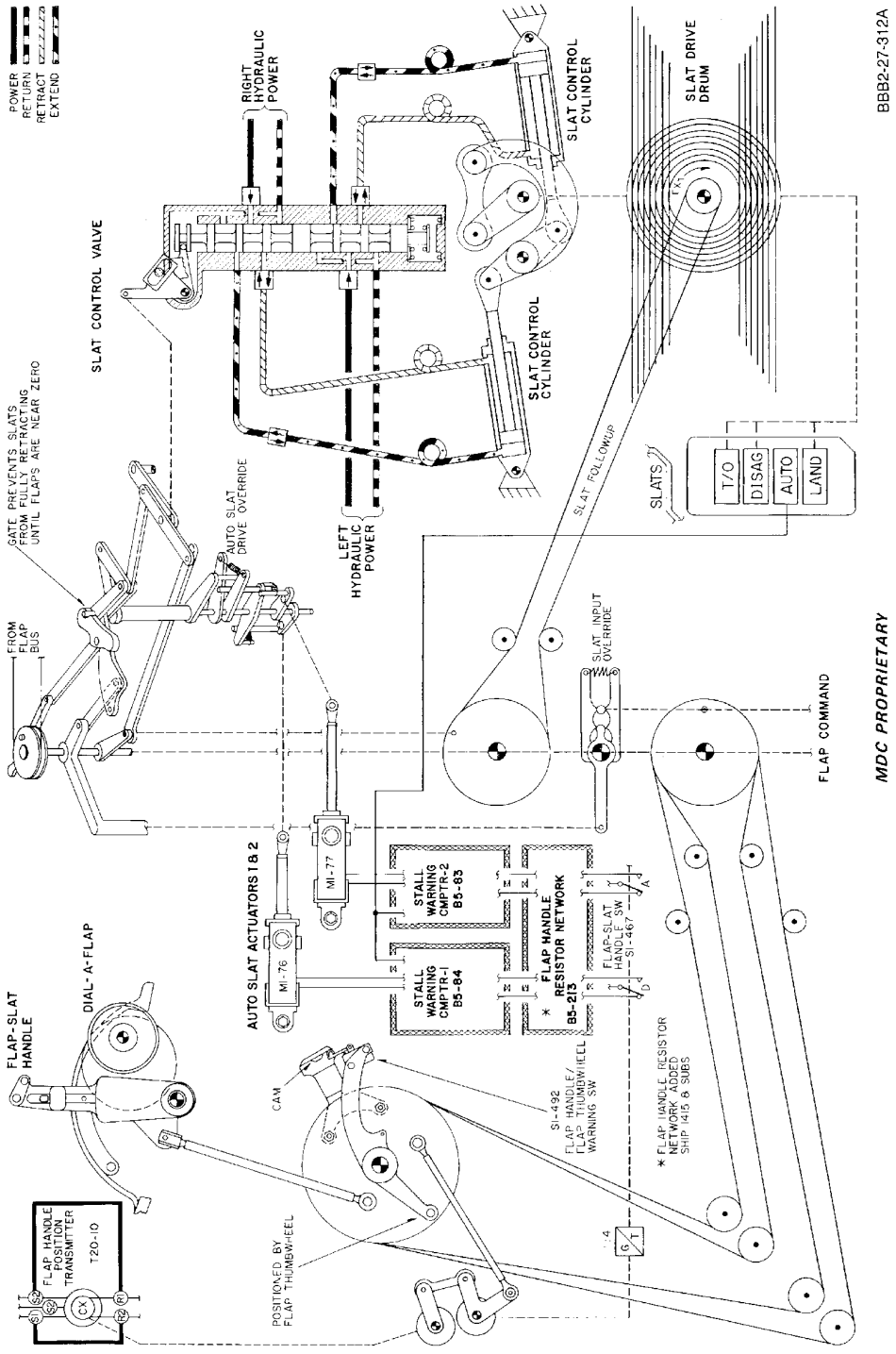
Possible Causes		Isolation Procedure	Correction
(b)		Proximity switch electronics unit test set or equivalent, may be used to isolate specific sensor that is causing problem.	
NOTE: These procedures are for NON-REVENUE test flights.			
K.	SLAT TAKEOFF LIGHT WILL NOT ILLUMINATE WHEN SLATS IN MID OR EXTEND (DISAGREE LIGHT OFF)		
(1)	No power to proximity switch electronics unit and annunciator lights	Check left proximity control circuit breaker	Replace faulty circuit breaker
L.	AUTO SLAT FAIL LIGHT ON		
(1)	Stall warning computer failure	Check stall warning computer (STALL WARNING SYSTEM - TROUBLE SHOOTING, PAGEBLOCK 34-19-00/101 Config 1)	Repair or replace, as necessary.
(2)	Auto slat system failure	Check auto slat fail light (STALL WARNING SYSTEM - TROUBLE SHOOTING, PAGEBLOCK 34-19-00/101 Config 1)	Repair or replace, as necessary.



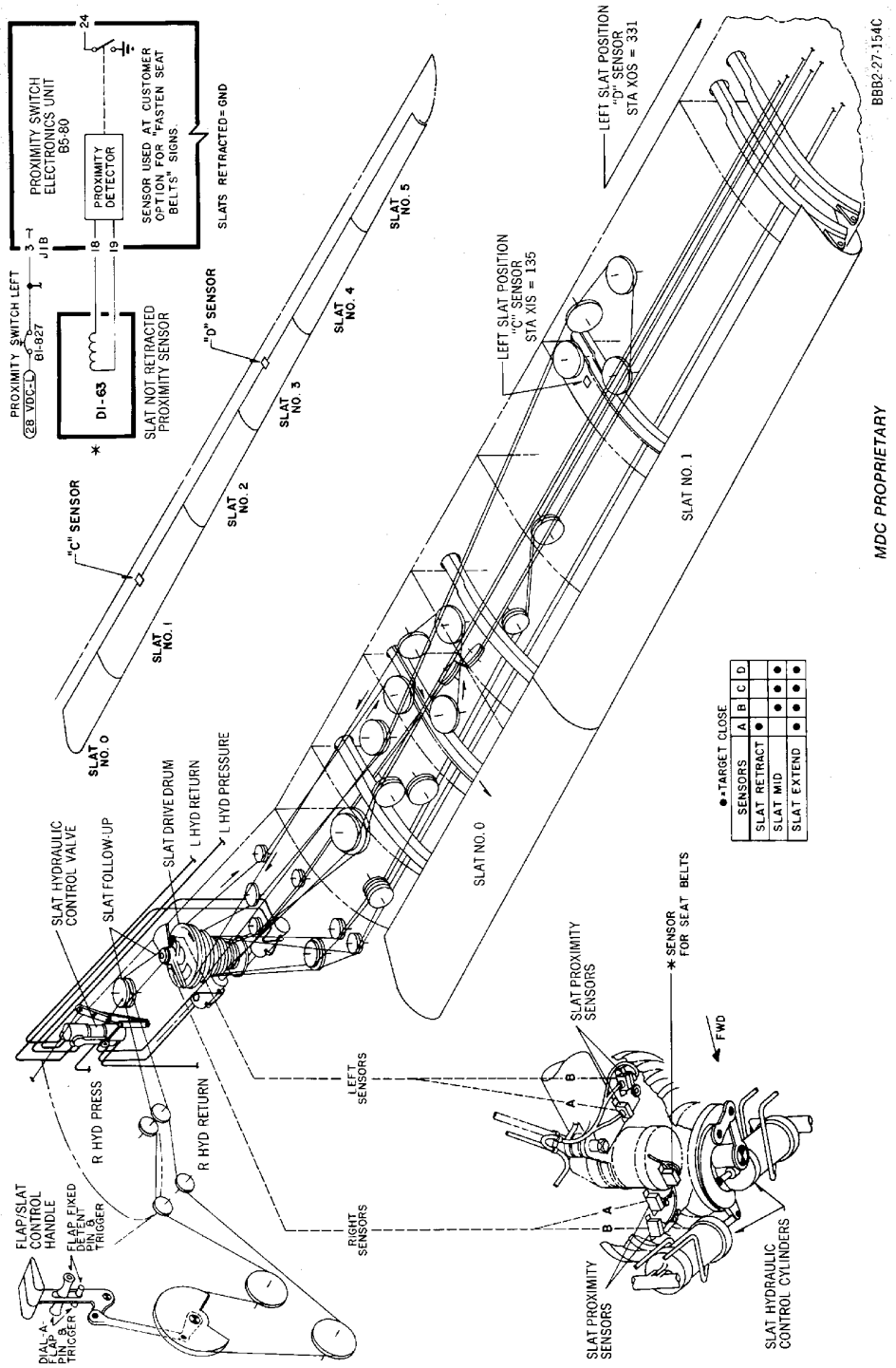
Slat Control
Figure 102/27-80-00-990-806 (Sheet 1 of 3)



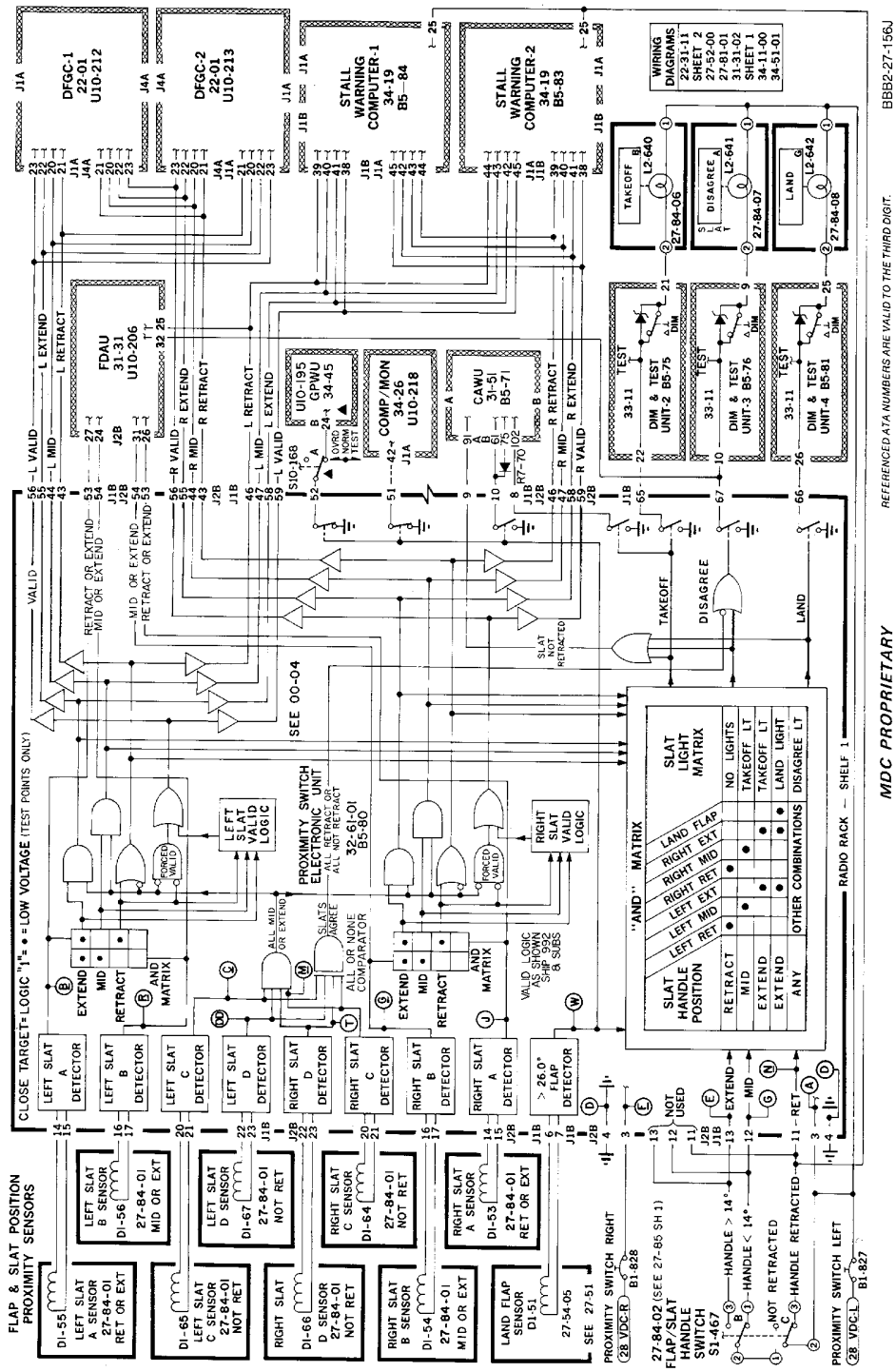
Slat Control
Figure 102/27-80-00-990-806 (Sheet 2 of 3)



Slat Control
Figure 102/27-80-00-990-806 (Sheet 3 of 3)

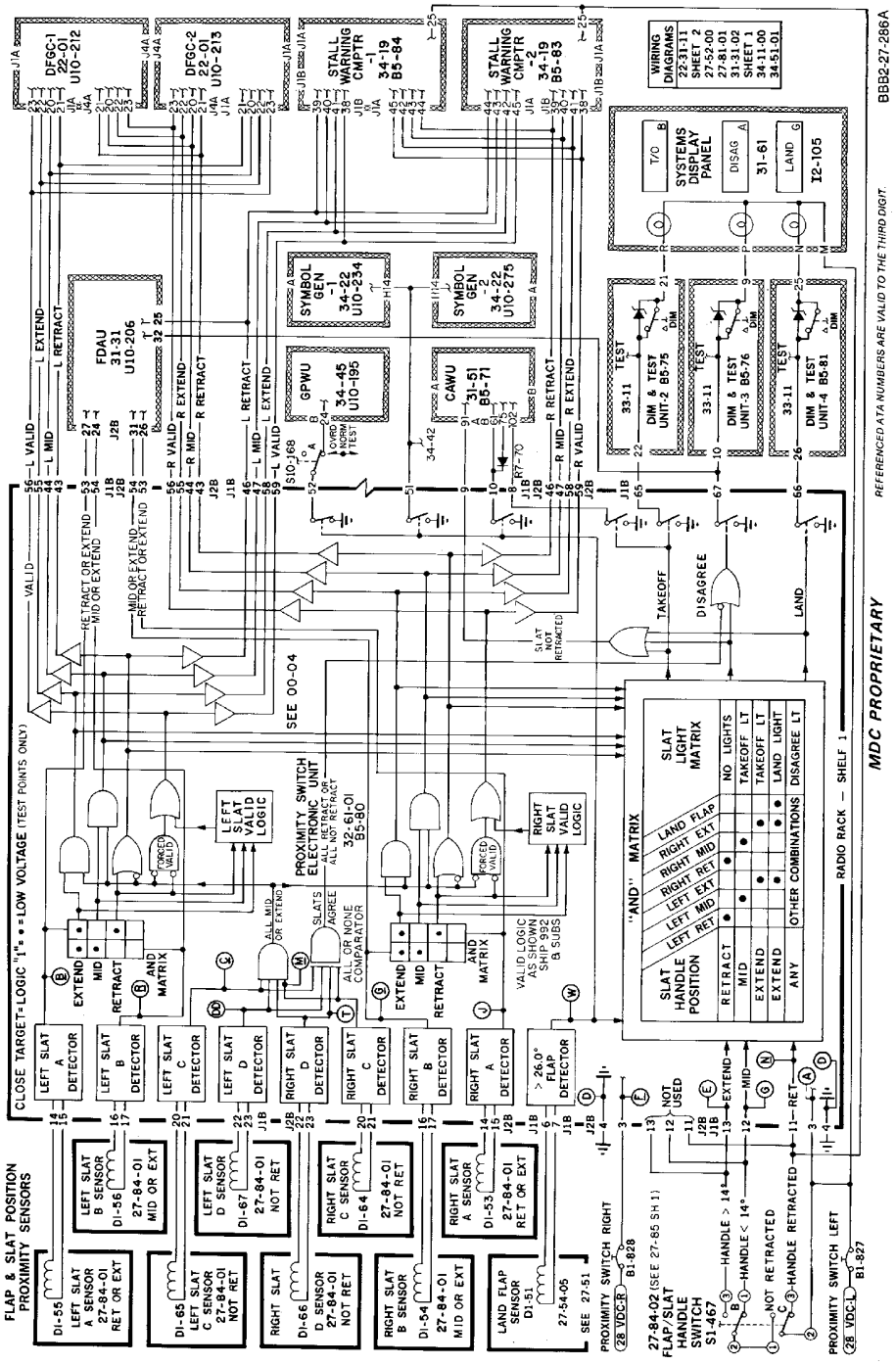


Slat Mechanical Actuation
Figure 103/27-80-00-990-807

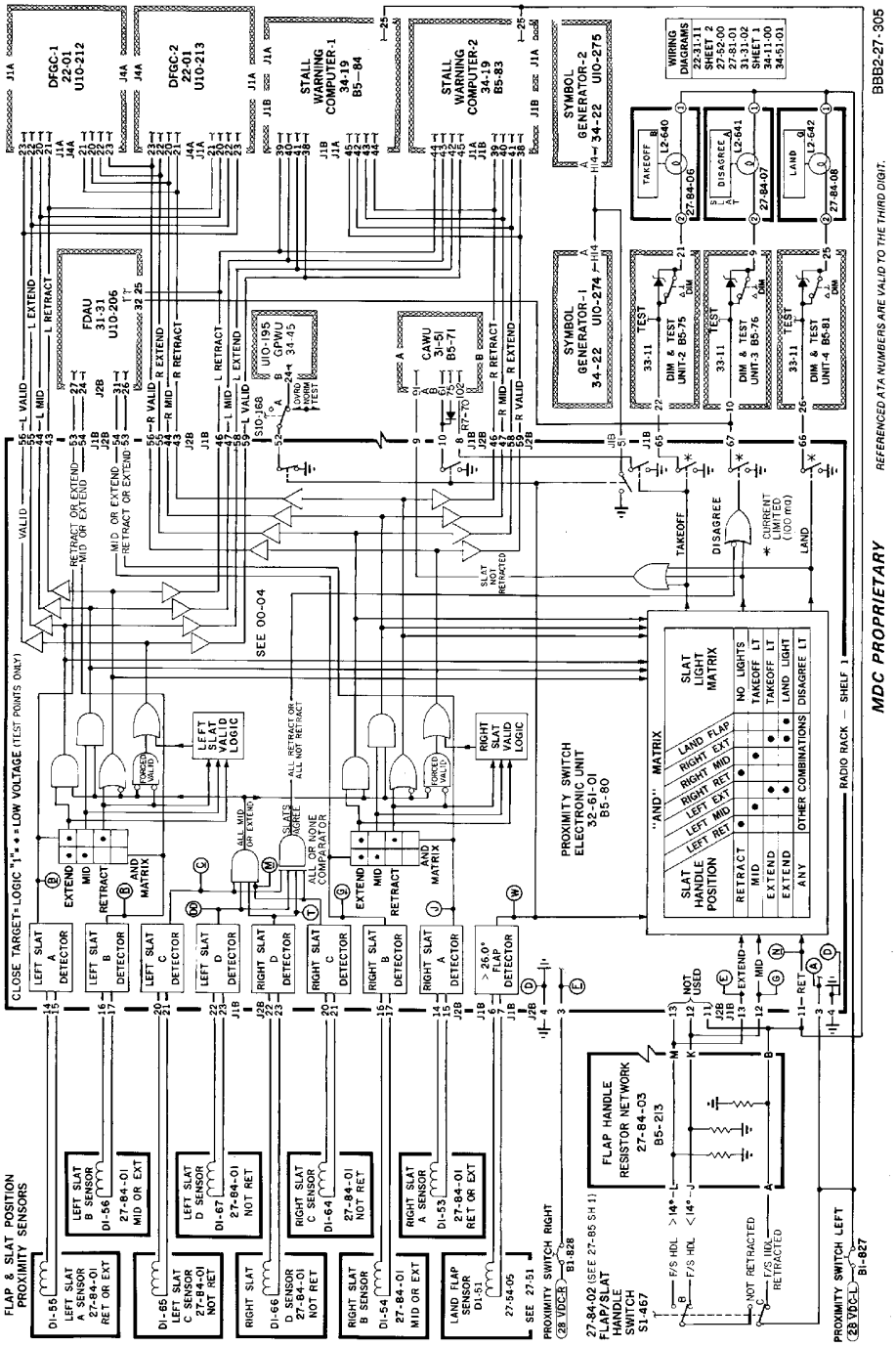


Flap and Slat Position Indicating
Figure 104/27-80-00-990-808 (Sheet 1 of 4)

EFFECTIVITY
WJE 409, 416, 420, 422, 424-427, 429, 868, 884, 891

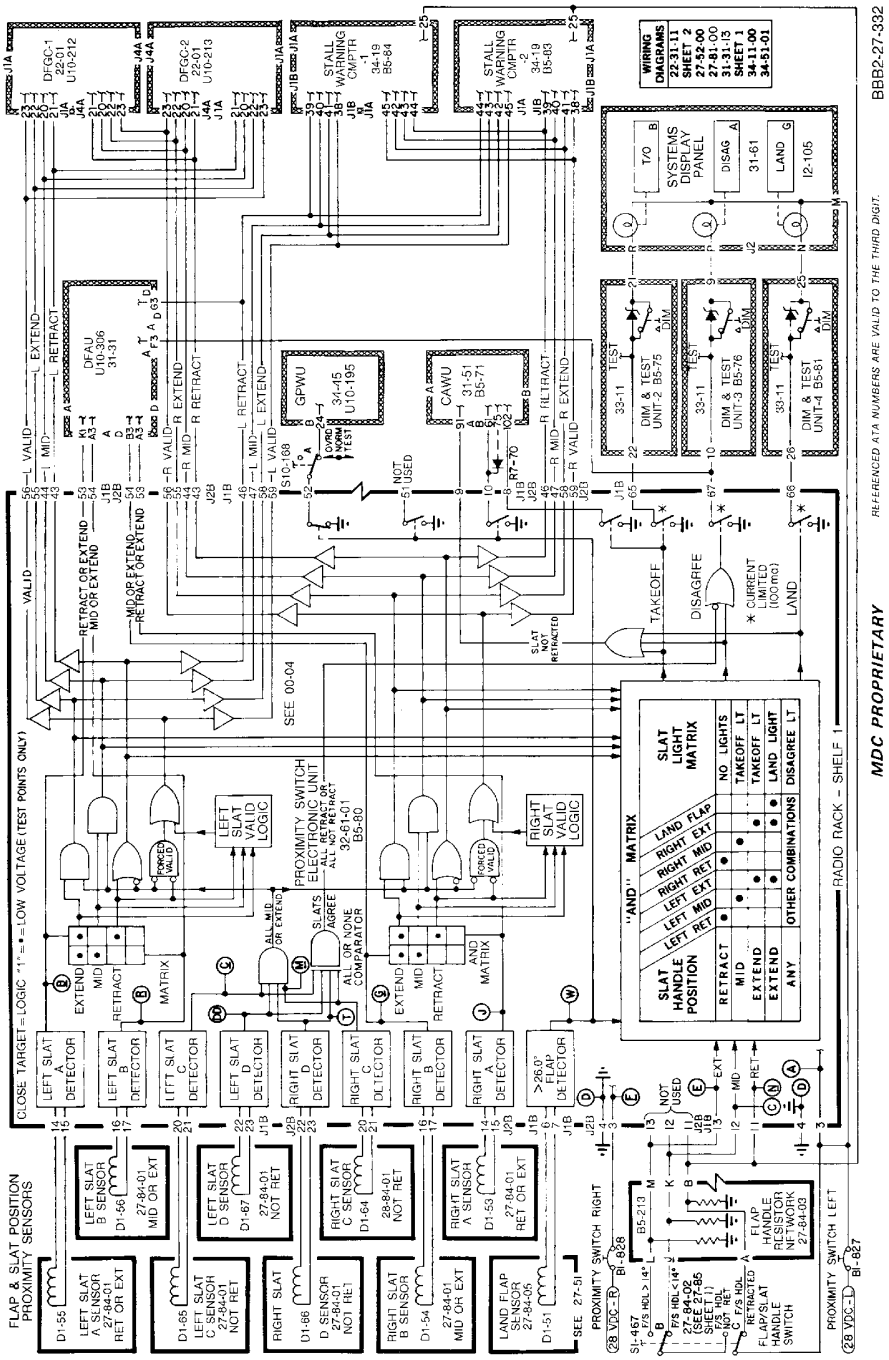


Flap and Slat Position Indicating
Figure 104/27-80-00-990-808 (Sheet 2 of 4)

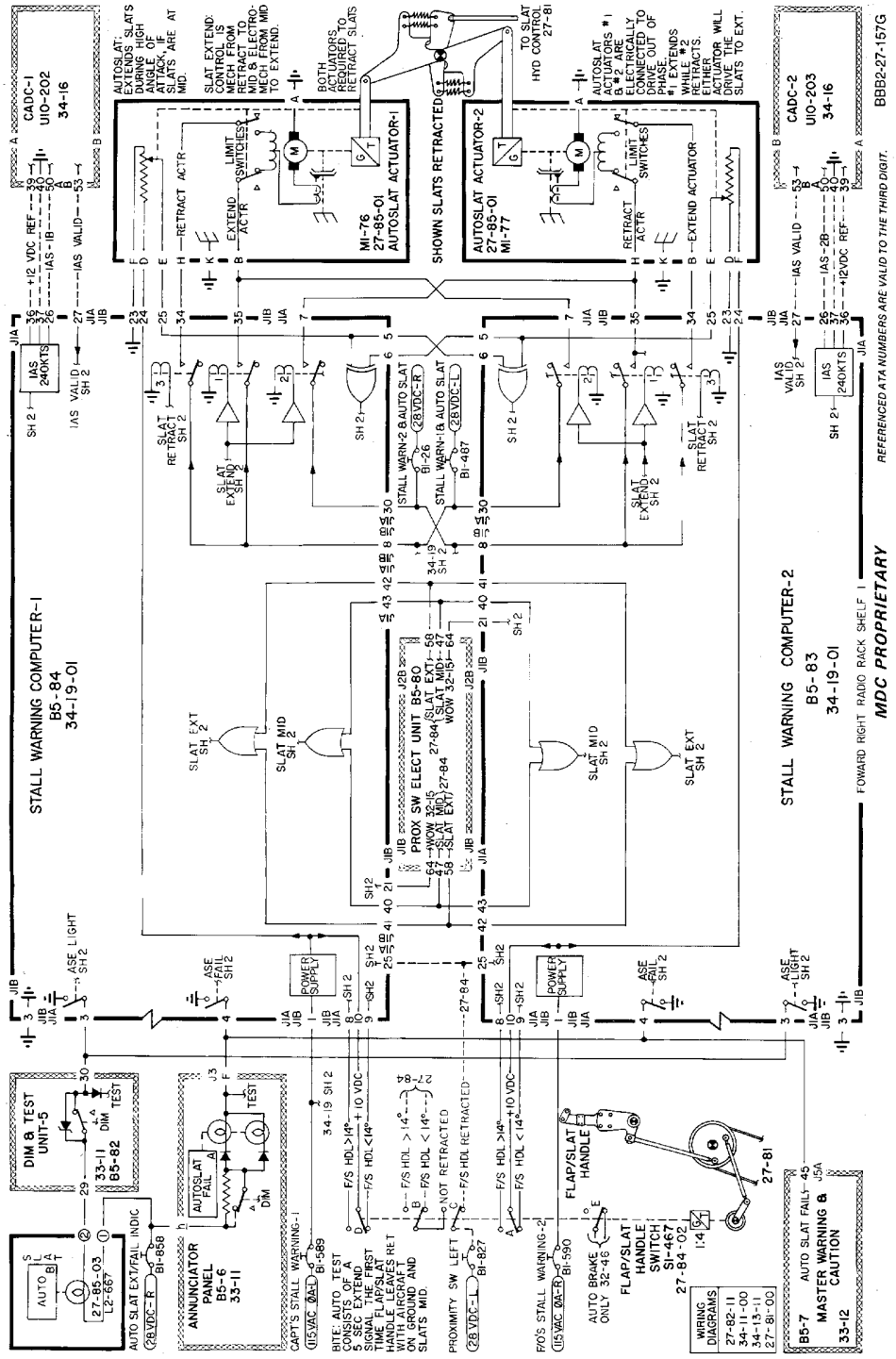


Flap and Slat Position Indicating
Figure 104/27-80-00-990-808 (Sheet 3 of 4)

EFFECTIVITY
WJE 405-408, 410, 411, 415, 417-419, 421, 423, 861-866, 869, 871-874, 880, 881, 883, 892, 893

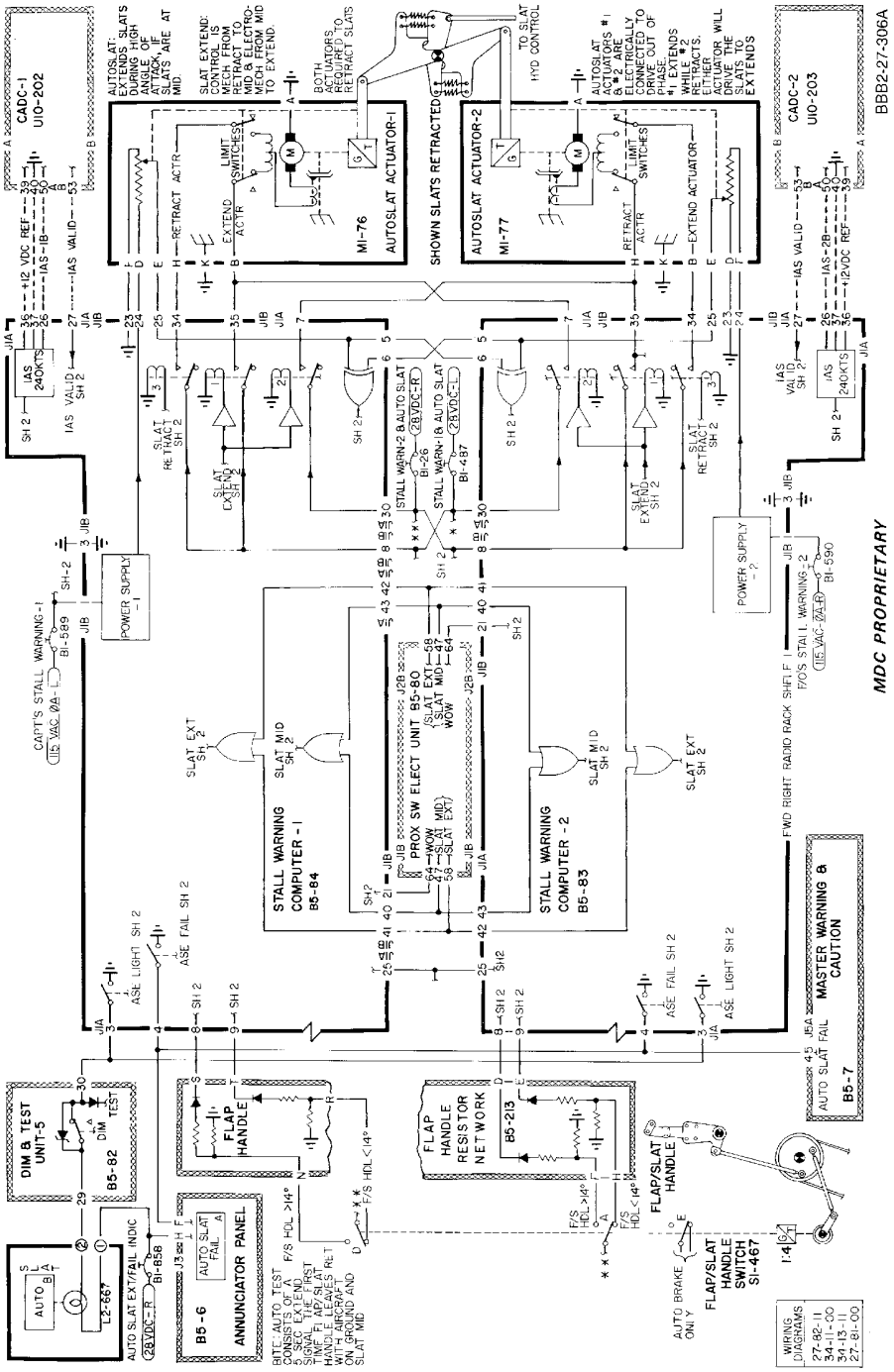


Flap and Slat Position Indicating
Figure 104/27-80-00-990-808 (Sheet 4 of 4)



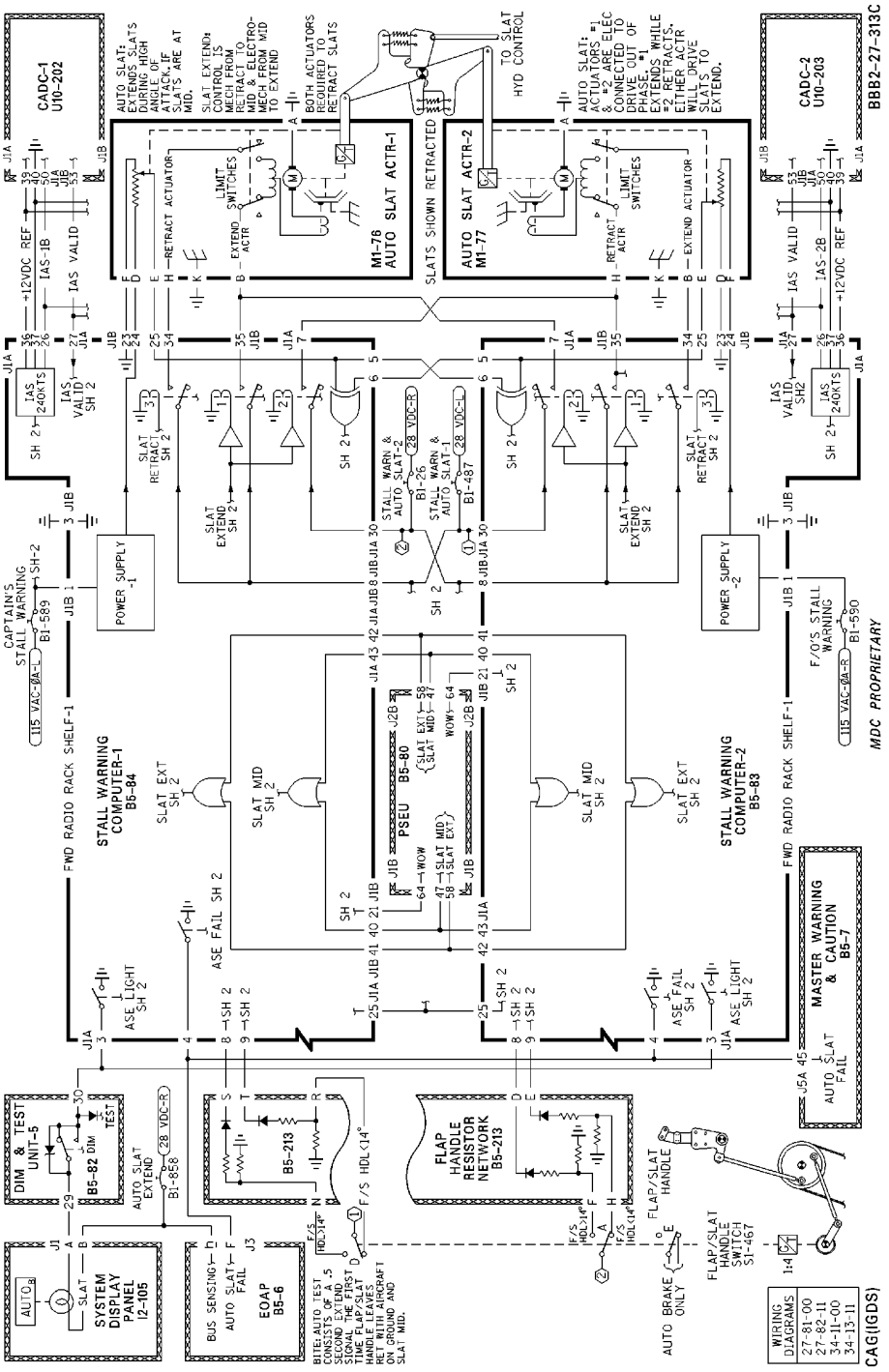
Auto Slat and Slat Extend (Mid to Extend)
Figure 105/27-80-00-990-809 (Sheet 1 of 3)

EFFECTIVITY
WJE 409, 416, 420, 422, 424-427, 429, 868, 884, 891

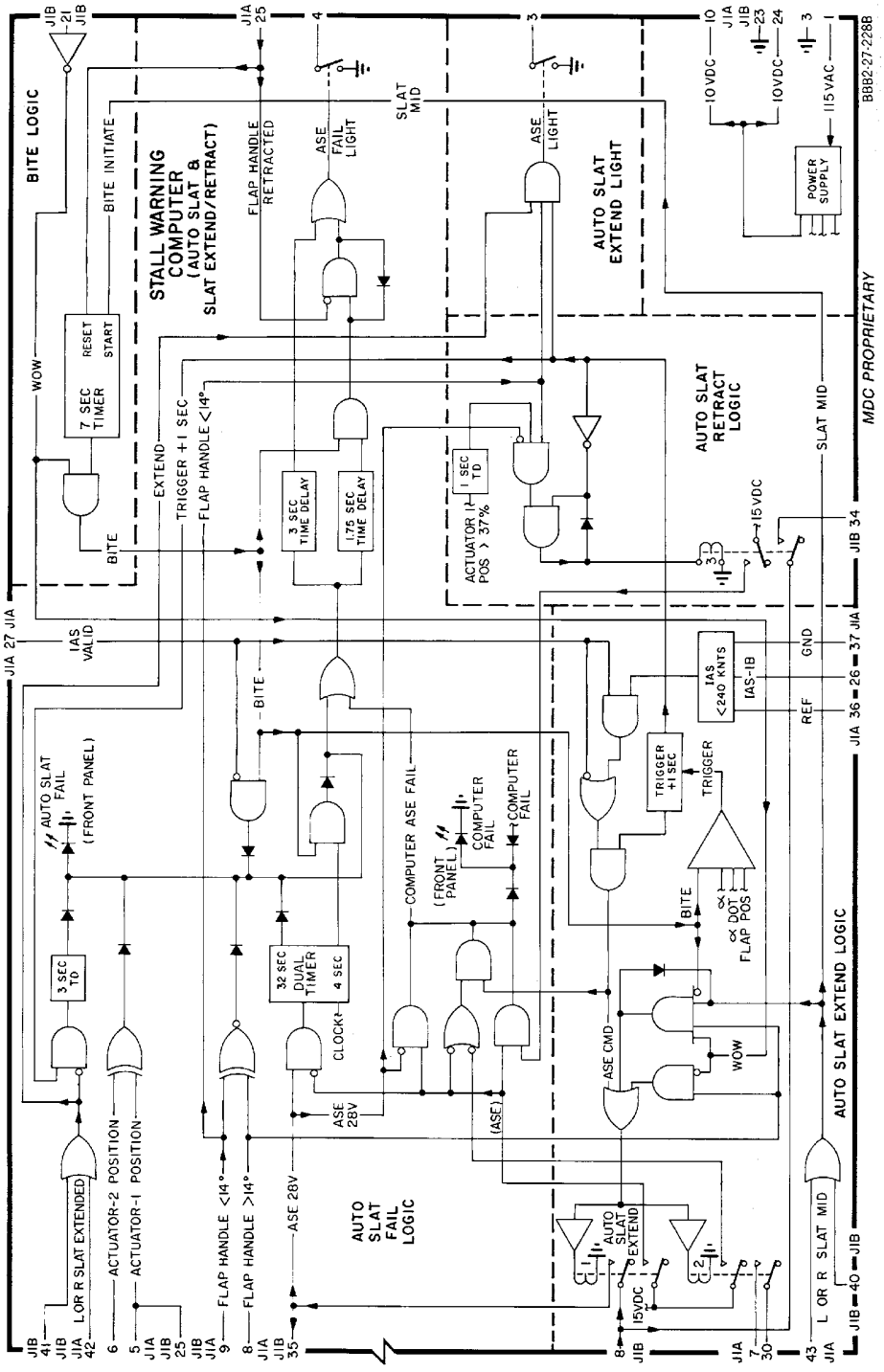


Auto Slat and Slat Extend (Mid to Extend)
Figure 105/27-80-00-990-809 (Sheet 2 of 3)

EFFECTIVITY
WJE 401-408, 410-412, 414, 861, 862, 873, 874, 880, 881, 883, 892, 893



Auto Slat and Slat Extend (Mid to Extend)
Figure 105/27-80-00-990-809 (Sheet 3 of 3)



Stall Warning Computer (Auto Slat and Slat Extend)
Figure 106/27-80-00-990-810

LIFT AUGMENTING - ADJUSTMENT/TEST

1. General

A. The following paragraphs provide instructions for the adjustment/test of the entire slat system. Specific segments of the system may be adjusted or tested by following the instructions in the applicable paragraph.

B. General maintenance practices must be read and understood before proceeding with the adjustment procedures. (PAGEBLOCK 27-00-00/201)

C. The numbers and letters enclosed by hexagon-shaped symbols in Figure 501 correspond to cable runs and segments listed in paragraph 4. Each cable run number is posted adjacent to the corresponding cable on the airplane. The letters in parentheses in the following text correspond to callouts in Figure 501.

NOTE: When any one slat cable is replaced or re-tensioned, the same systems in each wing must be tensioned symmetrically, example: Slat 1 in each wing at the same time. Never tension slat cables in one wing without also tensioning the same slat cables in the other wing.

D. There are six slats on each wing, numbered 0 through 5 from inboard to outboard.

E. Access to turnbuckles is given in the text as required. Access to other major components is as follows:

Table 501

Item	Access Door	Location
Slat control valve, slat drive drum and slat cylinders, auto slat actuators and flap/slat sequence mechanism	Aft bulkhead panel mid-cargo compartment	Center wing, front spar

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 502

Name and Number	Manufacturer
Tensiometer	Pacific Scientific Co.
Tensiometer control cables 3/16 in. (4.67 mm), 1/4 in. (6.35 mm), 5/16 in. (7.94 mm) (T5-8005-110-00)	Pacific Scientific Co.
Tensiometer, control cables 1/4 in. (6.35 mm), 5/16 in. (7.94 mm), 3/8 in. (9.53 mm) (DZZ7177–1)	Douglas Aircraft Co.
Tensiometer control cables 1/16 in. (1.59 mm), 1/8 in (3.18 mm), 3/16 in. (4.67 mm), 1/4 in. (6.35 mm) (T5-2002-101-00)	Pacific Scientific Co.

Table 502 (Continued)

Name and Number	Manufacturer
Compound, corrosion preventative, Castrol, Inc. transparent, non-tacky film, cold application (MIL-C-16173, Grade 4) DPM 667-1	Bray Products Div. Irvine, CA.
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. **Adjustment/Test Lift Augmenting**

NOTE: Retract cables should be adjusted first to ensure slats remains against retract stops while tensioning slat drive cables.

WARNING: BEWARE OF CONTROL SURFACES AND LINKAGE AFFECTED BY HYDRAULIC POWER. BEFORE DISCONNECTING CONTROL CABLES OR LINKAGE TO SURFACE ACTUATOR VALVES, DEPRESSURIZE HYDRAULIC SYSTEMS (PAGEBLOCK 29-00-00/201). DURING ADJUSTMENT PROCEDURES THAT REQUIRE HYDRAULIC PRESSURE, BEWARE OF CONTROLS AND CONTROL SURFACES AFFECTED BY HYDRAULIC PRESSURE.

WARNING: CORROSION PREVENTATIVE IS AN AGENT THAT IS FLAMMABLE, POISONOUS, AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN CORROSION PREVENTATIVE IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET CORROSION PREVENTATIVE IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

CAUTION: NEVER HAVE ALL THE CABLES IN ONE WING TENSIONED AND NONE TENSIONED IN THE OTHER WING. ALL CABLE TENSIONING MUST BE DONE SYMMETRICALLY ON BOTH WINGS IN TURN.

A. If installing new slat cable segment to cable runs numbered 209 through 240, tension cable per Figure 503, and cycle slats a minimum of 5 times.

NOTE: Before using turnbuckles to achieve cable tension, lubricate threaded cable ends (MIL-C-16173).

NOTE: Never tension slat cables in one wing without also tensioning same slat cables in opposite wing.

B. Adjust Slat Mechanical Controls and Actuation. (Figure 501)

NOTE: Flap mechanical controls (PAGEBLOCK 27-50-00/501) and slat surfaces (PAGEBLOCK 27-80-01/401) must be properly adjusted prior to adjusting slat controls.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Place flap/slat handle in RET detent.

(3) Disconnect pushrod (A) from slat control valve lever (F). Place lever (F) against retract stop and tie lever in position.

NOTE: Minimum differential cable loads between slat extend and retract cables to be 200 pounds (90.7 kg) except for cables 223A, B, 224A, B, 239A, B and 240A, B which shall be 75 pounds (34.0 kg).

(4) On the left wing, differentially adjust turnbuckles (A) and (J) Figure 501 (Sheet 1) for slat 0 retract and extend cables until tension is between minimum and maximum load per cable tension table Figure 502 (Sheet 1) for 5/16 inch (7.94 mm) cables 210A, B, and 209A, B.

NOTE: Turnbuckles (A) and (J) are located on wing center front spar. Access is through the mid cargo compartment aft panels 5138C and 5107C.

(5) Repeat Paragraph 3.B.(4) for right wing slat 0 cables 226A, B and 225A, B.

(6) Recheck Paragraph 3.B.(4) and readjust rig loads, as required, Paragraph 3.B.(4) and Paragraph 3.B.(5).

WARNING: BEFORE REMOVING TIE FROM SLAT CONTROL VALVE LEVER (F), MAKE CERTAIN THAT AREAS AROUND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(7) Remove tie from slat control valve lever (F). Using lever (F) cycle slats a minimum of 5 times.

(8) Place lever (F) against retract stop and tie lever in position.

(9) Recheck slat 0 rig loads Paragraph 3.B.(4) and readjust rig loads, as required, Paragraph 3.B.(4) and Paragraph 3.B.(5).

(10) Differentially adjust turnbuckles (B) and (K) Figure 501 (Sheet 2) for slat 1 retract and extend cables until tension is between minimum and maximum load per cable tension table Figure 502 (Sheet 2) for 3/8 inch (9.53 mm) cables 212A, B 211A, B.

NOTE: Turnbuckles (B) and (K) are located on the front spar and access is through lower wing panels 1160C and 1163C (left), 1263C and 1244C (right). Turnbuckle (B) is outboard of slat 1 drive track and turnbuckle (K) is inboard of drive track.

(11) Repeat Paragraph 3.B.(10) for right wing slat 1 cables 228A, B and 227A, B.

(12) Recheck Paragraph 3.B.(10) and readjust rig loads, as required, Paragraph 3.B.(10) and Paragraph 3.B.(11).

(13) Remove tie from slat control valve lever (F). Using lever (F) cycle slats a minimum of 5 times.

(14) Place lever (F) against retract stop and tie lever in position.

(15) Recheck slats 0 and 1 rig loads Paragraph 3.B.(4) through Paragraph 3.B.(11) and readjust rig loads, as required, Paragraph 3.B.(4) through Paragraph 3.B.(11).

(16) Differentially adjust turnbuckles (C) and (L) Figure 501 (Sheet 3) for slat 2 retract and extend cables until tension is between minimum and maximum load per cable tension table Figure 502 (Sheet 3) for 1/4 inch (6.35 mm) cables 214A, B, and 213A, B.

NOTE: Turnbuckles (C) and (L) are located on the front spar of slat 2 drive track and access is through lower wing panels 1132C and 1165C (left) and 1249C and 1253C (right).

(17) Repeat Paragraph 3.B.(16) for right wing slat 2 cables 230A, B and 229A, B.

(18) Recheck Paragraph 3.B.(16) and readjust rig loads, as required, Paragraph 3.B.(16) and Paragraph 3.B.(17).

(19) Remove tie from slat control valve lever (F). Using lever (F) cycle slats a minimum of 5 times.

(20) Place lever (F) against retract stop and tie lever in position.

(21) Recheck slats 0, 1, and 2 rig loads Paragraph 3.B.(4) through Paragraph 3.B.(17) and readjust rig loads, as required, Paragraph 3.B.(4) through Paragraph 3.B.(17).

(22) Differentially adjust turnbuckles (D) and (M) Figure 501 (Sheet 3) for slat 3 retract and extend cables until tension is between minimum and maximum load per cable tension table Figure 502 (Sheet 4) for 1/4 inch (6.35 mm) cables 216A, B, and 215A, B.

NOTE: Turnbuckles (D) and (M) are located on the front spar inboard of slat 3 drive track and access is through lower wing panels 1160C and 1165C (left), and 1263C and 1253C (right).

(23) Repeat Paragraph 3.B.(22) for right wing slat 3 cables 232A, B and 231A, B.

(24) Recheck Paragraph 3.B.(22) and readjust rig loads, as required, Paragraph 3.B.(22) and Paragraph 3.B.(23).

(25) Remove tie from slat control valve lever (F). Using lever (F) cycle slats a minimum of five times.

(26) Place lever (F) against retract stop and tie lever in position.

(27) Recheck slats 0, 1, 2 and 3 rig loads Paragraph 3.B.(4) through Paragraph 3.B.(23) and readjust rig loads, as required, Paragraph 3.B.(4) through Paragraph 3.B.(23).

(28) Differentially adjust turnbuckles (E) and (N) Figure 501 (Sheet 3) for slat 4 retract and extend cables until tension is between minimum and maximum load per cable tension table Figure 502 (Sheet 5) for 1/4 inch (6.35 mm) cables 218A, B, 217A, B.

NOTE: Turnbuckles (E) and (N) are located on front spar inboard of slat drive track and access is through lower wing panels 1163C and 1165C (left), and 1244C and 1253C (right).

(29) Repeat Paragraph 3.B.(28) for right wing slat 4 cables 234A, B and 233A, B.

(30) Recheck Paragraph 3.B.(28) and readjust rig loads, as required, Paragraph 3.B.(28) and Paragraph 3.B.(29).

(31) Remove tie from slat control valve lever (F). Using lever (F) cycle slats a minimum of 5 times.

(32) Place lever (F) against retract stop and tie lever in position.

(33) Recheck slats 0, 1, 2, 3 and 4 rig loads Paragraph 3.B.(4) through Paragraph 3.B.(29) and readjust rig loads, as required, Paragraph 3.B.(4) through Paragraph 3.B.(29).

(34) Pretension left wing slat 5 extend and retract cables (1/4 inch), 219 A and B; and 220 A and B to 300 pounds. Use turnbuckles (F) and (P).

NOTE: Turnbuckle (F) is located on the front spar, outboard of slat 0 drive track and access is through lower wing panel 1160C (left) and 1263C (right). Turnbuckle (P) is located inboard of slat 1 drive track and access is through lower wing panel 1163C (left) and 1244C (right).

NOTE: Make certain that slat 5 extend and retract cables for inboard and outboard drive tracks remain slack while pre-tensioning 1/4 inch cables (219 A/B and 220 A/B) to 300 pounds, and while obtaining dimension (A) in Paragraph 3.B.(35) following.

(35) Differentially adjust turnbuckles (F) and (P) until dimension (A) (Figure 501 (Sheet 4), View A-A) on transfer drum is 1.25(±.05) inch (31.75(±1.27) mm).

(36) Repeat Paragraph 3.B.(34) and Paragraph 3.B.(35) for right wing slat 5 drive extend and retract cables 235A, B and 236A, B.

(37) On left wing adjust slat 5 inboard and outboard drive track retract and extend cables as follows:

(a) Tension slat 5 inboard drive track retract cable, 222A, B and outboard drive track retract cable, 224A, B using turnbuckles "G" and "H" per cable tension table. (Figure 502 (Sheet 7)) and (Figure 502 (Sheet 8))

(b) Tension slat 5 inboard drive track extend cable, 221A, B and outboard drive track extend cable, 223A, B using turnbuckles "R" and "S" per cable tension table. (Figure 502 (Sheet 7)) and (Figure 502 (Sheet 8))

NOTE: Turnbuckles (H), (S), (R) and (G) are located on the front spar between the transfer drum and slat 5 inboard drive track. Access to turnbuckles (H) and (S) is through lower wing panels 1113C (left), 1213C (right); turnbuckles (R) and (G) is through lower wing panels 1115C (left) and 1215C (right).

(c) Dimension (A) should now be 1.69(±.120) inches (42.93(±3.18) mm); if not, adjust slat 5 1/4 inch (6.35 mm) cables 219A, B and 220A, B using turnbuckles "F" and "P".

(38) Repeat Paragraph 3.B.(37)(a) through Paragraph 3.B.(37)(c) for right wing slat 5 extend and retract cables 235A, B, 236A, B, 237A, B, 238A, B, 239A, B and 240A, B.

(39) Tension slat 5 1/4 inch (6.35 mm) cables on left wing per cable tension table (Figure 502 (Sheet 6)) using turnbuckles "F" and "P" for cables 219A, B and 220A, B.

(40) Repeat Paragraph 3.B.(39) for right wing slat 5 drive extend and retract cables 235A, B and 236A, B.

(41) Verify that dimension (A) on transfer drum is 1.69(±.120) inches (42.93(±3.18) mm), for both left and right wings. Adjust slat 5 extend and retract cables if necessary.

(42) Remove tie from slat control valve lever (F). Using lever (F) cycle slats a minimum of five times.

(43) Place lever (F) against retract stop and tie lever in position.

(44) Recheck slat 5 rig loads Paragraph 3.B.(37) through Paragraph 3.B.(39), then recheck slats 0, 1, 2, 3 and 4 rig loads Paragraph 3.B.(4) through Paragraph 3.B.(41) and readjust rig loads, as required, Paragraph 3.B.(4) through Paragraph 3.B.(41).

(45) Adjust turnbuckles (T) and (U) until tension is between minimum and maximum load per cable tension table (Figure 502 (Sheet 9)) for 1/16 (1.59 mm) inch cables 253A, B and 254A, B (slat follow-up cables).

NOTE: Cable tension of a new follow-up cable can be greater than the maximum shown in the tension chart by 60 percent.

NOTE: Cable tension of an original follow-up cable can be greater than the maximum shown in the tension chart by 40 percent.

NOTE: Turnbuckles (T) and (U) are located between the slat drive drum and flap/slat sequence mechanism. Access is through the aft panel of the mid cargo compartment.

(46) Differentially adjust turnbuckles (T) and (U) until rig mark on drum (A) is 2.28(±.03) inches (57.9(±0.76) mm) inboard of rig mark (E) on bracket looking aft. (Figure 501 (Sheet 5))

(47) Safety all turnbuckles with clips.

(48) Make certain that flap/slat handle is in RET detent.

(49) Connect pushrod (A) to slat control lever (F). Safety nut with cotter pin.

(50) With slats fully retracted, place a pencil mark on left and right wing leading edge at trailing edge of slat 2 in line with drive track. (Figure 501 (Sheet 6))

WARNING: WHEN AIRCRAFT IS ON THE GROUND WITH WEIGHT ON WHEELS, BITE TEST OF AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME FLAP/SLAT HANDLE IS MOVED FROM UP/RET POSITION TO 0°/T.O. EXT OR 11°/T.O. EXT POSITION. SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND THEN RETURN TO MID POSITION.

(51) Place flap/slat handle in 11°/T.O. EXT detent.

NOTE: Before measuring distance in following step, wait 5 to 7 minutes for slats to stabilize (no creep).

(52) Measure distance from pencil mark on left and right wing to trailing edge of slat 2 in line with drive track. Measurement should be 14.90(±0.15) inches (378.5(±4) mm). If necessary, adjust turnbuckle adjustment on pushrod (A) to position slats at 14.90(±0.15) inches (378.5(±4) mm) measurement. Tighten turnbuckle jamnuts. Safety the turnbuckle to pushrod with lockwire if the lockwire hole is present in pushrod (A). (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)(Figure 501 (Sheet 5))

NOTE: Turnbuckle adjustment is 0.20 inch (5.1 mm) of slat travel per one turn of turnbuckle. Rod end adjustment is 0.600 inch (15.3 mm) of slat travel per one half turn of rod end.

NOTE: Threads from both rod ends must be at least flush (visible) with ends of witness slot.

(53) Place flap/slat handle in RET detent.

NOTE: Paragraph 3.B.(51) through Paragraph 3.B.(54) adjust flap handle position switches.

(54) Using dial-a-flap (DAF) thumbwheel, set DAF dial to read 11.

(55) Move flap/slat handle to 11/T.O. EXT detent.

(56) Lift inboard trigger on flap/slat handle (releasing fixed 11/T.O. EXT detent) and increase DAF dial reading to 14°(+1/2°, -0°) with DAF thumbwheel.

NOTE: 14° is represented at the center of the word 'NOT'.

(57) Adjust switch pushrod (F) to provide electrical power to both auto-slat actuators on flap/slat sequence mechanism. Tighten pushrod jamnut. (Figure 501 (Sheet 7))

NOTE: One auto slat actuator will extend and the other auto slat actuator will retract when electrical power is applied.

NOTE: Flap handle position switches are located in the forward right side of the pilot's control pedestal.

(58) Place flap/slat handle in UP/RET detent.

(59) Using DAF thumbwheel set DAF dial to read 0.

(60) Shut off hydraulic pressure source.

(61) Make certain all cable turnbuckles are safetied with clips.

C. Test Slat Operation

NOTE: During the following procedures the term MID is used to define that the slats are in the mid extend position.

WARNING: WHEN THE AIRCRAFT IS ON THE GROUND, WITH WEIGHT ON WHEELS, THE BITE TEST OF THE AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME THE FLAP/SLAT HANDLE IS MOVED FROM THE UP/RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. THE SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

(1) Make certain that flap/slat handle is in UP/RET detent.

(2) Make certain that airplane is in ground mode (nose and main gear struts compressed).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(3) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(4) Move flap/slat handle from UP/RET detent to 0°/T.O. EXT detent and check following:

(a) Slats should extend to MID, continue to full extend and remain at full extend for approximately 5 seconds then return to MID position.

(b) AUTO SLAT EXTEND and SLAT DISAGREE lights, on center instrument panel, should come on for approximately 5 seconds and then go off.

(c) SLAT TAKEOFF light should come on.

(d) AUTO SLAT FAIL light, on overhead annunciator panel, should not come on.

(5) Move flap/slat handle to 11°/T.O. EXT detent. Slats should remain at MID position and be within tolerance. (Figure 501 (Sheet 6)) SLAT TAKEOFF light should be on.

(6) Move flap/slat handle to 15°/T.O. EXT detent. Slats should extend fully. SLAT TAKEOFF light should be on. AUTO SLAT EXTEND light should be off. SLAT DISAGREE light will come on as slats move from MID to EXTEND position.

(7) Move flap/slat handle to 28°/LAND detent. Slats should remain extended. SLAT TAKEOFF light should go off. SLAT LAND light should come on when flaps are near 26.5° indicated and SLAT DISAGREE light should go off.

(8) Move flap/slat handle to 40°/LAND detent. Slats should remain extended and SLAT LAND light should be on.

(9) Move flap/slat handle to UP/RET detent. SLAT LAND light should be off. SLAT DISAGREE light will momentarily go out, then should be on while slats are in transit and go off when slats approach fully retracted position. AUTO SLAT FAIL light should be off.

CAUTION: DO NOT USE EXCESSIVE FORCE WHEN USING DIAL-A-FLAP (DAF) THUMBWHEEL WITH THE FLAP/SLAT HANDLE IN 0°/T.O. EXT, 11°/T.O. EXT AND 15°/T.O. EXT DETENTS, INTERNAL DAMAGE TO MECHANISM MAY OCCUR.

(10) Using DAF thumbwheel set DAF dial wheel to read 13° (edge of yellow band).

(11) Move flap/slat handle until it engages DAF movable detent. Slats should extend and return to MID position.

(12) Using DAF thumbwheel, gently rotate DAF thumbwheel until index mark on pedestal is just inside yellow "DO NOT USE" band on dial (about 13 1/2°). Slats should remain in mid position, slat DISAGREE light remains off, slat TAKEOFF light remains ON, STALL INDICATION failure light remains off.

(13) Continue to rotate DAF thumbwheel until slats first extend from MID POSITION to full extend. DAF dial should read 14° (+1/2°,-0°).

NOTE: Slat extension can be verified by a momentary drop in hydraulic pressure as indicated on cockpit gauge.

NOTE: 14° is represented at the center of the word "NOT".

(14) Lift outboard trigger on flap/slat handle, set DAF dial wheel to read 20° indicated. Release outboard trigger. Place flap/slat handle in 15° fixed detent. Gently rotate dial wheel towards 14°, DAF movable detent should engage flap/slat handle at 15° and slats should not retract.

(15) Without using excessive force, move flap/slat handle back and forth against forward and aft edges of 15/T.O. EXT fixed detent and verify that flap/slat handle position switch cannot be actuated to get mid slats.

(16) Move flap/slat handle to UP/RET detent.

(17) Set DAF wheel to read 0°.

(18) Shut off hydraulic power source.

D. Test Slat Hydraulic Actuation

NOTE: Slat cable systems (Paragraph 3.A.) and flap systems (PAGEBLOCK 27-50-00/501) must be operational prior to testing slat hydraulic actuation.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

NOTE: Hydraulic pressure source must have a flow capacity of 9 gpm at 3000 PSI to properly perform rate test.

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Move flap/slat handle from UP/RET detent to 40°/LAND detent.

Check that slats extend smoothly without binding.

(3) Move flap/slat handle to UP/RET detent. Check that slats retract to faired position smoothly without binding.

NOTE: Paragraph 3.D.(4) through Paragraph 3.D.(10) check slat timing.

NOTE: Various slat positions called for in Paragraph 3.D.(5) through Paragraph 3.D.(20) should be timed precisely from slat disagree light ON until it extinguishes.

NOTE: Due to system tolerance build-up from component wear, time tolerances specified may not be attainable if actual slat position relative to wing leading edge is used as a bench mark. This test series is intended to use the slat disagree light.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	23	B1-589	CAPTAIN'S STALL WARNING
Z	23	B1-590	FIRST OFFICER'S STALL WARNING

(5) Move flap/slat handle to 0°/T.O. EXT detent. Check that slats extend to MID position in 6(±2) seconds.

(6) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	23	B1-589	CAPTAIN'S STALL WARNING
Z	23	B1-590	FIRST OFFICER'S STALL WARNING

(7) Move flap/slat handle to 15°/EXT detent. Check that slats move to full extend position in 3(±2) seconds.

(8) Move flap/slat handle in 0°/T.O. EXT detent. Check that slats retract to MID position in 3(±2) seconds.

(9) Move flap/slat handle to UP/RET detent. Check that slats retract to faired position in 4(+5, -3) seconds.

(10) Depressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

NOTE: Paragraph 3.D.(11) through Paragraph 3.D.(16) test slat operation with single hydraulic system.

NOTE: For purposes of this adjustment/test, it may be necessary to lower BUTE (bent up trailing edge) doors to allow flaps and slats to fully retract. Slats cannot be retracted to less than mid-sealed position until trailing edge flaps have retracted to within 2 degrees of full up position.

(11) Move flap/slat handle to 40°/LAND position. Check that slats extend smoothly without binding.

(12) Move flap/slat handle to UP/RET detent. Check that slats retract to faired position smoothly without binding.

(13) Move flap/slat handle to 0°/T.O. EXT detent. Check that slats extend to MID position in 6(±2) seconds.

(14) Move flap/slat handle to 15°/EXT detent. Check that slats move to full extend position in 3(±2) seconds.

(15) Move flap/slat handle in 0°/T.O. EXT detent. Check that slats retract to MID position in 3(±2) seconds.

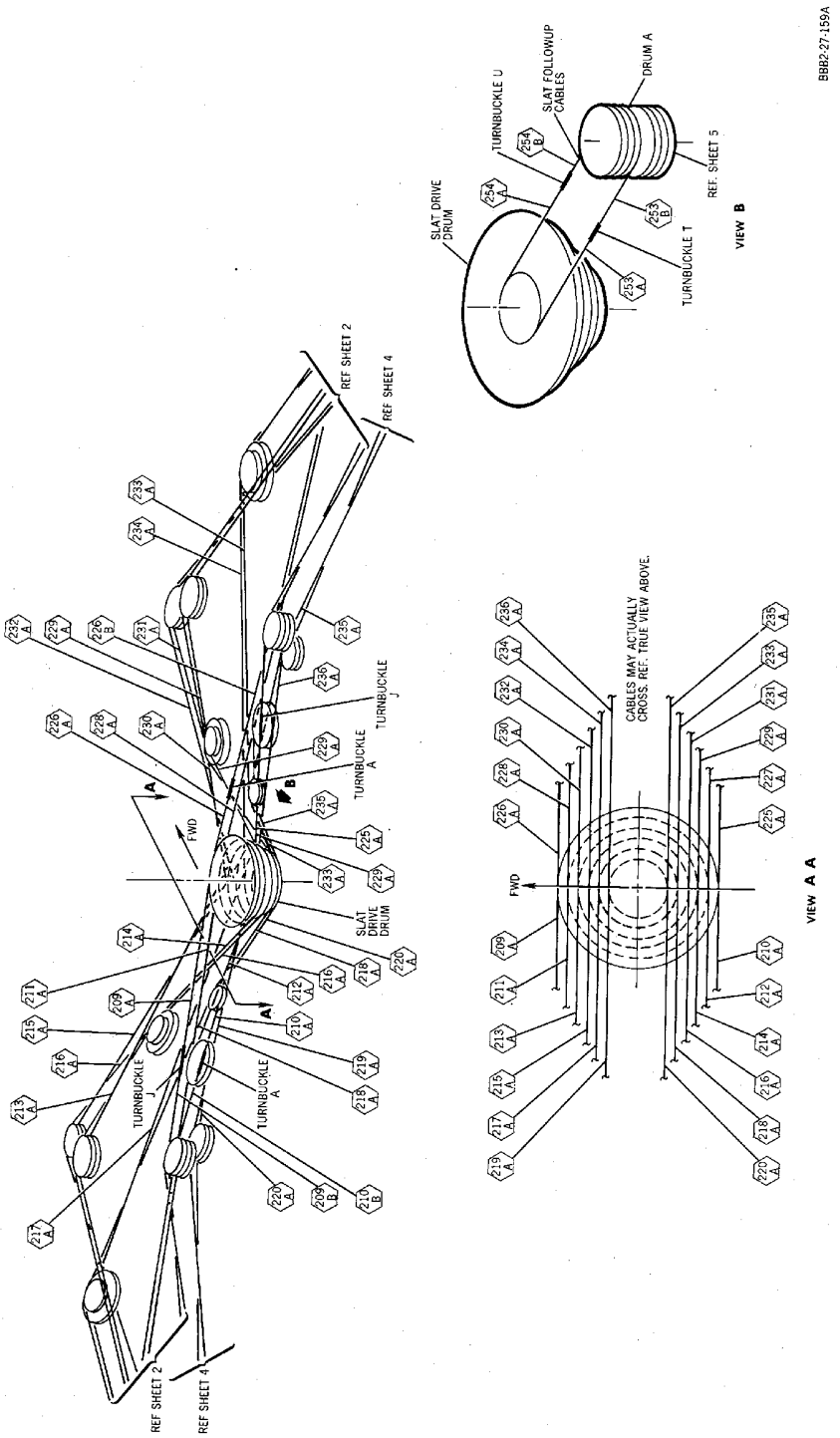
(16) Move flap/slat handle to UP/RET detent. Check that slats retract to faired position in 4(+5, -3) seconds.

(17) Depressurize left hydraulic system. (PAGEBLOCK 29-00-00/201)

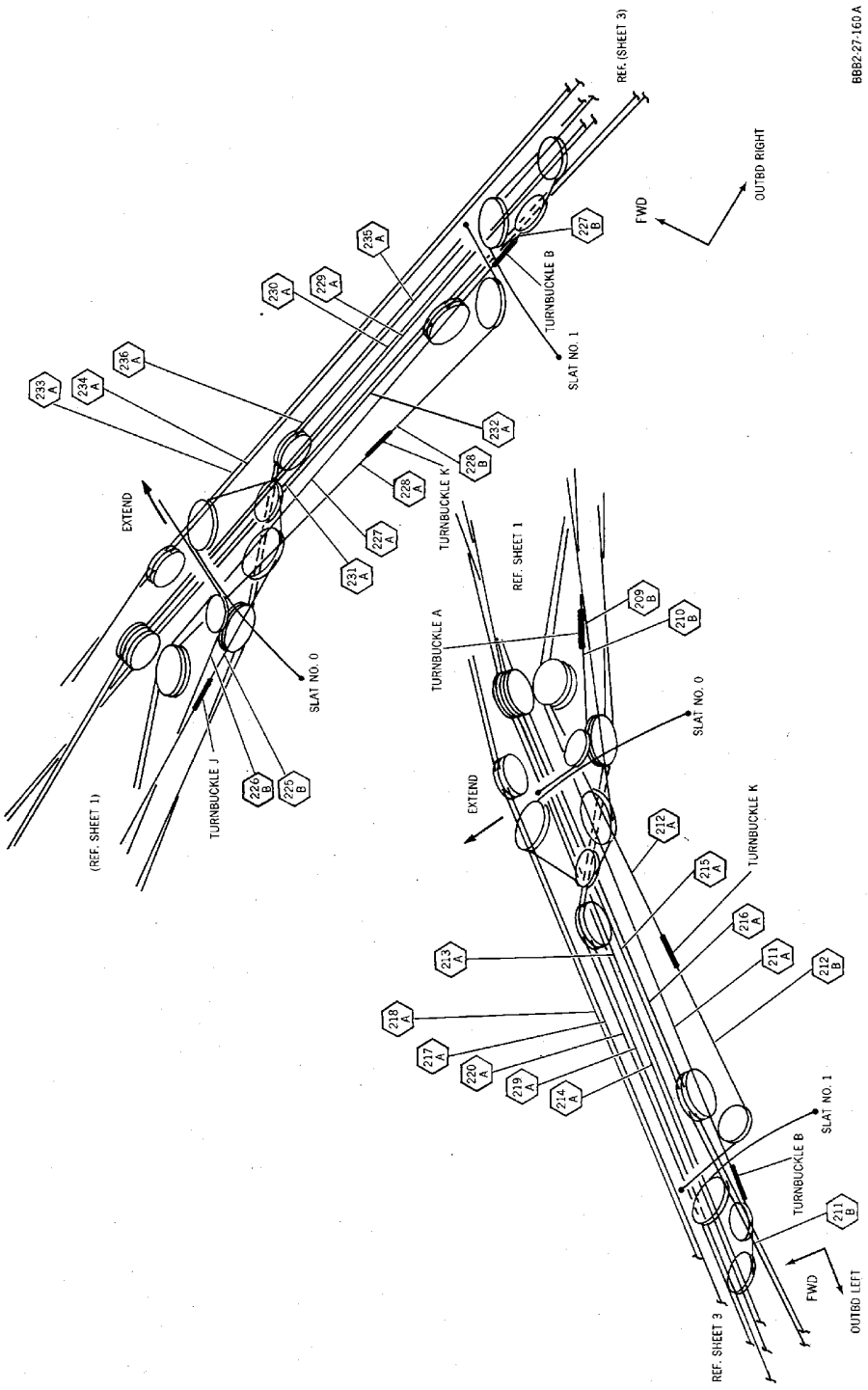
(18) Pressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

(19) Repeat Paragraph 3.D.(11) through Paragraph 3.D.(16) with right system pressurized.

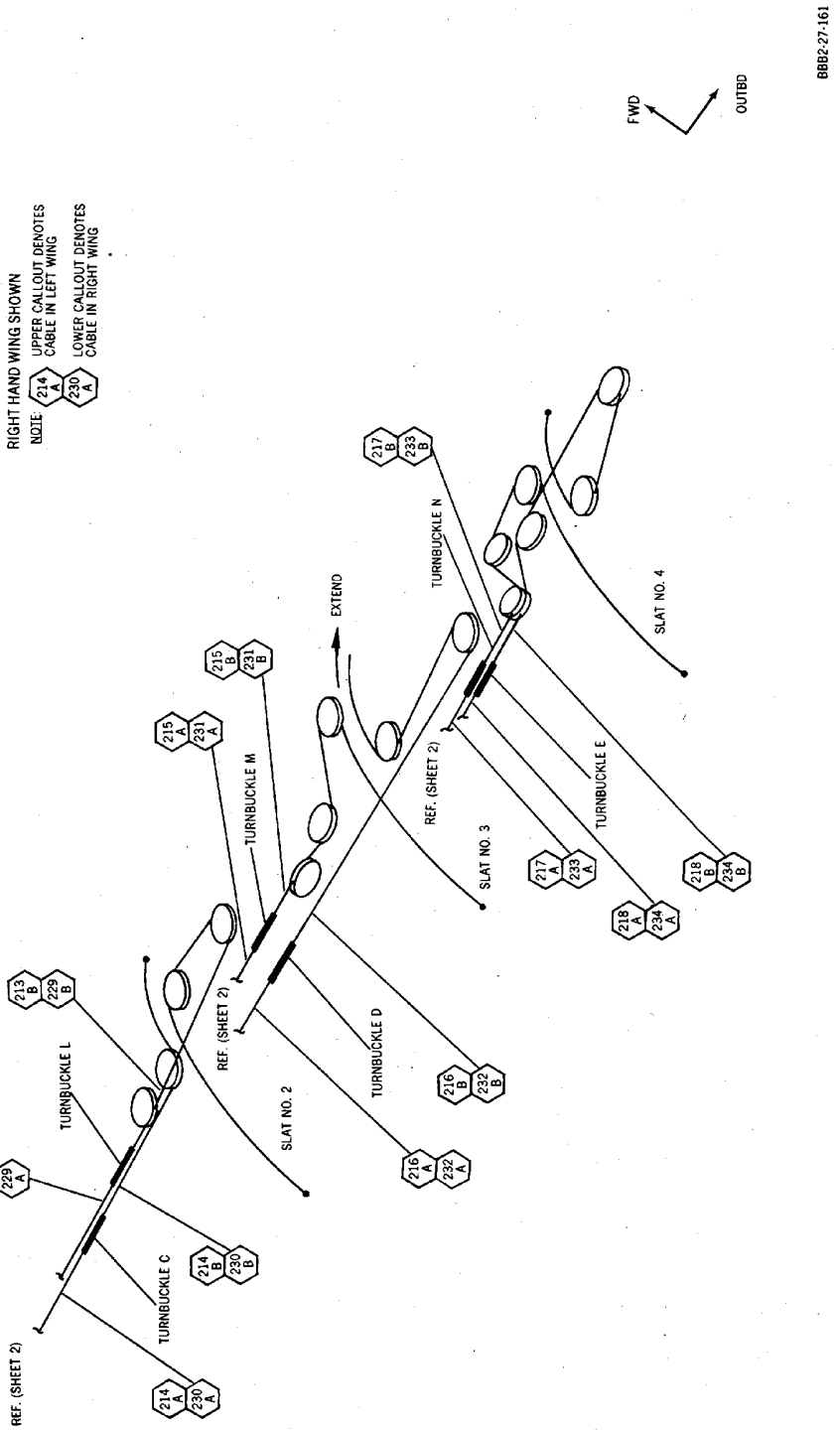
(20) Shut off hydraulic power source.



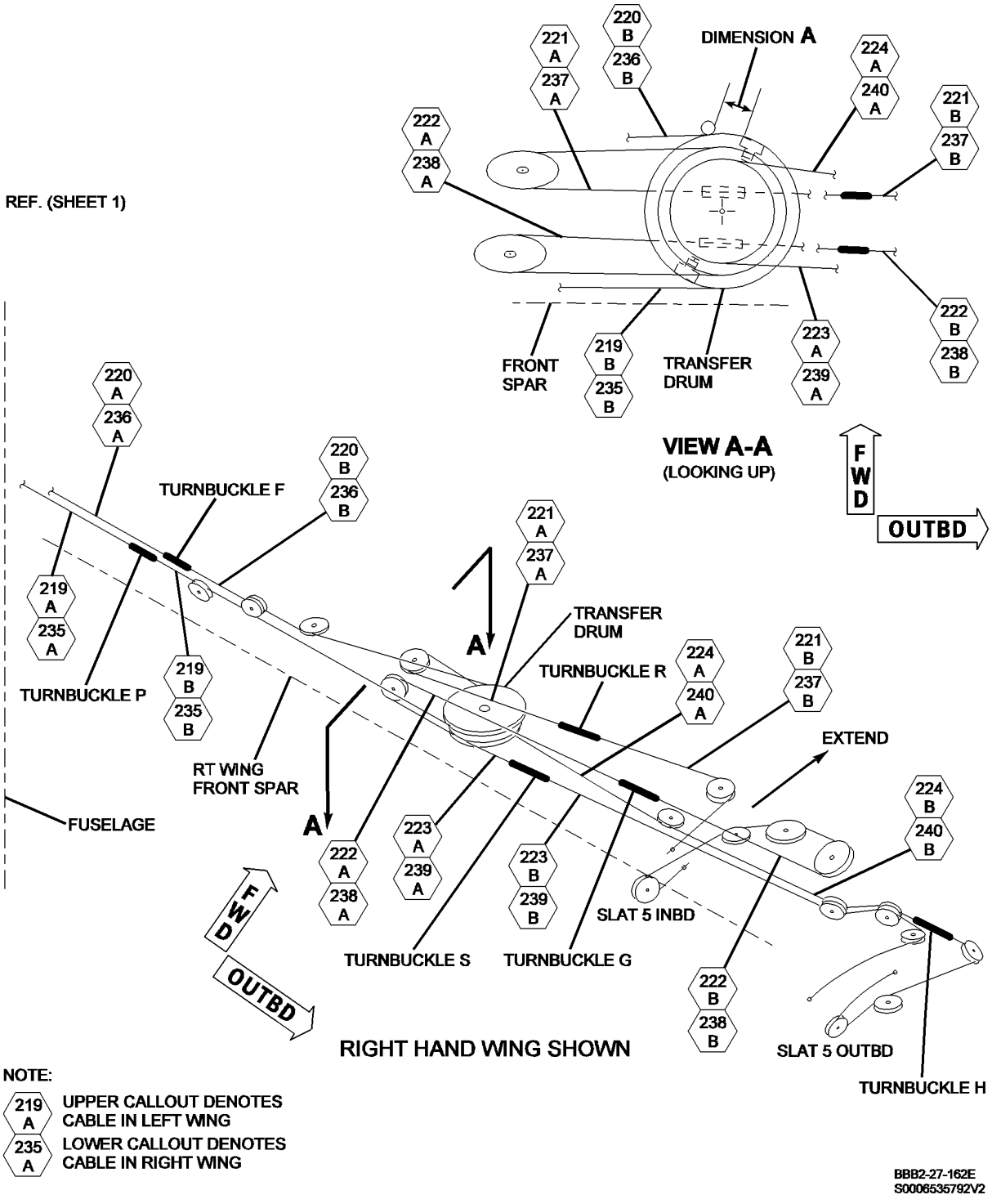
Slat Mechanical Controls -- Adjustment/Test
Figure 501/27-80-00-990-813 (Sheet 1 of 7)



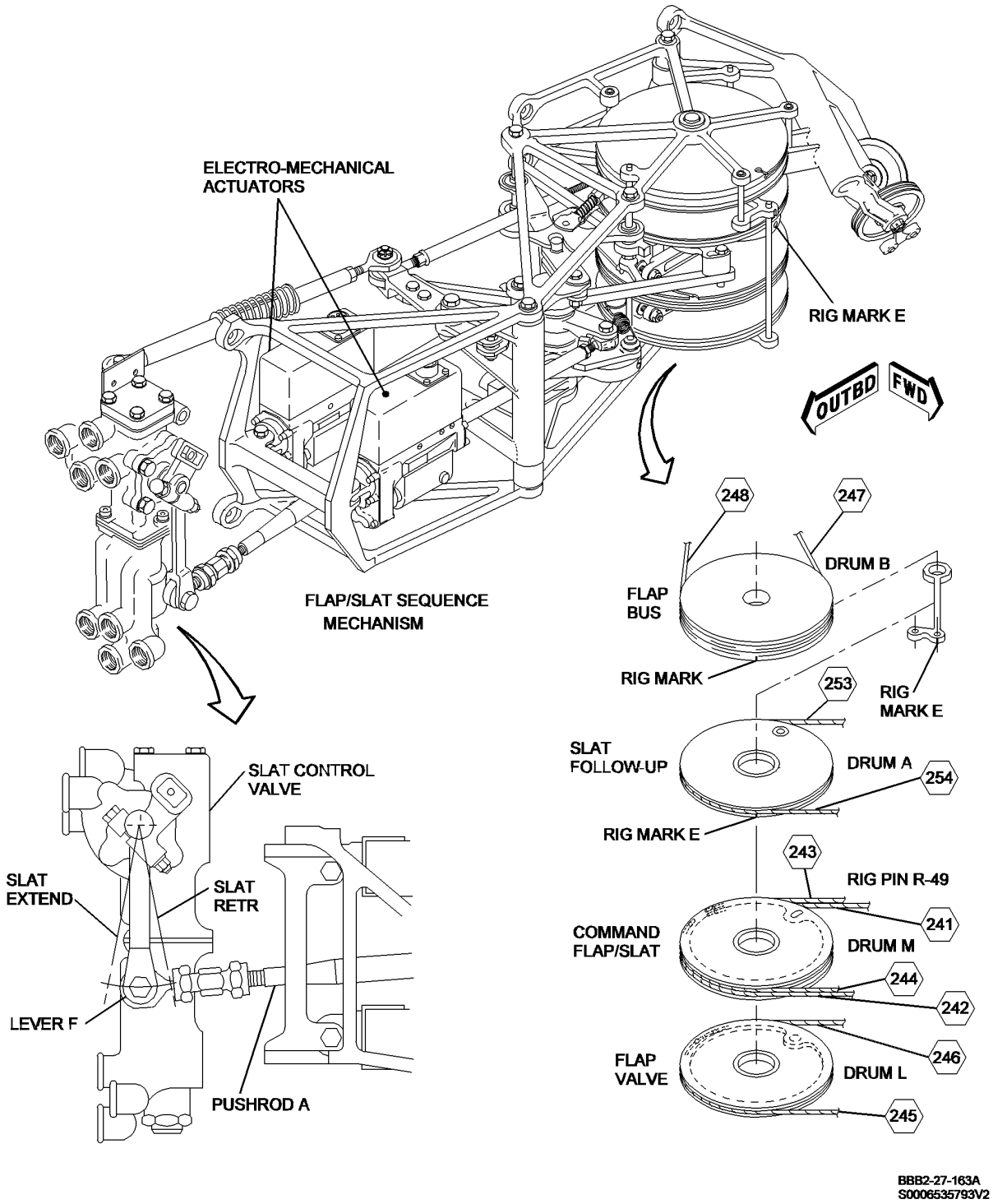
Slat Mechanical Controls -- Adjustment/Test
Figure 501/27-80-00-990-813 (Sheet 2 of 7)



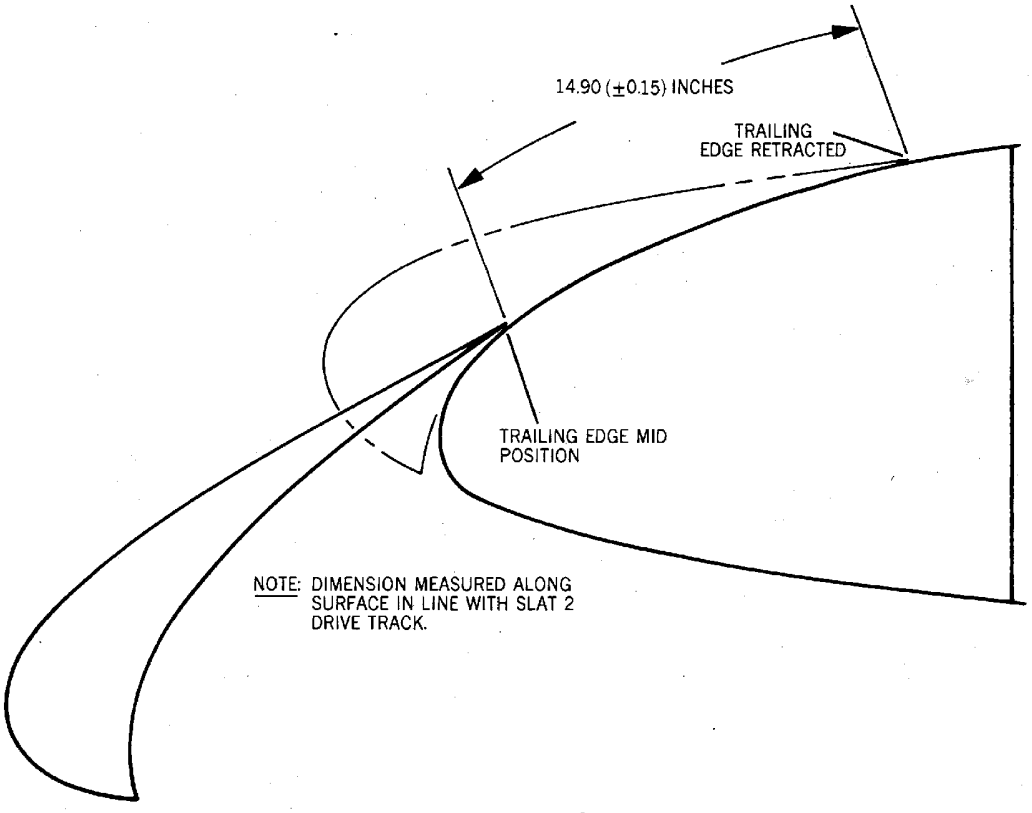
Slat Mechanical Controls -- Adjustment/Test
Figure 501/27-80-00-990-813 (Sheet 3 of 7)



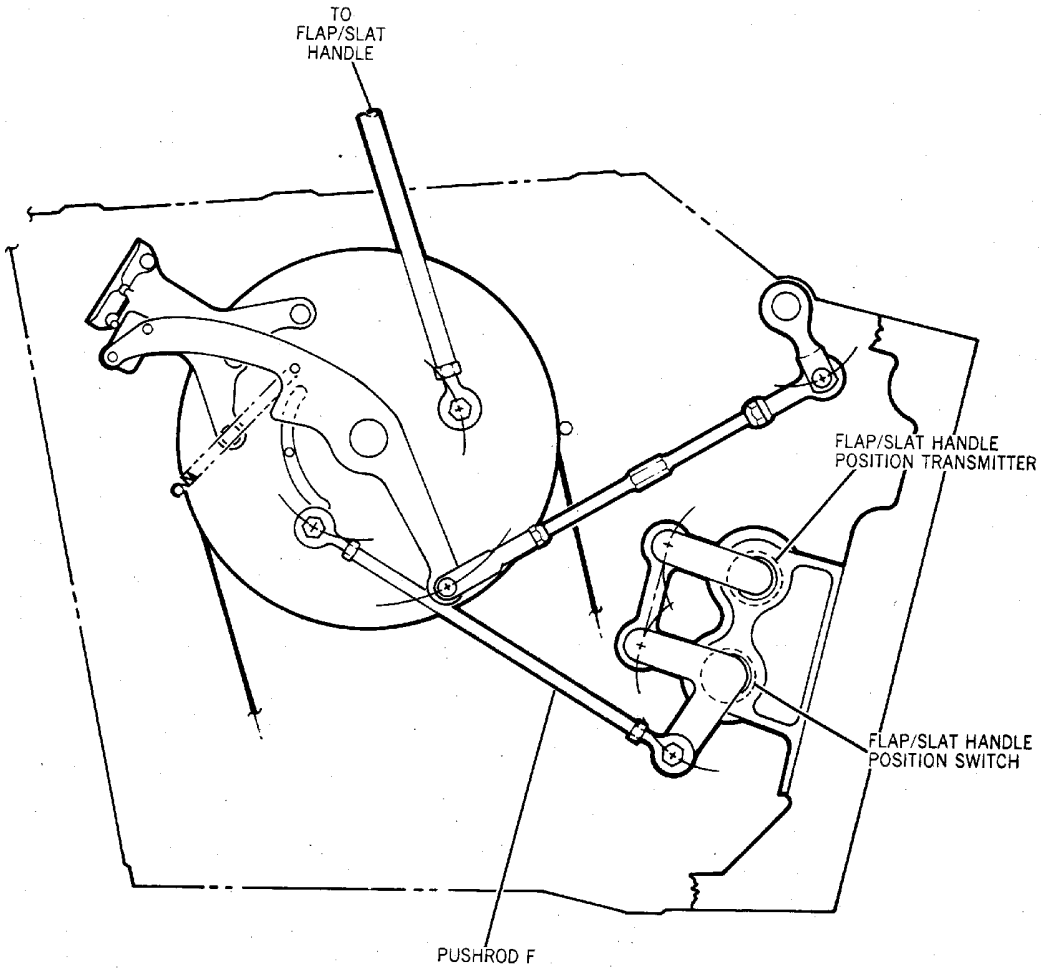
Slat Mechanical Controls -- Adjustment/Test
Figure 501/27-80-00-990-813 (Sheet 4 of 7)



Slat Mechanical Controls -- Adjustment/Test
Figure 501/27-80-00-990-813 (Sheet 5 of 7)



Slat Mechanical Controls -- Adjustment/Test
Figure 501/27-80-00-990-813 (Sheet 6 of 7)



Slat Mechanical Controls -- Adjustment/Test
Figure 501/27-80-00-990-813 (Sheet 7 of 7)

CABLE TENSION TABLE – SLAT NO. 0 (RETRACT)

TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD	TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD
-60	1349	1170	720	40	2009	1741	1071
-58	1364	1182	727	42	2022	1752	1078
-56	1378	1194	735	44	2035	1764	1085
-54	1392	1207	743	46	2048	1775	1092
-52	1407	1219	750	48	2062	1787	1100
-50	1421	1231	758	50	2075	1798	1107
-48	1435	1243	765	52	2088	1810	1114
-46	1448	1255	773	54	2102	1822	1121
-44	1462	1267	780	56	2115	1833	1128
-42	1476	1279	787	58	2129	1845	1136
-40	1490	1291	794	60	2143	1857	1143
-38	1503	1303	802	62	2157	1869	1150
-36	1517	1315	809	64	2171	1881	1158
-34	1530	1326	816	66	2184	1893	1165
-32	1544	1338	823	68	2198	1905	1173
-30	1557	1349	830	70	2213	1918	1180
-28	1570	1361	837	72	2227	1930	1188
-26	1583	1372	844	74	2241	1942	1195
-24	1597	1384	851	76	2256	1955	1203
-22	1610	1395	858	78	2270	1967	1211
-20	1623	1406	865	80	2285	1980	1219
-18	1636	1418	872	82	2299	1993	1226
-16	1649	1429	879	84	2314	2006	1234
-14	1662	1440	886	86	2329	2019	1242
-12	1675	1451	893	88	2344	2032	1250
-10	1687	1462	900	90	2359	2045	1258
-8	1700	1474	907	92	2375	2058	1267
-6	1713	1485	914	94	2390	2071	1275
-4	1726	1496	921	96	2406	2085	1283
-2	1739	1507	927	98	2421	2099	1291
0	1752	1518	934	100	2437	2112	1300
2	1764	1529	941	102	2453	2126	1308
4	1777	1540	948	104	2469	2140	1317
6	1790	1551	955	106	2486	2154	1326
8	1803	1562	961	108	2502	2168	1334
10	1815	1573	968	110	2518	2183	1343
12	1828	1584	975	112	2535	2197	1352
14	1841	1595	982	114	2552	2212	1361
16	1854	1606	989	116	2568	2226	1370
18	1866	1618	996	118	2585	2241	1378
20	1879	1629	1002	120	2603	2256	1388
22	1892	1640	1009	122	2621	2271	1398
24	1905	1651	1016	124	2639	2287	1407
26	1918	1662	1023	126	2656	2302	1417
28	1931	1673	1030	128	2674	2318	1426
30	1944	1684	1037	130	2693	2334	1436
32	1956	1696	1043	132	2711	2349	1446
34	1969	1707	1050	134	2729	2365	1456
36	1982	1718	1057	136	2746	2382	1466
38	1996	1729	1064	138	2767	2398	1476
				140	2786	2415	1486

CABLE TENSION TABLE – SLAT NO. 0 (EXTEND)

TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD	TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD
-60	532	461	284	40	1155	1001	616
-58	545	472	291	42	1167	1012	622
-56	558	484	298	44	1180	1022	629
-54	571	495	305	46	1192	1033	636
-52	584	506	312	48	1205	1044	642
-50	597	518	319	50	1217	1055	649
-48	610	529	325	52	1230	1066	656
-46	623	540	332	54	1242	1077	663
-44	636	551	339	56	1255	1088	669
-42	648	562	346	58	1268	1099	676
-40	661	573	353	60	1281	1110	683
-38	674	584	359	62	1293	1121	690
-36	686	595	366	64	1306	1132	697
-34	699	606	373	66	1319	1143	703
-32	712	617	379	68	1332	1154	710
-30	724	627	386	70	1345	1164	717
-28	737	638	393	72	1358	1177	724
-26	749	649	398	74	1371	1188	731
-24	761	660	406	76	1384	1199	738
-22	774	671	413	78	1397	1211	745
-20	786	681	419	80	1410	1222	752
-18	799	692	426	82	1424	1234	759
-16	811	703	433	84	1437	1245	766
-14	823	714	438	86	1450	1257	774
-12	836	724	446	88	1464	1268	781
-10	848	735	452	90	1477	1280	788
-8	860	745	459	92	1491	1292	795
-6	872	756	465	94	1505	1304	802
-4	885	767	472	96	1518	1316	810
-2	897	777	478	98	1532	1328	817
0	909	788	485	100	1546	1340	825
2	921	799	491	102	1560	1352	832
4	934	809	498	104	1574	1364	839
6	946	820	504	106	1588	1376	847
8	958	830	511	108	1602	1389	854
10	970	841	518	110	1616	1401	862
12	983	852	524	112	1631	1413	870
14	995	862	531	114	1645	1426	877
16	1007	873	537	116	1660	1438	885
18	1019	883	544	118	1674	1451	893
20	1032	894	550	120	1689	1464	901
22	1044	905	557	122	1704	1476	909
24	1056	915	563	124	1718	1489	916
26	1068	926	570	126	1733	1502	924
28	1081	937	576	128	1748	1515	932
30	1093	947	583	130	1763	1528	941
32	1105	958	589	132	1779	1542	949
34	1118	969	596	134	1794	1555	957
36	1130	979	603	136	1809	1568	965
38	1142	990	609	138	1825	1582	973
				140	1841	1595	982

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-165C

Slat Cable Tension Table - Retension
Figure 502/27-80-00-990-814 (Sheet 1 of 9)

CABLE TENSION TABLE – SLAT NO. 1 (RETRACT)

TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD	TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD
-60	1366	1201	739	40	2282	1978	1217
-58	1397	1211	745	42	2303	1996	1228
-56	1409	1221	752	44	2324	2014	1240
-54	1422	1232	758	46	2345	2033	1251
-52	1435	1243	765	48	2366	2051	1262
-50	1448	1255	772	50	2388	2069	1273
-48	1461	1266	779	52	2409	2087	1285
-46	1475	1278	787	54	2430	2106	1296
-44	1489	1291	794	56	2450	2124	1307
-42	1504	1303	802	58	2471	2142	1318
-40	1519	1316	810	60	2492	2160	1329
-38	1534	1329	818	62	2513	2178	1340
-36	1549	1343	826	64	2534	2196	1351
-34	1565	1356	835	66	2554	2214	1362
-32	1581	1370	843	68	2575	2231	1373
-30	1597	1384	852	70	2595	2249	1384
-28	1614	1399	861	72	2615	2266	1395
-26	1631	1413	870	74	2635	2284	1405
-24	1648	1428	879	76	2655	2301	1416
-22	1665	1443	888	78	2675	2318	1427
-20	1682	1458	897	80	2695	2335	1437
-18	1700	1474	907	82	2714	2352	1448
-16	1718	1489	916	84	2734	2369	1458
-14	1737	1505	926	86	2753	2386	1468
-12	1755	1521	936	88	2772	2402	1478
-10	1774	1537	946	90	2791	2419	1488
-8	1792	1553	956	92	2809	2435	1498
-6	1811	1570	966	94	2828	2451	1508
-4	1831	1587	976	96	2846	2467	1518
-2	1850	1603	987	98	2864	2482	1528
0	1869	1620	997	100	2882	2498	1537
2	1889	1637	1008	102	2900	2513	1546
4	1909	1654	1018	104	2917	2528	1556
6	1929	1672	1029	106	2934	2543	1565
8	1949	1689	1039	108	2951	2558	1574
10	1969	1707	1050	110	2968	2572	1583
12	1990	1724	1061	112	2984	2586	1591
14	2010	1742	1072	114	3000	2600	1600
16	2030	1760	1083	116	3016	2614	1608
18	2051	1778	1094	118	3031	2627	1617
20	2072	1796	1105	120	3046	2640	1625
22	2093	1814	1116	122	3061	2653	1633
24	2113	1832	1127	124	3076	2666	1641
26	2134	1850	1138	126	3090	2678	1648
28	2155	1868	1150	128	3104	2690	1656
30	2176	1886	1161	130	3118	2702	1663
32	2197	1904	1172	132	3131	2713	1670
34	2219	1923	1183	134	3144	2725	1677
36	2240	1941	1194	136	3156	2736	1683
38	2261	1959	1206	138	3169	2746	1690
				140	3180	2756	1696

CABLE TENSION TABLE – SLAT NO. 1 (EXTEND)

TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD	TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD
-60	894	775	477	40	1756	1522	936
-58	907	786	484	42	1776	1539	947
-56	920	797	490	44	1797	1557	958
-54	933	808	497	46	1817	1575	969
-52	946	820	504	48	1838	1593	980
-50	959	831	512	50	1859	1611	991
-48	973	843	519	52	1879	1629	1002
-46	987	855	526	54	1900	1647	1013
-44	1001	868	534	56	1921	1665	1025
-42	1016	880	542	58	1942	1683	1036
-40	1030	893	549	60	1963	1701	1047
-38	1045	906	557	62	1984	1719	1058
-36	1060	919	565	64	2004	1737	1069
-34	1075	932	574	66	2025	1755	1080
-32	1091	945	582	68	2046	1773	1091
-30	1107	959	590	70	2067	1792	1103
-28	1123	973	599	72	2088	1810	1114
-26	1139	987	607	74	2109	1828	1125
-24	1155	1001	616	76	2130	1846	1136
-22	1172	1015	625	78	2151	1864	1147
-20	1188	1030	634	80	2172	1882	1158
-18	1205	1044	643	82	2193	1901	1170
-16	1222	1059	652	84	2214	1919	1181
-14	1239	1074	661	86	2235	1937	1192
-12	1257	1089	670	88	2256	1955	1203
-10	1274	1104	680	90	2276	1973	1214
-8	1292	1120	689	92	2297	1991	1225
-6	1310	1135	699	94	2318	2009	1236
-4	1328	1151	708	96	2338	2027	1247
-2	1346	1167	718	98	2359	2045	1258
0	1364	1183	728	100	2380	2062	1269
2	1383	1199	738	102	2400	2080	1280
4	1402	1215	747	104	2421	2098	1291
6	1420	1231	757	106	2441	2116	1302
8	1439	1247	768	108	2461	2133	1313
10	1458	1264	778	110	2482	2151	1324
12	1477	1280	788	112	2502	2168	1334
14	1496	1297	798	114	2522	2186	1345
16	1516	1314	808	116	2542	2203	1356
18	1535	1331	819	118	2562	2220	1366
20	1555	1348	829	120	2582	2238	1377
22	1575	1365	840	122	2602	2255	1387
24	1594	1382	850	124	2621	2272	1398
26	1614	1399	861	126	2641	2289	1408
28	1634	1416	872	128	2660	2305	1419
30	1654	1434	882	130	2679	2322	1429
32	1674	1451	893	132	2699	2339	1439
34	1695	1469	904	134	2718	2355	1449
36	1715	1486	915	136	2737	2372	1460
38	1735	1504	925	138	2756	2388	1470
				140	2774	2404	1480

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-166C

Slat Cable Tension Table - Retension
Figure 502/27-80-00-990-814 (Sheet 2 of 9)

CABLE TENSION TABLE – SLAT NO. 2 (RETRACT)

TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV. RIG LOAD	TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV. RIG LOAD
-60	825	715	440	40	1202	1042	641
-58	833	722	444	42	1210	1048	645
-56	840	728	448	44	1218	1055	649
-54	848	735	452	46	1225	1062	654
-52	855	741	456	48	1233	1069	658
-50	863	748	460	50	1241	1076	662
-48	870	754	464	52	1249	1083	666
-46	878	761	468	54	1257	1089	670
-44	885	767	472	56	1265	1096	675
-42	893	774	476	58	1273	1103	679
-40	900	780	480	60	1281	1110	683
-38	908	787	484	62	1289	1117	687
-36	915	793	488	64	1297	1124	692
-34	923	800	492	66	1305	1131	696
-32	930	806	496	68	1313	1138	700
-30	938	813	500	70	1321	1145	705
-28	945	819	504	72	1330	1152	709
-26	952	825	508	74	1338	1160	714
-24	960	832	512	76	1346	1167	718
-22	967	838	516	78	1354	1174	722
-20	975	845	520	80	1363	1181	727
-18	982	851	524	82	1371	1188	731
-16	990	858	528	84	1380	1196	736
-14	997	864	532	86	1388	1203	740
-12	1005	871	536	88	1396	1210	745
-10	1012	877	540	90	1405	1218	749
-8	1020	884	544	92	1414	1225	754
-6	1027	890	548	94	1422	1232	758
-4	1035	897	552	96	1431	1240	763
-2	1042	903	556	98	1439	1247	768
0	1050	910	560	100	1448	1255	772
2	1057	916	564	102	1457	1263	777
4	1065	923	568	104	1466	1270	782
6	1072	929	572	106	1474	1278	786
8	1080	936	576	108	1483	1286	791
10	1087	942	580	110	1492	1293	796
12	1095	949	584	112	1501	1301	801
14	1102	955	588	114	1510	1309	805
16	1110	962	592	116	1519	1317	810
18	1117	968	596	118	1528	1325	815
20	1125	975	600	120	1538	1333	820
22	1133	982	604	122	1547	1340	825
24	1140	988	608	124	1556	1348	830
26	1148	995	612	126	1565	1357	835
28	1156	1002	616	128	1575	1365	840
30	1163	1008	620	130	1584	1373	845
32	1171	1015	625	132	1593	1381	850
34	1179	1022	629	134	1603	1389	855
36	1186	1028	633	136	1612	1397	860
38	1194	1035	637	138	1622	1406	865
				140	1632	1414	870

CABLE TENSION TABLE – SLAT NO. 2 (EXTEND)

TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV. RIG LOAD	TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV. RIG LOAD
-60	561	486	299	40	929	806	496
-58	567	492	303	42	938	813	500
-56	573	497	306	44	946	820	504
-54	579	502	309	46	954	827	509
-52	585	507	312	48	962	834	513
-50	592	513	316	50	970	841	517
-48	598	518	319	52	978	848	522
-46	604	524	322	54	986	855	526
-44	611	529	326	56	994	862	530
-42	617	535	329	58	1003	869	535
-40	624	541	333	60	1011	876	539
-38	631	547	336	62	1019	883	543
-36	637	552	340	64	1027	890	548
-34	644	558	344	66	1035	897	552
-32	651	564	347	68	1043	904	556
-30	658	570	351	70	1051	911	560
-28	665	577	355	72	1059	918	565
-26	672	583	359	74	1067	924	569
-24	679	589	362	76	1075	931	573
-22	687	595	366	78	1082	938	577
-20	694	601	370	80	1090	945	581
-18	701	608	374	82	1098	952	586
-16	709	614	378	84	1106	956	590
-14	716	621	382	86	1113	965	594
-12	724	627	386	88	1121	972	598
-10	731	634	390	90	1129	978	602
-8	739	640	394	92	1136	985	606
-6	746	647	398	94	1144	991	610
-4	754	653	402	96	1151	998	614
-2	762	660	406	98	1159	1004	618
0	769	667	410	100	1166	1011	622
2	777	673	414	102	1174	1017	626
4	785	680	419	104	1181	1024	630
6	793	687	423	106	1188	1030	634
8	801	694	427	108	1195	1036	638
10	809	701	431	110	1203	1042	641
12	816	708	435	112	1210	1048	645
14	824	715	440	114	1217	1054	649
16	832	721	444	116	1224	1060	653
18	840	728	448	118	1231	1066	656
20	848	735	452	120	1237	1072	660
22	856	742	457	122	1244	1078	664
24	865	749	461	124	1251	1084	667
26	873	756	465	126	1257	1090	671
28	881	763	470	128	1264	1095	674
30	889	770	474	130	1270	1101	678
32	897	777	478	132	1277	1106	681
34	905	784	483	134	1283	1112	684
36	913	791	487	136	1289	1117	688
38	921	798	491	138	1295	1123	691
				140	1301	1128	694

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-167D

Slat Cable Tension Table - Retension
Figure 502/27-80-00-990-814 (Sheet 3 of 9)

CABLE TENSION TABLE – SLAT NO. 3 (RETRACT)

TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV. RIG LOAD	TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV. RIG LOAD
-60	734	636	391	40	1105	958	589
-58	739	640	394	42	1114	965	594
-56	744	644	397	44	1123	973	599
-54	749	649	399	46	1132	981	604
-52	754	653	402	48	1140	988	608
-50	759	658	405	50	1149	996	613
-48	765	663	408	52	1158	1004	618
-46	770	668	411	54	1167	1011	622
-44	776	673	414	56	1176	1019	627
-42	782	678	417	58	1184	1026	632
-40	788	683	420	60	1193	1034	636
-38	794	688	424	62	1202	1041	641
-36	801	694	427	64	1210	1049	645
-34	807	700	430	66	1219	1056	650
-32	814	705	434	68	1227	1064	655
-30	820	711	438	70	1236	1071	659
-28	827	717	441	72	1244	1079	664
-26	834	723	445	74	1253	1086	668
-24	841	729	449	76	1261	1093	673
-22	848	735	452	78	1270	1100	677
-20	856	742	456	80	1278	1107	682
-18	863	748	460	82	1286	1115	686
-16	870	754	464	84	1294	1122	690
-14	878	761	468	86	1302	1129	695
-12	886	768	472	88	1310	1135	699
-10	893	774	476	90	1318	1142	703
-8	901	781	481	92	1326	1149	707
-6	909	788	485	94	1334	1156	711
-4	917	795	489	96	1341	1162	715
-2	925	802	493	98	1349	1169	719
0	933	809	498	100	1356	1176	723
2	941	816	502	102	1364	1182	727
4	950	823	506	104	1371	1188	731
6	958	830	511	106	1378	1194	735
8	966	837	515	108	1385	1201	739
10	975	845	520	110	1392	1207	743
12	983	852	524	112	1399	1213	746
14	992	859	529	114	1406	1218	750
16	1000	867	533	116	1412	1224	753
18	1009	874	538	118	1419	1230	757
20	1017	882	543	120	1425	1235	760
22	1026	889	547	122	1432	1241	763
24	1035	897	552	124	1438	1246	767
26	1043	904	557	126	1444	1251	770
28	1052	912	561	128	1449	1256	773
30	1061	920	566	130	1455	1261	776
32	1070	927	571	132	1461	1266	779
34	1079	935	575	134	1466	1271	782
36	1087	942	580	136	1471	1275	785
38	1096	950	585	138	1476	1280	787
				140	1481	1284	790

CABLE TENSION TABLE – SLAT NO. 3 (EXTEND)

TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV. RIG LOAD	TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV. RIG LOAD
-60	356	309	190	40	632	548	337
-58	361	312	192	42	639	554	341
-56	365	317	195	44	645	559	344
-54	370	321	197	46	652	565	348
-52	375	325	200	48	659	571	351
-50	379	329	202	50	666	577	355
-48	384	333	205	52	672	583	359
-46	389	337	207	54	679	589	362
-44	394	341	210	56	686	595	366
-42	399	345	213	58	693	601	370
-40	403	350	215	60	700	607	373
-38	408	354	218	62	707	613	377
-36	413	358	220	64	715	619	381
-34	418	363	223	66	722	626	385
-32	423	367	226	68	729	632	389
-30	429	371	229	70	736	638	393
-28	434	376	231	72	744	645	397
-26	439	380	234	74	751	651	401
-24	444	385	237	76	759	657	405
-22	449	389	240	78	766	664	409
-20	455	394	242	80	774	670	413
-18	460	399	245	82	781	677	417
-16	465	403	248	84	789	684	421
-14	471	408	251	86	797	690	425
-12	476	413	254	88	804	697	429
-10	481	417	257	90	812	704	433
-8	487	422	260	92	820	711	437
-6	493	427	263	94	828	718	442
-4	498	432	266	96	836	725	446
-2	504	437	269	98	844	732	450
0	509	442	272	100	852	739	455
2	515	446	275	102	860	746	459
4	521	451	278	104	869	753	463
6	527	456	281	106	877	760	468
8	533	462	284	108	885	767	472
10	538	467	287	110	894	774	477
12	544	472	290	112	902	782	481
14	550	477	294	114	911	789	486
16	556	482	297	116	919	797	490
18	562	487	300	118	928	804	495
20	569	493	303	120	936	812	499
22	575	498	306	122	945	819	504
24	581	503	310	124	954	827	509
26	587	509	313	126	963	834	513
28	593	514	316	128	972	842	518
30	600	520	320	130	981	850	523
32	606	525	323	132	990	858	528
34	613	531	327	134	999	866	533
36	619	536	330	136	1008	874	538
38	625	542	334	138	1017	882	543
				140	1027	890	547

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

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Slat Cable Tension Table - Retension
Figure 502/27-80-00-990-814 (Sheet 4 of 9)

CABLE TENSION TABLE – SLAT NO. 4 (RETRACT)

TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD	TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD
-60	677	587	361	40	878	761	468
-58	673	583	359	42	887	769	473
-56	669	580	357	44	896	777	478
-54	666	577	355	46	905	785	483
-52	664	575	354	48	915	793	488
-50	661	573	353	50	924	801	493
-48	659	571	352	52	933	809	498
-46	658	570	351	54	942	817	502
-44	657	569	350	56	951	825	507
-42	656	569	350	58	961	832	512
-40	656	569	350	60	970	840	517
-38	656	569	350	62	979	848	522
-36	657	569	350	64	988	856	527
-34	658	570	351	66	997	864	532
-32	659	571	351	68	1006	872	537
-30	661	572	352	70	1015	880	541
-28	663	574	353	72	1024	888	546
-26	665	576	355	74	1033	895	551
-24	667	578	356	76	1042	903	556
-22	670	581	358	78	1051	911	560
-20	674	584	359	80	1059	918	565
-18	677	587	361	82	1068	925	569
-16	681	590	363	84	1076	933	574
-14	685	594	366	86	1084	940	578
-12	690	598	368	88	1093	947	583
-10	695	602	370	90	1101	954	587
-8	700	606	373	92	1109	961	591
-6	706	611	376	94	1116	967	595
-4	710	616	379	96	1124	974	599
-2	716	621	382	98	1131	980	603
0	722	626	385	100	1139	987	607
2	728	631	388	102	1146	993	611
4	735	637	392	104	1153	999	615
6	741	643	395	106	1159	1005	618
8	748	648	399	108	1166	1010	622
10	755	655	403	110	1172	1016	625
12	762	661	407	112	1178	1021	628
14	770	667	411	114	1184	1026	631
16	777	674	415	116	1189	1031	634
18	785	680	419	118	1195	1035	637
20	793	687	423	120	1200	1040	640
22	801	694	427	122	1204	1044	642
24	809	701	432	124	1209	1048	645
26	817	708	436	126	1213	1051	647
28	826	716	440	128	1217	1055	649
30	834	723	445	130	1221	1058	651
32	843	731	450	132	1224	1061	653
34	852	738	454	134	1227	1063	654
36	861	746	459	136	1230	1066	656
38	869	753	464	138	1232	1068	657
				140	1234	1070	658

CABLE TENSION TABLE – SLAT NO. 4 (EXTEND)

TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD	TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD
-60	183	159	98	40	429	371	229
-58	187	162	100	42	434	376	232
-56	191	166	102	44	440	381	235
-54	196	169	104	46	446	386	238
-52	200	173	107	48	452	391	241
-50	204	177	109	50	457	396	244
-48	208	180	111	52	463	402	247
-46	212	184	113	54	469	407	250
-44	217	188	116	56	475	412	253
-42	221	192	118	58	481	417	257
-40	226	195	120	60	487	422	260
-38	230	199	123	62	493	427	263
-36	234	203	125	64	499	433	266
-34	239	207	127	66	505	438	269
-32	243	211	130	68	511	443	273
-30	248	215	132	70	517	448	276
-28	253	219	135	72	524	454	279
-26	257	223	137	74	530	459	283
-24	262	227	140	76	536	464	286
-22	267	231	142	78	542	470	289
-20	271	235	145	80	548	475	292
-18	276	239	147	82	555	481	296
-16	281	243	150	84	561	486	299
-14	286	248	152	86	567	492	303
-12	291	252	155	88	574	497	306
-10	296	256	158	90	580	503	309
-8	300	260	160	92	587	508	313
-6	305	265	163	94	593	514	316
-4	310	269	166	96	599	520	320
-2	315	273	168	98	606	525	323
0	321	278	171	100	612	531	327
2	326	282	174	102	619	536	330
4	331	287	176	104	626	542	334
6	336	291	179	106	632	548	337
8	341	296	182	108	639	554	341
10	346	300	185	110	645	559	344
12	352	305	188	112	652	565	348
14	357	309	190	114	659	571	351
16	362	314	193	116	666	577	355
18	368	319	196	118	672	583	359
20	373	323	199	120	679	589	362
22	378	328	202	122	686	594	366
24	384	333	205	124	693	600	369
26	389	337	208	126	700	606	373
28	395	342	211	128	706	612	377
30	400	347	214	130	713	618	380
32	406	352	216	132	720	624	384
34	412	357	219	134	727	630	388
36	417	362	222	136	734	636	392
38	423	366	226	138	741	642	395
				140	748	648	399

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-21C

Slat Cable Tension Table - Retension
Figure 502/27-80-00-990-814 (Sheet 5 of 9)

CABLE TENSION TABLE – SLAT NO. 5 (RETRACT)

TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD	TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD
-60	488	422	260	40	863	748	460
-58	495	429	264	42	870	754	464
-56	503	435	268	44	878	761	468
-54	510	442	272	46	885	767	472
-52	518	448	276	48	893	774	476
-50	525	455	280	50	900	780	480
-48	533	461	284	52	908	787	484
-46	540	468	288	54	915	793	488
-44	548	474	292	56	923	800	492
-42	555	481	296	58	930	806	496
-40	563	487	300	60	938	813	500
-38	570	494	304	62	945	819	504
-36	578	500	308	64	953	826	508
-34	585	507	312	66	960	832	512
-32	593	514	316	68	968	838	516
-30	600	520	320	70	975	845	520
-28	608	527	324	72	983	851	524
-26	615	533	328	74	990	858	528
-24	623	540	332	76	998	864	532
-22	630	546	336	78	1005	871	536
-20	638	553	340	80	1013	877	540
-18	645	559	344	82	1020	884	544
-16	653	566	348	84	1028	890	548
-14	660	572	352	86	1035	897	552
-12	668	579	356	88	1043	903	556
-10	675	585	360	90	1050	910	560
-8	683	592	364	92	1058	916	564
-6	690	598	368	94	1065	923	568
-4	698	605	372	96	1073	929	572
-2	705	611	376	98	1080	936	576
0	713	618	380	100	1088	942	580
2	720	624	384	102	1095	949	584
4	728	631	388	104	1103	955	588
6	735	637	392	106	1110	962	592
8	743	644	396	108	1118	968	596
10	750	650	400	110	1125	975	600
12	758	657	404	112	1133	981	604
14	765	663	408	114	1140	988	608
16	773	670	412	116	1148	994	612
18	780	676	416	118	1155	1001	616
20	788	683	420	120	1163	1007	620
22	795	689	424	122	1170	1014	624
24	803	696	428	124	1178	1020	628
26	810	702	432	126	1185	1027	632
28	818	709	436	128	1193	1034	636
30	825	715	440	130	1200	1040	640
32	833	722	444	132	1208	1047	644
34	840	728	448	134	1215	1053	648
36	848	735	452	136	1223	1060	652
38	855	741	456	138	1230	1066	656
				140	1238	1073	660

CABLE TENSION TABLE – SLAT NO. 5 (EXTEND)

TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD	TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD
-60	230	199	123	40	507	439	270
-58	237	205	126	42	512	444	273
-56	244	211	130	44	517	448	276
-54	251	217	134	46	522	453	279
-52	258	223	137	48	528	457	281
-50	264	229	141	50	533	462	284
-48	271	235	145	52	538	466	287
-46	277	240	148	54	544	471	290
-44	284	246	151	56	549	476	293
-42	290	251	155	58	554	480	296
-40	296	257	158	60	560	485	299
-38	303	262	161	62	565	490	302
-36	309	267	165	64	571	495	305
-34	315	273	168	66	577	500	308
-32	322	278	171	68	582	505	311
-30	328	283	174	70	588	510	314
-28	332	288	177	72	594	515	317
-26	338	293	180	74	600	520	320
-24	343	298	183	76	606	525	323
-22	349	302	186	78	612	531	326
-20	355	307	189	80	618	536	330
-18	360	312	192	82	625	541	333
-16	365	317	195	84	631	547	337
-14	371	321	198	86	637	552	340
-12	376	326	201	88	644	558	343
-10	381	331	203	90	651	564	347
-8	387	335	206	92	657	570	351
-6	392	340	208	94	664	576	354
-4	397	344	212	96	671	582	358
-2	402	348	214	98	678	588	362
0	407	353	217	100	685	594	365
2	412	357	220	102	693	600	369
4	417	362	223	104	700	607	373
6	422	366	225	106	707	613	377
8	427	370	228	108	715	620	381
10	432	375	231	110	723	626	385
12	437	379	233	112	731	633	390
14	442	383	236	114	739	640	394
16	447	388	239	116	747	647	398
18	452	392	241	118	755	654	403
20	457	396	244	120	763	662	407
22	462	400	246	122	772	669	412
24	467	405	249	124	781	677	416
26	472	409	252	126	789	684	421
28	477	413	254	128	798	692	426
30	482	418	257	130	808	700	431
32	487	422	260	132	817	708	436
34	492	426	262	134	826	716	441
36	497	431	265	136	836	724	446
38	502	435	268	138	846	733	451
				140	856	741	456

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-287C

Slat Cable Tension Table - Retension
Figure 502/27-80-00-990-814 (Sheet 6 of 9)

CABLE TENSION TABLE – OUTBOARD SLAT NO. 5 (RETRACT)

TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD	TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD
–60	323	280	172	40	420	364	224
–58	324	281	173	42	422	366	225
–56	325	282	174	44	424	368	226
–54	327	283	174	46	427	370	228
–52	328	285	175	48	429	372	229
–50	330	286	176	50	431	374	230
–48	331	287	177	52	433	376	231
–46	333	289	178	54	436	378	232
–44	335	290	178	56	438	380	234
–42	336	291	179	58	440	382	235
–40	338	293	180	60	443	384	236
–38	340	294	181	62	445	385	237
–36	341	296	182	64	447	387	238
–34	343	297	183	66	449	389	240
–32	345	299	184	68	452	391	241
–30	347	300	185	70	454	393	242
–28	348	302	186	72	456	395	243
–26	350	304	187	74	458	397	244
–24	352	305	188	76	461	399	246
–22	354	307	189	78	463	401	247
–20	356	309	190	80	465	403	248
–18	358	310	191	82	467	405	249
–16	360	312	192	84	469	407	250
–14	362	314	193	86	472	409	252
–12	364	315	194	88	474	411	253
–10	366	317	195	90	476	412	254
–8	368	319	196	92	478	414	255
–6	370	321	197	94	480	416	256
–4	372	322	198	96	482	418	257
–2	374	324	199	98	485	420	258
0	376	326	201	100	487	422	260
2	378	328	202	102	489	424	261
4	380	330	203	104	491	425	262
6	382	331	204	106	493	427	263
8	384	333	205	108	495	429	264
10	387	335	206	110	497	431	265
12	389	337	207	112	499	432	266
14	391	339	208	114	501	434	267
16	393	341	210	116	503	436	268
18	395	343	211	118	505	438	269
20	397	344	212	120	507	439	270
22	400	346	213	122	509	441	271
24	402	348	214	124	511	443	272
26	404	350	216	126	513	444	273
28	406	352	217	128	515	446	274
30	409	354	218	130	516	448	275
32	411	356	219	132	518	449	276
34	413	358	220	134	520	451	277
36	415	360	222	136	522	452	278
38	418	362	223	138	524	454	279
				140	525	455	280

CABLE TENSION TABLE – OUTBOARD SLAT NO. 5 (EXTEND)

TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD	TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD
–60	264	229	141	40	322	279	172
–58	265	230	141	42	323	280	172
–56	266	231	142	44	324	280	173
–54	267	232	143	46	326	282	174
–52	268	233	143	48	327	283	174
–50	270	234	144	50	328	284	175
–48	271	235	144	52	329	285	176
–46	272	236	145	54	330	286	176
–44	273	237	146	56	332	287	177
–42	274	238	146	58	333	288	178
–40	275	239	147	60	334	289	178
–38	276	240	147	62	335	291	179
–36	278	241	148	64	336	292	179
–34	279	242	149	66	338	293	180
–32	280	243	149	68	339	294	181
–30	281	244	150	70	340	295	181
–28	282	245	150	72	341	296	182
–26	283	246	151	74	343	297	183
–24	284	247	152	76	344	298	183
–22	286	248	152	78	345	299	184
–20	287	249	153	80	346	300	185
–18	288	250	154	82	347	301	185
–16	289	251	154	84	349	302	186
–14	290	252	155	86	350	303	187
–12	291	253	155	88	351	304	187
–10	293	254	156	90	352	305	188
–8	294	255	157	92	354	306	189
–6	295	256	157	94	355	308	189
–4	296	257	158	96	356	309	190
–2	297	258	159	98	357	310	191
0	298	259	159	100	359	311	191
2	300	260	160	102	360	312	192
4	301	261	160	104	361	313	193
6	302	262	161	106	362	314	193
8	303	263	162	108	364	315	194
10	304	264	162	110	365	316	195
12	305	265	163	112	366	317	195
14	307	266	164	114	367	318	196
16	308	267	164	116	369	320	197
18	309	268	165	118	370	321	197
20	310	269	165	120	371	322	198
22	311	270	166	122	372	323	199
24	313	271	167	124	374	324	199
26	314	272	167	126	375	325	200
28	315	273	168	128	376	326	201
30	316	274	169	130	378	327	201
32	317	275	169	132	379	328	202
34	318	276	170	134	380	330	203
36	320	277	170	136	381	331	203
38	321	278	171	138	383	332	204
				140	384	333	205

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-289B

Slat Cable Tension Table - Retension
Figure 502/27-80-00-990-814 (Sheet 7 of 9)

CABLE TENSION TABLE – INBOARD SLAT NO. 5 (RETRACT)

TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD	TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD
-60	422	366	225	40	606	525	323
-58	425	369	227	42	611	529	326
-56	428	371	228	44	615	533	328
-54	431	374	230	46	619	537	330
-52	435	377	232	48	624	541	333
-50	438	379	233	50	628	545	335
-48	441	382	235	52	633	548	337
-46	444	385	237	54	637	552	340
-44	447	388	239	56	642	556	342
-42	451	391	240	58	647	560	345
-40	454	393	242	60	651	564	347
-38	457	396	244	62	656	568	350
-36	461	399	246	64	661	572	352
-34	464	402	247	66	665	577	355
-32	467	405	249	68	670	581	357
-30	471	408	251	70	675	585	360
-28	474	411	253	72	680	589	362
-26	478	414	255	74	684	593	365
-24	481	417	257	76	689	597	368
-22	485	420	258	78	694	602	370
-20	488	423	260	80	699	606	373
-18	492	426	262	82	704	610	376
-16	495	429	264	84	709	615	378
-14	499	432	266	86	714	619	381
-12	502	435	268	88	719	623	384
-10	506	439	270	90	724	628	386
-8	510	442	272	92	729	632	389
-6	513	445	274	94	735	637	392
-4	517	448	276	96	740	641	395
-2	521	451	278	98	745	646	397
0	525	455	280	100	750	650	400
2	529	458	282	102	756	655	403
4	532	461	284	104	761	659	406
6	536	465	286	106	766	664	409
8	540	468	288	108	772	669	412
10	544	472	290	110	777	673	414
12	548	475	292	112	783	678	417
14	552	478	294	114	788	683	420
16	556	482	297	116	794	688	423
18	560	485	299	118	799	693	426
20	564	489	301	120	805	697	429
22	568	492	303	122	810	702	432
24	572	496	305	124	816	707	435
26	576	500	307	126	822	712	438
28	581	503	310	128	827	717	441
30	585	507	312	130	833	722	444
32	589	510	314	132	839	727	447
34	593	514	316	134	845	732	451
36	598	518	319	136	851	737	454
38	602	522	321	138	857	742	457
				140	862	747	460

CABLE TENSION TABLE – INBOARD SLAT NO. 5 (EXTEND)

TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD	TEMP deg F	MAX. RE-TENSION RIG LOAD	MIN. RE-TENSION RIG LOAD	MIN. ALLOW. IN SERV RIG LOAD
-60	150	130	80	40	253	219	135
-58	151	131	80	42	256	222	136
-56	152	132	81	44	259	224	138
-54	153	133	82	46	262	227	140
-52	154	134	82	48	265	230	141
-50	155	134	83	50	268	232	143
-48	156	135	84	52	271	235	145
-46	158	137	84	54	274	238	146
-44	159	138	85	56	278	241	148
-42	160	139	86	58	281	243	150
-40	162	140	86	60	284	246	152
-38	163	141	87	62	288	249	153
-36	164	143	88	64	291	252	155
-34	166	144	89	66	294	255	157
-32	168	145	89	68	298	258	159
-30	169	147	90	70	301	261	161
-28	171	148	91	72	305	264	162
-26	173	150	92	74	308	267	164
-24	174	151	93	76	311	270	166
-22	176	153	94	78	315	273	168
-20	178	154	95	80	318	276	170
-18	180	156	96	82	322	279	172
-16	182	158	97	84	326	282	174
-14	184	159	98	86	329	285	176
-12	186	161	99	88	333	289	178
-10	188	163	100	90	337	292	179
-8	190	165	101	92	340	295	181
-6	192	167	103	94	344	298	183
-4	195	169	104	96	348	301	185
-2	197	171	105	98	351	304	187
0	199	172	106	100	355	308	189
2	201	175	107	102	359	311	191
4	204	177	108	104	363	314	193
6	206	179	110	106	366	318	195
8	209	181	111	108	370	321	197
10	211	183	113	110	374	324	199
12	214	185	114	112	378	327	202
14	216	187	115	114	382	331	204
16	219	190	117	116	386	334	206
18	221	192	118	118	389	337	208
20	224	194	119	120	393	341	210
22	227	196	121	122	397	344	212
24	229	199	122	124	401	348	214
26	232	201	124	126	405	351	216
28	235	204	125	128	409	354	218
30	238	206	127	130	413	358	220
32	241	209	128	132	417	361	222
34	244	211	130	134	421	365	224
36	247	214	132	136	425	368	227
38	250	216	133	138	429	372	229
				140	433	375	231

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-288B

Slat Cable Tension Table - Retension
Figure 502/27-80-00-990-814 (Sheet 8 of 9)

CABLE TENSION TABLE – 1/16 DIAMETER

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
–60	5	0	0	40	18	12	8
–58	5	0	0	42	18	12	9
–56	5	0	0	44	18	12	9
–54	6	0	0	46	19	13	9
–52	6	0	0	48	19	13	9
–50	6	0	0	50	19	13	9
–48	7	1	0	52	20	14	10
–46	7	1	0	54	20	14	10
–44	7	1	0	56	20	14	10
–42	7	1	0	58	20	14	10
–40	8	2	1	60	21	15	11
–38	8	2	1	62	21	15	11
–36	8	2	1	64	21	15	11
–34	8	2	1	66	22	16	11
–32	9	3	1	68	22	16	12
–30	9	3	2	70	22	16	12
–28	9	3	2	72	23	17	12
–26	9	3	2	74	23	17	12
–24	10	4	2	76	23	17	13
–22	10	4	2	78	24	18	13
–20	10	4	2	80	24	18	13
–18	10	4	3	82	24	18	13
–16	11	5	3	84	25	19	14
–14	11	5	3	86	25	19	14
–12	11	5	3	88	25	19	14
–10	11	5	3	90	26	20	15
–8	12	6	4	92	26	20	15
–6	12	6	4	94	27	21	15
–4	12	6	4	96	27	21	16
–2	12	6	4	98	27	21	16
0	13	7	4	100	28	22	16
2	13	7	5	102	28	22	16
4	13	7	5	104	28	22	17
6	13	7	5	106	29	23	17
8	14	8	5	108	29	23	17
10	14	8	5	110	30	24	18
12	14	8	6	112	30	24	18
14	14	8	6	114	31	25	18
16	15	9	6	116	31	25	19
18	15	9	6	118	31	25	19
20	15	9	6	120	32	26	19
22	15	9	7	122	32	26	20
24	16	10	7	124	33	27	20
26	16	10	7	126	33	27	20
28	16	10	7	128	34	28	21
30	16	10	7	130	34	28	21
32	17	11	8	132	35	29	21
34	17	11	8	134	35	29	22
36	17	11	8	136	36	30	22
38	18	12	8	138	36	30	23
				140	37	31	23

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-279A

Slat Cable Tension Table - Retension
Figure 502/27-80-00-990-814 (Sheet 9 of 9)

CABLE TENSION TABLE - SLAT NO. 0 (RETRACT)

TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD	TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD
-60	1349	1170	40	2009	1741
-58	1364	1182	42	2022	1752
-56	1378	1194	44	2035	1764
-54	1392	1207	46	2048	1775
-52	1407	1219	48	2062	1787
-50	1421	1231	50	2075	1798
-48	1435	1243	52	2088	1810
-46	1448	1255	54	2102	1822
-44	1462	1267	56	2115	1833
-42	1476	1279	58	2129	1845
-40	1490	1291	60	2143	1857
-38	1503	1303	62	2157	1869
-36	1517	1315	64	2171	1881
-34	1530	1326	66	2184	1893
-32	1544	1338	68	2198	1905
-30	1557	1349	70	2213	1918
-28	1570	1361	72	2227	1930
-26	1583	1372	74	2241	1942
-24	1597	1384	76	2256	1955
-22	1610	1395	78	2270	1967
-20	1623	1406	80	2285	1980
-18	1636	1418	82	2299	1993
-16	1649	1429	84	2314	2006
-14	1662	1440	86	2329	2019
-12	1675	1451	88	2344	2032
-10	1687	1462	90	2359	2045
-8	1700	1474	92	2375	2058
-6	1713	1485	94	2390	2071
-4	1726	1496	96	2406	2085
-2	1739	1507	98	2421	2099
0	1752	1518	100	2437	2112
2	1764	1529	102	2453	2126
4	1777	1540	104	2469	2140
6	1790	1551	106	2486	2154
8	1803	1562	108	2502	2168
10	1815	1573	110	2518	2183
12	1828	1584	112	2535	2197
14	1841	1595	114	2552	2212
16	1854	1606	116	2568	2226
18	1866	1618	118	2586	2241
20	1879	1629	120	2603	2256
22	1892	1640	122	2621	2271
24	1905	1651	124	2639	2287
26	1918	1662	126	2656	2302
28	1931	1673	128	2674	2318
30	1944	1684	130	2693	2334
32	1956	1696	132	2711	2349
34	1969	1707	134	2729	2365
36	1982	1718	136	2748	2382
38	1996	1729	138	2767	2398
			140	2786	2415

CABLE TENSION TABLE - SLAT NO. 0 (EXTEND)

TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD	TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD
-60	532	461	40	1155	1001
-58	545	472	42	1167	1012
-56	558	484	44	1180	1022
-54	571	495	46	1192	1033
-52	584	506	48	1205	1044
-50	597	518	50	1217	1055
-48	610	529	52	1230	1066
-46	623	540	54	1242	1077
-44	636	551	56	1255	1088
-42	648	562	58	1268	1099
-40	661	573	60	1281	1110
-38	674	584	62	1293	1121
-36	686	595	64	1306	1132
-34	699	606	66	1319	1143
-32	712	617	68	1332	1154
-30	724	627	70	1345	1166
-28	737	638	72	1358	1177
-26	749	649	74	1371	1188
-24	761	660	76	1384	1199
-22	774	671	78	1397	1211
-20	786	681	80	1410	1222
-18	799	692	82	1424	1234
-16	811	703	84	1437	1245
-14	823	714	86	1450	1257
-12	836	724	88	1464	1269
-10	848	735	90	1477	1280
-8	860	745	92	1491	1292
-6	872	756	94	1505	1304
-4	885	767	96	1518	1316
-2	897	777	98	1532	1328
0	909	788	100	1546	1340
2	921	799	102	1560	1352
4	934	809	104	1574	1364
6	946	820	106	1588	1376
8	958	830	108	1602	1389
10	970	841	110	1616	1401
12	983	852	112	1631	1413
14	995	862	114	1645	1426
16	1007	873	116	1660	1438
18	1019	883	118	1674	1451
20	1032	894	120	1689	1464
22	1044	905	122	1704	1476
24	1056	915	124	1718	1489
26	1068	926	126	1733	1502
28	1081	937	128	1748	1515
30	1093	947	130	1763	1528
32	1105	958	132	1779	1542
34	1118	969	134	1794	1555
36	1130	979	136	1809	1568
38	1142	990	138	1825	1582
			140	1841	1595

BBB2-27-290A

Cable Tension Table - New Cable Tension
Figure 503/27-80-00-990-815 (Sheet 1 of 8)

BBB2-27-320

CABLE TENSION TABLE – SLAT NO. 1 (RETRACT)

TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD	TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD
-60	1386	1201	40	2282	1978
-58	1397	1211	42	2303	1996
-56	1409	1221	44	2324	2014
-54	1422	1232	46	2345	2033
-52	1435	1243	48	2366	2051
-50	1448	1255	50	2388	2069
-48	1461	1266	52	2409	2087
-46	1475	1278	54	2430	2106
-44	1489	1291	56	2450	2124
-42	1504	1303	58	2471	2142
-40	1519	1316	60	2492	2160
-38	1534	1329	62	2513	2178
-36	1549	1343	64	2534	2196
-34	1565	1356	66	2554	2214
-32	1581	1370	68	2575	2231
-30	1597	1384	70	2595	2249
-28	1614	1399	72	2615	2266
-26	1631	1413	74	2635	2284
-24	1648	1428	76	2655	2301
-22	1665	1443	78	2676	2318
-20	1682	1458	80	2696	2335
-18	1700	1474	82	2714	2352
-16	1718	1489	84	2734	2369
-14	1737	1506	86	2753	2386
-12	1755	1521	88	2772	2402
-10	1774	1537	90	2791	2419
-8	1792	1553	92	2809	2435
-6	1811	1570	94	2828	2451
-4	1831	1587	96	2846	2467
-2	1850	1603	98	2864	2482
0	1869	1620	100	2882	2498
2	1889	1637	102	2900	2513
4	1909	1654	104	2917	2528
6	1929	1672	106	2934	2543
8	1949	1689	108	2951	2558
10	1969	1707	110	2968	2572
12	1990	1724	112	2984	2586
14	2010	1742	114	3000	2600
16	2030	1760	116	3016	2614
18	2051	1778	118	3031	2627
20	2072	1796	120	3046	2640
22	2093	1814	122	3061	2653
24	2113	1832	124	3076	2666
26	2134	1850	126	3090	2678
28	2155	1868	128	3104	2690
30	2176	1886	130	3118	2702
32	2197	1904	132	3131	2713
34	2219	1923	134	3144	2725
36	2240	1941	136	3156	2736
38	2261	1959	138	3169	2746
			140	3180	2756

CABLE TENSION TABLE – SLAT NO. 1 (EXTEND)

TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD	TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD
-60	894	775	40	1756	1522
-58	907	786	42	1776	1539
-56	920	797	44	1797	1557
-54	933	808	46	1817	1575
-52	946	820	48	1838	1593
-50	959	831	50	1859	1611
-48	973	843	52	1879	1629
-46	987	855	54	1900	1647
-44	1001	868	56	1921	1665
-42	1016	880	58	1942	1683
-40	1030	893	60	1963	1701
-38	1045	906	62	1984	1719
-36	1060	919	64	2004	1737
-34	1075	932	66	2025	1756
-32	1091	945	68	2046	1773
-30	1107	959	70	2067	1792
-28	1123	973	72	2088	1810
-26	1139	987	74	2109	1828
-24	1155	1001	76	2130	1846
-22	1172	1015	78	2151	1864
-20	1168	1030	80	2172	1882
-18	1205	1044	82	2193	1901
-16	1222	1059	84	2214	1919
-14	1239	1074	86	2235	1937
-12	1257	1089	88	2256	1955
-10	1274	1104	90	2276	1973
-8	1292	1120	92	2297	1991
-6	1310	1135	94	2318	2009
-4	1328	1151	96	2338	2027
-2	1346	1167	98	2359	2045
0	1364	1183	100	2380	2062
2	1383	1199	102	2400	2080
4	1402	1215	104	2421	2098
6	1420	1231	106	2441	2116
8	1439	1247	108	2461	2133
10	1458	1264	110	2482	2151
12	1477	1280	112	2502	2168
14	1496	1297	114	2522	2186
16	1516	1314	116	2542	2203
18	1535	1331	118	2562	2220
20	1555	1348	120	2582	2238
22	1575	1365	122	2602	2255
24	1594	1382	124	2621	2272
26	1614	1399	126	2641	2289
28	1634	1416	128	2660	2305
30	1654	1434	130	2679	2322
32	1674	1451	132	2699	2339
34	1695	1469	134	2718	2355
36	1715	1486	136	2737	2372
38	1735	1504	138	2756	2388
			140	2774	2404

Cable Tension Table - New Cable Tension
Figure 503/27-80-00-990-815 (Sheet 2 of 8)

CABLE TENSION TABLE - OUTBOARD SLAT NO. 2 (RETRACT)

TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD	TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD
-60	825	715	40	1202	1042
-58	833	722	42	1210	1046
-56	840	728	44	1218	1055
-54	848	735	46	1225	1062
-52	855	741	48	1233	1069
-50	863	748	50	1241	1076
-48	870	754	52	1249	1083
-46	878	761	54	1257	1089
-44	885	767	56	1265	1096
-42	893	774	58	1273	1103
-40	900	780	60	1281	1110
-38	908	787	62	1289	1117
-36	915	793	64	1297	1124
-34	923	800	66	1305	1131
-32	930	806	68	1313	1138
-30	938	813	70	1321	1145
-28	945	819	72	1330	1152
-26	952	825	74	1338	1160
-24	960	832	76	1346	1167
-22	967	838	78	1354	1174
-20	975	845	80	1363	1181
-18	982	851	82	1371	1188
-16	990	858	84	1380	1196
-14	997	864	86	1388	1203
-12	1005	871	88	1396	1210
-10	1012	877	90	1405	1218
-8	1020	884	92	1414	1225
-6	1027	890	94	1422	1232
-4	1035	897	96	1431	1240
-2	1042	903	98	1439	1247
0	1050	910	100	1448	1255
2	1057	916	102	1457	1263
4	1065	923	104	1466	1270
6	1072	929	106	1474	1278
8	1080	936	108	1483	1286
10	1087	942	110	1492	1293
12	1095	949	112	1501	1301
14	1102	955	114	1510	1309
16	1110	962	116	1519	1317
18	1117	968	118	1528	1325
20	1125	975	120	1538	1333
22	1133	982	122	1547	1340
24	1140	988	124	1556	1348
26	1148	995	126	1565	1357
28	1156	1002	128	1575	1365
30	1163	1008	130	1584	1373
32	1171	1015	132	1593	1381
34	1179	1022	134	1603	1389
36	1186	1028	136	1612	1397
38	1194	1035	138	1622	1406
			140	1632	1414

CABLE TENSION TABLE - OUTBOARD SLAT NO. 2 (EXTEND)

TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD	TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD
-60	561	486	40	929	806
-58	567	492	42	938	813
-56	573	497	44	946	820
-54	579	502	46	954	827
-52	585	507	48	962	834
-50	592	513	50	970	841
-48	598	518	52	978	848
-46	604	524	54	986	855
-44	611	529	56	994	862
-42	617	535	58	1003	869
-40	624	541	60	1011	876
-38	631	547	62	1019	883
-36	637	552	64	1027	890
-34	644	558	66	1035	897
-32	651	564	68	1043	904
-30	658	570	70	1051	911
-28	665	577	72	1059	918
-26	672	583	74	1067	924
-24	679	589	76	1075	931
-22	687	595	78	1082	938
-20	694	601	80	1090	945
-18	701	608	82	1098	952
-16	709	614	84	1106	958
-14	716	621	86	1113	965
-12	724	627	88	1121	972
-10	731	634	90	1129	978
-8	739	640	92	1136	985
-6	746	647	94	1144	991
-4	754	653	96	1151	998
-2	762	660	98	1159	1004
0	769	667	100	1166	1011
2	777	673	102	1174	1017
4	785	680	104	1181	1024
6	793	687	106	1188	1030
8	801	694	108	1195	1036
10	809	701	110	1203	1042
12	816	708	112	1210	1048
14	824	715	114	1217	1054
16	832	721	116	1224	1060
18	840	728	118	1231	1066
20	848	735	120	1237	1072
22	856	742	122	1244	1078
24	865	749	124	1251	1084
26	873	756	126	1257	1090
28	881	763	128	1264	1095
30	889	770	130	1270	1101
32	897	777	132	1277	1106
34	905	784	134	1283	1112
36	913	791	136	1289	1117
38	921	798	138	1295	1123
			140	1301	1128

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Cable Tension Table - New Cable Tension
Figure 503/27-80-00-990-815 (Sheet 3 of 8)

BBB2-27-322

CABLE TENSION TABLE – SLAT NO. 3 (RETRACT)

TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD	TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD
-60	734	636	40	1105	958
-58	739	640	42	1114	965
-56	744	644	44	1123	973
-54	749	649	46	1132	981
-52	754	653	48	1140	988
-50	759	658	50	1149	996
-48	765	663	52	1158	1004
-46	770	668	54	1167	1011
-44	776	673	56	1176	1019
-42	782	678	58	1184	1026
-40	788	683	60	1193	1034
-38	794	688	62	1202	1041
-36	801	694	64	1210	1049
-34	807	700	66	1219	1056
-32	814	705	68	1227	1064
-30	820	711	70	1236	1071
-28	827	717	72	1244	1079
-26	834	723	74	1253	1086
-24	841	729	76	1261	1093
-22	848	735	78	1270	1100
-20	856	742	80	1278	1107
-18	863	748	82	1286	1115
-16	870	754	84	1294	1122
-14	878	761	86	1302	1129
-12	886	768	88	1310	1135
-10	893	774	90	1318	1142
-8	901	781	92	1326	1149
-6	909	788	94	1334	1156
-4	917	795	96	1341	1162
-2	925	802	98	1349	1169
0	933	809	100	1356	1176
2	941	816	102	1364	1182
4	950	823	104	1371	1188
6	958	830	106	1378	1194
8	966	837	108	1385	1201
10	975	845	110	1392	1207
12	983	852	112	1399	1213
14	992	859	114	1406	1218
16	1000	867	116	1412	1224
18	1009	874	118	1419	1230
20	1017	882	120	1425	1235
22	1026	889	122	1432	1241
24	1035	897	124	1438	1246
26	1043	904	126	1444	1251
28	1052	912	128	1449	1256
30	1061	920	130	1455	1261
32	1070	927	132	1461	1266
34	1079	935	134	1466	1271
36	1087	942	136	1471	1275
38	1096	950	138	1476	1280
			140	1481	1284

CABLE TENSION TABLE – SLAT NO. 3 (EXTEND)

TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD	TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD
-60	356	309	40	632	548
-58	361	312	42	639	554
-56	365	317	44	645	559
-54	370	321	46	652	565
-52	375	325	48	659	571
-50	379	329	50	666	577
-48	384	333	52	672	583
-46	389	337	54	679	589
-44	394	341	56	686	595
-42	399	345	58	693	601
-40	403	350	60	700	607
-38	408	354	62	707	613
-36	413	358	64	715	619
-34	418	363	66	722	626
-32	423	367	68	729	632
-30	429	371	70	736	638
-28	434	376	72	744	645
-26	439	380	74	751	651
-24	444	385	76	759	657
-22	449	389	78	766	664
-20	455	394	80	774	670
-18	460	399	82	781	677
-16	465	403	84	789	684
-14	471	408	86	797	690
-12	476	413	88	804	697
-10	481	417	90	812	704
-8	487	422	92	820	711
-6	493	427	94	828	718
-4	498	432	96	836	725
-2	504	437	98	844	732
0	509	442	100	852	739
2	515	446	102	860	746
4	521	451	104	869	753
6	527	456	106	877	760
8	533	462	108	885	767
10	538	467	110	894	774
12	544	472	112	902	782
14	550	477	114	911	789
16	556	482	116	919	797
18	562	487	118	928	804
20	569	493	120	936	812
22	575	498	122	945	819
24	581	503	124	954	827
26	587	509	126	963	834
28	593	514	128	972	842
30	600	520	130	981	850
32	606	525	132	990	858
34	613	531	134	999	866
36	619	536	136	1008	874
38	625	542	138	1017	882
			140	1027	890

Cable Tension Table - New Cable Tension
Figure 503/27-80-00-990-815 (Sheet 4 of 8)

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CABLE TENSION TABLE – SLAT NO. 4 (RETRACT)

TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD	TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD
–60	677	587	40	878	761
–58	673	583	42	887	769
–56	669	580	44	896	777
–54	666	577	46	905	785
–52	664	575	48	915	793
–50	661	573	50	924	801
–48	659	571	52	933	809
–46	658	570	54	942	817
–44	657	569	56	951	825
–42	656	569	58	961	832
–40	656	569	60	970	840
–38	656	569	62	979	848
–36	657	569	64	988	856
–34	658	570	66	997	864
–32	659	571	68	872	872
–30	661	572	70	1015	880
–28	663	574	72	1024	888
–26	665	576	74	1033	895
–24	667	578	76	1042	903
–22	670	581	78	1051	911
–20	674	584	80	1059	918
–18	677	587	82	1068	925
–16	681	590	84	1076	933
–14	685	594	86	1084	940
–12	690	598	88	1093	947
–10	695	602	90	1101	954
–8	700	606	92	1109	961
–6	705	611	94	1116	967
–4	710	616	96	1124	974
–2	716	621	98	1131	980
0	722	626	100	1139	987
2	728	631	102	1146	993
4	735	637	104	1153	999
6	741	643	106	1159	1005
8	748	648	108	1166	1010
10	755	655	110	1172	1016
12	762	661	112	1178	1021
14	770	667	114	1184	1026
16	777	674	116	1189	1031
18	785	680	118	1195	1035
20	793	687	120	1200	1040
22	801	694	122	1204	1044
24	809	701	124	1209	1048
26	817	708	126	1213	1051
28	826	716	128	1217	1055
30	834	723	130	1221	1058
32	843	731	132	1224	1061
34	852	738	134	1227	1063
36	861	746	136	1230	1066
38	860	753	138	1232	1068
			140	1234	1070

CABLE TENSION TABLE – SLAT NO. 4 (EXTEND)

TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD	TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD
–60	183	159	40	429	371
–58	187	162	42	434	376
–56	191	166	44	440	381
–54	196	169	46	446	386
–52	200	173	48	452	391
–50	204	177	50	457	396
–48	208	180	52	463	402
–46	212	184	54	469	407
–44	217	188	56	475	412
–42	221	192	58	481	417
–40	226	195	60	487	422
–38	230	199	62	493	427
–36	234	203	64	499	433
–34	239	207	66	505	438
–32	243	211	68	511	443
–30	248	215	70	517	448
–28	253	219	72	524	454
–26	257	223	74	530	459
–24	262	227	76	536	464
–22	267	231	78	542	470
–20	271	235	80	548	475
–18	276	239	82	555	481
–16	281	243	84	561	486
–14	286	248	86	567	492
–12	291	252	88	574	497
–10	296	256	90	580	503
–8	300	260	92	587	508
–6	305	265	94	593	514
–4	310	269	96	599	520
–2	315	273	98	606	525
0	321	278	100	612	531
2	326	282	102	619	536
4	331	287	104	626	542
6	336	291	106	632	548
8	341	296	108	639	554
10	346	300	110	645	559
12	352	305	112	652	565
14	357	309	114	659	571
16	362	314	116	666	577
18	368	319	118	672	583
20	373	323	120	679	589
22	378	328	122	686	594
24	384	333	124	693	600
26	389	337	126	700	606
28	395	342	128	706	612
30	400	347	130	713	618
32	406	352	132	720	624
34	412	357	134	727	630
36	417	362	136	734	636
38	423	366	138	741	642
			140	748	648

Cable Tension Table - New Cable Tension
Figure 503/27-80-00-990-815 (Sheet 5 of 8)

CABLE TENSION TABLE – SLAT NO. 5 (RETRACT)

TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD	TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD
-60	486	422	40	863	748
-58	495	429	42	870	754
-56	503	435	44	878	761
-54	510	442	46	885	767
-52	518	448	48	893	774
-50	525	455	50	900	780
-48	533	461	52	908	787
-46	540	468	54	915	793
-44	548	474	56	923	800
-42	555	481	58	930	806
-40	563	487	60	938	813
-38	570	494	62	945	819
-36	578	500	64	953	826
-34	585	507	66	960	832
-32	593	514	68	968	838
-30	600	520	70	975	845
-28	608	527	72	983	851
-26	615	533	74	990	858
-24	623	540	76	998	864
-22	630	546	78	1005	871
-20	638	553	80	1013	877
-18	645	559	82	1020	884
-16	653	566	84	1028	890
-14	660	572	86	1035	897
-12	668	579	88	1043	903
-10	675	585	90	1050	910
-8	683	592	92	1058	916
-6	690	598	94	1065	923
-4	698	605	96	1073	929
-2	705	611	98	1080	936
0	713	618	100	1088	942
2	720	624	102	1096	949
4	728	631	104	1103	955
6	735	637	106	1110	962
8	743	644	108	1118	968
10	750	650	110	1125	975
12	758	657	112	1133	981
14	765	663	114	1140	988
16	773	670	116	1148	994
18	780	676	118	1155	1001
20	788	683	120	1163	1007
22	795	689	122	1170	1014
24	803	696	124	1178	1020
26	810	702	126	1185	1027
28	818	709	128	1193	1034
30	825	715	130	1200	1040
32	833	722	132	1208	1047
34	840	728	134	1215	1053
36	848	735	136	1223	1060
38	856	741	138	1230	1066
			140	1238	1073

CABLE TENSION TABLE – SLAT NO. 5 (EXTEND)

TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD	TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD
-60	230	199	40	507	439
-58	237	205	42	512	444
-56	244	211	44	517	448
-54	251	217	46	522	453
-52	258	223	48	528	457
-50	264	229	50	533	462
-48	271	235	52	538	466
-46	277	240	54	544	471
-44	284	246	56	549	476
-42	290	251	58	554	480
-40	296	257	60	560	485
-38	303	262	62	565	490
-36	309	267	64	571	495
-34	315	273	66	577	500
-32	320	278	68	582	505
-30	326	283	70	588	510
-28	332	288	72	594	515
-26	338	293	74	600	520
-24	343	298	76	606	525
-22	349	302	78	612	531
-20	355	307	80	618	536
-18	360	312	82	625	541
-16	365	317	84	631	547
-14	371	321	86	637	552
-12	376	326	88	644	558
-10	381	331	90	651	564
-8	387	335	92	657	570
-6	392	340	94	664	576
-4	397	344	96	671	582
-2	402	348	98	678	588
0	407	353	100	685	594
2	412	357	102	693	600
4	417	362	104	700	607
6	422	366	106	707	613
8	427	370	108	715	620
10	432	375	110	723	626
12	437	379	112	731	633
14	442	383	114	739	640
16	447	388	116	747	647
18	452	392	118	755	654
20	457	396	120	763	662
22	462	400	122	772	669
24	467	405	124	781	677
26	472	409	126	789	684
28	477	413	128	798	692
30	482	418	130	808	700
32	487	422	132	817	708
34	492	426	134	826	716
36	497	431	136	836	724
38	502	435	138	846	733
			140	856	741

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Cable Tension Table - New Cable Tension
Figure 503/27-80-00-990-815 (Sheet 6 of 8)

CABLE TENSION TABLE – OUTBOARD SLAT NO. 5 (RETRACT)

TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD	TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD
–60	323	280	40	420	364
–58	324	281	42	422	366
–56	325	282	44	424	368
–54	327	283	46	427	370
–52	328	285	48	429	372
–50	330	286	50	431	374
–48	331	287	52	433	376
–46	333	289	54	436	378
–44	335	290	56	438	380
–42	336	291	58	440	382
–40	338	293	60	443	384
–38	340	294	62	445	385
–36	341	296	64	447	387
–34	343	297	66	449	389
–32	345	299	68	452	391
–30	347	300	70	454	393
–28	348	302	72	456	395
–26	350	304	74	458	397
–24	352	305	76	461	399
–22	354	307	78	463	401
–20	356	309	80	465	403
–18	358	310	82	467	405
–16	360	312	84	469	407
–14	362	314	86	472	409
–12	364	315	88	474	411
–10	366	317	90	476	412
–8	368	319	92	478	414
–6	370	321	94	480	416
–4	372	322	96	482	418
–2	374	324	98	485	420
0	376	326	100	487	422
2	378	328	102	489	424
4	380	330	104	491	425
6	382	331	106	493	427
8	384	333	108	495	429
10	387	335	110	497	431
12	389	337	112	499	432
14	391	339	114	501	434
16	393	341	116	503	436
18	395	343	118	505	438
20	397	344	120	507	439
22	400	346	122	509	441
24	402	348	124	511	443
26	404	350	126	513	444
28	406	352	128	515	446
30	409	354	130	516	448
32	411	356	132	518	449
34	413	358	134	520	451
36	415	360	136	522	452
38	418	362	138	524	454
			140	525	455

CABLE TENSION TABLE – OUTBOARD SLAT NO. 5 (EXTEND)

TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD	TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD
–60	264	229	40	322	279
–58	265	230	42	323	280
–56	266	231	44	324	281
–54	267	232	46	326	282
–52	268	233	48	327	283
–50	270	234	50	328	284
–48	271	235	52	329	285
–46	272	236	54	330	286
–44	273	237	56	332	287
–42	274	238	58	333	288
–40	275	239	60	334	289
–38	276	240	62	335	291
–36	278	241	64	336	292
–34	279	242	66	338	293
–32	280	243	68	339	294
–30	281	244	70	340	295
–28	282	245	72	341	296
–26	283	246	74	343	297
–24	284	247	76	344	298
–22	286	248	78	345	299
–20	287	249	80	346	300
–18	288	250	82	347	301
–16	289	251	84	349	302
–14	290	252	86	350	303
–12	291	253	88	351	304
–10	293	254	90	352	305
–8	294	255	92	354	306
–6	295	256	94	355	308
–4	296	257	96	356	309
–2	297	258	98	357	310
0	298	259	100	359	311
2	300	260	102	360	312
4	301	261	104	361	313
6	302	262	106	362	314
8	303	263	108	364	315
10	304	264	110	365	316
12	305	265	112	366	317
14	307	266	114	367	318
16	308	267	116	369	320
18	309	268	118	370	321
20	310	269	120	371	322
22	311	270	122	372	323
24	313	271	124	374	324
26	314	272	126	375	325
28	315	273	128	376	326
30	316	274	130	378	327
32	317	275	132	379	328
34	318	276	134	380	330
36	320	277	136	381	331
38	321	278	138	383	332
			140	384	333

BBB2-27-326

Cable Tension Table - New Cable Tension
Figure 503/27-80-00-990-815 (Sheet 7 of 8)

BBB2-27-325

CABLE TENSION TABLE – INBOARD SLAT NO. 5 (RETRACT)

TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD	TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD
-60	422	366	40	606	525
-58	425	369	42	611	529
-56	428	371	44	615	533
-54	431	374	46	619	537
-52	435	377	48	624	541
-50	438	379	50	628	545
-48	441	382	52	633	548
-46	444	385	54	637	552
-44	447	388	56	642	556
-42	451	391	58	647	560
-40	454	393	60	651	564
-38	457	396	62	656	568
-36	461	399	64	661	572
-34	464	402	66	665	577
-32	467	405	68	670	581
-30	471	408	70	675	585
-28	474	411	72	680	589
-26	478	414	74	684	593
-24	481	417	76	689	597
-22	485	420	78	694	602
-20	488	423	80	699	606
-18	492	426	82	704	610
-16	495	429	84	709	615
-14	499	432	86	714	619
-12	502	435	88	719	623
-10	506	439	90	724	628
-8	510	442	92	729	632
-6	513	445	94	735	637
-4	517	448	96	740	641
-2	521	451	98	745	646
0	525	455	100	750	650
2	529	458	102	756	655
4	532	461	104	761	659
6	536	465	106	766	664
8	540	468	108	772	669
10	544	472	110	777	673
12	548	475	112	783	678
14	552	478	114	788	683
16	556	482	116	794	688
18	560	485	118	799	693
20	564	489	120	805	697
22	568	492	122	810	702
24	572	496	124	816	707
26	576	500	126	822	712
28	581	503	128	827	717
30	585	507	130	833	722
32	589	510	132	839	727
34	593	514	134	845	732
36	598	518	136	851	737
38	602	522	138	857	742
			140	862	747

CABLE TENSION TABLE – INBOARD SLAT NO. 5 (EXTEND)

TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD	TEMP deg F	MAX. (NEW CABLE) RIG LOAD	MIN. (NEW CABLE) RIG LOAD
-60	150	130	40	253	219
-58	151	131	42	256	222
-56	152	132	44	259	224
-54	153	132	46	262	227
-52	154	133	48	265	230
-50	155	134	50	268	232
-48	156	135	52	271	235
-46	156	137	54	274	238
-44	158	138	56	278	241
-42	159	138	58	281	243
-40	160	140	60	284	246
-38	162	141	62	288	249
-36	163	143	64	291	252
-34	164	144	66	294	255
-32	166	145	68	298	258
-30	168	147	70	301	261
-28	169	148	72	305	264
-26	171	150	74	308	267
-24	173	151	76	311	270
-22	174	153	78	315	273
-20	176	154	80	319	276
-18	178	156	82	322	279
-16	180	158	84	326	282
-14	182	159	86	329	285
-12	184	161	88	333	289
-10	186	163	90	337	292
-8	188	165	92	340	295
-6	190	167	94	344	298
-4	192	169	96	348	301
-2	195	171	98	351	304
0	197	172	100	355	308
2	199	175	102	359	311
4	201	177	104	363	314
6	204	179	106	366	318
8	206	181	108	370	321
10	209	183	110	374	324
12	211	185	112	378	327
14	214	187	114	382	331
16	216	190	116	386	334
18	219	192	118	389	337
20	221	194	120	393	341
22	224	196	122	397	344
24	227	199	124	401	348
26	229	201	126	405	351
28	232	204	128	409	354
30	235	206	130	413	358
32	238	209	132	417	361
34	241	211	134	421	365
36	244	214	136	425	368
38	247	216	138	429	372
	250		140	433	375

Cable Tension Table - New Cable Tension
Figure 503/27-80-00-990-815 (Sheet 8 of 8)

4. Cable Assemblies

NOTE: The cable run numbers and segment letters listed below correspond to callouts in the hexagon-shaped symbols in Figure 501.

Table 503

Function	Cable Run Number	Segment Letter
Left slat 0 extend	209 209	A B
Left slat 0 retract	210 210	A B
Left slat 1 extend	211 211	A B
Left slat 1 retract	212 212	A B
Left slat 2 extend	213 213	A B
Left slat 2 retract	214 214	A B
Left slat 3 extend	215 215	A B
Left slat 3 retract	216 216	A B
Left slat 4 extend	217 217	A B
Left slat 4 retract	218 218	A B
Left slat 5 extend drive	219 219	A B
Left slat 5 retract drive	220 220	A B
Left slat 5 extend inbd	221 221	A B
Left slat 5 retract inbd	222 222	A B
Left slat 5 extend outbd	223 223	A B
Left slat 5 retract outbd	224 224	A B
Right slat 0 extend	225 225	A B
Right slat 0 retract	226 226	A B

Table 503 (Continued)

Function	Cable Run Number	Segment Letter
Right slat 1 extend	227 227	A B
Right slat 1 retract	228 228	A B
Right slat 2 extend	229 229	A B
Right slat 2 retract	230 230	A B
Right slat 3 extend	231 231	A B
Right slat 3 retract	232 232	A B
Right slat 4 extend	233 233	A B
Right slat 4 retract	234 234	A B
Right slat 5 extend drive	235 235	A B
Right slat 5 retract drive	236 236	A B
Right slat 5 extend inbd	237 237	A B
Right slat 5 retract inbd	238 238	A B
Right slat 5 extend outbd	239 239	A B
Right slat 5 retract outbd	240 240	A B
Slat follow-up extend	253 253	A B
Slat follow-up retract	254 254	A B

LIFT AUGMENTING SLATS - REMOVAL/INSTALLATION

1. General

A. There are six slats installed on the leading edge of each wing, numbering 0 through 5 from the fuselage outboard. The slats are mounted on tracks, which ride in roller supports attached to the wing structure leading edge.

B. A telescoping anti-icing duct is installed in slat 1. Thermal anti-icing air is furnished through the duct to interconnecting ducts in the leading edge of slats 0 through 5.

C. Slat 1 interconnects slats 0 and 2 with two interconnect pins in the inboard end of slat 1 and one interconnect pin in the outboard end of slat 1.

D. Access to slat attach points and anti-icing interconnect ducting is gained with the slats fully extended.

E. Removal and installation procedures are identical for all slats except as noted.

F. Fifteen slat tracks are installed in the leading edge of each wing. Seven of the tracks are cable operated drive tracks which extend and retract the slats. Eight of the tracks are idler tracks which support and stabilize slat operation. Up and down stops prevent possible overtravel during extension and retraction of the slats.

G. Each slat track rides in roller supports installed in the wing leading edge rib structure. Downstop pins are located at the aft roller supports. A slat proximity sensor actuating mechanism is mounted on the inboard roller supports of drive tracks for slat 1 and slat 3 (tracks 4 and 9).

H. Access to support rollers are through doors located in the wing leading edge and with the slats extended. Location of slat drive extend and retract cable turnbuckles is shown in Figure 27-80-00-990-813

I. Procedures and illustrations in this section are general in nature due to minor hardware differences of each slat and track. Removal and installation of tracks are identical except as noted.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 401

Name and Number	Manufacturer
Grease (MIL-G-81322) (DPM 5348)	Mobile Grease 28 Aeroshell 22
Parker-O-Lube (DPM 5367)	Parker Seal Co. Culver City, CA
Compound, Loctite MIL-S-46163, Grade M (DPM 6082)	Loctite Corp. Newington, CT
Adhesive (Lefkoweld 109NA) (DPM 6047)	Courtaulds Aerospace Inc. Glendale, CA

Table 401 (Continued)

Name and Number	Manufacturer
Torque wrench (0-200 inch-pounds) (0-22.6 kg)	
Drive track plate (3953817-1, -501)	Douglas Aircraft Co.
Vernier depth gage (6 inch)	
Developer nonaqueous, wet (D-100 Dubl Chek) DPM 2449-2	Sherwin, Inc. South Gate, CA
Fixture Set, rigging slat proximity sensor (3958328-1)	Douglas Aircraft Co.
Sealant, PR 1422 B-2 DMS 2082	Courtaulds Aerospace Inc. Glendale, CA
Clay, modeling	Commercially available
Wrench Set, slat adjust (5916804-501)	The Boeing Co.

3. **Removal/Installation of Slats**

A. Remove Slat (Figure 401)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Place flap/slat handle in 40/LAND detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

(4) Disconnect anti-icing duct joint at each end of slats by removing retainers and sliding connectors free from adjoining slat. (Figure 401, View D)

NOTE: When removing slat 1 also disconnect telescoping anti-icing duct from leading edge of slat. Remove bolts securing both duct bearing and seal retainer ring assemblies. Carefully pry ring assemblies onto tee section and remove tee section from slat. (Figure 401, View C)

(5) Remove slat track doors from forward end of tracks.

(6) If removing slat 0, 1 or 2, disconnect slat interconnect pins at slat 1 and slide pins into slat 0 or 2 sufficiently to gain clearance for applicable slat being removed. (Figure 401, View B)

(7) If removing slats 2, 3, 4 or 5 (individually) that are connected to common idler tracks 8, 10 and 12, remove stud attach nuts and eccentric retainers and eccentric bushings from slat being removed. Lightly tap stud, with plastic mallet, until stud end is flush with track surface, being careful not to disturb eccentric adjustment on opposite slat. (Figure 401 (Sheet 5))

(8) Remove stud attach, retainer attach, eccentric bushings, retainers, and cutout door strikers from forward and aft slat to track attach points. Record sequence of removal for reference during installation procedures.

NOTE: Before removing eccentric bushings, using a pencil, mark position of eccentrics as an aid for installation.

(9) Support slat and carefully remove slat from tracks, exercising care not to damage protruding end of anti-icing duct.

(10) If removing slat 0, remove and retain slat horn. Note and record arrangement and number of washers (3 places) at attach points. (Figure 401 (Sheet 3))

(11) If removing slats 0 or 2 remove interconnecting pins from receptacles and retain for installation.

B. Install Slats

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

NOTE: Slat tracks must be properly positioned Paragraph 8. and slat mechanical controls must be properly adjusted (PAGEBLOCK 27-80-00/501) prior to adjusting slat surfaces. Before installing slat surfaces, check slat tracks for wear. (Figure 409)

WJE ALL

(1) Make certain left and right hydraulic systems are depressurized.

(2) Make certain flap/slat handle is in 40/LAND detent.

(3) Apply light coat of grease to slat track/slat rib interfaces.

(4) Apply light coat of Parker-O-Lube to eccentric bushings and studs.

NOTE: If all slats were removed, install slats 1, 3 and 5 in numeric sequence, then install slats 2, 4 and 0, then slat horn.

NOTE: If installing slats 0 or 2, insert interconnecting pins into receptacles on outboard end of slat 0 and inboard end of slat 2.

NOTE: If installing slats 2, 3, 4 or 5 (individually), make certain that stud ends are flush with track surface at attach points for applicable slat being installed.

(5) Raise slat into position and connect slat ribs to tracks by installing studs, eccentric bushings, washers and nuts, door strikers as recorded during removal in Paragraph 3.A.(8). (Figure 401 (Sheet 4))(Figure 401 (Sheet 5)) (Figure 401 (Sheet 6))

(6) If installing slats 2, 3, 4 or 5 (individually), carefully tap studs, at opposite slat attach points with plastic mallet, until studs fully engage slat attach point being installed. Install eccentric bushings, washers and nuts. Tighten nuts finger tight.

(7) If installing slats 0, 1 or 2, install interconnecting pins in slat 1. (Figure 401, View B)

(8) If installing slat 0, install horn on slat. (Figure 401 (Sheet 3))

(9) If only one slat was removed, adjust eccentrics until slat is faired with adjacent slat(s). Tighten stud nuts. Do not install eccentric retainers at this time.

WARNING: DO NOT LET OBJECTS GET IN THE HOUSING ASSEMBLY OF THE SLAT TRACK. THIS WILL HELP PREVENT A PUNCTURE OF THE HOUSING ASSEMBLY THAT COULD CAUSE A FUEL LEAK. THE FUEL LEAK COULD CAUSE A FIRE AND POSSIBLE DEATH OR INJURY TO PERSONNEL.

(10) Examine the housing to ensure objects are not left in the slat track housing assembly.

CAUTION: USE HAND PUMP AS HYDRAULIC PRESSURE SOURCE DURING INITIAL STAGES OF SLAT TO WING ALIGNMENT AND CLEARANCE ADJUSTMENT. FULL SYSTEM HYDRAULIC PRESSURE COULD CAUSE DAMAGE TO SLAT AND WING IF SLAT IS GROSSLY MISADJUSTED. FINAL ADJUSTMENT SHOULD BE MADE WITH BOTH HYDRAULIC SYSTEMS FULLY PRESSURIZED.

(11) Place slats in retracted position and check that slat trailing edge does not contact wing leading edge surface.

CAUTION: PRELOADING SLAT ADJUSTMENT ECCENTRIC BUSHINGS MAY CAUSE STRUCTURAL DAMAGE TO SLAT RIB OR TRACK.

(12) Adjust eccentric bushings to properly fair slat to wing and to attain clearances. (Figure 402)

NOTE: Figure 402 and Figure 404 are used for acceptance gap check following complete slats removal and installation.

(a) Use go/no-go check to determine if individual gap checks are required.

(13) With slat retracted and 1000 psi (6900 kPa) hydraulic pressure applied to slats, adjust cable tension per Preliminary Slat Rig Load Table, if the cables were disturbed or the stops must be readjusted. (Figure 406)

(14) Check that upstop is within 0.000 to 0.062 inch (0.000 to 1.57 mm) of upstop pins. (Figure 401 (Sheet 7))

(15) Extend slats, with slats extended and 500 psi (3450 kPa) hydraulic pressure applied to slats, check that downstop is within 0.000 to 0.062 inch (0.000 to 1.57 mm) of downstop pins. (Figure 401 (Sheet 7))

(16) Shut off hydraulic pressure source.

(17) Install eccentric bushing retainers. (Figure 401 (Sheet 4))(Figure 401 (Sheet 5)) (Figure 401 (Sheet 6))

CAUTION: TRACK ATTACH STUDS MUST BE FREE ENOUGH TO BE MOVED BY LIGHTLY TAPPING WITH RUBBER OR PLASTIC MALLET OR TO TURN WITH TORQUE OF 120 INCH-POUNDS (13.56 N·M) OR LESS.

(18) Tighten track attach stud nuts.

(19) Connect anti-icing duct joint at each end of track by extending connectors and installing retainers. (Figure 401, View C)

NOTE: When installing slat 1 also connect telescoping anti-icing supply duct from wing leading edge. Carefully position O-rings, gaskets, and retainer rings, then install retaining bolts. (Figure 401, View D)

(20) Adjust slat drive extend and retract cables. (PAGEBLOCK 27-80-00/501)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT AREAS AROUND SLATS AND FLAPS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(21) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(22) Place flap/slat handle in RET detent.

CAUTION: IF READJUSTMENT OF SLAT TRACK UPSTOP POSITION IS MADE FOR ANY REASON AFTER CHECKING GAP SETTING, COMPLETE RETENSIONING OF SLAT CABLE SYSTEM MAY BE REQUIRED.

(23) Check that gap between track upstop and stop pin is within tolerance as shown on Figure 401 (Sheet 7).

NOTE: It is permissible to have no gap at drive track upstops or downstops under full hydraulic system pressure.

(24) Extend slats and check that gap between track downstops and stop pins is within tolerance as shown on Figure 401 (Sheet 7).

(25) At slat 4, make certain that clearance between drive track 11 downstop and fuel tank recess tube by performing the following: (Figure 403 (Sheet 1))

NOTE: Gain access to drive track downstop through access hole in upper surface of wing.

(a) Apply clay to upper surface of drive track downstop.

(b) Move slats to full retract position then back to full extend.

(c) Verify thickness of clay is not less than 0.060 inch (1.52 mm) minimum.

NOTE: If clearance is less than 0.060 inch (1.52 mm) minimum, rerig slat drive tracks as required to comply. (Paragraph 8.)

(d) Verify that all clay is removed.

(26) Retract slats.

(27) Check that clearances and gaps are as shown in Figure 402 from slat horn to outboard end of slat 5.

(28) Check that gaps between slat horn and slat 0 and between end of horn skin and fuselage closing rib are as shown in Figure 401 (Sheet 3).

NOTE: If clearances and gaps in Paragraph 3.B.(27) are not within tolerances readjust eccentric bushings as required. If gaps in Paragraph 3.B.(28) are not within tolerances remove or install washers as required.

(29) Extend and retract slats, check that seals between slat 0 and slat 1 have 0.06 inch (1.524 mm) minimum to 0.25 inch (6.35 mm) maximum seal engagement at all slat positions between full extend and full retract. If necessary, extend the slats and adjust seal on slat 0, as required, to obtain seal engagement as stated.

(30) Extend slats. Spray surface of wing fixed leading edge in slat seal contact area with D-100 Dubl Chek developer, retract slats and then extend slats. Check that leading edge seal contacts have 80% minimum contact. Clean leading edge with clean dry cloth.

NOTE: If necessary, shim seal as required to obtain contact.

(31) Place slats in retracted position.

(32) Shut off hydraulic pressure source.

WARNING: BEWARE OF CONTROL SURFACES AND LINKAGE AFFECTED BY HYDRAULIC POWER. BEFORE DISCONNECTING CONTROL CABLES OR LINKAGE TO SURFACE ACTUATOR VALVES, DEPRESSURIZE HYDRAULIC SYSTEMS (PAGEBLOCK 29-00-00/201). DURING ADJUSTMENT PROCEDURES THAT REQUIRE HYDRAULIC PRESSURE, BEWARE OF CONTROLS AND CONTROL SURFACES AFFECTED BY HYDRAULIC PRESSURE.

(33) Disconnect pushrod from slat control valve lever, located on the wing front center spar, access is through panels 5107C and 5138C in the forward cargo compartment.

(34) Pressurize left and right hydraulic systems.

(35) Manually move slat control valve lever in slat extend direction until slats reach the slat last sealed position, hold slats at this position. (Figure 404)

(36) Check gap between slat trailing edge and fixed leading edge from slat horn to outboard end of slat 5. Gap to be as shown in (Figure 404). If necessary readjust eccentric bushings to obtain gap limits.

NOTE: If readjustment is made per Paragraph 3.B.(36) it may be necessary to balance slat adjustment to achieve an intolerance condition for both the retracted and last sealed adjusted position.

(37) Move slat control valve lever in retract direction until slats are retracted. If necessary, repeat Paragraph 3.B.(36).

(38) Move slat control valve lever in retract direction until slats are fully retracted. If necessary, repeat Paragraph 3.B.(36) .

(39) Shut off hydraulic pressure source.

(40) Connect pushrod to slat control valve lever. Safety nut with cotter pin.

(41) Pressurize left and right hydraulic systems.

(42) Extend slats.

(43) Install slat track doors on forward end of tracks.

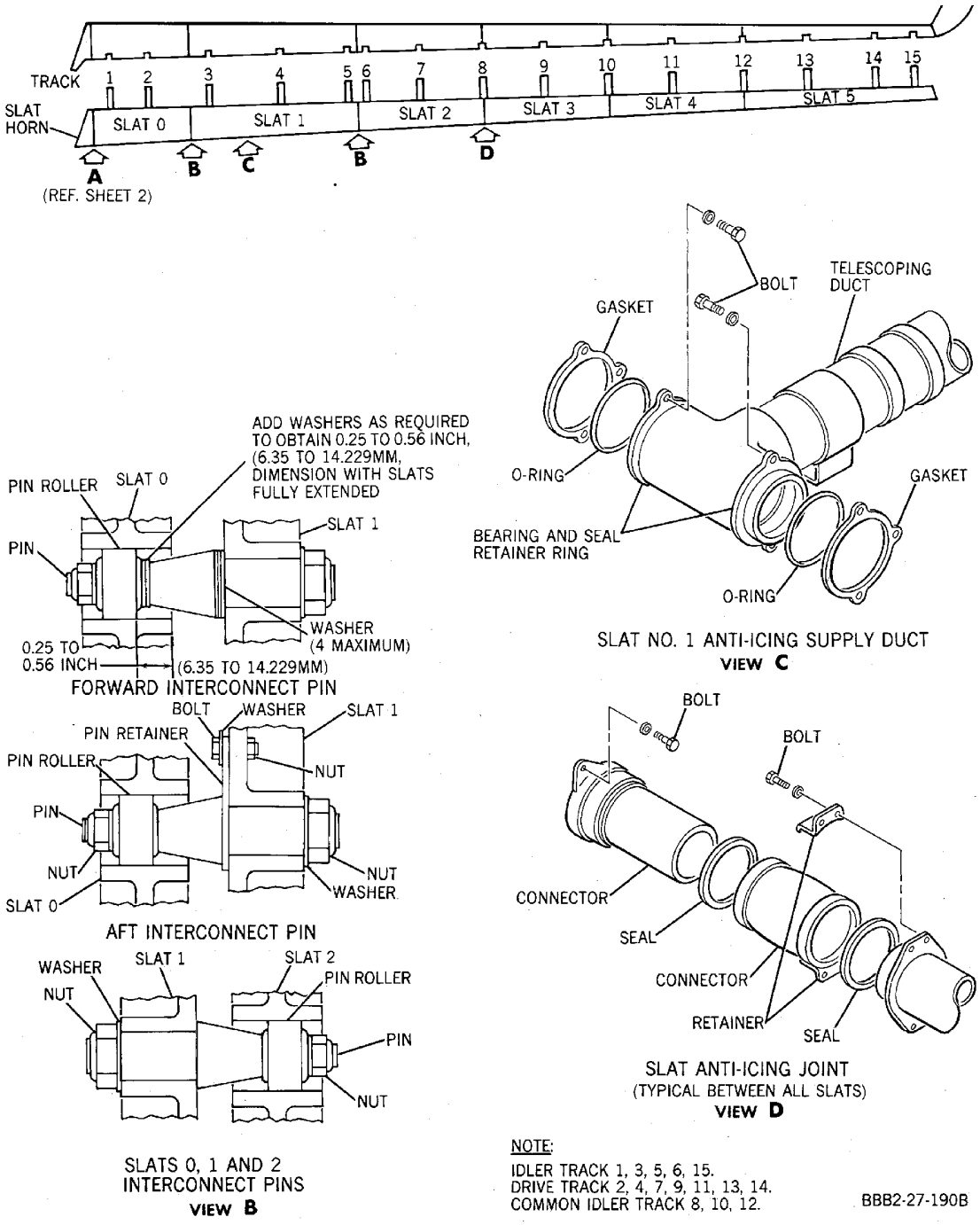
(44) Retract slats.

(45) Adjust slat track doors to fair with wing within gap clearances.

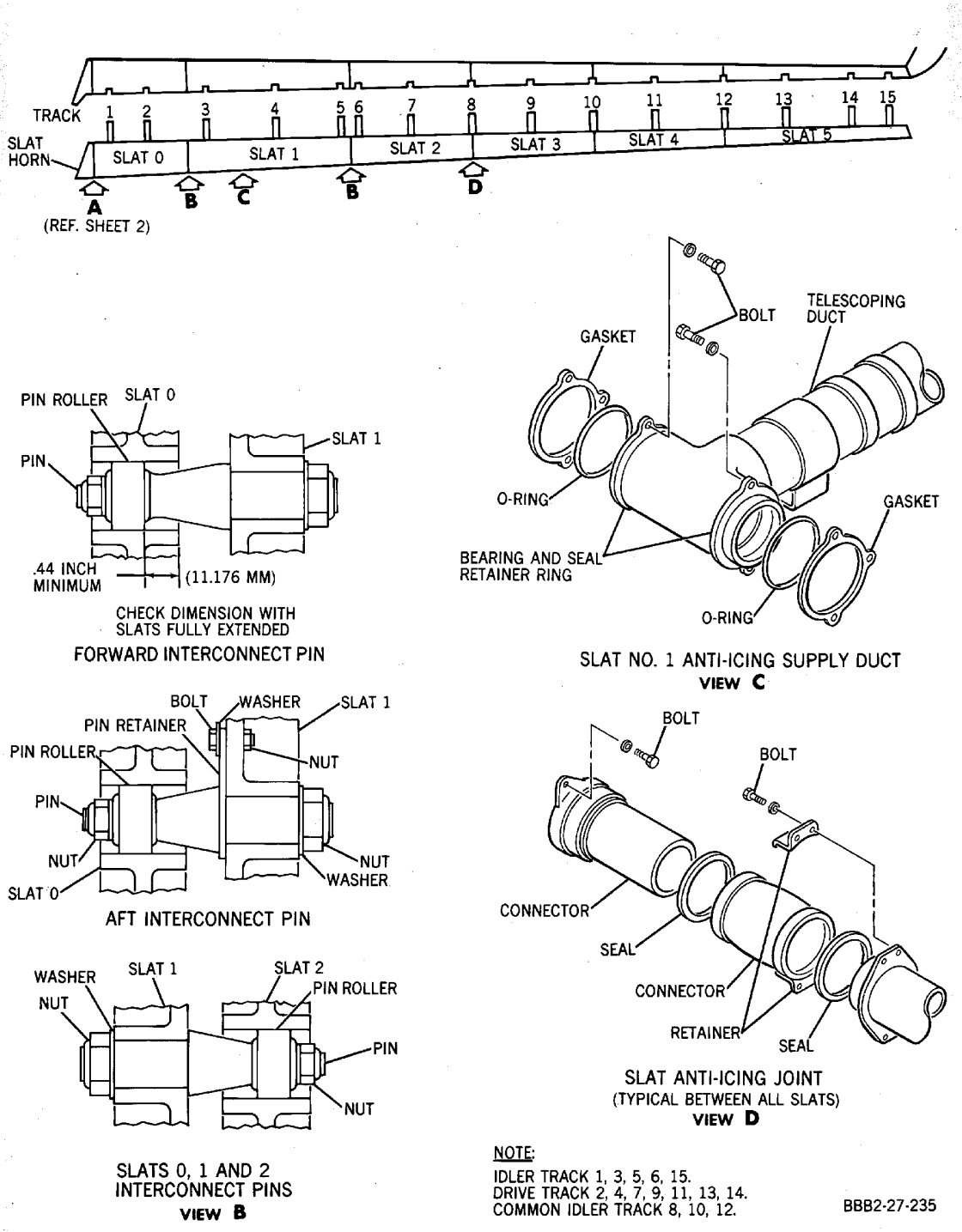
NOTE: Slats must be held in retracted position with hydraulic pressure applied, when checking clearances.

(46) Retract and extend slats several times, check slats for smooth operation without binding. Place flap/slat handle in RET detent.

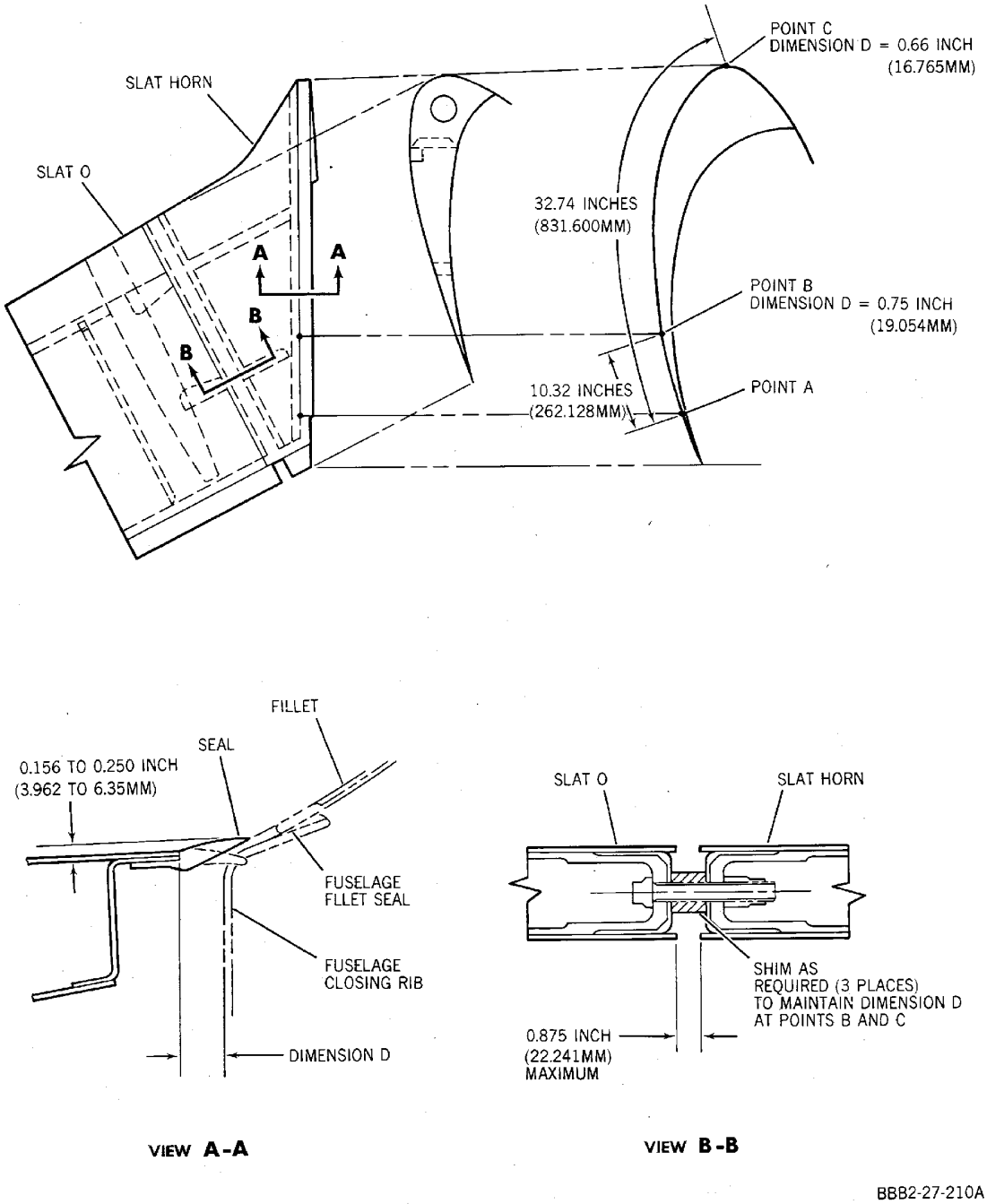
(47) Shut off hydraulic pressure source.



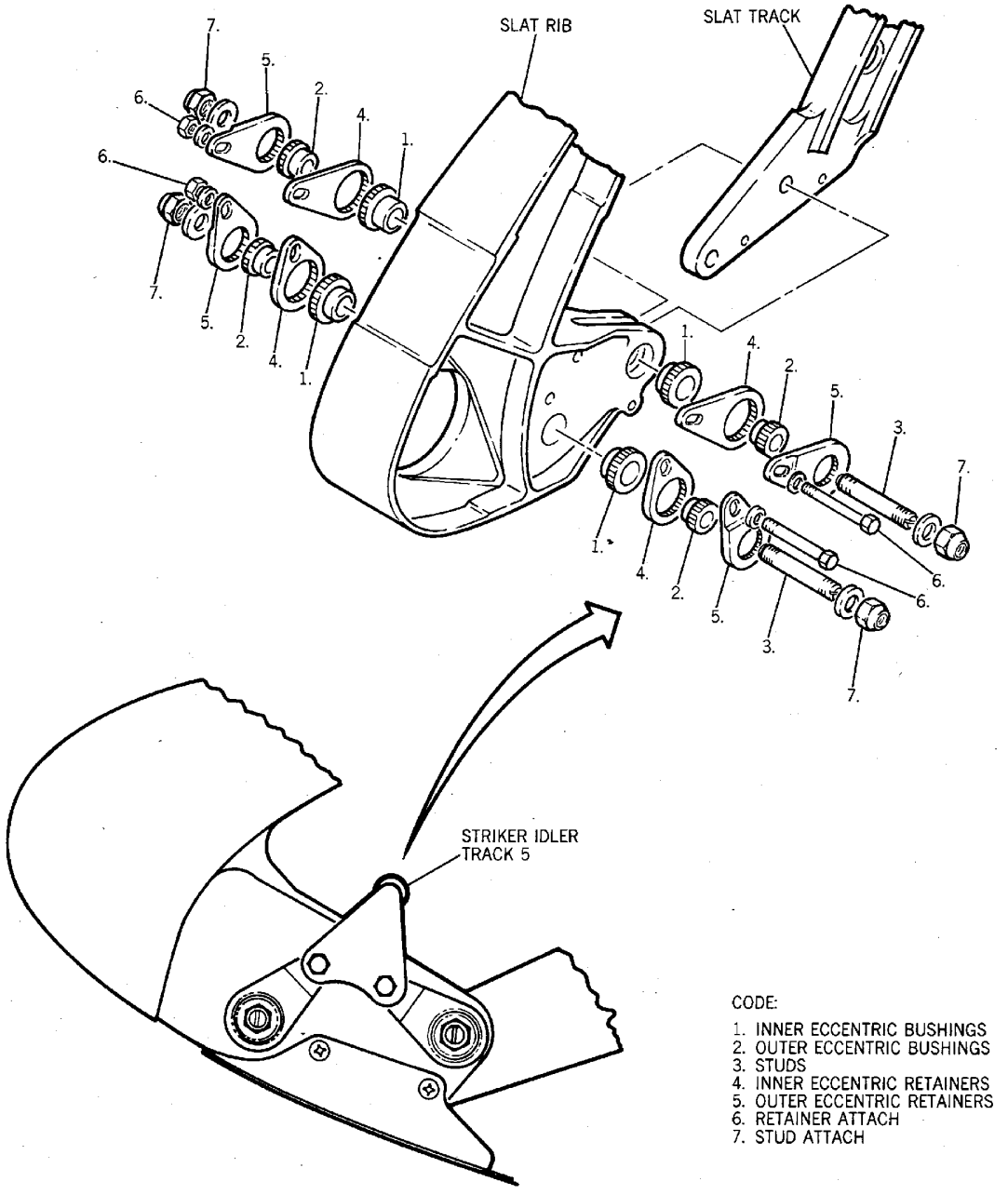
Slats - Removal/Installation
Figure 401/27-80-01-990-801 (Sheet 1 of 7)



Slats - Removal/Installation
Figure 401/27-80-01-990-801 (Sheet 2 of 7)

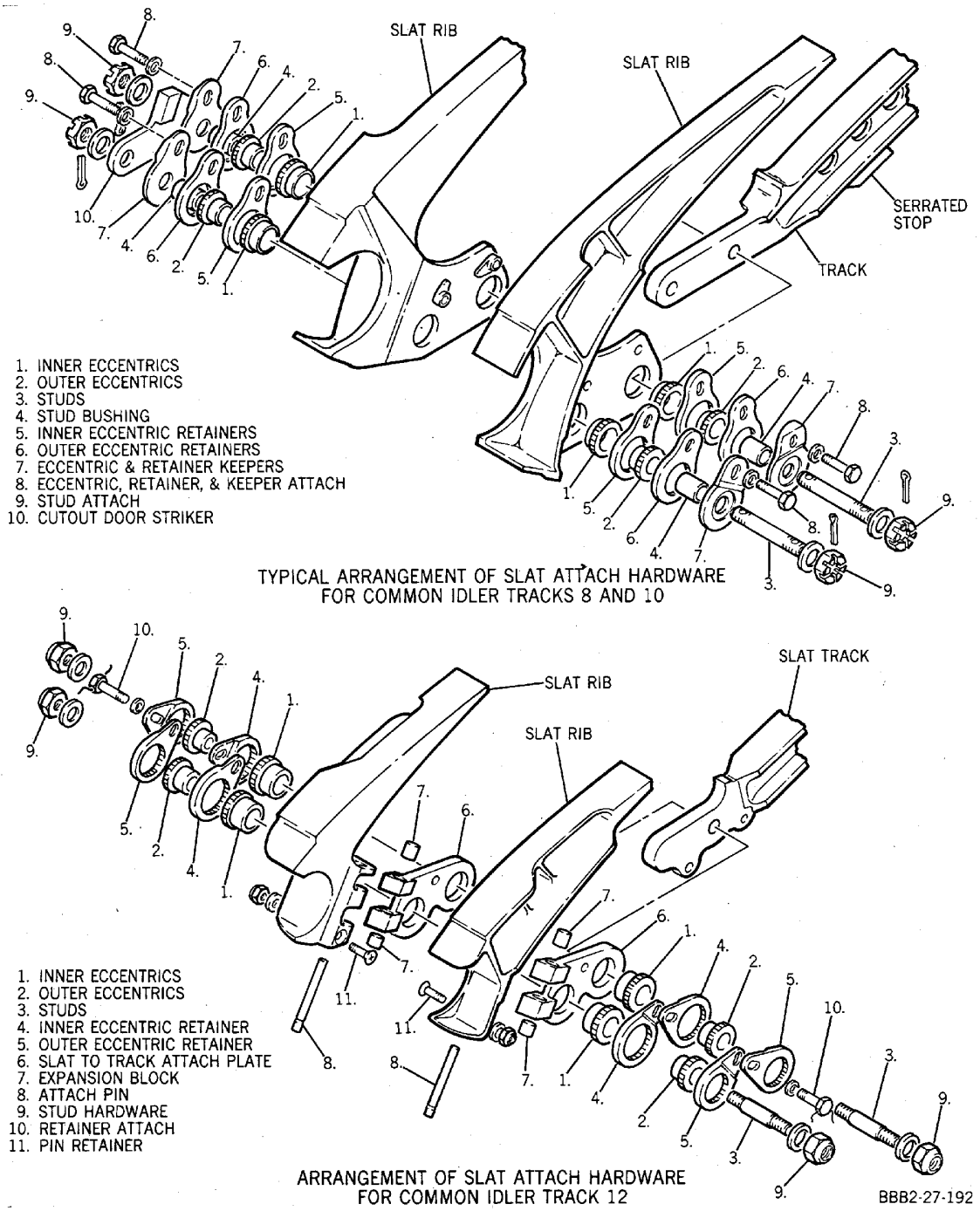


Slats - Removal/Installation
Figure 401/27-80-01-990-801 (Sheet 3 of 7)

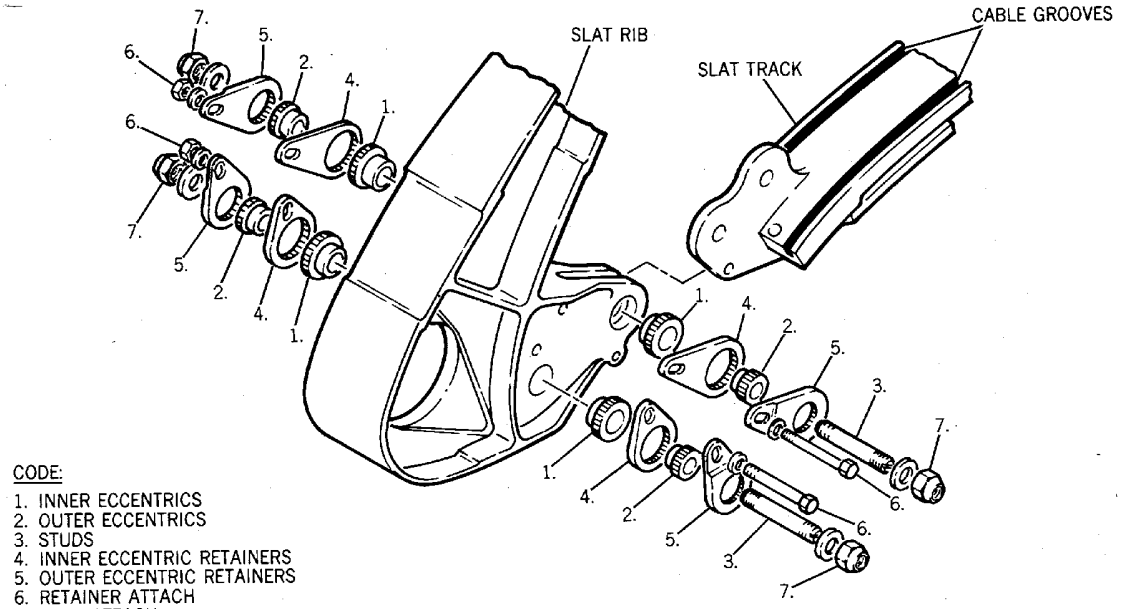


TYPICAL SLAT TO IDLER TRACK INSTALLATION FOR TRACKS 1, 3, 5, 6 AND 15 BBB2-27-191

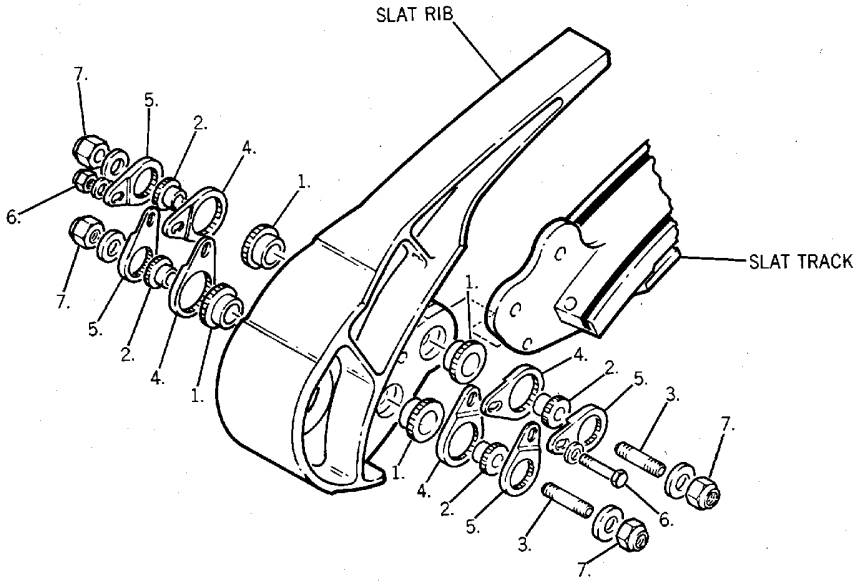
Slats - Removal/Installation
Figure 401/27-80-01-990-801 (Sheet 4 of 7)



Slats - Removal/Installation
Figure 401/27-80-01-990-801 (Sheet 5 of 7)



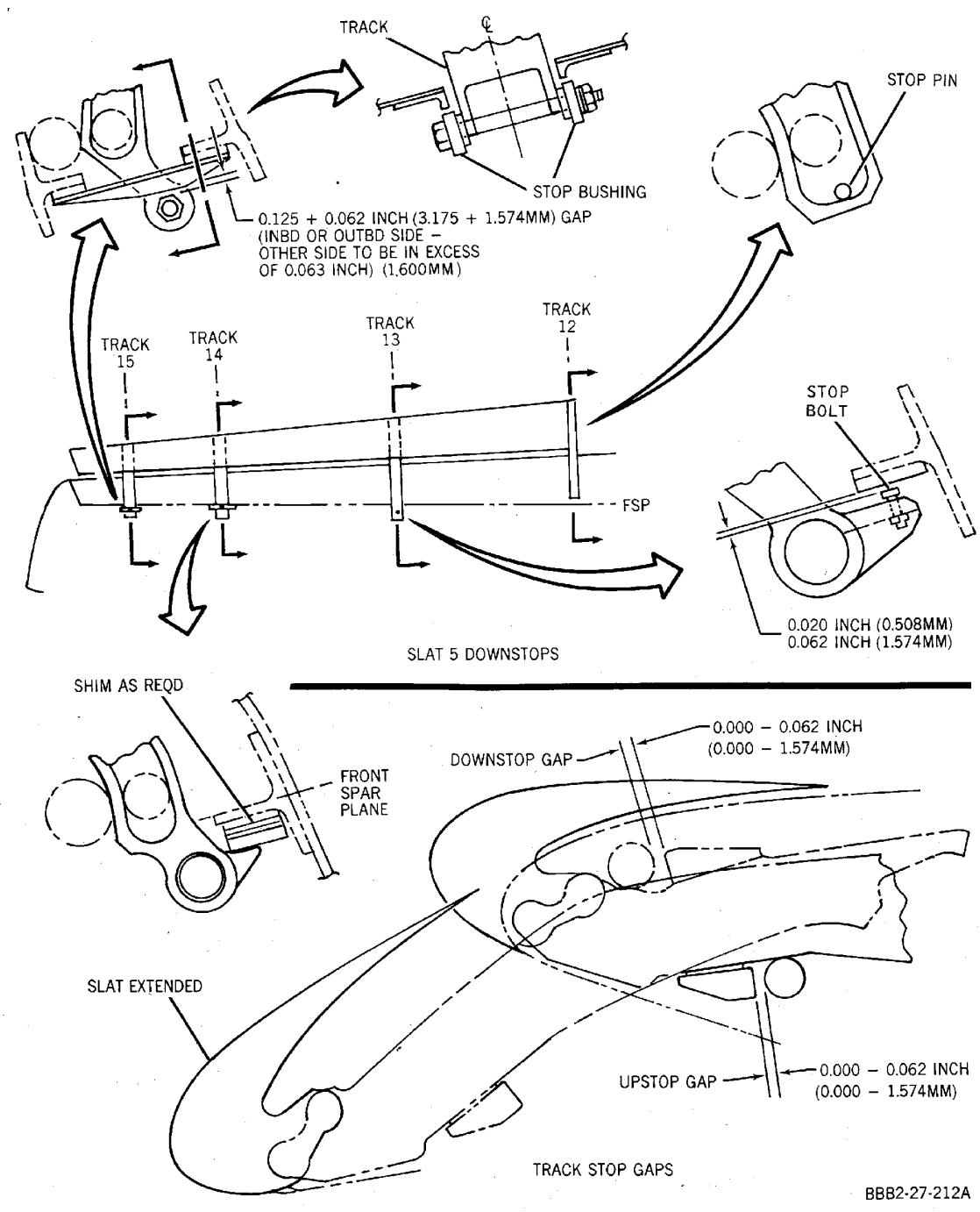
TYPICAL ARRANGEMENT OF SLAT ATTACH HARDWARE FOR DRIVE TRACKS 2, 4, AND 7



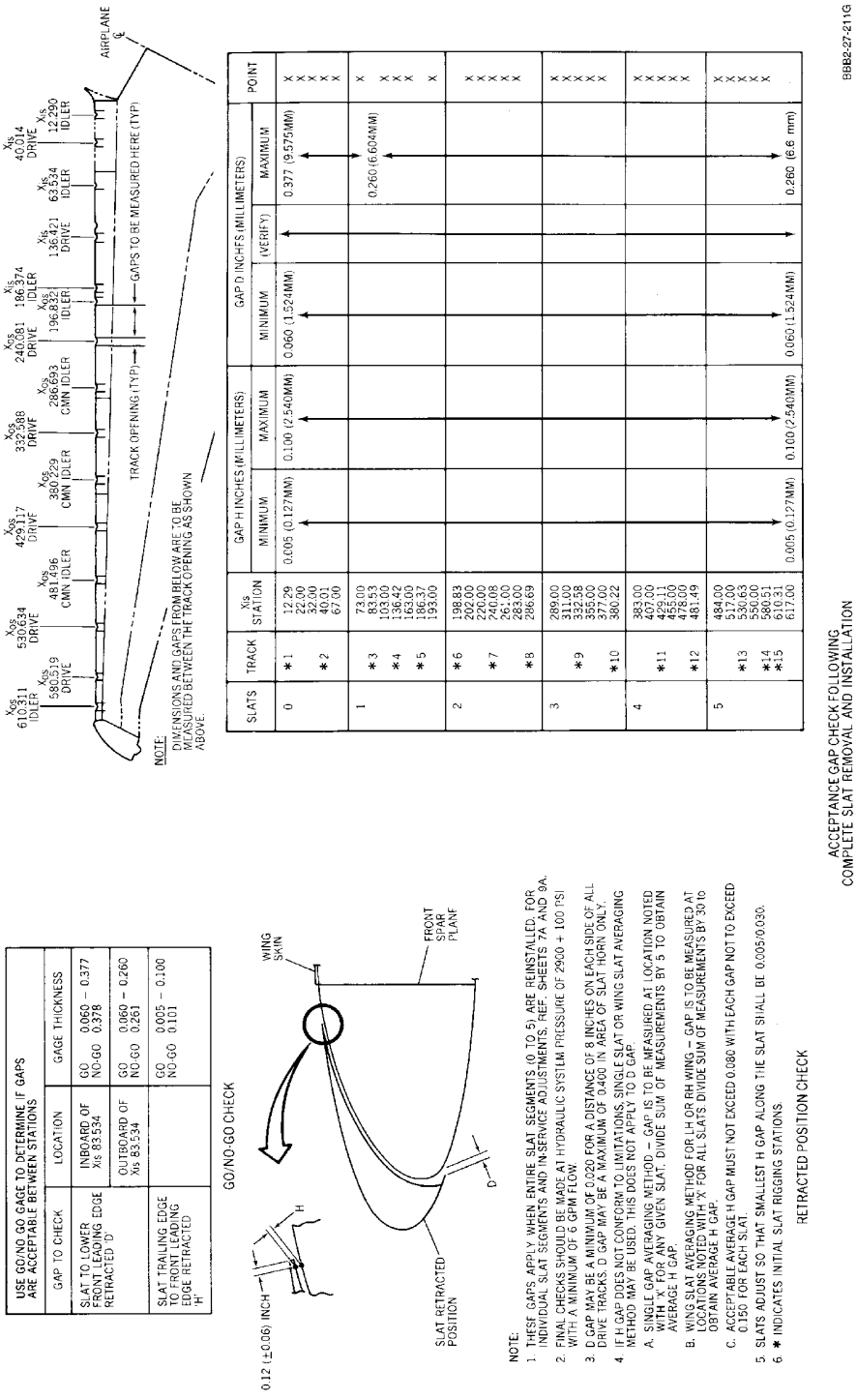
TYPICAL ARRANGEMENT OF SLAT ATTACH HARDWARE FOR DRIVE TRACKS 9, 11, 13, AND 14

BBB2-27-193

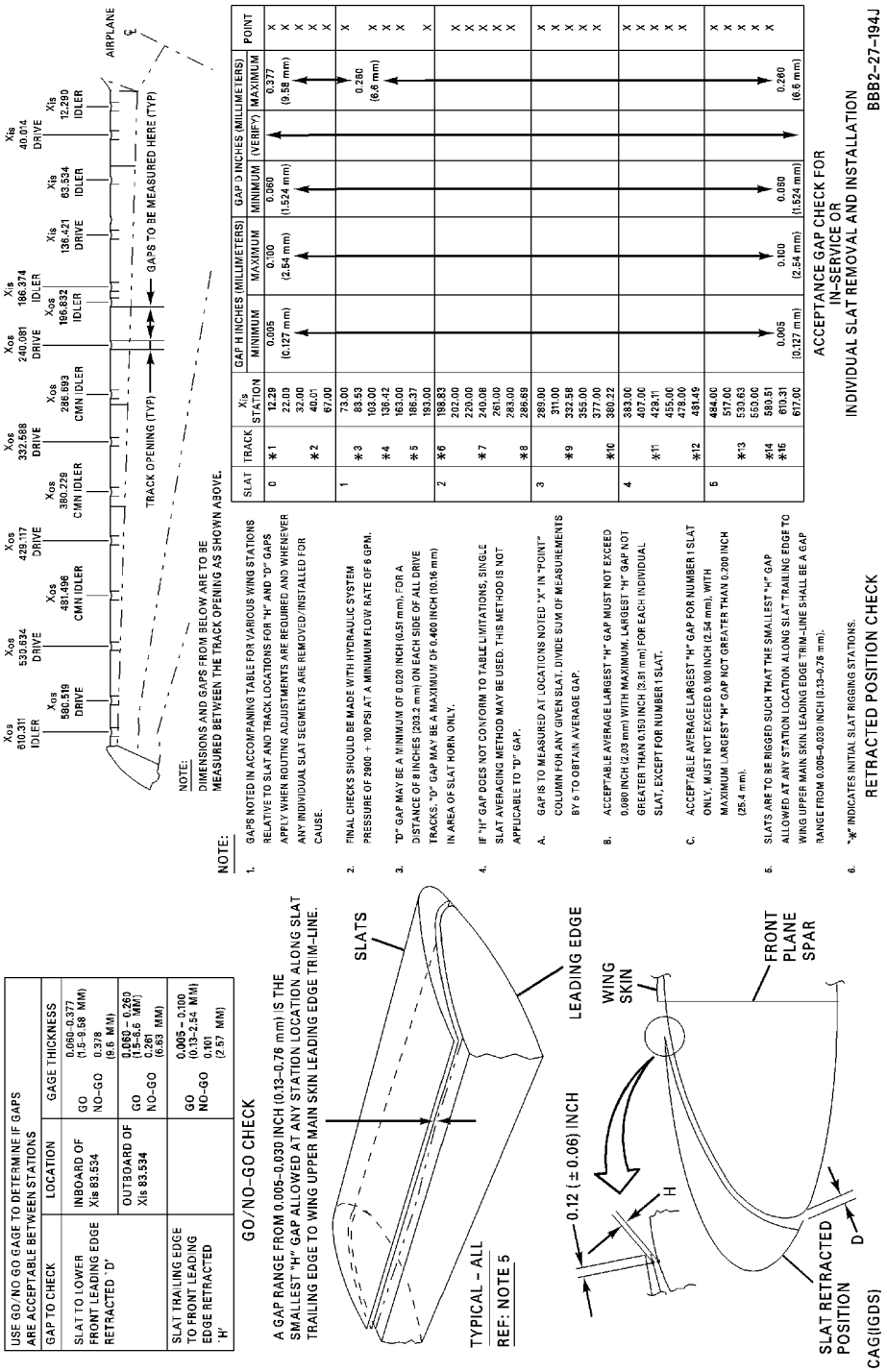
Slats - Removal/Installation
Figure 401/27-80-01-990-801 (Sheet 6 of 7)



Slats - Removal/Installation
Figure 401/27-80-01-990-801 (Sheet 7 of 7)

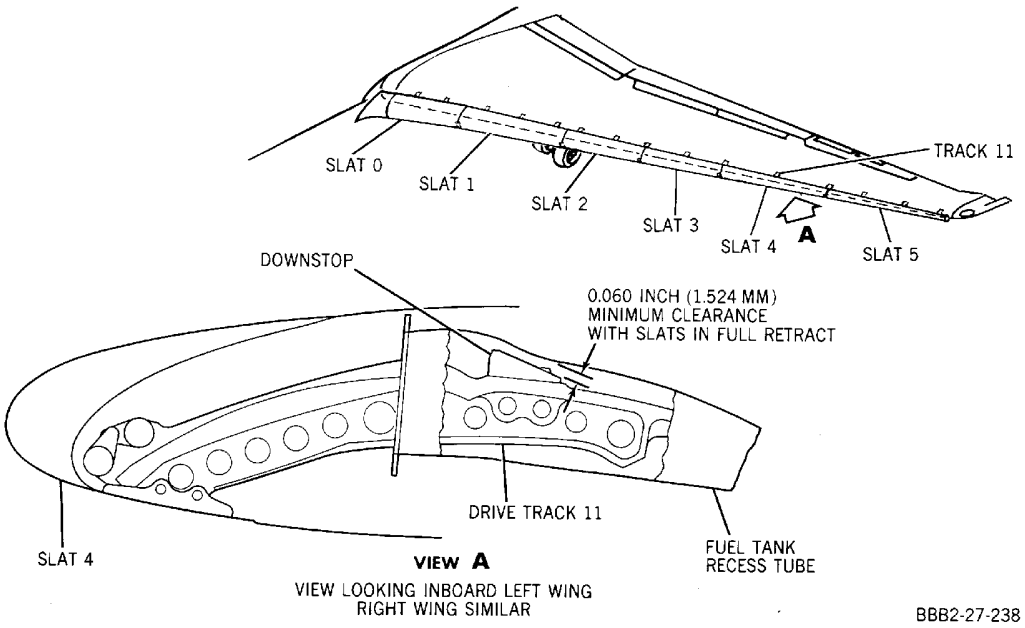


Slats - Removal/Installation
Figure 402/27-80-01-990-802 (Sheet 1 of 2)

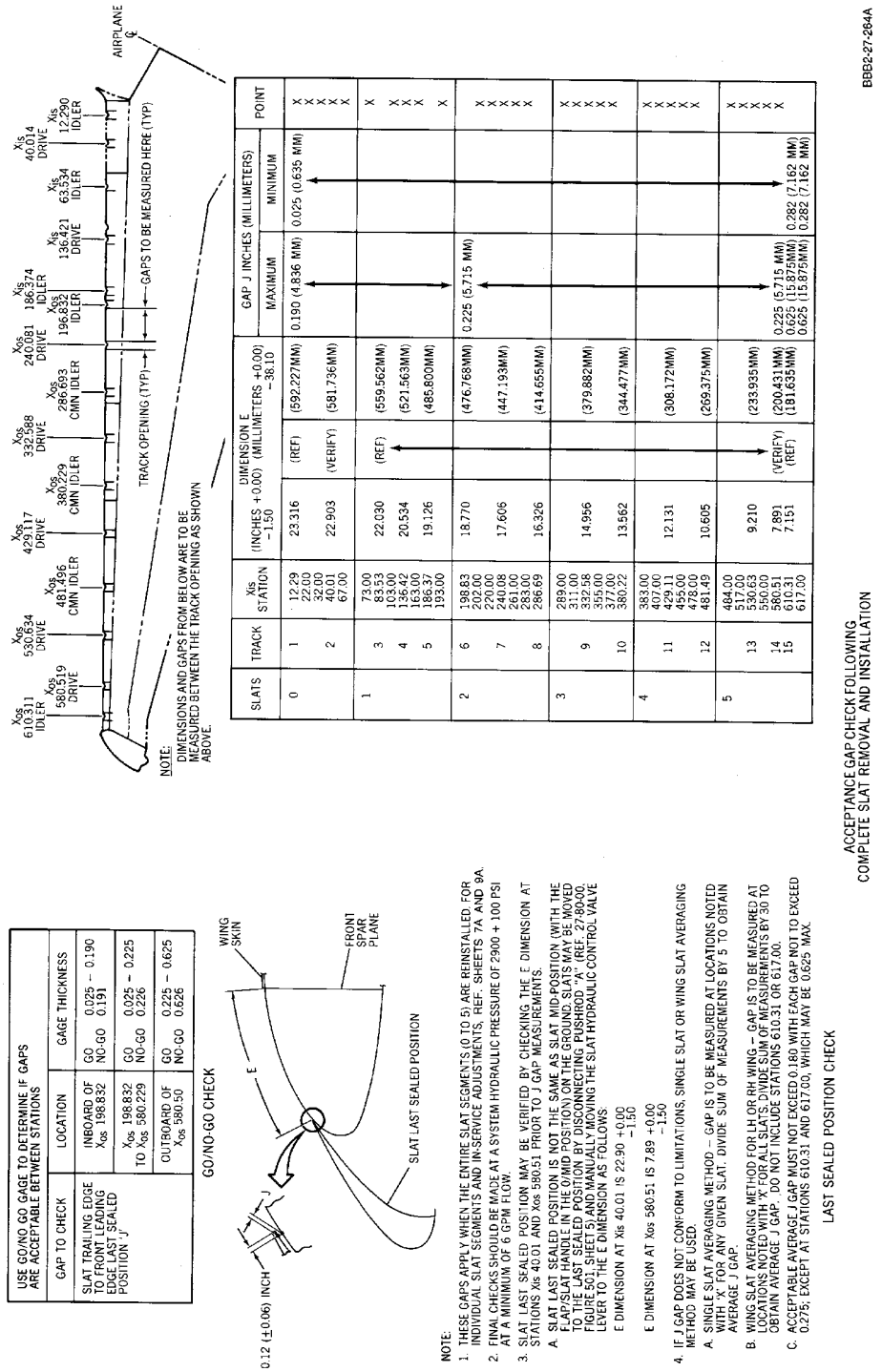


SLAT	TRACK	Xis STATION	GAP H INCHES (MILLIMETERS) MINIMUM	GAP H INCHES (MILLIMETERS) MAXIMUM	GAP D INCHES (MILLIMETERS) MINIMUM (VERIFY)	GAP D INCHES (MILLIMETERS) MAXIMUM	POINT
0	✱1	12.28	0.005 (0.127 mm)	0.100 (2.54 mm)	0.060 (1.524 mm)	0.377 (9.58 mm)	X
		22.03					X
		32.00					X
	✱2	40.01					X
		67.00					X
1		73.00					
	✱3	83.53					X
		103.00				0.260 (6.6 mm)	X
	✱4	136.42					X
		163.00					X
	✱5	186.37					X
		193.00					
2	✱6	198.83					X
		202.00					X
		220.00					X
	✱7	240.08					X
		261.00					X
	✱8	283.00					X
		286.69					X
3		289.00					X
		311.00					X
	✱9	332.58					X
		355.00					X
		377.00					X
	✱10	380.22					X
4		383.00					X
		407.00					X
	✱11	428.11					X
		455.00					X
		478.00					X
	✱12	481.49					X
5		484.00					X
		517.00					X
	✱13	530.63					X
		550.00					X
	✱14	580.51	0.005 (0.127 mm)	0.100 (2.54 mm)	0.080 (1.524 mm)	0.260 (6.6 mm)	
	✱16	610.31					
		617.00					

Slats - Removal/Installation
Figure 402/27-80-01-990-802 (Sheet 2 of 2)



Slats - Removal/Installation
Figure 403/27-80-01-990-803



SLATS	TRACK	Xis STATION	(INCHES +0.00) −1.50	DIMENSION E (MILLIMETERS +0.00) −38.10	GAP J INCHES (MILLIMETERS) MAXIMUM	GAP J INCHES (MILLIMETERS) MINIMUM	POINT
0	1	12.29	23.316	(REF) (592.227MM)	0.190 (4.836 MM)	0.025 (0.635 MM)	X
		22.00					X
	2	32.00	22.903	(VERIFY) (581.736MM)			X
		40.01					X
		67.00					X
1	3	73.00	22.030	(REF) (559.562MM)			X
		83.53					
	4	103.00	20.534	(521.563MM)			X
		136.42					X
	5	163.00	19.126	(485.800MM)			X
		186.37					
		193.00					
2	6	198.83	18.770	(476.768MM)	0.225 (5.715 MM)		
		202.00					X
		220.00					X
	7	240.08	17.606	(447.193MM)			X
		261.00					X
	8	283.00	16.326	(414.655MM)			X
		286.69					
3		289.00					X
		311.00					X
	9	332.58	14.956	(379.882MM)			X
		355.00					X
		377.00					X
	10	380.22	13.562	(344.477MM)			X
4		383.00					X
		407.00					X
	11	429.11	12.131	(308.172MM)			X
		455.00					X
		478.00					X
	12	481.49	10.605	(269.375MM)			X
5		484.00					X
		510.00					X
	13	536.63	9.210	(233.935MM)	0.225 (5.715 MM)	0.282 (7.162 MM)	X
		560.00			0.625 (15.875MM)	0.282 (7.162 MM)	X
	14	580.51	7.891	(VERIFY) (200.431MM)	0.225 (5.715 MM)		X
	15	610.31	7.151	(REF) (181.635MM)	0.625 (15.875MM)		X
		617.00			0.625 (15.875MM)	0.282 (7.162 MM)	X

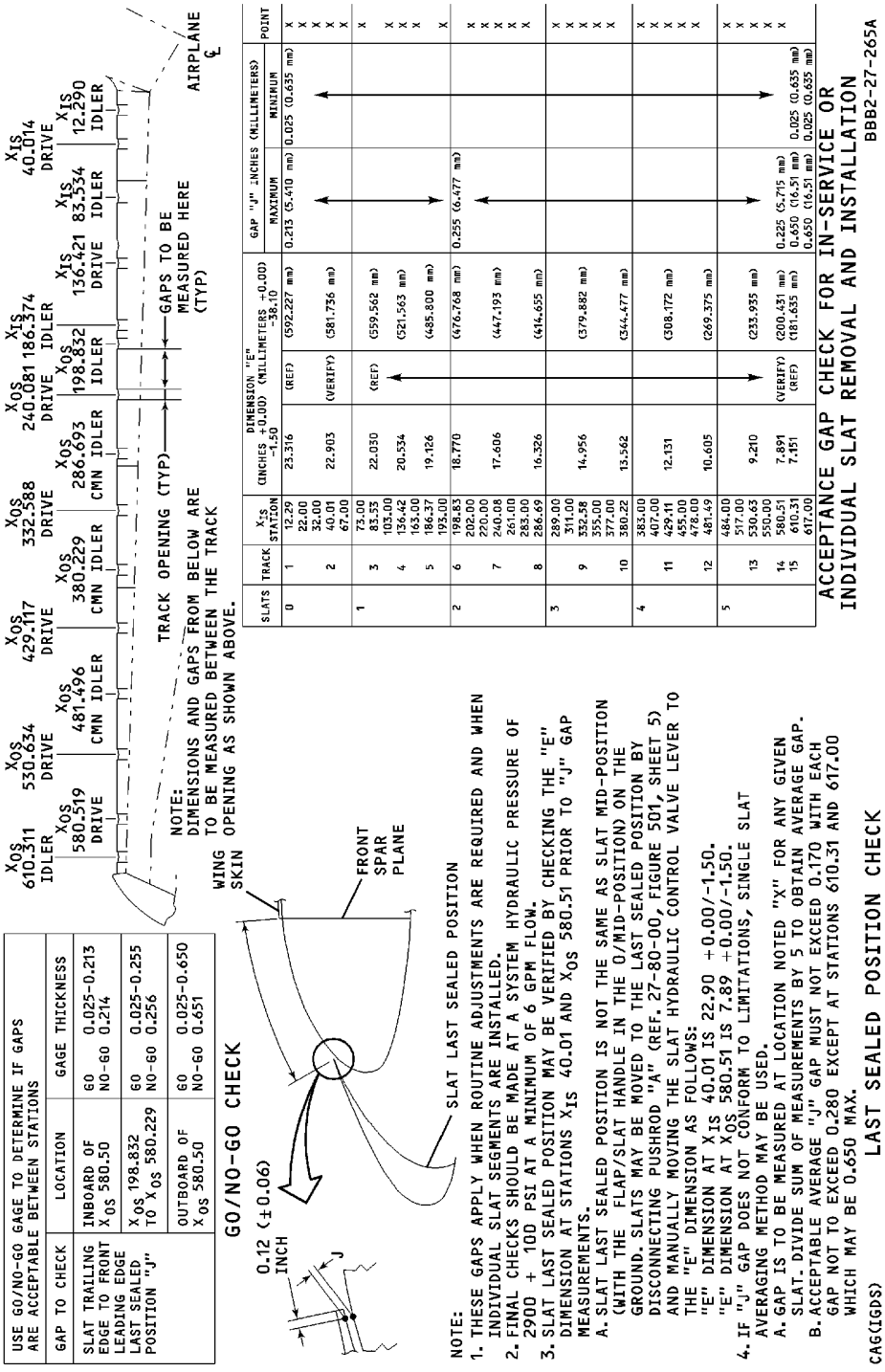
LAST SEALED POSITION CHECK

ACCEPTANCE GAP CHECK FOLLOWING COMPLETE SLAT REMOVAL AND INSTALLATION

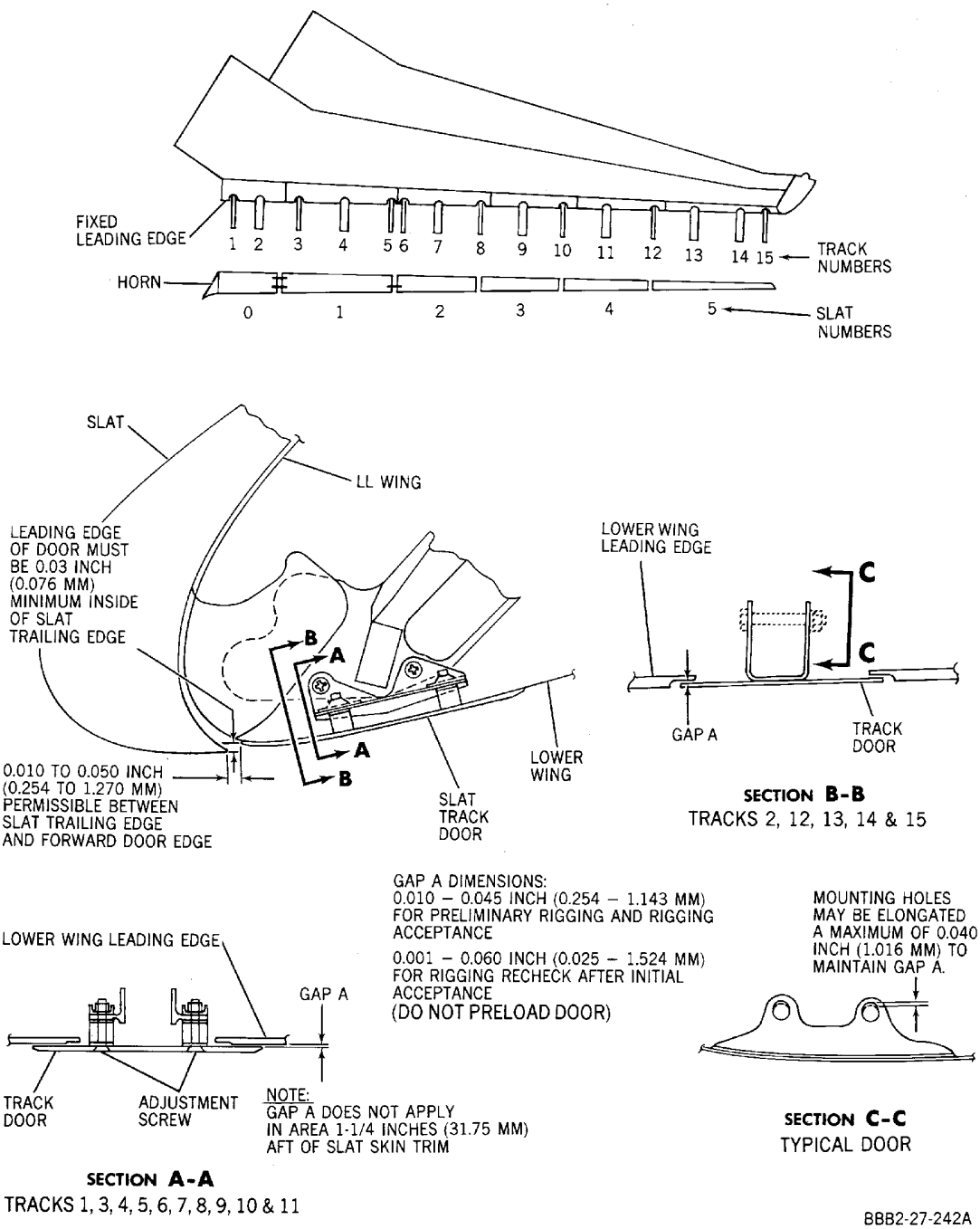
USE GO/NO GO GAGE TO DETERMINE IF GAPS ARE ACCEPTABLE BETWEEN STATIONS			
GAP TO CHECK	LOCATION		GAGE THICKNESS
SLAT TRAILING EDGE TO FRONT LEADING EDGE LAST SEALED POSITION "J"	INBOARD OF Xos 198.832	GO	0.025 – 0.190
		NO-GO	0.191
	Xos 198.832 TO Xos 580.229	GO	0.025 – 0.225
		NO-GO	0.226
	OUTBOARD OF Xos 580.50	GO	0.225 – 0.625
		NO-GO	0.626

NOTE:
1. THESE GAPS APPLY WHEN THE ENTIRE SLAT SEGMENTS (0 TO 5) ARE REINSTALLED. FOR INDIVIDUAL SLAT SEGMENTS, REF. SHEETS 7A AND 9A.
2. FINAL CHECKS SHOULD BE MADE AT A SYSTEM HYDRAULIC PRESSURE OF 2900 + 100 PSI AT A MINIMUM OF 6 GPM FLOW.
3. SLAT LAST SEALED POSITION MAY BE VERIFIED BY CHECKING THE E DIMENSION AT STATIONS Xis 40.01 AND Xos 580.51 PRIOR TO J GAP MEASUREMENTS.
   A. SLAT LAST SEALED POSITION IS NOT THE SAME AS SLAT MID-POSITION (WITH THE LEADING EDGE IN THE MID POSITION ON THE GROUND). SLATS MAY BE MOVED TO THE LAST SEALED POSITION BY DISCONNECTING A RUSHROD (A, REF. 27-80-00, FIGURE 501, SHEET 5) AND MANUALLY MOVING THE SLAT HYDRAULIC CONTROL VALVE LEVER TO THE E DIMENSION AS FOLLOWS:
      E DIMENSION AT Xis 40.01 IS 22.90 +0.00 −1.50
      E DIMENSION AT Xos 580.51 IS 7.89 +0.00 −1.50
4. IF J GAP DOES NOT CONFORM TO LIMITATIONS, SINGLE SLAT OR WING SLAT AVERAGING METHOD MAY BE USED.
   A. SINGLE SLAT AVERAGING METHOD — GAP IS TO BE MEASURED AT LOCATIONS NOTED WITH "X" FOR ANY GIVEN SLAT. DIVIDE SUM OF MEASUREMENTS BY 5 TO OBTAIN AVERAGE J GAP.
   B. WING SLAT AVERAGING METHOD FOR LH OR RH WING — GAP IS TO BE MEASURED AT LOCATIONS NOTED WITH "X" FOR ALL SLATS. DIVIDE SUM OF MEASUREMENTS BY 30 TO OBTAIN AVERAGE J GAP. DO NOT INCLUDE STATIONS 610.31 OR 617.00.
   C. ACCEPTABLE AVERAGE J GAP MUST NOT EXCEED 0.180 WITH EACH GAP NOT TO EXCEED 0.275, EXCEPT AT STATIONS 610.31 AND 617.00, WHICH MAY BE 0.625 MAX.

Slats - Removal/Installation
Figure 404/27-80-01-990-804 (Sheet 1 of 2)



Slats - Removal/Installation
Figure 404/27-80-01-990-804 (Sheet 2 of 2)



Slats - Removal/Installation
Figure 405/27-80-01-990-805

PRELIMINARY RIG LOAD TABLE

SLAT DRIVE CABLE SEGMENT NUMBER	TURN-BUCKLE	SLAT NO. & FUNCTION	TRACK NO.	PRELIMINARY CABLE RIG LOAD LBS.(Kg)
209A,B/225A,B	J	0 EXT	2	450-675 (204.1-306.1)
210A,B/226A,B	A	0 RET	2	750-1125 (340.2-510.3)
211A,B/227A,B	K	1 EXT	4	675-1065 (306.1-483.1)
212A,B/228A,B	B	1 RET	4	850-1300 (385.6-589.7)
213A,B/229A,B	L	2 EXT	7	350-525 (158.8-238.1)
214A,B/230A,B	C	2 RET	7	450-675 (204.1-306.1)
215A,B/321A,B	M	3 EXT	9	250-375 (113.4-170.1)
216A,B/232A,B	D	3 RET	9	400-625 (181.4-285.5)
217A,B/233A,B	N	4 EXT	11	175-265 (79.4-120.2)
218A,B/234A,B	E	4 RET	11	325-500 (147.4-226.8)
219A,B/235A,B	P	5 EXT	Drive	200-300 (90.7-136.0)
220A,B/236A,B	F	5 RET	Drive	325-500 (147.4-226.8)
221A,B/237A,B	R	5 EXT	13	100-150 (45.4-68.0)
222A,B/238A,B	G	5 RET	13	225-350 (102.0-158.8)
223A,B/239A,B	S	5 EXT	14	125-175 (56.7-79.4)
224A,B/240A,B	H	5 RET	14	150-225 (68.0-102.0)

NOTE: Preliminary rig loads are used only, while adjusting slat track upstops with 1000 psi (6900 kPa) hydraulic pressure on system.

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Slat - Preliminary Rig Load Table
Figure 406/27-80-01-990-806

4. Removal/Installation Slat Tracks

A. Remove Tracks (Figure 407)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Place flap/slat handle in 40/LAND detent.

(3) Shut off hydraulic pressure source.

(4) Remove slat(s) as required for track being removed. (Paragraph 3.A.)

(5) Remove idler tracks as follows:

CAUTION: RETAINER PLATES, SIDE RUB BLOCKS AND CAM FOLLOWER BEARING/ADAPTER PLUG ASSEMBLIES MUST BE TAGGED WITH INFORMATION AS TO EXACT LOCATION AND POSITION WHEN REMOVED FROM INBOARD AND OUTBOARD TRACK SUPPORTS TO PRECLUDE MALADJUSTMENT OF TRACK CLEARANCES WHEN ASSEMBLIES ARE INSTALLED.

(a) Remove retainer plate attach nuts and remove retainer plate and side rub blocks/cam follower bearing/adapter plug assemblies as a unit from inboard and outboard track support structure (4 places). (Figure 407 (Sheet 1)) (Figure 407 (Sheet 2))

NOTE: Note and record position of each assembly as removed from support structure.

(b) If removing idler track(s) 1, 3, 5, 6, 8, or 12, support track and remove stop pins. (Figure 407 (Sheet 1)) Remove track from wing by applying forward and downward pressure.

(c) If removing idler track 10, remove downstop from upper surface of track and remove track from wing. (Figure 407 (Sheet 6))

(d) If removing idler track 15, remove bolt assembly from aft end of track.(Figure 407 (Sheet 6)) Remove track from wing.

(6) If idler track is being replaced, remove and retain upstops from track, as applicable.

NOTE: Before removing upstops mark position of stops on serrated plates as an aid during installation.

(7) Remove drive tracks as follows:

(a) Remove tension from retract and extend cables, as applicable, for drive track being removed. (LIFT AUGMENTING - ADJUSTMENT/TEST, PAGEBLOCK 27-80-00/501 for turnbuckle location)

(b) If removing drive track(s) 2, 4, 7, 9, or 11, remove extend and retract cables from track. (Figure 407 (Sheet 3))

(c) If removing drive track(s) 13 or 14, remove slat track actuation cables from aft end of track. (Figure 407 (Sheet 4))

NOTE: Secure cable ends to adjacent structure, making certain that cables are clear of track.

(d) If removing drive track(s) 4 or 9, remove slat proximity sensor actuating mechanism from inboard track support. (Figure 408)

(e) If removing drive track(s) 2, 4, 7, 9, 11 or 13, remove retainer plate attach nuts and remove retainer plate cam follower bearing/adapter plug assemblies (4 places) from track supports. (Figure 407 (Sheet 5))

(f) If removing drive track 14, remove retainer plate attach nuts and remove retainer plate side rub block/cam follower bearing/adapter plug assemblies as a unit (4 places) from track supports. (Figure 407 (Sheet 2))

NOTE: Tag each assembly, as removed, with information as to exact position and location. Assemblies must be reinstalled in same location as removed.

(g) Remove downstops from upper surface of drive track(s) 2, 4, 7, 9, and 11 as applicable.

NOTE: Before removing downstops mark position of stops on serrated plates as an aid during installation.

(h) Remove slat track from supports, if removing track 13, move track up and aft to remove track from wing box.

(i) If drive track is being replaced, remove and retain upstops from track.

NOTE: Before removing upstops, mark position of stops on serrated plates as an aid during installation.

B. Install Tracks

NOTE: Before installing tracks, check track for wear. (Figure 409)

(1) Make certain left and right hydraulic systems are depressurized.

(2) If track was replaced, install upstop on track. (Figure 407 (Sheet 3))

NOTE: Position upstop on serrated plate as noted during removal in A.(6).

(3) Install idler tracks as follows:

(a) If installing idler track(s) 1, 3, 5, 6, 8, or 12, insert track(s) and install stop pins in support structure. (Figure 407 (Sheet 1))

(b) If installing idler track 10, insert track and install downstop on upper track surface. (Figure 407 (Sheet 6))

(c) If installing idler track 15, insert track and install bolt assembly on aft end of track. (Figure 407 (Sheet 6))

(d) Install retainer plate/side rub block/cam follower bearing/plug adapter assemblies (4 places) as a unit in track supports. (Figure 407 (Sheet 2)) Tighten retainer plate attach nuts.

NOTE: Assemblies must be installed in exact position and location as noted in Paragraph 4.A.(5)(a).

(e) Check that clearance between side rub blocks and track is as shown on Figure 410 (Sheet 1) . If necessary, adjust side rub blocks. (Paragraph 8.)

(f) Manually move tracks throughout their full range of movement. Check that tracks move freely without binding. If necessary adjust tracks. (Paragraph 8.)

(g) Tracks should clear all leading edge and front spar structure by 0.060 inch (1.524 mm).

(4) Install drive tracks as follows:

(a) If installing drive track(s) 2, 4, 7, 9, or 11, insert track(s) in leading edge. Push track back into leading edge several inches and apply upward force at front end of track and install retainer plate/cam follower bearing/adapter plug assemblies in track supports. (Figure 407 (Sheet 5)) Tighten retainer plate attach nuts.

(b) Install downstops on upper surface of drive track(s) 2, 4, 7, 9, or 11 as applicable.

NOTE: Position downstops on serrated plates as noted during removal in 4.A. (7)(g).

(c) If installing drive track (13), insert track in supports from wing box. Install retainer plate/ cam follower bearing/adapter plug assemblies in track supports (4 places). (Figure 407 (Sheet 2)) Tighten retainer plate nuts.

(d) If installing track (14), insert track in leading edge and install retainer plate/side rub block/ cam follower bearing/adapter plug assemblies (4 places). Tighten retainer plate attach nuts. (Figure 407 (Sheet 2))

NOTE: Assemblies must be installed in exact position and location as noted in Paragraph 4.A.(7)(f).

CAUTION: EXTREME CARE MUST BE TAKEN TO AVOID KINKING OR OTHERWISE DAMAGING, FREE OR UNRIGGED, SLAT DRIVE CABLES DURING MOVEMENT OF DRIVE TRACKS.

(e) Manually move drive track(s) through full travel and check that track moves freely without binding.

(f) Check that clearance between side rollers and track is as shown on Figure 410 (Sheet 3) , for tracks 2, 7 or 11; Figure 410 (Sheet 4) for tracks 4 and 9. If necessary, adjust side rollers. (Paragraph 8.)

NOTE: Side rollers at track 13 are not adjustable.

(g) Check that clearance between side rub block and track is as shown on Figure 410 (Sheet 1) . If necessary, adjust side rub block. (Paragraph 8.)

NOTE: Use adjustment procedures for idler tracks side rub blocks for drive track 14 side rub block adjustment.

(h) If installing drive track(s) 2, 4, 7, 9, or 11, connect extend and retract cables to track(s). (Figure 407 (Sheet 3))

(i) If installing drive track(s) 13 or 14, connect extend and retract cables to aft end of track(s). (Figure 407 (Sheet 4))

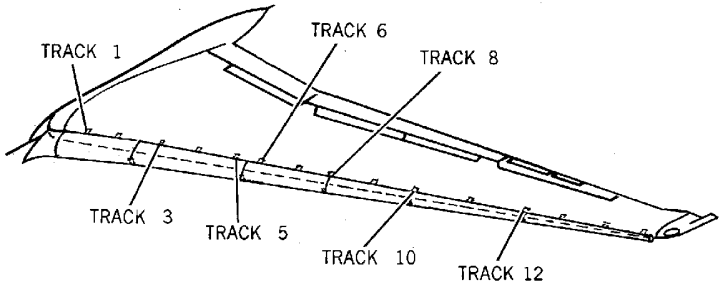
(j) If drive track(s) 4 or 9 was installed, install slat proximity sensor actuating mechanism on inboard track support. (Figure 408)

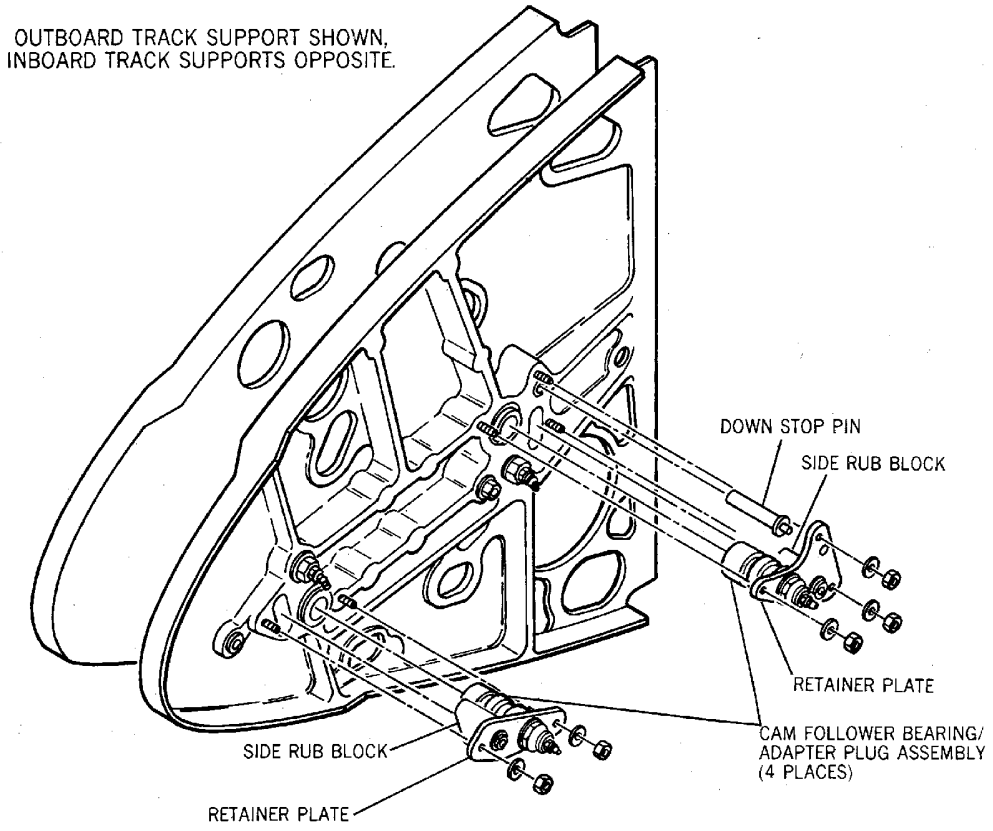
CAUTION: TURNBUCKLE THREAD ENGAGEMENT MUST BE SUFFICIENT TO PREVENT STRIPPING THREADS.

(5) Connect drive and retract cable turnbuckles with minimum thread engagement.

(6) Install slat on tracks, as applicable. (Paragraph 3.B.)

(7) Test slat advisory sensor (PAGEBLOCK 27-80-06/201). If necessary adjust slat proximity sensor actuating mechanism. (Paragraph 9.)





(TYPICAL IDLER TRACKS 1, 3, 5, 6, 8, 10, & 12 LEFT AND RIGHT WING)

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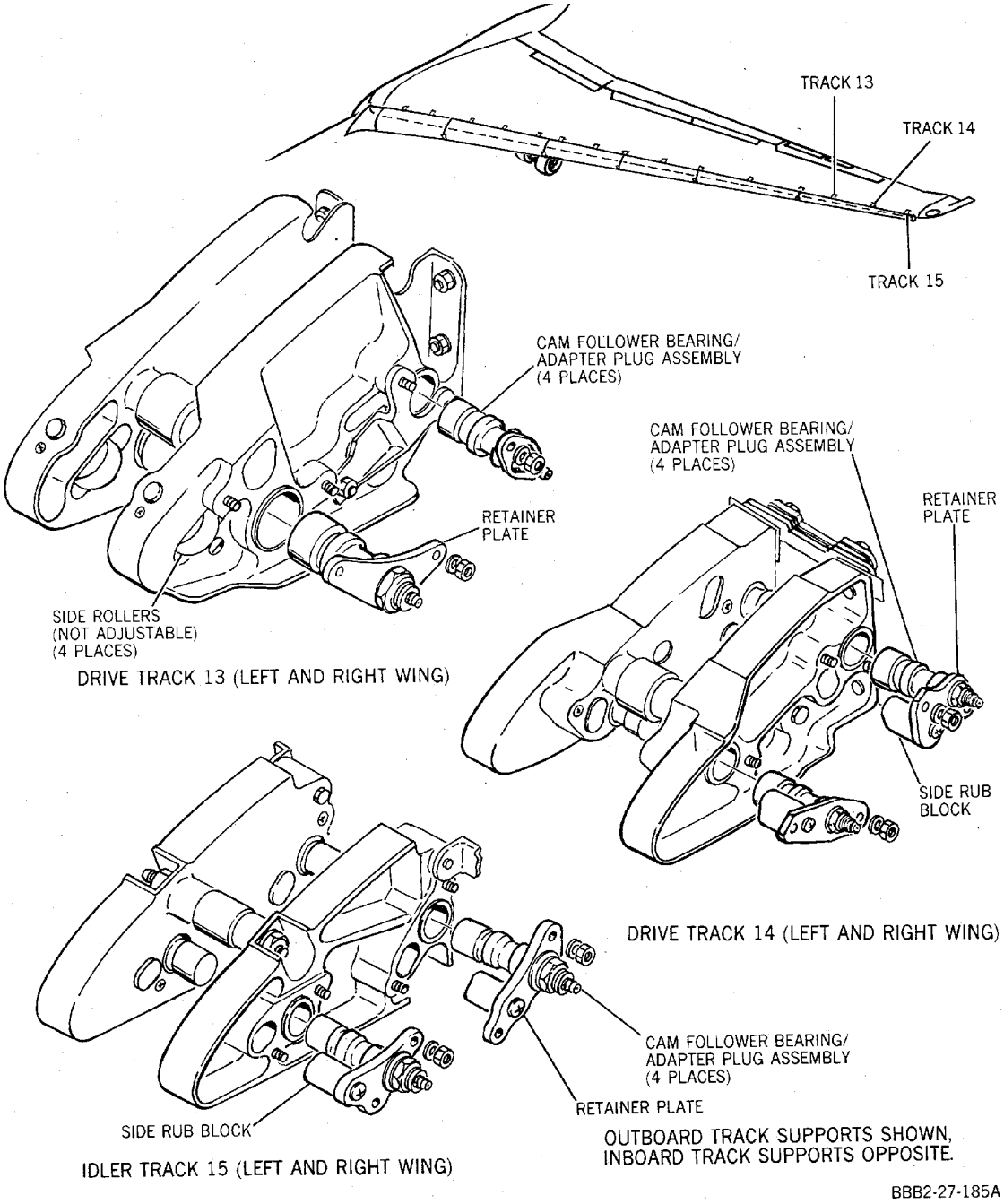
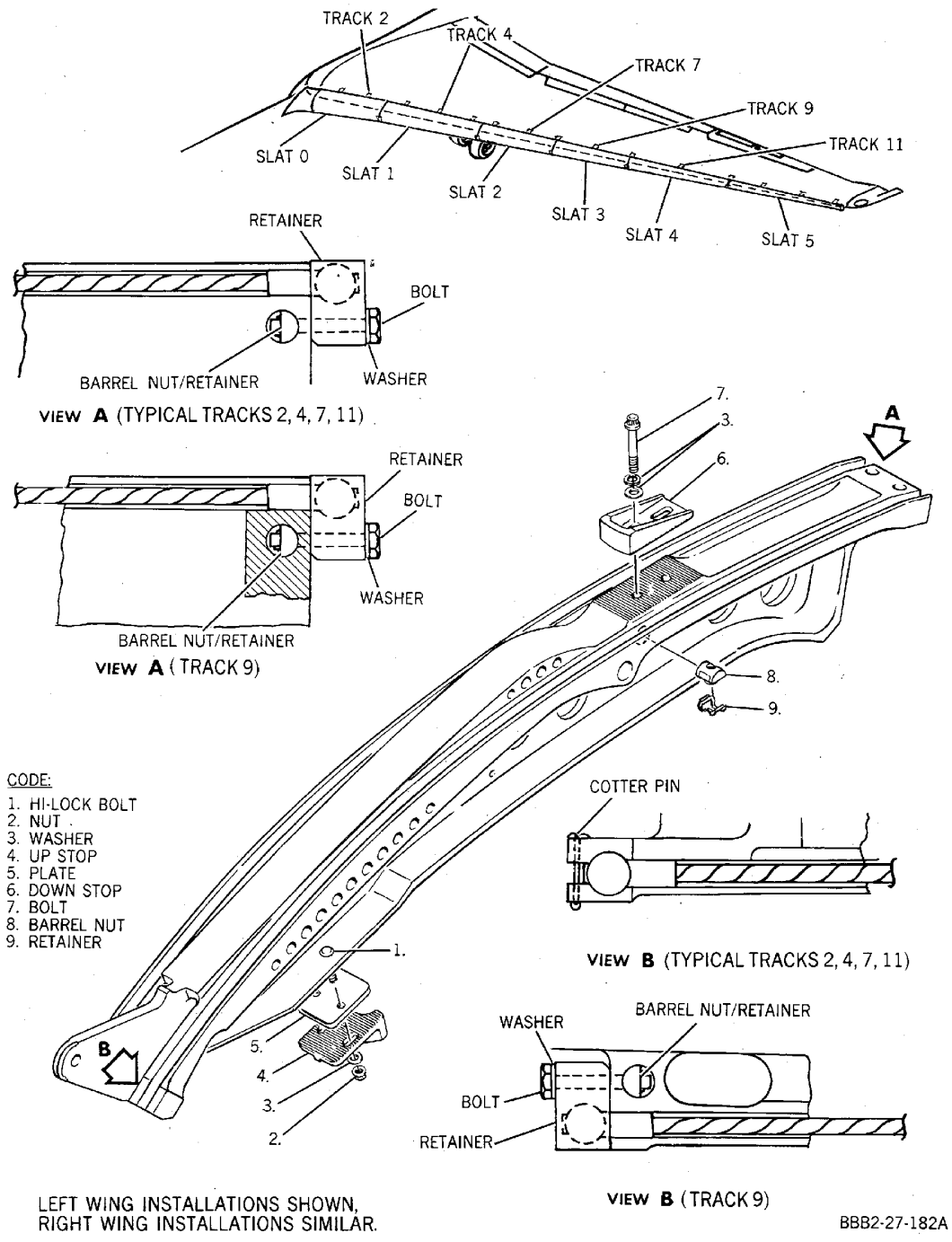
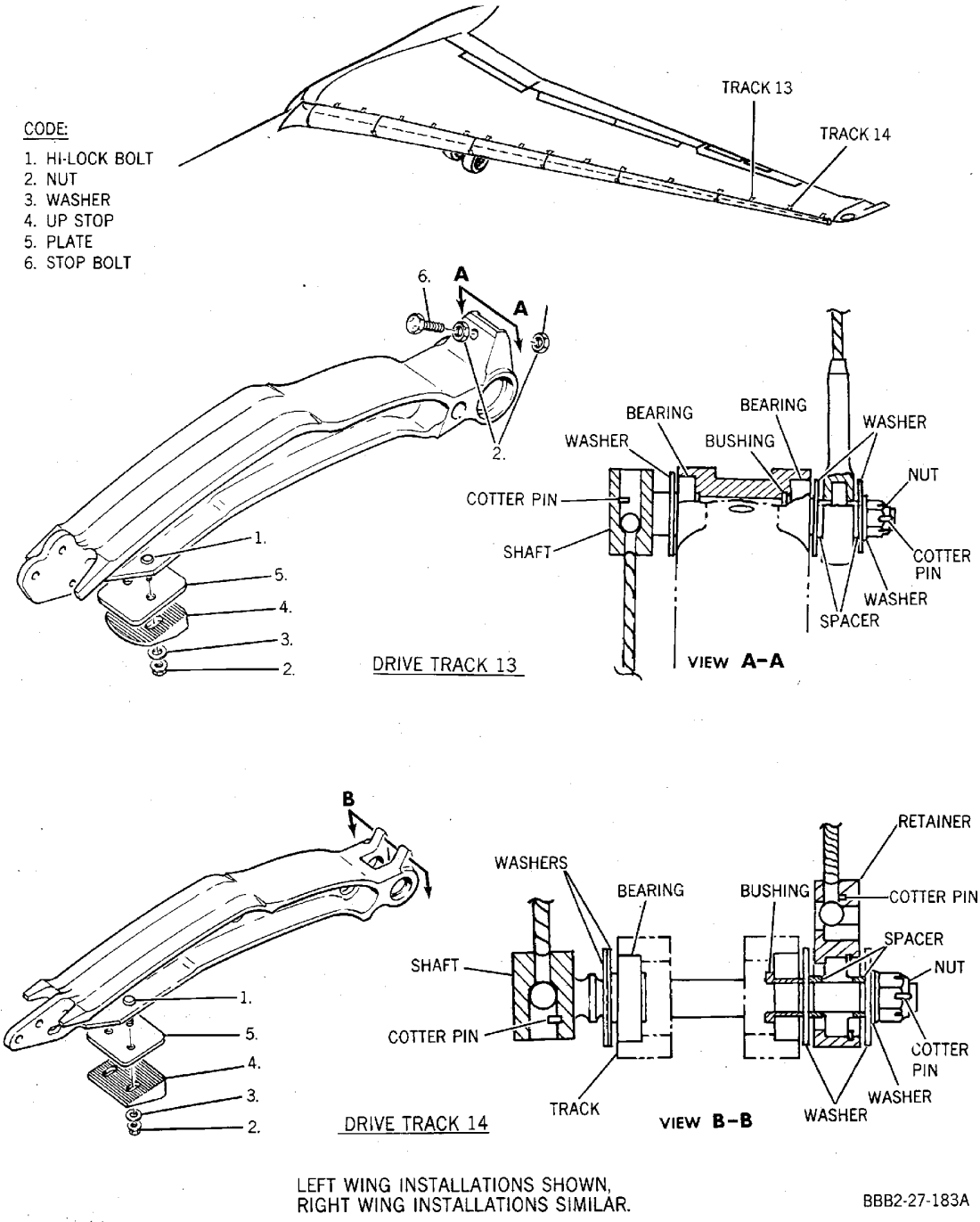
Slat Tracks - Removal/Installation
Figure 407/27-80-01-990-807 (Sheet 1 of 6)



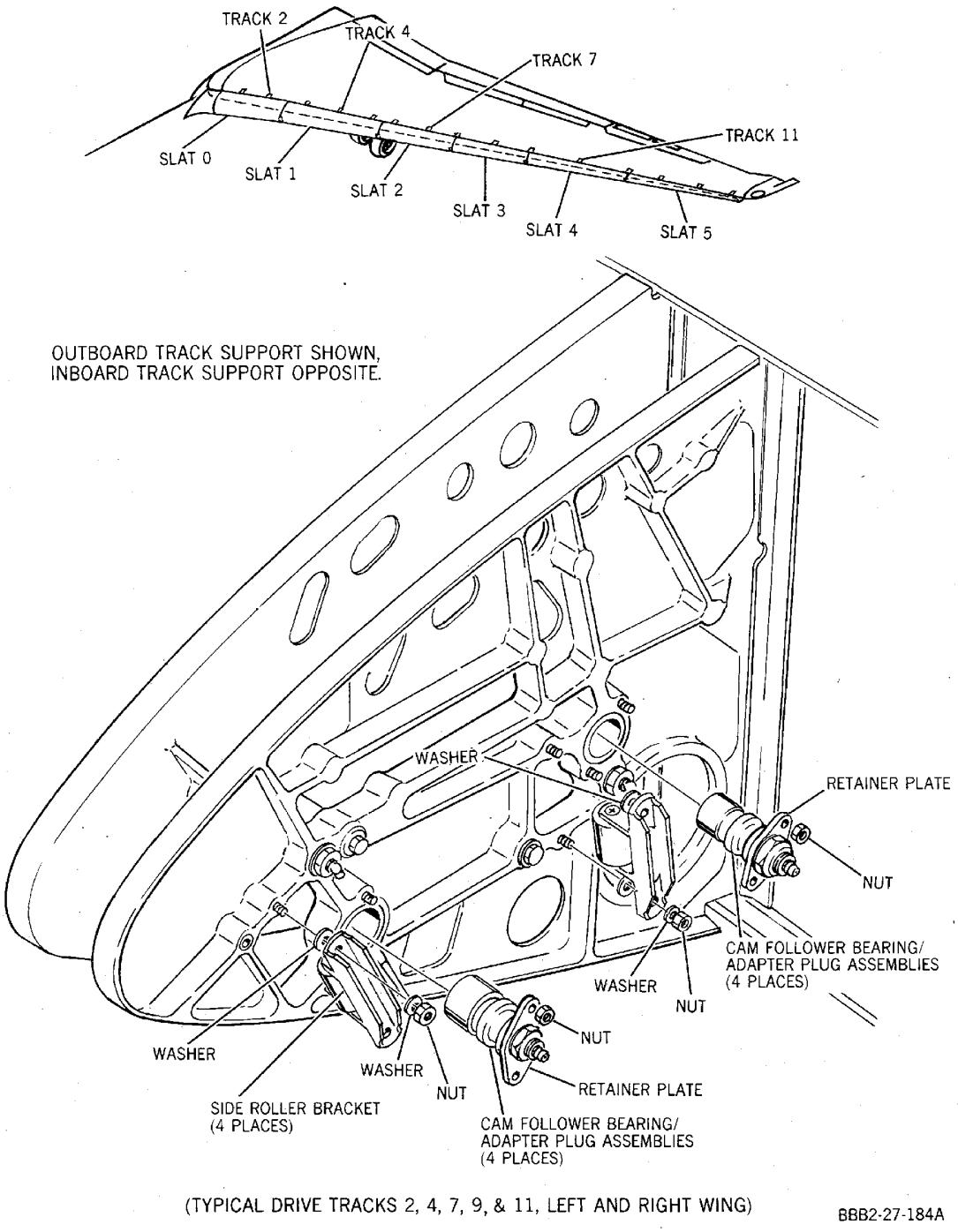
Slat Tracks - Removal/Installation
Figure 407/27-80-01-990-807 (Sheet 2 of 6)



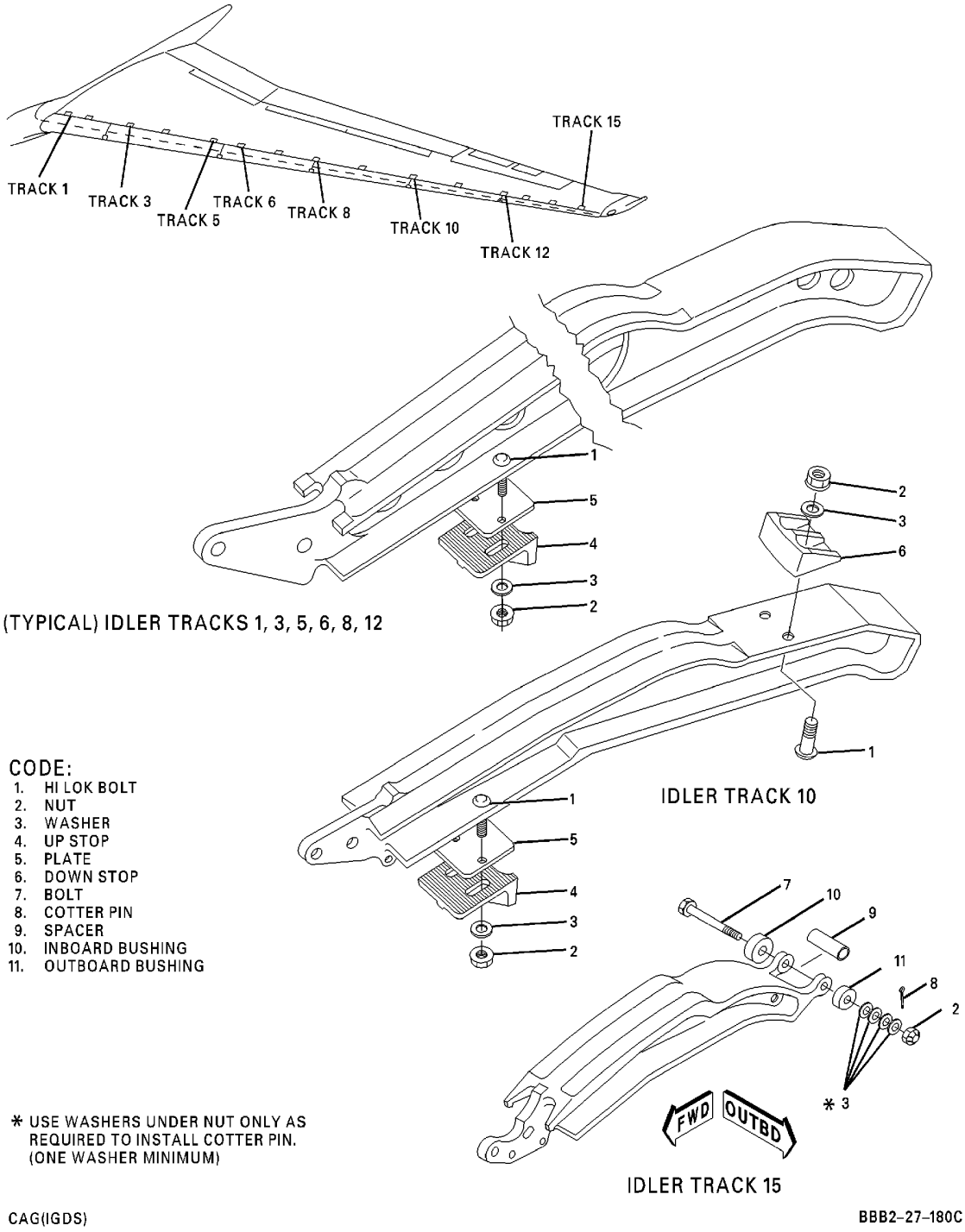
Slat Tracks - Removal/Installation
Figure 407/27-80-01-990-807 (Sheet 3 of 6)



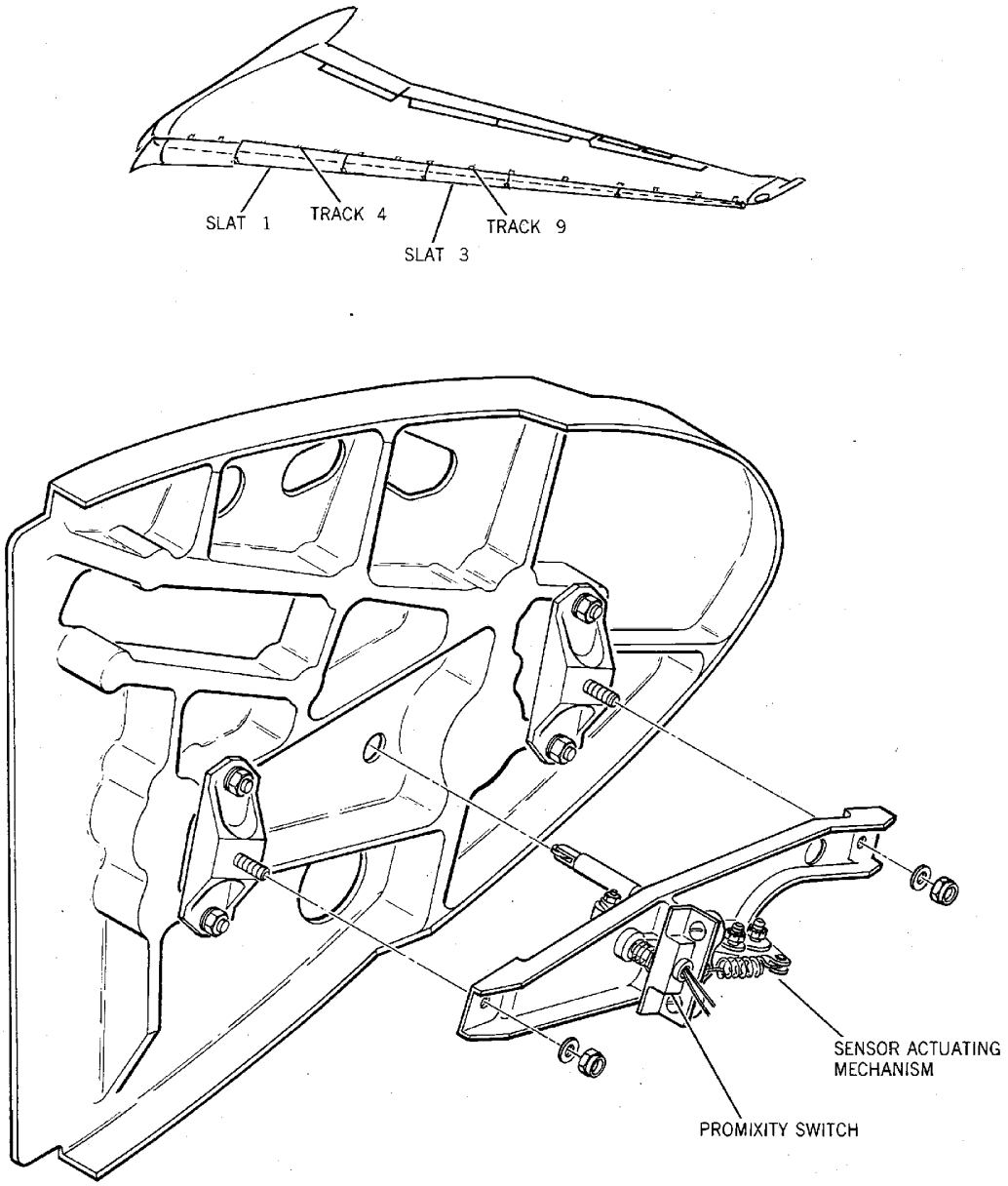
Slat Tracks - Removal/Installation
Figure 407/27-80-01-990-807 (Sheet 4 of 6)



Slat Tracks - Removal/Installation
Figure 407/27-80-01-990-807 (Sheet 5 of 6)

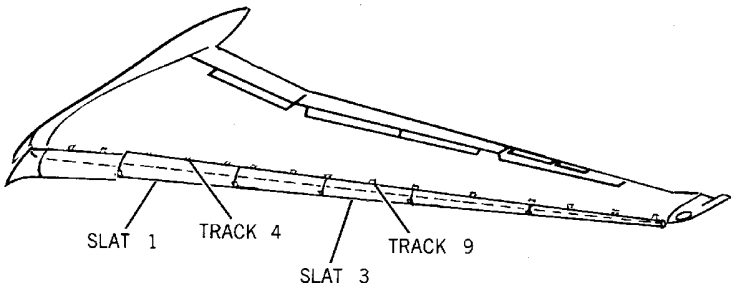


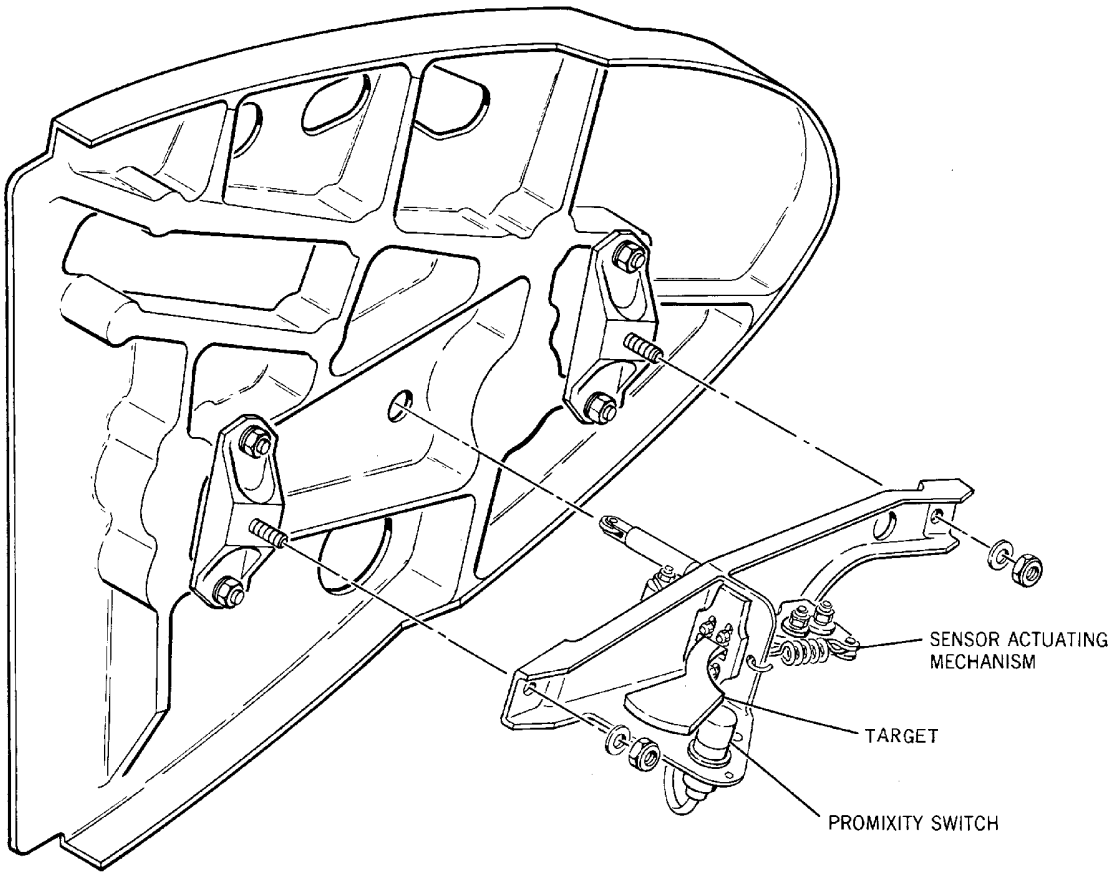
Slat Tracks - Removal/Installation
Figure 407/27-80-01-990-807 (Sheet 6 of 6)



SLAT PROXIMITY SENSOR ACTUATING MECHANISM

Slat Tracks - Removal/Installation
Figure 408/27-80-01-990-808 (Sheet 1 of 2)





SLAT PROXIMITY SENSOR ACTUATING MECHANISM

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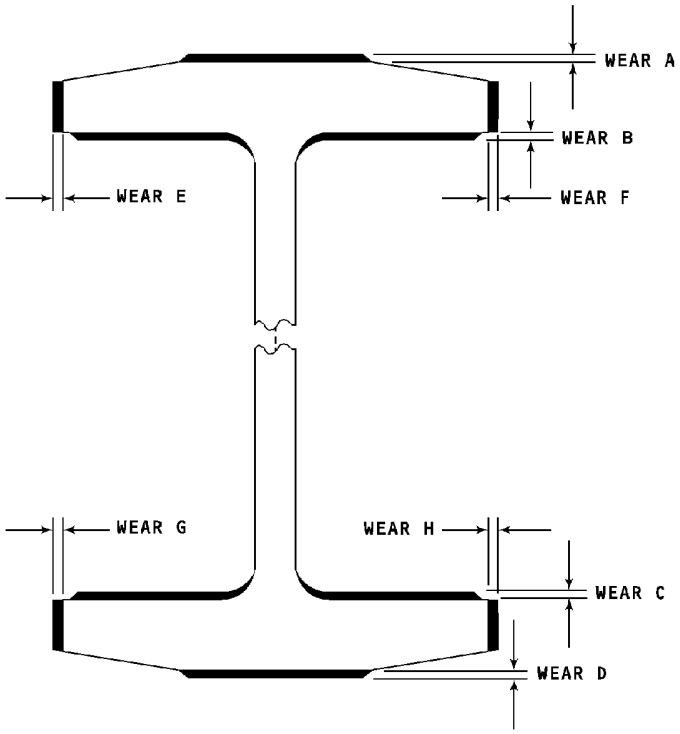
Slat Tracks - Removal/Installation
Figure 408/27-80-01-990-808 (Sheet 2 of 2)



MAXIMUM ALLOWANCE IDLER TRACK WEAR

IDLER TRACK WING SLAT STATION No.	MAXIMUM WEAR DEPTH IN INCHES (MILLIMETERS)					
	WEAR AT FWD ROLLERS			WEAR AT AFT ROLLERS		
	A	B	A&B	C	D	C&D
12.290	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
83.534	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
186.3738	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
198.832	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
286.693	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
380.229	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
481.496	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
610.311	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)

IDLER TRACK WING SLAT STATION No.	MAXIMUM WEAR DEPTH IN INCHES (MILLIMETERS)					
	WEAR AT UPPER SIDE ROLLERS			WEAR AT LOWER SIDE ROLLERS		
	E	F	E&F	G	H	G&H
12.290	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
83.534	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
186.3738	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
198.832	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
286.693	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
380.229	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
481.496	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
610.311	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)

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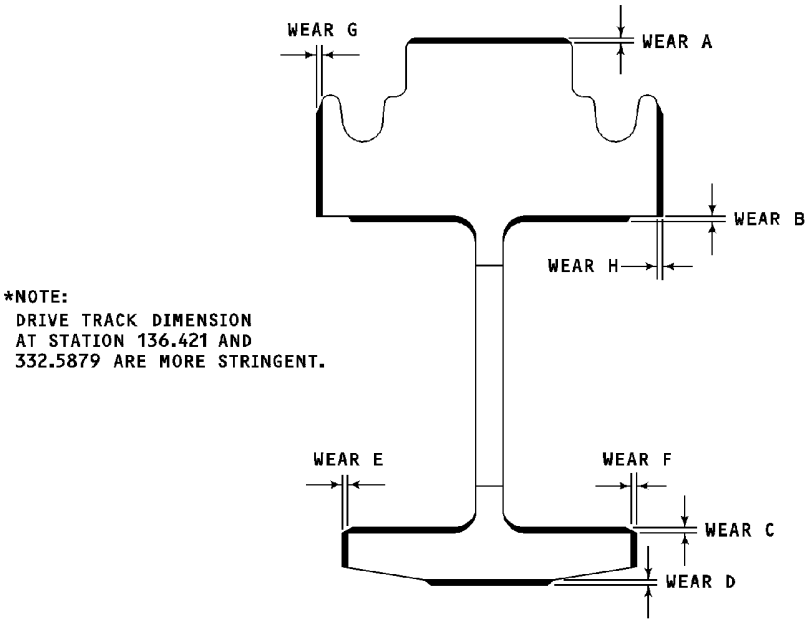
Drive Track Wear Limits
Figure 409/27-80-01-990-810 (Sheet 1 of 2)



MAXIMUM ALLOWANCE DRIVE TRACK WEAR

DRIVE TRACK WING SLAT STATION No.	MAXIMUM WEAR DEPTH IN INCHES (MILLIMETERS)					
	WEAR AT FWD ROLLERS			WEAR AT AFT ROLLERS		
	A	B	A&B	C	D	C&D
40.014	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
136.421	0.015 (0.38mm)	0.015 (0.38mm)	*0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	*0.030 (0.76mm)
240.081	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
332.5879	0.015 (0.38mm)	0.015 (0.38mm)	*0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	*0.030 (0.76mm)
429.117	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
530.634	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
580.519	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)

DRIVE TRACK WING SLAT STATION No.	MAXIMUM WEAR DEPTH IN INCHES (MILLIMETERS)			MAXIMUM WEAR DEPTH IN INCHES (MILLIMETERS)		
	WEAR AT SIDE ROLLERS			WEAR AT SIDE ROLLERS		
	E	F	E&F	G	H	G&H
40.014	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
136.421	0.015 (0.38mm)	0.015 (0.38mm)	*0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	*0.030 (0.76mm)
240.081	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
332.5879	0.015 (0.38mm)	0.015 (0.38mm)	*0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	*0.030 (0.76mm)
429.117	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
530.634	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)
580.519	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)	0.015 (0.38mm)	0.015 (0.38mm)	0.030 (0.76mm)

CAG(IGDS)

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Drive Track Wear Limits
Figure 409/27-80-01-990-810 (Sheet 2 of 2)

5. Removal/Installation Slat Track Side Rollers and Side Rub Blocks With Full Cable Tension

A. Remove Slat Track Side Rollers and Side Rub Blocks

NOTE: The following procedure is optional in lieu of slat track removal/installation with cable tension released. (Paragraph 4. and Paragraph 8.)

NOTE: This procedure may be performed only after check of the slat tracks has revealed no signs of track to structure interference or chafing. If wear is due to interference or chafing is present, the system must be derigged and thoroughly checked.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Place flap/slat handle in 40/land detent.

(3) Check that left and right hydraulic systems are depressurized.

CAUTION: DURING THIS PROCEDURE, TAG EACH SIDE ROLLER/RUB BLOCK BRACKET UNIT REMOVED WITH INFORMATION AS TO EXACT POSITION AND LOCATION OF THAT UNIT. BRACKET UNITS MUST BE INSTALLED IN SAME POSITION AS REMOVED; EXTRA CAUTION MUST BE USED TO ENSURE THAT ALL SHIMS ARE ACCOUNTED FOR IN THEIR ORIGINAL POSITION.

B. Install Slat Track Side Rollers and Side Rub Blocks

NOTE: If any one side roller bearing/rub block requires replacement, all rollers/rub blocks are to be removed from that slat track location one at a time to verify condition and clearances per this procedure.

(1) For roller units which have signs of bearing wear, replace bearings as follows:

(a) Remove bearing/bushing from bracket unit.

(b) Check bushing in bearing center. Remove and replace bushing as necessary. If new bushing is being installed, ream bushing I.D. to 0.2495 to 0.2505 inch (6.34 to 6.36 mm) diameter. (Ref. Overhaul Manual Chapter 20-10-07).

(c) Install replacement bearing/bushing into support bracket unit.

6. Removal/Installation Slat Idler Track and Drive Track Number 14 Side Rub Blocks (Tracks 1, 3, 5, 6, 8, 10, 12, 14, 15)

A. Remove Slat Idler Track and Drive Track Side Rub Blocks

WARNING: WEDGE TRACK AGAINST SUPPORT RIB SUCH THAT THERE IS NO DEFLECTION OF TRACK UPON REMOVAL OF RUB BLOCK UNITS.

(1) Remove retainer plate attach nuts and remove each inboard side rub block unit one at a time as a unit from track supports. (Figure 407 (Sheet 1)) Tag and identify location of each unit.

NOTE: Side rub block units should be re-installed using original shims; however, at operator's discretion, proper shim thickness may be checked using following procedure:

(a) Measure the 2 inboard side rub blocks. Identify and note dimensions L1 and L2. (Figure 410 (Sheet 1))

(b) Refer to Figure 410 (Sheet 2), table 1 and select proper dimensions D1 and D2 for appropriate track location.

(c) Check shim thickness t1 and t2: t1 = D1 - L1 and t2 = D2 - L2. Adjust laminated shims to within 0.003 inch (0.08 mm) of t1 and t2, as required.

(2) Remove side rub block from retainer plate and install proper thickness shims in original position between side rub block and retainer plate. Bond shims to retainer plates using sealant PR-1422, or equivalent.

NOTE: Use equal thickness shims on each side of retainer plate.

NOTE: At idler tracks 12 and 15, it may be necessary to use more than one shim. If shims are stacked, bond them to each other prior to bonding to the retainer plate.

B. Install Slat Idler Track and Drive Track Side Rub Blocks

(1) Install side rub block on retainer plate and install unit on inboard support rib in position noted in Paragraph 6.A.(1).

(2) Remove outboard side rub blocks from retainer plates and install required shim thickness between side rub block and retainer plate to satisfy dimension A plus B = 0.010 inch (0.25 mm) minimum, to 0.060 inch (1.52 mm) maximum at forward and aft side rub blocks with units installed.

(Figure 410 (Sheet 1))

Adjustment may require removing and re-installing outboard units to obtain required clearance.

NOTE: It is recommended that shims be adjusted equally on inboard and outboard sides, if possible.

NOTE: At idler tracks 12 and 15, it may be necessary to use more than one shim. If shims are stacked, bond them to each other prior to bonding to the retainer plate.

(3) Bond shims to outboard retainer plates using sealant PR-1422, or equivalent, and install retaining screw with Loctite H.

(4) Install outboard rub block units on support ribs in positions noted in Paragraph 6.A.(1).

(5) Check track to side rub block total clearance per

Paragraph 6.B.(2). (Figure 410 (Sheet 1))

7. Removal/Installation Slat Drive Track Side Rollers (Tracks 2, 4, 7, 9, 11)

WARNING: WEDGE TRACK AGAINST SUPPORT RIB SUCH THAT THERE IS NO DEFLECTION OF TRACK UPON REMOVAL OF SIDE ROLLER BRACKET UNITS.

A. Remove Slat Drive Track Side Rollers

NOTE: If replacing roller bearings at drive tracks 4 and 9, remove slat proximity sensor actuating mechanism from roller brackets, located on inboard track support. (Figure 408)

NOTE: Drive track 13 side rollers are not adjustable and drive track 14 has side rub blocks and are adjusted same as idler tracks in Paragraph 6..

NOTE: If any single roller bearing requires replacement, all rollers from that track location are to be checked for condition and clearance.

(1) Remove inboard side roller bracket units one at a time from track supports. (Figure 407 (Sheet 5)) Tag and identify location of each unit.

(2) Replace any worn bearings, as required, as follows:

NOTE: Side rub block units should be installed using original shims; however, at operator's discretion, proper shim thickness may be checked using following procedure:

(a) Measure inboard side roller bracket units one at a time to identify and note dimensions K1 and K2 (for drive tracks 2, 7, and 11, refer to

Figure 410 (Sheet 3)

for drive tracks 4 and 9, refer to

Figure 410 (Sheet 4)

(b) Refer to Figure 410 (Sheet 2), table 1, and select proper dimension D1 and D2 for appropriate track location.

(c) Verify shim thickness t1 and t2, where t1 = k1 - d1, and t2 = k2 - d2. Adjust laminated shims as required to within 0.003 inch (0.08 mm) of dimensions t1 and t2.

(3) Bond proper thickness shims to inboard roller brackets in original position using sealant PR-1422, or equivalent.

B. Install Slat Drive Track Side Rollers

(1) Install inboard side roller brackets on inboard support rib in positions noted in Paragraph 7.A.(1). Tighten roller bracket attach nuts.

(2) To adjust clearances at tracks 2, 7, and 11, perform following:

(a) Install outboard roller bracket units with appropriate thickness shim to satisfy dimension A plus B = 0.005 inch (0.13 mm) minimum to 0.036 inch (0.91 mm) maximum at forward and aft side roller bracket units.

(Figure 410 (Sheet 3))

(b) Check dimensions A and B: Remove roller bracket units and correct shim thickness as required to satisfy tolerances specified in . Check that roller is parallel to support rib.

Paragraph 7.B.(2)(a)

Check that roller is parallel to support rib.

(Figure 410 (Sheet 3))

NOTE: It is recommended that shims be adjusted equally on inboard and outboard sides, if possible.

(3) To adjust clearances at tracks 4 or 9, proceed as follows:

(a) Install outboard roller bracket units with appropriate thickness shims to satisfy dimension A plus B = 0.005 inch (0.13 mm) minimum to 0.016 inch (0.41 mm) maximum at forward and aft side roller bracket units.

(Figure 410 (Sheet 4))

(b) Check dimensions A and B: Remove roller bracket units and correct shim thickness as required to satisfy tolerances specified in . Check that roller is parallel to support rib.

Paragraph 7.B.(3)(a)

Check that roller is parallel to support rib.

(Figure 410 (Sheet 4))

NOTE: It is recommended that shims be adjusted equally on inboard and outboard sides, if possible.

(4) Remove outboard side roller bracket units one at a time. Tag each unit to identify exact location and position. Bond shims to outboard roller brackets using sealant PR-1422, or equivalent.

(5) Install outboard side roller bracket units in their positions as noted in Paragraph 7.A.(1). Tighten roller bracket attach nuts.

(6) Adjust slat proximity sensor actuating mechanism, with tracks retracted, as follows:

(a) Wedge slat 4 and/or 9 track firmly against outboard side rollers.

(b) Install drive track plate, as applicable, on top of inboard roller units.

NOTE: 3953817-1 plate is installed at track 9, -501 is installed at track 4.

(c) Measure dimension E through hole in drive track plate. Dimension E must be 3.396 to 3.428 inches (86.26 to 87.07 mm) at drive track 4 and dimension E must be 3.038 to 3.070 inches (77.17 to 77.98 mm) at drive track 9.

(Figure 410 (Sheet 4))

NOTE: The above dimensions are critical to make certain of proper installation of the slat proximity sensor actuating mechanism.

(d) If necessary, add washers to top of roller brackets, as required, to meet E dimension. Washers should be installed equally on each end of drive track plate. Bond washers to each other and to top of roller brackets using sealant PR-1422, or equivalent.

WARNING: DO NOT LET OBJECTS GET IN THE HOUSING ASSEMBLY OF THE SLAT TRACK. THIS WILL HELP PREVENT A PUNCTURE OF THE HOUSING ASSEMBLY THAT COULD CAUSE A FUEL LEAK. THE FUEL LEAK COULD CAUSE A FIRE AND POSSIBLE DEATH OR INJURY TO PERSONNEL.

(7) Examine the housing to ensure objects are not left in the slat track housing assembly.

(8) Operate slat system through its full travel 3 to 4 times with hand hydraulic pump to ensure proper operation and recheck all track/roller clearances based on A + B tolerance, as specified in Paragraph 6.B.(2), Paragraph 7.B.(2) and Paragraph 7.B.(3).

CAUTION: VERIFY THAT MINIMUM OF 0.060 INCH (1.52 MM) CLEARANCE EXISTS BETWEEN SLAT TRACK AND ALL SURROUNDING STRUCTURE. IF 0.060 INCH (1.52 MM) MINIMUM CLEARANCE CANNOT BE MAINTAINED, SLAT TRACK MUST BE ADJUSTED WITH CABLE TENSION RELEASED. PARAGRAPH 4., PARAGRAPH 8., AND PARAGRAPH 9.

(9) Restore hydraulic power to aircraft and again operate slat system through its full travel to ensure proper operation.

8. Adjustment/Test Slat Tracks

A. Adjust Slat Tracks

(1) Make certain left and right hydraulic systems are depressurized.

(2) Adjust idler tracks and drive track 14 side rub blocks as follows:

CAUTION: TAG EACH SIDE RUB BLOCK/CAM FOLLOWER BEARING/ADAPTER PLUG ASSEMBLIES, DURING REMOVAL, WITH INFORMATION AS TO EXACT POSITION AND LOCATION. ASSEMBLIES MUST BE INSTALLED IN SAME POSITION AS REMOVED.

(a) Remove retainer plate attach nuts and remove retainer plate/side rub block/cam follower bearing/adapter plug assemblies, as a unit, (4 places) from track supports. (Figure 407 (Sheet 1)) Tag and identify location of each unit.

(b) Measure the 2 inboard side rub blocks, identify and record dimensions L1 and L2.

(Figure 410 (Sheet 1))

(c) Refer to Figure 410 (Sheet 2), table 1 and select proper dimension D1 and D2 for idler track being adjusted.

(d) Determine shim thickness, t1 and t2; t1 = D1 - L1, t2 = D2 - L2. Adjust laminated shim within 0.003 inch (0.076 mm) of t1 and t2.

(e) Remove side rub block from retainer plate and install proper shim between side rub block and retainer plate.

(f) Install side rub block on retainer plate and install retainer plate/side rub block/cam follower bearing/adapter plug assemblies on inboard support rib in position as noted during removal.

(g) Wedge idler track firmly against inboard side rub blocks.

(h) Remove outboard side rub blocks from retainer plates and install required shim thickness between side rub block and retainer plate to satisfy dimension A plus B = 0.010 inch (0.254 mm) minimum to 0.060 (1.524 mm) inch maximum at forward and aft side rub blocks with assemblies installed.

(Figure 410 (Sheet 1))

(i) Install retainer plate/side rub block/cam follower bearing/adapter plug assemblies on outboard support rib in position as noted during removal.

(j) Remove wedge and check dimension A plus B at forward and aft side rub blocks. Repeat Paragraph 8.A.(2)(a) through Paragraph 8.A.(2)(h) if out of tolerance.

(k) Manually move tracks through full range of travel and check that tracks are free from binding. Tracks should clear all leading edge front spar structure by 0.060 inch (1.524 mm). Should binding occur repeat Paragraph 8.A.(2)(a) through Paragraph 8.A.(2)(i).

(l) Remove retainer plate/side rub block/cam follower bearing/adapter plug assemblies from support ribs. Record and note position of assemblies.

CAUTION: DO NOT INTERCHANGE SHIMS.

(m) Remove side rub block from retainer plate and bond shims to retainer plate with Lefkoweld 109 adhesive. Install side rub block on retainer plate and install retaining screw with Loctite H.

NOTE: At idler tracks 12 and 15 it may be necessary to use more than one shim. If shims are stacked bond shims to each other prior to bonding to retainer plate.

(n) Install retainer plate/side rub block/cam follower bearing/adapter plug assemblies on support ribs, in position as recorded during removal in Paragraph 6.A.(1).

(o) Recheck track to side rub block clearance.

(Figure 410 (Sheet 1))

(3) Adjust drive track side rollers as follows:

NOTE: Drive track 13 side rollers are not adjustable. Drive track 14 has side rub blocks and are adjusted same as idler tracks in Paragraph 8.A.(2).

CAUTION: TAG EACH SIDE ROLLER BRACKET ASSEMBLY DURING REMOVAL WITH INFORMATION AS TO EXACT POSITION AND LOCATION. SIDE ROLLER BRACKET ASSEMBLIES MUST BE INSTALLED IN SAME POSITION AS REMOVED.

(a) Remove roller bracket assemblies (4 places) from track supports. Figure 407 (Sheet 5) Tag and identify location of each assembly.

NOTE: If adjusting drive tracks 4 or 9, remove slat proximity sensor actuating mechanism from roller brackets, located on inboard track support. (Figure 408)

(b) Measure the 2 inboard side roller bracket assemblies, identify and record dimensions K1 and K2 , for drive tracks 2 and 11; for drive tracks 4 and 9).

Figure 410 (Sheet 3)

for drive tracks 2 and 11;

Figure 410 (Sheet 4)

(c) Measure the 2 inboard side roller bracket assemblies, identify and record dimensions K1 and K2

Figure 410 (Sheet 3)

for drive tracks 2, 7, 11;

Figure 410 (Sheet 4)

for drive tracks 4 and 9).

(d) Refer to Figure 410 (Sheet 2), table 1 and select proper dimension D1 and D2 for drive track being adjusted.

(e) Determine shim thickness t1 and t2: t1 = K1 - D1, t2 = K2 - D2. Adjust laminated shims to within 0.003 inch (0.076 mm) of t1 and t2.

(f) Install inboard side rollers with proper shims on inboard support rib in position as recorded during removal in Paragraph 7.A.(1).

NOTE: Use equal thickness shims on each side of roller bracket.

(g) Wedge track firmly against inboard side rollers.

(h) If adjusting drive tracks 2, 7, or 11, perform following:

1) Install outboard roller bracket assemblies with appropriate thickness shim to satisfy dimension A plus B = 0.005 inch (0.127 mm) minimum to 0.036 inch (0.914 mm) maximum at forward and aft side roller bracket assemblies.

(Figure 410 (Sheet 3))

2) Remove wedge and check dimension A plus B at forward and aft side rollers. Repeat Paragraph 8.A.(3)(a) through Paragraph 8.A.(3)(h)2) if out of tolerance (A plus B = 0.005 inch (0.127 mm) minimum to 0.036 inch (0.914 mm) maximum).

(i) If adjusting drive tracks 4 or 9, perform following:

1) Install outboard roller bracket assemblies with appropriate thickness shims to satisfy dimension A plus B = 0.005 inch (0.127 mm) minimum to 0.016 inch (0.406 mm) maximum at forward and aft side roller bracket assemblies.

(Figure 410 (Sheet 4))

2) With slat track in retracted position, wedge track firmly against outboard side rollers.

3) Install drive track plate 3953817-1 or -501, as applicable, on top of inboard roller assemblies.

NOTE: 3953817-1 plate is installed at track 9, -501 is installed at track 4.

4) Measure dimension E through hole in drive track plate, dimension E must be 3.396 to 3.428 inches (86.259 to 87.073 mm) at drive track 4 and dimension E must be 3.038 to 3.070 inches (77.165 to 77.978 mm) at drive track 9.

(Figure 410 (Sheet 4))

NOTE: The above dimensional ranges are critical to assure proper installation of slat position indication switches.

5) If necessary add washers to top of roller brackets, as required to meet E dimension. Bond washers to each other and to top of roller brackets using Lefkoweld 109 adhesive.

6) After E dimension is satisfied, remove drive track plate from inboard side roller brackets.

7) Remove wedge and check dimensions A plus B at forward and aft side rollers. Repeat Paragraph 8.A.(3)(a) through Paragraph 8.A.(3)(g) and Paragraph 8.A.(3)(i) if out of tolerance (A plus B = 0.005 inch (0.127 mm) minimum to 0.016 inch (0.406 mm) maximum).

CAUTION: EXTREME CARE MUST BE TAKEN TO AVOID KINKING OR OTHERWISE DAMAGING, FREE OR UNRIGGED, SLAT DRIVE CABLES DURING MOVEMENT OF DRIVE TRACKS.

(j) If drive track extend and retract cables are tensioned, remove tension from cables by loosening applicable turnbuckles for track being adjusted (PAGEBLOCK 27-80-00/501) and manually move track through full travel and check that track moves freely without binding. Tracks should clear all leading edge and front spar structure by 0.060 inch (1.52 mm).

CAUTION: DO NOT INTERCHANGE SHIMS.

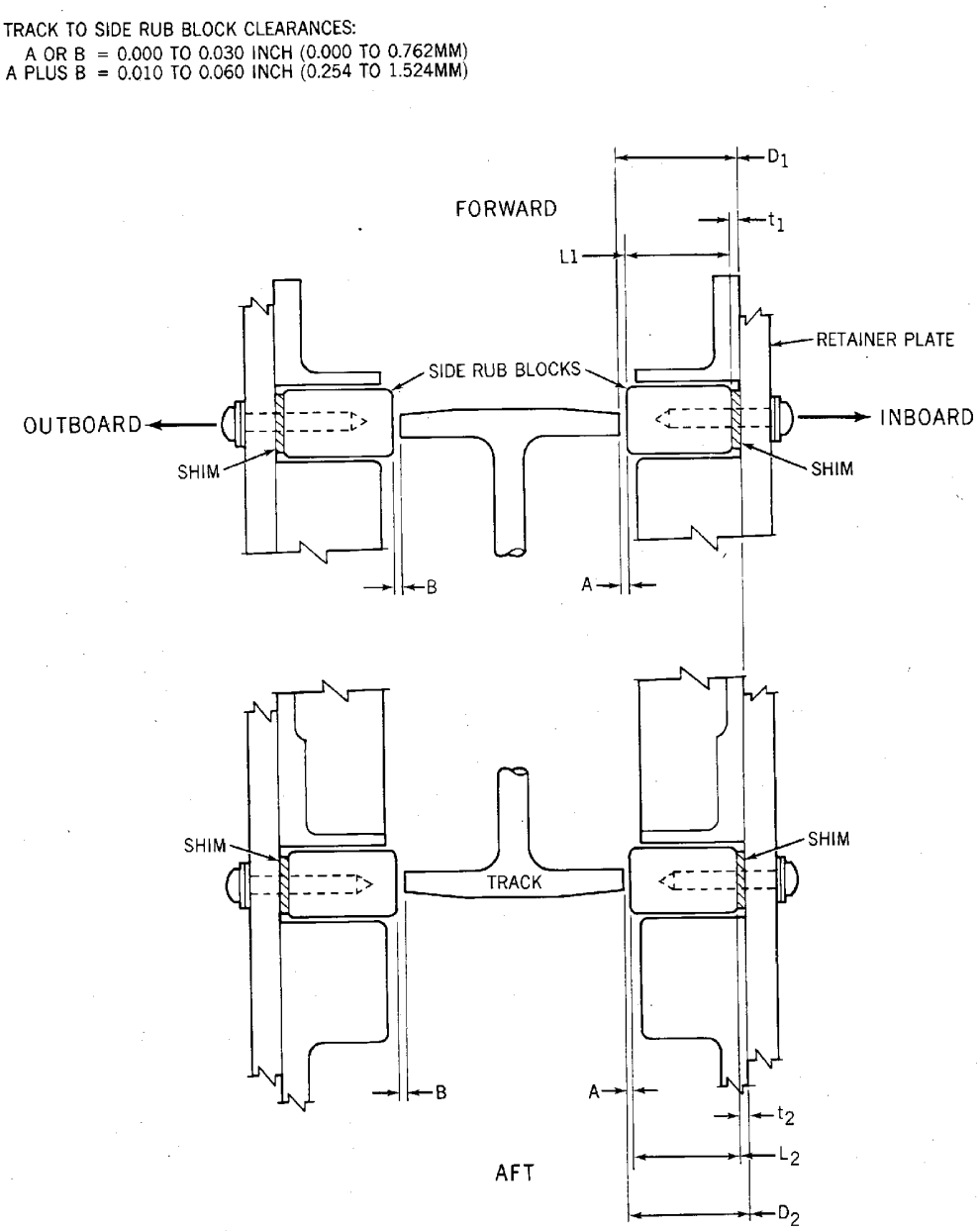
(k) Remove side roller brackets (4 places). Tag each side roller bracket as to exact location and position. Bond shims to side roller brackets with Lefkoweld 109.

(l) Install side roller bracket assemblies in position and location as tagged in Paragraph 8.A.(3)(k). Tighten roller bracket attach nuts.

(m) If drive track 4 or 9 was adjusted, install slat proximity sensor actuating mechanism on inboard roller supports. (Figure 408)

(4) If tension from slat extend and retract cables was removed, retension slat actuation cables. (PAGEBLOCK 27-80-00/501)

(5) If track 4 or 9 was adjusted, test slat advisory sensor (PAGEBLOCK 27-80-06/201). If necessary adjust slat proximity sensor actuating mechanism. (Paragraph 9.)



IDLER TRACK TO SIDE RUB BLOCK CLEARANCES

Slat Tracks - Adjustment/Test
Figure 410/27-80-01-990-811 (Sheet 1 of 4)

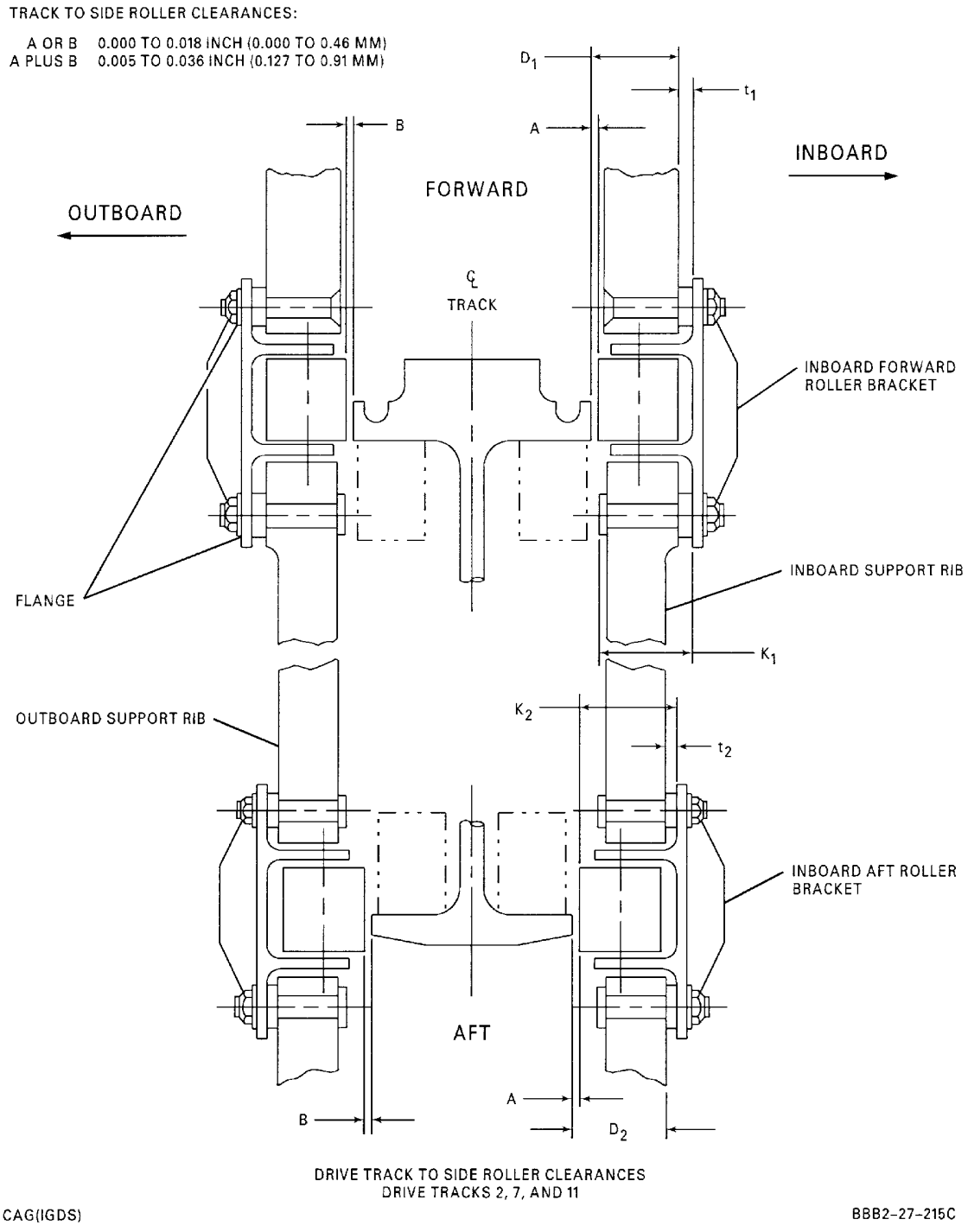
TABLE 1
DIMENSIONS D_1 AND D_2

TRACK	DRIVE IDLER	D1 FWD (INCHES)	D1 FWD (MILLIMETERS)	D2 AFT (INCHES)	D2 AFT (MILLIMETERS)
1	I	1.584	(40.23MM)	1.584	(40.23MM)
2	D	1.183	(30.05MM)	1.576	(40.03MM)
3	I	1.584	(40.23MM)	1.584	(40.23MM)
4	D	1.480	(37.59MM)	1.587	(40.31MM)
5	I	1.251	(31.78MM)	1.251	(31.78MM)
6	I	1.251	(31.78MM)	1.251	(31.78MM)
7	D	1.090	(27.69MM)	1.090	(27.69MM)
8	I	1.260	(32.00MM)	1.260	(32.00MM)
9	D	1.089	(27.66MM)	1.089	(27.66MM)
10	I	1.251	(31.78MM)	1.251	(31.78MM)
11	D	1.089	(27.66MM)	1.263	(32.08MM)
12	I	1.334	(33.88MM)	1.334	(33.88MM)
13	D	*	*	*	*
14	D	1.115	(28.32MM)	1.115	(28.32MM)
15	I	1.210	(30.74MM)	1.210	(30.74MM)

* NOTE: SIDE ROLLERS AT TRACK 13 ARE NOT ADJUSTABLE.

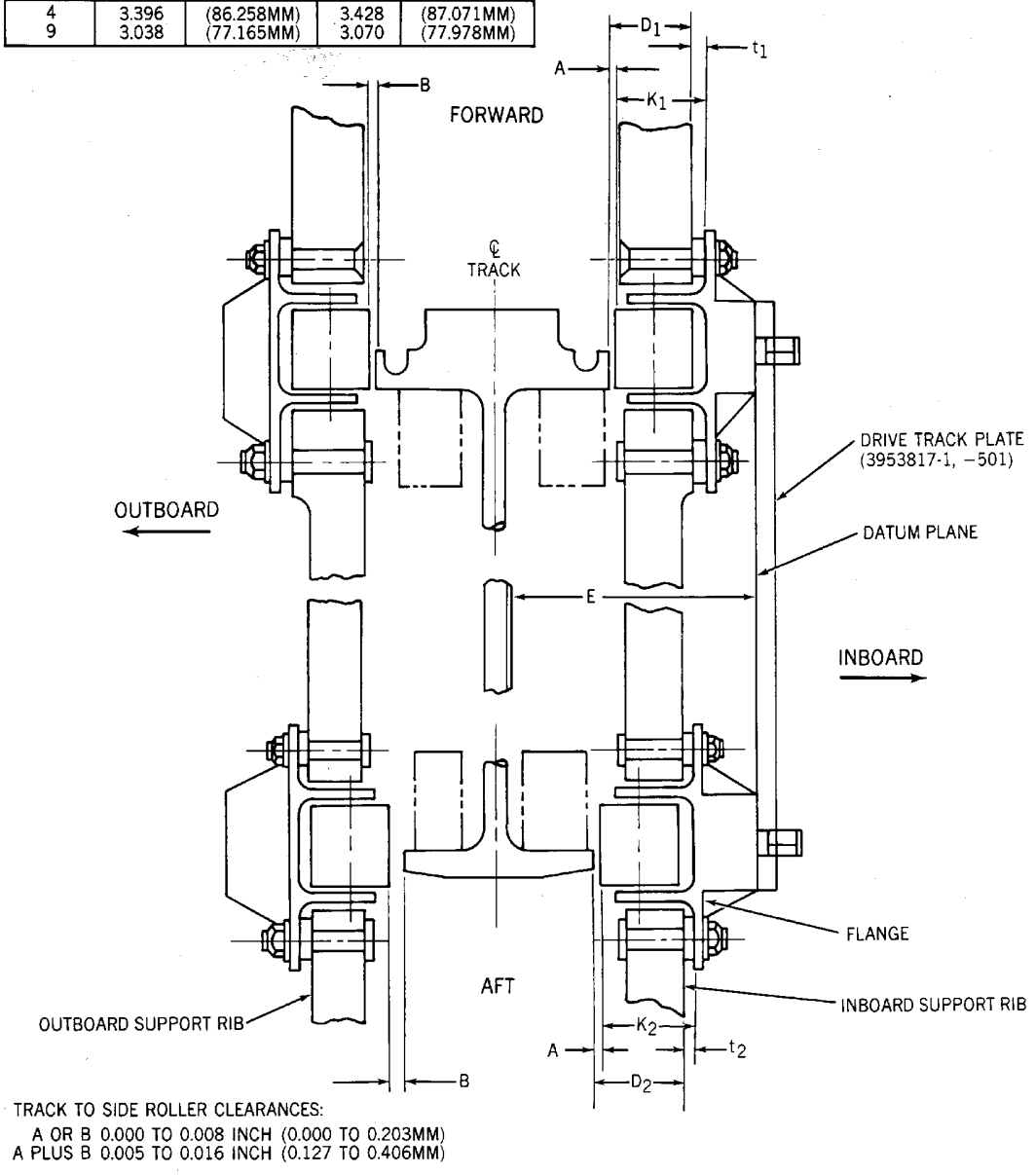
BBB2-27-214 C

Slat Tracks - Adjustment/Test
Figure 410/27-80-01-990-811 (Sheet 2 of 4)



Slat Tracks - Adjustment/Test
Figure 410/27-80-01-990-811 (Sheet 3 of 4)

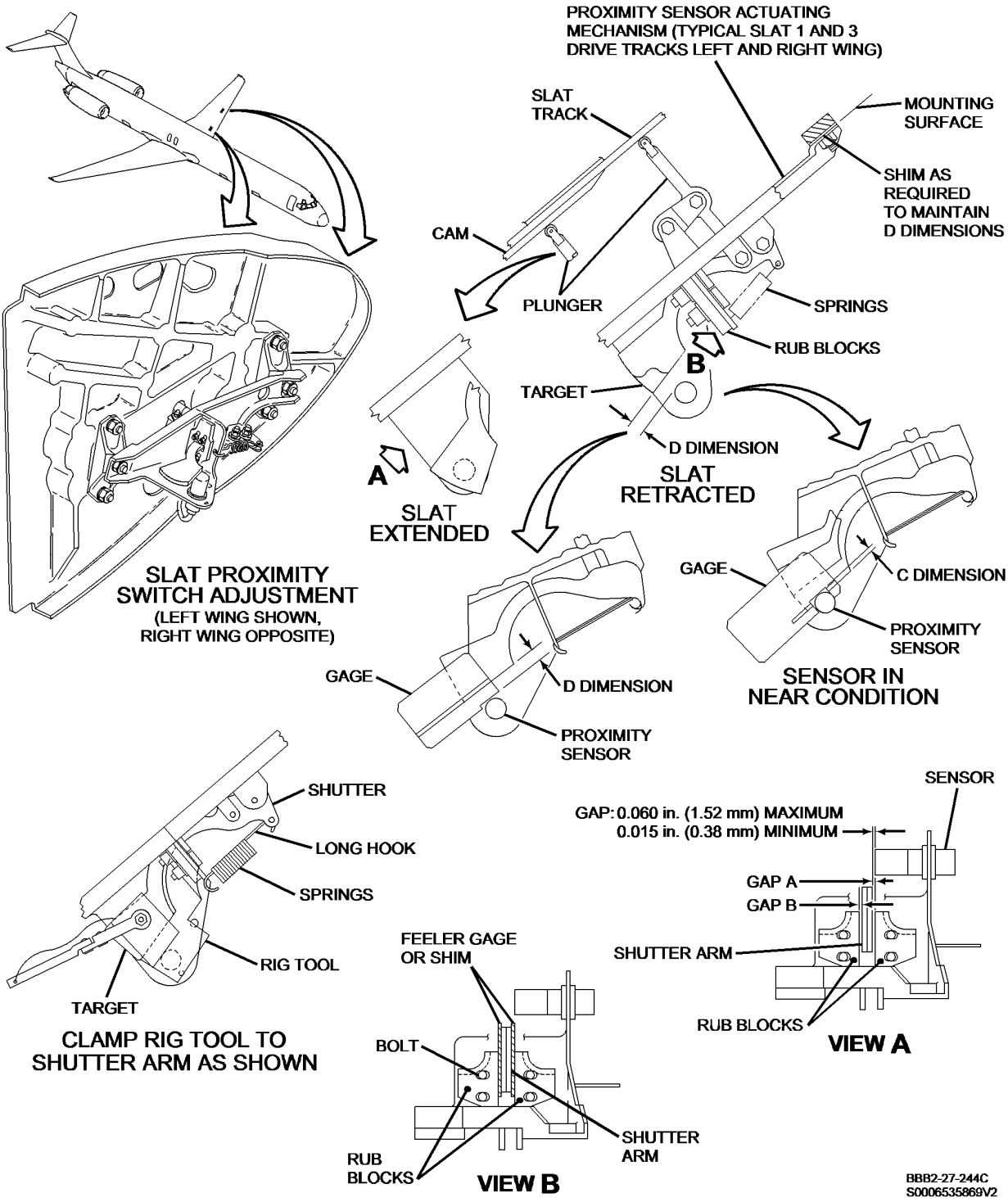
DIMENSION E INCH (MM)				
TRACK	E MIN (INCH)	E MIN (MILLIMETERS)	E MAX (INCH)	E MAX (MILLIMETERS)
4 9	3.396 3.038	(86.258MM) (77.165MM)	3.428 3.070	(87.071MM) (77.978MM)



DRIVE TRACK TO SIDE ROLLER CLEARANCES
DRIVE TRACKS 4 AND 9

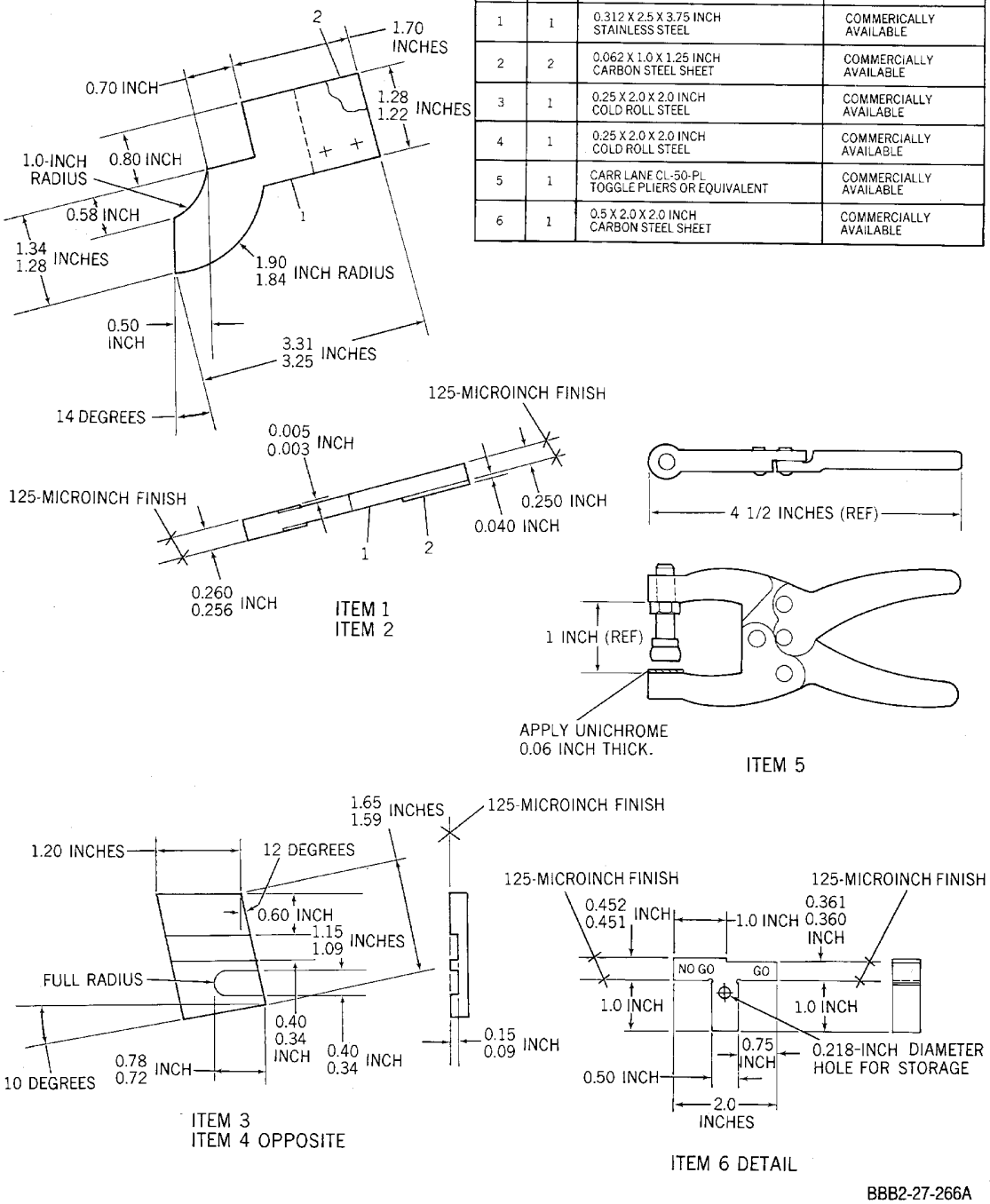
BBB2-27-216C

Slat Tracks - Adjustment/Test
Figure 410/27-80-01-990-811 (Sheet 4 of 4)



Slat Proximity Sensor Actuating Mechanism - Adjustment
Figure 411/27-80-01-990-812

ITEM	REQ'D	DESCRIPTION	SOURCE
1	1	0.312 X 2.5 X 3.75 INCH STAINLESS STEEL	COMMERCIALLY AVAILABLE
2	2	0.062 X 1.0 X 1.25 INCH CARBON STEEL SHEET	COMMERCIALLY AVAILABLE
3	1	0.25 X 2.0 X 2.0 INCH COLD ROLL STEEL	COMMERCIALLY AVAILABLE
4	1	0.25 X 2.0 X 2.0 INCH COLD ROLL STEEL	COMMERCIALLY AVAILABLE
5	1	CARR LANE CL-50-PL TOGGLE PLIERS OR EQUIVALENT	COMMERCIALLY AVAILABLE
6	1	0.5 X 2.0 X 2.0 INCH CARBON STEEL SHEET	COMMERCIALLY AVAILABLE



Slat Proximity Sensor Actuating Mechanism - Rig Tool
Figure 412/27-80-01-990-813

9. **Adjustment/Test Slat Proximity Sensor Actuating Mechanism**

A. Adjust Sensor Actuating Mechanism

NOTE: The following test is applicable to aircraft with Service Bulletin 27-245.

NOTE: Lift augmenting system (PAGEBLOCK 27-80-00/501), slat surfaces and slat tracks must be properly adjusted prior to adjusting sensor actuating mechanism.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Place flap/slat handle in UP/RET detent.

(3) Open access doors on wing leading edge lower surface as follows:

WJE 412, 414, 422, 424, 429, 875-879

(WING ZONES AND ACCESS DOORS - DESCRIPTION AND OPERATION, PAGEBLOCK 06-21-00/001 Config 1 or WING ZONES AND ACCESS DOORS - DESCRIPTION AND OPERATION, PAGEBLOCK 06-21-00/001 Config 2)

WJE 401-412, 414-421, 423, 425-427, 861-866, 868, 869, 871-874, 876, 878-881, 883, 884, 886, 887, 891-893

(WING ZONES AND ACCESS DOORS - DESCRIPTION AND OPERATION, PAGEBLOCK 06-21-00/001 Config 2)

WJE ALL

Table 402

(a)	1171C	Left Wing
(b)	1165C	Left Wing
(c)	1242C	Right Wing
(d)	1258C	Right Wing

(4) With hydraulic pressure on and slats in the full retract position, check that dimension D is 0.36 to 0.45 inch (9.14 to 11.43 mm). (Figure 411) If gap is out of tolerance, perform the following.

NOTE: GO/NO GO Gage 3958328-3 from fixture set 3958328-1 may be used to make certain that gap D is in tolerance (Figure 411).

(a) Remove actuating mechanism, and increase or decrease number of washers under actuating mechanism to obtain dimension D. Install actuating mechanism.

(b) If dimension D cannot be obtained through the use of washers, shim slat track side rollers. (Paragraph 8.A.(3)(i))

(5) Hydraulic system need not be pressurized for remainder of rig procedure.

(6) Insert 0.010 inch (0.25 mm) shim between shutter arm and upper rub block. (Figure 411, View B) With shim in place, manually actuate shutter arm through complete travel and make certain that no restriction or evidence of binding. If shutter arm moves freely without binding, proceed to Paragraph 9.A.(6)(a)2). If unable to insert shim or evidence of binding exists, perform the following:

(a) Lightly pull shutter arm toward sensor until arm contact lower rub block and verify gap between sensor and target is 0.015 inch (0.38 mm) minimum. If unable to obtain required gap, perform the following:

NOTE: When manually pushing or pulling shutter arm, force should be applied between pivot point and rub blocks to minimize erroneous sensor-to-target gap measurements.

1) Make certain that shutter arm does not contact slot edge of mechanism casting. Slot width may be increased by 0.38 inch (9.65 mm) maximum, if necessary. Alodine and FR prime reworked area.

NOTE: It is recommended that rig tool be used when adjusting slat proximity sensor mechanism, Paragraph 9.A.(6)(a)2) through Paragraph 9.A.(6)(a)10). If rig tool is not available, perform Paragraph 9.A.(6)(a)11) through Paragraph 9.A.(6)(a)21).

2) Loosen bolts attaching rub blocks. (Figure 411)

3) Clamp sensor mechanism rig tool onto shutter arm. (Figure 411)

4) Lightly pull shutter arm toward sensor until tool face contacts sensor.

5) With rig tool held lightly against sensor, position lower rub block flush with tool and shutter arm. Tighten nuts until block does not move, then tighten nuts additional 1/4 turn. Make certain that rub block does not move during tightening.

6) Insert 0.005 inch (0.13 mm) shim between upper rub block and shutter arm and rig tool. (Figure 411, View B)

7) Adjust upper rub block until shutter arm moves freely through entire arm travel with shim in place, and no restriction. Remove rig tool and shim.

8) Check that gaps A plus B is 0.005 to 0.015 inch (0.13 to 0.38 mm). (Figure 411)

9) Tighten upper rub block nuts until block does not move, then tighten nut additional 1/4 turn. Make certain that 0.005 inch (0.13 mm) minimum gap is maintained after tightening upper rub block bolts.

NOTE: Gap may close down slightly while tightening bolts.

10) Place 0.005 inch (0.127 mm) shim between upper rub block and shutter arm and verify shutter arm moves freely through entire arm travel with shim in place. Proceed to Paragraph 9.A.(7).

NOTE: It is recommended that rig tool be used when adjusting slat proximity sensor mechanism, Paragraph 9.A.(6)(a)2) through Paragraph 9.A.(6)(a)10). If rig tool is not available, perform Paragraph 9.A.(6)(a)11) through Paragraph 9.A.(6)(a)21).

11) Loosen bolts attaching rub blocks. (Figure 411)

12) Manually move target over sensor and insert 0.025 inch (0.64 mm) shim between sensor and target.

13) With target held lightly against shim and sensor, position lower rub block against and parallel to shutter arm.

14) Tighten lower rub block nuts until rub block does not move, then tighten nut additional 1/4 turn. Make certain that requirements in Paragraph 9.A.(6)(a)12) and Paragraph 9.A.(6)(a)13) are maintained while tightening bolts. Remove shim.

15) Using slight downward force to hold shutter arm against lower rub block, manually move arm through complete travel and make certain that target does not contact sensor.

NOTE: When manually pushing or pulling shutter arm, force should be applied between pivot point and rub blocks to minimize erroneous sensor-to-target gap measurements.

16) Manually move target over sensor and make certain that gap between sensor and target is 0.015 to 0.040 inch (0.38 to 1.02 mm).

17) Insert 0.010 inch (0.254 mm) shim between shutter arm and upper rub block.

18) Adjust upper rub block until shutter arm moves freely through full arm travel with no restriction with shim in place. Remove shim.

19) Tighten upper rub block nuts until block does not move, then tighten nut additional 1/4 turn. Make certain that 0.005 inch (0.13 mm) minimum gap is maintained after tightening bolts.

NOTE: Gap may close down slightly while tightening bolts.

20) Check that gaps A plus B is 0.005 to 0.015 inch (0.13 to 0.38 mm). (Figure 411, View A)

21) Place 0.005 inch (0.13 mm) shim between upper rub block and shutter arm and verify shutter arm moves freely through entire arm travel with shim in place.

NOTE: When manually pushing or pulling shutter arm, force should be applied between pivot point and rub blocks to minimize erroneous sensor-to-target gap measurements.

(7) Manually move target toward sensor and verify that each sensor actuates when dimension C is 0.15 to 0.20 inches (3.81 to 5.08 mm). (Figure 411)

NOTE: Sensor actuation can be determined by observing slat disagree light on cockpit center instrument panel.

NOTE: Gage 3958328-5 from fixture set 3958328-1 may be used to make certain that dimension C does not exceed the maximum limit. (Figure 411)

(8) Test slat advisory sensors. (PAGEBLOCK 27-80-06/201)

(9) Install access doors removed in Paragraph 9.A.(3).

LIFT AUGMENTING SLATS CONTROL VALVE - MAINTENANCE PRACTICES

1. General

A. The slat control valve is located on the center wing front spar, outboard of the flap/slat sequence mechanism. Access to the valve is through the aft bulkhead panel of the mid-cargo compartment.

2. Removal/Installation Slat Control Valve

A. Remove Slat Control Valve

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: SLAT DRIVE DRUM AND SLAT PANELS MAY MOVE SLIGHTLY WHEN SLAT CONTROL VALVE LEVER IS CYCLED IN THE NEXT STEP. MAKE CERTAIN THAT AREAS AROUND THE SLAT DRIVE MECHANISM, AND SLAT PANELS, ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(4) Disconnect pushrod from control valve lever and cycle lever several times to relieve pressure in slat drive drum control cylinders.

(5) Disconnect and plug hydraulic lines from slat control valve. Cap valve fittings.

(6) Remove bolt and bushing at control valve upper attach point.

(7) Remove bolt and spacer at control valve lower attach point.

(8) Remove control valve from mounting bracket.

(9) Remove hydraulic fittings, restrictors and check valves from control valve. Discard O-rings. Plug open ports.

NOTE: Make note of location and direction of flow arrows when removing restrictors and check valves.

B. Install Slat Control Valve

(1) Make certain left and right hydraulic systems are depressurized.

(2) Using new O-rings install restrictors, check valves and fittings in control valve as noted during removal.

(3) Position control valve in mounting bracket.

(4) Install spacer and bolt at lower attach point of control valve. Tighten bolt.

(5) Install clamp up bushing and bolt at upper attach point of control valve. Tighten bolt.

(6) Connect pushrod to control valve lever. Safety nut with cotter pin.

(7) Connect hydraulic lines to control valve.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(8) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(9) Using flap/slat handle, retract and extend slats several times. Check slats for smooth operation. Retract slats.

(10) Visually check slat control valve fittings and line connections for leakage.

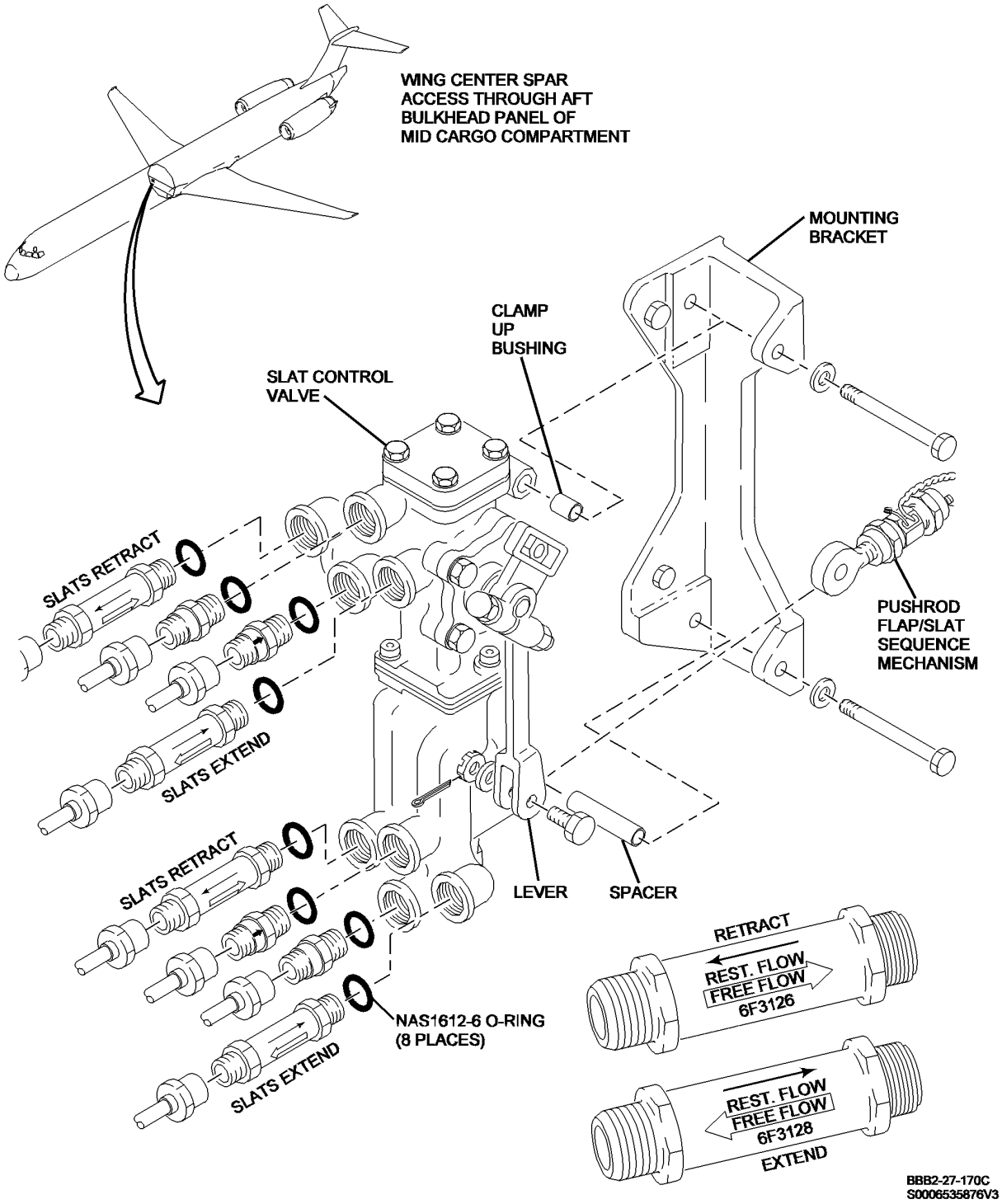
WARNING: WHEN THE AIRPLANE IS ON THE GROUND WITH WEIGHT ON WHEELS, THE BITE TEST OF THE AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME THE FLAP/SLAT HANDLE IS MOVED FROM THE RET POSITION TO THE 0°/T.O. EXT OR 11°/T.O. EXT POSITION. THE SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND THEN RETURN TO MID POSITION.

(11) Place flap/slat handle in 11°/T.O. EXT detent.

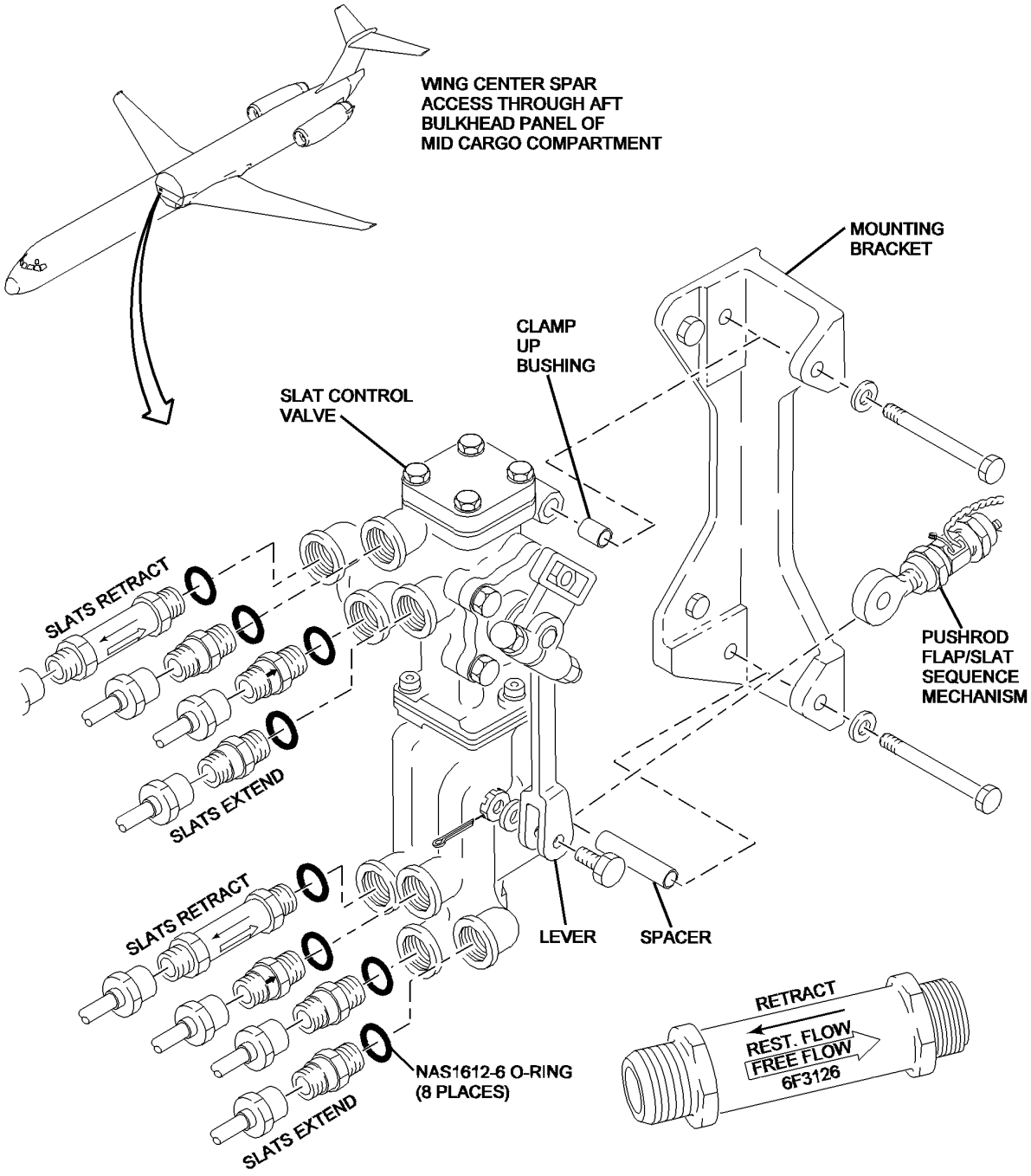
(12) Check that slat throws is within tolerance. (Figure 27-80-00-990-813, SHEET 6) If necessary, adjust control valve pushrod. (PAGEBLOCK 27-80-00/501)

(13) Place flap/slat handle in RET detent.

(14) Shut off hydraulic pressure source.



Slat Control Valve -- Removal/Installation
Figure 201/27-80-03-990-801 (Sheet 1 of 2)



Slat Control Valve -- Removal/Installation
Figure 201/27-80-03-990-801 (Sheet 2 of 2)

SLAT DRIVE MECHANISM - REMOVAL/INSTALLATION

1. General

A. The slat drive mechanism consists of a support assembly, a bellcrank assembly, two hydraulic cylinders and a cable drum.

B. The slat drive mechanism controls the slat positions of both the right and left wings.

C. The slat drive mechanism is removed from cable drum so as not to disturb drive cable adjustments.

D. Location of slat drive mechanism is on front spar in the center wing section under main cabin floor. Access to mechanism is through mid cargo door.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 401

Name and Number	Manufacturer
Roller track tool 5952435-1	Douglas Aircraft Co.
Lockwire, NASM20995N40, DPM684*[1]	Not specified
Lockwire, NASM20995N51, DPM684*[1]	Not specified
2" x 4" Lumber, (Approx. 6 foot long) (3 pieces) (50.8 x 101.6 x 1828.8 mm)	
Sealant, PR-1422 B-2 DMS 2082	Courtaulds Aerospace Inc. Glendale, CA

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Slat Drive Mechanism

A. Remove Slat Drive Mechanism

(1) Remove and retain access panels 5107C and 5138C, and attaching hardware, and remove vertical stiffener located on center line of aircraft just forward of slat drive mechanism.

WARNING: BEFORE PRESSURIZING SYSTEMS, MAKE CERTAIN THAT LANDING GEAR LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left and right hand hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING SLAT/FLAP HANDLE, MAKE CERTAIN THAT AREAS AROUND SLATS AND FLAPS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Fully extend slats by placing slat/flap handle in 40/LAND detent. (Tag handle).

CAUTION: LEFT AND RIGHT HAND HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(4) Depressurize left and right hand hydraulic systems. (PAGEBLOCK 29-00-00/201)

CAUTION: BOLTS WILL BE PRELOADED DUE TO SLAT CABLE LOADS.

(5) Disconnect hydraulic lines and remove actuating cylinders from drive mechanism. Plug open hydraulic lines and cap open cylinder fittings. (Figure 401) Cylinders to be retained in aircraft for reinstallation.

(6) Remove clamps attaching hydraulic lines to drive mechanism.

(7) Place boards (3 pieces approx. 2" x 4" x 6 foot long) (50.8 x 101.6 x 1828.8 mm) under drive mechanism, extending from cargo floor, above structural frame under drive mechanism, and aft to front spar. Support aft end of 2" x 4" (50.8 x 101.6 mm) boards with 1" x 4" (25.4 x 101.6 mm) square blocks.

(8) Disconnect struts and barrel assemblies, A,B,C,D,E and G, from slat drive mechanism only. Do not change adjustment of struts and barrel assemblies. (Figure 401)

CAUTION: WEIGHT OF MECHANISM IS APPROX. (250) LBS. (112) KILOGRAMS. EXTREME CARE SHOULD BE TAKEN WHEN REMOVING OR INSTALLING TO AVOID INJURY TO PERSONNEL AND DAMAGE TO CARGO COMPARTMENT FLOOR AND OTHER SURROUNDING STRUCTURE.

(9) Supporting each end of drive mechanism, remove bolts, (8 places) attaching lower drive mechanism to cable drum. (Figure 401)

NOTE: Bolts to be removed in a diametrical opposing pattern.

CAUTION: DO NOT ALLOW ADAPTER AND DRUM TO CONTACT WHILE LOWERING DRIVE MECHANISM. DAMAGE COULD RESULT TO EITHER ASSEMBLY.

(10) Lower drive mechanism to rest on boards. While lowering, rotate bottom of mechanism forward maintaining clearance between upper end of adapter and drum. Lower drive mechanism until adapter clears drum.

(11) Place plywood over center floor from work area to mid cargo door.

(12) Move drive mechanism forward to mid cargo door and remove from airplane.

B. Install Slat Drive Mechanism

CAUTION: USE CARE NOT TO DAMAGE CARGO COMPARTMENT FLOOR WHEN MOVING SLAT DRIVE MECHANISM FROM CARGO DOOR TO FRONT SPAR AREA.

(1) Place plywood over center floor from mid cargo door aft to work area.

(2) Place lower half slat drive mechanism in cargo compartment. Move aft to front spar area and rest on boards.

(3) Adjust table on roller track tool (5952435-1) to lowest position.

CAUTION: DO NOT ALLOW ADAPTER AND DRUM TO CONTACT WHILE RAISING SLAT DRIVE MECHANISM.

(4) With drive mechanism positioned forward of drum, rotate top of mechanism aft and guide adapter into drum. Support and raise drive mechanism high enough to gain clearance for roller track tool.

(5) Remove boards from under drive mechanism and index roller track tool (5952435-1) to front spar and fasten to cargo compartment floor.

(6) Lower drive mechanism onto table and attach to the table.

(7) Slowly raise table and slat drive mechanism. Utilizing table adjusting screws, guide indexing hole in adapter onto indexing pin of drum. After indexing has been accomplished, adjust table as required to maintain a gap of 0.002 to 0.015 inches (0.050 to 0.381 mm) between adapter and drum, from centering ring to outside diameter completely around periphery of adjoining parts.

(8) Adjust pads on roller track tool to raise lower half as required to obtain a gap of 0.005 to 0.010 inch (0.127 to 0.254 mm) all around periphery of adapter.

WARNING: INTEGRAL FUEL TANKS SEALING COMPOUND (POLYSULFIDE SEALANT B1/2 AND B2) IS AN AGENT THAT IS POISONOUS AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN INTEGRAL FUEL TANKS SEALING COMPOUND IS USED.

- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET INTEGRAL FUEL TANKS SEALING COMPOUND IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA.
- APPROVED SAFETY EQUIPMENT.
- EMERGENCY MEDICAL AID.
- TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(9) Install bolts, washers and new nuts (8 places) in diametrical opposing pattern joining upper and lower halves. Install fasteners wet with PR-1422 B-2 sealant.

(a) For aircraft without DAC Service Bulletin 27–279 R5, measure dimension (X) and install washers between nut and adapter as required per Figure 401, View A. Tighten attaching nuts to torque of 400-450 inch pounds (45.2-50.9 N·m).

(b) For aircraft with DAC Service Bulletin 27–279 R5 or fuselage 2030 and subsequent, install washers between nut and adapter as required to prevent the nut from bottoming out on the shoulder of the bolt. Tighten attaching nuts to torque of 1040-1140 inch pounds (117.5-128.8 N·m). Figure 402, View A

NOTE: Pre and Post DAC Service Bulletin 27–279 R5 configurations can be identified by the nut configuration used in the installation. Pre 27–279 R5 installation uses a nut with part number MS21245L8, which is a hex nut (6 point nut) having a total height of 0.328 inch. Post 27–279 R5 installation uses a nut with part number EWSN22M8, which is a double hex nut (12 point nut) having a total height of 0.394 inch. Figure 402 for nut configuration differences.

NOTE: Quantity and thickness of washers may vary at each location.

NOTE: Make certain sufficient clearance between the bolts and top of bracket assembly exists.

(10) Connect strut and barrel assemblies, A,B,C,D,E and G, to slat drive mechanism. (Figure 401).

(11) Lower adjustment pads and remove roller track tool.

(12) Measure horizontal distances at outboard ends of straight part of rails to front wing spar. Readjust struts, if necessary, so that measurements are within 0.06 inch (1.524 mm) of each other, (4 places). Safety the strut jam nuts with .040 lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Paragraph 3.B.(12) andParagraph 3.B.(13) only apply when struts A, B, C, D, E, or G have been replaced or adjusted, or, if slat drive mechanism being installed is different than unit removed.

(13) Measure vertical distances from upper rail at outboard ends to floor beam. Readjust struts on left side, if necessary, so that measurements are within 0.06 inch (1.524 mm) of each other, (2 places). Safety the strut jam nuts with .040 lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Paragraph 3.B.(12) and Paragraph 3.B.(13) only apply when struts A, B, C, D, E, or G have been replaced or adjusted, or, if slat drive mechanism being installed is different than unit removed.

(14) Position slat drive cylinder in slat drive mechanism and install attach bolts, making certain that head of bolts are properly seated at anti-rotation lugs. Torque nuts from 20 ft-lb (27 N·m) to 45 ft-lb (61 N·m) and safety nuts with cotter pin. Safety the head of bolts with .051 lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(15) Connect hydraulic lines to actuating cylinder fittings and install clamps.

WARNING: BEFORE PRESSURIZING SYSTEMS, MAKE CERTAIN THAT LANDING GEAR LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(16) Pressurize left and right hydraulic systems and bleed all air from lines. (PAGEBLOCK 29-00-00/201)

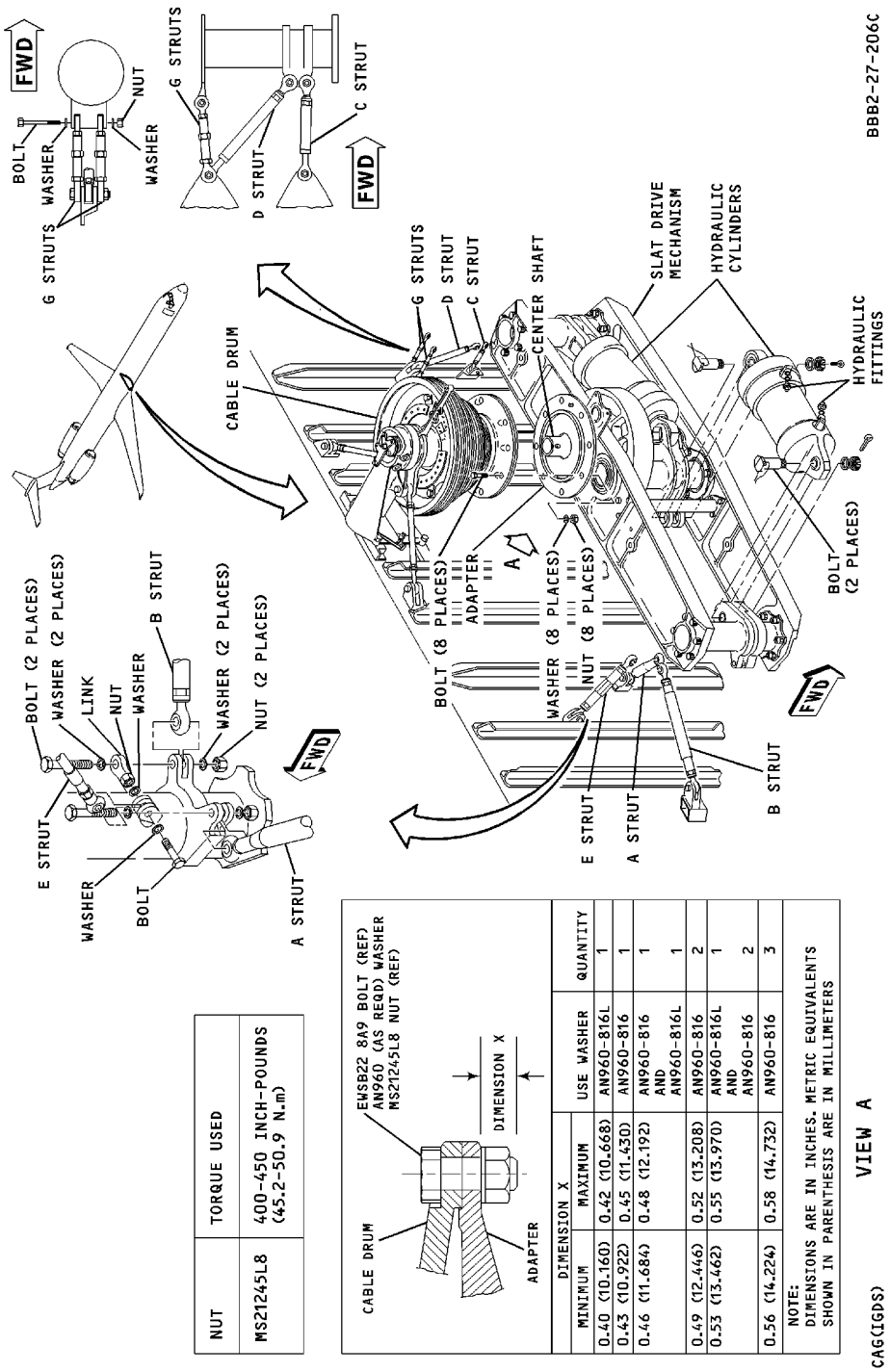
WARNING: BEFORE MOVING SLAT/FLAP HANDLE, MAKE CERTAIN THAT AREAS AROUND SLATS AND FLAPS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(17) Remove tag from handle and operate slats, from retract to full extend several times to be certain of proper operation.

NOTE: Check hydraulic lines at actuating cylinders for leaks and observe operation of slat drive cable drum to verify clearance between cables and bolt heads and clearance between bolt shank and upper rail of mechanism.

(18) Shut off hydraulic power to aircraft.

(19) Replace vertical stiffener and access panels, 5107C and 5138C.



DIMENSION X		USE WASHER	QUANTITY
MINIMUM	MAXIMUM		
0.40 (10.160)	0.42 (10.668)	AN960-816L	1
0.43 (10.922)	0.45 (11.430)	AN960-816	1
0.46 (11.684)	0.48 (12.192)	AN960-816 AND AN960-816L	1
0.49 (12.446)	0.52 (13.208)	AN960-816	2
0.53 (13.462)	0.55 (13.970)	AN960-816L AND AN960-816	1
0.56 (14.224)	0.58 (14.732)	AN960-816	3

Slat Drive Mechanism - Removal/Installation (Before Service Bulletin 27-279 Rev 5)
Figure 401/27-80-04-990-801

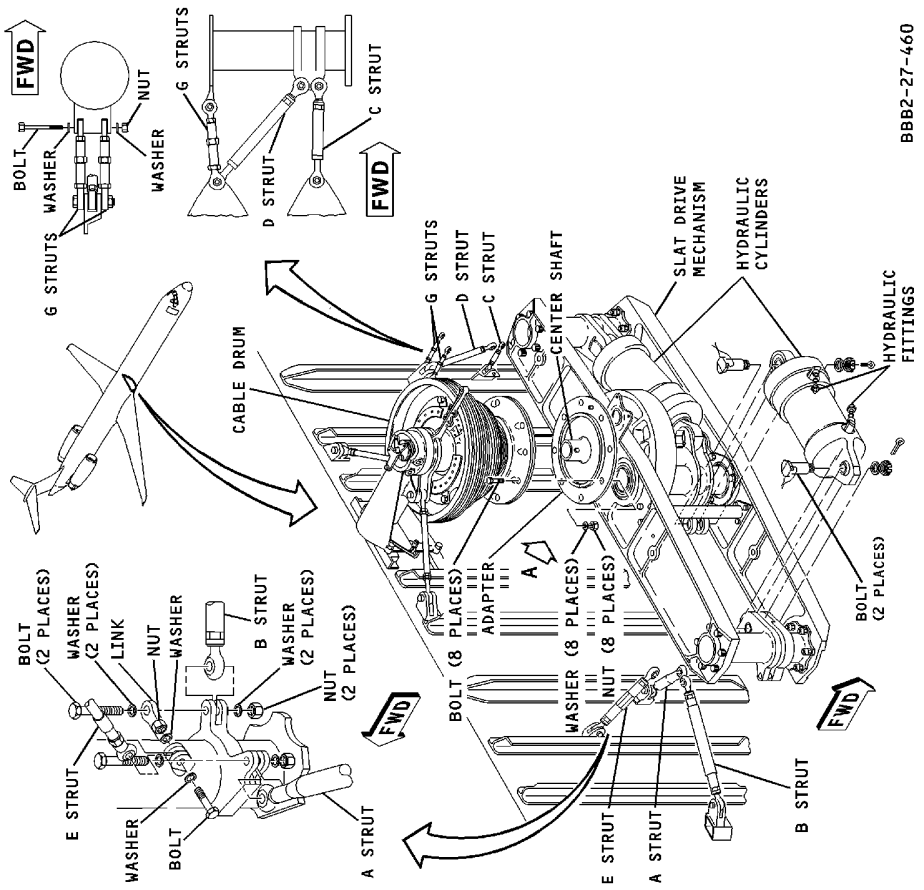
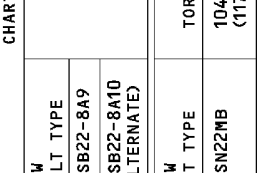


CHART B

NEW BOLT TYPE
EWSB22-8A9
EWSB22-8A10 (ALTERNATE)

NEW NUT TYPE	TORQUE USED
EWSN22MB	1040 TO 1140 INCH-POUNDS (117.5-128.8 N.m)

NOTE: ADJUST AMOUNT AND THICKNESS OF WASHERS ON EACH BOLT TO KEEP NUT FROM BOTTOMING OUT ON SHOULDER OF BOLT AS REQUIRED.



DIMENSION X		USE WASHER	QUANTITY
MINIMUM	MAXIMUM		
0.40 (10.160)	0.42 (10.668)	AN960-816L	1
0.43 (10.922)	0.45 (11.430)	AN960-816	1
0.46 (11.684)	0.48 (12.192)	AN960-816 AND AN960-816L	1
0.49 (12.446)	0.52 (13.208)	AN960-816	2
0.53 (13.462)	0.55 (13.970)	AN960-816L AND AN960-816	1 2
0.56 (14.224)	0.58 (14.732)	AN960-816	3

NOTE:
DIMENSIONS ARE IN INCHES. METRIC EQUIVALENTS SHOWN IN PARENTHESIS ARE IN MILLIMETERS

VIEW A

CAG(IGDS)

Slat Drive Mechanism - Removal/Installation (With Service Bulletin 27-279 Rev 5)
Figure 402/27-80-04-990-803

SLAT DRIVE CYLINDER - MAINTENANCE PRACTICES

1. General

A. Two slat drive cylinders are mounted on the slat drive mechanism, located on the center wing front spar. Access to the cylinders is through the mid cargo compartment aft panel.

B. Removal and installation procedures are identical for each hydraulic slat drive cylinder.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following items.

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

Name and Number	Manufacturer
Grease (MIL-G-81322) (DPM 5348)	Mobile Grease 28 Aeroshell Grease 22
Lockwire, NASM20995N51, DPM 684*[1]	Not specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Slat Drive Cylinder

A. Remove Slat Drive Cylinder

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

(4) Disconnect and plug hydraulic lines from slat drive cylinder. Cap fittings.

(5) Remove cylinder attach bolts and remove cylinder from slat drive mechanism.

(6) Remove fittings from cylinder ports. Discard O-rings. Plug open cylinder ports.

B. Install Slat Drive Cylinder

(1) Make certain left and right hydraulic systems are depressurized.

(2) Using new O-rings install fittings in slat drive cylinder.

(3) Position slat drive cylinder in slat drive mechanism and install attach bolts, making certain that head of bolts are properly seated at anti-rotation lugs. Torque bolts to 20-45 foot-pounds and safety nuts with cotter pin. Safety the head of bolts with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(4) Connect hydraulic lines to slat drive cylinder fittings.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(5) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: USE APPROPRIATE SAFETY PRECAUTIONS TO AVOID GETTING HYDRAULIC FLUID IN EYE. (PAGEBLOCK 27-00-00/201)

(6) Bleed air from slat drive cylinder if required.

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

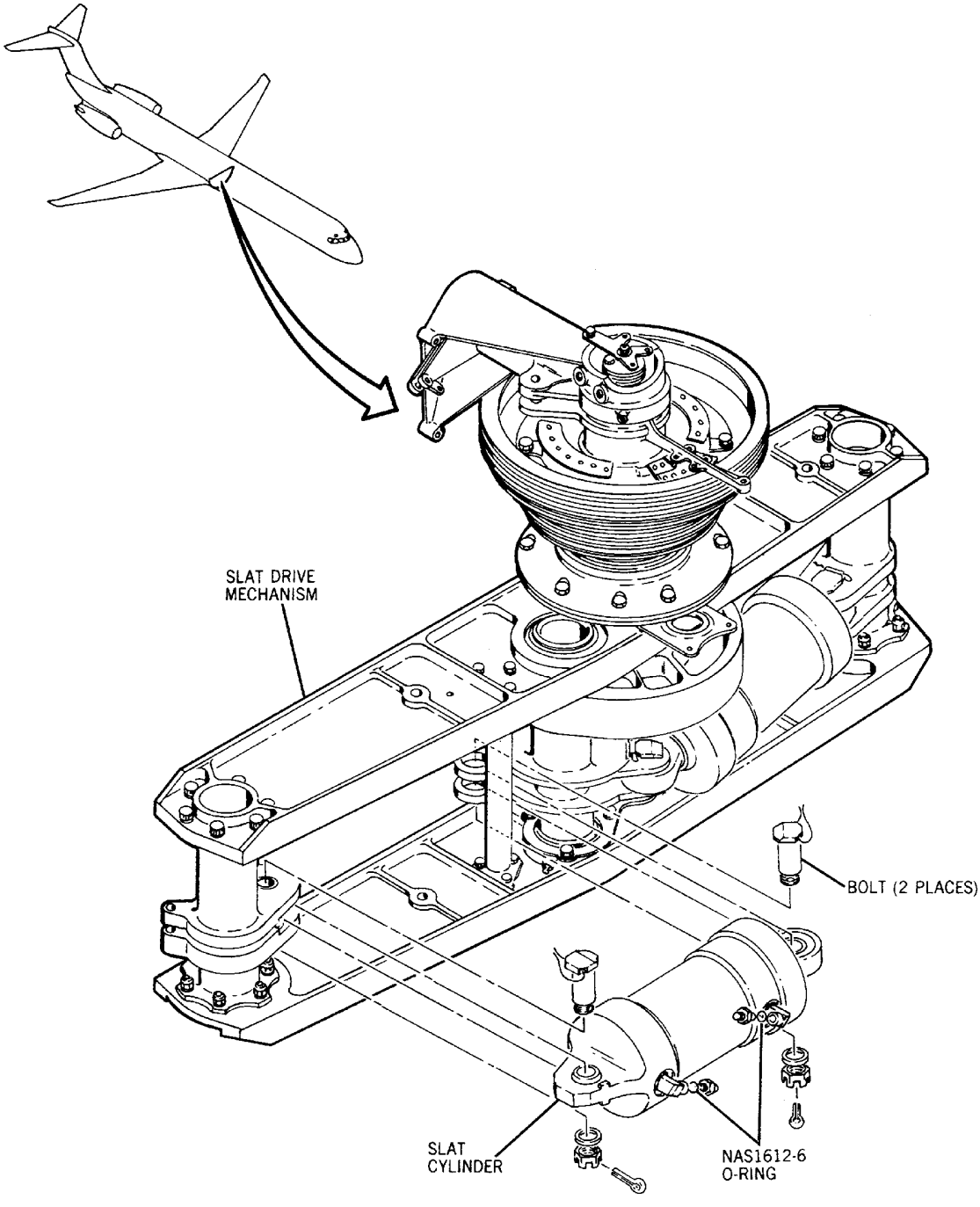
(7) Using flap/slat handle extend and retract slats several times. Check slats for smooth operation.

(8) Check that minimum of .015 inches clearance exists between outside periphery of cylinder barrell attach lug and cylinder attachment post throughout complete cycle of slat operation.

(9) Visually check slat drive cylinder fittings and line connections for leakage.

(10) Place flap/slat handle in retract position.

(11) Shut off hydraulic pressure source.



Slat Drive Cylinder -- Removal/Installation
Figure 201/27-80-05-990-801

SENSORS SLAT ADVISORY - MAINTENANCE PRACTICES

1. General

A. There are nine slat position sensors in the slat advisory system. Five of the sensors are located on the slat drive mechanism support at the slat drive drum and four sensors are located in the left and right wing leading edge.

B. The five sensors mounted on brackets of the slat drive mechanism support at the slat drive drum are activated by targets attached to the slat drive drum. The wing leading edge sensors are mounted on a slat sensor actuating mechanism attached to the slat track roller support inboard of slat 1 and 3 drive tracks on left and right wing. The sensors are activated by a target on the sensor actuating mechanism. All nine sensors are connected electrically to the proximity switch electronics unit. Eight sensors, designated A, B, C and D, are connected, electrically, from the proximity switch electronic unit to the slat position advisory lights. On some airplanes one sensor, located on the slat drive support (no letter designation) is connected electrically from the proximity switch electronic unit to the fasten seat belts sign.

C. Access to the sensors on the slat drive support is through the mid cargo compartment aft bulkhead panel. Access to the wing leading edge sensors is through panels on the wing lower surface at slats 1 and 3.

D. Removal/installation procedures are identical for each sensor except for noted items.

E. A BITE check of the proximity sensor system can be performed at any time to determine if the PSEU and proximity sensors are functioning properly. (PAGEBLOCK 32-60-00/101)

2. Removal/Installation Slat Advisory Sensor

A. Remove Sensor

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Place flap/slat handle in 40/LAND detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open these circuit breakers and install safety tags:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

(5) Remove the applicable sensor from mount. (Figure 201) (Figure 202) (Figure 203) (Figure 204)

(6) Disconnect sensor wires at splice and remove sensor.

B. Install Sensors

(1) Make certain left and right hydraulic systems are depressurized.

(2) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

(3) Connect sensor wires at splice. (Ref. Wiring Diagram Manual 20-10-03, Page 201).

(4) If replacing sensors at slat drive drum, make certain that dimension between proximity sensor target and sensor is 0.050 to 0.150 inches (1.27 to 3.81 mm). Add or remove shims between mounting bracket and support bracket as required to maintain this dimension. (Figure 202)

(5) Install sensor on mount.

(6) If replacing sensor at either slat 1 or slat 3, left and/or right wing, check clearances between target and sensor as follows:

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(a) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(b) Place flap/slat handle in UP/RET detent.

(c) On aircraft without Service Bulletins 27-245 or 27-319, with sensor track roller off cam (full retract), check that gap between sensor face and target is not less than 0.312 inch (7.93 mm). Check that gap between sensor back face and bracket (full retract) is 0.60 inch (15.24 mm). (Figure 203) Move flap/slat handle from UP/RET detent to 0°/T.O. EXT. With slats fully extended, and plunger roller on slat track cam, check that clearance between target and face of sensor does not exceed 0.075 inch (1.905 mm). (Figure 203)

(d) On aircraft with Service Bulletin 27-245 but without Service Bulletin 27-319, check that target, on sensor actuating mechanism, is 0.360-0.450 inch (9.14-11.43 mm) from face of proximity sensor. (Figure 204) Manually move target toward sensor and check that sensor activates a signal when target overlaps sensor by 0.15-0.20 inch (3.81-5.08 mm). (Figure 204)

(e) On aircraft with Service Bulletin 27-319 or fuselage 2110 and subsequent, add or remove shim washers (5) as necessary to obtain the 0.20-0.40 inch (5.08-10.16 mm) dimension. The proper dimension is between slat advisory sensor (1) and target (6). (Figure 204 (Sheet 2))

(f) If clearances between target and sensor are not within tolerances of Paragraph 2.B.(6)(c) through Paragraph 2.B.(6)(e), adjust sensor actuating mechanism. (PAGEBLOCK 27-80-01/401)

(g) Shut off hydraulic pressure source and depressurize left and right hydraulic systems.

(7) Remove the safety tags and close these circuit breakers:

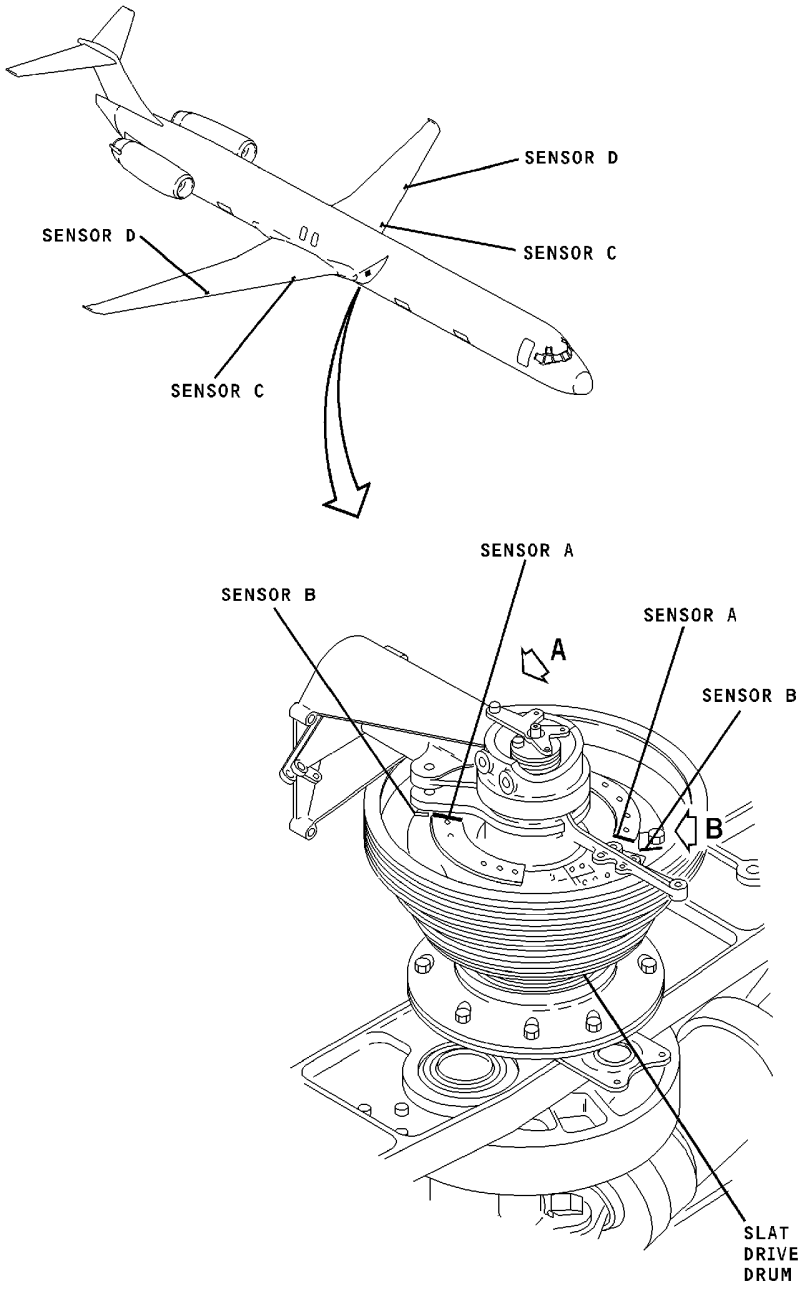
LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

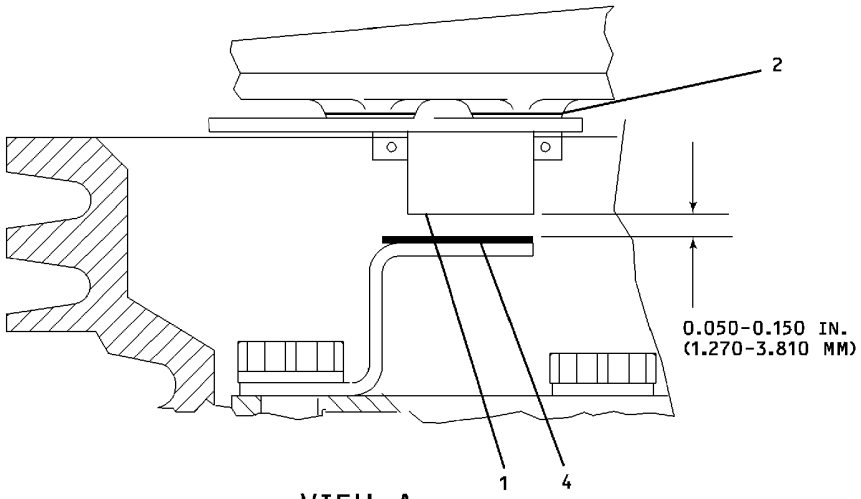
LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

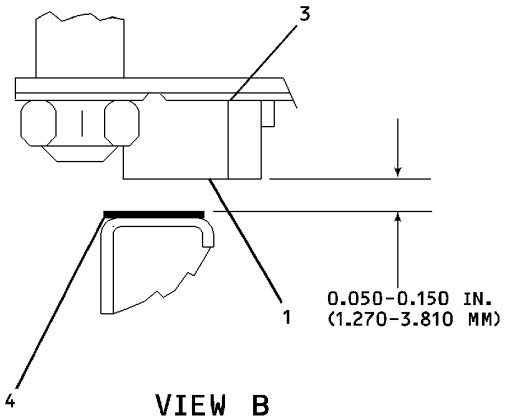
(8) Test sensor. (Paragraph 3.)



Slat Advisory Sensors -- Removal/Installation
Figure 201/27-80-06-990-801



VIEW A



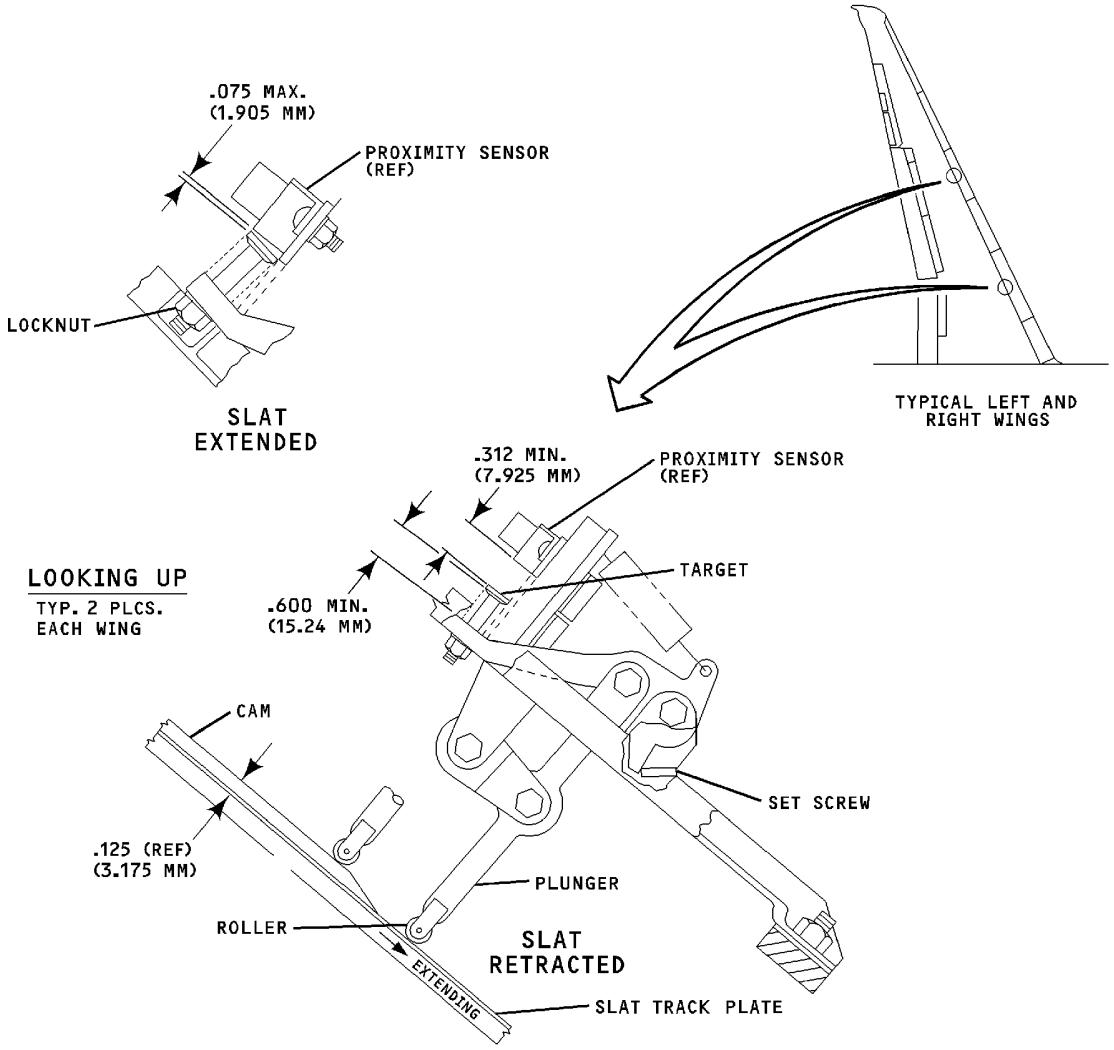
VIEW B

LEGEND:
1. SLAT DRIVE DRUM ADVISOR SENSOR
2. SHIM WASHER
3. SHIM
4. TARGET

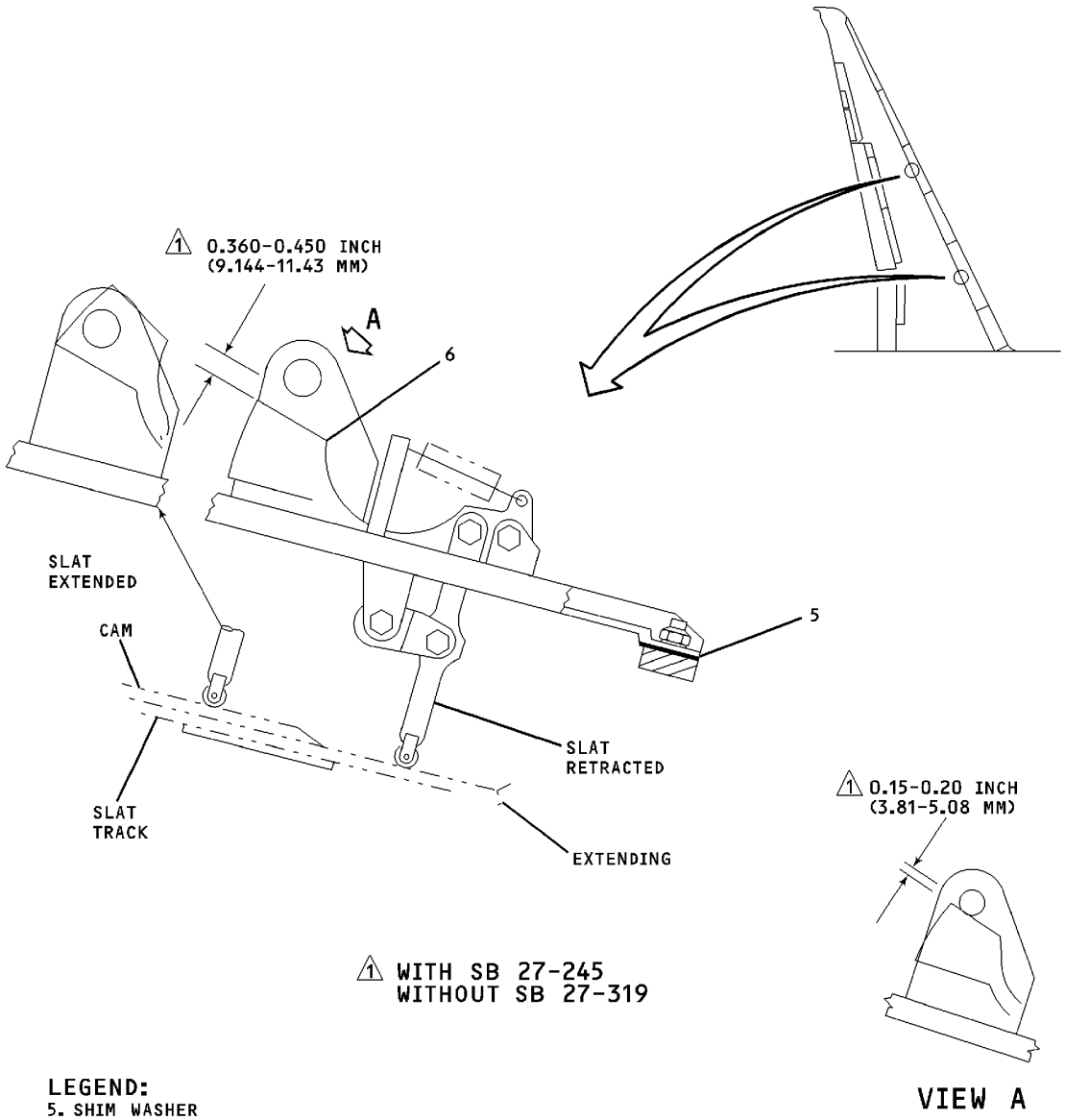
CAG(IGDS)

BBB2-27-245B

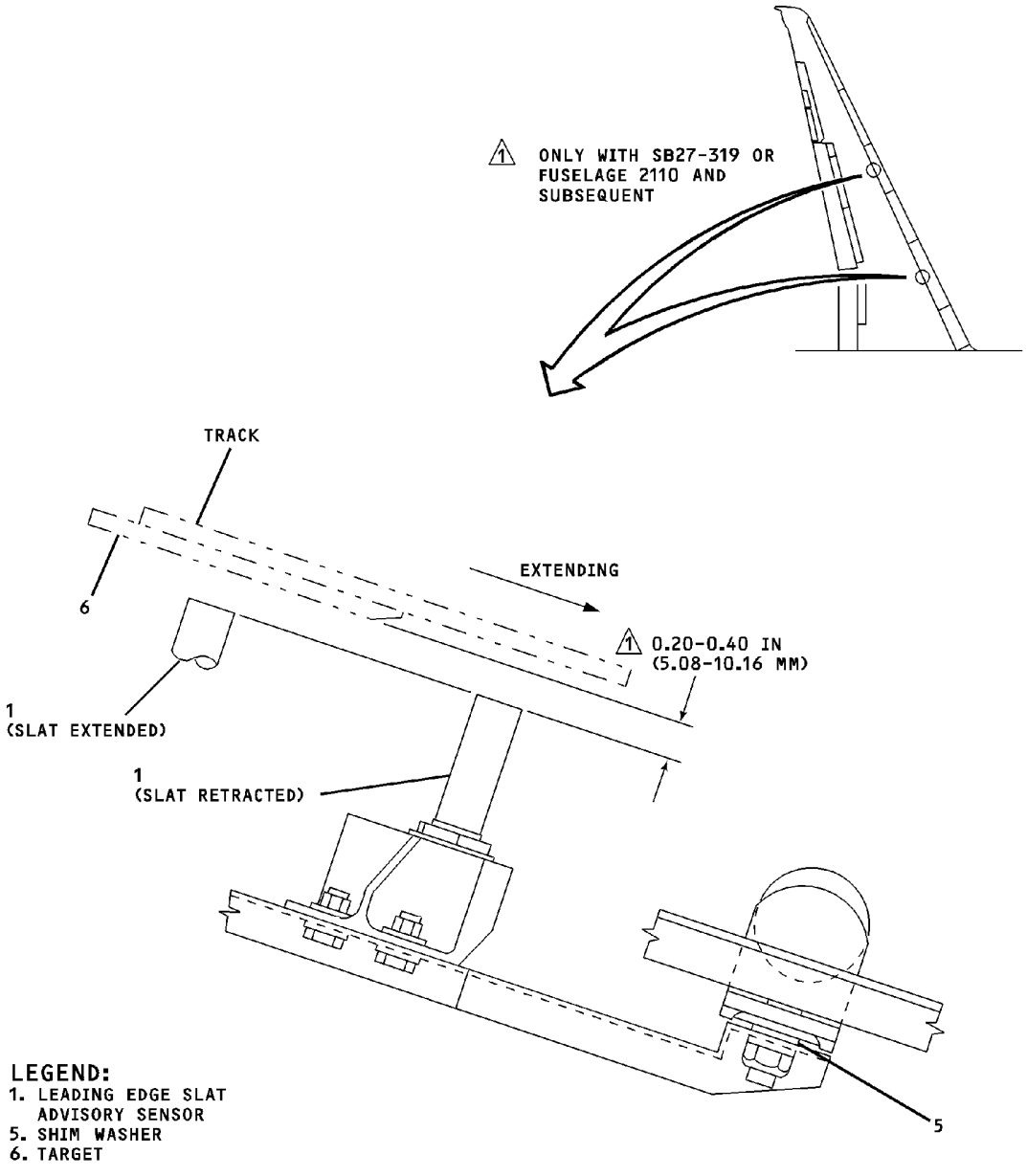
Slat Drive Drum Advisory Sensors -- Removal/Installation
Figure 202/27-80-06-990-802



Slat Advisory Sensors -- Removal/Installation
Figure 203/27-80-06-990-803



Slat Advisory Sensors -- Removal/Installation
Figure 204/27-80-06-990-804 (Sheet 1 of 2)



Slat Advisory Sensors -- Removal/Installation
Figure 204/27-80-06-990-804 (Sheet 2 of 2)

3. Adjustment/Test Slat Advisory Sensors

WARNING: WHEN AIRCRAFT IS ON GROUND, WITH WEIGHT ON WHEELS, BITE TEST OF AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME FLAP/SLAT HANDLE IS MOVED FROM RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

A. Test Sensors

NOTE: During the following procedures the term MID is used to define that the slats are in the mid extend position.

(1) Make certain that flap/slat handle is in RET detent.

(2) Make certain that aircraft is in ground mode (nose and main gear struts compressed).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(3) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(4) Move flap/slat handle from RET detent to 0°/T.O. EXT detent and check following:

(a) Slats should extend to MID, continue to full extend and remain at full extend for approximately 5 seconds then return to MID position.

(b) AUTO SLAT EXTEND and SLAT DISAGREE lights, on center instrument panel, should come on for approximately 5 seconds and then go off.

(c) SLAT TAKEOFF light, on center instrument panel, should come on.

(d) AUTO SLAT FAIL light, (on aircraft with EOAP, AUTO SLAT FAIL legend) on overhead annunciator panel, should not come on.

(5) Move flap/slat handle to 11°/T.O. EXT detent. Slats should remain at MID position. SLAT TAKEOFF light should be on.

(6) Move flap/slat handle to 15°/T.O. EXT detent and check following:

(a) Slats extend fully.

(b) SLAT TAKEOFF light comes on.

(c) AUTO SLAT EXTEND light goes off.

(d) SLAT DISAGREE light comes on as slats move from MID to EXTEND position.

(e) SLAT DISAGREE light goes off when slats are fully extended.

(7) Move flap/slat handle to 28°/LAND detent. Slats should remain extended. SLAT TAKEOFF light should go off. SLAT LAND light should come on when flaps are near 26.5° indicated.

(8) Move flap/slat handle to 40°/LAND detent. Slats should remain extended and SLAT LAND light should be on.

(9) Move flap/slat handle to RET detent. SLAT LAND light should be off. SLAT DISAGREE light should be on while slats are in transit and should go off when slats approach fully retracted position (approximately 10 inches (254 mm) from fully retracted).

(10) Shut off hydraulic pressure source. Depressurize left and right hydraulic systems.

(11) Install access panels removed.

FLAP/SLAT HANDLE POSITION SWITCHES AND TRANSMITTER - MAINTENANCE PRACTICES

1. General

A. The flap/slat handle position switches and position transmitter, located in the right side of the pilot's center control pedestal, is a unit consisting of a support, synchros, a cam switch, electrical leads and electrical connectors.

B. The flap/slat handle (cam) switch is indexed to the support and is actuated by a crank and pushrod connected to the flap/ slat handle control drum. The flap handle position transmitter (synchro) is mechanically slaved, by linkage, to the flap/slat handle position switch.

C. Electrically the flap/slat handle switch is connected to the auto slat extend portion of the stall warning computers and the proximity switch electronics unit. The flap handle position transmitter synchro is electrically connected to the digital flight guidance system.

D. The flap/slat handle switch assembly must be adjusted for proper actuation prior to adjusting the flap handle transmitter.

E. The removal/installation procedures for flap/slat handle position switch assembly and position transmitter are identical except for obvious differences between the two units.

2. Removal/Installation Flap/Slat Handle Position Switches and Transmitter

A. Remove Flap/Slat Handle Switches and Transmitter

NOTE: To allow better access to flap/slat handle position switches, remove first officer seat. (PAGEBLOCK 25-13-01/201)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	23	B1-589	CAPTAIN'S STALL WARNING
Z	23	B1-590	FIRST OFFICER'S STALL WARNING

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	35	B1-26	STALL WARNING AND AUTO SLAT-2
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
A	11	B1-89	LEFT FLAP POSITION

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	2	B1-90	RIGHT FLAP POSITION

(2) Disconnect electrical connectors P1-671, P1-672 and P1-1182 from receptacles at lower forward end of pedestal.

(3) Disconnect pushrod from switch actuating crank.

(4) Remove switch/transmitter support attach bolts and remove support, switches and transmitter as a unit from pedestal.

(5) Remove flap/slat handle position switch.

(6) Remove flap/slat handle position transmitter.

B. Install Flap/Slat Handle Switches and Transmitter

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	23	B1-589	CAPTAIN'S STALL WARNING
Z	23	B1-590	FIRST OFFICER'S STALL WARNING

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	35	B1-26	STALL WARNING AND AUTO SLAT-2
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
A	11	B1-89	LEFT FLAP POSITION

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	2	B1-90	RIGHT FLAP POSITION

(2) Position flap/slat handle position switch/transmitter for installation onto support and crank and verify the following:

(a) Index pin on switch is aligned with hole on support.

CAUTION: GREAT CARE MUST BE TAKEN WHEN ACCOMPLISHING ALIGNMENT OF THE CRANK AND SHAFT. EXCESSIVE FORCE DAMAGES THE MICRO SWITCHES WITHIN THE FLAP/SLAT HANDLE POSITION SWITCH CAUSING ERRORS IN THE SYNCHRO READINGS.

(b) Align missing valley on crank with missing tooth on shaft of switch.

NOTE: Verify that heat-shrinkable tubing is installed over switch body of sufficient length to extend 3/16 to 3/8 inch beyond end of switch after application of heat. If heat-shrink has been removed during maintenance or damaged it should be replaced.

(3) Install switch and secure with (4) clamps.

(4) Install transmitter and secure with (4) clamps.

(5) Position switch/transmitter support on pedestal frame and install attach bolts.

(6) Connect electrical connectors P1-671, P1-672 and P1-1182 to receptacles at lower forward end of pedestal.

(7) Connect pushrod to actuating crank. Safety nut with cotter pin.

(8) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	23	B1-589	CAPTAIN'S STALL WARNING
Z	23	B1-590	FIRST OFFICER'S STALL WARNING

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1
P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	35	B1-26	STALL WARNING AND AUTO SLAT-2
R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL

UPPER EPC, LEFT INSTR BUS

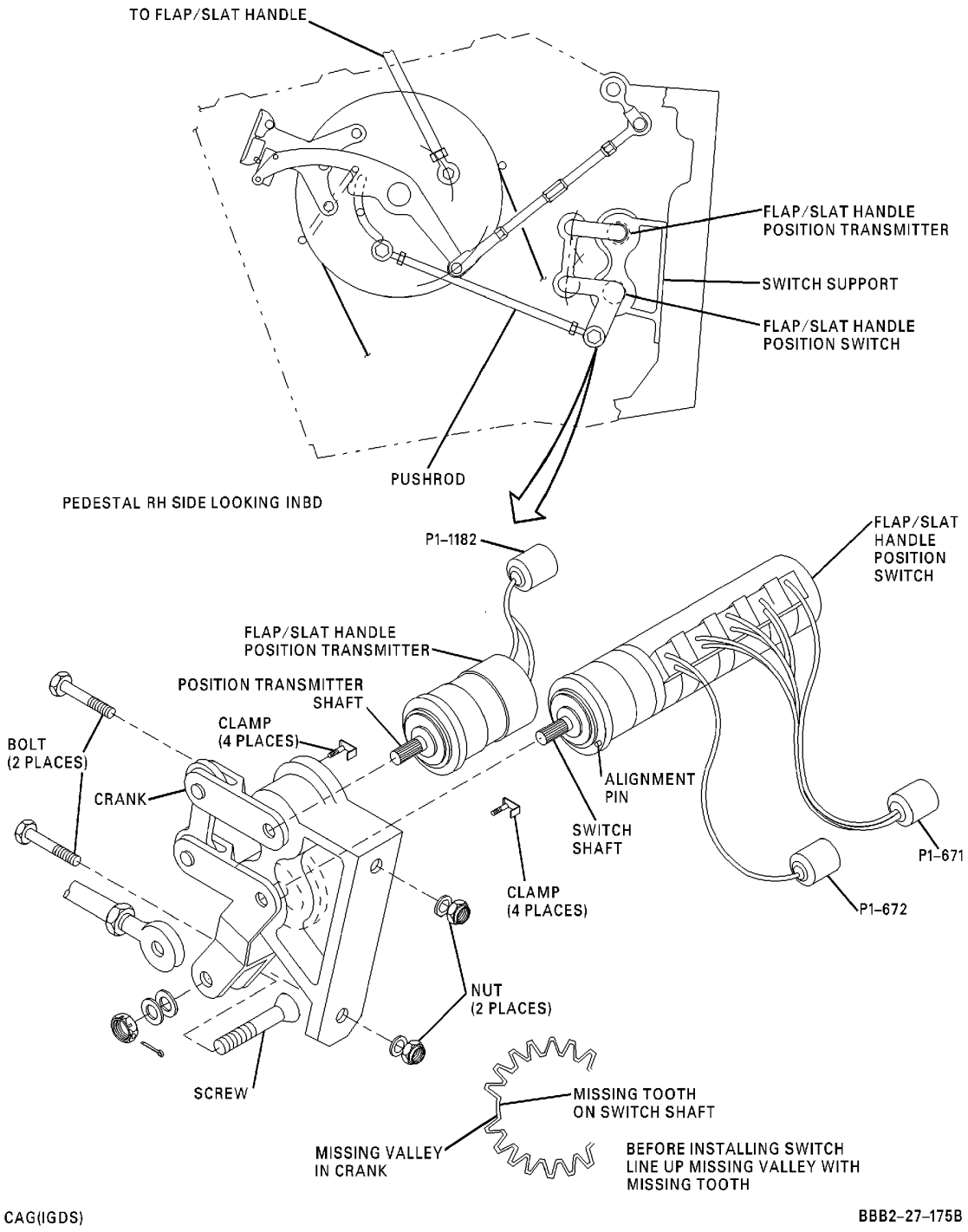
Row	Col	Number	Name
A	11	B1-89	LEFT FLAP POSITION

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	2	B1-90	RIGHT FLAP POSITION

(9) Adjust/Test flap/slat handle position switches. (Paragraph 3.)

NOTE: Performing entire flap/slat handle position switch and flap/slat handle position transmitter tests are critical to proper function of switch assembly. Switch function affects auto-brake, auto slat and stall warning systems.



Flap/Slat Handle Position Switch & Transmitter -- Removal/Installation
Figure 201/27-80-07-990-801

3. **Adjustment/Test Flap/Slat Handle Position Switches**

A. Adjust Flap/Slat Handle (Cam) Switch

(1) Make certain left and right hydraulic systems are pressurized. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

(2) Using dial-a-flap (DAF) thumbwheel, set DAF dial to read 11.

(3) Move flap/slat handle to 11/T.O. EXT detent.

(4) Lift inboard trigger on flap/slat handle (releasing fixed 11/T.O. EXT detent) and adjust DAF thumbwheel to increase DAF reading to 14°(+1/2°, -0°).

NOTE: 14° is represented at the center of the word 'NOT'.

(5) Adjust switch pushrod to provide electrical power to both auto-slat actuators on flap/slat sequence mechanism. Tighten pushrod jamnut.

NOTE: One auto slat actuator will extend and the other auto slat actuator will retract when electrical power is applied.

(6) Monitor 14 degree (0.244 rad) switch input to Stall Warning Computer Number One at S30-28, (Sta. 160R) pin 24A and Stall Warning Computer Number Two at S30-119, (Sta. 110), pin 88A for 10 VDC when flaps are greater than 14 degree (0.244 rad). Adjust switch pushrod so that switches are actuated as close as possible to 14 degree (0.244 rad), using Dial-A-Flap thumbwheel.

NOTE: Dial-A-Flap thumbwheel should only be used in the down or increasing flap position direction, never up.

(7) Place flap/slat handle in RET detent.

(8) Using DAF thumbwheel set DAF dial to read 0.

(9) Test flap/slat handle switch. (Paragraph 3.C.)

(10) Adjust/test flap/slat handle position transmitter.

B. Adjust Flap Handle Position Transmitter

NOTE: Flap/slat handle (cam) switch must be adjusted prior to adjusting transmitter.

(1) Make certain left and right hydraulic systems are depressurized. (PAGEBLOCK 29-00-00/201)

(2) Place flap/slat handle in 0°/T.O. EXT detent.

(3) Loosen transmitter clamp screws. Rotate transmitter until STATUS TEST PANEL, in flight compartment reads 0.1°(+0.25°, -0°). Tighten transmitter clamp screws.

NOTE: Status test panel instructions are located in DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201. Reading values are found in "Run Maintenance Test" section under sensor values.

(4) An alternate method is to adjust INPUT PUSHROD rod end, as needed, until Flight Guidance Status Test Panel reads 0.1° (+0.25°, -0°). Reattach rod end to crank.

(5) Place flap/slat handle in RET detent.

(6) Perform RTS (return to service) test. DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201

C. Test Flap/Slat Handle (Cam) Switch

NOTE: During the following procedures the term MID is used to define that the slats are in the mid extend position.

WARNING: WHEN THE AIRCRAFT IS ON THE GROUND, WITH WEIGHT ON WHEELS, THE BITE TEST OF THE AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME THE FLAP/SLAT HANDLE IS MOVED FROM THE RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. THE SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

(1) Make certain that flap/slat handle is in RET detent.

(2) Make certain that aircraft is in ground mode (nose and main gear struts compressed).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(3) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(4) Move flap/slat handle from RET detent to 0°/T.O. EXT detent and check following:

(a) Slats should extend to MID, continue to full extend and remain at full extend for approximately 5 seconds then return to MID position.

(b) AUTO SLAT EXTEND and SLAT DISAGREE lights, on center instrument panel, should come on for approximately 5 seconds and then go off.

(c) SLAT TAKEOFF light should come on.

(d) AUTO SLAT FAIL light, on overhead annunciator panel, should not come on.

(5) Move flap/slat handle to 11°/T.O. EXT detent. Slats should remain at MID position. SLAT TAKEOFF light should be ON.

(6) Move flap/slat handle to 15°/T.O. EXT detent. Slats should extend fully. SLAT TAKEOFF light should be on. AUTO SLAT EXTEND light should be off.

(7) Move flap/slat handle to 28°/LAND detent. Slats should remain extended. SLAT TAKEOFF light should go off. SLAT LAND light should come on when flaps are near 26.5° indicated and SLAT DISAGREE light should be off.

(8) Move flap/slat handle to 40°/LAND detent. Slats should remain extended and SLAT LAND light should be on.

(9) Move flap/slat handle to RET detent. SLAT LAND light should be off. SLAT DISAGREE light should be on while slats are in transit and go off when slats approach fully retracted position.

CAUTION: DO NOT USE EXCESSIVE FORCE WHEN USING DIAL-A-FLAP (DAF) THUMBWHEEL WITH FLAP/SLAT HANDLE IN 0°/T.O. EXT, 11°/T.O. EXT, AND 15°/T.O. EXT DETENTS, INTERNAL DAMAGE TO MECHANISM MAY OCCUR.

(10) Using DAF thumbwheel set DAF dial wheel to read 13° (edge of yellow band).

(11) Move flap/slat handle until it engages DAF movable detent. Slats should extend and return to MID position.

(12) Using DAF thumbwheel, gently rotate DAF thumbwheel until index mark on pedestal is just inside yellow "DO NOT USE" band on dial (about 13 1/2°), slat should remain in mid position.

(13) Continue to rotate DAF thumbwheel until slats first extend from MID POSITION to full extend. DAF dial should read 14° (+1/2°,-0°).

NOTE: Slat extension can be verified by a momentary drop in hydraulic pressure as indicated on cockpit gauge.

NOTE: 14° is represented at the center of the word "NOT".

(14) Lift outboard trigger on flap/slat handle, set DAF dial wheel to read 20° indicated. Release outboard trigger. Place flap/slat handle in 15° fixed detent. Gently rotate dial wheel towards 14°, DAF movable detent should engage flap/slat handle at 15° and slats should remain fully extended.

(15) With DAF movable detent set at 15°, make certain that 15° fixed detent matches exactly.

(16) Without using excessive force, move flap/slat handle back and forth against forward and aft edges of 15/T.O. EXT fixed detent and verify that flap/slat handle position switch cannot be actuated to get mid slats.

(17) Move flap/slat handle to RET detent.

(18) Set DAF wheel to read 0°.

(19) Shut off hydraulic power source.

AUTO SLAT ACTUATORS - MAINTENANCE PRACTICES

1. General

A. The two electro/mechanical auto slat actuators are mounted within the flap/slat sequence mechanism located in center wing, front spar area, just outboard and aft of slat drive mechanism, right hand side.

B. Access to auto slat actuators is through aft bulkhead, access panel 5138C, in mid cargo compartment.

C. Removal and installation procedures are identical for both actuators.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items.

Table 201

Name and Number	Manufacturer
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Auto Slat Actuator

A. Remove Actuator

NOTE: If both auto slat actuators are to be replaced, remove and replace one actuator at a time to ensure that original rod end adjustments are maintained.

WARNING: BEFORE PRESSURIZING SYSTEMS, MAKE CERTAIN THAT LANDING GEAR LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN AREA AROUND SLATS AND FLAPS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Place flap/slat handle in 11°/T.O. detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201) Tag flap/slat control handle.

(4) Remove access panel 5138C from aft bulkhead, mid cargo compartment.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(5) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	23	B1-589	CAPTAIN'S STALL WARNING
Z	23	B1-590	FIRST OFFICER'S STALL WARNING

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	35	B1-26	STALL WARNING AND AUTO SLAT-2

(6) Remove electrical connector from actuator being removed. (Figure 201 (Sheet 1))

(7) Remove cotter pin, nut, and washer from attach bolts.

(8) While supporting actuator, remove attach bolts and remove actuator through front side, outboard end of bracket.

B. Install Actuator

(1) Make certain hydraulic systems are depressurized.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	23	B1-589	CAPTAIN'S STALL WARNING
Z	23	B1-590	FIRST OFFICER'S STALL WARNING

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	35	B1-26	STALL WARNING AND AUTO SLAT-2

(3) While holding replacement actuator in area of installation, connect electrical connectors, PI-669 or PI-670, to actuator as applicable.

(4) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	23	B1-589	CAPTAIN'S STALL WARNING
Z	23	B1-590	FIRST OFFICER'S STALL WARNING

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	35	B1-26	STALL WARNING AND AUTO SLAT-2

(5) Place flap/slat handle in 15°/T.O. detent.

(6) Forward actuator should retract, aft actuator should extend.

(7) Place flap/slat handle in 11°/T.O. detent.

(8) Forward actuator should extend, aft actuator should retract.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(9) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	23	B1-589	CAPTAIN'S STALL WARNING
Z	23	B1-590	FIRST OFFICER'S STALL WARNING

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	35	B1-26	STALL WARNING AND AUTO SLAT-2

(10) Remove electrical connector from replacement acutator.

(11) Position actuator in flap/slat sequence mechanism and install attach bolt in actuator end. (Figure 201 (Sheet 1))

(12) Ensure that crank (X) is contacting stop bolt (Y). (Figure 201 (Sheet 3)) If crank (X) is not contacting stop bolt (Y), remove both actuator rod end attach bolts, position crank (X) to contact stop bolt (Y) and adjust both actuator rod ends so that attach bolts fit freely in attach holes.

(13) Install attach bolts. Tighten nuts and safety with cotter pins.

(14) Connect electrical connector to actuator.

(15) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	23	B1-589	CAPTAIN'S STALL WARNING
Z	23	B1-590	FIRST OFFICER'S STALL WARNING

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	35	B1-26	STALL WARNING AND AUTO SLAT-2

(16) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(17) Place flap/slat handle in UP/RET detent.

(18) Place flap/slat handle in 15 degree/T.O. detent.

(19) Forward actuator should retract, aft actuator should extend.

(20) Place flap/slat handle in UP/RET detent.

(21) Forward actuator should extend, aft actuator should retract.

(22) Ensure that crank (X) is contacting stop bolt (Y). If crank (X) is not contacting stop bolt (Y), remove both rod end actuator rod end attach bolts, position crank (X) to contact stop bolt (Y) and adjust both actuator rod ends so that attach bolts fit freely in attach holes.

(23) Install attach bolts. Tighten nuts and safety with cotter pins.

(24) With slats fully retracted, place pencil mark on right wing only leading edge upper skin at trailing edge of slat 2 in line with drive track. (Figure 201 (Sheet 2))

WARNING: WHEN AIRCRAFT IS ON GROUND WITH WEIGHT ON WHEELS, BITE TEST OF AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME FLAP/SLAT HANDLE IS MOVED FROM UP/RET POSITION TO 0°/T.O. EXT OR 11°/T.O. EXT POSITION. SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND THEN RETURN TO MID POSITION.

(25) Place flap/slat handle in 11°/T.O. EXT detent.

NOTE: Before measuring distance in following step, wait 5 to 7 minutes for slats to stabilize (no creep).

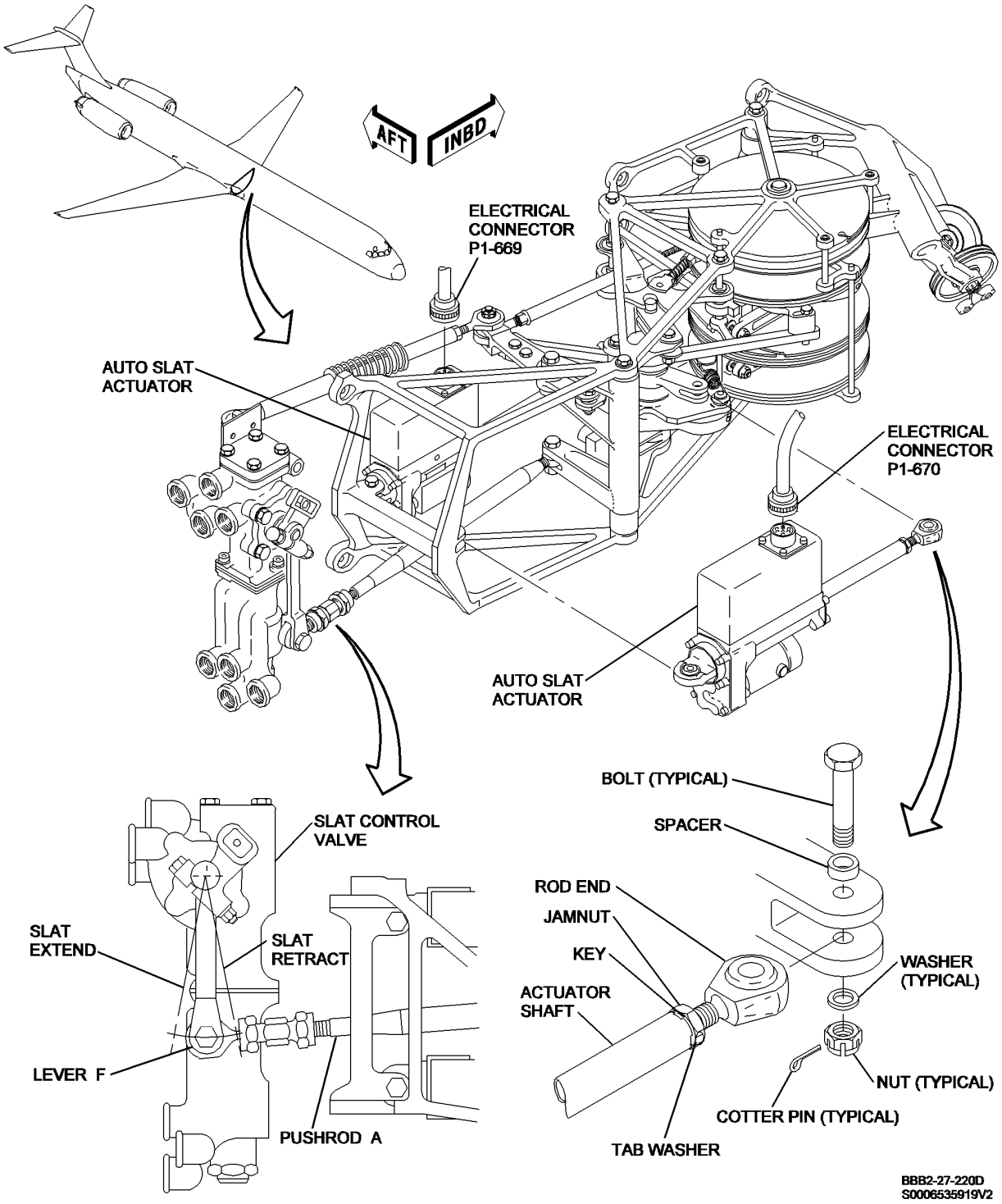
(26) Measure distance from pencil mark on right wing upper skin (Paragraph 3.B.(24)) above to trailing edge of slat 2 in line with drive track. Measurement should be 14.90(±0.15) inches (378.5(±4) mm). If necessary, adjust turnbuckle adjustment on pushrod (A) to position slats at 14.90(±0.15) inches (378.5(±4) mm) measurement. Tighten turnbuckle jamnuts. (Figure 201 (Sheet 1))

NOTE: Turnbuckle adjustment is 0.20 inch (5.1 mm) of slat travel per one turn of turnbuckle. Rod end adjustment is 0.600 inch (15.3 mm) of slat travel per one half turn of rod end.

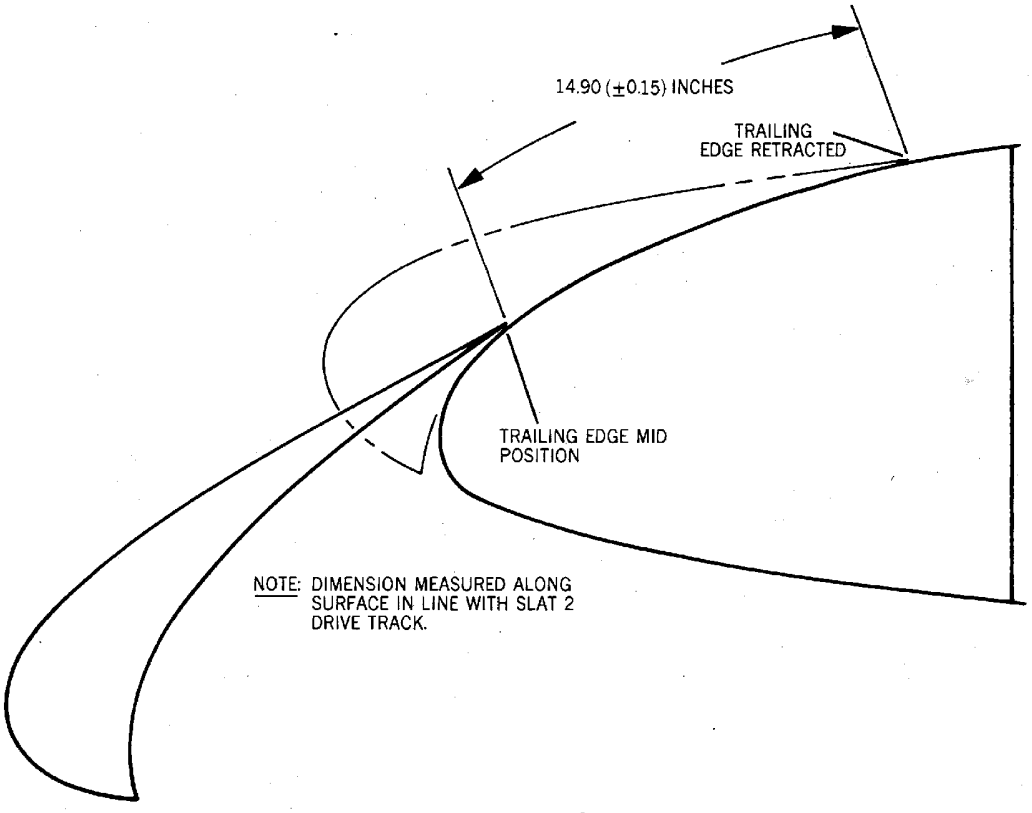
(a) Safety the turnbuckle to the pushrod with lockwire, if the lockwire hole is present in pushrod (A). (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(27) Place flap/slat handle in UP/RET detent.

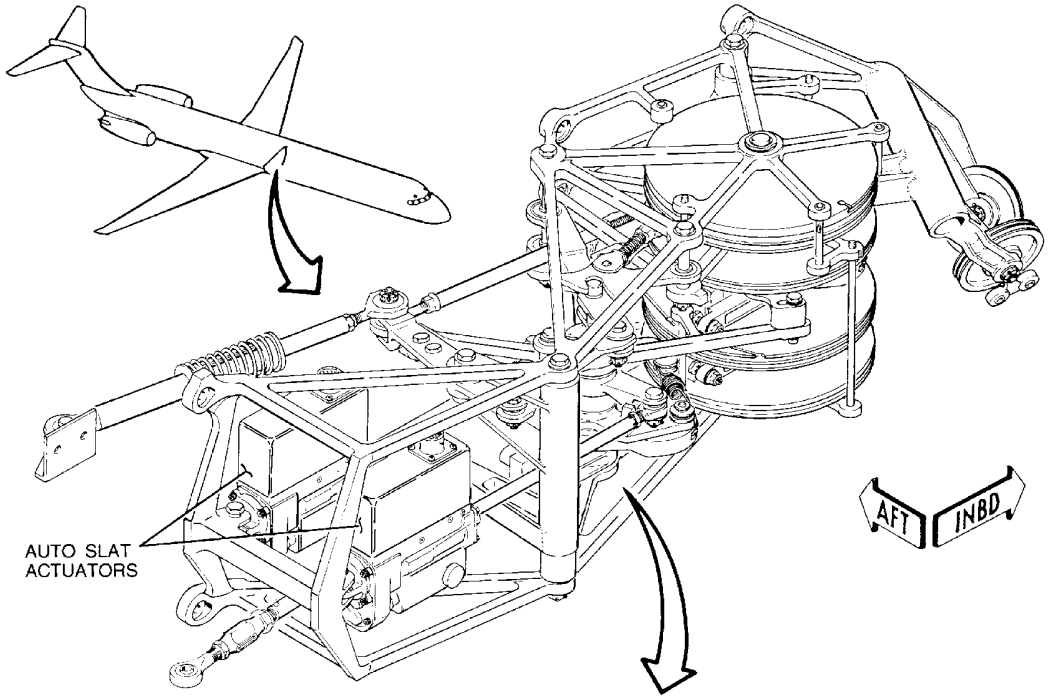
(28) Install access panel 5138C on aft bulkhead, mid cargo compartment.



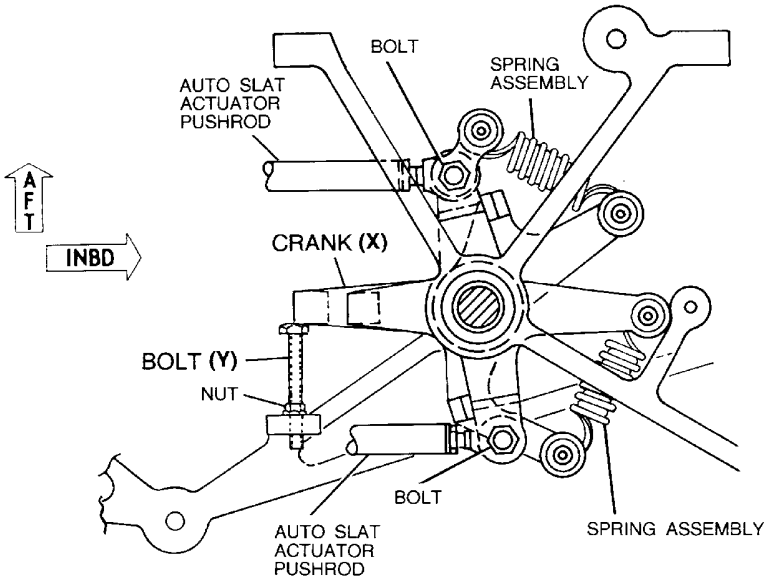
Auto Slat Actuator - Removal/Installation
Figure 201/27-80-08-990-801 (Sheet 1 of 3)



Auto Slat Actuator - Removal/Installation
Figure 201/27-80-08-990-801 (Sheet 2 of 3)



FLAP/SLAT SEQUENCE MECHANISM



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Auto Slat Actuator - Removal/Installation
Figure 201/27-80-08-990-801 (Sheet 3 of 3)

4. **Adjustment/Test Auto Slat Actuator**

A. Test Auto Slat Actuator

NOTE: During the following procedures, the term MID is used to define that the slats are in the MID extend position.

WARNING: WHEN AIRCRAFT IS ON GROUND, WITH WEIGHT ON WHEELS, BITE TEST OF AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME FLAP/SLAT HANDLE IS MOVED FROM RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

(1) Make certain that flap/slat handle is in UP/RET detent.

(2) Make certain that aircraft is in ground mode, (nose and main gear struts compressed).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(3) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

NOTE: Reset the memory from the stall WARNING COMPUTER by holding the test switch to the NORM TEST position while holding the MEMORY RESET button in.

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND SLATS AND FLAPS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(4) Move flap/slat handle from RET detent to 0°/T.O. EXT detent and check following:

(a) Slats should extend to MID, continue to full extend and remain at full extend for approximately 5 seconds then return to MID position.

(b) AUTO SLAT EXTEND and SLAT DISAGREE lights, on center instrument panel, should come on for approximately 5 seconds and then go off.

(c) SLAT TAKEOFF light should come on.

(d) STALL INDICATION FAILURE light is off.

(5) Move flap/slat handle to 15°/T.O. EXT detent. Slats should extend fully. SLAT TAKEOFF light should be on. AUTO SLAT EXTEND light should be off.

(6) Move flap/slat handle to 28°/LAND detent. Slats should remain extended. SLAT TAKEOFF light should go off. SLAT LAND light should come on and SLAT DISAGREE light should go off.

(7) Move flap/slat handle to 40°/LAND detent. Slats should remain extended and SLAT LAND light should be on.

(8) Move flap/slat handle to UP/RET detent. SLAT LAND light should be off. SLAT DISAGREE light should be on while slats are in transit and go off when slats are fully retracted.

CAUTION: DO NOT USE EXCESSIVE FORCE WHEN USING DIAL-A-FLAP (DAF) THUMBWHEEL WITH THE FLAP/SLAT HANDLE IN 0°/T.O. EXT, 11°/T.O. EXT AND 15°/T.O. EXT DETENTS, INTERNAL DAMAGE TO MECHANISM MAY OCCUR.

(9) Using DAF thumbwheel set DAF dial wheel to read 13° (edge of yellow band).

(10) Move flap/slat handle until it engages DAF movable detent. Slats should extend and return to MID position.

(11) Using DAF thumbwheel, gently rotate DAF thumbwheel until index mark on pedestal is just inside yellow "DO NOT USE" band on dial (about 13 1/2°), slat should remain in mid position.

(12) Continue to rotate DAF thumbwheel until slats first extend from MID POSITION to full extend. DAF dial should read 14° (+1/2°,-0°).

NOTE: Slat extension can be verified by a momentary drop in hydraulic pressure as indicated on cockpit gauge.

NOTE: 14° is represented at the center of the word "NOT".

(13) Lift outboard trigger and place flap/slat handle in 15°/T.O. EXT detent.

(14) Lift outboard trigger on flap/slat handle, set DAF dial wheel to read 20° indicated. Release outboard trigger. Gently rotate dial wheel towards 14°, DAF movable detent should engage flap/slat handle at 15° and slats should not retract.

(15) Without using excessive force, move flap/slat handle back and forth against forward and aft edges of 15/T.O. EXT fixed detent and verify that flap/slat handle position switch cannot be actuated to get mid slats.

(16) Move flap/slat handle to UP/RET detent.

(17) Set DAF wheel to read 0°.

(18) Shut off hydraulic power source.

SLAT DRIVE LINK - REMOVAL/INSTALLATION

1. General

A. The slat drive link is an integral part of the slat drive mechanism and is attached to the drive shaft and the bellcrank assembly.

B. The slat drive link couples together, the slat drive mechanism and the slat cable drum to actuate the left and right wing slats.

C. Removal of the slat drive link does not require removal of the slat drive mechanism nor the slat drum. Only the eight drum to adapter attaching bolts, washers and nuts are required to be removed so as to rotate the bellcrank about to gain easy access for bolt removal.

D. Location of slat drive link is on slat drive mechanism, below the drum adapter and top rail on the front spar in the center wing section under main cabin floor. Access to mechanism and link is through mid cargo door.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 401

Name and Number	Manufacturer
Strap wrench	
Lockwire, NASM20995N51, DPM 684*[1]	Not specified
Torque wrench 0-600 inch-pounds (0-67.8 N·m)	
Torque wrench 1000-1500 inch-pounds (113-169 N·m)	
Sealant, PR-1422 B-2 DMS 2082	Courtaulds Aerospace Inc . Glendale, CA

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Slat Drive Link

A. Remove Slat Drive Link

(1) Remove and retain access panels 5107C and 5138C, and attaching hardware, and remove vertical stiffener located on center line of aircraft just forward of slat drive mechanism.

WARNING: MAKE SURE THE LANDING GEAR LOCKPINS ARE INSTALLED AND THE APPLICABLE CONTROLS ARE CORRECTLY SET. THIS WILL PREVENT THE ACCIDENTAL OPERATION OF THE LANDING GEAR AND THE FLIGHT CONTROL SYSTEMS. ACCIDENTAL OPERATION CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(2) Pressurize left and right hand hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Place flap/slat handle in UP/RETRACT detent.

(4) With slats fully retracted, gain access to slat drive drum and cylinders through the mid cargo compartment aft panel.

(5) Remove three attachment bolts on slat drive drum and adapter assembly. (Identify hardware for reinstallation in same holes.) (Figure 401 (Sheet 1))

(6) Place flap/slat handle in 15 degree detent: slats are now in full extend position.

CAUTION: LEFT AND RIGHT HAND HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(7) Depressurize left and right hand hydraulic systems. (PAGEBLOCK 29-00-00/201)

(8) Remove remaining 5 bolts from slat drum and adapter assembly. Retain all bolts, nuts, and washers. (Identify hardware for reinstallation in same holes.) (Figure 401 (Sheet 2))

(9) Mark the position of index pin on drum and adapter assembly. (Figure 401 (Sheet 2))

(10) Remove and retain index pin.

CAUTION: BOLTS WILL BE PRELOADED DUE TO SLAT CABLE LOADS.

(11) Disconnect slat drive hydraulic actuating cylinders from drive mechanism at rod end. Attaching hardware to be retained in aircraft for installation. (Figure 401 (Sheet 2))

NOTE: Extend hydraulic line may have to be cracked at hydraulic fitting on cylinder to relieve pressure on rod end for easier removal of rod end bolt.

NOTE: Use Figure 401 (Sheet 3) for Paragraph 3.A.(12) through Paragraph 3.A.(15).

(12) Remove inboard drive link pin (A) from drive link (B) and crank arm (C).

(13) Rotate lower adapter assembly with 10 inch strap wrench to allow removal of pin "D" from shaft arm "E".

(14) Remove pin "D".

(15) Remove link assembly "B".

B. Install Slat Drive Link

NOTE: Use Figure 401 (Sheet 3) for Paragraph 3.B.(1) through Paragraph 3.B.(4).

(1) Install pin "D" and drive link assembly "B" on shaft arm "E".

(2) Rotate lower adapter assembly with 10 inch strap wrench back so index mark and pin hole line up.

(3) Install inboard drive link pin "A" and drive link assembly "B" onto crank arm "C".

CAUTION: DO NOT EXCEED 351 FOOT-POUNDS TORQUE.

(4) Install nuts and washers onto pins "A" and "D" and torque nuts to 249 foot-pounds. Continue tightening nuts until slot in nuts aligns with hole in pins "A" and "D". Install new cotter pins.

(5) Install index pin into drive drum and adapter assembly. (Figure 401 (Sheet 2))

WJE 401-409, 411, 412, 414-427, 429, 861-866, 868, 869, 871-874, 880, 881, 883, 884, 886, 887, 891-893

WARNING: INTEGRAL FUEL TANKS SEALING COMPOUND (POLYSULFIDE SEALANT B1/2 AND B2) IS AN AGENT THAT IS POISONOUS AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN INTEGRAL FUEL TANKS SEALING COMPOUND IS USED.

- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET INTEGRAL FUEL TANKS SEALING COMPOUND IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS MSDS FOR:

- MORE PRECAUTIONARY DATA.
- APPROVED SAFETY EQUIPMENT.
- EMERGENCY MEDICAL AID.
- TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(6) Install 5 bolts, nuts, and washers wet with sealant, onto slat drum and adapter assembly. Torque nuts 400 in-lb (45.2 N·m) to 450 in-lb (50.8 N·m). Torque stripe nuts. (Figure 401 (Sheet 2))

NOTE: DAC Service Bulletin 27-279.3 recommends torque values of 400 in-lb (45.2 N·m) to 450 in-lb (50.8 N·m) for fastener nut part number MS21245L8. For fastener nut part number is 3D0036-8M. The torque requirement for this nut is 1040 in-lb (117.51 N·m) to 1140 in-lb (128.8 N·m).

WJE 410, 875-879

WARNING: INTEGRAL FUEL TANKS SEALING COMPOUND (POLYSULFIDE SEALANT B1/2 AND B2) IS AN AGENT THAT IS POISONOUS AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN INTEGRAL FUEL TANKS SEALING COMPOUND IS USED.

- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET INTEGRAL FUEL TANKS SEALING COMPOUND IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WJE 410, 875-879 (Continued)

(WARNING PRECEDES)

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS MSDS FOR:

- MORE PRECAUTIONARY DATA.
- APPROVED SAFETY EQUIPMENT.
- EMERGENCY MEDICAL AID.
- TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(7) Install 5 bolts, nuts, and washers wet with sealant, onto slat drum and adapter assembly. Torque nuts 1040 in-lb (117.51 N·m) to 1140 in-lb (128.8 N·m). Torque stripe nuts. (Figure 401 (Sheet 2))

WJE ALL

(8) Install slat drive actuator rod end attach bolts, making certain that heads of bolts are properly seated at anti-rotation lugs. Tighten nuts and safety nuts with cotter pin. Safety head of bolts with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

CAUTION: IF EXTEND HYDRAULIC LINE WAS CRACKED OPEN AT CYLINDER FITTING, REFERENCE STEP (11) REMOVAL PROCEDURES; RETIGHTEN EXTEND LINE AT HYDRAULIC CYLINDER FITTING BEFORE APPLYING HYDRAULIC PRESSURE.

(9) Pressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

(10) Retract slats to full up position.

(11) Remove left and right hydraulic system pressure. (PAGEBLOCK 29-00-00/201)

WJE 401-409, 411, 412, 414-427, 429, 861-866, 868, 869, 871-874, 880, 881, 883, 884, 886, 887, 891-893

WARNING: INTEGRAL FUEL TANKS SEALING COMPOUND (POLYSULFIDE SEALANT B1/2 AND B2) IS AN AGENT THAT IS POISONOUS AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN INTEGRAL FUEL TANKS SEALING COMPOUND IS USED.

- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET INTEGRAL FUEL TANKS SEALING COMPOUND IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS MSDS FOR:

- MORE PRECAUTIONARY DATA.
- APPROVED SAFETY EQUIPMENT.
- EMERGENCY MEDICAL AID.
- TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

WJE 401-409, 411, 412, 414-427, 429, 861-866, 868, 869, 871-874, 880, 881, 883, 884, 886, 887, 891-893 (Continued)

(WARNING PRECEDES)

(12) Install remaining 3 bolts, washer and nuts wet with sealant, to slat drum and adapter assembly. Torque nuts 400 in-lb (45.2 N·m) to 450 in-lb (50.8 N·m). Torque stripe nuts. (Figure 401 (Sheet 1))

NOTE: DAC Service Bulletin 27-279.3 recommends torque values of 400 in-lb (45.2 N·m) to 450 in-lb (50.8 N·m) for fastener nut part number MS21245L8. For fastener nut part number is 3D0036-8M. The torque requirement for this nut is 1040 in-lb (117.51 N·m) to 1140 in-lb (128.8 N·m).

NOTE: There should be a total of eight bolts attaching the slat drive drum to adapter assembly.

WJE 410, 875-879

WARNING: INTEGRAL FUEL TANKS SEALING COMPOUND (POLYSULFIDE SEALANT B1/2 AND B2) IS AN AGENT THAT IS POISONOUS AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN INTEGRAL FUEL TANKS SEALING COMPOUND IS USED.

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- EMERGENCY MEDICAL AID.
- TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

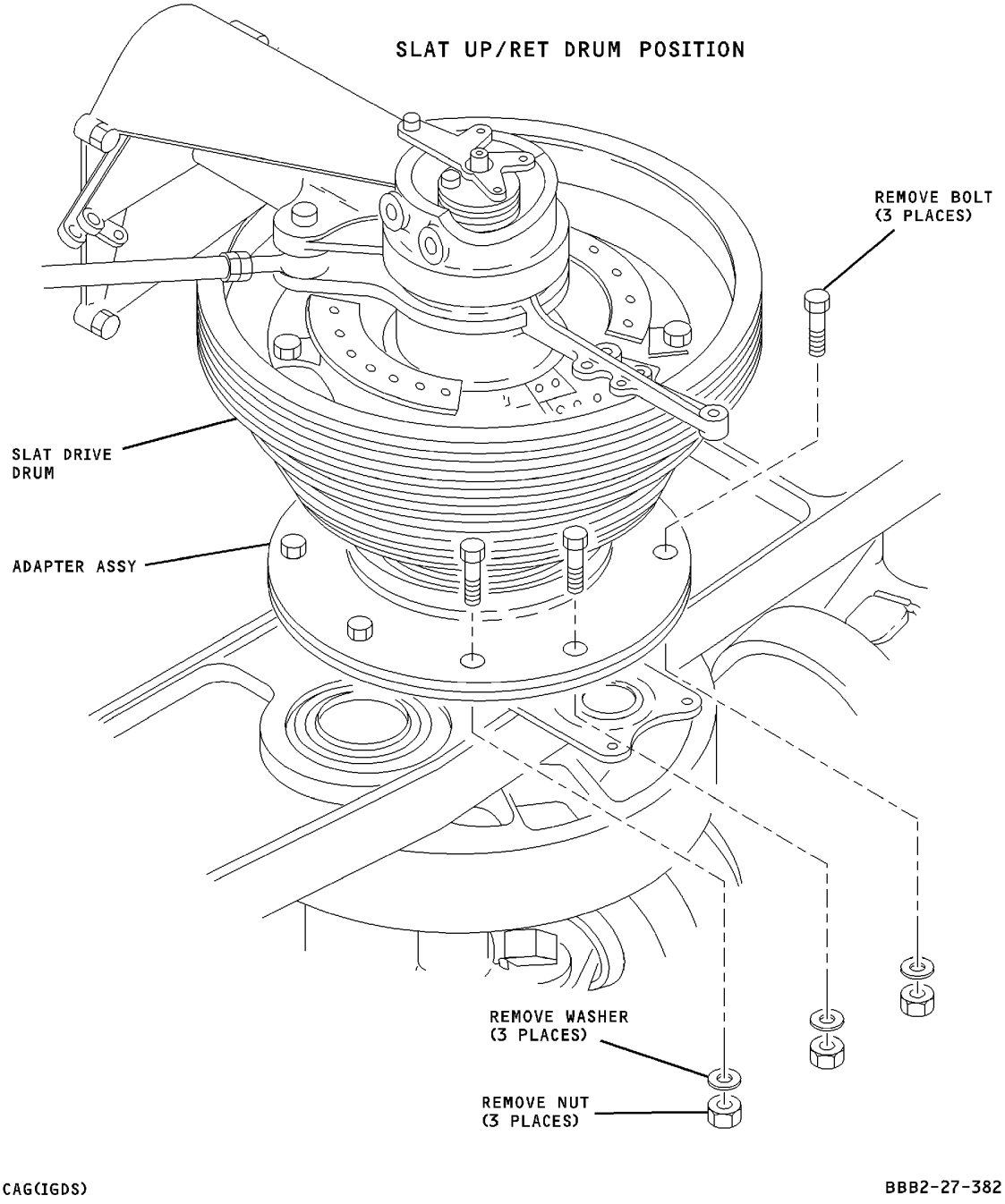
(13) Install remaining 3 bolts, washer and nuts wet with sealant, to slat drum and adapter assembly. Torque nuts 1040 in-lb (117.51 N·m) to 1140 in-lb (128.8 N·m). Torque stripe nuts. (Figure 401 (Sheet 1))

NOTE: There should be a total of eight bolts attaching the slat drive drum to adapter assembly.

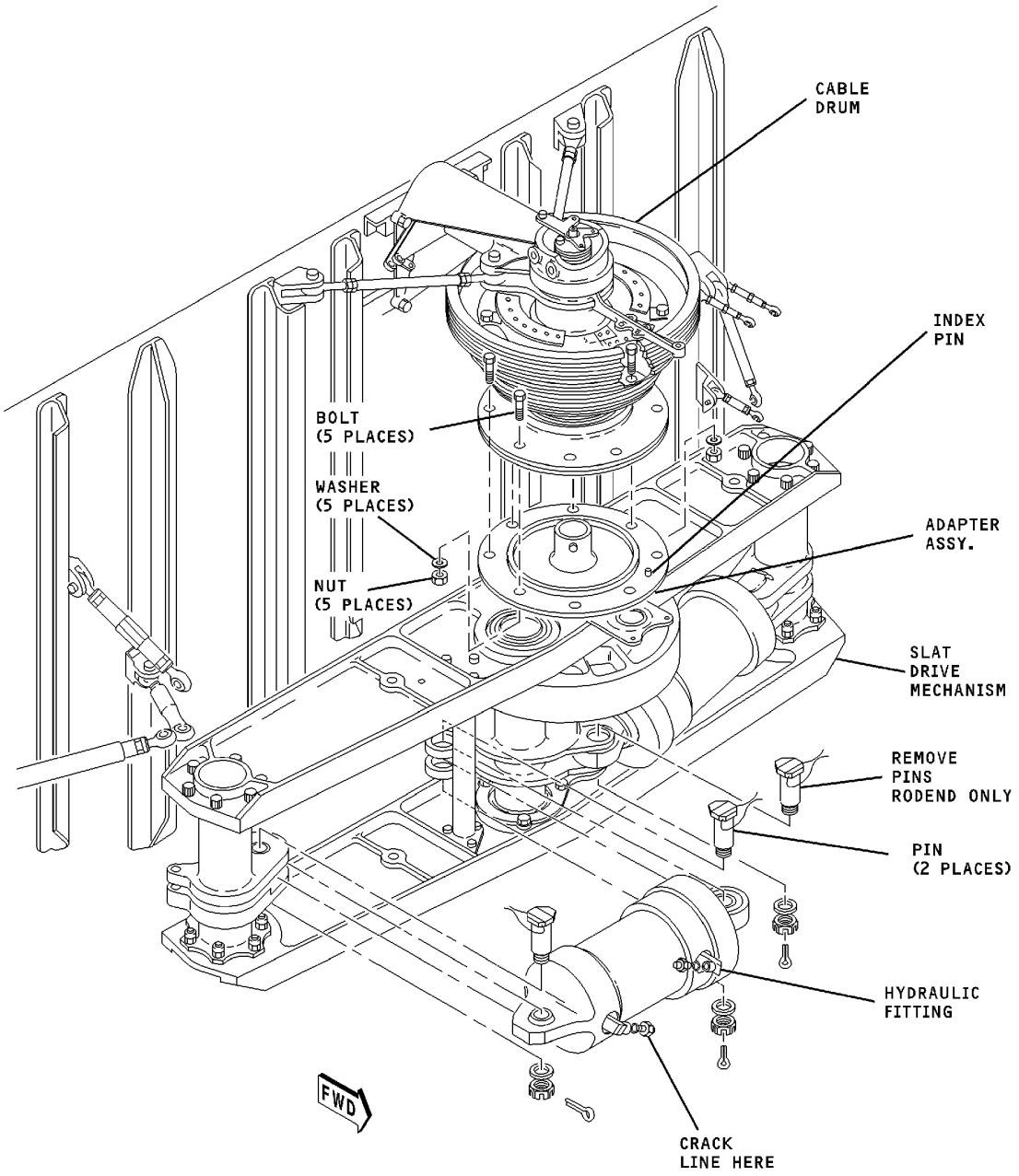
WJE ALL

(14) Pressurize left and right hydraulic system and operate slats up and down to check for smooth operation and hydraulic leaks.

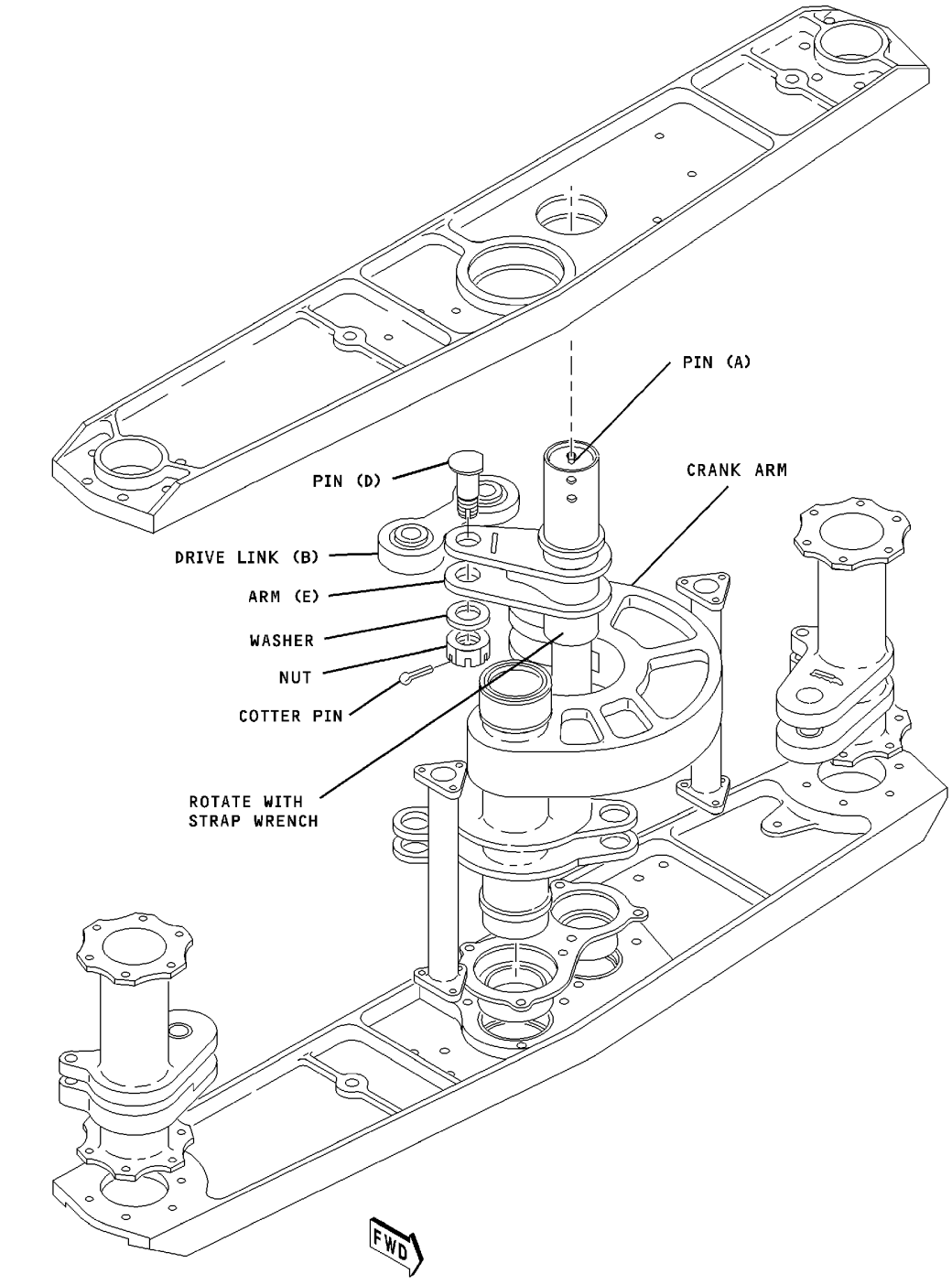
(15) Close up mid cargo compartment aft panels.



Slat Drive Link - Removal/Installation
Figure 401/27-80-09-990-801 (Sheet 1 of 3)



Slat Drive Link - Removal/Installation
Figure 401/27-80-09-990-801 (Sheet 2 of 3)



Slat Drive Link - Removal/Installation
Figure 401/27-80-09-990-801 (Sheet 3 of 3)

SLAT DISAGREE/AUTOSLAT AND STALL INDICATION FAILURE - TROUBLE SHOOTING

1. General

A. Trouble shooting provided in this section consists of three individual, but integrated procedures for isolating and correcting faults in the stall warning system. The fault isolation flowcharts on the following pages will aid in isolating the more prevalent failure indications in the slat disagree, autoslat failure and stall indication failure annunciations.

B. The basic causes of a faulty system operation are, generally, faulty aircraft wiring, faulty line replaceable units (LRU's) or out of rig cable systems and/or components.

C. By using the basic check procedures indicated by the logic charts and accompanying notes contained in this section, quick basic isolation and correction of the indicated system problem can be accomplished.

D. When making electrical checks during trouble shooting procedures, refer to Wiring Diagram Manual appropriate sections for check points or pin numbers of components or LRU's to be checked.

E. Lift augmenting slats control system components and location are as follows:

Table 101

Component	Location
Flap/slat handle	Control pedestal flight compartment
Flap/slat sequence mechanism	Center wing front spar
Electro-mechanical actuators	Center wing front spar (flap/slat sequence mechanism)
Slat drive actuators	Center wing front spar (slat drive mechanism)
Slat control valve	Center wing front spar
Slat position proximity sensors	Two on each wing (adjacent to 1 and 3 slat drive tracks) (four located on slat drive drum support)
Flap/slat handle position switches	Control pedestal, in flight compartment, lower right side
Slat position indicator lights	Center instrument panel, adjacent to flap position indicator.
AUTO SLAT FAIL light (or legend, with EOAP)	Overhead annunciator panel
Proximity switch electronics unit	Electrical/electronics compartment
AUTO SLAT FAIL light (or legend, with EOAP)	Overhead annunciator panel
Proximity switch electronics unit	Electrical/electronics compartment
Stall warning and autoslat 1 and 2 circuit breakers	Lower EPC C/B panel
Slat extend failure advisory circuit breaker	Lower EPC C/B panel

Table 101 (Continued)

Component	Location
Captain's stall warning and First Officer's stall warning circuit breakers	Lower EPC C/B panel
Proximity switch control left and right circuit breakers	Lower EPC C/B panel
Stall warning alpha flap1 and 2 circuit breakers	Upper EPC C/B panel

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed item:

Table 102

Name and Number	Manufacturer
Multimeter (2000A)	Dana

3. Trouble Shooting Lift Augmenting Slat System

WARNING: IF HYDRAULIC AND ELECTRICAL POWER IS REQUIRED DURING CHECK, MAKE CERTAIN FLAP AND SLAT SURFACES ARE CLEAR OF PERSONNEL AND EQUIPMENT.

WARNING: WHEN THE AIRPLANE IS ON THE GROUND, WITH WEIGHT ON WHEELS, THE BITE TEST OF THE AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME THE FLAP/SLAT HANDLE IS MOVED FROM THE RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. THE SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

A. Slats may not move from mid to extend when flap/slat handle is moved beyond 14 degrees due to autoslat fail. Slat operation from retract to mid is mechanical and electrical/mechanical from mid to extend.

B. With slats retracted, drive tracks should be against retract stops with slats faired to leading edge. With slats in retracted position, mark left and right wing leading edge at trailing edge of Slat Number 2 drive track. When slats are extended to mid/sealed position, dimension should 14.90(±0.15) inches (378.46(±127) mm). (PAGEBLOCK 27-80-00/501)

C. Intentionally blank

D. Flap/Slat handle switch S1-467 consists of 5 segments - "A", "B", "C", "D" and "E". Each segment has a different actuation point and function.

(1) Segment function is as follows:

Table 103

SEGMENT	FUNCTION
A	AUTOSLAT
B	SLAT DISAGREE
C	SLAT DISAGREE AND AUTOSLAT
D	AUTOSLAT

Table 103 (Continued)

SEGMENT	FUNCTION
E	AUTOBRAKES, ONLY WHEN INSTALLED

(2) Switch actuation points:

Table 104

SEGMENT	SWITCH ACTUATION POINTS
A	FLAP/SLAT HANDLE POSITION CORRESPONDING TO 14 DEGREES
B	FLAP/SLAT HANDLE POSITION CORRESPONDING TO 14 DEGREES
C	FLAP/SLAT HANDLE MOVEMENT OUT OF UP/RET DETENT
D	FLAP/SLAT HANDLE POSITION CORRESPONDING TO 14 DEGREES
E	FLAP/SLAT HANDLE POSITION CORRESPONDING TO 26 DEGREES

E. Slat Sensor Channels

Slat Sensor Channels					
CH	SENSOR	CH	SENSOR	CH	SENSOR
25	LAND/FLAP	31	LEFT C	38	RIGHT A
26	LEFT A	32	LEFT D	39	RIGHT B
27	LEFT B	37	RIGHT C	48	RIGHT D

F. Flap/slat handle switch test points--with resistor network

FLAP/SLAT HANDLE SWITCH TEST POINTS FOR AIRCRAFT WITH FLAP HANDLE RESISTOR NETWORK				
SEGMENT	POSITION	+12 OR ** 28 VDC	0 VDC	E & E STA
A	< 14 DEGREES	**S30-119-88X	S30-119-88A	110
A	> 14 DEGREES	**S30-119-88A	S30-119-88X	110
B	UP/RET	----------	S30-210-20,21	218
B	>RET-< 14 DEGREES	*S30-210-20	S30-210-21	218
B	> 14 DEGREES	*S30-210-21	S30-210-20	218
C	UP/RET	*S30-210-19	----------	218
C	< 14 DEGREES	----------	S30-210-19	218
D	> 14 DEGREES	**S30-28-24X	S30-28-24A	160R
D		**S30-28-24A	S30-28-24X	160R
REFERENCE: WIRING DIAGRAM MANUAL 27-81-00 AND 27-82-11				

G. Reference:

(1) Douglas Service Bulletin 27-245, replacement of plunger type sensor mechanism with shutter type mechanism.

(2) All Operators Letter 9-1793, improved adjustment procedure for shutter type sensor mechanism.

(3) Douglas Service Bulletin 27-275, increase current flow through flap/slat handle switch contacts to increase reliability.

H. Check slat track rollers for excessive wear when following conditions are exhibited:

(1) No disagree light on ground, but disagree light on in flight, due to air loads causing a shift of C and D targets toward sensor.

(2) Slat disagree light during initial climb out or on approach with slats at mid or extend.

I. The autoslat system is tested automatically with weight on wheels, when flap/slat handle is moved from "0" degrees RET position and slats reach a mid slat position. A valid test is indicated by illumination of auto slat extend (AUTO) light momentarily on center instrument panel and an invalid test illuminates the Auto Slat Do Not Use light (or on aircraft with EOAP, the Auto Slat Fail Legend) on overhead annunciator panel.

The auto slat portion of stall warning computer provides independent left and right outputs to extend both auto slat actuators. Each computer is capable of retracting only it's respective actuator. The auto slat actuators operate a push-pull mechanical arrangement, thus to be more precise, one actuator extends and the other retracts.

J. Flap/slat handle switch S1-467 "D" segment, L/H weight on wheels, and CADC No. 1 IAS valid inputs are used by stall warning computer No. 1; while stall warning computer No. 2 uses inputs from flap/slat handle switch S1-467 "A" segment, R/H weight on wheels, and CADC No. 2 IAS valid.

K. The status test panel and EFIS flight fault review features can be used to aid in isolating weight on wheels failures to a specific sensor.

L. Autoslat Actuator

Table 105

COMPONENT SPECIFICATIONS	
Stroke, Length Stroke Elapsed Time, STP to STP FWD Actuator, Plug Number AFT Actuator, Plug Number	0.71(±.05) inch (18(±1.27) mm) 1.5 Seconds (MAX) P1-670/Item M1-77 to SWC -2 P1-669/Item M1-76 to SWC -1
Actuator Plug Pinouts	Function
A b d e f h k	Motor Ground 28 VDC Extend 10 VDC Excit. No. 1 ACTR, Common No. 2 ACTR Position feed back (wiper) from ACTR Common No. 1 ACTR, 10 VDC Excit. No. 2 ACTR 28 VDC Retract Case Ground
Actuator Pot:	Resistance:
Pin D to F Pin E to F EXT Pin E to F RET	10,000 Ohms 7,000 Ohms 3,000 Ohms

M. Stall Warning Computer No. 1 Power Inputs

Table 106

B1-487	Stall Warn 1 and Auto Slat	S30-26-13	J1B-8	28VDC
B1-858	Auto Slat Ext/Fail Logic	S30-119-9/69	J1A-3/4	28VDC
B1-589	Capts Stall Warning 1	S30-28-14	J1B-1	115VAC
B1-838	Stall Warn 1/Alpha/Flap	S30-25-7	J1B-6	28VAC
B1-26	Stall Warn 2 and Autoslat	S30-48-97	J1A-30	28VDC

Table 106 (Continued)

B1-550	Stall Ind Fail	S30-28-11/12	J1B-13	28VDC

N. Stall Warning Computer No. 2 Power Inputs

Table 107

B1-26	Stall Warn 2 and Auto Slat	S30-118-97	J1B-8	28VDC
B1-858	Auto Slat Ext/Fail Logic	S30-119-9/69	J1A-3/4	28VDC
B1-590	F/O Stall Warning	S30-119-96X	J1B-1	115VAC
B1-837	Stall Warn 2/Alpha/Flap	S30-119-95	J1B-6	28VAC
B1-487	Stall Warn 1 and Autoslat	S30-26-13	J1A-30	28VDC
B1-550	Stall Ind Fail	S30-28-11/12	J1B-13	28VDC

O. Stall Warning Computer No. 1 Synchro Excitation and Grounds

Table 108

B1-838 Stall Warn No. 1 Alpha/Flap	S30-25-7	J1B-6	28VAC
Alphavane Xmtr No. 1	P1-648-C (Synchro Excit)		28VAC
	P1-648-T (Synchro Gnd)		0 Ohms
Flap Xmtr No. 1	P1-603-T (Synchro Excit)		28VAC
	P1-603-S (Synchro Gnd)		0 Ohms
Stabilizer Xmtr No. 1	P1-707-B (Synchro Excit)		28 VAC
	P1-707-A (Synchro Gnd)		0 Ohms

P. Stall Warning Computer No. 2 Synchro Excitation and Grounds

Table 109

B1-837 Stall Warn No. 2 Alpha/Flap	S30-119-95	J1B-6	28VAC
Alphavane Xmtr No. 2	P1-649-C (Synchro Excit)		28VAC
	P1-649-T (Synchro Gnd)		0 Ohms
Flap Xmtr No. 2	P1-602-T (Synchro Excit)		28VAC
	P1-602-S (Synchro Gnd)		0 Ohms
Stabilizer Xmtr No. 2	P1-706-B (Synchro Excit)		28 VAC
	P1-706-A (Synchro Gnd)		0 Ohms

Q. If only one stall warning computer is displaying a failure or difference fault or faults, stall warning computers should be interchanged and retested prior to proceeding. (STALL WARNING COMPUTER - MAINTENANCE PRACTICES, PAGEBLOCK 34-19-02/201) If faults follow a respective computer to other system, remove and replace that stall warning computer. If faults do not follow a respective stall warning computer, troubleshoot system to isolate fault and repair as required.

R. If Ground Shift (GND SNS) or Weight On Wheels (WOW) are suspected to be causing vane failure or vane difference faults, the faulted computer may aid in isolating problem to either left or right GND SNS or WOW. A faulted No. 1 stall warning computer would be related to left WOW or GND SNS and faulted No. 2 stall warning computer would be related to right WOW or GND SNS (Stall Indication Failure Light will be ON).

NOTE: Flight Mode = Open Circuit Ground Mode = 0 Ohms (Grounded)

Table 110

L/H WOW	SWC-1	J1B-21	S30-25-5A	STA 160
L/H GND Shift	SWC-1	J1B-20	S30-25-6A	STA 160
R/H WOW	SWC-2	J1B-21	S30-119-39X	STA 110
R/H GND Shift	SWC-2	J1B-20	S30-119-39A	STA 110
NOTE: The DFGC and EFIS flight fault review features can be used to aid in isolating WOW and GND SNS failures to a specific sensor or relay. A GND SNS or WOW failure causing Stall Indication Failure light will normally cause stall warning computer to log into memory or display an Angle Of Attack difference or fail fault.				

S. To troubleshoot suspected Proximity Switch Electronic Unit or sensor problems, perform automatic system test of PSEU. Record results and note faults. If faults indicate an internal component failure, remove and replace PSEU. If fault indicates a failure external to PSEU, perform sensor status monitor test of failed sensor and repair as required.

T. Slat Proximity Outputs to Stall Warning Computers No. 1 and 2:

(1) Primary

Table 111

	PRIMARY SWC #1 PRIMARY SWC #2		**PRIMARY #1**		**PRIMARY #2**		
PRIMARY	Valid	J1B-38	S30-25-4	STA 160	S30-119-89	STA 110	28VDC
	RET	J1B-39	S30-25-1	STA 160	S30-119-92	STA 110	RET*
	MID	J1B-40	S30-25-2	STA 160	S30-119-91	STA 110	MID*
	EXT	J1B-41	S30-25-3	STA 160	S30-119-90	STA 110	EXT*

(2) Alternate

	ALTRNAT SWC #1 ALTRNAT SWC #2		**ALTRNAT #1**		**ALTRNAT #2**		
ALTERNATE	RET	J1A-44	S30-119-92	STA 110	S30-25-1	STA 160	RET *
	MID	J1A-43	S30-119-91	STA 110	S30-25-2	STA 160	MID *
	EXT	J1A-42	S30-119-90	STA 110	S30-25-3	STA 160	EXT *
	Valid	J1A-45	S30-119-89	STA 110	S30-25-4	STA 160	28VDC

(Continued)

ALTRNAT SWC #1 **ALTRNAT SWC #2**	**ALTRNAT #1**		**ALTRNAT #2**		

NOTE: * 28 VDC when slats in position noted.
0 VDC when slats not in position noted.

U. A maintenance test is used to further isolate faults that are present at the time. This is accomplished by setting input sensors to a specific value and comparing it to reference signal in the stall warning computer. In comparison, if input signal is not within tolerance of reference signal, cross monitor circuitry will turn on system difference indicators on stall warning computer front panel. The computer difference will only be indicated in absence of all other line replaceable unit faults or differences.

(1) Test values:

Table 112

SENSOR	SETTING	TOLERANCE
Alpha	Mid 0 Degree	± 2
Flap	0 Degree	± 3.4 Degrees
Slat	RET	
Stabilizer	5 Degrees Nose Up	± 1.2 Degrees
NOTE: Status test panel sensor values can be used to verify physical position of sensor. It must be remembered that no electrical interface exists between Stall Warning and Flight Guidance.		
NOTE: Due to maintenance test tolerance and cross monitor tolerance within stall warning computer, a dead band exists at both ends of tolerance range where no lights will illuminate on front panel of stall warning computer. If this should occur, sensors should be reset to maintenance test position using voltage measurement method and maintenance test re-run to verify a successful test.		

V. The stall warning test plug on front panel of each stall warning computer can be used as an aid in troubleshooting, setting sensors for maintenance test, and for checking linearity.

(1) Test value table:

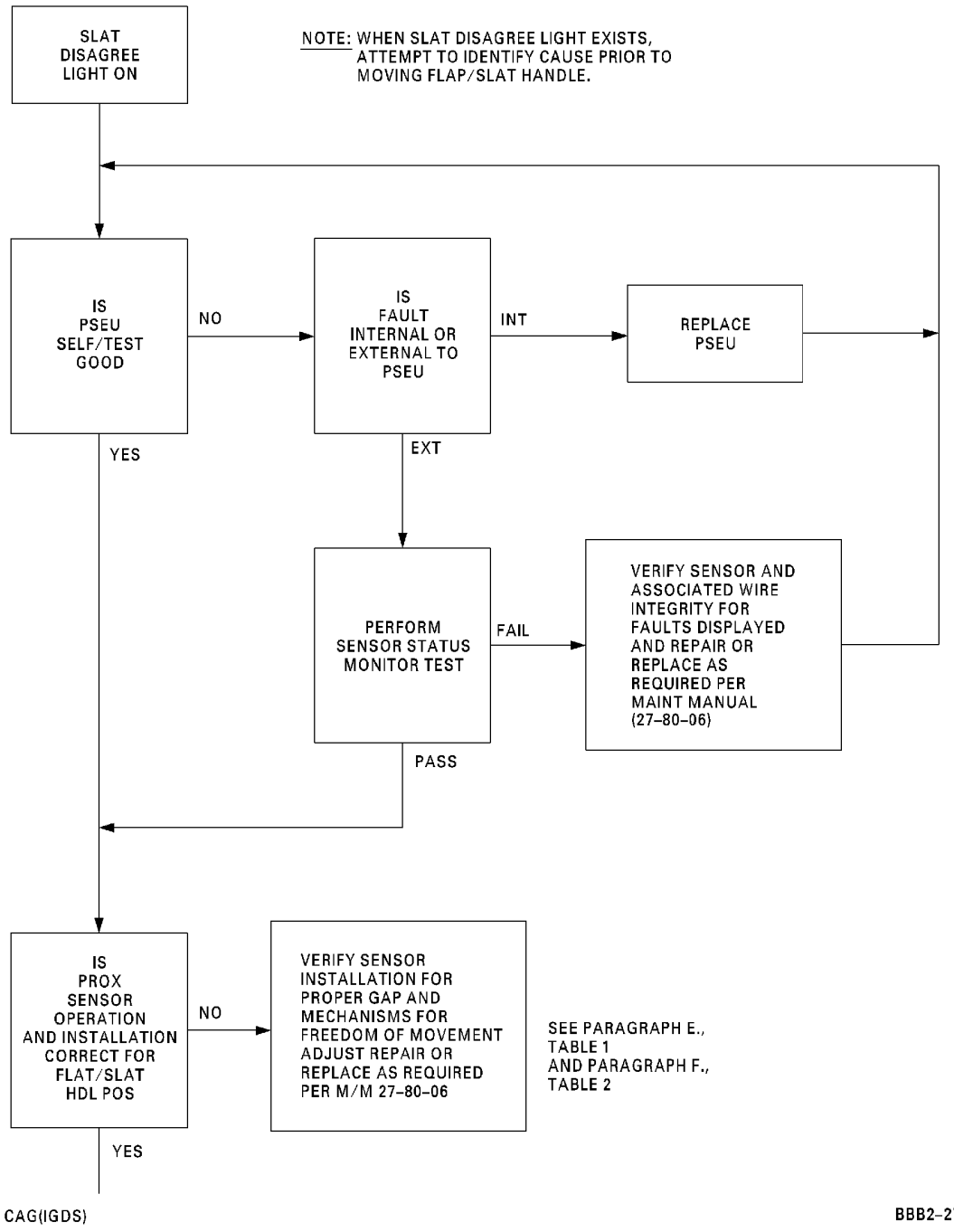
Table 113

PIN	FUNCTION	POSITION	VOLTAGE	
1	Ground			
2	Alpha	Mid Scribe	0	±0.8 VDC*[1]
		1st Scribe Up	-4.05	±0.2 VDC
		2nd Scribe Up	-8.10	±0.2 VDC
		3rd Scribe Up	-12.15	±0.2 VDC
		1st Scribe Dn	4.05	±0.2 VDC
		2nd Scribe Dn	8.10	±0.2 VDC
		3rd Scribe Dn	12.15	±0.2 VDC
a) Each degree of AOA Vane movement from "0" degree (null) thorough 30 degrees full travel UP or DOWN, equals 0.4 VDC per degree.				

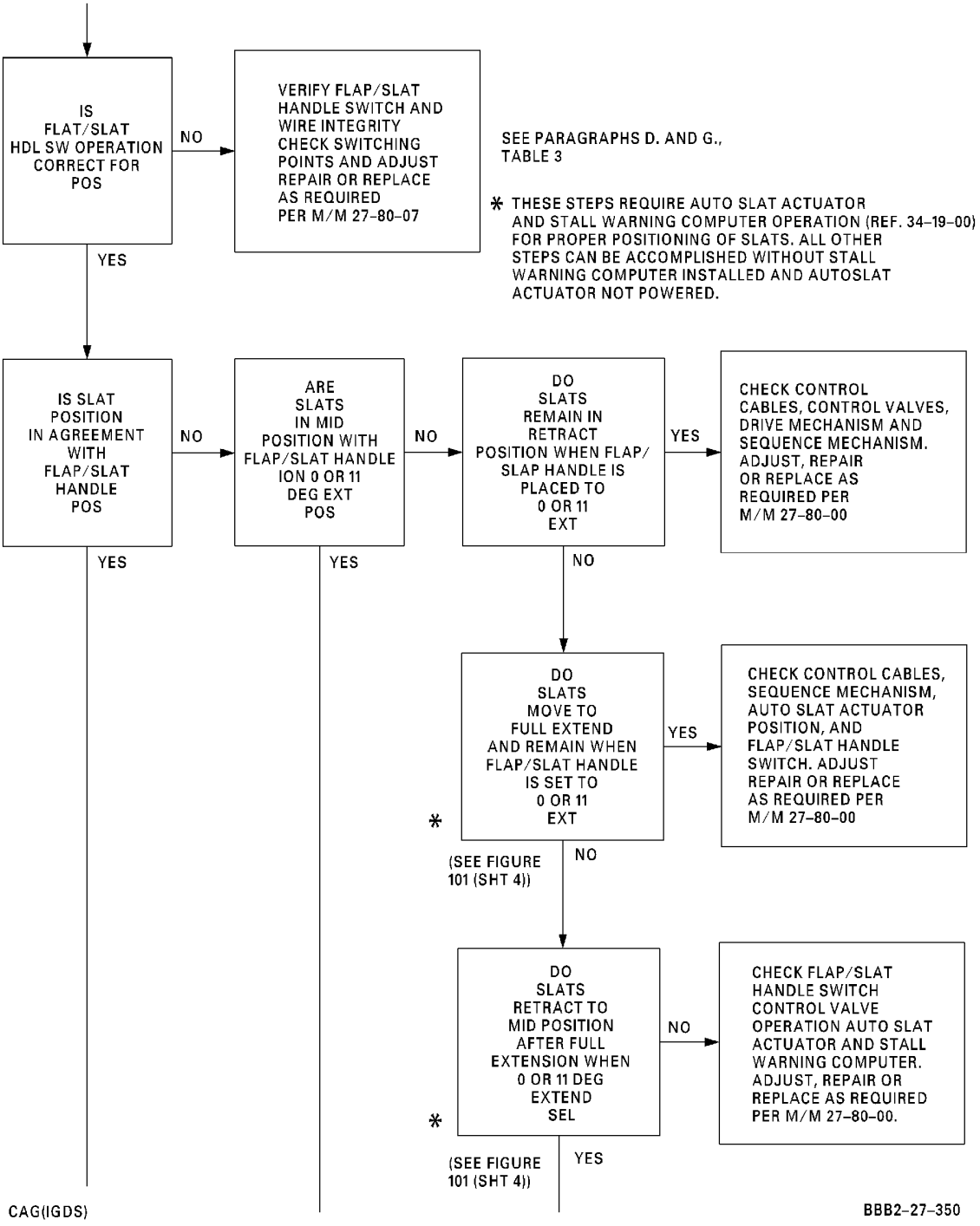
Table 113 (Continued)

PIN	FUNCTION	POSITION		VOLTAGE	
b) Each scribe mark equals 10 degrees of AOA vane movement.					
4	Flap	0 Degrees		0	±0.5 VDC*[1]
		40	Degrees	6.00	±0.4 VDC
a) Each degree of flap travel from 0 degree (full up) through 40 degrees (full extend) equals 0.15 VDC per degree.					
23	Stabilizer	1.6 Degrees NU		0	±-.2 VDC
		5.0 Degrees NU		2.83	±1.0 VDC*[1]
		10.0 Degrees NU		7.00	±0.3 VDC
a) Each degree of travel of horizontal stabilizer from null point of 0 VDC or 1.6 degree stabilizer nose up, equals 0.833 VDC per degree					

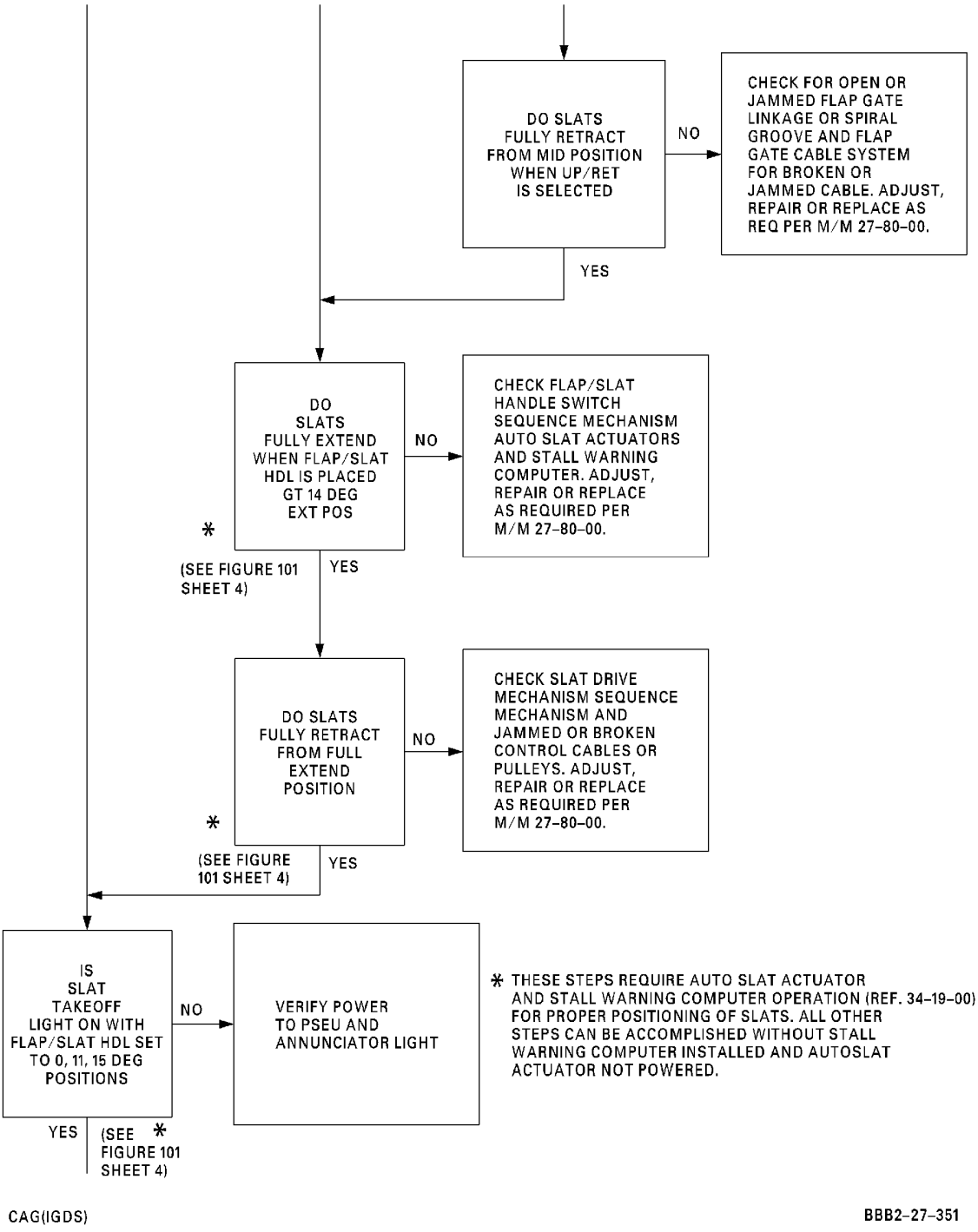
*[1] *Settings for Maintenance Test



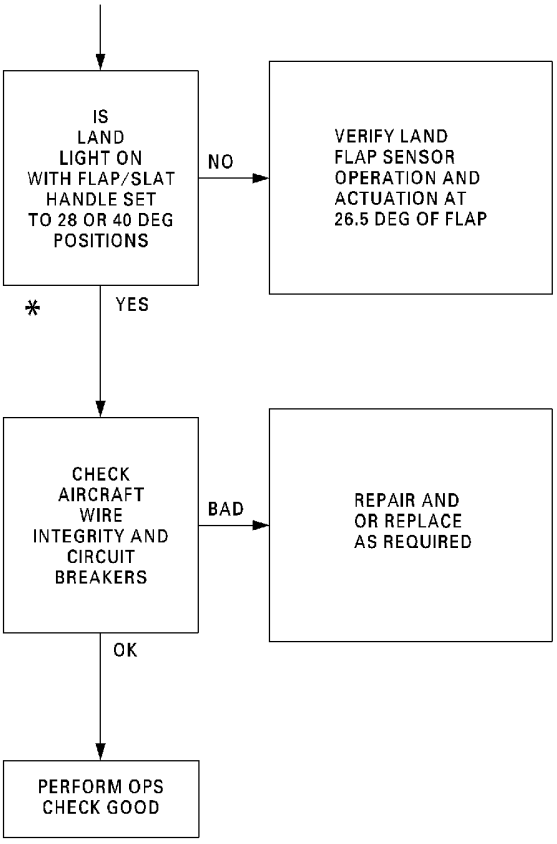
Slat Disagree Light On -- Fault Isolation
Figure 101/27-81-00-990-801 (Sheet 1 of 4)



Slat Disagree Light On -- Fault Isolation
Figure 101/27-81-00-990-801 (Sheet 2 of 4)



Slat Disagree Light On -- Fault Isolation
Figure 101/27-81-00-990-801 (Sheet 3 of 4)



* THESE STEPS REQUIRE AUTO SLAT ACTUATOR AND STALL WARNING COMPUTER OPERATION (REF. 34–19–00) FOR PROPER POSITIONING OF SLATS. ALL OTHER STEPS CAN BE ACCOMPLISHED WITHOUT STALL WARNING COMPUTER INSTALLED AND AUTOSLAT ACTUATOR NOT POWERED.

CAG(IGDS)

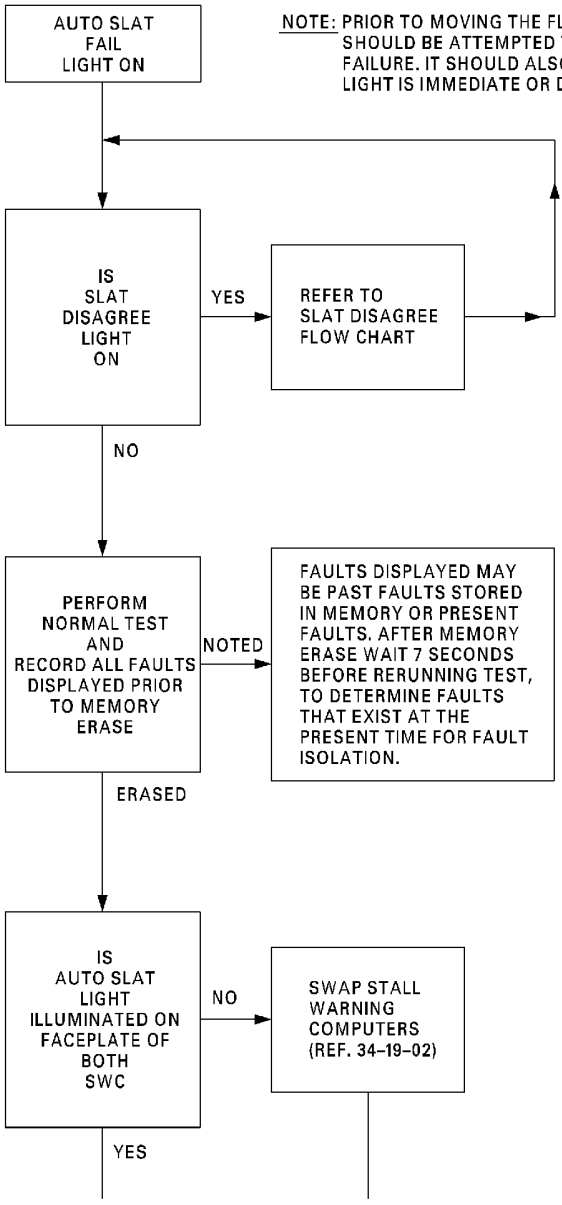
BBB2–27–352

Slat Disagree Light On -- Fault Isolation
Figure 101/27-81-00-990-801 (Sheet 4 of 4)

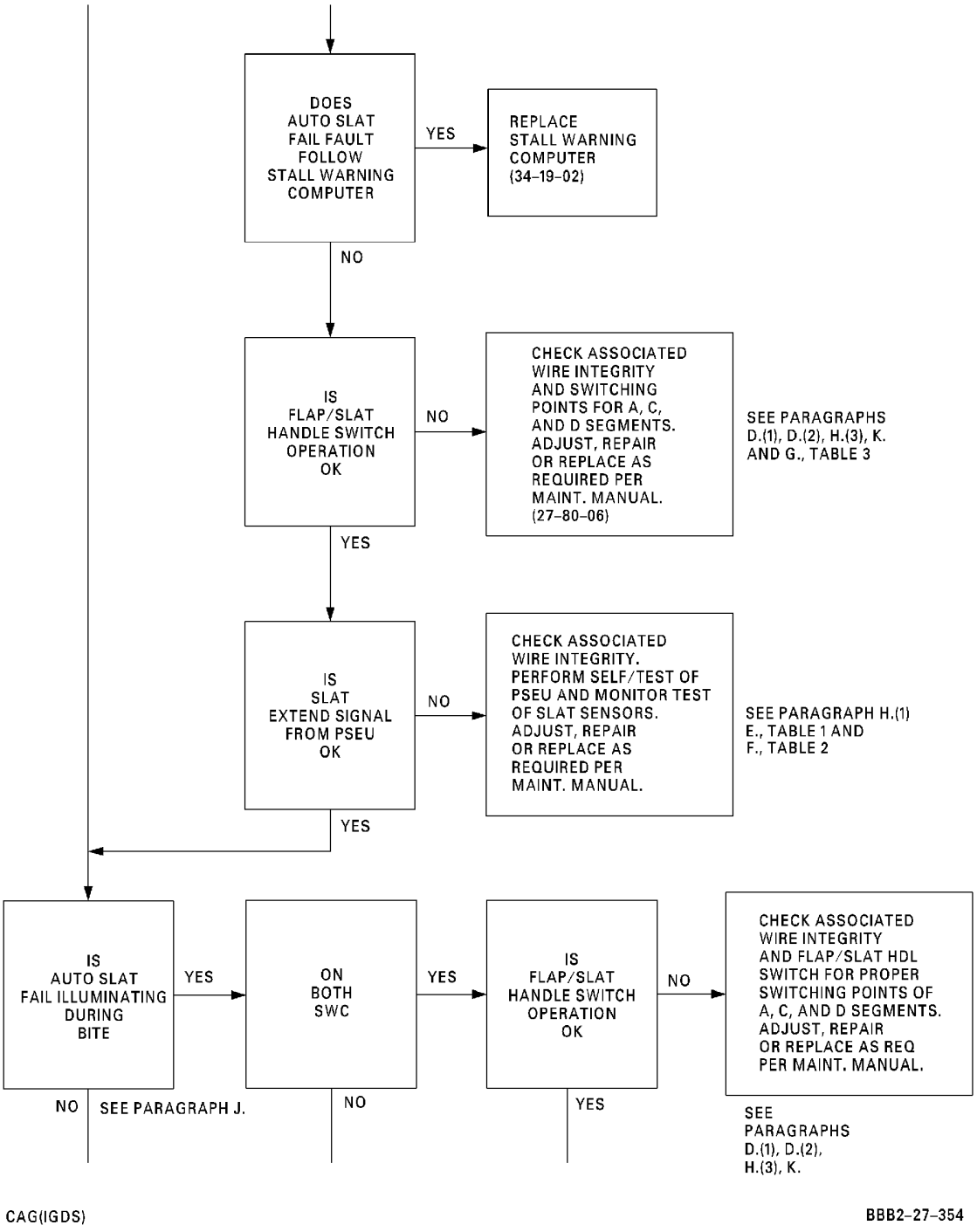
TEST POINTS, FUNCTION, AND VOLTAGE				
FUNCTION	REAR CONN.	SWC #1 TERM PT	SWC #2 TERM PT	VOLTAGE
1) IAS Valid	J1A-27	S30-110-23 STA110	S30-115 28 STA110	28VDC
2) WOW (On Ground)	J1B-21	S30-25-5A- STA160R	S30-119-39X STA110	GND
3) Flap Handle (C) (RET)	J1A-25	S30-119-1 STA110	S30-210-19 STA218	12VDC
4) Actuator (Ref)	J1B-24	S30-28-21X STA160R	S30-119-85X STA110	10VDC
5) Actuator (Com)	J1B-23	S30-28-21X STA160R	S30-119-85X STA110	GND
6) Actuator (Ext Pos)	J1B-25	S30-28-22X STA160R	S30-119-87A STA110	> 6.3VDC
7) Actuator (Ret Pos)	J1B-25	S30-28-22X STA160R	S30-119-87A STA110	< 3.7VDC
8) Slat Ext	J1B-35	S30-28-23 STA160R	S30-119-86 STA110	28VDC
9) Slat Ret	J1B-34	S30-28-23 STA160R	S30-119-40A STA110	28VDC
10) F/S Handle (A > 14 deg)	J1A-8		S30-119-88A STA110	12VDC
11) F/S Handle (A < 14 deg)	J1A-9		S30-119-88A STA110	12VDC
12) F/S Handle (D > 14 deg)	J1A-8	S30-28-24A STA160R		12VDC
13) F/S Handle (D < 14 deg)	J1A-D	S30-28-24X STA160R		12VDC

BBB2-27-361A

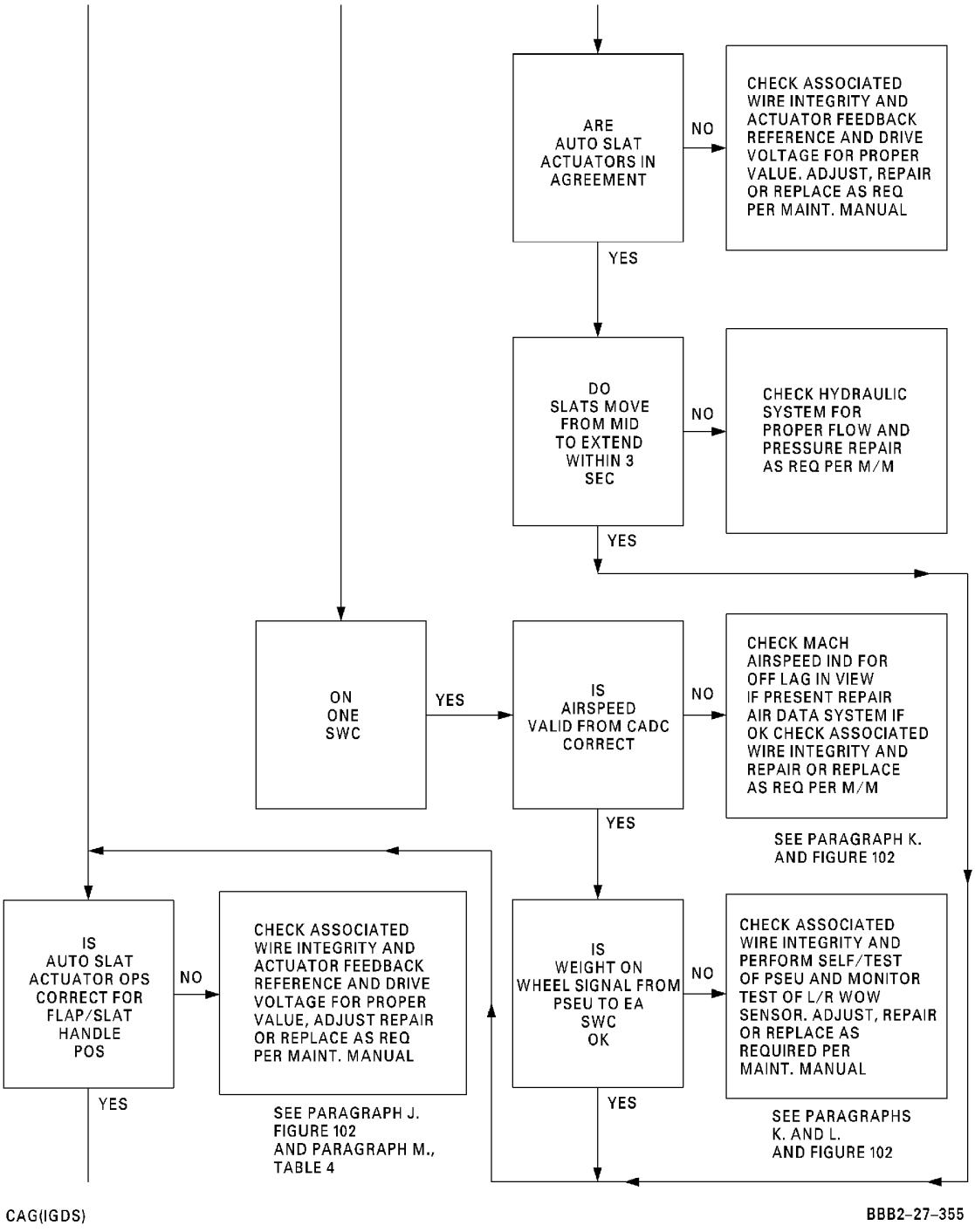
Auto Slat Fail Light On -- Test Points, Function and Voltage
Figure 102/27-81-00-990-802



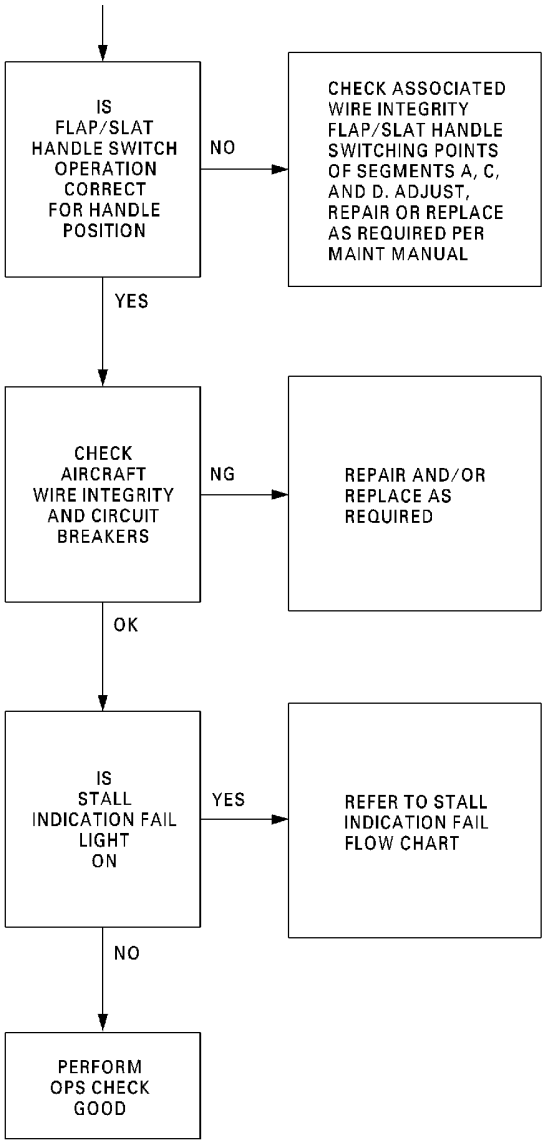
Auto Slat Fail Light On -- Fault Isolation
Figure 103/27-81-00-990-803 (Sheet 1 of 4)



Auto Slat Fail Light On -- Fault Isolation
Figure 103/27-81-00-990-803 (Sheet 2 of 4)



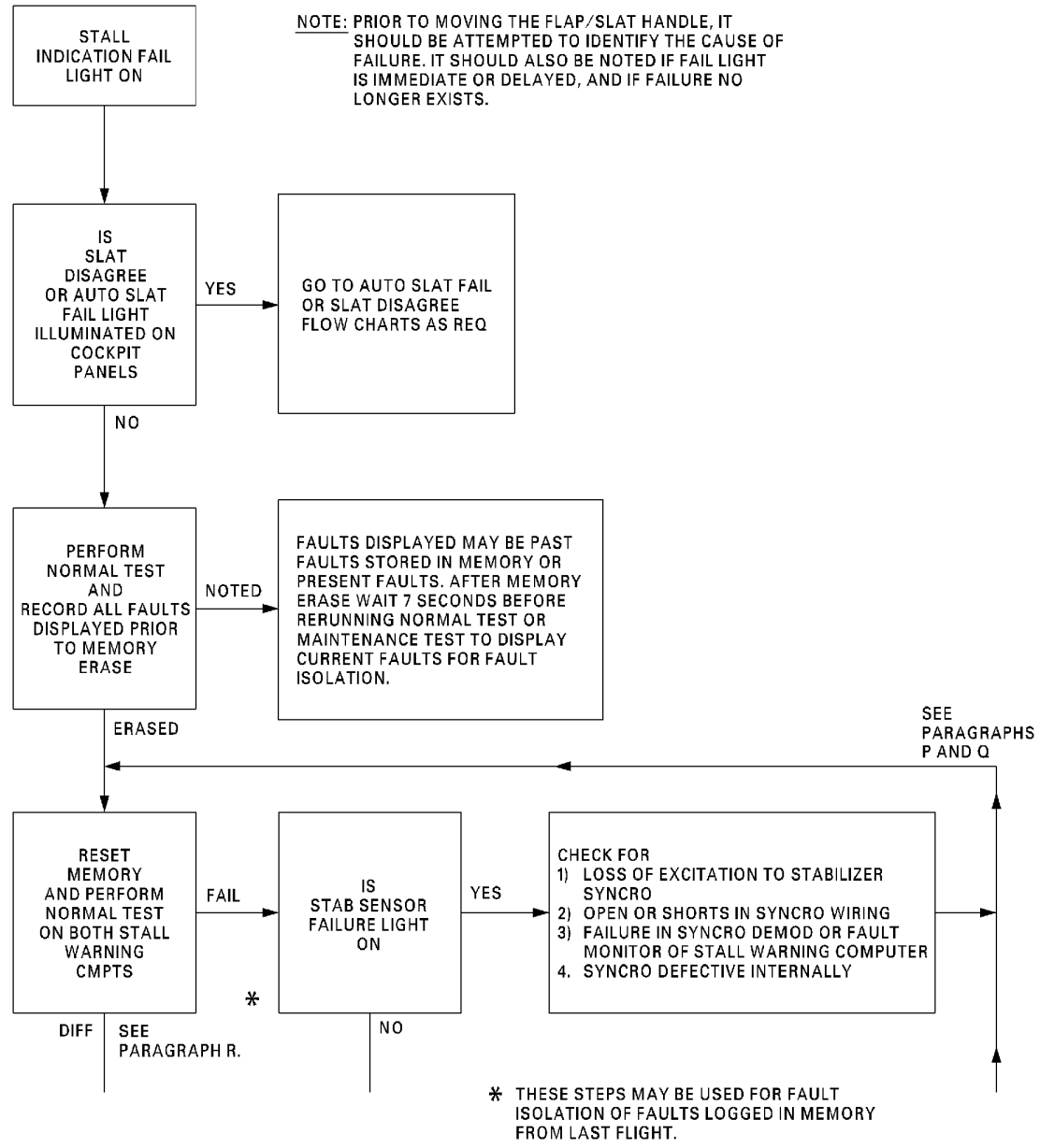
Auto Slat Fail Light On -- Fault Isolation
Figure 103/27-81-00-990-803 (Sheet 3 of 4)



CAG(IGDS)

BBB2–27–356

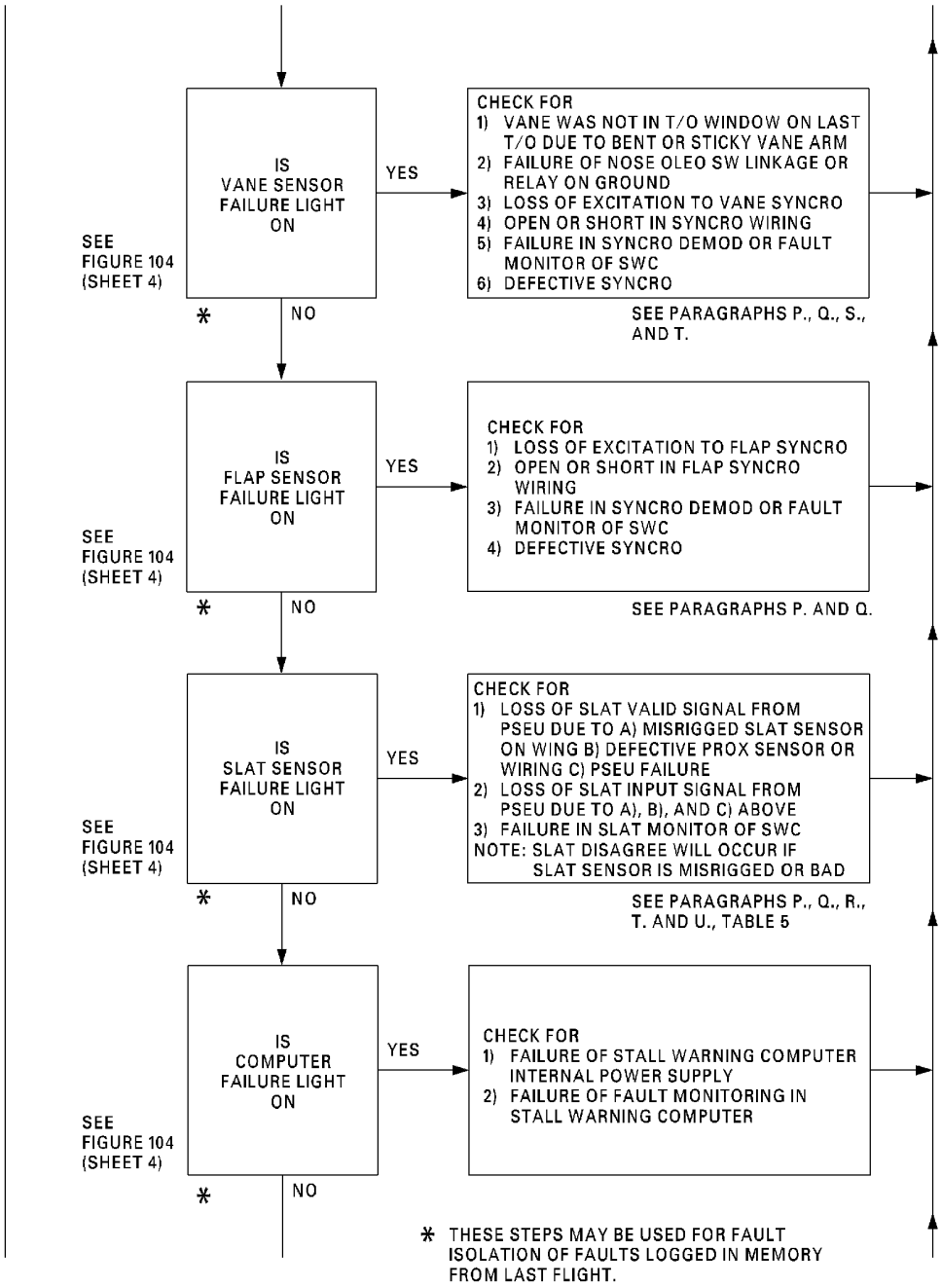
Auto Slat Fail Light On -- Fault Isolation
Figure 103/27-81-00-990-803 (Sheet 4 of 4)



CAG(IGDS)

BBB2–27–357

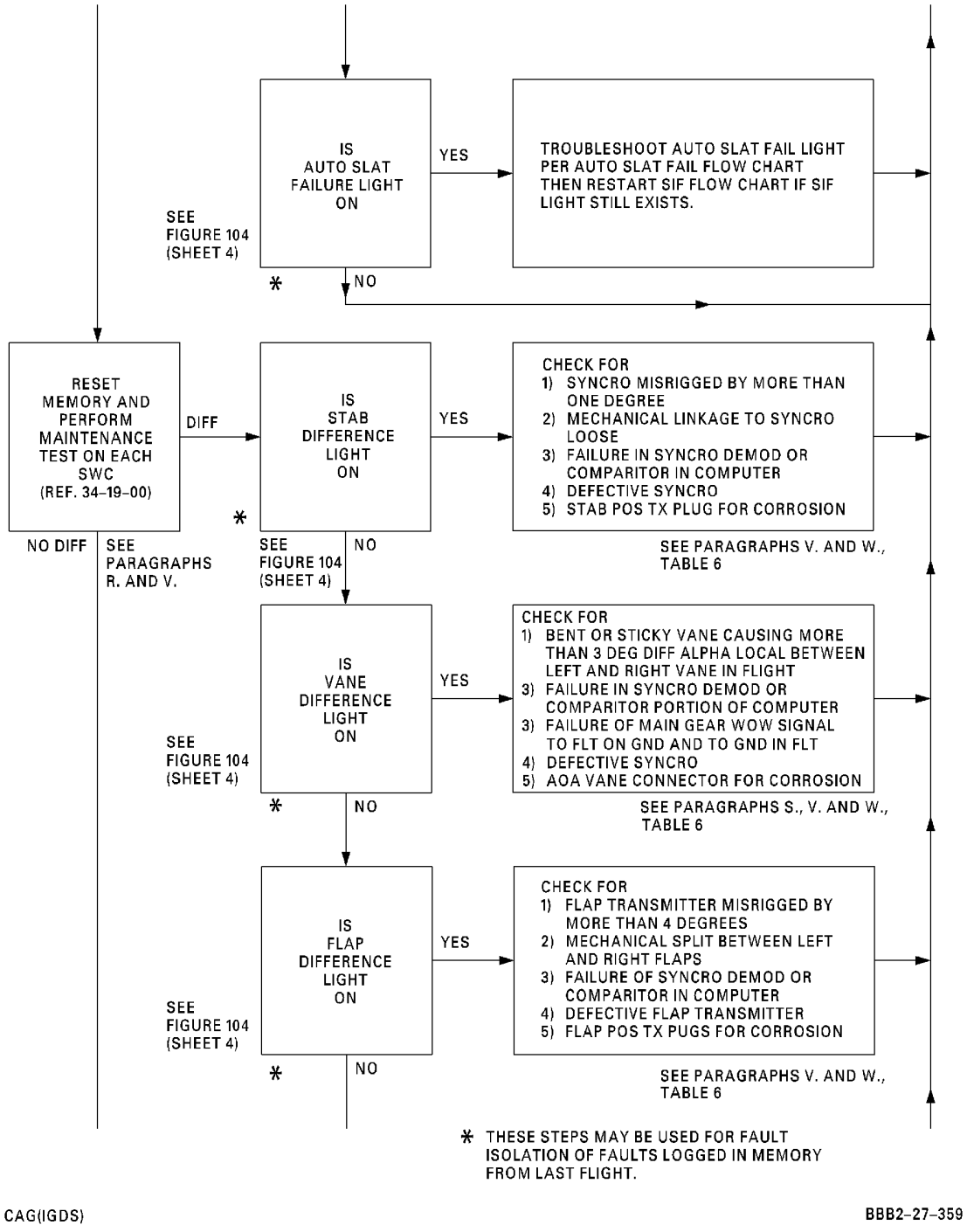
Stall Indication Fail Light On -- Fault Isolation
Figure 104/27-81-00-990-804 (Sheet 1 of 4)



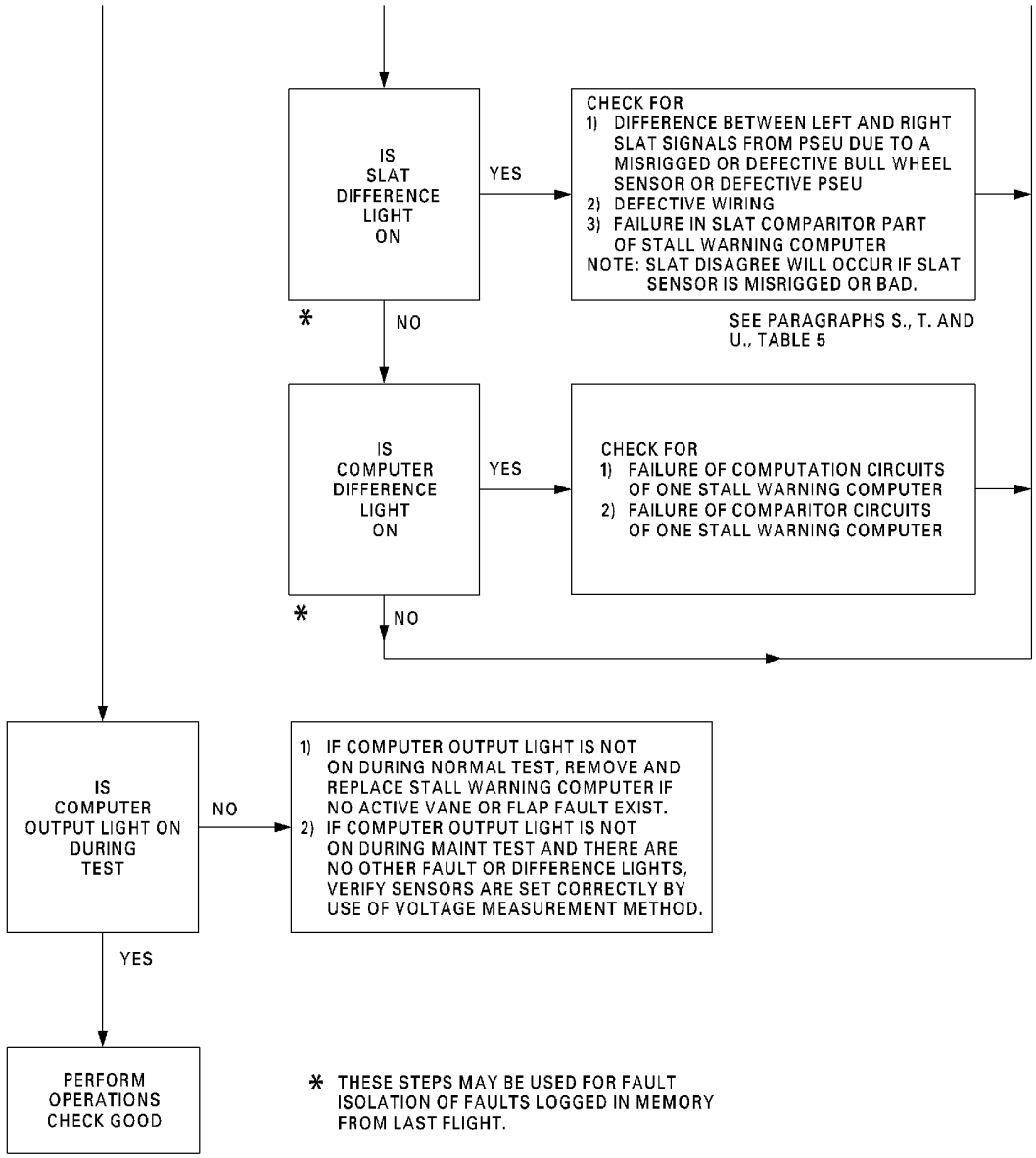
CAG(IGDS)

BBB2–27–358

Stall Indication Fail Light On -- Fault Isolation
Figure 104/27-81-00-990-804 (Sheet 2 of 4)



Stall Indication Fail Light On -- Fault Isolation
Figure 104/27-81-00-990-804 (Sheet 3 of 4)



CAG(IGDS)

BBB2–27–360

Stall Indication Fail Light On -- Fault Isolation
Figure 104/27-81-00-990-804 (Sheet 4 of 4)

SLAT DRIVE MECHANISM ASSEMBLY - REMOVAL/INSTALLATION

1. General

A. The slat drive drum is actuated by the left and right hydraulic drive cylinders. It contains twelve grooves from which six closed cable loops are routed to the left wing slats and six to the right wing slats.

B. The slat drive drum moves cables which control movement of leading edge wing slats in either extend or retract direction, as selected through flight deck controls.

C. Removal and installation of the slat drive drum requires removal of the entire slat drive mechanism assembly to gain access to the drum. Slat drive drum replacement should be performed with entire assembly outside the aircraft.

D. Location of slat drive mechanism and drum is on wing front spar in the wing center section under main passenger cabin floor in aft end of mid cargo compartment. The area is accessible through the mid cargo door.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 401 Equipment and Materials

Name and Number	Manufacturer
Roller Track Tool 5952435-1	Douglas Aircraft Co.
Torque wrench (0-250 inch pounds) (0-28.25 N·m)	
Torque wrench (0-600 inch pounds) (0-67.8 N·m)	
Lockwire, NASM20995N51, DPM684*[1]	Not specified
Lockwire, NASM20995N40, DPM684*[1]	Not specified
2" x 4" Lumber, (approximate. 6 feet long) (50 x 101 x 1828.8 mm) (3 pieces)	
1" thick x 4" (25 thick x 101 mm) (square blocks)	
Sealant, PR-1422 B-2 DMS 2082	Courtaulds Aerospace Inc. Glendale, CA

Table 401 Equipment and Materials (Continued)

Name and Number	Manufacturer
Compound, corrosion preventive, transparent, non-tacky film, cold application (MIL-C-16173, Grade 4) DPM 667-1	Bray Products Div. Castrol, Inc. Irvine, CA

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Slat Drive Mechanism Assembly

A. Remove Slat Drive Mechanism Assembly From Aircraft

(1) Remove and retain access panels 5107C and 5138C, and attaching hardware, and remove vertical stiffener located on center line of aircraft just forward of slat drive mechanism.

WARNING: BEFORE PRESSURIZING SYSTEMS, MAKE CERTAIN THAT LANDING GEAR LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING SLAT/FLAP HANDLE, MAKE CERTAIN THAT AREAS AROUND SLATS AND FLAPS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(3) Fully extend slats by placing slat/flap handle in 40/Land detent. (Tag handle.)

WARNING: BEWARE OF CONTROL SURFACES AND LINKAGE AFFECTED BY HYDRAULIC POWER. BEFORE DISCONNECTING CONTROL CABLES OR LINKAGE TO SURFACE ACTUATOR VALVES, DEPRESSURIZE HYDRAULIC SYSTEMS. DURING ADJUSTMENT PROCEDURES THAT REQUIRE HYDRAULIC PRESSURE, BEWARE OF CONTROLS AND CONTROL SURFACES AFFECTED BY HYDRAULIC PRESSURE.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(4) Depressurize left and right hydraulic systems. (Tag hydraulic system switches.) (PAGEBLOCK 29-00-00/201)

(5) Disconnect hydraulic lines from actuating cylinders in drive mechanism. Plug open hydraulic lines and cap open cylinder fittings. Remove both actuating cylinders from slat drive mechanism and retain in aircraft for installation. (Figure 401)

(6) Remove clamps attaching hydraulic lines to drive mechanism.

(7) Remove turnbuckles "G" and "H" from slat follow-up cables 253A, 254A, 253B and 254B. (Figure 401, View C) Secure cables as necessary to retain cable routing. Remove follow-up cable from top of slat drive cable drum.

(8) Remove turnbuckles "E" and "F" from flap control cables 245A, 246A, 245B and 246B. Secure cables as necessary to retain cable routing. Remove and retain two pulleys and attaching parts from cable drum support bracket assembly. (Figure 401, View C)

NOTE: Access to turnbuckles (E) and (F) is through cabin floor panel above center wing between stations Y880 and Y920.

(9) Remove and retain slat drum support bracket and attaching parts. (Figure 401, View C)

(10) Remove and retain slat cable drum rear cable guard pin bracket assembly and attaching parts. (Figure 402, View E)

(11) Remove and retain slat cable drum forward cable guard pin bracket assembly and attaching parts. (Figure 402, View E)

(12) Remove 12 slat drive cable drum cotter pins and guard pins. Retain guard pins. (Figure 401, Views A and B)

CAUTION: CABLE TENSIONS MUST BE REDUCED SYMMETRICALLY ON BOTH WINGS IN TURN. EXAMPLE: LOWER SLAT "0" LEFT AND THEN SLAT "0" RIGHT, PRIOR TO LOWERING SLAT CABLES NUMBER 1 LEFT AND RIGHT.

CAUTION: INSTALL CABLE BLOCKS ON ALL SLAT OPERATING CABLES AS REQUIRED TO RETAIN CABLE ROUTING PRIOR TO LOOSENING OR DISCONNECTING ANY CABLE TURNBUCKLES.

(13) Loosen turnbuckles for slat drive cables and remove cable swages from slat drive drum. Make certain that each cable is adequately secured and stowed as it is removed to avoid damage. (Table 402) (Figure 401, Views A and B)

NOTE: Tie string between cable ends to retain cable routing. Tag and identify cables to facilitate cable installation/tensioning.

(14) Place boards (3 pieces approx. 2" x 4" x 6 feet long) (50.8 x 101.6mm) under drive mechanism, extending from cargo floor, above structural frame under drive mechanism, and aft to front spar. Support aft end of 2" x 4" (50.8 x 101.6 mm) boards with 1" thick x 4" (25.4 thick x 101.6 mm) square blocks. Support weight of slat drive mechanism.

(15) Remove and retain two H strut assemblies and attaching parts from wing center section front spar and slat actuating mechanism support bracket. (Figure 402, View C)

(16) Remove and retain four bolts and associated hardware attaching slat cable drum support bracket assembly to wing center section front spar for installation. (Figure 402, View C)

(17) Disconnect struts and barrel assemblies, A, B, C, D, E, F, G and H from slat drive mechanism and drum assembly. Do not change adjustment of struts and barrel assemblies (Figure 401).

CAUTION: WEIGHT OF MECHANISM AND DRUM ASSEMBLY WITHOUT ACTUATING CYLINDERS IS APPROXIMATELY 260 LBS. (117 KILOGRAMS). EXTREME CARE SHOULD BE TAKEN WHEN REMOVING OR INSTALLING UNIT TO AVOID DAMAGE TO CARGO COMPARTMENT FLOOR, SIDEWALL LINING, OTHER SURROUNDING STRUCTURE AND ANY PERSONNEL INJURIES.

(18) Supporting each end of drive mechanism, carefully lower mechanism and drum assembly to rest on boards. While lowering, rotate bottom of assembly forward, maintaining clearance from surrounding structural and systems components in immediate area.

Table 402 Table I

SLAT NO.	CABLE SEGMENT NO.		TURNBUCKLE NO.	WING ACCESS PANEL NO.	
	LEFT	RIGHT		LEFT	RIGHT
0	209 210	225 226	J A	5138C	5107C
1	211 212	227 228	B K	1160C/1165C	1263C/1244C

Table 402 Table I (Continued)

SLAT NO.	CABLE SEGMENT NO.		TURNBUCKLE NO.	WING ACCESS PANEL NO.	
	LEFT	RIGHT		LEFT	RIGHT
2	213 214	229 230	L C	1132C/1165C	1249C/1242C
3	215 216	231 232	M D	1160C/1165C	1263C/1242C
4	217 218	233 234	N E	1163C/1165C	1244C/1242C
5	219	235	F	1160C/1163C	1263C/1244C

(19) Place plywood over center floor from work area to mid cargo door.

(20) Move drive mechanism forward to mid cargo door and remove assembly from aircraft.

B. Remove Slat Drive Drum from Rail Assembly

NOTE: Procedures for removing slat drive drum from slat drive mechanism rail assembly are best accomplished with entire unit removed from aircraft. Removal steps are similar to those for removing/installing rail assembly only in the aircraft. (LIFT AUGMENTING SLATS - REMOVAL/INSTALLATION, PAGEBLOCK 27-80-01/401)

(1) Remove eight bolts attaching cable drum to support/pivot assembly adapter. Discard eight nuts. Retain bolts and washers for reinstallation. (Figure 402, View F)

(2) Remove cable drum from shaft/support adapter assembly.

(3) Remove and retain proximity sensor brackets, proximity targets support assembly and attaching parts from top of slat cable drum. (Retain sensor brackets, support assembly and attaching parts for reinstallation on new slat drive drum. (Figure 402, View C)

(4) Remove six bolts attaching pivot assembly to cable drive drum. Discard six nuts. Retain bolts and washers for reinstallation. (Figure 402, View C)

C. Install Slat Drive Drum on Rail Assembly

NOTE: Procedures for installing slat drive drum on slat drive mechanism rail assembly are best accomplished with entire unit removed from aircraft. Installation steps are similar to those for removing/installing rail assembly only in the aircraft. (LIFT AUGMENTING SLATS - REMOVAL/INSTALLATION, PAGEBLOCK 27-80-01/401)

(1) Install retained pivot on new slat drive drum, using (6) retained attaching bolts and washers, with new nuts. Tighten nuts to torque of 288-414 inch-pounds (32.5-46.8 N·m).

(2) Install retained proximity sensor brackets, proximity targets support assembly and attaching parts on top of slat drive cable drum. (Figure 402, View C) Tighten nuts to torque of 50-70 inch-pounds (5.7-7.9 N·m).

(3) Install slat drive drum on shaft/adapter assembly. Align indexing hole in adapter with indexing pin in drum. Adjust drum on adapter as required to obtain a gap of 0.005-0.010 inch (0.13-0.25 mm) all around periphery of adapter.

WJE 401-409, 411, 412, 414-427, 429, 861-866, 868, 869, 871-874, 880, 881, 883, 884, 886, 887, 891-893

WARNING: INTEGRAL FUEL TANKS SEALING COMPOUND (POLYSULFIDE SEALANT B1/2 AND B2) IS AN AGENT THAT IS POISONOUS AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN INTEGRAL FUEL TANKS SEALING COMPOUND IS USED.

- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET INTEGRAL FUEL TANKS SEALING COMPOUND IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS MSDS FOR:

- MORE PRECAUTIONARY DATA.
- APPROVED SAFETY EQUIPMENT.
- EMERGENCY MEDICAL AID.
- TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(4) Install retained bolts and washers, with new nuts (8 places) in diametrical opposing pattern in drum and adapter flanges. Make adapter wet with sealant. Measure dimension (X) and install washers between nut and adapter to fill gap. (Figure 402, View E) Tighten nuts to torque of 400-450 inch-pounds (45.2-50.9 N·m). Torque stripe nuts.

NOTE: DAC Service Bulletin 27-279.3 recommends torque values of 400-450 inch-pounds (45.2-50.9 N·m) for fastener nut part number MS21245L8. Beginning with fuselage 2030, or the completion of DAC Service Bulletin 27-279.4 or 27-279.5, fastener nut part number is EWSN22M8. The torque requirement for this nut is 1040-1140 inch-pounds (117.5-128.8 N·m).

NOTE: Quantity and thickness of washers may vary at each location.

NOTE: Make certain sufficient clearance between the bolts and top of bracket assembly exists.

WJE 410, 875-879

WARNING: INTEGRAL FUEL TANKS SEALING COMPOUND (POLYSULFIDE SEALANT B1/2 AND B2) IS AN AGENT THAT IS POISONOUS AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN INTEGRAL FUEL TANKS SEALING COMPOUND IS USED.

- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET INTEGRAL FUEL TANKS SEALING COMPOUND IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WJE 410, 875-879 (Continued)

(WARNING PRECEDES)

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS MSDS FOR:

- MORE PRECAUTIONARY DATA.
- APPROVED SAFETY EQUIPMENT.
- EMERGENCY MEDICAL AID.
- TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(5) Install retained bolts and washers, with new nuts (8 places) in diametrical opposing pattern in drum and adapter flanges. Make adapter wet with sealant. Measure dimension (X) and install washers between nut and adapter to fill gap. (Figure 402, View E) Tighten nuts to torque of 1040-1140 inch-pounds (117.5-128.8 N·m). Torque stripe nuts.

NOTE: Quantity and thickness of washers may vary at each location.

NOTE: Make certain sufficient clearance between the bolts and top of bracket assembly exists.

WJE ALL

D. Install Slat Drive Mechanism Assembly In Aircraft

CAUTION: USE CARE NOT TO DAMAGE CARGO COMPARTMENT FLOOR WHEN MOVING SLAT DRIVE MECHANISM FROM CARGO DOOR TO FRONT SPAR AREA.

(1) Place plywood over center floor from mid cargo door aft to work area.

(2) Place slat drive mechanism assembly in mid cargo compartment. Move aft to front spar area and rest on boards.

NOTE: Use of roller track tool to install slat drive mechanism is optional, based upon operators experience and own operating procedures.

(3) Adjust table on roller track tool (5952435-1) to lowest position.

CAUTION: DO NOT ALLOW SLAT DRIVE ADAPTER AND DRUM ASSEMBLY TO CONTACT AIRCRAFT STRUCTURE WHILE RAISING DRIVE MECHANISM.

(4) With drive mechanism assembly positioned, support and raise drive mechanism high enough to gain clearance for roller track tool.

(5) Remove boards from under drive mechanism and index roller track tool (5952435-1) to front spar and fasten to cargo compartment floor.

(6) Lower drive mechanism onto table and attach to table.

(7) Slowly raise table and slat drive mechanism. Utilizing table adjusting screws, carefully guide assembly into position.

(8) Connect strut and barrel assemblies, A, B, C, E, G and H to slat drive mechanism. (Figure 401).

(9) Lower adjustment pads and remove roller track tool.

(10) Measure horizontal distances at outboard ends of straight part of rails to wing front spar. Readjust struts, as necessary, so that measurements are within 0.06 inch (1.524 mm) of each other, (4 places). Tighten and safety the strut rod-end jamb nuts with .040 lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Paragraph 3.D.(10) and Paragraph 3.D.(11) only apply when struts A, B, C, D, E, or G have been replaced or adjusted, or, if slat drive mechanism being installed is different than unit removed.

(11) Measure vertical distances from upper rail at outboard ends to floor beam. Readjust struts on left side, as necessary, so that measurements are within 0.06 inch of each other (2 places). Tighten and safety the strut rod-end jamb nuts with .040 lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Paragraph 3.D.(10) and Paragraph 3.D.(11) only apply when struts A, B, C, D, E, or G have been replaced or adjusted, or, if slat drive mechanism being installed is different than unit removed.

(12) Install retained slat drive drum support bracket on slat drive drum assembly using retained attaching parts. (Figure 402, View C)

(13) Install slat cable drum support bracket assembly to wing center section front spar using four retained bolts and associated hardware. (Figure 402, View C)

(14) One at a time, install each cable swage fitting and guard pins on slat drive drum using new cotter pins. (Table 402) (Figure 401)

WARNING: USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1036, CORROSION PREVENTATIVE (DPM 665/667)

HAZMAT 1000, REFER TO MSDS

(15) One at a time, remove cable blocks and string between cable ends (as installed) and connect cable turnbuckles.

NOTE: Before connecting cable turnbuckles and tensioning cables, lubricate threaded cable end fittings (MIL-C-16173).

(16) Install rear slat drive drum cable guard bracket using retained hardware and attaching parts. (Figure 402, View E)

(17) Install forward slat drive drum cable guard bracket using retained hardware and attaching parts. (Figure 402, View E)

(18) Install control cables 245A and 246A on pulleys. Install two retained pulleys and attaching parts on cable drum support bracket assembly. (Figure 402, View E)

(19) Install turnbuckles (E) and (F) on flap control cable segments 245A, 245B and 246A, 246B. (Figure 402, View C)

NOTE: Access to turnbuckles (E) and (F) is through cabin floor panel above center wing between stations Y880 and Y920.

(20) Adjust turnbuckles (E) and (F) until tension is between minimum and maximum load per cable tension table for 1/16 inch (1.6 mm) cables. (Figure 27-50-00-990-809, Sheet 1)

(21) Install cable segments 253A and 254A on follow-up pulley on top of slat drive drum.

(22) Install turnbuckles (G) and (H) on cable segments 253A, 253B and 254A, 254B. (Figure 402, View C)

(23) Adjust turnbuckles (G) and (H) until tension is between minimum and maximum load per cable tension table for 1/16 inch (1.6 mm) cables 253A, 254A, 253B and 254B. (Figure 27-81-02-990-803)

(24) Install left and right slat drive drum actuating cylinders in slat drive mechanism using retained bolts, washers and nuts. Make certain that bolt heads are properly seated in anti-rotation lugs. Tighten nuts and safety nuts with new cotter pins. Safety the heads of bolts with .051 lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)Connect hydraulic lines to slat actuating cylinder fittings and install clamps on hydraulic lines.

(25) Tension all cables, one at a time, alternately. (Figure 27-80-00-990-815, Sheet 1 through 8)

NOTE: Cable Tensions must be increased alternately between wings. Never tension slat cables in one wing without also tensioning same slat cables in opposite wing.

Example: Increase tensions on cables for number "0" slat, left and then right wings prior to increasing tension on cables for number "1" slat.

NOTE: Slat retract cables should be adjusted first to make certain slats remain against retract stops while tensioning slat drive cables.

WARNING: BEFORE PRESSURIZING SYSTEMS, BEWARE OF CONTROL SURFACES, MECHANICAL SYSTEMS AND LINKAGE AFFECTED BY HYDRAULIC POWER. DURING ADJUSTMENT PROCEDURES THAT REQUIRE HYDRAULIC PRESSURE MAKE CERTAIN THAT LANDING GEAR LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS. MAKE CERTAIN THAT ALL AREAS AROUND AIRCRAFT ARE CLEAR OF EQUIPMENT AND PERSONNEL PRIOR TO OPERATING ANY CONTROLS.

WARNING: BEFORE PRESSURIZING SYSTEMS, MAKE CERTAIN THAT LANDING GEAR LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(26) Pressurize left and right hydraulic systems and bleed all air from lines. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING SLAT/FLAP HANDLE, MAKE CERTAIN THAT AREAS AROUND SLATS AND FLAPS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(27) Retract and extend flaps several times. Place flap/slat handle in UP/RET detent.

(28) Visually check valve fittings and line connections for leakage.

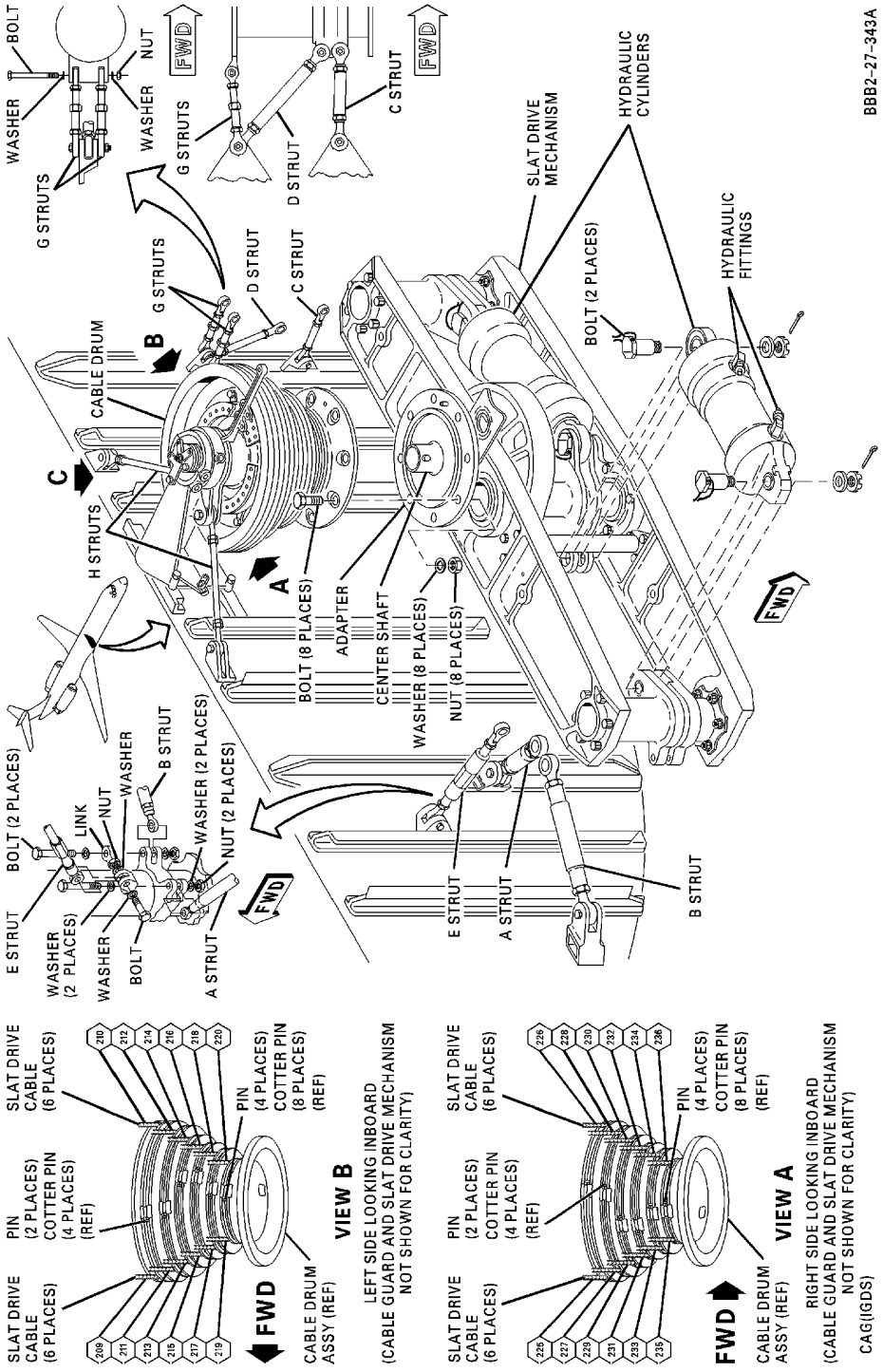
(29) Place flap/slat handle in 11/MID degree detent. Check that 11° placard on each inboard track is lined up with scribe line on structure within 0.128 inch (3.3 mm). If necessary, adjust valve.

(30) Perform Operational Test of slat actuating system. (PAGEBLOCK 27-80-00/501)

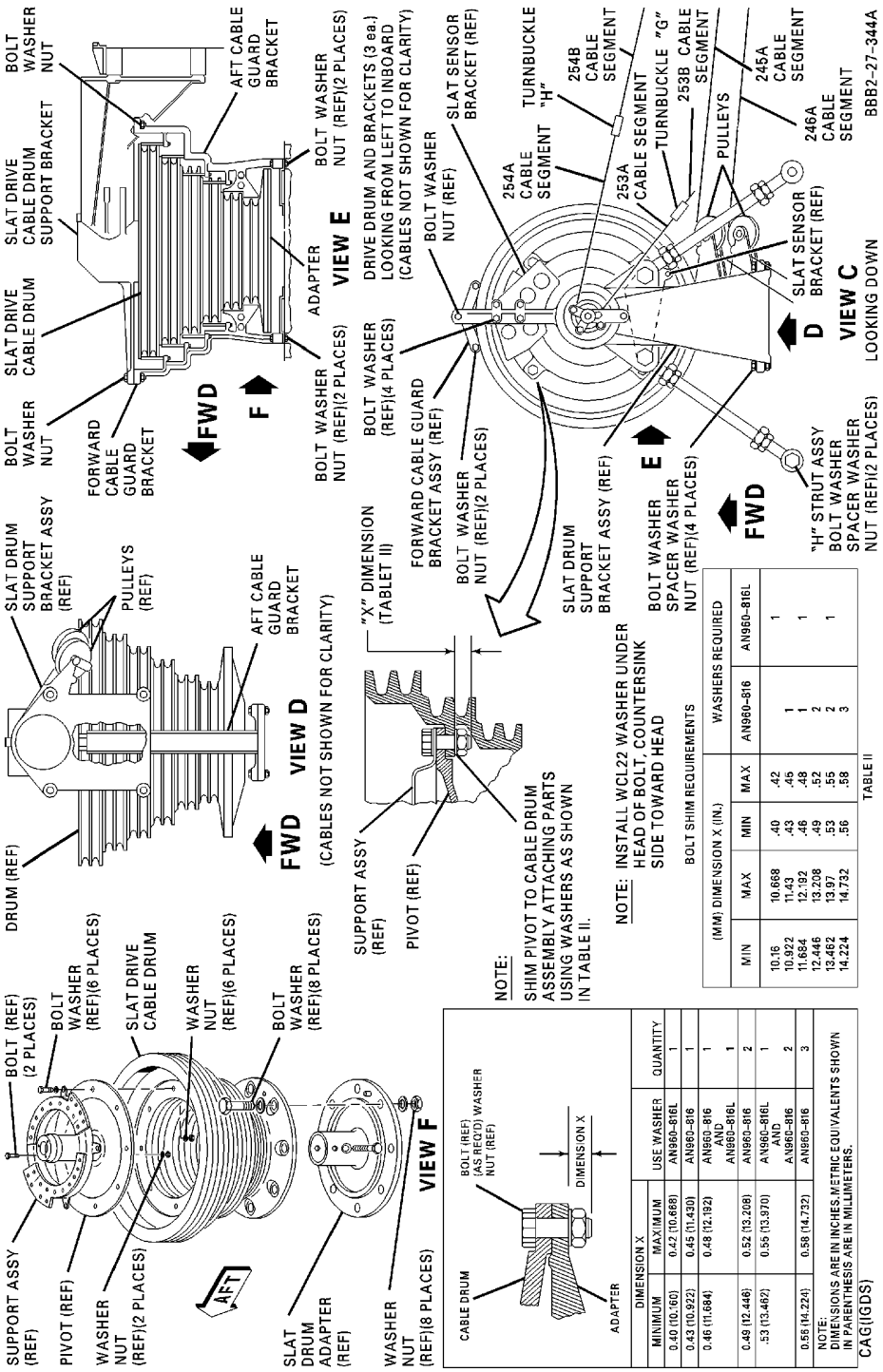
NOTE: Check hydraulic lines at actuating cylinders for leaks and observe operation of slat drive cable drum and mechanism to be certain that adequate clearance is maintained between cables and drum to adapter attach bolt heads and between bolt shanks and upper rail of actuating mechanism.

(31) Shut off hydraulic power and depressurize left and right hydraulic systems.

(32) Install vertical stiffener and access panels 5107C and 5138C at center cargo compartment aft bulkhead.



Slat Drive Mechanism Assembly -- Removal/Installation
Figure 401/27-81-01-990-801



Slat Drive Mechanism Assembly -- Removal/Installation
Figure 402/27-81-01-990-802

FLAP/SLAT SEQUENCE MECHANISM - MAINTENANCE PRACTICES

1. General

A. The flap/slat sequence mechanism is located on the center wing front spar, above the slat drive mechanism. Access to the flap/slat sequence mechanism is through the aft bulkhead panel of the mid cargo compartment. The flap/slat sequence mechanism weighs approximately 22 pounds (10 kg).

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
Tensiometer	Pacific Scientific Co.
Tensioner, control cable, 1/16 to 3/8 inch (1.587 to 9.525 mm) (5954644-1, -503, -505)	Douglas Aircraft Co.
Door safety locks	Douglas Aircraft Co.
Rig pins (2)(5-5) 5/16 by 5 5/8 inches (7.937 x 142.875 mm)	Douglas Aircraft Co.
Lockwire, NASM20995N32, DPM 684*[1]	Not specified

*[1] For the installation of control cables and associated hardware, NASM20995C (DPM 5865) lockwire can be used.

3. Removal/Installation Flap/Slat Sequence Mechanism

A. Remove Sequence Mechanism

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Place flap/slat handle in 40 degree detent.

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left and right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	23	B1-589	CAPTAIN'S STALL WARNING
Z	23	B1-590	FIRST OFFICER'S STALL WARNING

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
P	36	B1-550	STALL WARNING FAILURE ADVISORY

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
WJE ALL			
R	35	B1-26	STALL WARNING AND AUTO SLAT-2

(5) Remove access panel 5138C from aft bulkhead, mid cargo compartment.

(6) Disconnect electrical connectors P1-669 and P1-670 from auto slat actuators noting applicable connector to actuator. (Figure 201)

(7) Disconnect pushrod (A) from slat control valve.

NOTE: Retain hardware for installation.

(8) Remove bungee and bracket.

(9) Disconnect bungee from bracket.

(10) Identify, tag and note cable routing on drums to aid installation. (Figure 201)

(11) Remove cable guard pins and remove following:

(a) Loosen turnbuckles (G) and (H) sufficiently to remove cables 253B and 254B from drum (A). Remove cables from drum (A).

NOTE: Access to turnbuckles (G) and (H) is through aft bulkhead mid cargo compartment panel 5138C.

(b) Loosen turnbuckles (J) and (K) sufficiently to remove cables 247A and 248A from drum (B). Remove cables from drum.

NOTE: Access to turnbuckles (J) and (K) is through cabin floor panel above center wing between stations Y884 and Y972.

(c) Loosen turnbuckles (E) and (F) sufficiently to remove cables 245A and 246A from drum (L). Remove cables from drum.

NOTE: Access to turnbuckles (E) and (F) is through cabin floor panel above center wing between stations Y880 and Y920.

(d) Loosen turnbuckles (A), (B), (C), and (D) sufficiently to remove cables 241B, 242B, 243B and 244B from drum (M). Remove cables from drum.

NOTE: Access to turnbuckles (A), (B), (C), and (D) is through forward cargo compartment ceiling panels 5151C and 5154C.

WARNING: SUPPORT FLAP/SLAT SEQUENCE MECHANISM ADEQUATELY WHEN REMOVING FROM AIRCRAFT. MECHANISM WEIGHS APPROXIMATELY 22 POUNDS (10 KG).

(12) Remove mounting bolts and remove flap/slat sequence mechanism from aircraft.

B. Install Sequence Mechanism

WARNING: SUPPORT FLAP/SLAT SEQUENCE MECHANISM WHEN INSTALLING IN AIRCRAFT. MECHANISM WEIGHS APPROXIMATELY 22 POUNDS (10 KG).

(1) Place flap/slat sequence mechanism in position and install mounting bolts. (Figure 201)

(2) Install command flap/slat cables 241B and 242B into bottom groove of drum (M) and safety the ball end with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(3) Install command flap/slat cables 243B and 244B into top groove of drum (M) and safety the ball end with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(4) Install flap valve cables 245A and 246A on drum (L) and safety the ball end with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(5) Install flap bus cables 247A and 248A on drum (B) and safety the ball end with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(6) Install slat follow-up cables 253B and 254B on drum (A) and safety the ball end with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(7) Check cables for proper routing.

(8) Install guard pins and safety with cotter pins.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(9) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	23	B1-589	CAPTAIN'S STALL WARNING
Z	23	B1-590	FIRST OFFICER'S STALL WARNING

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

P	36	B1-550	STALL WARNING FAILURE ADVISORY

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name

WJE ALL

R	35	B1-26	STALL WARNING AND AUTO SLAT-2

(10) Connect electrical connectors P1-669 and P1-670 to appropriate auto slat actuator.

(11) Connect bungee to bracket and safety with cotter pin.

(12) Install bungee and bracket on mount.

(13) Connect pushrod (A) to slat control valve.

(14) Remove the safety tags and close these circuit breakers:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	23	B1-589	CAPTAIN'S STALL WARNING
Z	23	B1-590	FIRST OFFICER'S STALL WARNING

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

P	36	B1-550	STALL WARNING FAILURE ADVISORY

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name

WJE ALL

R	35	B1-26	STALL WARNING AND AUTO SLAT-2

(15) Perform adjustment/test of flap/slat sequence mechanism. (Paragraph 4.)

4. Adjustment/Test Flap/Slat Sequence Mechanism

A. Adjust Mechanism

(1) Adjust flap mechanical control. (FLAPS - ADJUSTMENT/TEST, PAGEBLOCK 27-50-00/501, paragraph 3.B.)

B. Adjust Flap Bus to Elevator Servo Force Limiter Cable System

NOTE: Elevator and tab control system (ELEVATOR AND TAB - ADJUSTMENT/TEST, PAGEBLOCK 27-30-00/501), flap mechanical control and flap bus cable systems (PAGEBLOCK 27-50-00/501), horizontal stabilizer trim indicating system (PAGEBLOCK 27-40-00/501) must be properly adjusted prior to adjusting flap bus to elevator servo force limiter cable system.

(1) Make certain horizontal stabilizer indicator is at 0° indicated.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(2) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks.

WARNING: BEFORE PRESSURING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(3) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

WARNING: WHEN AIRCRAFT IS ON GROUND, WITH WEIGHT ON WHEELS, BITE TEST OF AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME FLAP/SLAT HANDLE IS MOVED FROM RET DETENT TO 0°/T.O. EXT OR 11°/T.O. EXT DETENTS. SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND POSITION THEN RETURN TO MID EXTEND POSITION.

(4) Place flap/slat handle in 11°T.O. EXT detent.

(5) Adjust flap bus cable turnbuckles (J) and (K) so that tension in cables 247A, B and 248A, B is per cable tension table 1/16 inch (1.59 mm) cables. (Figure 203)

(6) Differentially adjust turnbuckles (J) and (K) until rig mark on drum (B) is 3/16(±1/16) inch (4.76(±1.59) mm) to the left of rig mark (E) on bracket, when looking aft. (Figure 201)

C. Adjust Slat Follow-up Cables

NOTE: Flap mechanical controls (PAGEBLOCK 27-50-00/501) and slat surfaces (PAGEBLOCK 27-80-01/401) must be properly adjusted prior to adjusting slat controls.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: BEFORE MOVING FLAP/SLAT HANDLE, MAKE CERTAIN THAT AREAS AROUND FLAPS AND SLATS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(2) Place flap/slat handle in RET detent.

(3) Disconnect pushrod (A) from slat control valve lever (F). Place lever (F) against retract stop and tie lever in position.

(4) Adjust turnbuckles (G) and (H) to obtain tension per cable tension table for 1/16 (1.59 mm) inch cables 253A, B and 254A, B (slat follow-up cables). (Figure 203)

(5) Differentially adjust turnbuckles (G) and (H) until rig mark on drum (A) is 2.28(±.03) inches (57.94(±0.79) mm) inboard of rig mark (E) on bracket, looking aft. (Figure 201)

(6) Safety all turnbuckles with clips.

(7) Make certain that flap/slat handle is in RET detent.

(8) Connect pushrod (A) to slat control lever (F). Safety nut with cotter pin.

(9) With slats fully retracted, place pencil mark on left and right wing leading edge at trailing edge of slat 2 in line with drive track. (Figure 204)

WARNING: WHEN AIRCRAFT IS ON GROUND WITH WEIGHT ON WHEELS, BITE TEST OF AUTO-SLAT EXTEND SYSTEM IS ENABLED EACH TIME FLAP/SLAT HANDLE IS MOVED FROM UP/RET POSITION TO 0°/T.O. EXT OR 11°/T.O. EXT POSITION. SLATS WILL AUTOMATICALLY EXTEND TO FULL EXTEND THEN RETURN TO MID POSITION.

(10) Place flap/slat handle in 11°/T.O. EXT detent.

NOTE: Before measuring distance in following step, wait 5 to 7 minutes for slats to stabilize (no creep).

(11) Measure distance from pencil mark on left and right wing to trailing edge of slat 2 in line with drive track. Measurement should be 14.90(±0.15) inches (378.5(±3.8) mm). If necessary, adjust turnbuckle adjustment on pushrod (A) to position slats at 14.90(±0.15) inches (378.5(±3.8) mm) measurement. Tighten turnbuckle jamnuts.

NOTE: Turnbuckle adjustment is 0.20 inch (5.1 mm) of slat travel per one turn of turnbuckle. Rod end adjustment is 0.600 inch (15.3 mm) of slat travel per one half turn of rod end.

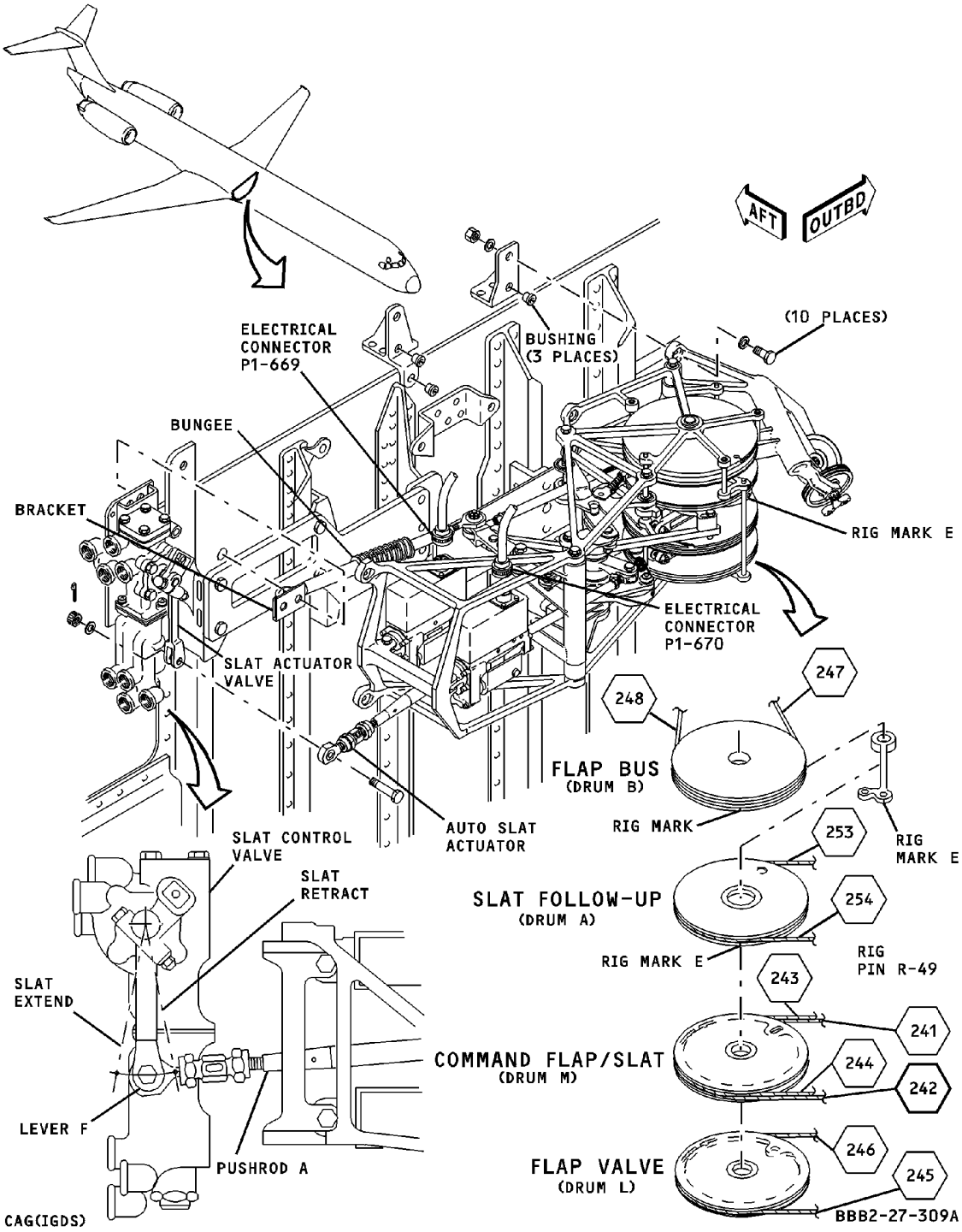
(12) Place flap/slat handle in UP/RET detent.

(13) Using DAF thumbwheel set DAF dial to read 0.

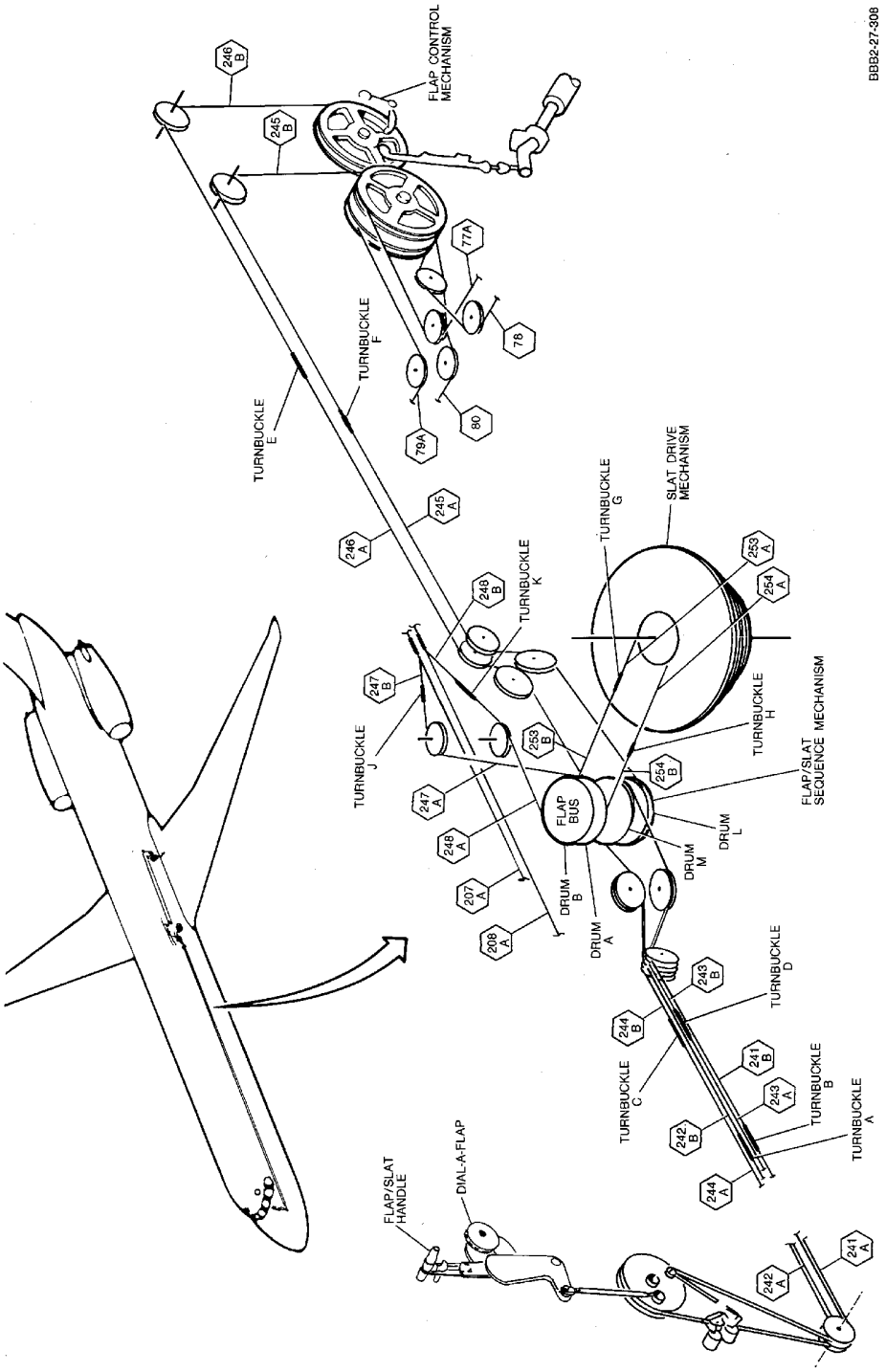
(14) Shut off hydraulic pressure source.

(15) Make certain all cable turnbuckles are safetied with clips.

(16) Test slat operation. (PAGEBLOCK 27-80-00/501)



Flap/Slat Sequence Mechanism -- Removal/Installation
Figure 201/27-81-02-990-801



Flap/Slat Sequence Mechanism Control Cable -- Routing
Figure 202/27-81-02-990-802

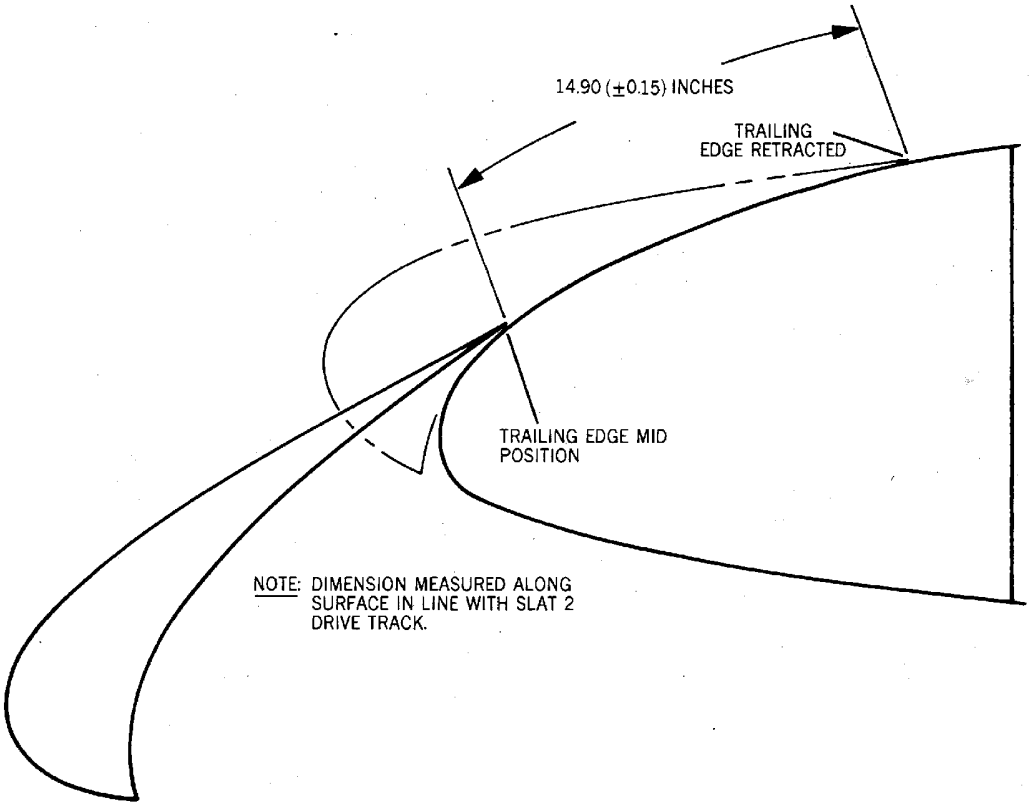
CABLE TENSION TABLE – 1/16 DIAMETER

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD	TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
–60	5	0	0	40	18	12	8
–58	5	0	0	42	18	12	9
–56	5	0	0	44	18	12	9
–54	6	0	0	46	19	13	9
–52	6	0	0	48	19	13	9
–50	6	0	0	50	19	13	9
–48	7	1	0	52	20	14	10
–46	7	1	0	54	20	14	10
–44	7	1	0	56	20	14	10
–42	7	1	0	58	20	14	10
–40	8	2	1	60	21	15	11
–38	8	2	1	62	21	15	11
–36	8	2	1	64	21	15	11
–34	8	2	1	66	22	16	11
–32	9	3	1	68	22	16	12
–30	9	3	2	70	22	16	12
–28	9	3	2	72	23	17	12
–26	9	3	2	74	23	17	12
–24	10	4	2	76	23	17	13
–22	10	4	2	78	24	18	13
–20	10	4	2	80	24	18	13
–18	10	4	3	82	24	18	13
–16	11	5	3	84	25	19	14
–14	11	5	3	86	25	19	14
–12	11	5	3	88	25	19	14
–10	11	5	3	90	26	20	15
–8	12	6	4	92	26	20	15
–6	12	6	4	94	27	21	15
–4	12	6	4	96	27	21	16
–2	12	6	4	98	27	21	16
0	13	7	4	100	28	22	16
2	13	7	5	102	28	22	16
4	13	7	5	104	28	22	17
6	13	7	5	106	29	23	17
8	14	8	5	108	29	23	17
10	14	8	5	110	30	24	18
12	14	8	6	112	30	24	18
14	14	8	6	114	31	25	18
16	15	9	6	116	31	25	19
18	15	9	6	118	31	25	19
20	15	9	6	120	32	26	19
22	15	9	7	122	32	26	20
24	16	10	7	124	33	27	20
26	16	10	7	126	33	27	20
28	16	10	7	128	34	28	21
30	16	10	7	130	34	28	21
32	17	11	8	132	35	29	21
34	17	11	8	134	35	29	22
36	17	11	8	136	36	30	22
38	18	12	8	138	36	30	23
				140	37	31	23

NOTE: The minimum allowable service load is the minimum cable loads acceptable before tensioning is required. When tensioning is required, tension cable until the final rig load is between maximum rig load and minimum rig load.

BBB2-27-279A

Cable Tension Table
Figure 203/27-81-02-990-803



Slat Mechanical Controls -- Adjustment/Test
Figure 204/27-81-02-990-804