CHAPTER

76

ENGINE CONTROLS

MD-80
AIRCRAFT MAINTENANCE MANUAL

CHAPTER 76
ENGINE CONTROLS

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GENERAL - DESCRIPTION AND OPERATION

1. General

A. Engine controls consist of throttle/thrust reverser lever, a fuel shutoff lever, and two fire control handles mounted in the upper instrument panel. All controls are accessible to both the captain and the first officer.

2. Power Control

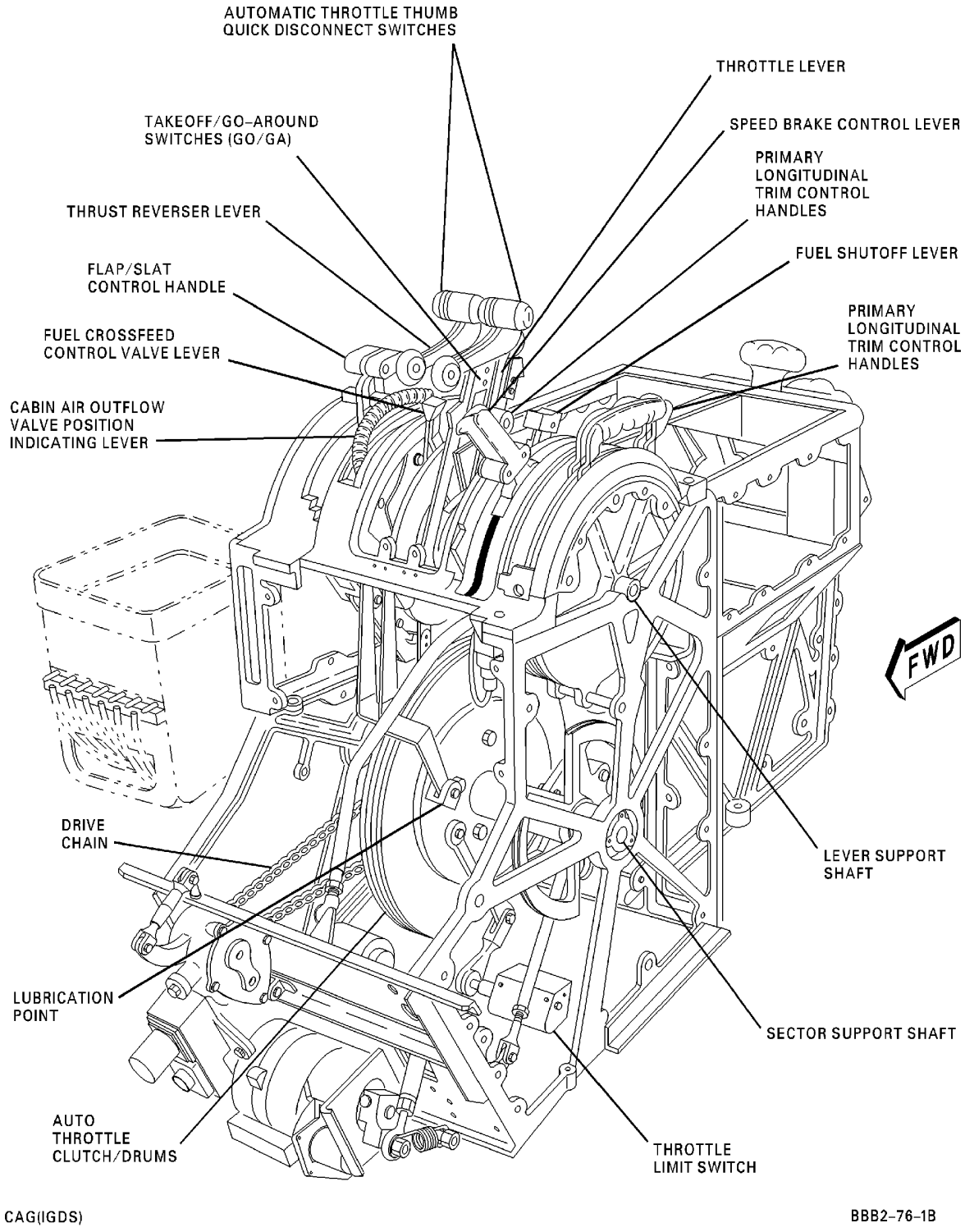
A. Engine power control consists of the throttle/thrust reverser and fuel shutoff controls, which are mechanically linked to the engine with rigged cables and push-pull control cables.

B. The automatic throttle drive unit is installed in the control pedestal and is coupled to the throttles by a clutch. For a complete description and operation of the automatic throttle control system, refer to SUBJECT 22-31-00, Page 1.

C. The cables extend between drums and sectors located within the control pedestal and push-pull control sectors which are located below the floor on the left and right side forward of the pressure bulkhead. One fuel shutoff cable and one throttle push-pull control cable are connected to the sectors and routed through the firewall to the linkage on the inboard side of each engine. For a complete description and operation of power control system, refer to SUBJECT 76-10-00, Page 1.

3. Emergency Shutdown

A. Fire control handles located on the upper instrument panel provide the means for emergency shutdown. In the extended position, the fuel shutoff valve and the hydraulic shutoff valve will be closed. Turning the handle to the left discharges extinguisher container number 1, while turning the handle to the right discharges extinguisher container number 2. Discharging of the extinguisher agent is accomplished through the activation of microswitches located under the glareshield. For a complete description and operation of emergency shutdown system, refer to PAGEBLOCK 76-20-00/001.



Control Pedestal - General Arrangement
Figure 1/76-00-00-990-801

1. General Maintenance Features

A. Maintenance Interphone System

(1) The maintenance interphone system provides a means of communication between the flight compartment and maintenance personnel working in the other areas of the aircraft. A maintenance interphone switch, located on the overhead switch panel, is utilized to actuate the system.

(2) Two interphone jacks are accessible to personnel working in the engine areas. One each on the left and right side of fuselage adjacent to the engine pylons.

B. Engine Accessibility

WARNING: TO PREVENT INJURY TO PERSONNEL, EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN.

CAUTION: TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

CAUTION: OPEN UPPER COWL DOOR ONLY AS MUCH AS NECESSARY TO ALLOW HOLD-OPEN RODS TO BE CONNECTED TO ENGINE. OPENING DOOR TOO FAR MAY CAUSE DAMAGE TO PYLON HINGE POINTS.

CAUTION: MAKE CERTAIN RIGHT ENGINE UPPER COWL DOOR IS CLOSED BEFORE OPERATING APU, OR APU EXHAUST WILL IMPINGE DIRECTLY ON COWL DOOR CAUSING EXTENSIVE DAMAGE.

(1) Accessibility is provided to all systems and components within the engine installation. The forward lower cowl door provides access to the accessory gearbox area and forward lower half of the engine and the aft lower cowl door provides access to the aft lower portion of the engine. The upper cowl door provides access to the upper portion of the engine. Small access doors are provided in the cowl doors for access to areas requiring frequent servicing.

C. Component Interchangeability

(1) Identical accessories are installed on both engines.

2. Safety and Operating Precautions

A. Before any maintenance is performed on the engine control system, personnel should read and thoroughly understand the following steps. Careful adherence to these instructions will aid in maintaining a functional and trouble-free system.

CAUTION: BEFORE ANY ADJUSTMENT ON THROTTLE CONTROL SYSTEM, VERIFY THAT THRUST REVERSER CONTROL VALVE IS IN DUMP POSITION AND SAFETY PIN IS INSTALLED. (PAGEBLOCK 78-00-00/201)

B. Circuit Breakers

CAUTION: EXTRA CAUTION MUST BE OBSERVED TO MAKE CERTAIN ELECTRICAL CIRCUITS TO ALL FIRE EXTINGUISHER CONTAINER CARTRIDGES ARE ISOLATED WHEN TEST PROCEDURES REQUIRE OPERATION OF FIRE EXTINGUISHER OR EMERGENCY SHUTDOWN SYSTEMS.

(1) All circuit breakers opened during maintenance should be tagged to prevent inadvertent operation of affected system.

C. High-Voltage System and Components

(1) Prior to performing maintenance on high-voltage system or components, make certain that power to system or components has been shut off and that all affected circuit breakers are open and tagged.

D. Application of External Power and Pressurization of Fluid Systems

3. General Maintenance Practices

WARNING: BEFORE ACTIVATING ANY FUEL, ELECTRICAL, HYDRAULIC, OR PNEUMATIC SYSTEM FOR MAINTENANCE PURPOSES, MAKE CERTAIN THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR OF OPERATING PORTIONS OF THE AIRCRAFT. INADVERTENT OPERATION OF AN AIRCRAFT SYSTEM COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

A. Protective Covers - When lines, cables, turnbuckles, push-pull control cables, rods, linkage, and electrical connectors are disconnected or components are removed, caps, covers, or other suitable means should be provided to prevent damage or foreign material from contaminating any component.

B. Minor chafing on the throttle/fuel shutoff cables that does not penetrate the outer rubber shield is acceptable. Repair chafed area with red stretch tape. Ensure that tape extends at least 1/4 inch past the chafed area.

C. General Rigging Procedures and Requirements

(1) When lines, cables, turnbuckles, push-pull control cables and rods, and linkage are disconnected and/or components are removed, protection should be provided to prevent damage or foreign material from contaminating any component by using caps, covers, or other suitable means.

(2) When electrical connectors are disconnected, caps or other protective materials should be used to prevent entry of oil, fuel, hydraulic fluid, moisture, and other foreign matter.

(3) Spilled oil, fuel, or hydraulic fluid should be cleaned up immediately to prevent damage to wiring and cables or other components, and to prevent future false leak reports.

(4) Position and angle of all fittings and brackets removed from components should be checked to ensure proper placement when installing replacement components.

(5) When cables are disconnected and/or components are removed, make certain cable is not kinked, frayed, or damaged. When more than six wires are broken within a one inch long section of cable, replace cable. Replace any cable which is worn to a point that material reduction at any cross section is equivalent to, or in excess of, an area of six wires.

NOTE: Cross sectional wear half-way through 12 wires is equivalent to 6 broken wires and cable replacement justified.

Example: A cable is worn to the point where material reduction of a cross section is equivalent to five wires and one wire is broken in the worn area. The cable should be replaced since the total area of worn wires and the broken wire are equal to six wires.

Check end fittings, turnbuckles, pulleys, pulley guard pins, brackets, fairleads, and any associated equipment, carefully, and replace them when necessary. Refer to PAGEBLOCK 20-10-17/201 for detailed information.

(6) No rigging procedure is considered complete until a check is made to make certain that all bolts, nuts, cotter pins, safety wire, and guard pins have been replaced and/or secured.

(7) It must be considered that no rigging is complete until a check is made to ensure every rig pin, clamp, and fixture is removed from the aircraft.

(8) Rig loads shown in Figure 201 and Figure 202, must be within ±3 pounds. Tensiometer T5-2006-115-00 (Pacific Scientific Co., 1346 So. State College Blvd., Anaheim, Calif.) should be used to measure rig loads of 1/16 inch diameter cables if the normal rig load is less than 38 pounds at 70°F (21.1°C). This tensiometer with a range of 0 to 50 pounds, has a large needle deflection therefore making an accurate reading possible.

D. External Electrical Power

(1) For procedures to connect external electrical power to air-craft, refer to PAGEBLOCK 24-00-00/001.

E. External Pneumatic Power

(1) For procedures to connect external pneumatic power to aircraft, refer to PAGEBLOCK 36-00-00/001.

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	42	31	25	18
–58	8	2	1	44	31	25	19
–56	8	2	1	46	32	26	19
–54	8	2	1	48	33	27	20
–52	9	3	1	50	33	27	20
–50	9	3	2	52	34	28	21
–48	9	3	2	54	34	28	21
–46	10	4	2	56	35	29	22
–44	10	4	2	58	36	30	22
–42	11	5	3	60	36	30	23
–40	11	5	3	62	37	31	23
–38	11	5	3	64	38	32	24
–36	12	6	4	66	38	32	24
–34	12	6	4	68	39	33	25
–32	12	6	4	70	39	33	25
–30	13	7	5	72	40	34	26
–28	13	7	5	74	41	35	26
–26	14	8	5	76	41	35	27
–24	14	8	6	78	42	36	27
–22	15	9	6	80	43	37	28
–20	15	9	6	82	44	38	28
–18	15	9	7	84	44	38	29
–16	16	10	7	86	45	39	29
–14	16	10	7	88	46	40	30
–12	17	11	8	90	46	40	30
–10	17	11	8	92	47	41	31
–8	18	12	8	94	48	42	31
–6	18	12	9	96	48	42	32
–4	19	13	9	98	49	43	33
–2	19	13	9	100	50	44	33
0	20	14	10	102	51	45	34
2	20	14	10	104	51	45	34
4	21	15	10	106	52	46	35
6	21	15	11	108	53	47	35
8	22	16	11	110	54	48	36
10	22	16	12	112	54	48	37
12	23	17	12	114	55	49	37
14	23	17	12	116	56	50	38
16	24	18	13	118	57	51	38
18	24	18	13	120	58	52	39
20	25	19	14	122	58	52	40
22	25	19	14	124	59	53	40
24	26	20	14	126	60	54	41
26	26	20	15	128	61	55	41
28	27	21	15	130	62	56	42
30	27	21	16	132	62	56	43
32	28	22	16	134	63	57	43
34	28	22	17	136	64	58	44
36	29	23	17	138	65	59	45
38	30	24	17	140	66	60	45
40	30	24	18				

NOTE: The minimum allowable in-service tension load is the minimum cable load acceptable before tension adjustment is required. When tension adjustment is required, increase or decrease cable tension until the final rigging load is between minimum and maximum rigging cable tension loads.

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Cable Rigging Tension Table
Figure 201/76-00-00-990-802

CABLE TENSION TABLE – 1/16 DIAMETER

TEMP deg F	MAX. CABLE RIG LOAD	MIN. CABLE RIG LOAD	MIN. ALLOW. SERV. LOAD
-60	5	0	0
-58	5	0	0
-56	5	0	0
-54	6	0	0
-52	6	0	0
-50	6	0	0
-48	7	1	0
-46	7	1	0
-44	7	1	0
-42	7	1	0
-40	8	2	1
-38	8	2	1
-36	8	2	1
-34	8	2	1
-32	9	3	1
-30	9	3	2
-28	9	3	2
-26	9	3	2
-24	10	4	2
-22	10	4	2
-20	10	4	2
-18	10	4	3
-16	11	5	3
-14	11	5	3
-12	11	5	3
-10	11	5	3
-8	12	6	4
-6	12	6	4
-4	12	6	4
-2	12	6	4
-0	13	7	4
2	13	7	5
4	13	7	5
6	13	7	5
8	14	8	5
10	14	8	5
12	14	8	6
14	14	8	6
16	15	9	6
18	15	9	6
20	15	9	6
22	15	9	7
24	16	10	7
26	16	10	7
28	16	10	7
30	16	10	7
32	17	11	8
34	17	11	8
36	17	11	8
38	18	12	8
40	18	12	8
42	18	12	9
44	18	12	9
46	19	13	9
48	19	13	9
50	19	13	9
52	20	14	10
54	20	14	10
56	20	14	10
58	20	14	10
60	21	15	11
62	21	15	11
64	21	15	11
66	22	16	11
68	22	16	12
70	22	16	12
72	23	17	12
74	23	17	12
76	23	17	13
78	24	18	13
80	24	18	13
82	24	18	13
84	25	19	14
86	25	19	14
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112	30	24	18
114	31	25	18
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120	32	26	19
122	32	26	20
124	33	27	20
126	33	27	20
128	34	28	21
130	34	28	21
132	35	29	21
134	35	29	22
136	36	30	22
138	36	30	23
140	37	31	23

NOTE: The minimum allowable in-service tension load is the minimum cable load acceptable before tension adjustment is required. When tension adjustment is required, increase or decrease cable tension until the final rigging load is between minimum and maximum rigging cable tension loads.

BBB2-76-41C

Cable Rigging Tension Chart
Figure 202/76-00-00-990-803

POWER CONTROL - DESCRIPTION AND OPERATION

1. General

A. The power control, which provides the means for controlling engine fuel, consists of the throttle and fuel shutoff systems.

B. The throttle system provides a means of setting the forward thrust of the engine from idle to takeoff thrust. The throttle and thrust reverser levers, one for each engine, are installed in the control pedestal, and are mounted on the lever support shaft. Moving the throttles forward from idle produces engine thrust as desired. As the throttle is moved, mechanical linkage connected to a cable system transfers motion to the fuel control. This lever also provides a means of actuating the thrust reverser system at the appropriate time to shorten the landing roll of the airplane. The thrust reverser levers are connected at the top of each throttle.

C. The fuel shutoff system provides fuel on/off control at the inlet to the engine fuel control. Two fuel shutoff levers, one for each engine, are installed in the control pedestal aft of the throttle, and mounted on the lever support shaft. Each lever is connected by a cable system to a crank assembly which is attached to the inboard side of each engine by a push-pull control cable. Moving the fuel shutoff lever from the off to the on position, activates the engine ignition system and allows fuel to flow into the fuel control unit.

D. Other controls mounted on the lever support shaft are as follows:

(1) Flap/Slat control lever.

(2) Cabin air outflow valve position indicating lever.

(3) Fuel crossfeed control valve lever.

(4) Alternate longitudinal trim motor and brake control switch lever.

(5) Rudder hydraulic power shutoff valve control lever.

(6) Speedbrake control lever.

(7) Longitudinal trim indicator.

(8) Primary longitudinal trim control handle.

E. All of the above controls ride on ball bearings to ensure ease of operation. The lever support shaft runs horizontally through the pedestal and is mounted on supports on the pedestal frame. Access to the controls is through the detachable side covers on the control pedestal.

2. Throttle Control

A. Description

(1) Two throttles, one for each engine, are installed on the control pedestal to provide means of setting the forward thrust of the engines from idle to takeoff thrust. Each throttle has a total travel of 60-degrees and is linked by a connecting pushrod to a throttle drum inside the control pedestal. The throttle is connected by a cable system to the throttle aft control sector in the aft cargo compartment and a thrust lever reverser control valve sector mounted on both the forward and aft side of the aft pressure bulkhead. Push-pull control cables connected to the throttle aft control sector extend through the firewall and to the inboard side of the engine cross shaft. On the right engine the push-pull control cable connects to the fuel control. On the left engine the cable connects to the rod end of the engine synchronizer, which is connected to the fuel control. (Figure 1)

(2) The automatic throttle systems consist of a Digital Flight Guidance Computer, servodrive unit, an automatic throttle clutch unit, a control and interlock circuit, and a warning light.

(3) During takeoff or landing, the automatic throttle system provides a means of controlling the throttles. An automatic throttle engage switch, is located on the glareshield and is used to manually engage or disengage the system. An alternate method for disengaging the automatic throttle system is provided by a thumb quick-disconnect switch contained in each throttle handle housing. For a complete description and operation of the automatic throttle control system, refer to SUBJECT 22-31-00, Page 1.

(4) Two thrust reverser levers, one for each engine, are hinged to the top of the throttles. Each thrust reverser lever is connected to the throttle drum through a bellcrank, one end of the bellcrank acting as the cam follower, and the other end attached to the throttle pushrod. The bellcrank is controlled and operated by the thrust reverser lever when the throttles are in idle position. Whenever the throttles are in the forward thrust range above idle, it is impossible to actuate the thrust reverser levers due to the bellcrank cam follower position on the throttle interlock cam.

(5) Each thrust reverser lever has a total travel of 117 degrees. Movement of the levers upward through the first half of travel actuates the thrust reverser control valve and a feel detent in the fuel control unit is engaged. Movement of the levers above the detent produces the desired reverse thrust rating.

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(6) On aircraft with a three position selector switch (N1, OFF, N2), the engine synchronization system is interconnected to the throttle system on the left engine only. The synchronization system consists of a control box, the three position selector switch, a system "ON" indicator light on overhead annunciator panel, an actuator mounted on left engine nacelle apron, a flexshaft between actuator and rod-end trimmer and an adjustable rod end trimmer mounted to engine cross-shaft crank in the left nacelle. With the selector switch in the N1 or N2 position, signals from the tachometer generators of both engines are fed into the control box. Any differences in the pulse rates of the signals will cause the control box to operate the actuator, and through the flexshaft and rod end trimmer connected to the left engine fuel control, trim the left engine compressor speed to match the speed of the right engine compressor. In this mode the synchronization system is operated after takeoff and prior to landing and reversing, and can be overridden at any time by the throttle control levers.

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(7) On aircraft with a four-position selector switch (EPR, OFF, N1, N2), the engine synchronization system is interconnected to the throttle system on the left engine only. The synchronization system consists of a control box, EPR sync driver, selector switch, indicator light on overhead annunciator panel, sync actuator mounted on left engine nacelle apron, flex shaft between actuator and rod-end trimmer and adjustable rod-end trimmer mounted to engine cross-shaft crank. With the selector switch in the N1 or N2 position, signals from the tachometer generators of both engines are fed into the control box. With the selector switch in the EPR position and the EPR sync driver powered, the EPR synchronizer allows both engines to automatically attain full target EPR values for takeoff and prior to landing by sync pulses from the DFGC which are routed through the EPR sync driver to the sync actuator. In this mode, the DFGC will control the left engine to maintain its EPR equal to the right engine EPR. Any differences in the pulse rates of the respective input signals will cause the control box to operate the actuator, and through the flexshaft and rod end trimmer connected to the left engine fuel control, trim the left engine compressor speed to match the speed of the right engine compressor. In these modes the synchronization system is operated after takeoff and prior to landing and reversing. The system can be overridden at any time by the throttle control levers.

(8) An ENG SYNC ON annunciator light is located on the overhead annunciator panel. The light is wired in series with a switch on the landing gear handle so that it will come on any time the landing gear handle is in the DOWN position and the synchronizer switch in any position other than OFF. During normal synchronizer operation in flight (gear handle in UP position), the ENG SYNC ON light does not come on.

(9) On aircraft with an engine synchronizer failure indication light installed, the light is located on the cockpit overhead panel adjacent to the automatic engine synchronizer selector switch. The annunciator light is actuated by circuitry in the engine synchronizer control box. Illumination of the "Sync Fail" annunciator light indicates when the engines N1 or N2 speeds are not synchronized after the control box has pulsed to the end of its command range.

(10) The Digital Flight Guidance Computer (DFGC) controls the engine EPR synchronizer system when the selector switch is in the OFF position and the autothrottle is in the EPR mode. The EPR mode is used for takeoff, landing, or in thrust reverse operation. The DFGC assumes synchronization control, utilizing engine synchronizer components to improve autothrottle operation.

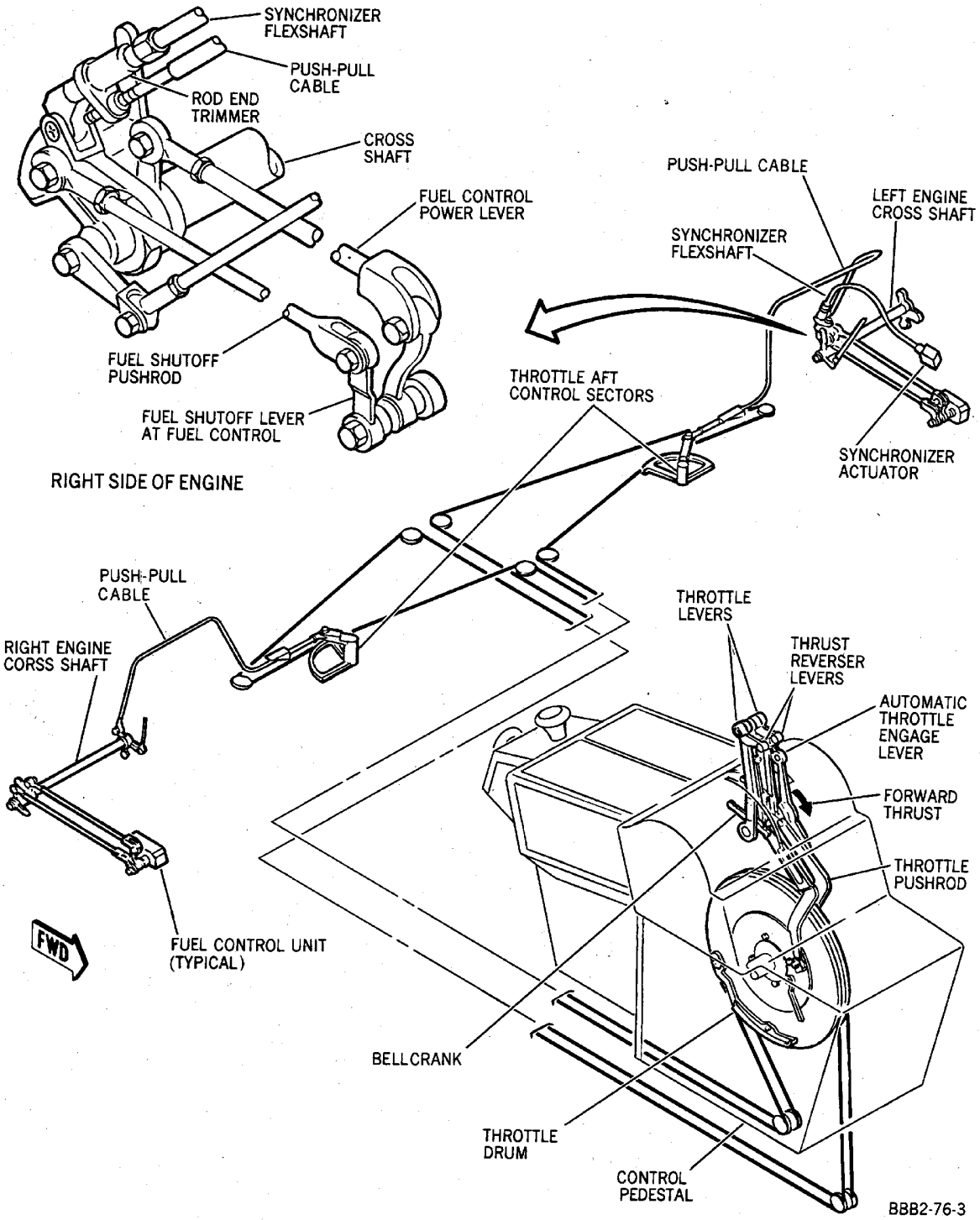
B. Operation

(1) Moving the throttle from idle toward the full forward position produces engine thrust as desired. As the throttle is moved through the 60-degree forward thrust range, force is applied to a bellcrank inside the control pedestal. As the forward end of the bellcrank rotates downward, the motion is transmitted to a throttle drum by a pushrod connected between the bellcrank and the drum. The force rotates the throttle drum forward on its axis (as viewed from aft of control pedestal). As the throttle drum rotates forward, a sequencing cam attached to the drum comes in contact with a mechanical switch located in the aft portion of the pedestal.

(2) The limit switch pushrod, attached to the throttle sector through mechanical linkage transfers sector movement to the throttle limit switch package. Refer to CHAPTER 21, CHAPTER 22, CHAPTER 27 and CHAPTER 34 for individual switch operation. Refer to SUBJECT 76-10-03 for the complete adjustment of the switch package.

(3) Sector rotation permits the cables attached to the pedestal sectors and the sector at the pressure bulkhead to transfer motion to the fuel control unit, by means of a pushrod connection between the engine cross shaft and the fuel control unit linkage.

(4) Returning the throttles to idle position allows actuation of the thrust reverser levers. As the lever is lifted through its 117-degree range, it applies a force upward on the bellcrank, pulling the attached throttle pushrod upward, and rotates the throttle drum aft on its shaft. As the throttle drum assembly rotates aft, cable runs attached to the throttle drum and running through the fuselage to the throttle aft sector will rotate. Sector rotation is transferred by the push-pull control, attached to the throttle sector to the fuel control unit linkage on each engine. At the same time, cable runs attached to the throttle drum and to the thrust reverser control valve sector transfer cable movement for thrust reverser control valve rod actuator.



Throttle Systems
Figure 1/76-10-00-990-801

3. Fuel Control Shutoff

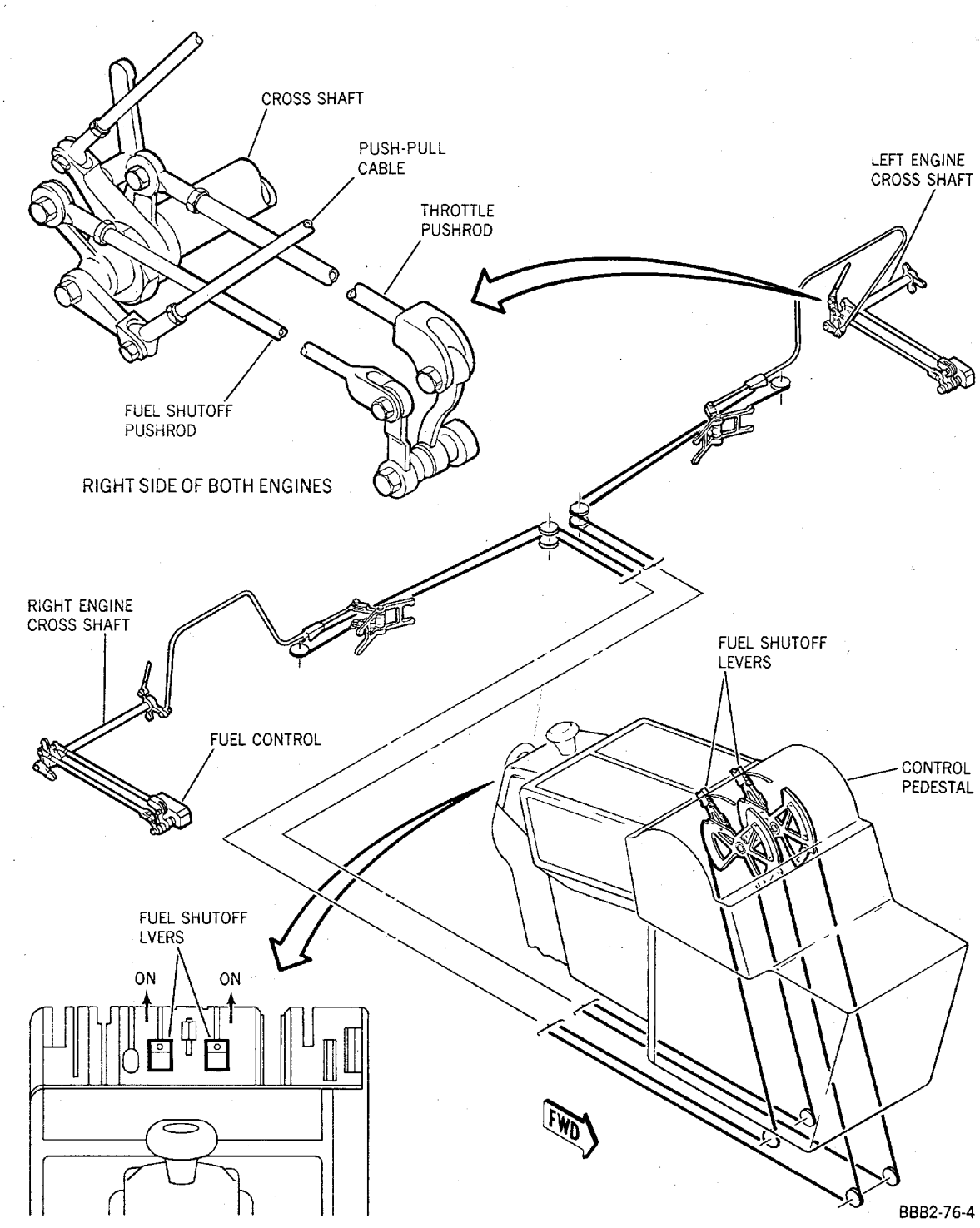
A. Description

(1) Two fuel shutoff levers, one for each engine, are installed on the control pedestal aft of the throttle and thrust reverser levers. The fuel shutoff levers actuate the respective fuel shutoff valve admitting fuel to the engine during starting and operation, and shutting off fuel flow during engine shutdown. (Figure 2)

(2) Each fuel shutoff lever is connected by a cable system to a crank which is attached to the inboard side of each engine cross shaft by a push-pull control crank. A separate crank located on the cross shaft then transmits motion to the fuel control by means of a pushrod.

B. Operation

(1) The fuel shutoff lever, when moved from the off to the on position, activates the engine ignition system and allows fuel flow to the fuel control unit. During the engine shutdown sequence, closing the fuel shutoff valve drops the pressure signal to the pressurizing and dump valve thereby initiating fuel shutoff action.



Fuel Shutoff System
Figure 2/76-10-00-990-802

LEVER SUPPORT SHAFT - MAINTENANCE PRACTICES

1. General

A. The lever support shaft is located in the control pedestal in the flight compartment. Access is through the pedestal side panels.

WARNING: MAKE CERTAIN FLIGHT COMPARTMENT THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION.

B. All control cables are adjusted and removed with the reverser system stowed. Before beginning adjustment or removal procedures, check that the thrust reverser control valve is in the dump position and that the safety pin is installed.

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 Lever Support Shaft

A. Remove Lever Support Shaft

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

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, 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

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	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

(2) Remove right side cover panel from pedestal.

(3) Remove left side panel from control pedestal.

(4) Remove autopilot control panel from aft side of pedestal.

(5) Remove horizontal stabilizer position indicator module.

(6) Remove flap control module. (PAGEBLOCK 27-52-05/201)

(7) Remove following components from levers on pedestal:

(a) Knob from fuel crossfeed control valve lever.

(b) Two knobs from alternate longitudinal trim motor and brake control switch levers.

(c) Knob from rudder hydraulic power shutoff valve control lever.

(d) Two knobs from fuel shutoff levers.

(e) Pointer from cabin air pressure controller.

(8) Place throttle levers full forward.

(9) Place fuel shutoff levers full aft.

CAUTION: DO NOT DAMAGE PEDESTAL COVER LIGHTING ELECTRICAL PINS WHEN REMOVING COVER PLATES.

(10) Remove three pedestal cover plates from pedestal frame.

(11) Remove two speedbrake lever cams, latching guide and speedbrake quadrant from pedestal upper cover frame.

(12) Disconnect two throttle interlock cams from pedestal upper cover frame.

(13) Disconnect cabin air pressure controller support and turnbuckle from pedestal upper cover frame.

(14) Remove pedestal upper cover frame from pedestal.

(15) Disconnect two throttle pushrods from lower shaft sectors.

(16) Disconnect alternate longitudinal trim motor control switch from upper shaft sector.

(17) Disconnect automatic spoiler pushrod from crank on upper shaft.

(18) Disconnect speedbrake pushrod from upper shaft crank.

CAUTION: IN ORDER TO AVOID CABLES DRAGGING AND BECOMING FOULED WITH AIRCRAFT STRUCTURE, AN ACCEPTABLE METHOD FOR CLAMPING CABLES PRIOR TO RELIEVING CABLE TENSION SHOULD BE EMPLOYED.

(19) Relieve cable tension by loosening applicable turnbuckles at station 350, and disconnect following cables from drums, sectors and pulleys on upper shaft.

NOTE: Each cable should be tagged to facilitate installation.

Table 202

Cable Identification	Function
25A	Rudder power shutoff--On
26A	Rudder power shutoff--Off
55A	Left engine fuel shutoff--Off
56A	Left engine fuel shutoff--On
57A	Right engine fuel shutoff--Off
58A	Right engine fuel shutoff--On
71A	Fuel crossfeed--Off
72A	Fuel crossfeed--On
119A	Pressure control override--Decrease
120A	Pressure control override--Increase

Table 202 (Continued)

Cable Identification	Function
125A	Horizontal stabilizer primary motor contactor overrider--Noseup
126A	Horizontal stabilizer primary motor contactor overrider--Nosedown
127A	Horizontal stabilizer primary brake override switch--Noseup
128A	Horizontal stabilizer primary brake override switch--Nosedown
131A	Horizontal stabilizer position indicator--Noseup
132A	Horizontal stabilizer position indicator--Nosedown
159A	Speedbrake--Extend
160A	Speedbrake--Retract

(20) Disconnect and tag electrical wire connected to cabin pressure auto/manual selector switch.

(21) Disconnect speed command go-around select switch wires and automatic throttle quick-disconnect switch wires from terminal strip located on forward right side of forward pedestal equipment support.

NOTE: To facilitate installation, each wire should be tagged as it is removed.

(22) Disconnect two fuel shutoff guard pin supports from pedestal frame.

(23) Disconnect alternate longitudinal trim brake control switch support from pedestal frame.

(24) Disconnect slat control pushrod.

(25) Remove nut, washer, and cotter pin from upper shaft.

(26) Remove bolts and spacers that secure shields between primary longitudinal trim handles and longitudinal trim indicator.

(27) Remove bolt that secures upper shaft to pedestal frame.

(28) Lift upper shaft and attached components from pedestal.

NOTE: To facilitate installation, each component should be tagged as it is removed from the shaft.

B. Install Lever Support Shaft

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

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, DC AIR CONDITIONING & MISCELLANEOUS

Row	Col	Number	Name
U	22	B1-757	CABIN PRESSURE CONTROL-1

(Continued)

LOWER EPC, DC AIR CONDITIONING & MISCELLANEOUS

Row	Col	Number	Name
W	22	B1-759	CABIN PRESSURE CONTROL-2

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL

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	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

(2) Assemble components on lever support shaft as follows:

NOTE: To ensure alignment of handles or levers with slots in pedestal cover plates, certain dimensions must be maintained. Unless otherwise stated these dimensions are measured (with shaft locknut tight) between right side of applicable handle or lever and center of lever shaft installation bolt hole. The dimensions are called out after lever or handle. Laminated shims should be used as required to obtain these dimensions.

(a) Horizontal stabilizer indicator crank.

(b) Spacer.

(c) Primary longitudinal trim control handle.

(d) Primary longitudinal trim control handle shield.

(e) Primary longitudinal trim control handle.

(f) Longitudinal trim indicator.

(g) Spacer.

(h) Longitudinal trim indicator shield.

(i) Speedbrake control lever assembly 3.208 inches (81.7 mm) from center of handle.

(j) Spacer.

(3) Build up following components on left side of throttle support assembly before installation:

(a) Left fuel shutoff lever

(b) Left fuel shutoff lever guard pin support

(c) Rudder hydraulic power shutoff valve control lever 4.810 inches (122.2 mm).

(d) Ground spoiler unarm cam do not tighten setscrew until following step.

(4) Install left throttle support assembly on support shaft with throttle interlock cam installed between two legs of throttle lever.

NOTE: At this point, the index mark on ground spoiler unarm cam should be aligned with the index mark on support shaft and the setscrew tightened.

(5) Install alternate longitudinal trim motor and brake control switch lever assembly 6.653 inches (169.0 mm) measured from center of shield.

(6) Install shim on lever support shaft.

(7) Install right throttle lever with throttle interlock cam installed between two legs of throttle lever 7.357 inches (186.9 mm).

(8) Install right fuel shutoff lever.

(9) Install right fuel shutoff lever guard pin support.

(10) Install fuel crossfeed control valve lever. Dimension is 8.653 inches (219.8 mm).

(11) Install two washers on lever support shaft.

(12) Install cabin pressure controller on lever support shaft. Dimension is 10.116 inches (256.9 mm) measured from wheel assembly furthest side. Minimum clearance of 0.031 inch (0.79 mm) must exist between cutout on pedestal frame assembly and each side of the cabin pressure controller.

(13) Install spacer on lever support shaft.

(14) Install flap control module on lever support shaft. (PAGEBLOCK 27-52-05/201)

(15) Install washer(s) and nut on right side of lever support shaft.

CAUTION: EXCESSIVE TORQUE ON LOCKNUT WILL DAMAGE LAMINATED SHIMS INSTALLED BETWEEN COMPONENTS.

(16) Tighten nut until washer(s) rotation just stops (washer no longer spins freely), then back off one cotter pin hole and safety with cotter pin.

(17) Install lever support shaft retaining nut and bolt in left end of shaft. Safety bolt to frame with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(18) Remove tags and connect following cables to applicable drums, pulleys, and sectors. Safety cable balls, with lockwire or cotter pin, making certain that no cotter pin prongs extend over side of sector. Tighten turnbuckles at station 350 and rig system to recommended rig loads. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: In order to ensure consistent 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 outdoors, readings are to be taken during the time period between three (3) hours after sunset and one (1) hour after sunrise.

Table 203

Cable Identification	Function
25A	Rudder power shutoff--On
26A	Rudder power shutoff--Off
55A	Left engine fuel shutoff--Off
56A	Left engine fuel shutoff--On
57A	Right engine fuel shutoff--Off
58A	Right engine fuel shutoff--On
71A	Fuel crossfeed--Off
72A	Fuel crossfeed--On
241A	Flap control--Flap down
242A	Flap control--Flap up
243A	Flap control--Flap down
244A	Flap control--Flap up
119A	Pressure control override--Decrease
120A	Pressure control override--Increase
125A	Horizontal stabilizer primary motor contactor overrider--Noseup
126A	Horizontal stabilizer primary motor contactor overrider--Nosedown
127A	Horizontal stabilizer primary brake override switch--Noseup
128A	Horizontal stabilizer primary brake override switch--Nosedown
131A	Horizontal stabilizer position indicator--Noseup

Table 203 (Continued)

Cable Identification	Function
132A	Horizontal stabilizer position indicator--Nosedown
159A	Speedbrake--Extend
160A	Speedbrake--Retract

(19) Install bolts and spacers that secure longitudinal trim shield and longitudinal trim indicator shield to pedestal frame.

NOTE: Laminated washers should be used as required to prevent rubbing between shield and handles.

(20) Install horizontal stabilizer position indicator module.

(21) Connect two fuel shutoff lever guard pin supports to frame.

(22) Connect alternate longitudinal trim brake control switch support to frame.

(23) Connect flap/slat control pushrod.

(24) Connect electrical wire to cabin pressure auto/manual selector switch.

(25) Connect speed command go-around select switch wires and automatic throttle quick-disconnect switch wires to terminal strip located on forward right side of forward pedestal equipment support.

(26) Connect speedbrake pushrod to upper shaft crank.

(27) Connect automatic spoiler pushrod to crank on upper shaft.

(28) Connect two throttle pushrods to lower shaft sectors.

(29) Connect alternate longitudinal trim motor control switch pushrod to upper shaft sector.

(30) Install pedestal upper cover frame on pedestal.

(31) Connect two throttle lever interlock cams to upper pedestal frame.

NOTE: Cam shims should be used as required until throttles just clear to move into reverse thrust range.

(32) Connect cabin pressure controller support to upper pedestal frame.

(33) Install two speedbrake lever cams, latching guide and speedbrake quadrant on pedestal upper cover frame.

(34) Adjust cabin pressure controller as follows:

(a) Place cabin pressure controller lever in auto position.

(b) Adjust controller turnbuckle until brake teeth touch wheel internal gear teeth when rotating wheel 360 degrees by pulling cabin pressure override cable.

(c) Rotate wheel to nearest lock position and shorten turnbuckle 2 to 2-1/2 turns. Lock turnbuckle in nearest lock position by shortening only.

(d) Connect turnbuckle to pedestal upper pedestal frame.

(e) Place lever in manual position and rotate wheel through full range.

NOTE: Wheel must be pressed completely down to rotate in manual position.

(f) Place lever in auto position and check for free rotation of wheel through full range (no touching of brake teeth when pulling cabin pressure override cable).

(g) Place controller lever in manual position measure distance between frame and handle (Dimension "A").

(h) Adjust switch actuator until switch closes.

(i) Move controller lever toward auto position checking that switch closes between 0.38 and 0.62 inch (9.7 to 15.7 mm) greater than dimension "A" and remains closed through auto position range.

(j) Move lever from auto to manual position checking that switch opens between 0.56 and 0.31 inch (14.2 to 7.9 mm) greater than dimension "A".

(k) Place controller lever in manual position, push wheel down until it bottoms, cycle through full range checking that switch remains open.

(35) Engage electrical pins and install three pedestal cover plates on pedestal frame.

(36) Install following components on pedestal levers:

(a) Pointer on cabin air pressure controller

(b) Two knobs on fuel shutoff levers

(c) Knob on rudder hydraulic power shutoff valve control lever

(d) Two knobs from alternate longitudinal trim motor and brake control switch levers

(e) Knob on fuel crossfeed control valve lever

(f) Flap/slat handle, detent slide assembly knobs, and spring from wing flap control handle.

(37) 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, 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

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	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

(38) Restore electrical power to airplane and perform following alignment and switch actuation checks before installing pedestal slide panels:

(a) Check that alternate longitudinal trim motor control switch actuates with minimum clearance of 1/16 inch (1.6 mm) between lever and frame stop in both noseup and nosedown position.

(b) Check that alternate longitudinal trim brake control switch is actuated a minimum of 1/8 inch (3.2 mm), before alternate stabilizer motor switch is actuated in both noseup and nosedown position.

(c) Check that ignition switches actuate when fuel shutoff levers are advanced 5/8 to 1-1/16 inch (15.9 to 27.0mm) from fuel off detent as measured on surface of cover.

(d) Check that minimum authority switch is actuated when throttle lever is moved aft approximately 1 1/32 inch (26.2 mm) from aft stop. Distance is measured on surface of cover between aft stop and throttle lever.

(e) Check that cabin pressure auto/manual selector switch is actuated in open position through full travel range with lever up (latched).

(f) Check that cabin pressure auto/manual selector switch is actuated in closed position through full travel range with lever down (automatic operation).

(g) Check that with the autothrottle servo driving the throttle lever aft, lever should continue moving when an opposing force of approximately 1 pound (.454 kg) is applied to centerline of throttle lever knob. Make this check on throttle at approximately midtravel and for a full 360 degree of clutch travel. Repeat check in opposite direction. Apply opposing force great enough to stop throttle lever travel. Remove opposing force checking that clutch drives throttle lever again.

NOTE: The autothrottle clutch is not adjustable.

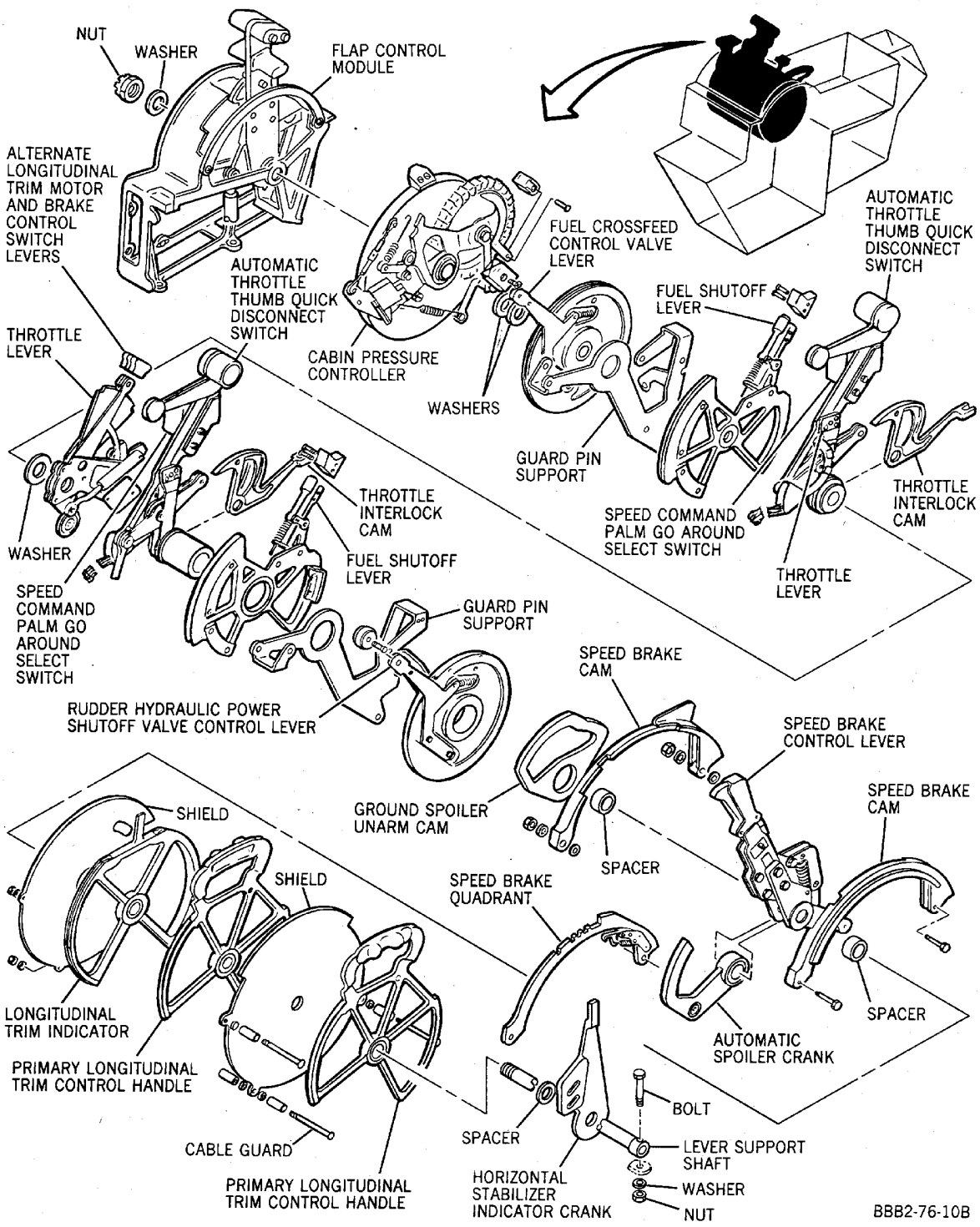
(39) Refer to THROTTLE LIMIT SWITCHES - MAINTENANCE PRACTICES, PAGEBLOCK 76-10-03/201 Config 1 for automatic throttle switch adjustment and actuation check.

(40) Install autopilot control panel in aft side of control pedestal.

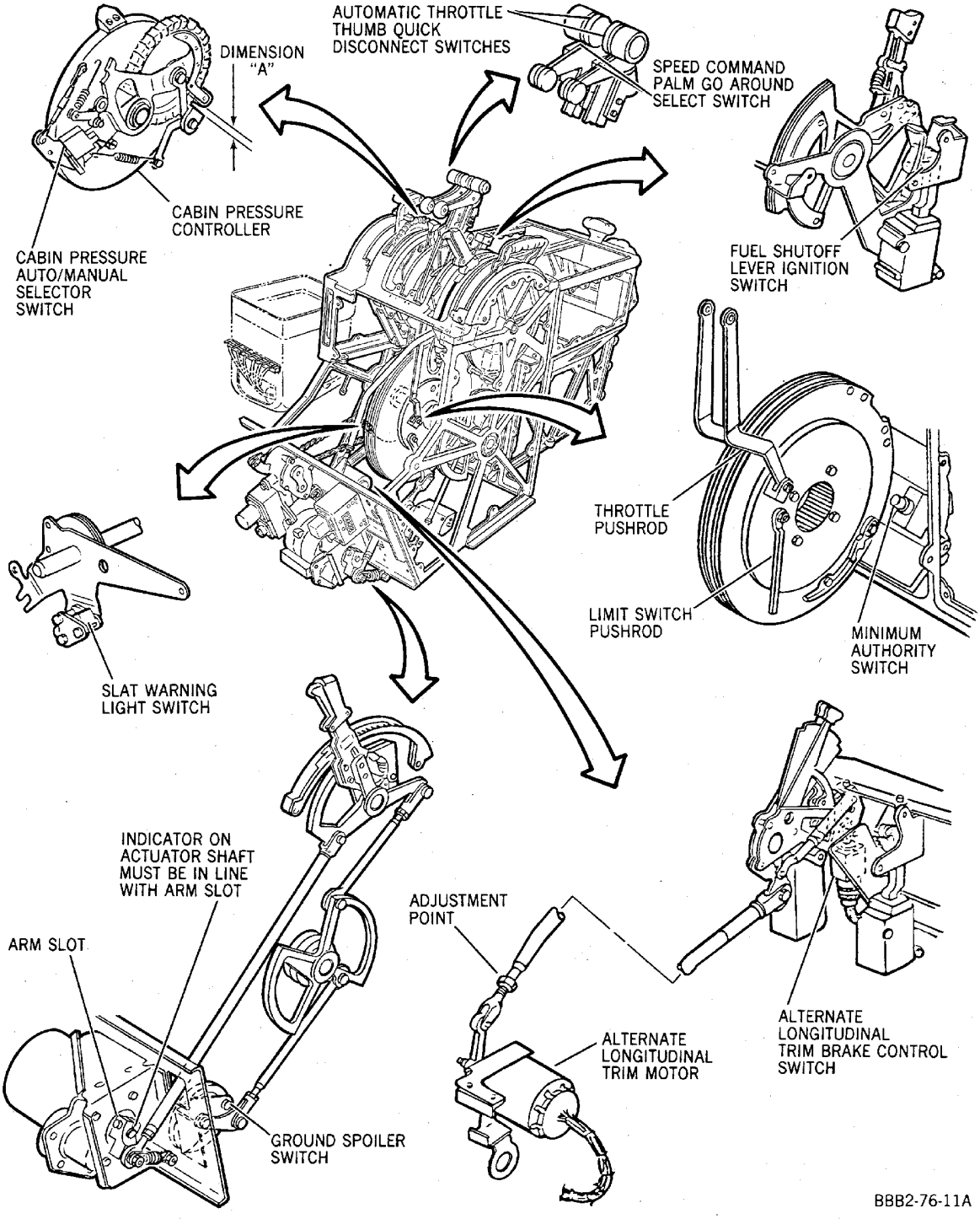
CAUTION: WIRE BUNDLES MUST BE INSTALLED IN LOWER SIDE PANELS POCKET SHIELDS TO PREVENT BUNDLES CHAFING AGAINST CONTROL CABLES.

(41) Perform adjustment checks. (PAGEBLOCK 76-11-00/501 Config 1)

(42) Install side panels on control pedestal.



Lever Support Shaft - Installation
Figure 201/76-10-01-990-801



Pedestal Switch Actuation Points
Figure 202/76-10-01-990-802

SECTOR SUPPORT SHAFT - MAINTENANCE PRACTICES

1. General

A. The sector support shaft is located in the control pedestal in the flight compartment. Access is through the pedestal side panels.

WARNING: MAKE CERTAIN FLIGHT COMPARTMENT THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION.

B. All control cables are adjusted and removed with the reverser system stowed. Before beginning Removal/Installation or Adjustment/Test procedures the thrust reverser control valve should be in the dump position and the safety pin installed.

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 Sector Support Shaft

A. Remove Sector Support Shaft

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

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, 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

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	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

(2) Remove lever support shaft. (PAGEBLOCK 76-10-01/201)

NOTE: The lever support shaft need not be disassembled; however removal procedures should be followed to point of disassembly.

CAUTION: IN ORDER TO AVOID CABLE DRAGGING AND BECOMING FOULED WITH AIRCRAFT STRUCTURE, AN ACCEPTABLE METHOD FOR CLAMPING CABLES PRIOR TO RELIEVING CABLE TENSION SHOULD BE EMPLOYED.

(3) Relieve cable tension by loosening applicable turnbuckles at station 350, and disconnect following cables from drum, sectors and pulleys on sector support shaft.

NOTE: Each cable should be tagged to facilitate installation.

Table 202

Cable Identification	Function
47A	Left engine reverser--Extend
48A	Left engine reverser--Retract
51A	Right engine reverser--Extend
52A	Right engine reverser--Retract
49A	Left engine--Power Off
50A	Left engine--Power On
53A	Right engine--Power Off
54A	Right engine--Power On
159A	Speedbrake--Extend
160A	Speedbrake--Retract
241A	Flap control--Flap down
242A	Flap control--Flap up
243A	Flap control--Flap down
244A	Flap control--Flap up

(4) Disconnect ground spoiler control switch pushrod from sector.

(5) Disconnect throttle limit switch pushrod from autothrottle drum.

(6) Remove all guard pins from guard pin support brackets.

(7) Remove chain from autothrottle clutch shaft. (PAGEBLOCK 22-31-01/201)

(8) Disconnect flap drum drive pushrod from flap control cable drum.

(9) Remove nuts and bolts that secure support shaft at pedestal frame.

(10) Remove shaft retaining bolt and slide support shaft from pedestal frame.

(11) Lift sector support shaft and attached components from pedestal.

(12) Slide components off shaft removing retaining bolts as necessary.

NOTE: To facilitate installation, each component should be tagged as it is removed from shaft.

B. Install Sector Support Shaft

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

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, 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

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	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

(2) Assemble clutch components on autothrottle shaft prior to installation as follows:

(a) Retaining ring.

(b) Autothrottle clutch and drum.

(c) Spring.

(d) Autothrottle clutch and drum.

(e) Retaining ring.

(3) Install flap switch, take-off agree crank on sector support shaft.

(4) Install spacer on sector support shaft.

(5) Install flap/slat control cable drum on sector support shaft.

(6) Install washer, pedestal guard pin support and washer on sector support shaft.

(7) Install cabin pressurization indicating pulley on sector support shaft.

(8) Install shim on sector support shaft.

NOTE: Shim as required so that throttle pushrod clears drum of clutch assembly on inboard side and fuel shutoff sector on outboard side in all positions of travel.

(9) Install autothrottle clutch assembly on sector support shaft.

(10) Install autothrottle shaft support on sector support shaft.

(11) Install shim on sector support shaft.

NOTE: Shim as required so that throttle pushrod clears drum of clutch assembly on inboard side and fuel shutoff sector on outboard side in all positions of travel.

(12) Install autothrottle guard pin support on sector support shaft.

(13) Install support retaining bolt in sector support shaft.

NOTE: Autothrottle guard pin support and pedestal guard pin support guard pin holes should align for guard pin installation.

(14) Install spoiler sector on sector support shaft.

(15) Install shim to provide 0.005 to 0.010 inch (0.127 to 0.254 mm) clearance.

(16) Install longitudinal trim indicator sector on sector support shaft.

(17) Install longitudinal trim indicator crank on sector support shaft.

(18) Lower sector support shaft into pedestal frame.

(19) Install support thru frame and onto pedestal shaft.

(20) Install nuts and bolts that attach support to pedestal frame.

(21) Install shaft retaining bolt.

(22) Connect chain to autothrottle clutch shaft. (PAGEBLOCK 22-31-01/201)

(23) Connect ground spoiler pushrod to sector.

(24) Connect flap drum drive pushrod to flap control cable drum.

(25) Connect throttle limit switch pushrod to throttle drum and safety with a cotter pin.

(26) Remove tags and connect following cables to applicable drums, pulleys, and sectors. Safety all cable balls, with lockwire or cotter pin, making certain that no cotter pin prongs extend over side of sector. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

Table 203

Cable Identification	Function
47A	Left engine reverser--Extend
48A	Left engine reverser--Retract
51A	Right engine reverser--Extend
52A	Right engine reverser--Retract
49A	Left engine--Power Off
50A	Left engine--Power On
53A	Right engine--Power Off
54A	Right engine--Power On
159A	Speedbrake--Extend
160A	Speedbrake--Retract
241A	Flap control--Flap down
242A	Flap control--Flap up
243A	Flap control--Flap down
244A	Flap control--Flap up

(27) Install guard pins in all guard pin support brackets.

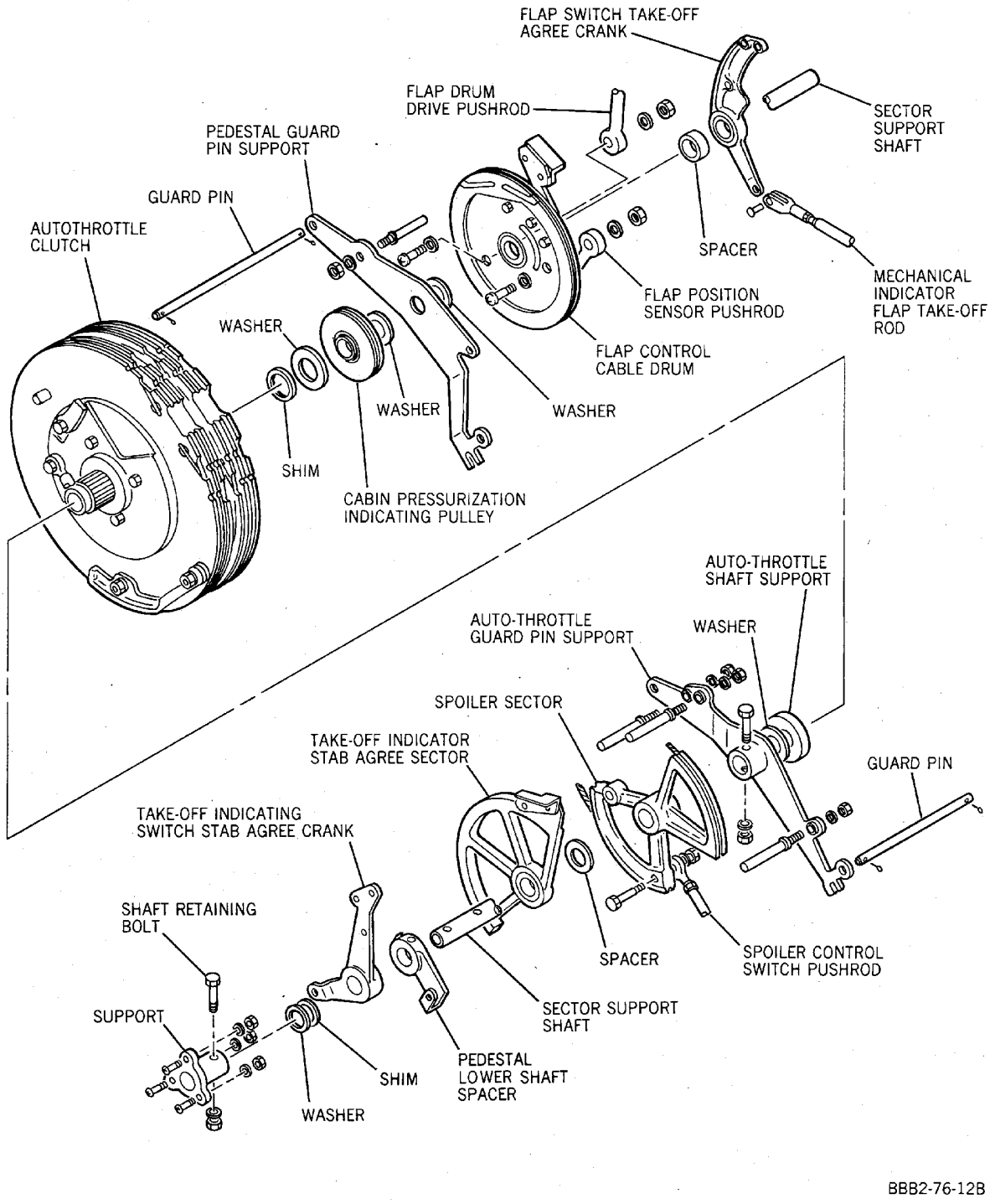
(28) Install lever support shaft. (PAGEBLOCK 76-10-01/201)

(29) Tighten turnbuckles at station 350, and check for proper rig loads. Safety turnbuckles.

NOTE: In order to ensure consistent 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 outdoors, readings are to be taken during the time period between three (3) hours after sunset and one (1) hour after sunrise.

(30) Perform adjustment checks. (PAGEBLOCK 76-11-00/501 Config 1)

(31) Install pedestal side panel.



Sector Support Shaft - Installation
Figure 201/76-10-02-990-801

THROTTLE LIMIT SWITCHES - MAINTENANCE PRACTICES

1. General

A. The throttle actuated limit switches are located in the control pedestal in the flight compartment. Access to the switches is through the pedestal side panels. Procedures are identical for left and right switch units.

B. Adjustment/test of individual switches and cams within the switch unit are presented in specific system chapters. This data has been extracted from CHAPTER 21, CHAPTER 27, CHAPTER 32 and CHAPTER 34 and condensed to be included as part of this Chapter/Section in order to treat the switch package as a unit.

C. Procedures for replacing, adjusting, and testing the switch package as a unit or an individual switch are contained in this section. It is recommended that in case of switch failure that the entire switch unit be replaced, and that individual switch replacement be performed in the shop.

2. Equipment and Materials

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

Table 201

Name and Number	Manufacturer
Flexible scale	Commercially available

3. Removal/Installation Limit Switch Unit

A. Remove Switch Unit

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

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
U	22	B1-757	CABIN PRESSURE CONTROL-1
U	24	B1-772	LEFT ALTITUDE BIAS CONTROL
W	22	B1-759	CABIN PRESSURE CONTROL-2
W	24	B1-771	RIGHT ALTITUDE BIAS CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

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
WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
D	19	B10-322	COMPARATOR MONITOR-1

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	19	B10-324	COMPARATOR MONITOR-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891-893			
D	7	B10-323	COMPARATOR MONITOR-2

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
E	07	B10-325	COMPARATOR MONITOR-2

WJE ALL

(2) Move throttle levers to idle position.

(3) Remove side panels from control pedestal.

(4) Disconnect limit switch unit electrical connector.

(5) Disconnect throttle crank from pushrod.

(6) Remove switch cover.

(7) Remove switch unit holddown bolts and remove switch unit from pedestal.

NOTE: Access to the holddown bolts is through the forward accessory compartment. A thin 3/8 inch open-end wrench may be used to hold bolt heads when removing the attach nuts. Bolts and switch unit are removed together.

B. Replace Individual Switch in Switch Unit (with unit removed from airplane)

(1) Remove wire bundle clamp.

(2) Disconnect wires from switch being replaced. Tag wires as necessary for identification. (Figure 201)

CAUTION: ENSURE THAT SWITCHES, WASHERS, SPACERS, AND BARRIERS ARE KEPT IN SAME RELATIVE ORDER FOR REASSEMBLY. DO NOT LOOSEN CAM SHAFT NUT.

(3) Remove nuts from switch retaining rods and slide rods out of unit only far enough to remove affected switch.

(4) Hold new switch in place and slide switch retaining rod through unit while ensuring that washers, spacers, and barriers are in proper order.

(5) Install and tighten nuts on retaining rods.

(6) Remove wire identification tags and connect wires to switch.

(7) Install wire bundle clamp.

C. Install Switch Unit

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

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
U	22	B1-757	CABIN PRESSURE CONTROL-1
U	24	B1-772	LEFT ALTITUDE BIAS CONTROL
W	22	B1-759	CABIN PRESSURE CONTROL-2
W	24	B1-771	RIGHT ALTITUDE BIAS CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

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
WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
D	19	B10-322	COMPARATOR MONITOR-1

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	19	B10-324	COMPARATOR MONITOR-1

UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891-893			
D	7	B10-323	COMPARATOR MONITOR-2

WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891-893 (Continued)

UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
E	07	B10-325	COMPARATOR MONITOR-2

WJE ALL

(2) Install switch unit in pedestal and bolt in place.

(3) Connect throttle crank to pushrod.

(4) Perform Adjustment/Test. (Paragraph 4.)

4. Adjustment/Test Limit Switch Unit

A. Adjustment Switch Unit

(1) Secure flexible scale to throttle quadrant. (Figure 202)

(a) Retard left throttle to mechanical stop and immobilize.

(b) Place flexible scale even with rear of throttles to determine switch actuation points.

(c) Repeat Paragraph 4.A.(1)(a) and Paragraph 4.A.(1)(b) for right throttle.

(2) Advance/retard throttle lever, as required, to dimensions from idle stop-forward, shown in Figure 203 and check for appropriate switch actuation. All switches within switch unit should be checked for proper actuation after any switch(es) is adjusted.

NOTE: A multimeter or continuity light should be used to check switch actuation.

(3) Continue this procedure until all switches have been checked.

NOTE: If switches do not actuate at dimensions shown in Figure 203, proceed as follows:

CAUTION: TO PREVENT OTHER SWITCH CAM POSITIONS FROM BEING DISTURBED, DO NOT MOVE THROTTLE WHILE CAM SHAFT NUT IS LOOSE.

(a) Loosen cam shaft nut one turn, then retighten finger tight.

NOTE: The nut is retightened finger tight to prevent adjacent switch cam rotation after each cam is adjusted.

CAUTION: EXCESSIVE SPREADING OF CAM MAY DAMAGE HOLDING CAPABILITY OF CAM.

(b) Slightly spread switch cam by inserting screwdriver in cam slot and rotate cam on shaft until switch actuates at proper position. Start with cam adjacent to lever, and adjust each cam in sequence, working toward nut end of switch. Adjustment must be made by moving cam to final position in clockwise direction only, as viewed from nut end of switch.

NOTE: It may be necessary to retard throttle lever to idle a reverse thrust to gain access to cam slot.

(c) Repeat procedure as necessary for other switches.

(d) Tighten cam shaft nut to torque of 50 to 70 inch-pounds (5.7 to 7.9 N·m) and recheck switch actuation points.

(e) Repeat adjustment procedure and retorque nut if necessary.

(f) Safety with cotter pin.

B. Close Up

(1) Connect switch unit electrical connector.

(2) Install cover on switch unit.

(3) Install pedestal side panels.

(4) Remove flexible scale from throttle quadrant.

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

LOWER EPC, DC AIR CONDITIONING & MISCELLANEOUS

Row	Col	Number	Name
U	22	B1-757	CABIN PRESSURE CONTROL-1
U	24	B1-772	LEFT ALTITUDE BIAS CONTROL
W	22	B1-759	CABIN PRESSURE CONTROL-2
W	24	B1-771	RIGHT ALTITUDE BIAS CONTROL

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	26	B1-187	LANDING GEAR WARNING

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
WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
D	19	B10-322	COMPARATOR MONITOR-1

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
E	19	B10-324	COMPARATOR MONITOR-1

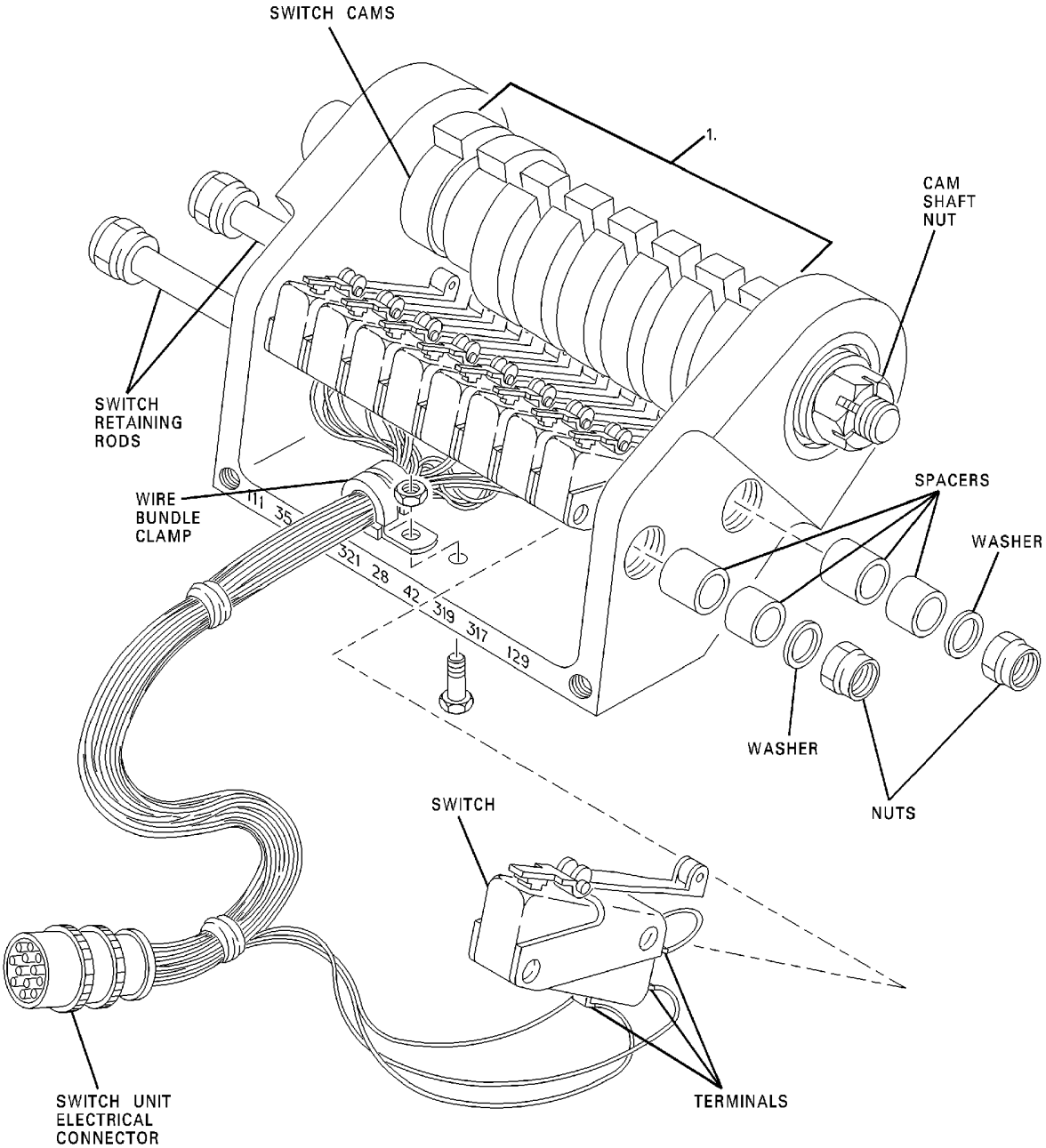
UPPER EPC, RIGHT RADIO AC BUS

Row	Col	Number	Name
WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891-893			
D	7	B10-323	COMPARATOR MONITOR-2

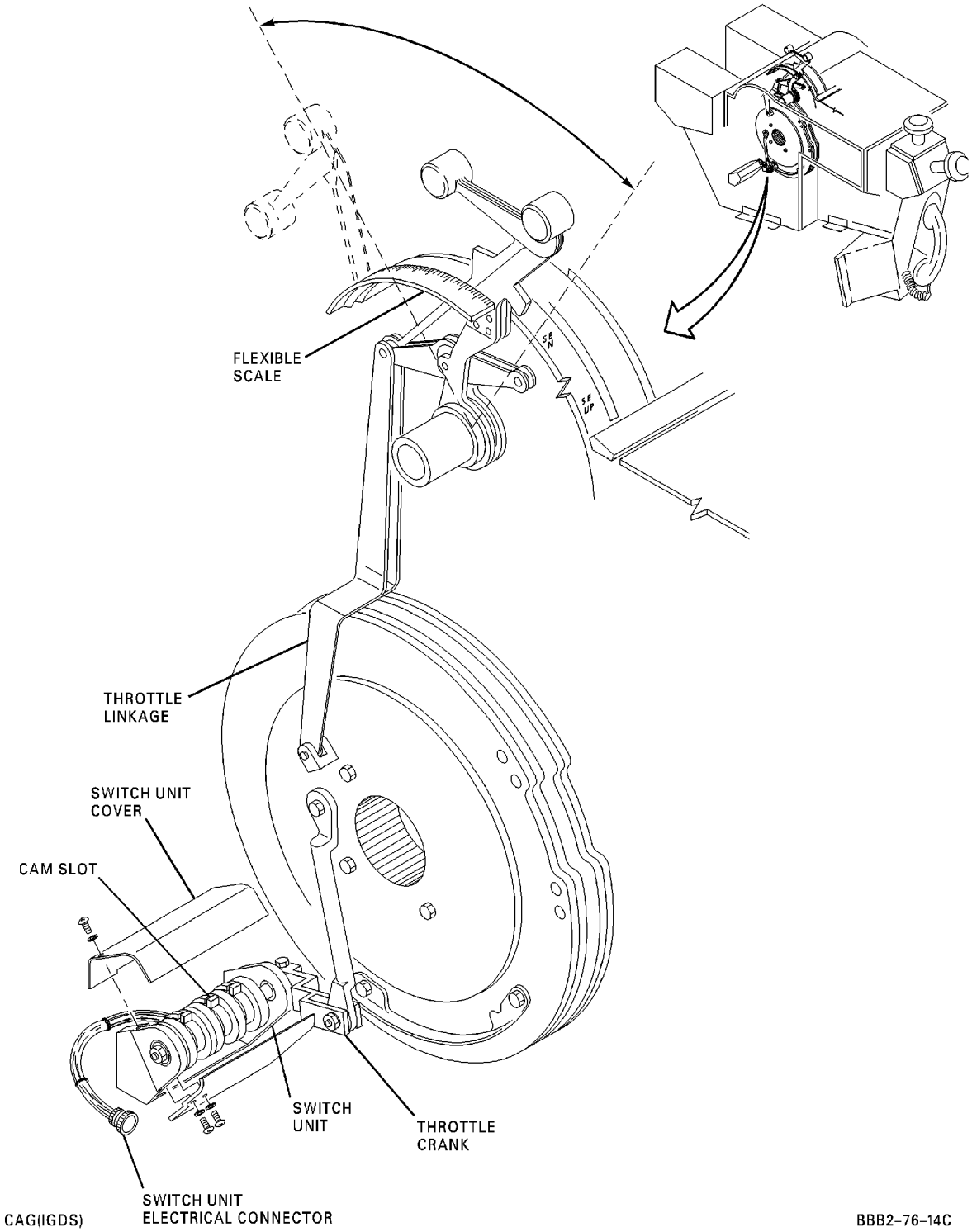
UPPER EPC, RIGHT RADIO DC BUS

Row	Col	Number	Name
WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
E	07	B10-325	COMPARATOR MONITOR-2

WJE ALL



Throttle Switch Unit - Switch Replacement
Figure 201/76-10-03-990-801



Throttle Switch Unit - Adjustment/Test
Figure 202/76-10-03-990-802

SWITCH/ITEM No.	PLUG/PINS	THROTTLE LEVER TRAVEL AND DIRECTION (MEASURED FROM IDLE STOP)	ACTUATOR ROLLER POSITION ON CAM
AIR CONDITIONING ALTITUDE BIAS CONTROL S1-111 (LS) S1-112 (RS)	P1-1193 c AND b P1-1194 c AND b	2-9/16 ±1/8 in. (65.1 ±3.2mm) POWER OFF (2)	ON HIGH SURFACE OF CAM AT IDLE (3)
AIR CONDITIONING S1-111 (LS) S1-112 (RS)	P1-1193 c AND b P1-1194 C AND B	4.3 ±.21 in. PILOTS REVERSE LEVEL TRAVEL (MEASURED FROM IDLE POSITION AND IN THE REVERSE POSITION)	ON LOW SURFACE OF CAM AT MAX POWER (4)
AIR CONDITIONING S10-35 (LS) S10-38 (RS)	P1-1193 Z AND a P1-1194 Z AND a	2.125 ±1/8 in. (54.0 ±3.2 mm)) POWER ON (1)	ON HIGH SURFACE OF CAM AT IDLE
TAKEOFF WARNING S1-321 (LS) S1-322 (RS)	P1-1193 R AND S P1-1194 T AND U	1-23/32 ±1/8 in. (43.7 ±3.2 mm) POWER ON (1)	ON LOW SURFACE OF CAM AT IDLE
LANDING GEAR WARNING S1-319 (LS) S1-320 (RS)	P1-1193 V AND U P1-1194 V AND Y	5/8 ±1/8 in. (15.875 ±3.175 mm) POWER OFF (2)	ON LOW SURFACE OF CAM AT IDLE
NAV/INST MONITOR S10-129 (LS) S10-130 (RS)	P1-1193 M AND T P1-1194 P AND R	1-23/32 ±1/8 in. (43.7 ±3.2 mm) POWER ON (1)	ON LOW SURFACE OF CAM AT IDLE
INHIBIT SPOILER DEPLOYED ANNUNCIATOR LIGHT * S10-28	P1-1193 D AND X P1-1193 W AND X	1-23/32 ±1/8 in. (43.7 ±3.2 mm) POWER ON (1)	ACTUATOR ROLLER ON LOW PART OF CAM AT IDLE

* ON AIRCRAFT WITH SERVICE BULLETIN 27-257 INCORPORATED

(1) Throttle moved FORWARD from idle stop - POWER ON.
(2) Throttle moved AFT towards idle stop - POWER OFF.
(3) For aircraft with altitude bias control.
(4) For aircraft without altitude bias control.

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S0006556177V2

Switch Actuating Continuity
Figure 203/76-10-03-990-803

THROTTLE POSITION SWITCHES - MAINTENANCE PRACTICES

1. General

A. This procedure provides instruction for the removal/installation of the throttle position switches.

B. This procedure provides instruction for the adjustment/test of the throttle position switches.

2. Removal/Installation Throttle Position Switches

A. Gain access to the lower left aft side of the pedestal or lower aft right side for switch access.

B. Remove the switch by removing the mounting screws from the plunger assembly. (Figure 201)

NOTE: Do not remove the plunger assembly from the switch unless it also is to be replaced.

C. Tag and disconnect the wires from the switch terminals.

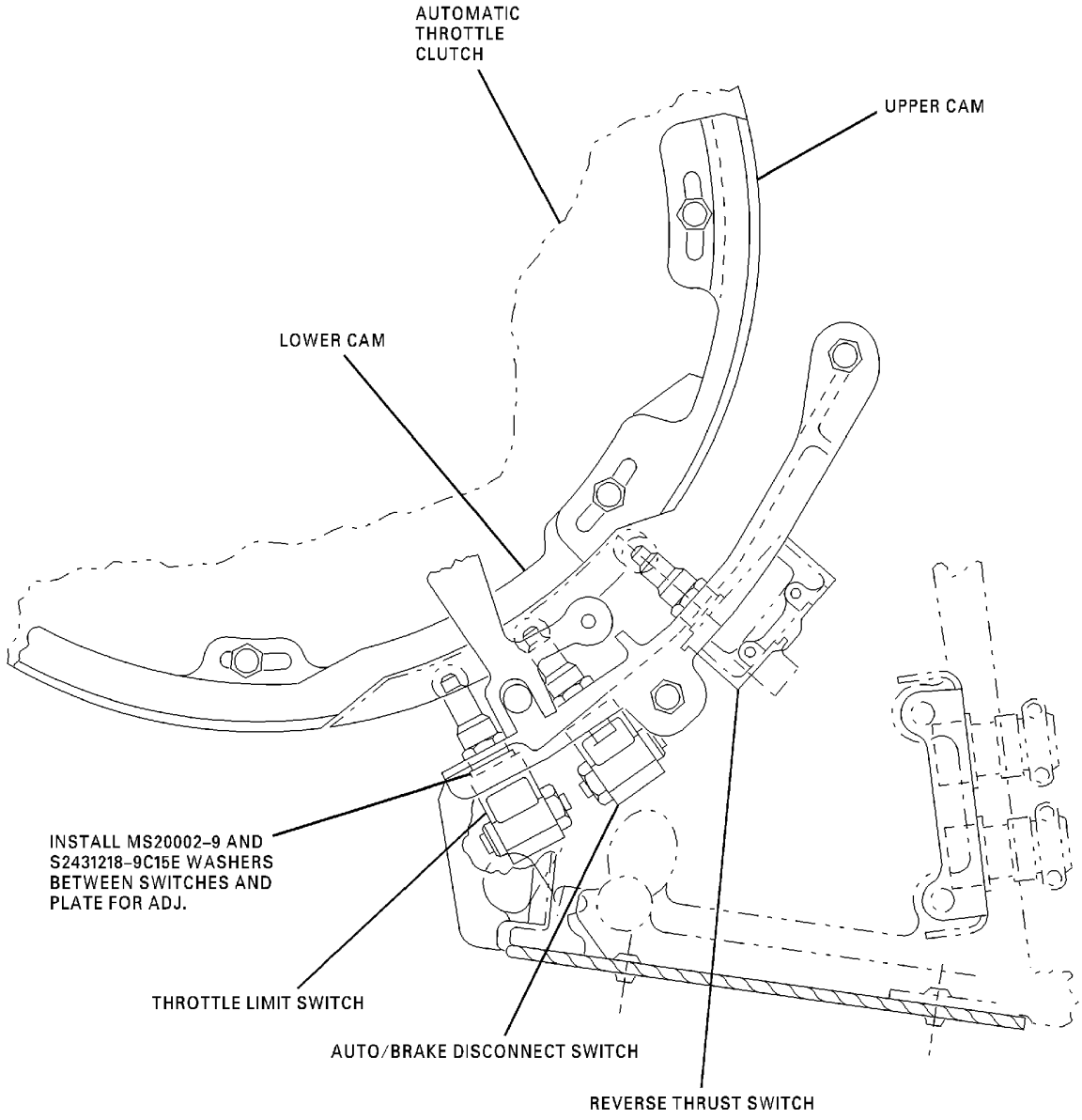
D. Connect the wires to the new switch.

E. Install MS20002-9 and S2431218-9C15E washers between switches and plate for adjustment.(Figure 201 (Sheet 2))

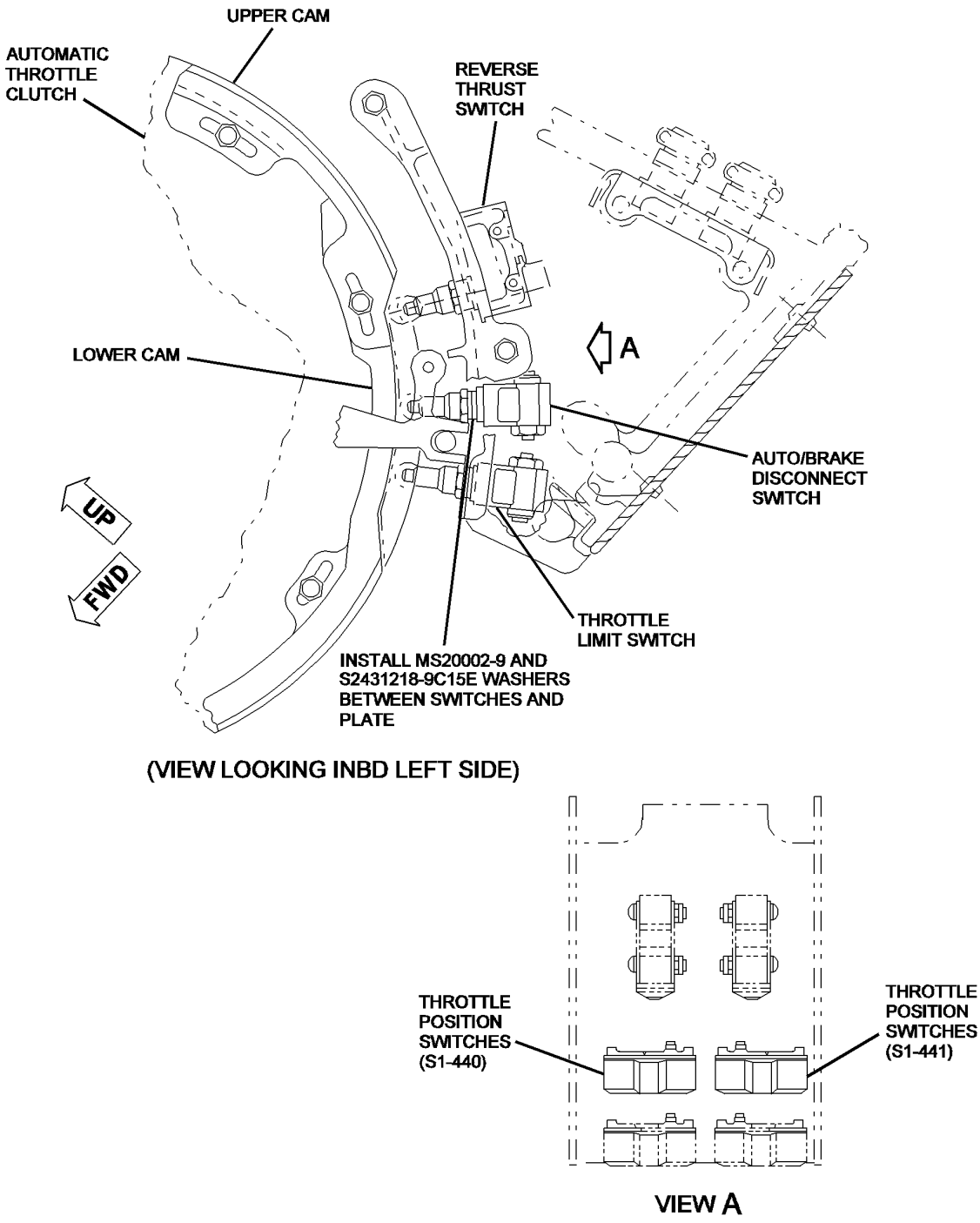
F. Install the switch in the plunger assembly.

G. Adjust and test the switch per THROTTLE SYSTEMS - ADJUSTMENT/TEST, PAGEBLOCK 76-11-00/501 Config 1.

H. Replace the access panels removed in Paragraph 2.A..



Throttle Position Switches - Replacement
Figure 201/76-10-04-990-801 (Sheet 1 of 2)



Throttle Position Switches - Replacement
Figure 201/76-10-04-990-801 (Sheet 2 of 2)

3. Adjustment/Test Throttle Position Switches

A. Adjust the cam with the throttle lever in the idle position. (Figure 201)

(1) Move reverse thrust lever to full reverse position.

(2) Move reverse thrust lever to idle position.

(3) Hold reverse thrust lever in idle position.

(4) Adjust upper switch (reverse thrust) for a gap between 0.045 in. (0.114 cm) to 0.060 in. (0.152 cm) exists between roller and surface of cam.

B. Adjust the cam to actuate switches.

(1) Lowest switch (throttle limit) shall actuate when throttle lever has been moved aft to a position 1.015 in. (2.578 cm) to 1.045 in. (2.654 cm).

(2) The aft stop measured on the surface of the cover.

(3) Middle switch (Auto Brake Disconnect) shall actuate when the throttle lever has been moved forward from idle to 1.57 in. (3.99 cm) to 2.08 in. (5.28 cm) from the aft stop measured on the surface of the cover.

(4) Switch actuators should have a minimum 0.030 in. (0.076 cm) of travel remaining when cam and switch are fully engaged at highest point on cam.

(a) Washers between switches and plate may be added or removed as necessary to achieve noted dimensions.

THROTTLE SYSTEMS - TROUBLE SHOOTING

1. General

A. The following trouble shooting procedures cover both Douglas furnished system components and Pratt and Whitney engine fuel control components.

B. Substitute components which are known to be in good working condition to isolate trouble whenever possible.

WARNING: BEFORE ANY TROUBLE SHOOTING ON THROTTLE SYSTEM, VERIFY THAT THRUST REVERSER CONTROL VALVE IS IN DUMP POSITION AND SAFETY PIN IS INSTALLED.

C. Before performing trouble shooting procedures, consult the flight record book or any other data source for pertinent information to aid in isolation of cause for any malfunction.

NOTE: Power lever misalignment will require a trim check of both engines to determine which power lever is misaligned.

NOTE: If restricted throttle movement for left engine during autothrottle operation has been reported, or if trouble shooting has revealed binding of the engine synchronizer flexshaft between the sychronizer actuator and rod end trimmer, check for binding where the flexshaft guide is mounted to engine flange E1. (PAGEBLOCK 76-11-02/201 Config 1)

POSSIBLE CAUSE. TEST OR REPLACE AS REQUIRED.

TROUBLE/SYMPTOM	RUBBING CABLES OR GUARD PINS, MISALIGNED OR DEFECTIVE PULLEYS OR FAIRLEADS	PULLEY RUBBING OR BRACKET	TAKEOFF OR LANDING GEAR WARNING SWITCH HAS DIRT OR DEBRIS IN MECHANISM	TAKEOFF OR LANDING GEAR WARNING SWITCH BINDING AND RUBBING IN CAM GUIDE TUBES	TURNBUCKLE STRIKES FAIRLEAD	DEFECTIVE PULLEY OR BRACKET	BINDING COMPONENTS OR BEARING IN ENGINE CONTROL SHAFT ASSEMBLY OR CROSS SHAFT	DEFECTIVE FUEL CONTROL UNIT	PUSH-PULL CONTROL CONDUIT DAMAGED, KINKED, OR ROUTED TOO SHARP	FOREIGN OBJECT OR RIGGING PIN IN CABLE DRUM OR CONTROL LINKAGE	TURNBUCKLE NOT RIGGED TO PROPER TENSION
A. EXCESSIVE FORCE REQUIRED TO ACTUATE THROTTLE LEVER	1	2	3	4	5		7	6	8		
B. THROTTLE SYSTEM JAMMED					6	3	2	5	4	1	
C. EXCESSIVE SLACK ON THROTTLE LEVER						2					1

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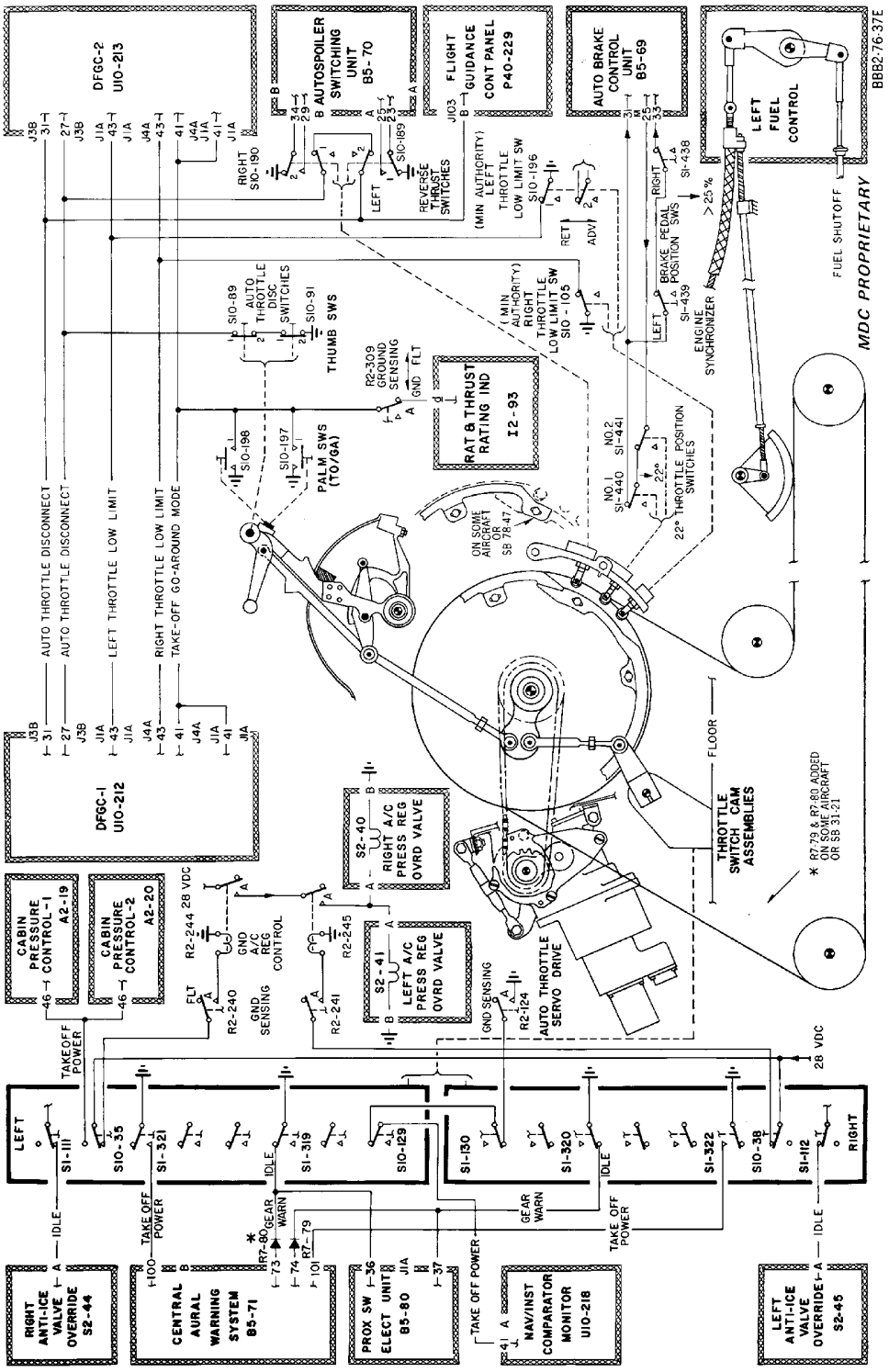
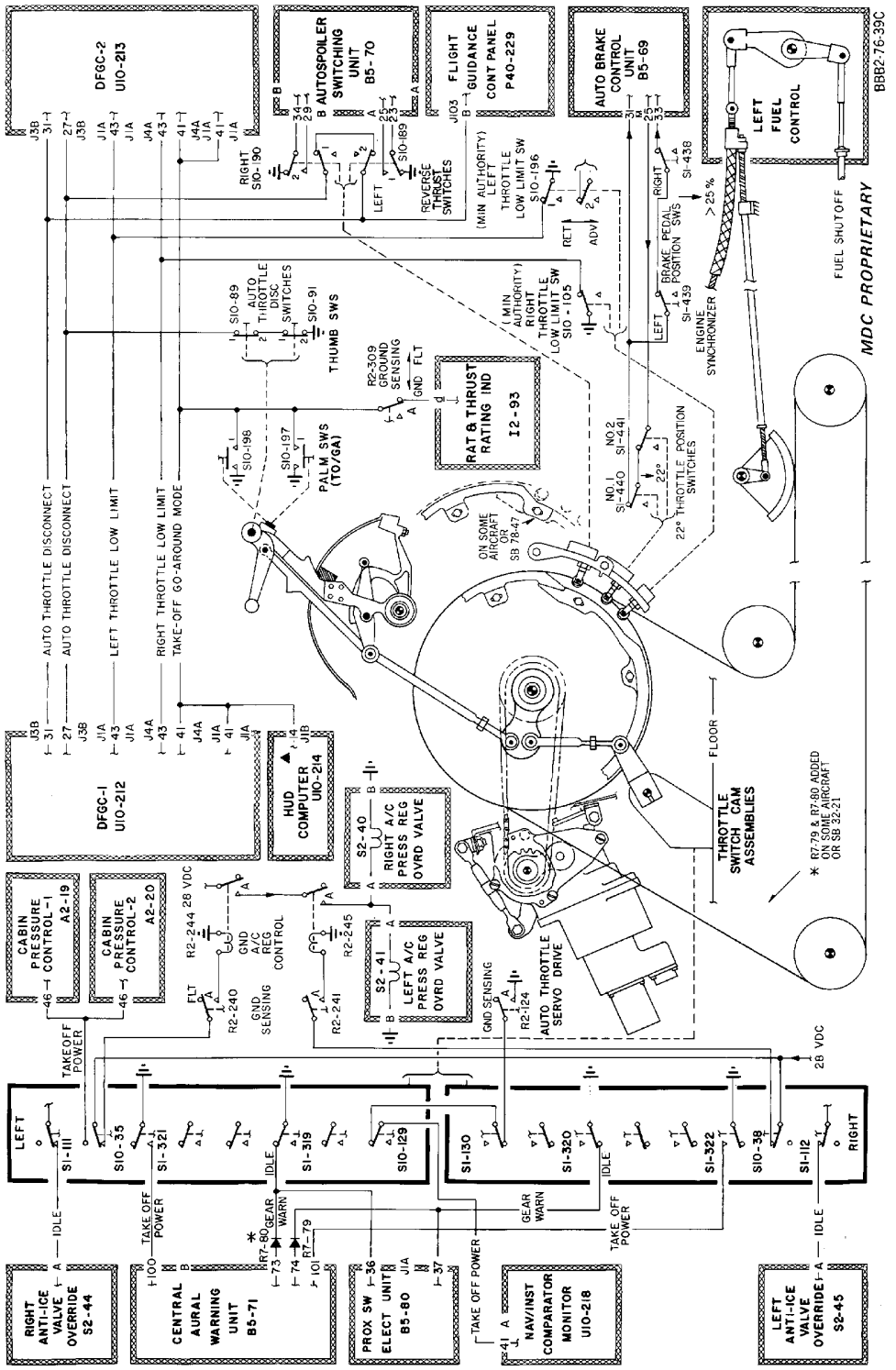
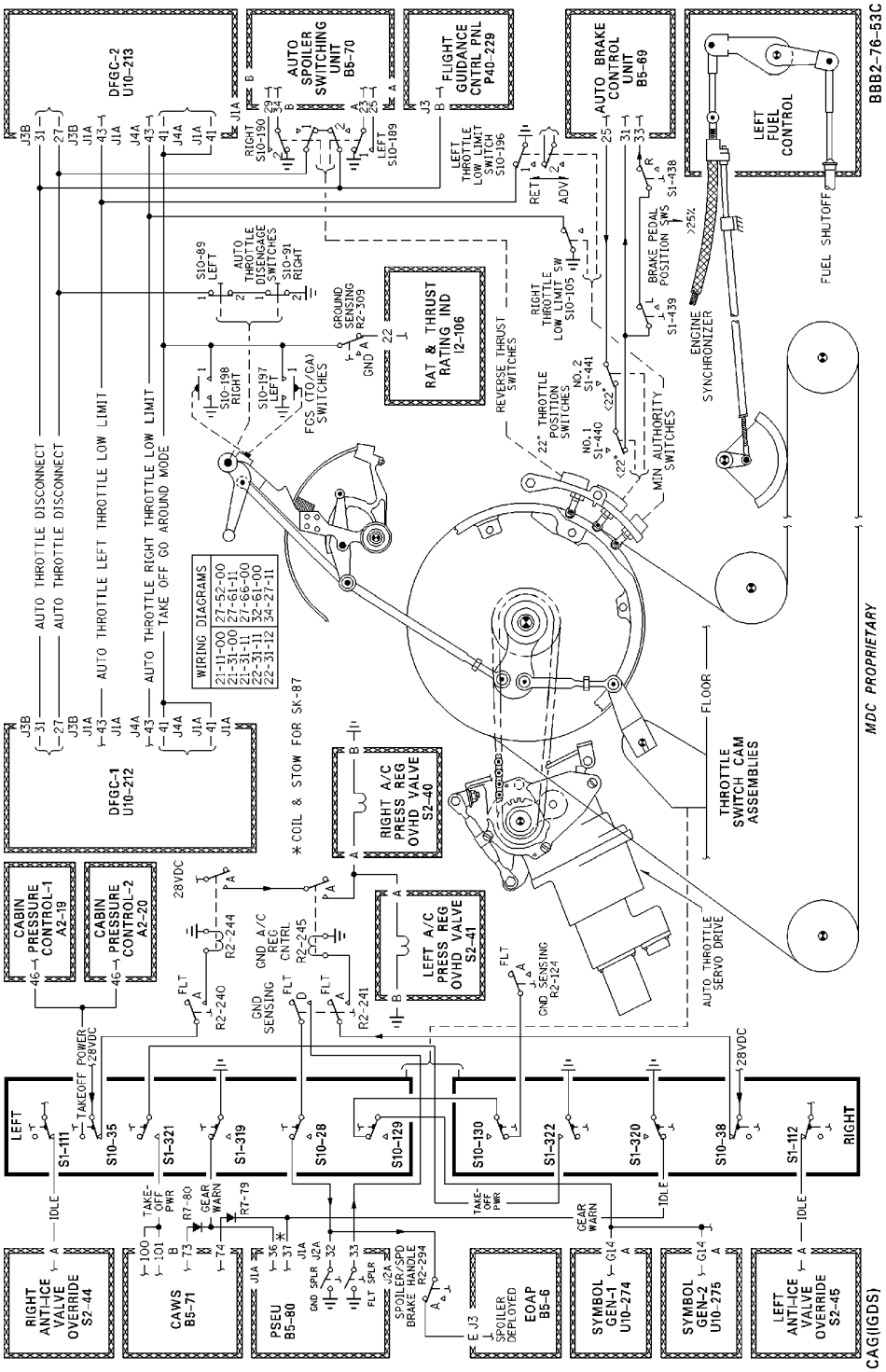
Throttle System - Trouble Shooting Chart
Figure 101/76-11-00-990-801



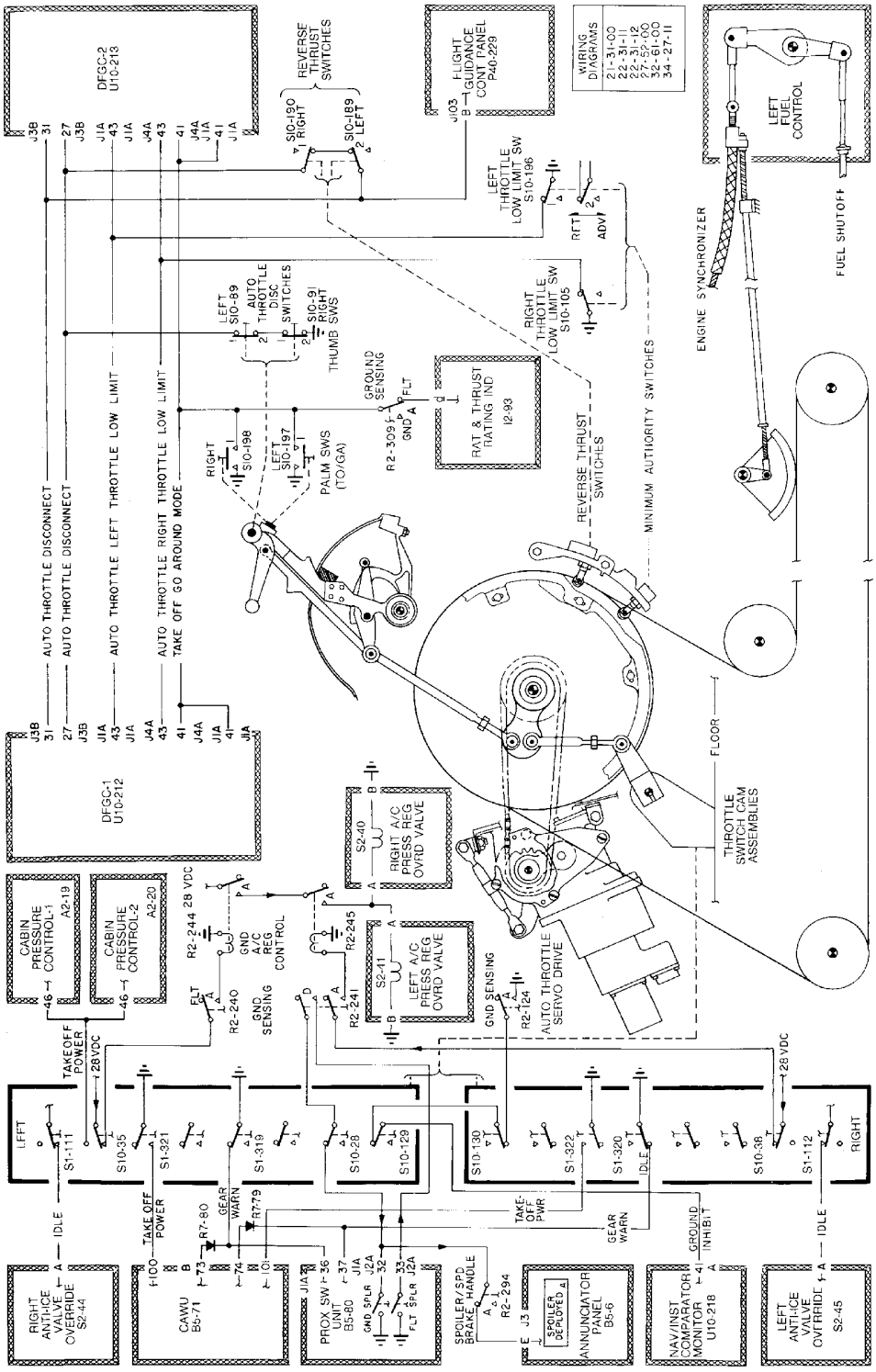
Throttle System - Schematic
Figure 102/76-11-00-990-803 (Sheet 1 of 6)



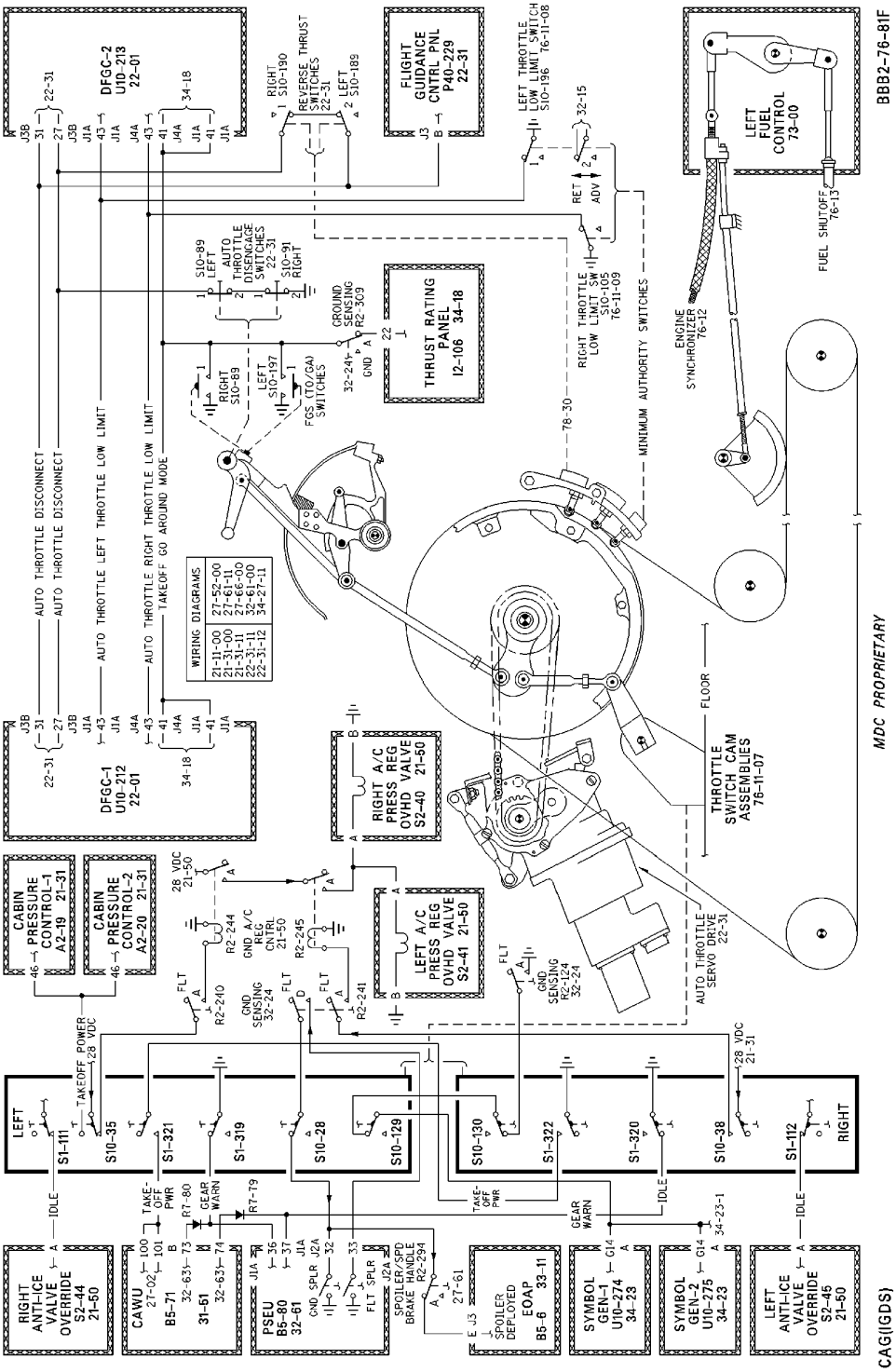
Throttle System - Schematic
Figure 102/76-11-00-990-803 (Sheet 2 of 6)



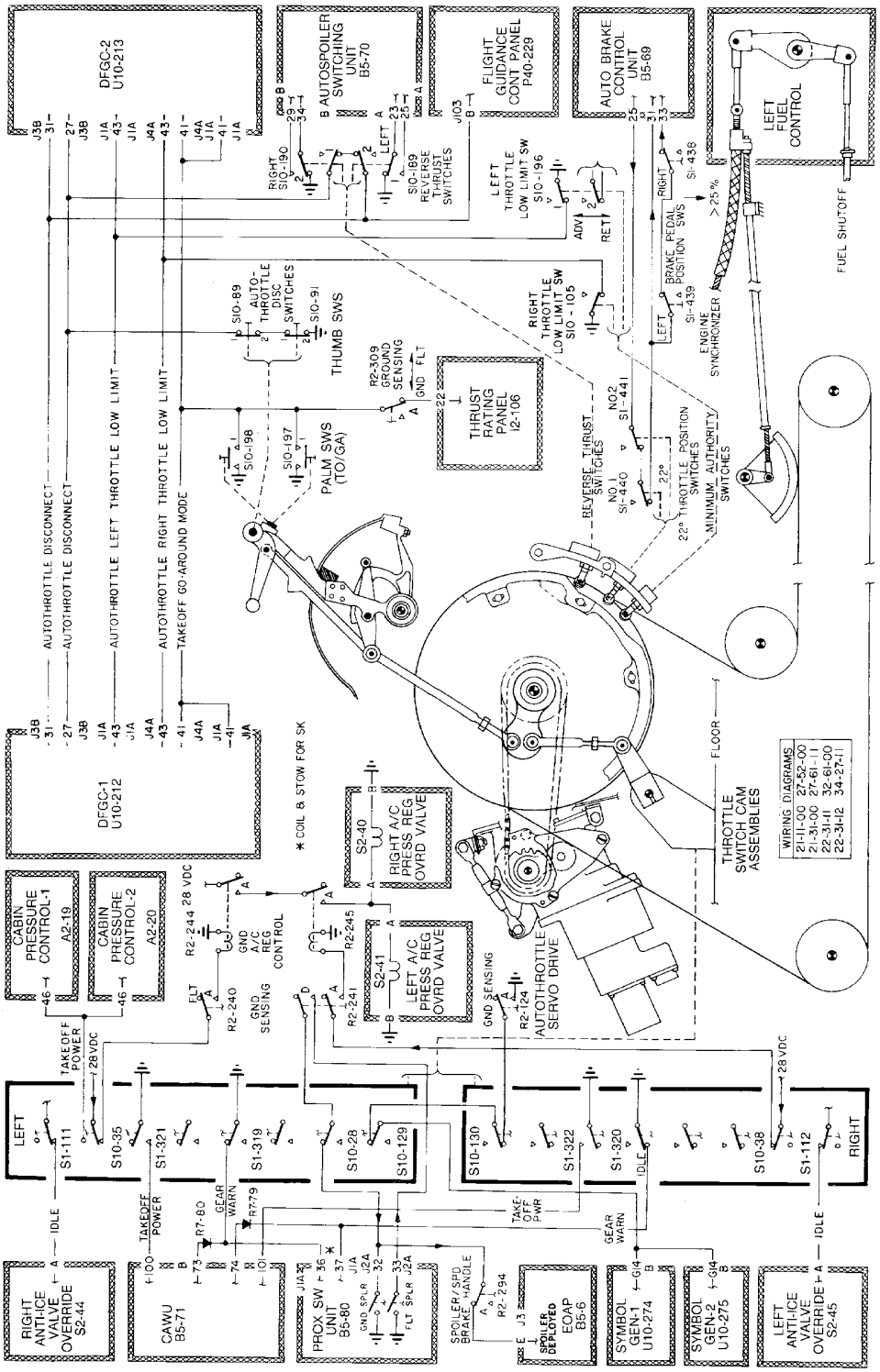
Throttle System - Schematic
Figure 102/76-11-00-990-803 (Sheet 3 of 6)



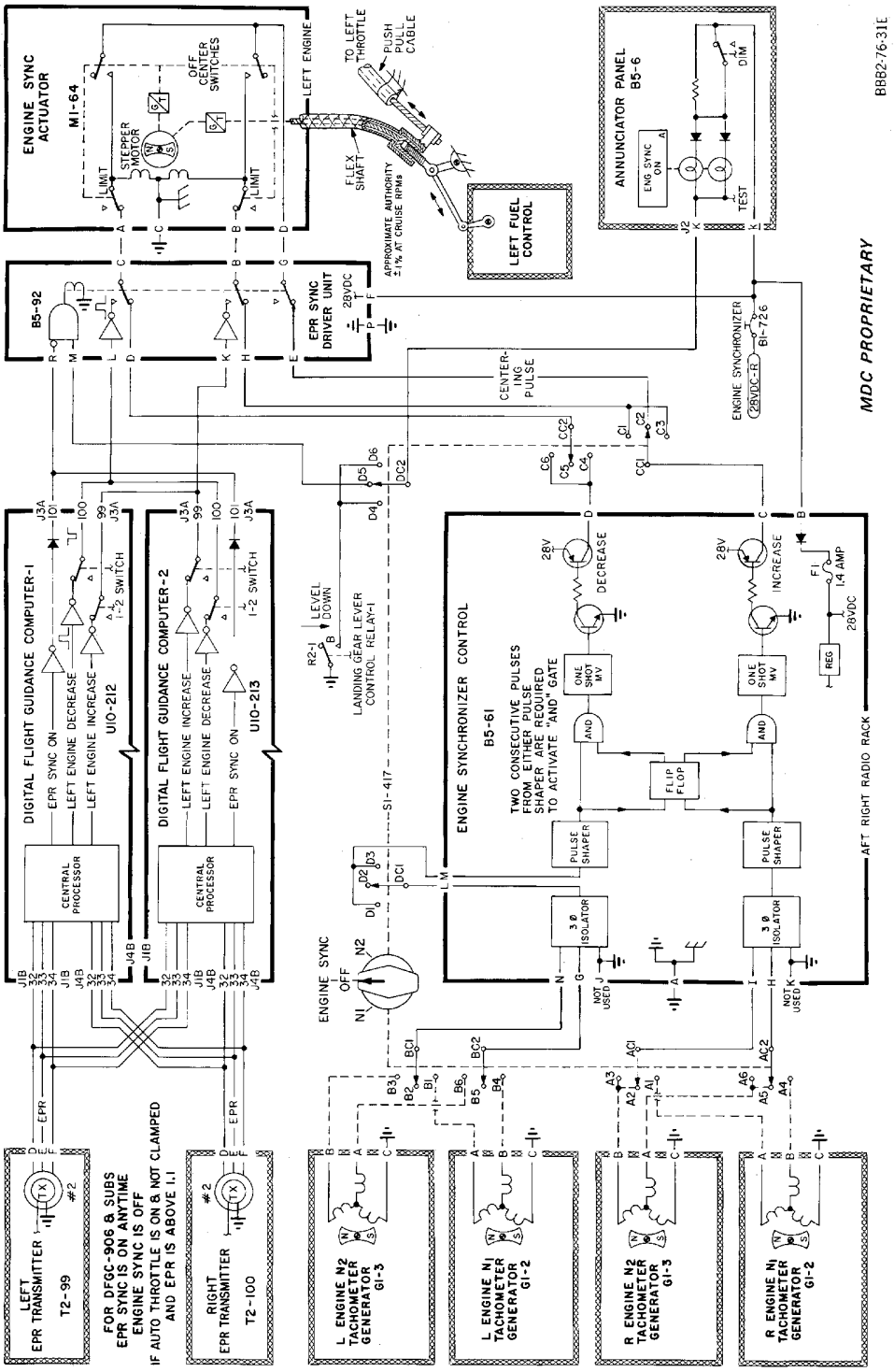
Throttle System - Schematic
Figure 102/76-11-00-990-803 (Sheet 4 of 6)



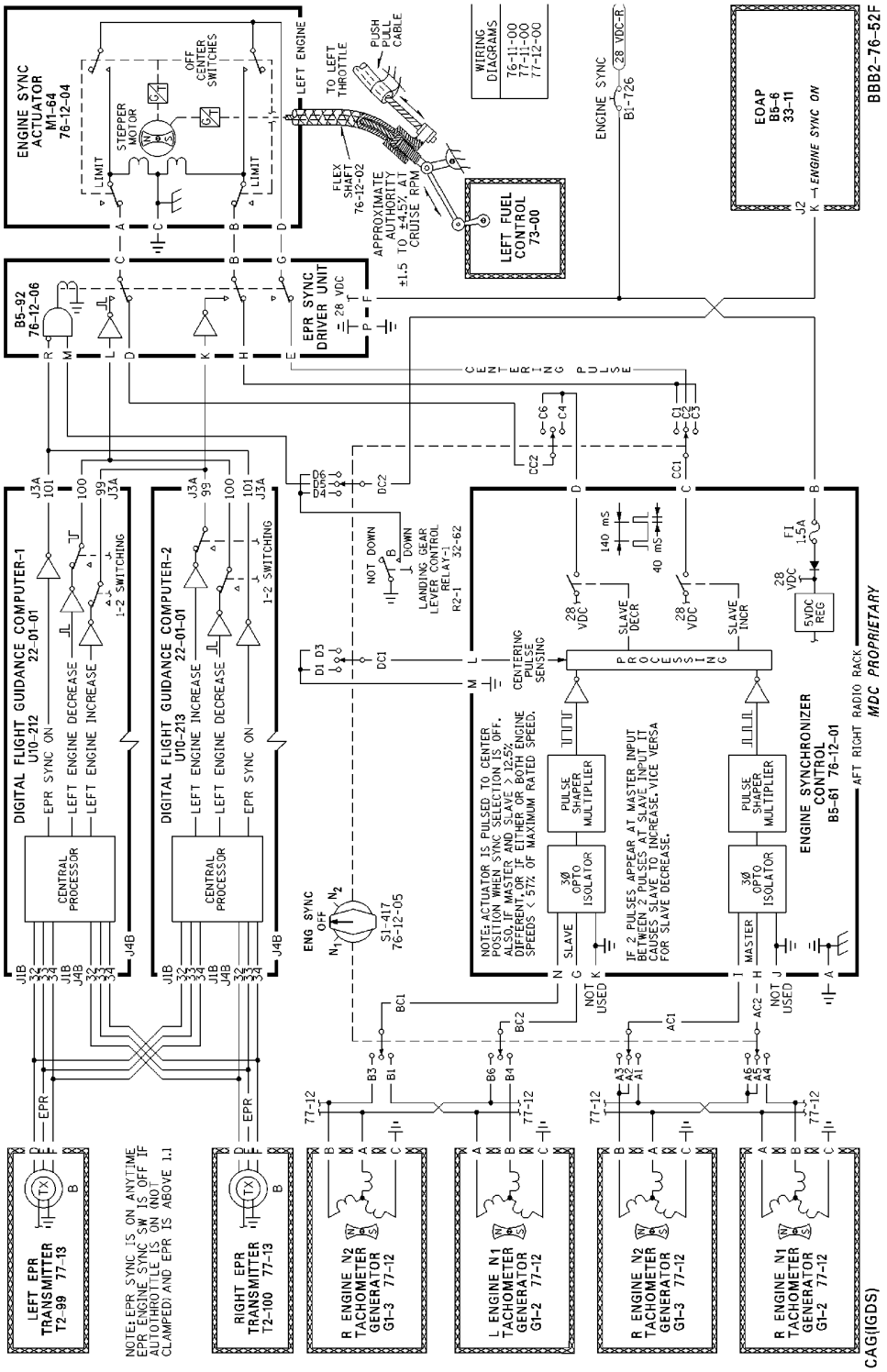
Throttle System - Schematic
Figure 102/76-11-00-990-803 (Sheet 5 of 6)



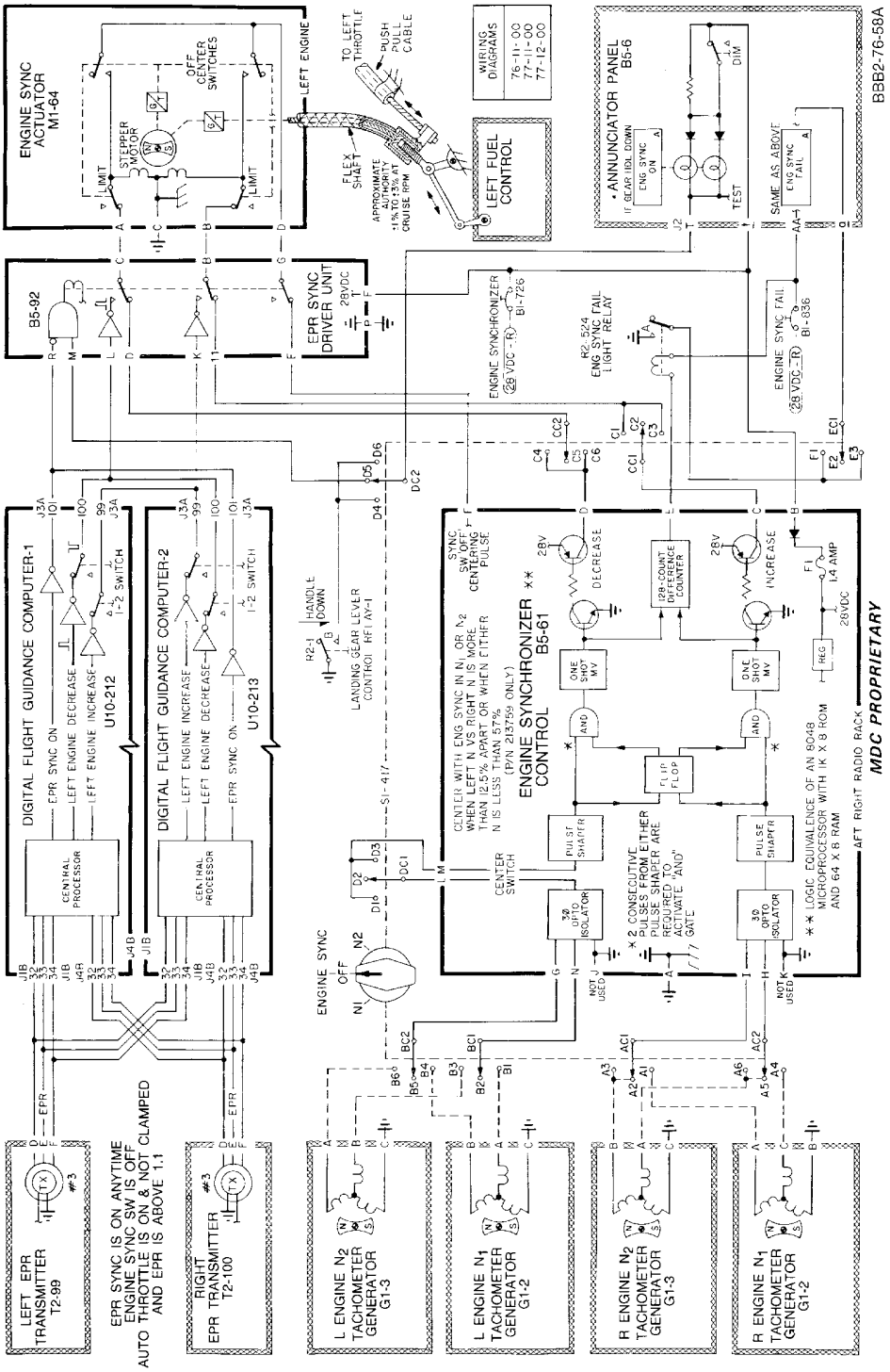
Throttle System - Schematic
Figure 102/76-11-00-990-803 (Sheet 6 of 6)



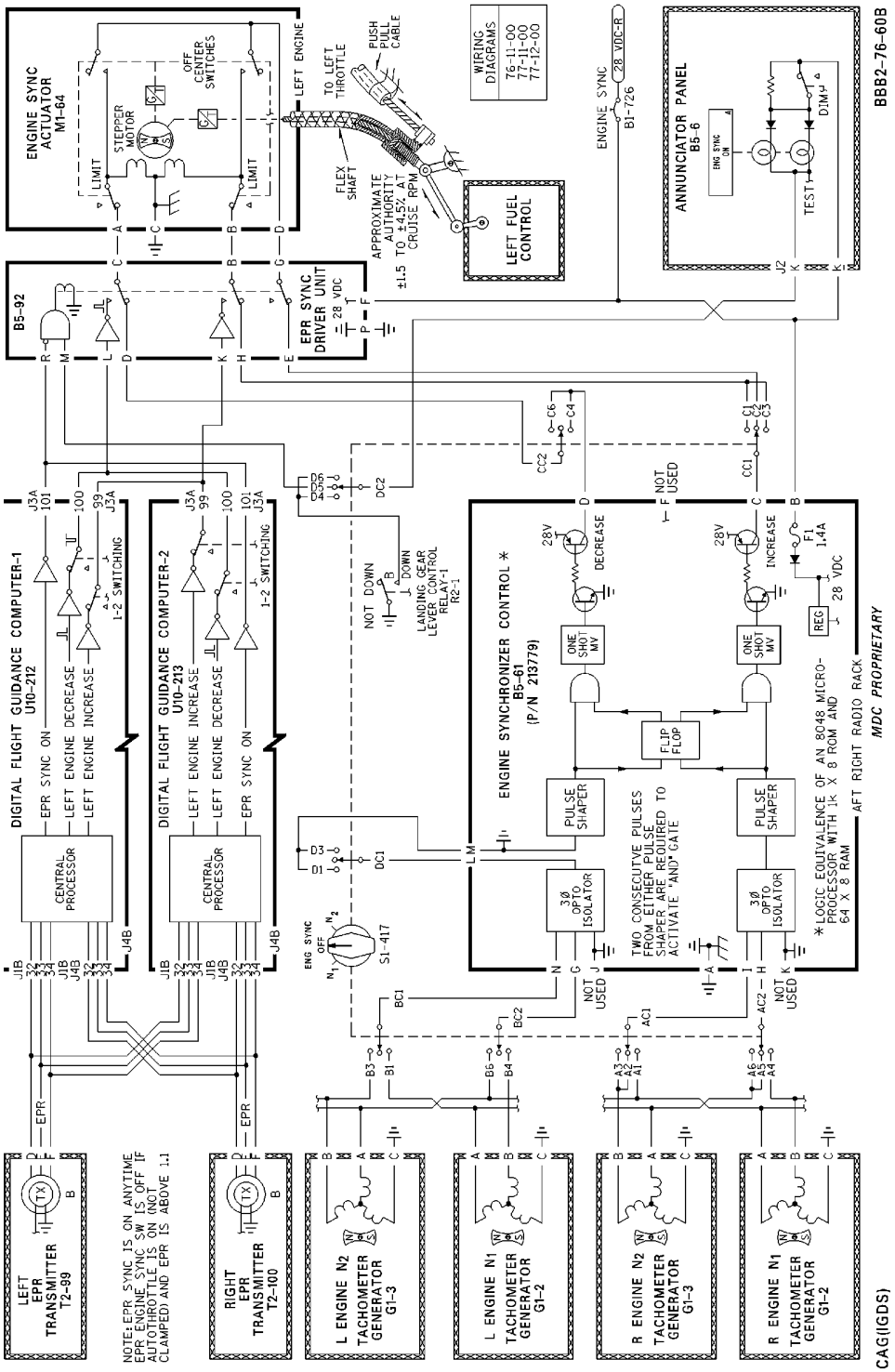
Engine Synchronizer - Schematic
Figure 103/76-11-00-990-804 (Sheet 1 of 5)



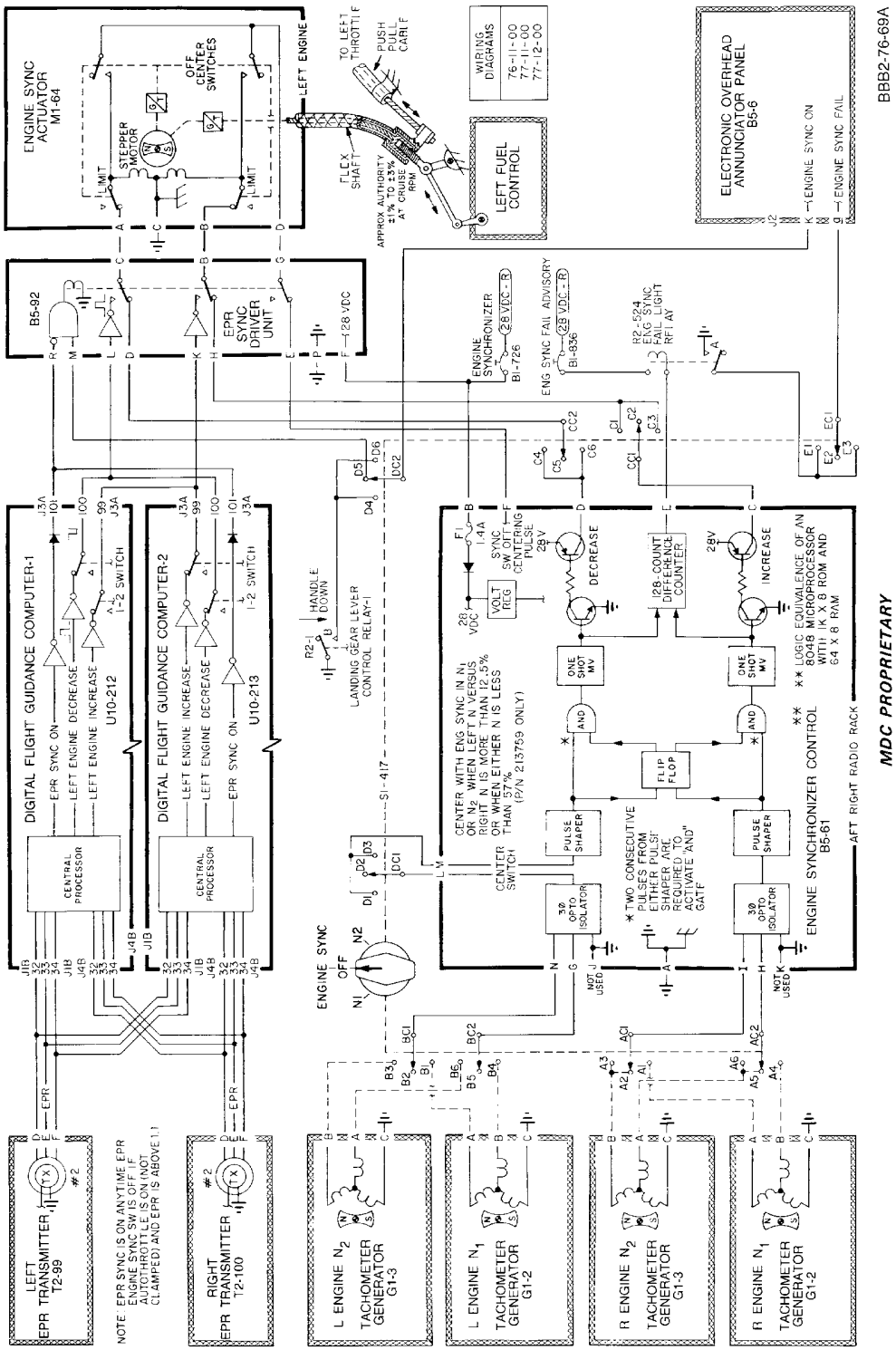
Engine Synchronizer - Schematic
Figure 103/76-11-00-990-804 (Sheet 2 of 5)



Engine Synchronizer - Schematic
Figure 103/76-11-00-990-804 (Sheet 3 of 5)



Engine Synchronizer - Schematic
Figure 103/76-11-00-990-804 (Sheet 4 of 5)



Engine Synchronizer - Schematic
Figure 103/76-11-00-990-804 (Sheet 5 of 5)

THROTTLE SYSTEMS - ADJUSTMENT/TEST

1. General

A. The following procedures apply to the complete system including the pedestal automatic throttle clutch. The adjustment procedures are divided into separate paragraphs to facilitate adjustment of part of a system. When installing rig pins, the cable turnbuckles must be adjusted differentially to permit free installation of the rig pins during test procedures. If any force is required to remove or install the rig pin, the cable turnbuckle, linkage rod ends, or clevis ends must be readjusted to eliminate the binding. Do not spring the rig pin holes to obtain rig pin alignment.

NOTE: Push-push control cable has a flat internal sliding ribbon and will bend in one direction only.

CAUTION: USE EXTREME CARE WHEN WORKING WITH ENGINE PUSH-PULL CABLES. DO NOT BEND CABLE IN RADIUS SMALLER THAN 7-INCHES (177.8MM) MINIMUM OR DAMAGE TO CABLE WILL RESULT.

B. The cable tension chart is listed in, Figure 76-00-00-990-802 and Figure 76-00-00-990-803. Rig pin designations are listed in Paragraph 2.. The numbers and letters enclosed by 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 airplane.

NOTE: In order to ensure consistent 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 outdoors, readings are to be taken during the time period between three (3) hours after sunset and one (1) hour after sunrise.

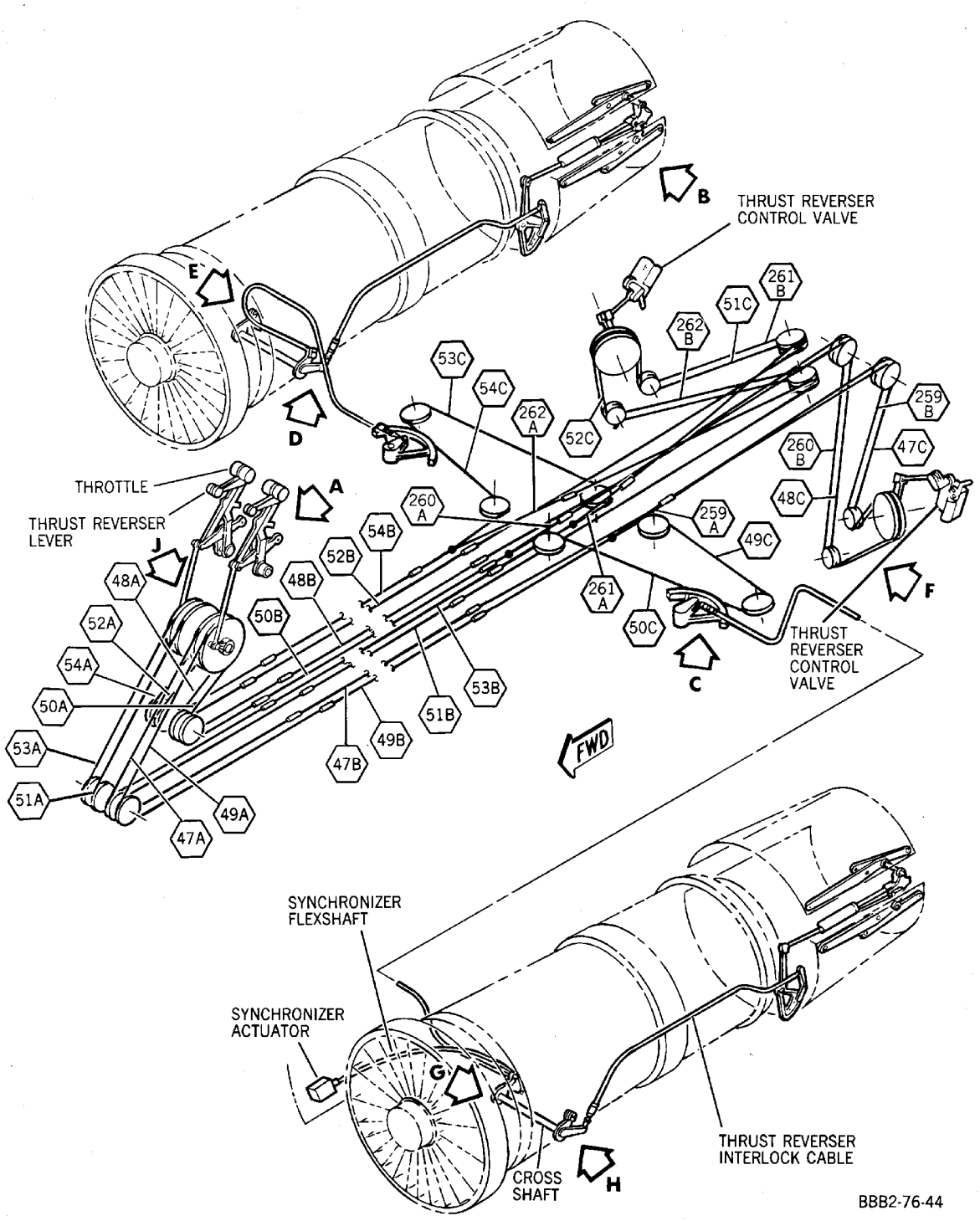
C. Immediately after the adjustment/test procedure is complete, check that all rig pins have been removed and that all applicable components have been safetied.

WARNING: MAKE CERTAIN FLIGHT COMPARTMENT THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION.

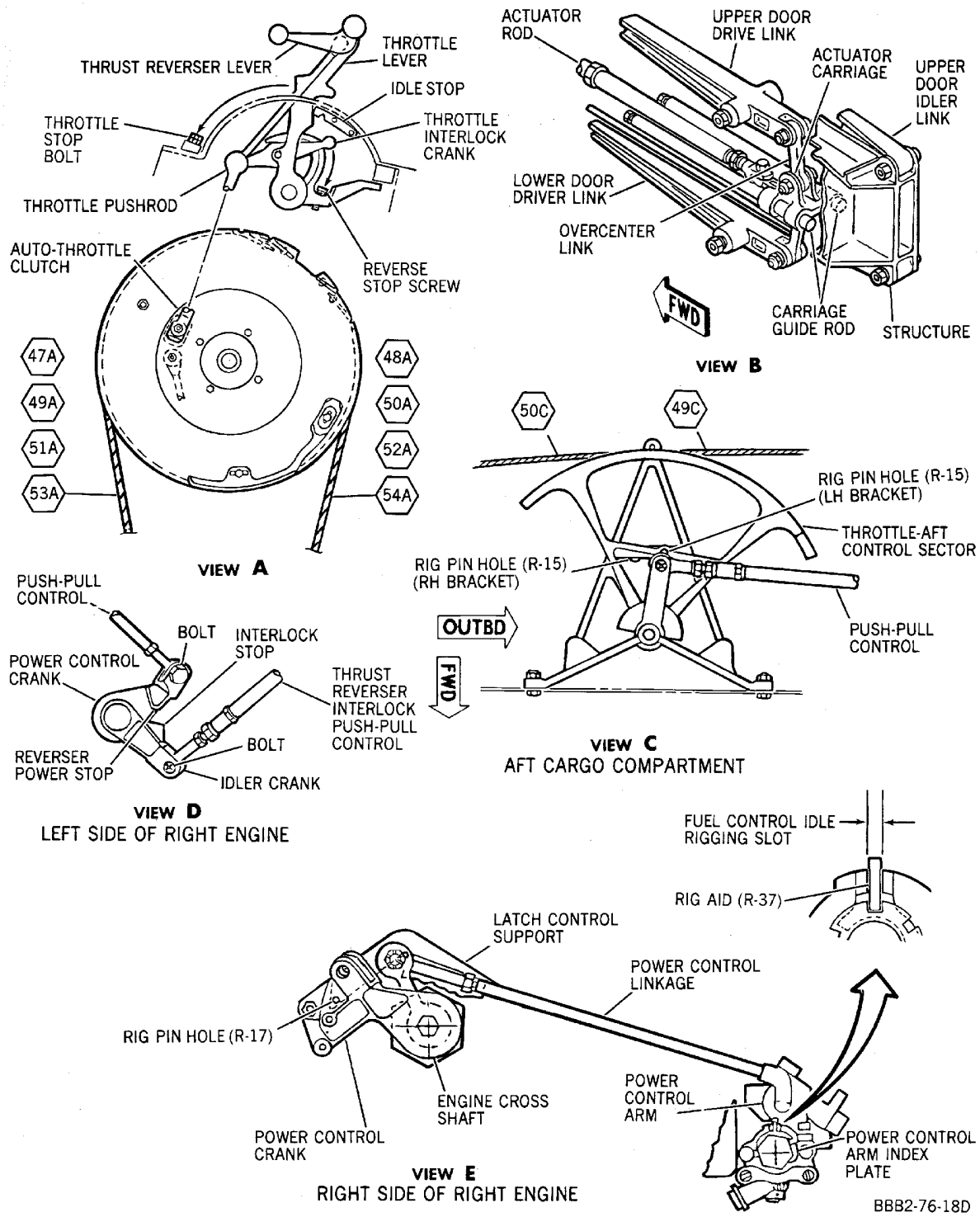
D. All control cables are adjusted and removed with the reverser system stowed; before beginning adjustment or removal procedures, check that the thrust reverser control valve is in the dump position and that the safety pin is installed.

WARNING: TO PREVENT INJURY TO PERSONNEL, EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN.

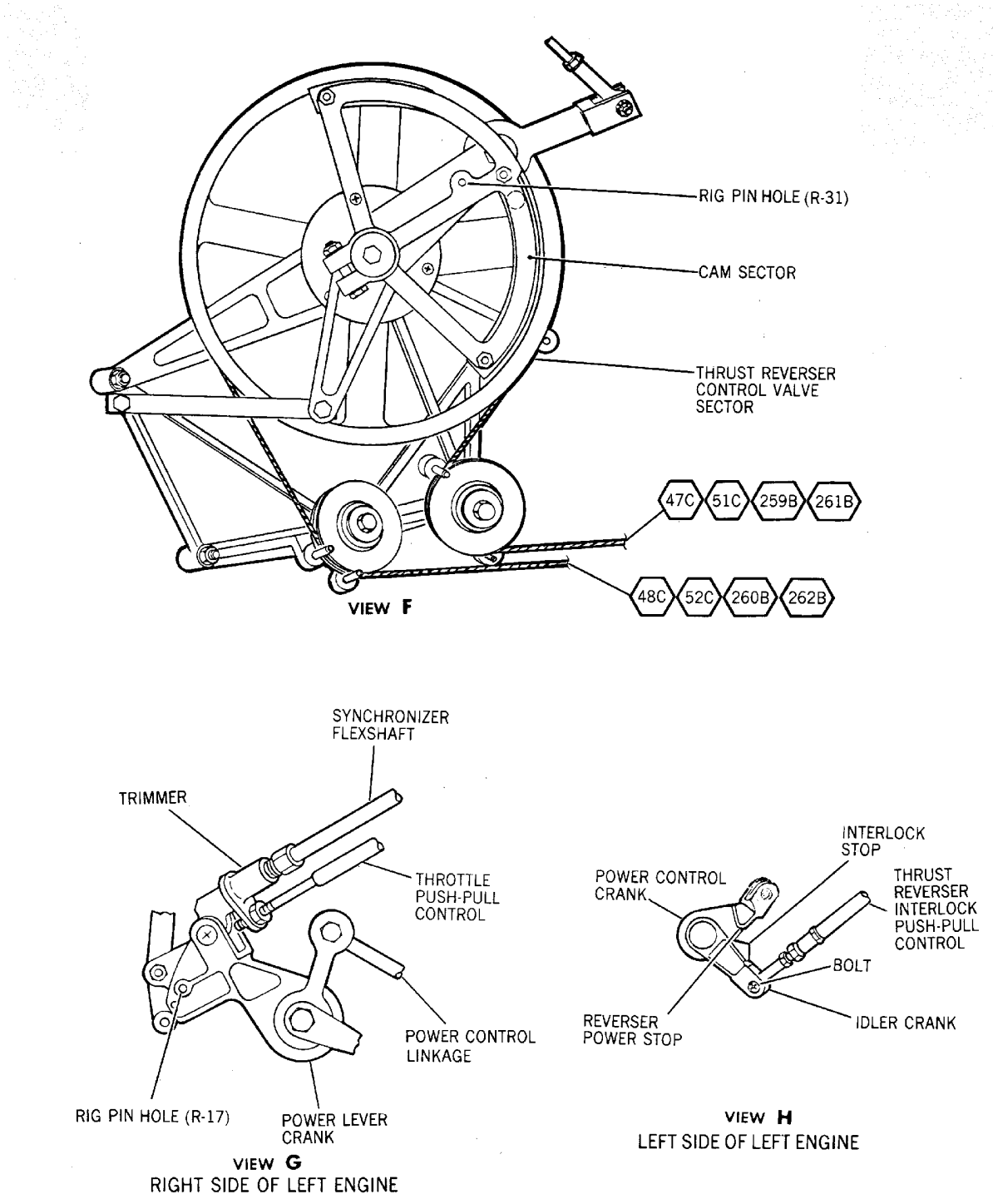
E. Access to engine area control cables is through forward lower cowl door.



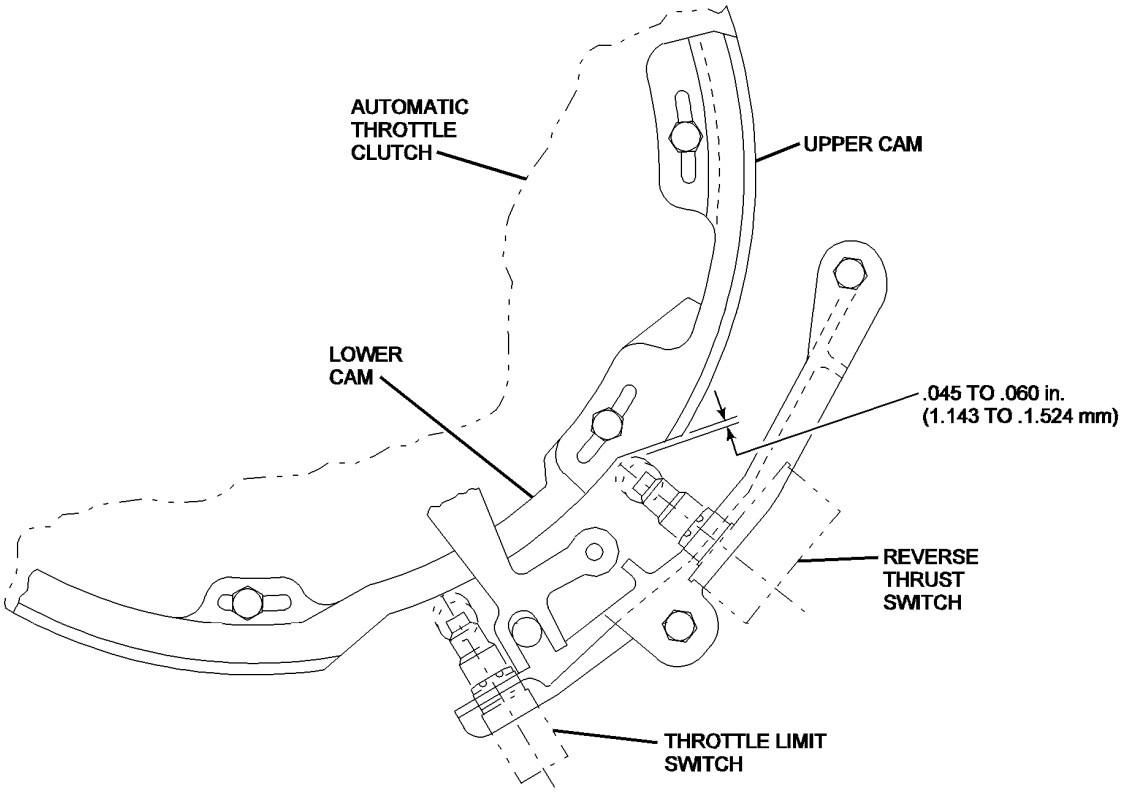
Throttle System - Adjustments
Figure 501/76-11-00-990-805 (Sheet 1 of 4)



Throttle System - Adjustments
Figure 501/76-11-00-990-805 (Sheet 2 of 4)



Throttle System - Adjustments
Figure 501/76-11-00-990-805 (Sheet 3 of 4)



VIEW J

BBB2-76-43A
S0006556230V2

Throttle System - Adjustments
Figure 501/76-11-00-990-805 (Sheet 4 of 4)

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
Rig pin (4-2) 1/4 X 2 5/8, 2 required	
Rig pin (4-3) 1/4 X 3 5/8, 1 required	
Rig aid (R-37) (0.093-inch harden flat stock 3 inches long) (Figure 502)	
Tensiometer (0 to 50 pound range)	
Square drive (1/8 inch)	
Hunter Force Gage (0-30 lb)	

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

NOTE: Rig pin sizes are in inches (diameter X length; length = grip plus 5/8 inch).

3. Adjustment/Test Throttle Pedestal Stops

A. Adjust Throttle Pedestal Stops

(1) Slowly move throttle lever from idle to full forward, against throttle stop bolt. Then release throttle lever. (Figure 501 (Sheet 2), View A)

(2) Adjust throttle stop bolt until rig aid (R-37) can be installed freely in fuel control maximum forward power slot. (Figure 501 (Sheet 2), View A and E)

(3) Remove rig aid (R-37) from fuel control maximum forward power slot.

(4) Place throttle in idle position.

(5) Slowly move thrust reverser lever to reverse thrust position, so throttle interlock crank contact against reverse stop screw. Then release thrust reverser lever.

(6) Adjust reverse stop screw until rig aid (R-37) can be installed freely in fuel control maximum reverse power slot.

(7) Remove rig aid (R-37) from fuel control maximum reverse power slot.

(8) Rotate thrust reverser lever to forward idle position.

4. Adjustment/Test Throttle Limit Switch and Reverse Thrust Switch

A. Adjust Throttle Limit Switch and Reverse Thrust Switch

(Figure 501 (Sheet 4))

(1) Move throttle lever full forward and then aft to 1.025(±.015) inches (26.035(±0.38) mm) from aft stop measured on pedestal cover.

(2) Check throttle limit switch actuated, if necessary adjust lower cam to actuate switch.

(3) Move throttle lever fully to the aft idle stop.

(4) Rotate thrust reverser lever up to the full reverse position and than lower back to the idle position and hold. This is to ensure clearance between switch and cam.

(5) Check for a clearance of 0.045 in. (1.143 mm) to 0.060 in. (1.524 mm) between reverse thrust switch roller and upper cam. (Figure 501 (Sheet 4))

(6) If the clearance is not correct adjust the cam as follows:

(a) Loosen the two bolts retaining the cam, and adjust the cam to obtain the proper gap, then retighten the bolts.

(b) Repeat steps Paragraph 4.A.(3) to Paragraph 4.A.(5) to confirm the gap is correct.

5. Adjustment/Test Fuselage Cable System

A. Adjust Fuselage Cable System

(1) Make certain that throttle pedestal stops are adjusted per Paragraph 3..

(2) Slowly move throttle lever full forward and back to idle position. When throttle lever is released it will move slightly away from idle stop. This is rig position.

(3) Disconnect or slacken thrust reverser bridle cables.

NOTE: Thrust reverser bridle cable turnbuckles are accessible through ceiling access panels 5732C and 5735C in aft cargo compartment.

(4) In aft cargo compartment install rig pin (4-2) in rig pin hole (R-15) in throttle-aft control sector. (Figure 501 (Sheet 2), View C)

CAUTION: WHEN APPLYING TENSION TO CABLE RUN 49, MAKE SURE THAT CABLE SEGMENT 49A IS PROPERLY ROUTED THROUGH THE PULLEY BRACKETS LOCATED BENEATH THE COCKPIT CONTROL PEDESTAL AT FUSELAGE STATION Y=101.550. THE CENTER MOUNTING LUGS ON THESE BRACKETS CAN BE DAMAGED IF THIS CABLE SEGMENT IS MISROUTED BENEATH THE LUGS.

(5) Adjust throttle cable tension as follows:

NOTE: Throttle cables are 1/16-inch (1.59 mm) diameter, but are tensioned to rig load of a 3/32 inch (2.38 mm) cable.

NOTE: Throttle cable turnbuckles are accessible through ceiling access panels 5154C and 5156C in forward cargo compartment and through ceiling access panels 5730C and 5732C in aft cargo compartment.

(a) Obtain normal cable tension value for throttle cable from Figure 76-00-00-990-802 (example 33 to 39 pounds at 70°F (21.6°C)).

(b) Adjust throttle cable to maximum rig load value obtained in Paragraph 5.A.(5)(a).

(c) Differentially adjust turnbuckles until rig pin can be freely removed and installed.

NOTE: Rig pin must not bind when installed through rig pin holes.

WJE 412, 414

(6) New cables must be rigged to double maximum cable tension called out on Figure 76-00-00-990-803. System cycled a minimum of five times, and cable tension reduced to between minimum and maximum cable tension.

WJE ALL

(7) With thrust reverser cables adjusted (PAGEBLOCK 78-30-00/501) remove rig pin (4-2) from rig pin hole (R-15).

(8) Connect and/or tighten thrust reverser bridle cables until differences in cable tension forward and aft of bridle cable splices on C segment of throttle cables is 5(±1) pounds (2.27(±0.45 kg).

NOTE: This step minimizes rig load on bridle cables by rigging them to approximately 5 pounds (2.27 kg) tension. Since cable tensiometer will not read this low, bridle cable tension is obtained by checking tension on throttle cables.

(9) Safety all turnbuckles with clips.

6. Adjustment/Test Engine Throttle Cable Control System

A. Adjust Right Engine Throttle Cable Control System

(1) Remove bolt connecting throttle push-pull control to power control crank at engine cross shaft. (Figure 501 (Sheet 2), View D)

(2) Disconnect throttle push-pull control from throttle-aft control sector as follows: (Figure 501 (Sheet 2), View C)

(a) Restrain inner rod and loosen jamnut.

(b) Restrain outer sleeve and screw inner rod out of rod end.

(3) Check force required to start and maintain motion of push-pull control cable as follows:

(a) Disconnect push-pull cable from engine mount bracket.

(b) Move push-pull cable away from attach point at mount bracket, keeping fore and aft alignment with hole in bracket, until there is enough room for force scale.

(c) Slowly move cable and measure force required to push and pull cable over its entire travel. Force must be constant within 1/4 pound (.112 kg) and should not exceed 2 1/2 pounds (1.13 kg).

(d) Check cable for free operation. Cable must move smoothly without ratchet, gritty or detent like feeling.

NOTE: If cable does not meet requirements outlined in Paragraph 6.A.(3)(c) and Paragraph 6.A.(3)(d) above, cable must be replaced.

(e) Install push-pull cable in engine mount bracket and install fitting.

(4) Connect push-pull control throttle-aft control sector as follows:

(a) Restrain outer sleeve and screw inner rod into rod end.

(b) Restrain inner rod and tighten jamnut. Safety jamnut with 0.032 inch lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(5) Install rig pin (4-2) in rig pin hole (R-15) in throttle-aft control sector. (Figure 501 (Sheet 2), View C)

(6) Install rig pin (4-2) in rig pin hole (R-17) in power control crank at engine cross shaft.

(7) Adjust rod end of push-pull control at engine cross shaft until connecting bolt can be freely removed and installed.

CAUTION: ADJUSTMENT OF PUSH-PULL CONTROL MUST BE MADE AT ROD ENDS ONLY.

(8) Check rod end witness hole to ensure sufficient threaded end engagement.

(9) If connecting bolt cannot be freely removed and installed while maintaining sufficient threaded end engagement, proceed as follows:

(a) At throttle-aft control sector restrain inner rod and loosen jamnut.

(b) Restrain outer sleeve and adjust inner rod threaded end to obtain approximate adjustment needed at engine cross shaft.

(c) Restrain inner rod and tighten jamnut. Safety jamnut with 0.032 inch lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(d) Check rod end witness hole to ensure sufficient threaded end engagement.

(10) Adjust rod end of push-pull control at engine cross shaft until connecting bolt can be freely removed and installed.

(11) Restrain rod end and tighten jamnut. Safety jamnut with 0.032 inch lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

CAUTION: ADJUSTMENT OF PUSH-PULL CONTROL MUST BE MADE AT ROD ENDS ONLY.

(12) Check rod end witness hole to ensure sufficient threaded end engagement.

(13) Connect rod end to engine cross shaft. Safety nut with cotter pin.

(14) Remove all rig pins.

B. Adjust Left Engine Throttle Cable Control System

(1) Loosen throttle push-pull control jamnut at engine synchronizer trimmer. (Figure 501 (Sheet 3), View G)

(2) Remove throttle push-pull control threaded end from trimmer.

(3) Disconnect throttle push-pull control from throttle-aft control sector as follows:

(a) Restrain inner rod and loosen jamnut.

(b) Restrain outer sleeve and screw inner rod out of rod end.

(4) Check that force required to start and maintain motion of push-pull control cable as follows:

(a) Disconnect push-pull cable from engine mount bracket.

(b) Move push-pull cable away from attach point at mount bracket, keeping fore and aft alignment with hole in bracket, until there is enough room for force scale.

(c) Slowly move cable and measure force required to push and pull cable over its entire travel. Force must be constant within 1/4 pound (.112 kg) and should not exceed 2 1/2 pounds (1.13 kg).

(d) Check cable for free operation. Cable must move smoothly without ratchet, gritty or detent like feeling.

NOTE: If cable does not meet requirements outlined in Paragraph 6.B.(4)(c) and Paragraph 6.B.(4)(d) above, cable must be replaced.

(e) Install push-pull cable in engine mount bracket and install fitting.

(5) Disconnect engine synchronizer flexshaft coupling nut from actuator.

(6) Pull flexshaft to disengage from actuator.

(7) Turn square end of flexshaft inner drive until trimmer reaches end of its travel.

NOTE: Rod end trimmer has a travel range of 4 complete turns from stop to stop.

(8) Adjust trimmer to mid-travel position by turning square end of flexshaft inner drive in opposite direction 2 complete turns from either stop position.

(9) Connect push-pull control throttle-aft control sector as follows:

(a) Restrain outer sleeve and screw inner rod into rod end.

(b) Restrain inner rod and tighten jamnut. Safety jamnut with 0.032 inch lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(10) Install rig pin (4-2) in rig pin hole (R-15) in throttle-aft control sector.

(11) Position power lever crank so threaded hole in trimmer for push-pull control can be engaged.

(12) Screw push-pull control threaded end into trimmer until power lever crank is positioned so that rig pin (4-2) can be freely removed and installed in rig pin hole (R-17) in power lever crank; install rig pin.

(13) Tighten push-pull control jamnut at engine synchronizer trimmer. Safety jamnut with 0.032 inch lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(14) Check that threaded end of push-pull control extends through flange of trimmer rod end by 1/4(±1/8) inch (6.4±3.2 mm).

(15) If rod end penetration is not within tolerance proceed as follows:

(a) Loosen push-pull control jamnut at engine synchronizer trimmer.

(b) Remove push-pull control threaded end from trimmer.

(c) Adjust push-pull control at throttle-aft control sector as follows:

1) Restrain inner rod and loosen jamnut.

2) Restrain outer sleeve and adjust inner rod threaded end to obtain adjustment needed at power lever crank.

3) Restrain inner rod and tighten jamnut. Safety jamnut with 0.032 inch lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(d) Remove rig pin (4-2) from rig pin hole (R-17) from power lever crank at engine cross shaft.

(e) Position power control crank so threaded hole in trimmer for push-pull control can be engaged.

(f) Screw push-pull control threaded end into trimmer until power lever crank is positioned so that rig pin (4-2) can be freely removed and installed in power lever crank.

(g) Tighten push-pull control jamnut at engine synchronizer trimmer. Safety jamnut with 0.032 inch lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(h) Check that threaded end of push-pull control extends through flange of trimmer rod end by 1/4(±1/8) inch (6.4±3.2 mm).

(16) Adjust synchronizer actuator to neutral position as follows:

CAUTION: TURN DRIVER SLOWLY WITH A MAXIMUM FORCE OF 1 1/2 INCH-POUNDS (0.17 N·M) TO PREVENT DAMAGING ACTUATOR.

(a) Insert 1/8-inch square drive in actuator square drive and turn actuator to either stop (extended or stowed position).

NOTE: Actuator has a three turn range stop to stop.

(b) Using 1/8-inch square drive, turn actuator to center of its range (1 1/2 complete turns or 27 detent stops (clicks)). Remove square drive.

(17) Insert synchronizer flexshaft in actuator socket.

(18) Connect flexshaft coupling nut.

(19) Remove all rig pins.

7. **Adjustment/Test Quick Engine Change**

A. Adjust Right Engine Throttle System

(1) Slowly move throttle lever full forward and back to idle position. When throttle lever is released it will move slightly away from idle stop. This is rig position.

(2) Disconnect throttle push-pull control from throttle-aft control sector as follows: (Figure 501 (Sheet 2), View C)

(a) Restrain inner rod and loosen jamnut.

(b) Restrain outer sleeve and screw inner rod out of rod end.

(3) Check force required to start and maintain motion of push-pull control cable as follows:

(a) Disconnect push-pull cable from engine mount bracket.

(b) Move push-pull cable away from attach point at mount bracket, keeping fore and aft alignment with hole in bracket, until there is enough room for force scale.

(c) Slowly move cable and measure force required to push and pull cable over its entire travel. Force must be constant within 1/4 pound (.112 kg) and should not exceed 2 1/2 pounds (1.13 kg).

(d) Check cable for free operation. Cable must move smoothly without ratchet, gritty or detent like feeling.

NOTE: If cable does not meet requirements outlined in Paragraph 7.A.(3)(c) and Paragraph 7.A.(3)(d) above, cable must be replaced.

(e) Install push-pull cable in engine mount bracket and install fitting.

(4) Connect push-pull control throttle-aft control sector as follows:

(a) Restrain outer sleeve and screw inner rod into rod end.

(b) Restrain inner rod and tighten jamnut. Safety jamnut with 0.032 inch lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(5) Check that engine cross shaft is in idle position and install rig pin (4-2) in rig pin hole (R-17) in power crank. (Figure 501 (Sheet 2), View E)

(6) Adjust rod end of throttle push-pull control at engine cross shaft until connecting bolt can be removed and installed freely. (Figure 501 (Sheet 2), View D)

(7) Restrain rod end and tighten jamnut. Safety jamnut with 0.032 inch lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

CAUTION: ADJUSTMENT OF PUSH-PULL CONTROL MUST BE MADE AT ROD ENDS ONLY.

(8) Check rod end witness hole to ensure sufficient threaded end engagement.

(9) Connect rod to engine cross shaft. Safety nut with cotter pin.

(10) Remove rig pin (4-2).

B. Adjust Left Engine Throttle System

(1) Slowly move throttle lever full forward and back to idle position. When throttle lever is released it will move slightly away from idle stop. This is rig position.

(2) Disconnect throttle push-pull control from throttle-aft control sector as follows: (Figure 501 (Sheet 2), View C)

(a) Restrain inner rod and loosen jamnut.

(b) Restrain outer sleeve and screw inner rod out of rod end.

(3) Check force required to start and maintain motion of push-pull control cable as follows:

(a) Disconnect push-pull cable from engine mount bracket.

(b) Move push-pull cable away from attach point at mount bracket, keeping fore and aft alignment with hole in bracket, until there is enough room for force scale.

(c) Slowly move cable and measure force required to push and pull cable over its entire travel. Force must be constant within 1/4 pound (.112 kg) and should not exceed 2 1/2 pounds (1.13 kg).

(d) Check cable for free operation. Cable must move smoothly without ratchet, gritty or detent like feeling.

NOTE: If cable does not meet requirements outlined in Paragraph 7.B.(3)(c) and Paragraph 7.B.(3)(d) above, cable must be replaced.

(e) Install push-pull cable in engine mount bracket and install fitting.

(4) Connect push-pull control throttle-aft control sector as follows:

(a) Restrain outer sleeve and screw inner rod into rod end.

(b) Restrain inner rod and tighten jamnut. Safety jamnut with 0.032 inch lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(5) Check that engine cross shaft is in idle position and install rig pin (4-2) in rig pin hole (R-17) in power crank. (Figure 501 (Sheet 3), View G)

(6) Loosen throttle push-pull control jamnut at engine synchronizer trimmer.

(7) Adjust threaded end of push-pull control at trimmer until bolt connecting trimmer to power control crank can be freely removed and installed.

(8) Tighten push-pull control jamnut at engine synchronizer trimmer. Safety jamnut with 0.032 inch lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(9) Check that threaded end of push-pull control extends through flange of trimmer rod end by 1/4(±1/8) inch (6.4(±3.2) mm).

(10) If threaded end of push-pull control does not extend through flange of trimmer rod end by 1/4(±1/8) inch (6.4(±3.2) mm), adjust left engine cable control system per Paragraph 6.B..

(11) Connect engine synchronizer trimmer to power control crank. Safety bolt with cotter pin.

(12) Remove rig pin (4-2).

8. Adjustment/Test Engine Fuel Control to Cross Shaft Idle

A. Adjust Engine Fuel Control to Cross Shaft Idle

(1) Visually check that thrust reverser doors are fully stowed.

NOTE: Thrust reverser door stowed position can be checked by looking outboard through opening in reverser stang.

(2) Visually check that point at which overcenter link is attached to guide carriage is overcenter and aft of driver link attachment.

(3) Remove bolt connecting power control linkage to engine cross shaft.

(4) Rotate engine fuel control power lever to idle and install rig aid (R-37) in fuel control idle rigging slot provided between power lever and power control crank arm index plate.

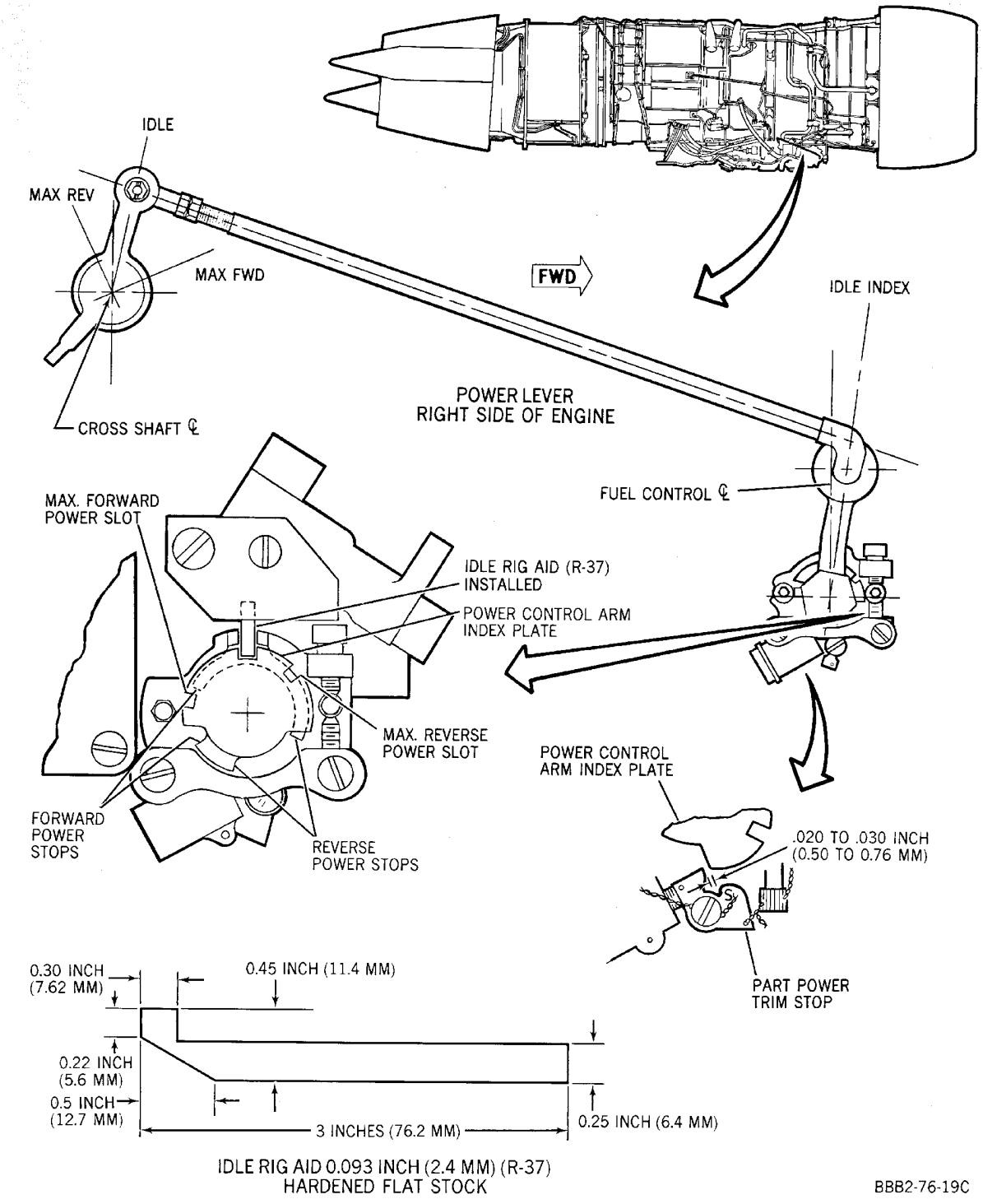
(5) Install rig pin (4-2) in rig pin hole (R-17) between power control crank and latch control support at engine cross shaft.

(6) Adjust power control linkage from engine cross shaft to fuel control unit until connecting bolt can be freely removed and installed.

(7) Install bolt.

(8) Safety power control linkage with 0.032 inch lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(9) Remove rig pin and rig aid.



Engine Fuel Control to Cross Shaft - Adjustment
Figure 502/76-11-00-990-806

9. Adjustment/Test Throttle System

A. Test Throttle System

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

(1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

(2) Depressurize aircraft hydraulic system. (PAGEBLOCK 29-00-00/201)

(3) Open engine cowl doors.

(4) Open access door (5901C) for left engine and (5902C) for right engine.

(5) Place thrust reverser control valve in dump position and install lockpin. (PAGEBLOCK 78-00-00/201)

(6) Place throttle and thrust reverser levers in idle position (throttle against pedestal aft stop and thrust reverser lever fully down).

(7) Slowly move throttle lever fully forward and observe following:

(a) Thrust reverser control valve arm remains in stowed position.

(b) Rig aid (R-37) can be installed in fuel control maximum forward power slot prior to or concurrent with throttle lever hitting against pedestal stop bolt.

(c) Hold throttle levers against pedestal forward stops, then release levers. Check for 0.015 inch (0.38 mm) minimum clearance between forward power stops on power control arm index plate. (Figure 502)

(8) Slowly move throttle lever full forward and back to idle position. When throttle lever is released it will move slightly away from idle stop. This is rig position. Check rig pin (4-2) can be freely installed in rig pin hole (R-17) in power control crank at engine cross shaft.

NOTE: If rig pin can not be freely installed adjust throttle push-pull control (Paragraph 6.) and/or thrust reverser interlock push-pull control. (PAGEBLOCK 78-30-00/501)

(9) Slowly move throttle lever full forward and back to idle position and check rig aid (R-37) can be freely installed in fuel control idle rigging slot.

NOTE: If rig aid can not be freely installed adjust power control linkage. (Paragraph 8.)

(10) Raise thrust reverser lever and check that reverser control valve arm has moved to extend position by the time reverse idle detent roller drops into detent of reverse idle cam.

(11) Return thrust reverser lever to forward thrust position.

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

WARNING: MAKE CERTAIN ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION, OR INJURY TO PERSONNEL COULD RESULT.

(12) Pressurize aircraft hydraulic system. (PAGEBLOCK 29-00-00/201)

(13) Remove lockpin from thrust reverser control valve and stow lockpin. (PAGEBLOCK 78-00-00/201)

(14) Move thrust reverser lever to reverse idle detent and check following:

(a) Reverser doors fully extend.

(b) Amber REVERSE UNLOCK light is on, blue REVERSE THRUST light comes on in reverse thrust.

(15) Return thrust reverser lever to forward idle position.

(16) Make certain auto flight system circuit breakers listed in AUTO FLIGHT, SUBJECT 22-00-00, Page 201 are closed.

(17) Place autothrottle engage switch to AUTO THROT position and observe that switch remains in position when released.

(18) Slowly move left thrust reverser lever to reverse idle detent and check that left reverse thrust switch causes AUTO THROT switch to move to OFF prior to amber REVERSER UNLOCK light coming on.

(19) Return left thrust reverser lever to forward idle position.

(20) Place autothrottle engage switch to AUTO THROT position and observe that switch remains in position when released.

(21) Slowly move right thrust reverser lever to reverse idle detent and check that right reverse thrust switch causes AUTO THROT switch to move to OFF prior to amber REVERSER UNLOCK light coming on.

(22) Return right thrust reverser lever to forward idle position.

(23) Move thrust reverser lever to full reverse thrust position and check rig aid (R-37) can be installed in fuel control maximum reverse power slot prior to or concurrent with thrust reverser lever moving to full reverse thrust position.

NOTE: If rig aid can not be freely installed adjust thrust reverser. (PAGEBLOCK 78-30-00/501)

(24) Depressurize reverser hydraulic system by placing thrust reverser control valve in dump position and install lockpin.

(25) Move thrust reverser lever to forward thrust position, reverser doors remain extended and amber REVERSER UNLOCK light and blue REVERSE THRUST light should remain on.

(26) Manually close reverser doors REVERSE THRUST light should go off before doors are half closed.

(27) Pressurize reverser hydraulic system by removing lockpin from thrust reverser control valve and stowing lockpin.

(28) Reverser doors should fully stow and amber REVERSER UNLOCK light should go off.

(29) Depressurize reverser hydraulic system by placing thrust reverser control valve in dump position and install lockpin.

(30) Reverser doors should remain closed and amber REVERSER UNLOCK light should remain off.

(31) Check force required to move an individual throttle fore-and-aft does not exceed 7.5 pounds (3.4 kg).

NOTE: A momentary increase of 1 to 2 pounds (0.45 to 0.9 kg) over specified lever loads may be experienced when throttle cams come in contact with rollers of throttle switches.

(32) Check force required to move an individual thrust reverser lever in either direction does not exceed 13 pounds (5.9 kg). Minimum force required to move thrust reverser lever should be 2 pounds (0.91 kg) from 1.50 inches (38.1 mm) from full stow position and increase to 8 pounds (3.64 kg) minimum at reverse idle detent.

NOTE: An increase of 1 to 2 pounds (0.45 to 0.91 kg) force may be experienced when roller goes in or out of reverse idle detent.

(33) Make certain that part power trim stop is in standard day position. (Figure 502)

NOTE: Part power trim stop is in standard day position when the letter S on trim stop is facing outward.

Paragraph 9.A.(33) through Paragraph 9.A.(35) check the relative position of the throttles and need be performed only if there is a question of throttle misalignment.

(34) Moves throttle forward until a gap of 0.020 to 0.030 inch (0.5 to 1.0 mm) exists between power control arm index plate and part power trim stop.

NOTE: Gap is necessary in order to prevent preloading of system.

(35) Check that throttle levers are aligned within 1/2 diameter of knob.

(36) Place part power trim stop in stowed position and safety with 0.032 inch lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(37) Close access doors.

10. Adjustment/Test Engine Synchronizer System

A. Test Caution Advisory Light Logic

(1) Rotate ENGINE SYNC selector switch to OFF position.

(2) Open ENGINE SYNC circuit breaker located on lower EPC panel

(3) Close LANDING GEAR WARNING circuit breaker located on lower EPC panel.

(4) Check that landing gear lever is in gear DOWN position.

(5) ENG SYNC ON annunciator light should be off.

(6) Close ENGINE SYNC circuit breaker; ENG SYNC ON light should stay off.

(7) Rotate ENGINE SYNC switch to N_1 position; ENG SYNC ON light should come on.

(8) Rotate ENGINE SYNC switch to N_2 position; ENG SYNC ON light should come on.

(9) Rotate ENGINE SYNC switch to OFF position.

CAUTION: MAKE CERTAIN THAT LANDING GEAR SAFETY PINS ARE INSTALLED PRIOR TO MOVING LANDING GEAR LEVER TO UP POSITION.

(10) Place landing gear lever in gear UP position.

(11) Rotate ENGINE SYNC switch to N_1 and then to N_2 positions; ENG SYNC ON light should stay off.

(12) Rotate ENGINE SYNC switch to OFF position.

(13) Place landing gear lever in gear DOWN position.

B. Test N_1 Synchronizing

NOTE: Refer to Paragraph 10.E. for adjustment/test, N_1/N_2, without engines running.

(1) Start engines as outlined in GENERAL, SUBJECT 71-00-00, Page 501, Adjustment/Test .

(2) Rotate ENGINE SYNC selector switch to OFF position.

(3) Close ENGINE SYNC circuit breaker located on lower EPC panel. Allow approximately 5 seconds for engine synchronizer actuator to center.

(4) Advance both engine throttles to 65 percent N_1 RPM.

(5) Rotate ENGINE SYNC switch to N_1 position. ENG SYNC ON light should come on.

(6) Check that both engines remain at 65(±1.0) percent N_1 RPM.

(7) Rotate ENGINE SYNC switch to OFF position.

(8) With right engine throttle remaining at 65 percent N_1 RPM, retard left engine throttle to 63 percent N_1 RPM.

(9) Rotate ENGINE SYNC switch to N_1 position.

(10) Left engine N_1 RPM should synchronize toward right engine N_1 RPM within 5 seconds.

(11) Rotate ENGINE SYNC switch to OFF position. Left engine should return toward 63 percent N_1 RPM while right engine remains at 65 percent N_1 RPM.

(12) With right engine throttle remaining at 65 percent N_1 RPM, advance left engine throttle to 67 percent N_1 RPM.

(13) Rotate ENGINE SYNC switch to N_1 position.

(14) Left engine N_1 RPM should synchronize toward right engine N_1 RPM within 5 seconds.

(15) Rotate ENGINE SYNC switch to OFF position. Left engine should return toward 67 percent N_1 RPM while right engine remains at 65 percent N_1 RPM.

C. Test N_2 Synchronizing

NOTE: Refer to Paragraph 10.E. for adjustment/test, N_1/N_2, without engines running.

(1) Rotate ENGINE SYNC selector switch to OFF position.

(2) Close ENGINE SYNC circuit breaker located on lower EPC panel. Allow approximately 5 seconds for engine synchronizer actuator to center.

(3) Advance both engine throttles to 79 percent N_2 RPM.

(4) Rotate ENGINE SYNC switch to N_2 position. ENG SYNC ON light should come on.

(5) Check that both engines remain at 79(±1.0) percent N_2 RPM.

(6) Rotate ENGINE SYNC switch to OFF position.

(7) With right engine throttle remaining at 79 percent N_2 RPM, retard left engine throttle to 77 percent N_2 RPM.

(8) Rotate ENGINE SYNC switch to N_2 position.

(9) Left engine N_2 RPM should synchronize toward right engine N_2 RPM within 5 seconds.

(10) Rotate ENGINE SYNC switch to OFF position. Left engine should return toward 77 percent N_2 RPM while right engine remains at 79 percent N_2 RPM.

(11) With right engine throttle remaining at 79 percent N_2 RPM, advance left engine throttle to 81 percent N_2 RPM.

(12) Rotate ENGINE SYNC switch to N_2 position.

(13) Left engine N_2 RPM should synchronize toward right engine N_2 RPM within 5 seconds.

(14) Rotate ENGINE SYNC switch to OFF position. Left engine should return toward 81 percent N_2 RPM while right engine remains at 79 percent N_2 RPM.

(15) Shut down engines as outlined in GENERAL, SUBJECT 71-00-00, Page 501, Adjustment/Test .

D. Test EPR Synchronizing

NOTE: The following procedure tests the EPR SYNC driver unit. This unit enables transfer of actuator control authority when auto throttle is engaged in EPR mode of control.

NOTE: Do not conduct test when ambient temperature exceeds 118°F (48°C) or excessive wind condition exists.

(1) Start engines as outlined in GENERAL, SUBJECT 71-00-00, Page 501, Adjustment/Test.

(2) Check that GROUND CONTROL RELAY circuit breaker located on upper EPC panel is closed.

(3) Rotate ENGINE SYNC selector switch to OFF position.

(4) On Flight Guidance Control panel (FGCP), place AP DFGC selector switch in position 1 or 2.

(5) On center instrument panel, place ART switch in OFF position.

(6) On Thrust Rating Indicator (TRI) momentarily press TO FLX mode select button, light should be on.

(7) On center instrument panel set ASSUMED TEMP to 59°C.

(8) Check EPR LIM on TRI and EPR LIM bugs on EPR indicators should agree.

(9) Manually set both throttle levers to 1.4 EPR and allow engines to stabilize.

(10) On FGCP, place autothrottle engage switch to AUTO THROT position, CLMP displayed in ATS Flight Mode Annunciators (FMA's).

(11) On FGCP momentarily press EPR LIM button; both throttles should advance to EPR equal to "EPR LIM" on TRI. EPR overshoot should not exceed ±.040 EPR.

(12) Retard left throttle 1/4 knob width aft of right throttle and release. Left engine EPR should advance to same value as right engine EPR. EPR overshoot should not exceed ±.010 EPR.

(13) Advance left throttle 1/4 knob width forward of right throttle and release. Left engine EPR should retard to same value as right engine EPR. EPR overshoot should not exceed ±.010 EPR.

(14) Momentarily press either throttle disconnect switch. Throttle switch will disengage and THROTTLE warning lights on FMA's will flash.

(15) Momentarily press either throttle disconnect switch again. THROTTLE warning lights should go out.

(16) Rotate ENGINE SYNC switch to N_1 position. ENG SYNC on light should come on.

(17) Retard left throttle 1/4 knob width and release. Left engine N_1 should advance to same N_1 as right engine N_1.

NOTE: If opposite system test is desired place AP DFGC in opposite position and repeat Paragraph 10.D.(6) through Paragraph 10.D.(17).

(18) Shut down engines as outlined in GENERAL, SUBJECT 71-00-00, Page 501, Adjustment/Test.

E. Optional Test for Tach Sync N_1 and N_2 only, using Woodward Test Instrument, Part No. 213615

NOTE: Ground run of engines not required for this test.

(1) This test is for engines N_1 and N_2tachometer synchronization system only using only the Woodward Governor Test Set. Engine synchronizer control box is mounted on aft lower right radio rack in forward lower accessory compartment.

(2) Access to engine synchronizer control box is gained through access door 4501A.

(3) Wiring Test

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

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
WJE 401-404, 406, 410, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887			
X	35	B1-965	EGT, N1, N2 DISPLAY RIGHT
X	36	B1-964	EPR, FF DISPLAY LEFT

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
WJE ALL			
T	40	B1-726	ENGINE SYNC

OVERHEAD EMERGENCY 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			
B	15	B1-890	ENGINE EXHAUST TEMP LEFT
C	15	B1-891	ENGINE EXHAUST TEMP RIGHT

WJE ALL

(b) Select engine synchronizer control switch on flight compartment overhead switch panel OFF.

(c) Disconnect electrical connector from synchronizer control box.

(d) Connect test set connector P1 to aircraft connector at synchronizer control box, leave control box disconnected - not used for this test.

(e) On test set position selector switch to: WIRING TEST.

(f) Check resistance between test jacks A (Neg) and B (Pos) as follows:

1) With digital multimeter set at OHMS, measured resistance should be a minimum of 40 ohms.

(g) Check resistance at test jacks, digital multimeter set at OHMS per values in the table that follows:

WJE 401-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-881, 883, 884, 886, 887

Table 502 Table I

A to H	Ohms - 18 to 30	A to N	Ohms - Open
A to G	Ohms - Open	I to H	Ohms - 18 to 30
A to I	Ohms - 18 to 30	G to N	Ohms - Open

WJE ALL

(4) Tachometer Generator Wiring Test

(a) On test set position selector switch to: TACHS.

(b) Select engine synchronizer control switch on flight compartment overhead switch panel to N1.

(c) On test set, check resistance at master and slave jacks. Check readings per values listed in the following table.

WJE 401-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-881, 883, 884, 886, 887

Table 503 Table II

MASTER	N1 or N2	SLAVE	N1 or N2
A to H	Ohms - 18 to 30	A to G	Ohms - 18 to 30
A to I	Ohms - 18 to 30	A to N	Ohms - 18 to 30
I to H	Ohms - 18 to 30	N to G	Ohms - 18 to 30

WJE ALL

(d) Select engine synchronizer control switch on flight compartment overhead switch panel to N2.

(e) Repeat Paragraph 10.E.(4)(c), for N2.

(f) Select engine synchronizer control switch on flight compartment overhead switch panel OFF.

(5) Actuator Test

(a) On test set, position selector switch to MANUAL PULSE.

1) With selector switch in this position, engine synchronizer actuator can be manually pulsed through test set to determine it is functioning and make certain an acceptable level of mechanical friction exists within flexible shaft, synchronizer trimmer rod-end and engine fuel control linkage.

2) Electrical connector should remain disconnected from synchronizer control box.

3) This test is performed using only pulse generating circuitry within test set.

(b) Close following circuit breakers--warning tags should remain until completion of all tests:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
WJE 401-404, 406, 410, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887			
X	35	B1-965	EGT, N1, N2 DISPLAY RIGHT

WJE 401-404, 406, 410, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887 (Continued)

(Continued)

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
X	36	B1-964	EPR, FF DISPLAY LEFT

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
WJE ALL			
T	40	B1-726	ENGINE SYNC

OVERHEAD EMERGENCY 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			
B	15	B1-890	ENGINE EXHAUST TEMP LEFT
C	15	B1-891	ENGINE EXHAUST TEMP RIGHT

WJE ALL

(c) On test set, check voltage between test jacks A (Neg) and B (Pos) with voltmeter. Indicated voltage should be between 26 and 30 volts.

(d) Select engine synchronizer control switch on flight compartment overhead switch panel to N1.

(e) On flight compartment control pedestal, position left engine thrust lever to mid-range.

(f) On test set, depress manual pulse push-button to DEC.

1) Make certain that decrease light on test set blinks once.

2) Make certain that actuator steps once in decrease RPM direction.

(g) On test set, depress manual pulse in DEC direction until actuator stalls at end of travel.

(h) On test set, depress manual pulse push-button to INC.

1) Check synchronizer actuator for following:

a) Actuator and rod-end are stepping towards INCREASE RPM. (The increase and centering lights on test set panel should blink simultaneously while pulsing toward INCREASE RPM). In a total of 53-54 steps for P/N 5485-040 or 51-56 steps for P/N 5485-064 (N1 actuator), actuator should reach end of its three-turn range of travel.

(i) Return actuator to CENTER by pulsing towards DECREASE RPM (26 to 27 steps).

(j) Select engine synchronizer control switch on flight compartment overhead switch panel to N2. Repeat Paragraph 10.E.(5)(f) through Paragraph 10.E.(5)(i) (throttle should still be in mid position on flight compartment center control pedestal).

(6) Internal Oscillator Test

(a) Open following circuit breaker. Tag should have remained in place from previous tests.

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	40	B1-726	ENGINE SYNC

(b) Connect test set connector P2 to connector on engine synchronizer control box on lower right radio rack in lower forward accessory compartment.

(c) Close this circuit breaker:

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	40	B1-726	ENGINE SYNC

(d) Select engine synchronizer control switch on flight compartment overhead switch panel to N1.

1) On test set, select control box switch to 213729 position for engine synchronizer control box P/N 213729 or 213779. Select switch to 213759 position for engine synchronizer control box P/N 213759.

(e) On test set, position selector switch to Int Osc. In this mode, engine synchronizer control box will be supplied with AC voltage which will simulate input signal from engine tachometer generators. Output signal of one oscillator is fixed. Output signal of second oscillator can be varied through test set to simulate underspeed and overspeed of slave engine. This function will check functions of aircraft installed engine synchronizer control box.

(f) Slowly rotate test set slave control towards INC and DEC positions to check that engine synchronizer control box will respond correctly to respective inputs.

(g) Check that synchronizer flex shaft rod end trimmer is responding to each pulse step from control box to actuator in correct direction. Check that actuator does not double pulse and pulse lights do not illuminate steady. A steady pulse light is indication of synchronizer control box internal malfunction.

(h) With engine synchronizer actuator on INC side of center position, select synchronizer control switch on flight compartment overhead switch panel OFF. Check that system returns actuator to CENTER before it shuts off.

NOTE: INC light will continue to blink after actuator has centered from either direction.

(i) Select engine synchronizer control switch on flight compartment overhead switch panel to N2 and repeat Paragraph 10.E.(5)(f) through Paragraph 10.E.(5)(h).

(7) Test Completion

(a) Disconnect test set connector cables P1 and P2 from engine synchronizer control box and aircraft connector at lower right radio rack. Remove test equipment from aircraft.

(b) Reconnect aircraft connector to engine synchronizer control box.

(c) Remove any remaining tools, other equipment and any debris from area of lower forward electrical/electronics compartment and lower aft right hand radio rack. Make certain that all components and systems are in normal operational status.

(d) Remove all warning tags from flight compartment controls, switches and circuit breakers used for this test. Remove any remaining tools, other test related equipment and any debris from flight compartment. Make certain that all affected systems and controls are in normal operational status.

11. Cable Assemblies

NOTE: Cable run numbers and segment letters in the following chart correspond to callouts in Figure 501.

Table 504

Function	Cable Run Number	Segment Letter
Left engine--Power off	49 49 49	A B C
Left engine--Power on	50 50 50	A B C
Right engine--Power off	53 53 53	A B C
Right engine--Power on	54 54 54	A B C
Reverser - left engine bridle extend	259 259	A B
Reverser - left engine bridle retract	260 260	A B
Reverser - right engine bridle extend	261 261	A B
Reverser - right engine bridle retract	262 262	A B

THROTTLE PUSH-PULL CONTROL CABLE - MAINTENANCE PRACTICES

1. General

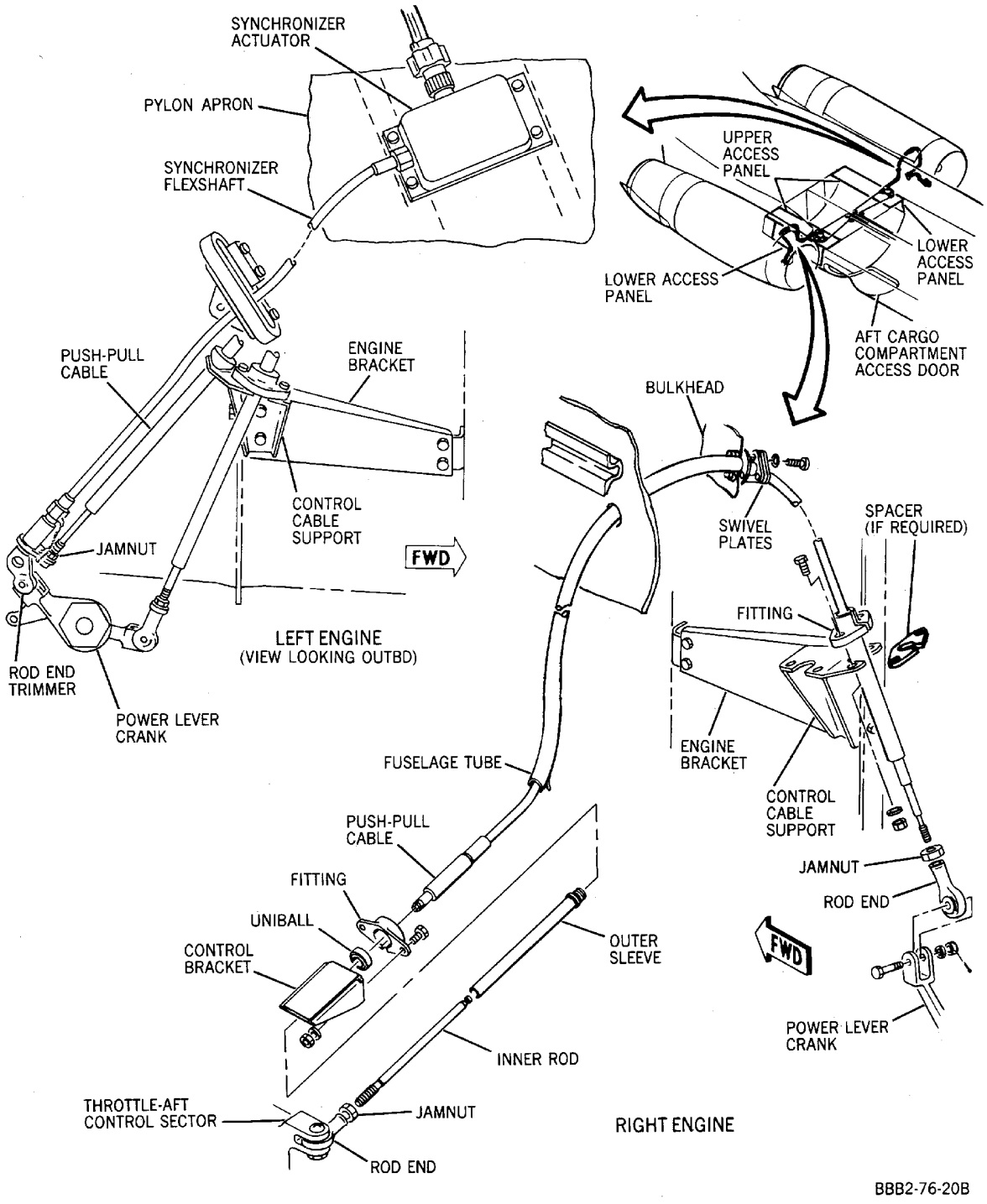
A. This maintenance practices provides removal/installation instructions for the throttle push-pull cable.

B. Cable has a flat internal sliding ribbon and will bend in one plane only.

WARNING: EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

CAUTION: USE EXTREME CARE WHEN WORKING WITH ENGINE PUSH-PULL CABLES. DO NOT BEND CABLE IN RADIUS SMALLER THAN 7-INCHES (177.8MM) MINIMUM OR DAMAGE TO CABLE WILL RESULT.

C. The throttle push-pull cable is connected to the engine cross shaft and extends through the pylon to the throttle aft control sector in the aft cargo compartment. Access to the engine cross shaft is through the forward lower engine cowl. Access to the control sector is through removal of aft cargo compartment aft upper left or right panel. The removal and installation procedures of the throttle push-pull control cable are identical for both engines except as noted.



Throttle Push-Pull Control Cable - Installation
Figure 201/76-11-01-990-801

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
Lockwire, NASM20995N32, DPM 684*[1]	Not Specified
Compound, sealing/locking, Loctite #290, Grade R	Loctite Corp. Newington, CT
Sealant PR-1422	
Hunter Force Gage (0-30 lb.) (0-13.6 Kg)	
Square drive (1/8 inch)	
Rig pin (4-2) 1/4 X 2 5/8, 2 required	

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

NOTE: Rig pin sizes are in inches (diameter X length; length = grip plus 5/8 inch.

3. Removal/Installation of Throttle Push-Pull Control Cable

A. Remove Throttle Push-pull Control Cable

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

(1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

(3) Disassemble throttle push-pull cable at throttle aft control sector as follows. (Figure 201)

(a) Restrain inner rod and loosen jamnut.

(b) Restrain outer sleeve and screw inner rod out of rod end.

(c) Restrain push-pull cable and screw outer sleeve from cable.

(d) Slide sleeve towards rod end and disengage inner rod from push-pull cable, remove sleeve and inner rod.

(e) Pull push-pull cable through control bracket and uniball.

(f) Remove fitting and uniball from control bracket.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

(4) Tape exposed end of push-pull cable.

WJE ALL

(5) Remove bolts attaching push-pull cable swivel plates to bulkhead.

(6) On right engine disconnect push-pull cable rod end from power lever crank.

(7) On left engine loosen push-pull cable jamnut at rod end trimmer.

(8) On left engine remove push-pull cable threaded end from trimmer.

(9) Remove push-pull cable fitting from control cable support.

(10) Slide push-pull cable out of fuselage tube from engine end of cable

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

(11) Remove tape from push-pull cable.

WJE ALL

(12) Install uniball on push-pull cable.

(13) Slide inner rod through outer sleeve and engage with push-pull cable.

(14) Restrain push-pull cable and connect outer sleeve.

B. Install Throttle Push-Pull Control Cable

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

(1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(2) Make certain thrust reverser control valve is in dump position and safety pin is installed.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

(3) Disassemble end of push-pull cable that goes to throttle aft control sector as follows:

(a) Restrain push-pull cable and screw outer sleeve from cable.

(b) Slide outer sleeve clear and disengage inner rod from cable, remove outer sleeve and inner rod.

(c) Remove uniball from push-pull cable.

(d) Tape exposed end of push-pull cable.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891 (Continued)

CAUTION: USE EXTREME CARE WHEN WORKING WITH ENGINE PUSH-PULL CABLES. DO NOT BEND CABLE IN RADIUS SMALLER THAN 7-INCHES (177.8MM) MINIMUM OR DAMAGE TO CABLE WILL RESULT.

(4) Hold push-pull cable at approximately midpoint. Cable will form a smooth arc in plane of flat metal ribbons.

NOTE: This will determine side of cable that will bend. The metal ribbons permit bending in one place only and within that plane, resist bending in one direction and will not bend a full 360 degrees.

WJE 401-404, 412, 414, 873, 874, 892, 893

CAUTION: USE EXTREME CARE WHEN WORKING WITH ENGINE PUSH-PULL CABLES. DO NOT BEND CABLE IN RADIUS SMALLER THAN 7-INCHES (177.8MM) MINIMUM OR DAMAGE TO CABLE WILL RESULT.

(5) Slide push-pull cable from engine through fuselage tube to aft control sector.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

(6) With bend radius of push-pull cable in same plane as fuselage tube, gently slide push-pull cable from engine through fuselage tube to aft control sector.

NOTE: Allow flexible casing to rotate internally during installation. Care should be exercised to avoid twisting cable on installation or forcing cable perpendicular to fuselage.

WJE ALL

(7) Install push-pull cable in control cable support and temporarily install fitting.

WJE 401-404, 412, 414, 873, 874, 892, 893

(8) Install uniball on outer sleeve, thread cable through control bracket, and connect inner reaction member and inner rod.

NOTE: Uniball and fitting can be installed inside or outside control bracket. Deciding factor for uniball and fitting position, is the length of the push-pull cable installed tension-free between swivelball and control bracket.

(9) Restrain push-pull cable and connect outer sleeve a minimum of 2 threads. Apply 1 drop Loctite Grade R to threads. Tighten outer sleeve to torque of40 in-lb (4.5 N·m).

(10) Install fitting.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

(11) Remove tape from inboard end of push-pull cable.

NOTE: Allow end of push-pull cable to hang free.

WJE ALL

(12) Cycle push-pull cable several times, then connect swivel plates to bulkhead. Tighten swivel plate bolts evenly and torque bolts 20 in-lb (2.3 N·m).

WJE 401-404, 412, 414, 873, 874, 892, 893

(13) Seal inboard swivel plate with sealant.

WJE ALL

(14) Check force required to start and maintain motion of push-pull control cable as follows:

WJE 401-404, 412, 414, 873, 874, 892, 893

(a) Disconnect push-pull cable from engine mount bracket.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

(b) Disconnect push-pull cable from control cable support.

WJE ALL

(c) Move push-pull cable away from attach point at cable support, keeping fore and aft alignment with hole in support, until there is enough room for force scale.

(d) Slowly move cable and measure force required to push and pull cable over its entire travel. Force must be constant within 0.25 lb (0.11 kg) and should not exceed 2.5 lb (1.1 kg).

(e) Check cable for free operation. Cable must move smoothly without ratchet, gritty or detent like feeling.

NOTE: If cable does not meet requirements outlined in Paragraph 3.B.(14)(d) and Paragraph 3.B.(14)(e), cable must be replaced.

WJE 401-404, 412, 414, 873, 874, 892, 893

(f) Install push-pull cable in engine mount support and install fitting.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

(g) Install push-pull cable in control cable support and install fitting.

NOTE: If required, spacer may be installed between fitting and control cable support to obtain proper cable adjustment.

(15) Install uniball on push-pull cable, thread cable through control bracket and install fitting.

NOTE: Uniball and fitting can be installed inside or outside control bracket, whichever is practical, to eliminate difficulty in connecting inboard end of push-pull cable.

(16) Slide inner rod through outer sleeve and engage rod with push-pull cable.

(17) Restrain push-pull cable and connect outer sleeve a minimum of 2 threads. Apply 1 drop Loctite Grade R to threads. Tighten outer sleeve to torque of 35 to 40 inch-pounds (3.9 to 4.5 N·m).

(18) Seal inboard swivel plate and tube with sealant.

WJE ALL

(19) Install jamnuts on both ends of push-pull cable.

(20) Perform Paragraph 3.B.(21) through Paragraph 3.B.(39) for right engine, or Paragraph 3.B.(40) through Paragraph 3.B.(63) for left engine for cable adjustment.

(21) Install rod end on push-pull cable at power lever crank.

(22) Install rig pin (4-2) in rig pin hole (R-17) in power lever crank at engine cross shaft.

(23) Install rig pin (4-2) in rig pin hole (R-15) in throttle aft control sector.

(24) Connect push-pull cable at throttle aft control sector as follows:

(a) Restrain outer sleeve and screw inner rod into rod end.

WJE 401-404, 412, 414, 873, 874, 892, 893

CAUTION: ADJUSTMENT OF PUSH-PULL CONTROL MUST BE MADE AT ROD ENDS ONLY.

(b) Check rod end witness hole to ensure sufficient threaded end engagement

WJE 401-404, 412, 414, 873, 874, 892, 893 (Continued)

(c) Restrain inner rod and tighten jamnut.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

(d) Restrain inner rod and tighten jamnut. Safety jamnut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Rod end witness hole should be checked to ensure sufficient cable engagement.

WJE ALL

(25) Adjust rod end at power lever crank until bolt connecting rod end to power lever can be freely removed and installed.

WJE 401-404, 412, 414, 873, 874, 892, 893

NOTE: In case the engine end of the push-pull cable is too long and rod end cannot be adjusted any more, the engine mounted bracket fitting can be shimmed.

(26) If connecting bolt cannot be freely removed and installed while maintaining sufficient threaded end engagement, proceed as follows:

(a) At throttle aft control sector restrain inner rod and loosen jamnut.

(b) Restrain outer sleeve and adjust inner rod threaded end to obtain approximate adjustment needed at engine cross shaft.

(c) Restrain inner rod and tighten jamnut.

(d) Check rod end witness hole to ensure sufficient threaded end engagement.

(e) Adjust rod end of push-pull control at engine cross shaft until connecting bolt can be freely removed and installed.

(f) Restrain rod end and tighten jamnut.

(g) Check rod end witness hole to ensure sufficient threaded end engagement.

CAUTION: ADJUSTMENT OF PUSH-PULL CONTROL MUST BE MADE AT ROD ENDS ONLY.

(27) Connect rod end to engine cross shaft.

(28) Remove rig pin in throttle aft control sector and engine cross shaft.

(29) From cockpit operate throttle and reverser control handles 3 times on their full range.

(30) Disconnect rod end from engine cross shaft.

(31) Verify engine cross shaft is in idle position and install rig pin (R-17) in power control crank at engine cross shaft.

(32) Set flight compartment throttle handle to idle position (against pedestal stop). Then move reverser lever up to reverse detent position and then select forward idle thrust again.

(33) If necessary, adjust rod end of push-pull control at engine cross shaft until connecting bolt can be freely removed and installed. If connecting bolt cannot be freely removed and installed, while maintaining sufficient threaded end engagement, repeat Paragraph 3.B.(26)-Paragraph 3.B.(33).

(34) Connect rod end to engine cross shaft. Safety nut with cotter pin.

(35) Restrain rod end and tighten jamnut.

(36) With lockwire safety jamnut at throttle aft control sector and at rod end at engine cross shaft. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

(37) Restrain rod end and tighten jamnut. Safety jamnut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Rod end witness hole should be checked to ensure sufficient cable engagement.

(38) Connect rod end to power lever crank. Safety nut with cotter pin.

WJE ALL

(39) Remove all rig pins.

(40) Disconnect engine synchronizer flexshaft coupling nut from actuator.

(41) Remove flexshaft from actuator.

(42) Turn square end of flexshaft inner drive until trimmer reaches end of its travel.

NOTE: Rod end trimmer has a travel range of 4 complete turns from stop to stop.

(43) Adjust trimmer to mid-travel position by turning square end of flexshaft inner drive in opposite direction 2 complete turns from either stop position.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

(44) Connect push-pull cable at throttle aft control sector as follows:

(a) Restrain outer sleeve and screw inner rod into rod end.

(b) Restrain inner rod and tighten jamnut. Safety jamnut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Rod end witness hole should be checked to ensure sufficient cable engagement.

WJE ALL

(45) Install rig pin (4-2) in rig pin hole (R-15) in throttle aft control sector.

WJE 401-404, 412, 414, 873, 874, 892, 893

(46) Position power control crank so that threaded hole in trimmer for push-pull control can be engaged.

(47) Screw push-pull control threaded end into trimmer until power control crank is positioned so that rig pin (4-2) can be freely removed and installed in power control crank and tighten push-pull jamnut.

NOTE: The inner rod and the cable inner reaction member are of a one piece design. That means when turning the inner rod for adjustment, the inner reaction member must also turn in the push-pull cable outer case. Therefore, if the inner rod is hard to turn, operate the throttle several times to maximum power and back to idle to relax inner reaction member friction.

(48) Remove rig pin in throttle aft control sector and engine cross shaft.

(49) From cockpit operate throttle and reverser control handles 3 times on their full range.

(50) Set flight compartment throttle handle to idle position (against pedestal stop). Then move reverser lever up to reverse detent position and then select forward idle thrust again.

(51) If necessary, loosen push-pull control jamnut at engine synchronizer trimmer and adjust push-pull control threaded end at trimmer (engine cross shaft) until rig pin (R-17) can be freely removed and installed in power lever crank at engine cross shaft.

(52) Tighten push-pull control jamnut at engine synchronizer rod end trimmer.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

(53) Position power lever crank so threaded hole in trimmer for push-pull cable can be engaged.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891 (Continued)

(54) Screw push-pull cable threaded end into trimmer until power lever crank is positioned so that rig pin (4-2) can be freely removed and installed in rig pin hole (R-17) in power lever crank, install rig pin.

(55) Tighten push-pull cable jamnut at engine synchronizer trimmer. Safety jamnut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

WJE ALL

(56) Check that threaded end of push-pull control extends through flange of trimmer rod end by 1/4(+1/8) inch (6.4(±3.2) mm).

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

(57) If rod end penetration is not within tolerance proceed as follows:

(a) Loosen push-pull cable jamnut at engine synchronizer trimmer.

(b) Remove push-pull cable threaded end from trimmer.

(c) Adjust push-pull cable at throttle aft control sector as follows:

1) Restrain inner rod and loosen jamnut.

2) Restrain outer sleeve and adjust inner rod threaded end to obtain adjustment needed at power lever crank.

3) Restrain inner rod and tighten jamnut. Safety jamnut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Rod end witness hole should be checked to ensure sufficient cable engagement.

(d) Remove rig pin (4-2) from rig pin hole (R-17) from power lever crank at engine cross shaft.

(e) Position power lever crank so threaded hole in trimmer for push-pull cable can be engaged.

(f) Screw push-pull cable threaded end into trimmer until power lever crank is positioned so that rig pin (4-2) can be freely removed and installed in rig pin hole (R-17) in power lever crank.

(g) Check that threaded end of push-pull cable extends through flange of trimmer rod end by 1/4 (+1/8) inch (6.4+3.2 mm).

WJE 401-404, 412, 414, 873, 874, 892, 893

(58) If rod penetration is not within tolerance, proceed as follows:

(a) Loosen push-pull control jamnut at engine synchronizer trimmer.

(b) Remove rig pin (R-17) from power control crank at engine cross shaft.

(c) Adjust push-pull control at throttle aft control sector as follows:

1) Restrain inner rod and loosen jamnut.

2) Restrain outer sleeve and adjust inner rod threaded end to obtain adjustment needed at engine cross shaft.

3) Check rod end witness hole to ensure sufficient threaded end engagement.

WJE 401-404, 412, 414, 873, 874, 892, 893 (Continued)

CAUTION: ADJUSTMENT OF PUSH-PULL CONTROL MUST BE MADE AT ROD ENDS ONLY.

4) Restrain inner rod and tighten jamnut.

(d) Repeat Paragraph 3.B.(49) to Paragraph 3.B.(56).

(59) With lockwire safety jamnut at throttle aft control sector and at engine synchronizer rod end trimmer. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

WJE ALL

(60) Adjust synchronizer actuator to neutral position as follows:

(a) Insert 1/8-inch square drive in actuator drive socket and translate actuator to either stop (extended or stowed position).

WJE 401-404, 412, 414, 873, 874, 892, 893

(b) Using 1/8-inch square drive, translate actuator to center of its range (27 detent stops (clicks)). Remove square drive.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

(c) Using 1/8 inch square drive, translate actuator to center of its range (1 1/2 complete turns or 27 detent stops (clicks)). Remove square drive.

WJE ALL

(61) Insert synchronizer flexshaft in actuator socket.

(62) Connect flexshaft coupling nut.

(63) Remove all rig pins.

WJE 401-404, 412, 414, 873, 874, 892, 893

(64) Loosen bolts that attach control cable support and support bracket to engine (do not remove bolts).

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

(65) Loosen bolts that attach control cable support and engine bracket to engine (do not remove bolts).

WJE 401-404, 412, 414, 873, 874, 892, 893

(66) Cycle throttle lever several times, full forward and back to idle position, to align push-pull cable with engine cross shaft.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

(67) Cycle throttle lever several times, full forward and back to idle position, to align push-pull cable with engine cross shaft.

NOTE: This removes any preload that might exist in push-pull cable being caused by adverse tolerances.

WJE 401-404, 412, 414, 873, 874, 892, 893

(68) Tighten bolts that attach support bracket and control cable support to engine.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 886, 887, 891

(69) Tighten bolts that attach engine bracket and control cable support to engine.

WJE ALL

(70) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(71) Remove safety pin from thrust reverser control valve. Stow safety pin.

(72) Check throttle pedestal stops for each affected engine according to THROTTLE SYSTEMS - ADJUSTMENT/TEST, PAGEBLOCK 76-11-00/501 Config 1, paragraph 3.A.

4. Repair of Throttle Push-Pull Control Cable

A. Preparation

(1) Gain access to throttle push-pull control cable as necessary. (Paragraph 3.)

(2) Clean outer covering of cable with cloth dampened with water.

B. Repair

(1) Trim covers at bulkhead fitting ends to 1/4 inch, if required.

(2) Cut 3/4 inch Versafit heat shrink tubing, G60917 to length for each end of cable assembly to cover original Versafit heat shrink tubing, G60917 and overlap approximately 1/2 inch into caps.

(3) Heat shrink into place so that new covers are coincidental with old covers on inboard ends and extend 1/4 inch maximum into caps.

NOTE: Do not hide part markings.

NOTE: Approximate weight of cable will now be increased by approximately .02 lbs/foot but cable will still meet weight requirements. OD of covers on repaired cable to be .500 inch maximum.

(4) If removed, install throttle push-pull control cable. (Paragraph 3.)

ENGINE SYNCHRONIZER - MAINTENANCE PRACTICES

1. General

A. This maintenance practices provides removal/installation and check instructions for the engine synchronizer actuator, flexshaft and rod end trimmer and control box.

WARNING: TO PREVENT INJURY TO PERSONNEL, EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN.

B. The engine synchronizer actuator is located on the forward end of the left engine pylon apron. Access to the engine synchronizer actuator is through the forward lower engine cowl.

C. The engine synchronizer control box is mounted on shelf No. 2 in the aft right radio rack in the electrical/electronic compartment. Access is through access door number 4501A.

2. Equipment and Materials

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

NOTE: Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

Table 201

Name and Number	Manufacturer
Lockwire, NASM20995N32, DPM 684	Not Specified
Rig pin (4-2) 1/4 X 2 5/8, 2 required	
Square drive (1/8 inch)	
Lubricant, G-N Metal Assembly Paste	Dow Corning G-n Metal Assembly Paste Dow Corning Corp., Midland, MI USA
SAE 30 Engine Oil or equivalent	Not specified
NOTE: Rig pin sizes are in inches (diameter X length; length = grip plus 5/8 inch).	

3. Removal/Installation Engine Synchronizer Actuator

CAUTION: A FAILED ENGINE SYNCHRONIZER ACTUATOR CAN ALSO CAUSE DAMAGE TO CONTROL BOX OR VICE VERSA. BEFORE REPLACING EITHER COMPONENT, MAKE CERTAIN THAT OTHER COMPONENT IS NOT ALSO DAMAGED.

A. Remove Engine Synchronizer Actuator

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

(1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
WJE ALL			
T	40	B1-726	ENGINE SYNC

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

(3) Disconnect synchronizer actuator electrical connector.

(4) Disconnect engine synchronizer flexshaft coupling nut from actuator.

(5) Remove flexshaft from actuator.

(6) Remove actuator from pylon apron.

(7) Disconnect flexshaft rod end trimmer from power control crank at engine cross shaft.

(8) Loosen push-pull control jamnut at engine synchronizer trimmer.

(9) Remove push-pull control threaded end from trimmer.

(10) Disconnect guide cap from guide on engine mounted bracket.

(11) Remove synchronizer flexshaft and rod end trimmer.

(12) Remove rod end trimmer from flexshaft.

(13) Check flex shaft housing for breaks or sharp bends.

NOTE: No breaks or sharp bends of flex shaft housing allowed.

(14) Check rotation of flex shaft.

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 1464, PASTE/G-N METAL ASSEMBLY (Dow Corning)

HAZMAT 1765, AEROSHELL OIL 65

HAZMAT 1000, REFER TO MSDS

(a) If excessive drag or binding is evident, lubricate flexible shaft as follows: (STANDARD PRACTICES - ENGINE - MAINTENANCE PRACTICES, PAGEBLOCK 70-00-00/201)

1) Mix SAE 30 engine oil with the Molykote G-N assembly paste until the paste mixture flows easily.
2) Apply the mixture to one end of the flexshaft housing.
3) Manually turn the shaft to apply a thin layer of the mixture to the internal surfaces of the housing and shaft.
4) Let the remaining mixture drain from the flexshaft housing.
5) Remove all remaining mixture from the external surfaces of the flexshaft housing with a dry cloth.
6) Do not let the mixture get on the trimmer rod end.

B. Install Engine Synchronizer Actuator

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

CAUTION: A FAILED ENGINE SYNCHRONIZER ACTUATOR CAN ALSO CAUSE DAMAGE TO CONTROL BOX OR VICE VERSA. BEFORE REPLACING EITHER COMPONENT, MAKE CERTAIN THAT OTHER COMPONENT IS NOT ALSO DAMAGED.

CAUTION: FLEXING AND BENDING BEFORE INSTALLATION MAY CAUSE SHAFT TO SHORTEN DUE TO HIGH SCALE OF INTERLOCKED OUTER HOUSING. GRASP HOUSING AT EACH END AND PULL WITH SLIGHT TWISTING MOTION BEFORE CHECKING AGAINST SPECIFIED LENGTH.

(1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are open and tagged.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP

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

U	41	B1-2	ENGINE IGNITION RIGHT

WJE 415-427, 429, 861-866, 868, 869, 871-874, 891 (Continued)

(Continued)

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
WJE ALL			
T	40	B1-726	ENGINE SYNC

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6555 TO 7245 KPA) (PRECHARGE PRESSURE).

(2) Make certain thrust reverser control valve is in dump position and safety pin is installed.

(3) Install engine synchronizer actuator on pylon apron.

CAUTION: WHEN TIGHTENING FLEX SHAFT COUPLING NUT, DO NOT ALLOW FLEX SHAFT HOUSING TO ROTATE. THIS MAY CAUSE HOUSING TO INCREASE IN LENGTH, THEREBY CAUSING BINDING IN FLEX SHAFT ASSEMBLY.

(4) Connect rod end trimmer to flexshaft. Safety nut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(5) Connect trimmer to power control crank at engine cross shaft. Safety nut with cotter pin.

CAUTION: ON LEFT ENGINE, WHEN INSTALLING FLEXSHAFT THROUGH GUIDE ON ENGINE MOUNTED BRACKET, ENSURE GUIDE IS PROPERLY INSTALLED AS SHOWN IN FIGURE 201. IMPROPER INSTALLATION MAY CAUSE RESTRICTED THROTTLE MOVEMENT.

(6) Thread flexshaft through guide on engine mounted bracket and install guide cap.

(7) Turn square end of flexshaft inner drive until trimmer reaches end of its travel.

NOTE: Rod end trimmer has a travel range of 4 complete turns from stop to stop.

(8) Adjust trimmer to mid-travel position by turning square end of flexshaft inner drive in opposite direction 2 complete turns from either stop position. Mid-travel equals 1 7/32(±1/32) inch (31(±0.79) mm). (Figure 201)

(9) Install rig pin (4-2) in rig pin hole (R-15) in throttle aft control sector.

(10) Position power control crank so threaded hole in trimmer for push-pull control can be engaged.

(11) Screw push-pull control threaded end into trimmer until power control crank is positioned so that rig pin (4-2) can be freely removed and installed in rig pin hole (R-17), install rig pin.

(12) Tighten push-pull control jamnut at engine synchronizer trimmer. Safety jamnut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(13) Check that threaded end of push-pull control extends through flange of trimmer rod end by 1/4(±1/8) inch (6.4±3.2 mm).

(14) If rod penetration is not within tolerance proceed as follows:

(a) Loosen push-pull control jamnut at engine synchronizer trimmer.

(b) Remove push-pull control threaded end from trimmer.

(c) Adjust push-pull control at throttle aft control sector as follows:

1) Restrain inner rod and loosen jamnut.

2) Restrain outer sleeve and adjust inner rod threaded end to obtain adjustment needed at engine cross shaft.

3) Restrain inner rod and tighten jamnut. Safety jamnut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(d) Remove rig pin (4-2) from rig pin hole (R-17) from power control crank at engine cross shaft.

(e) Position power control crank so threaded hole in trimmer for push-pull control can be engaged.

(f) Screw push-pull control threaded end into trimmer until power control crank is positioned so that rig pin (4-2) can be freely removed and installed in rig pin hole (R-17) in power control crank.

(g) Tighten push-pull control jamnut at engine synchronizer trimmer. Safety jamnut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(h) Check that threaded end of push-pull control extends through flange of trimmer rod end by ¼ in. (6 mm)(±1/8) inch (6.4±3.2 mm).

(15) Adjust synchronizer actuator to neutral position as follows:

(a) Insert 1/8-inch (3.175 mm) square drive in actuator drive socket and translate actuator to either stop (extended or stowed position).

(b) Using 1/8-inch (3.175 mm) square drive, translate actuator to center of its range (1 1/2 complete turns or 27 detent stops (clicks)). Remove square drive.

(16) Insert synchronizer flexshaft in actuator socket.

CAUTION: WHEN TIGHTENING FLEX SHAFT COUPLING NUT, DO NOT ALLOW FLEX SHAFT HOUSING TO ROTATE. THIS MAY CAUSE HOUSING TO INCREASE IN LENGTH, THEREBY CAUSING BINDING IN FLEX SHAFT ASSEMBLY.

(17) Connect flexshaft coupling nut.

(18) Remove all rig pins.

(19) Connect synchronizer actuator electrical connector.

(20) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
WJE ALL			
T	40	B1-726	ENGINE SYNC

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
K	26	B1-424	LEFT ENGINE IGNITION

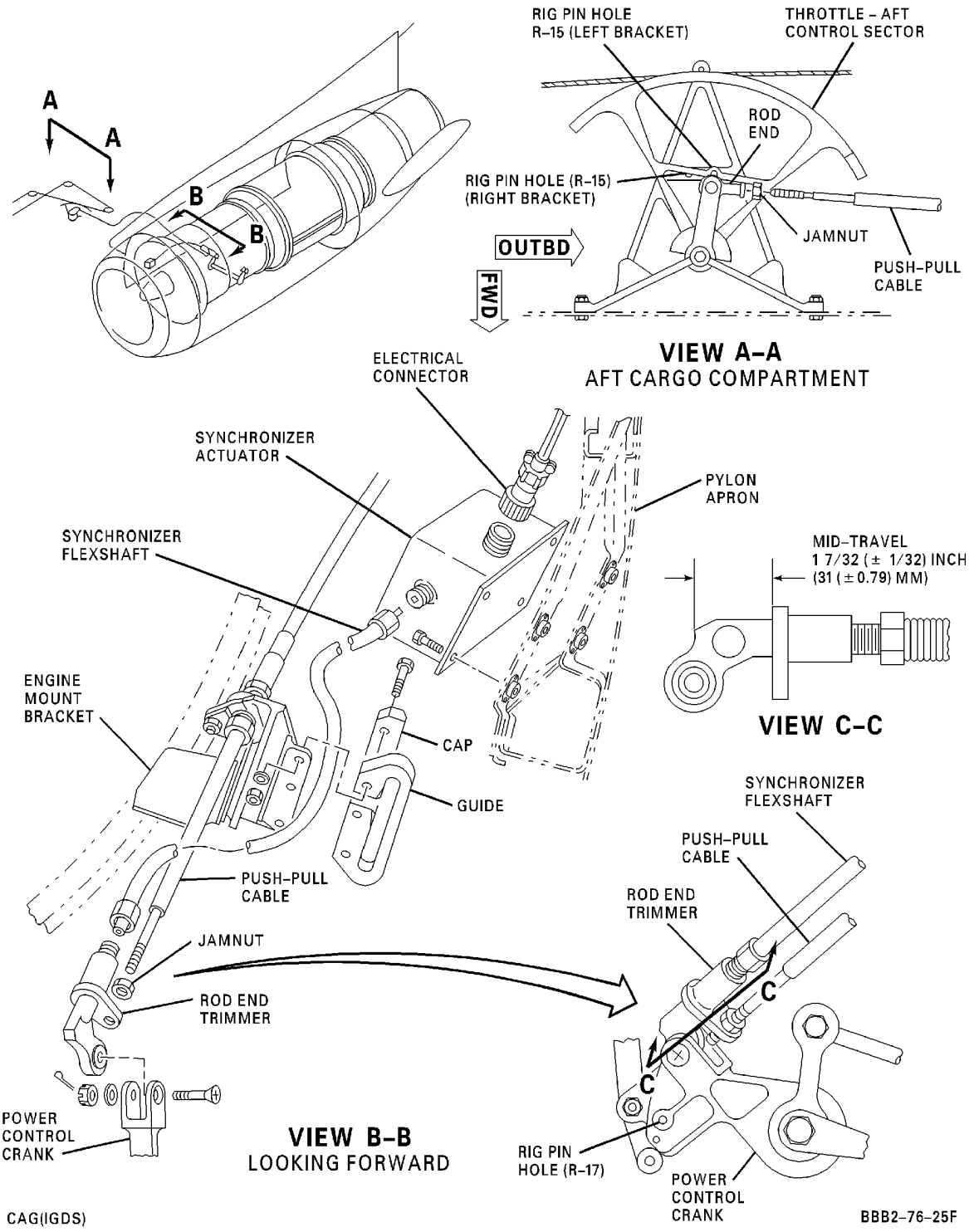
UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI 20,700 KPA IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(21) Remove safety pin from thrust reverser control valve. Stow safety pin.

(22) Perform engine synchronizer system test. (PAGEBLOCK 76-11-00/501 Config 1)



Engine Synchronizer Actuator - Installation
Figure 201/76-11-02-990-802

4. Removal/Installation Engine Synchronizer Control Box

CAUTION: A FAILED ENGINE SYNCHRONIZER ACTUATOR CAN ALSO CAUSE DAMAGE TO CONTROL BOX OR VICE VERSA. BEFORE REPLACING EITHER COMPONENT, MAKE CERTAIN THAT OTHER COMPONENT IS NOT ALSO DAMAGED.

A. Remove Control Box

(1) Open and tag following circuit breaker as applicable.

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	40	B1-726	ENGINE SYNC

CAUTION: TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

(2) Disconnect control box electrical connector.

(3) Remove control box from radio rack.

CAUTION: A FAILED ENGINE SYNCHRONIZER ACTUATOR CAN ALSO CAUSE DAMAGE TO CONTROL BOX OR VICE VERSA. BEFORE REPLACING EITHER COMPONENT, MAKE CERTAIN THAT OTHER COMPONENT IS NOT ALSO DAMAGED.

B. Install Control Box

(1) Make sure that this circuit breaker is open and has safety tag:

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	40	B1-726	ENGINE SYNC

(2) Install control box in radio rack.

CAUTION: TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

(3) Connect electrical connector to control box.

(4) Remove the safety tag and close this circuit breaker:

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	40	B1-726	ENGINE SYNC

(5) Perform engine synchronizer system test. (THROTTLE SYSTEMS - ADJUSTMENT/TEST, PAGEBLOCK 76-11-00/501 Config 1)

5. Check Engine Synchronizer

A. Check Synchronizer Flexible Shaft

(1) Check flexible shaft housing for breaks or sharp bends.

NOTE: No breaks or sharp bends of flexshaft housing allowed.

(2) Check rotation of flexible shaft.

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 1464, PASTE/G-N METAL ASSEMBLY (Dow Corning)

HAZMAT 1765, AEROSHELL OIL 65

HAZMAT 1000, REFER TO MSDS

(a) If excessive drag or binding evident, lubricate flexible shaft as follows:(STANDARD PRACTICES - ENGINE - MAINTENANCE PRACTICES, PAGEBLOCK 70-00-00/201)

1) Mix SAE 30 engine oil with the Molykote G-N assembly paste until the paste mixture flows easily.
2) Apply the mixture to one end of the flexshaft housing.
3) Manually turn the shaft to apply a thin layer of the mixture to the internal surfaces of the housing and shaft.
4) Let the remaining mixture drain from the flexshaft housing.
5) Remove all remaining mixture from the external surfaces of the flexshaft housing with a dry cloth.
6) Do not let the mixture get on the trimmer rod end.

ENGINE SYNCHRONIZER ROD END TRIMMER - REMOVAL/INSTALLATION

1. General

A. This procedure contains task card data.

B. Refer to AOL 9-2096B (MD80-AOL-2096).

TASK 76-11-02-901-801

2. Engine Synchronizer Rod End Trimmer - Restoration

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
76-11-02 P/B 201 Config 1	ENGINE SYNCHRONIZER - MAINTENANCE PRACTICES

B. Remove Engine Synchronizer Rod End Trimmer for Restoration

SUBTASK 76-11-02-020-001

(1) Remove engine synchronizer rod end trimmer assembly. (ENGINE SYNCHRONIZER - MAINTENANCE PRACTICES, PAGEBLOCK 76-11-02/201 Config 1)

NOTE: Refer to the all operator letter 9-2096B for applicable part numbers.

C. Send Engine Synchronizer Rod End Trimmer to the Shop for Restoration

SUBTASK 76-11-02-510-001

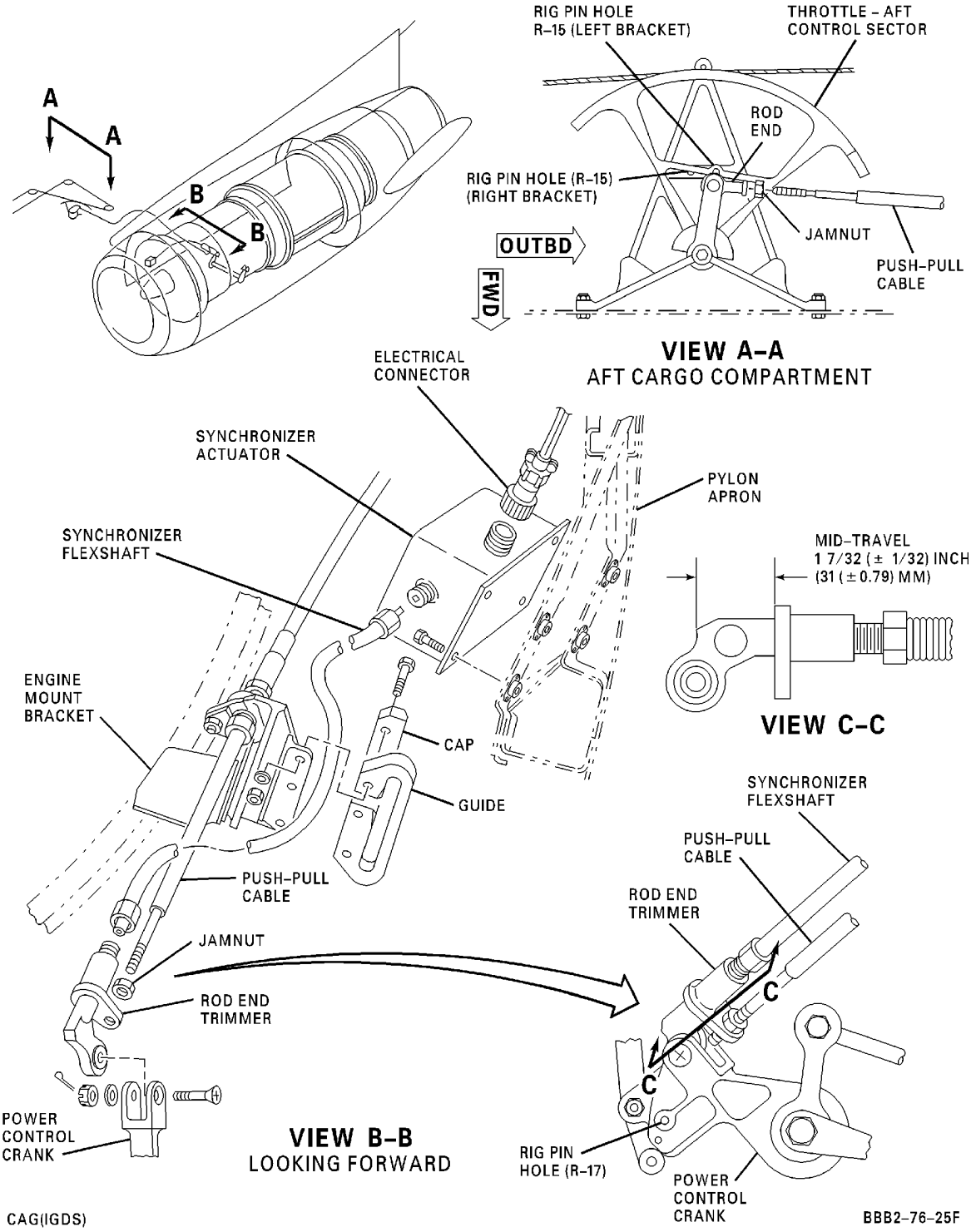
(1) Send engine synchronizer rod end trimmer to the shop for restoration.

D. Install Engine Synchronizer Rod End Trimmer

SUBTASK 76-11-02-420-001

(1) Install serviceable engine synchronizer rod end trimmer. (ENGINE SYNCHRONIZER - MAINTENANCE PRACTICES, PAGEBLOCK 76-11-02/201 Config 1)

——— END OF TASK ———



ENGINE SYNCHRONIZER ROD END TRIMMER
Figure 401/76-11-02-990-803

ENGINE PRESSURE RATIO SYNCHRONIZATION SWITCH - MAINTENANCE PRACTICES

1. General

A. This maintenance practice provides instructions for removal/installation of the Engine Pressure Ratio (EPR) Synchronization (SYNC) Driver Switch. The EPR SYNC driver switch is mounted on the equipment panel, located on the aft left radio rack.

B. Access to the EPR SYNC driver switch is gained through access door 4501A.

2. Removal/Installation Engine Pressure Ratio Synchronization 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 this circuit breaker and install safety tag:

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	40	B1-726	ENGINE SYNC

(2) Disconnect electrical connector from switch.

(3) Remove switch from bracket.

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, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	40	B1-726	ENGINE SYNC

(2) Install switch on panel. Tighten nuts to torque of 20 inch-pounds (2.26 N·m).

(3) Connect switch electrical connector.

(4) Remove the safety tag and close this circuit breaker:

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	40	B1-726	ENGINE SYNC

(5) Perform engine synchronizer system test. (THROTTLE SYSTEMS - ADJUSTMENT/TEST, PAGEBLOCK 76-11-00/501 Config 1)

AUTOTHROTTLE CLUTCH/DRUMS - MAINTENANCE PRACTICES

1. General

A. The clutches are located in the control pedestal in the flight compartment. Access is through the pedestal side panels.

B. All control cables are removed or adjusted with the reverser system stowed.

2. Equipment and Materials

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

NOTE: Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

Table 201

Name and Number	Manufacturer
Oil, lubricating D5263	Zip Products San Jose, CA

3. Autothrottle Clutch/Drums-Servicing

A. Autothrottle Clutch/Drums-Servicing

(1) Remove left and right pedestal side covers.

(2) Place throttle levers at forward position.

(3) Lubricate clutch as follows:

(a) Insert needle of tool between throttle control pushrod attach fitting and side of clutch and push needle through seal. Angle needle to ensure penetration into clutch. (Figure 201)

(b) Inject approximately 0.17 fl. oz. (5cc.) of Zip D5263 lubricant into seal by pressing down on aerosol can cap for ten seconds. Repeat procedure for opposite clutch.

(c) Operationally test autothrottle while cycling levers fore and aft. (PAGEBLOCK 22-31-00/201)

(d) Perform return to service 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)

4. Removal/Installation Autothrottle Clutch/Drums

A. Remove Autothrottle Clutch/Drums

(Figure 203)

WARNING: BEFORE BEGINNING TEST PROCEDURES, MAKE CERTAIN THAT THRUST REVERSER CONTROL VALVE IS IN DUMP POSITION AND THAT SAFETY PIN AND WARNING STREAMERS ARE INSTALLED. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE THRUST REVERSER DOORS IN RESPONSE TO THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

(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, 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

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	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

(2) Remove captain's and first officer's seats. (PAGEBLOCK 25-13-01/201)

(3) Remove access panel 4408A. (INTERNAL ACCESS DOORS - DESCRIPTION AND OPERATION, PAGEBLOCK 06-31-00/001 Config 2 or INTERNAL ACCESS DOORS - DESCRIPTION AND OPERATION, PAGEBLOCK 06-31-00/001 Config 4 or INTERNAL ACCESS DOORS - DESCRIPTION AND OPERATION, PAGEBLOCK 06-31-00/001 Config 1)

(4) Remove all lightplates from top of pedestal and control panels from upper aft pedestal.

(5) Remove left and right pedestal side panels and left and right observer footrests.

CAUTION: TO AVOID CABLE DRAGGING AND BECOMING FOULED WITH AIRCRAFT STRUCTURE, AN ACCEPTABLE METHOD OF CLAMPING CABLES PRIOR TO RELIEVING CABLE TENSION SHOULD BE EMPLOYED.

(6) Remove forward cargo compartment ceiling panels 5151 and 5154. (INTERNAL ACCESS DOORS - DESCRIPTION AND OPERATION, PAGEBLOCK 06-31-00/001 Config 2 or INTERNAL ACCESS DOORS - DESCRIPTION AND OPERATION, PAGEBLOCK 06-31-00/001 Config 4 or INTERNAL ACCESS DOORS - DESCRIPTION AND OPERATION, PAGEBLOCK 06-31-00/001 Config 1)

(7) Relieve cable tension and remove following cables from transition pulleys under pedestal. Access to pulleys is from forward accessory compartment.

(a) Flap cables 241A, 242A, 243A, and 244A. (FLAPS - ADJUSTMENT/TEST, PAGEBLOCK 27-50-00/501)

(b) Cabin pressurization control cables 119A and 120A.

(c) Fuel crossfeed cables 71A and 72A. (Figure 28-20-12-990-803)

(d) Fuel shutoff cables 57A and 58A. (Figure 76-12-00-990-803)

(e) Speedbrake cables 159A and 160A. (SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 or SPOILER - ADJUSTMENT/TEST, PAGEBLOCK 27-60-00/501 Config 2 Figure 501)

(f) Throttle cables 49A, 50A, 53A and 54A. (Figure 76-11-00-990-805)

(g) Thrust reverser cables 47A, 48A, 51A and 52A. (Figure 78-30-00-990-801)

NOTE: To facilitate installation, each component should be tagged as it is removed from shaft.

(8) Remove pushrod from flap control module and sector support shaft flap pulley.

(9) Remove horizontal stabilizer takeoff warning indicator module pushrod to crossover shaft in upper forward pedestal and pushrod to horizontal stabilizer takeoff warning switch sector. (PAGEBLOCK 27-40-08/201)

(10) Remove horizontal stabilizer takeoff position indicator module from left forward pedestal frame. (PAGEBLOCK 27-40-12/201)

(11) Remove lever support shaft nut and washer on right side of upper pedestal.

(12) Remove flap control module from right forward pedestal. (PAGEBLOCK 27-52-05/201)

(13) Remove left lever support shaft retainer bushing.

(14) Loosen autothrottle servo actuator tensioning turnbarrel and remove drive chain from actuator sprocket.

(15) To relieve excess tension on left frame, remove three screws in left sector support shaft bushing support and remove two vertical bolts inboard of frame. Mark shaft to indicate bottom side for reinstallation.

(16) Remove right forward pedestal frame.

(17) Remove pushrod from horizontal stabilizer takeoff warning indicator module crossover shaft and flap handle position pushrod which connects to flap pulley on sector support shaft.

(18) Remove flap pulley from sector support shaft with cables connected and set pulley to right side of pedestal.

(19) Remove flap handle switch support forward pedestal frame and set aside. Do not remove wires from switch.

(20) Remove autothrottle switch cams from forward section of pedestal.

(21) Remove left and right throttle rods to clutch drum and throttle switch cam lower pushrod at clutch drum.

(22) Remove wire support and cable guard from sector support shaft.

(23) Remove cabin pressure idler pulley from sector support shaft.

(24) Remove autothrottle drive chain from drive shaft sprocket.

(25) Remove two screws on aft upper pedestal and disconnect cabin pressure auto/manual switch turnbarrel and spring from cabin pressure controller. (PAGEBLOCK 21-32-05/501)

NOTE: Locally manufactured tool may be used to remove and install lever support shaft and sector support shaft. (Figure 205)

(26) Lightly tap sector support shaft toward let side of pedestal until cabin pressure controller can be removed. Retain shims and washers for installation.

(27) Remove right ignition switch below fuel shutoff lever and wiring to flap takeoff warning switch.

(28) Tap lever support shaft toward left side of pedestal until fuel crossfeed unit can be removed and set aside.

(29) Remove right ignition switch bracket from lever support shaft.

(30) Remove fuel shutoff lever from lever support shaft.

CAUTION: THROTTLE INTERLOCK CAMS ARE HELD IN PLACE BY ONE SCREW ON UPPER PEDESTAL AND LEVER SUPPORT SHAFT. CAMS AND THROTTLES MUST BE REMOVED TOGETHER SINCE CAMS ARE LOCATED ON LEVER SUPPORT SHAFT BETWEEN THROTTLE ARMS ON SHAFT.

(31) Tap lever support shaft to left side of pedestal until throttle levers and throttle interlock cams can be removed. Pull throttle levers up through pedestal slots clear of top of pedestal.

(32) Remove lower screws in aft throttle position switch brackets for left and right throttles. Loosen top screw and rotate bracket aft to clear autothrottle clutch.

(33) Holding switch brackets aside, pull autothrottle clutch to right side of pedestal.

(34) Remove autothrottle clutch from sector support shaft.

B. Install Autothrottle Clutch/Drums

WARNING: BEFORE BEGINNING TEST PROCEDURES, MAKE CERTAIN THAT THRUST REVERSER CONTROL VALVE IS IN DUMP POSITION AND THAT SAFETY PIN AND WARNING STREAMERS ARE INSTALLED. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE THRUST REVERSER DOORS IN RESPONSE TO THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

(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, 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

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	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

CAUTION: CENTER PEDESTAL SUPPORT FRAME BEARING SPACER MAY STICK TO LEFT END OF CLUTCH SHAFT. INSTALL SPACER IN FRAME SUPPORT BEFORE INSTALLING CLUTCHES.

(2) Loosen throttle cams on autothrottle clutch drums to permit adjustment of throttle limit switches.

(3) Install and safety throttle cables on autothrottle clutches. Install clutches on sector support shaft.

(4) Install throttle levers and throttle interlock cams by tapping lever support shaft through cams and levers.

(5) Install shim washer and fuel shutoff lever on lever support shaft with control cables attached.

(6) Install fuel crossover on lever support shaft.

(7) Install right ignition switch bracket on lever support shaft.

(8) Install right and left throttle levers and switch cam pushrods to autothrottle clutch drums.

(9) Install autothrottle drive chain on drive sprocket on sector support shaft. Make certain that an equal amount of slack exists at top and bottom of drive chain.

(10) Install cabin pressure controller on lever support shaft while tapping shaft through controller.

(11) Install idler pulley on sector support shaft and position forward cabin pressure control cable on aft side of pulley.

(12) Install wire support and cable guard bracket on sector support shaft.

(13) Install right ignition switch and flap takeoff warning switch support on sector support shaft. Install wiring to flap takeoff warning switch.

(14) Install right forward pedestal frame.

(15) Install sector support shaft support bushing on left side of pedestal and install three retaining screws and two vertical screws previously removed from inboard of frame.

(16) Install flap handle position switch support on sector support shaft to flap takeoff warning switch crossover shaft in upper forward pedestal.

(17) Safety left and right throttle lever and throttle switch cam pushrod bolts to autothrottle clutch drums. Remove slack from throttle cables and remove cable blocks. Check throttles for freedom of movement.

(18) Tap lever support shaft to left side of pedestal until shaft retainer bolt holes align and install support bushing and retainer bolt.

(19) Install cabin pressure control manual/auto lever spring and turnbarrel forward on control unit. (PAGEBLOCK 21-32-05/501)

(20) Install horizontal stabilizer takeoff warning position indicator on left forward pedestal frame and connect pushrod to flap takeoff warning switch crossover shaft. (PAGEBLOCK 27-40-08/201)

(21) Install pushrod from horizontal stabilizer takeoff indicator module to horizontal stabilizer takeoff warning switch.

(22) Install flap module on right forward pedestal and pushrod to flap control pulley on sector support shaft. (PAGEBLOCK 27-52-05/201)

(23) Tension autothrottle servo drive chain with turnbarrel to produce 0.25 inch (6.35 mm) midspan movement of chain.

(24) Move left and right aft throttle limit switch brackets back into position and install bolts.

(25) Remove cable blocks and retention all cables.

NOTE: In order to ensure consistent 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 outdoors, readings are to be taken during the time period between three (3) hours after sunset and one (1) hour after sunrise.

(26) Adjust throttle limit switch cams for proper switch operation. (THROTTLE LIMIT SWITCHES - MAINTENANCE PRACTICES, PAGEBLOCK 76-10-03/201 Config 1)

(27) Adjust flap takeoff warning switch. (PAGEBLOCK 27-53-01/201)

(28) Perform test of following systems:

(a) Cabin Pressurization. (PAGEBLOCK 21-32-05/501)

(b) Autothrottles. (PAGEBLOCK 22-31-00/201)

(c) Takeoff Warning. (PAGEBLOCK 27-00-00/201)

(d) Flaps. (PAGEBLOCK 27-50-00/501)

(e) Fuel Crossfeed. (PAGEBLOCK 28-20-12/501)

(f) Throttles. (THROTTLE SYSTEMS - ADJUSTMENT/TEST, PAGEBLOCK 76-11-00/501 Config 1)

(g) Engine Ignition. (GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 74-00-00/501 Config 1 or GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 74-00-00/501 Config 2)

(h) Fuel Shutoff. (PAGEBLOCK 76-12-00/501)

(i) Thrust Reverser. (PAGEBLOCK 78-30-00/501).

(29) Install pedestal covers, control boxes, and left and right observer footrests.

(30) Install captain's and first officer's seats. (PAGEBLOCK 25-13-01/201)

(31) Install access panel 4408A. (INTERNAL ACCESS DOORS - DESCRIPTION AND OPERATION, PAGEBLOCK 06-31-00/001 Config 2 or INTERNAL ACCESS DOORS - DESCRIPTION AND OPERATION, PAGEBLOCK 06-31-00/001 Config 4 or INTERNAL ACCESS DOORS - DESCRIPTION AND OPERATION, PAGEBLOCK 06-31-00/001 Config 1)

(32) Install forward cargo compartment ceiling panels 5151 and 5154. (INTERNAL ACCESS DOORS - DESCRIPTION AND OPERATION, PAGEBLOCK 06-31-00/001 Config 2 or INTERNAL ACCESS DOORS - DESCRIPTION AND OPERATION, PAGEBLOCK 06-31-00/001 Config 4 or INTERNAL ACCESS DOORS - DESCRIPTION AND OPERATION, PAGEBLOCK 06-31-00/001 Config 1)

(33) Remove tools, equipment, loose hardware and debris from maintenance area.

(34) 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, 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

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	23	B10-95	PRIMARY LONGITUDINAL TRIM BRAKE

UPPER EPC, LIGHTS - LEFT AC BUS

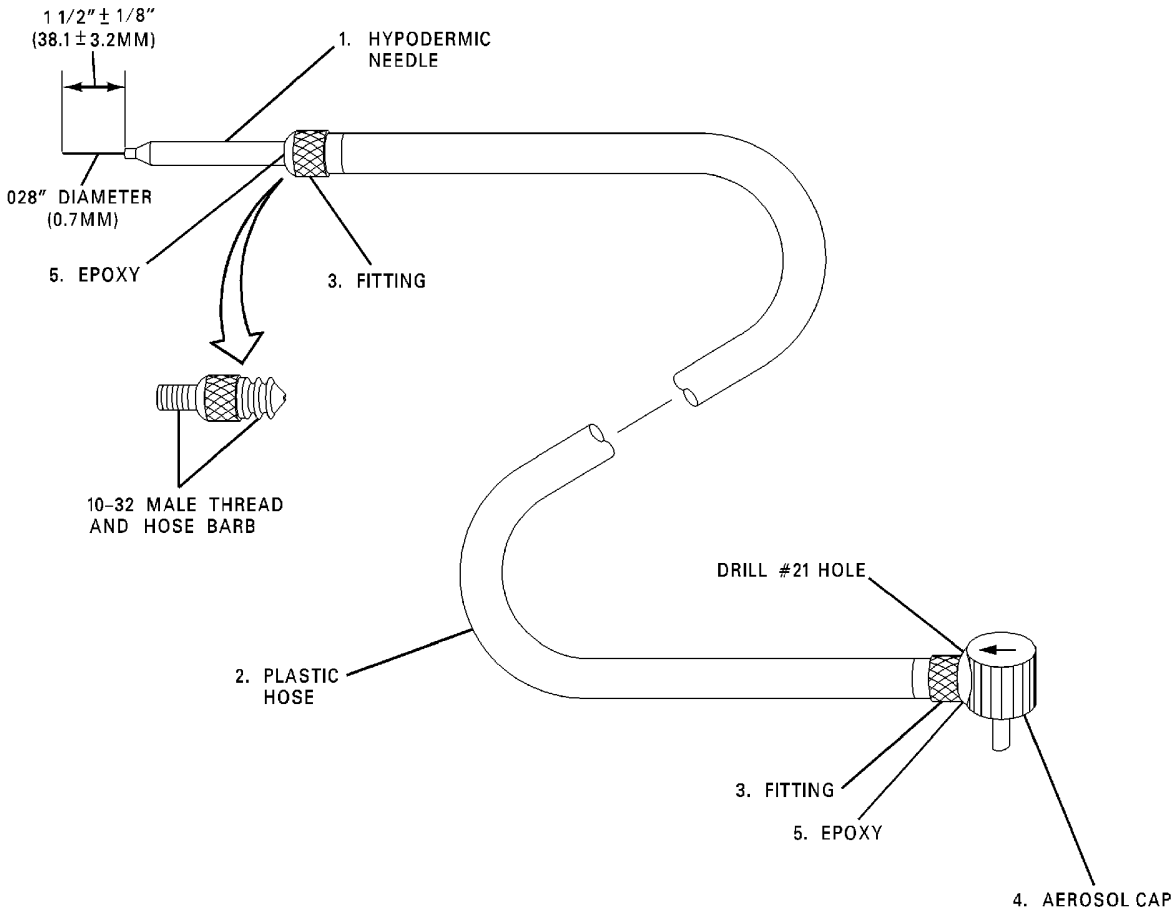
Row	Col	Number	Name
K	19	B1-309	INTEGRAL LIGHTS PEDESTAL

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



CODES:

1. 5157 (MID-CONTINENT MEDICAL) (OR EQUIVALENT)
2. R3603, 0.125 INCH (3.2 MM) I.D. BY 30 INCHES (762 MM) LENGTH, TYGON CO.
3. 62-0136-7 FITTING (MIDLAND/ROSS CORP.)
4. D5263, (ZIP PRODUCTS CORP.)
5. EPOXY 45, 44581, (LOCTITE CORP.)

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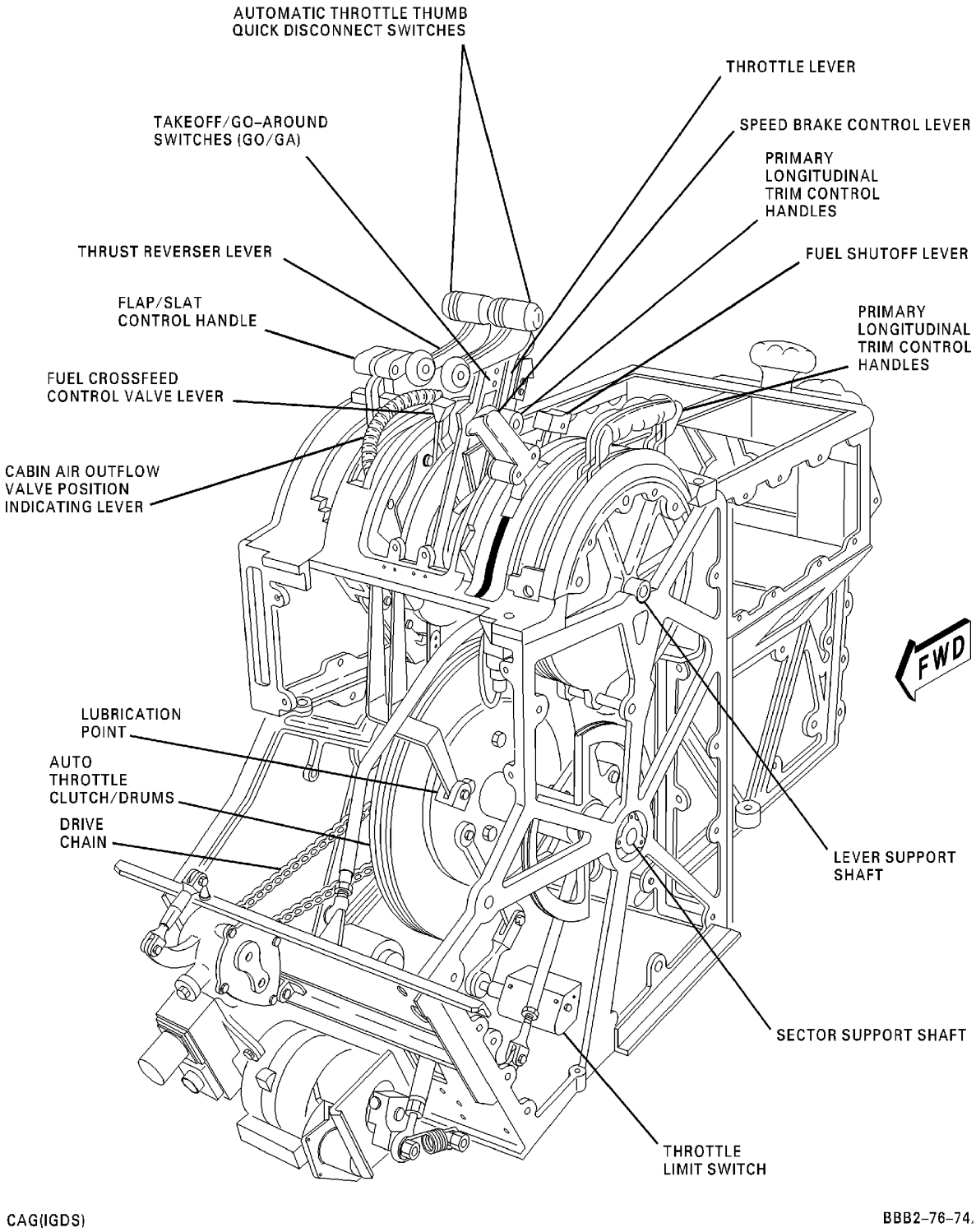
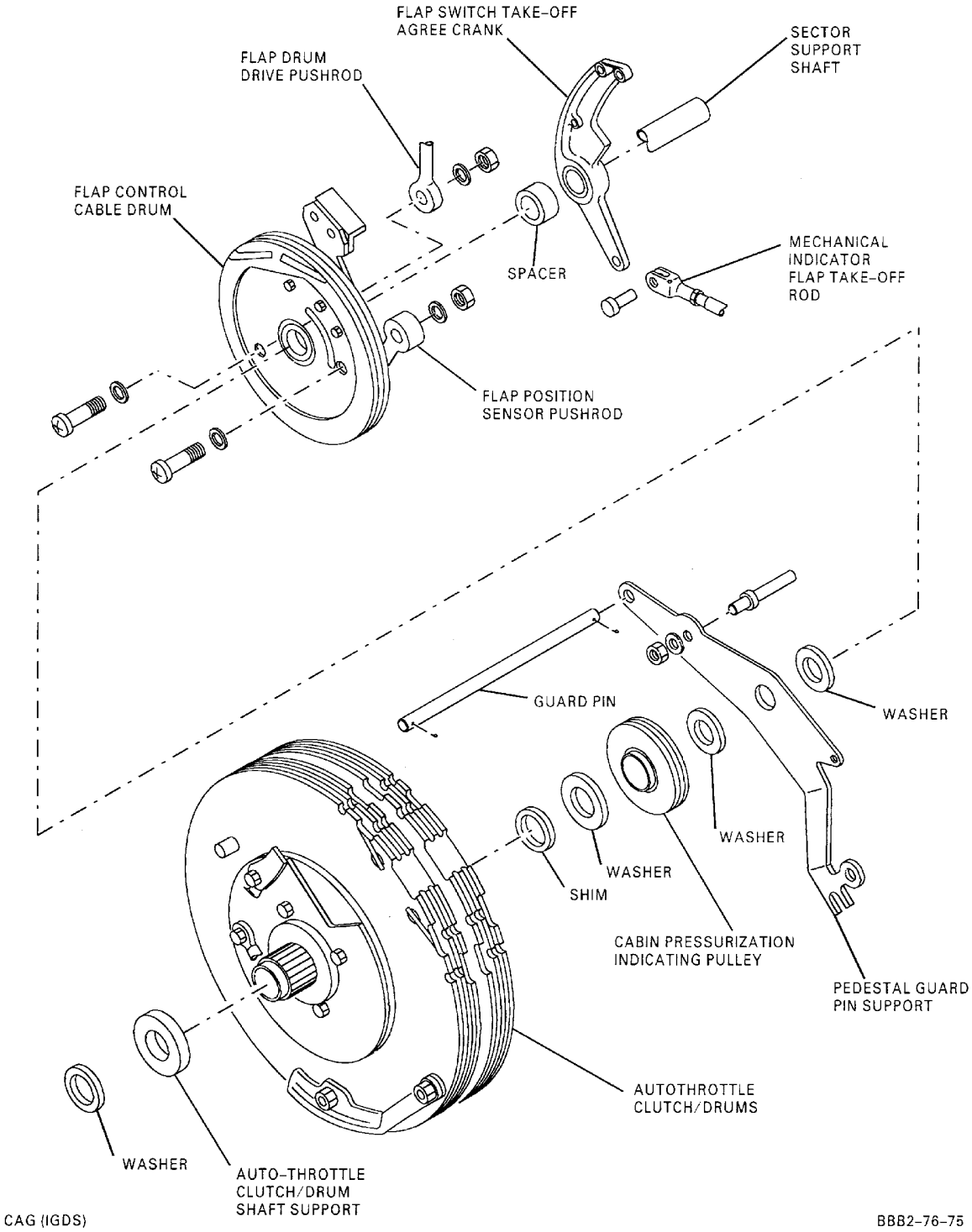
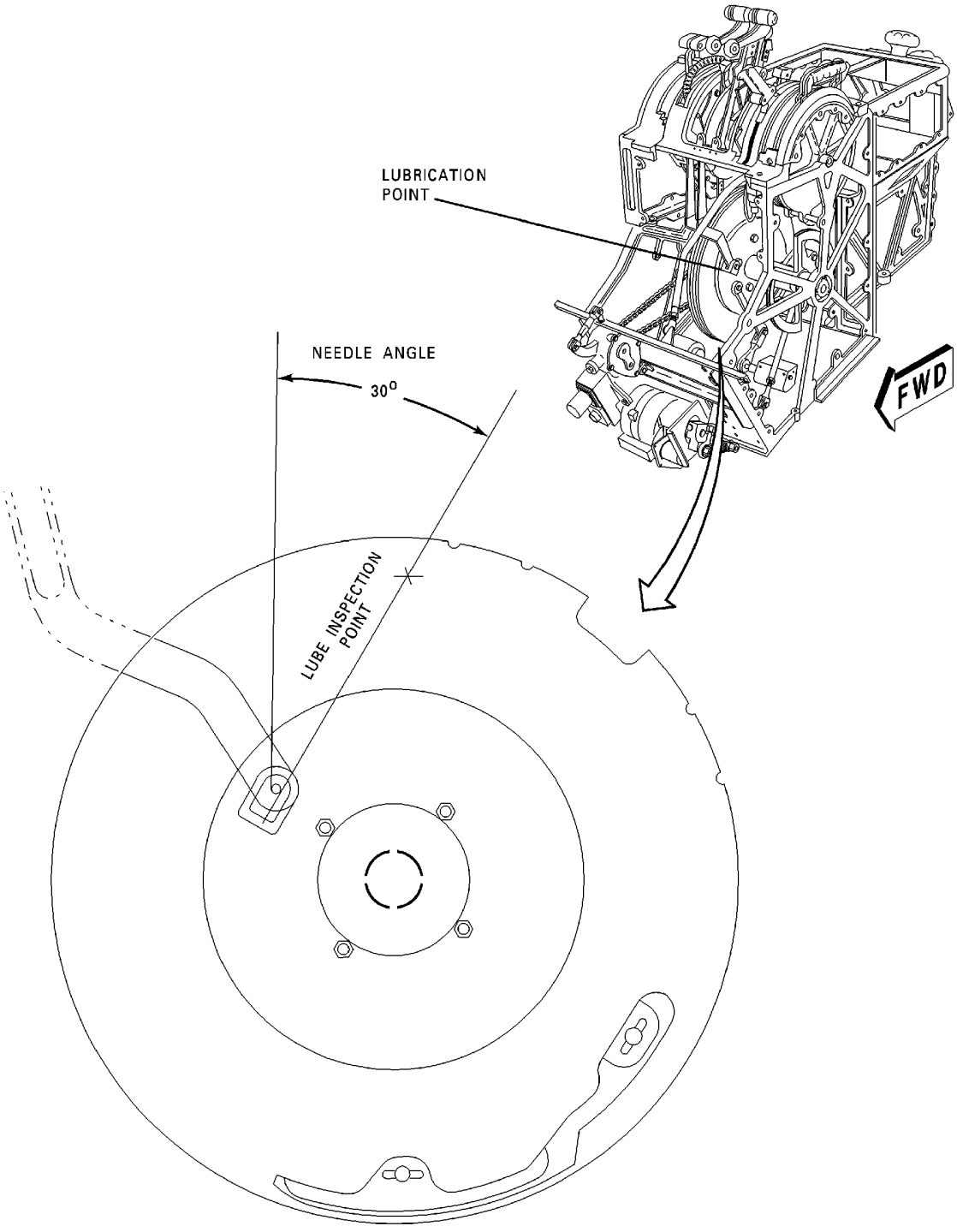
Lubrication Tool, Autothrottle Clutch/Drums
Figure 201/76-11-04-990-802



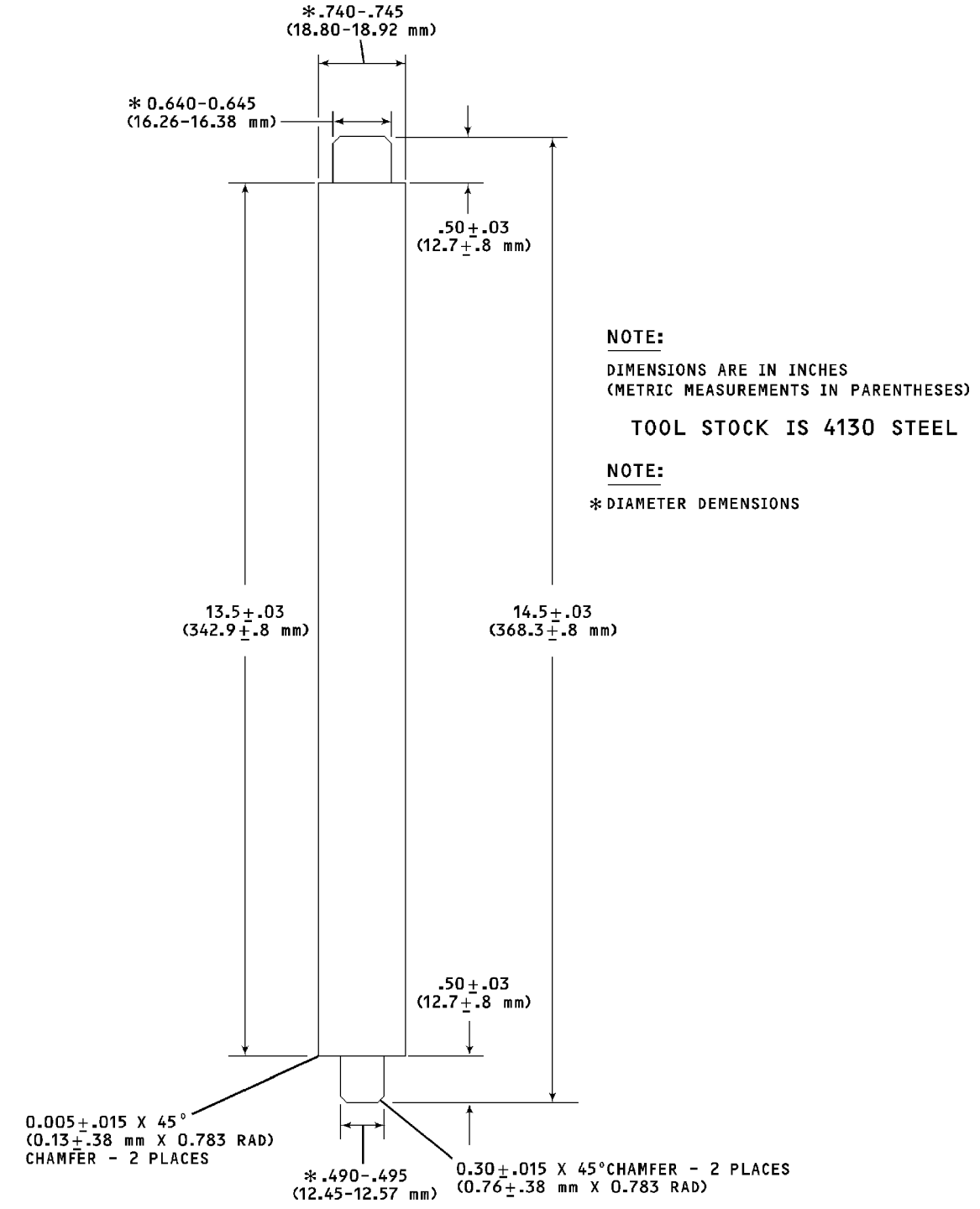
Control Pedestal and Autothrottle Clutch/Drums General Arrangement
Figure 202/76-11-04-990-803



Autothrottle Clutch/Drums - Removal/Installation
Figure 203/76-11-04-990-804



Control Pedestal and Autothrottle Clutch/Drums Lubrication Point
Figure 204/76-11-04-990-805



Shaft Removal/Installation Tool
Figure 205/76-11-04-990-806

AUTOTHROTTLE CLUTCH/DRUMS - ADJUSTMENT/TEST

1. General

A. These procedures provide test instructions for the autothrottle clutch/drums. The autothrottle clutches are pre-set at the factory and no adjustment is possible.

2. Equipment and Materials

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

Table 501

Name and Number	Manufacturer
Push-pull scale (0 to 100 lbs, 0 to 45 kg) range	John Chattillon & Son
Cable blocks	

3. Test Autothrottle Clutch/Drums

A. Determine Slip Test Force

WARNING: BEFORE BEGINNING TEST PROCEDURES, MAKE CERTAIN THAT THRUST REVERSER CONTROL VALVE IS IN DUMP POSITION AND THAT SAFETY PIN AND WARNING STREAMERS ARE INSTALLED. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE THRUST REVERSER DOORS IN RESPONSE TO THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(1) Remove forward cargo compartment ceiling panels 5151 and 5154. (SUBJECT 06-31-00, Page 1)

(2) Position throttle levers to 12 o'clock position.

(3) Attach cable blocks to cables 49A, 50A, 53A, and 54A. (THROTTLE SYSTEMS - ADJUSTMENT/TEST, PAGEBLOCK 76-11-00/501 Config 1, Figure 501)

(a) Attach loop of safety wire or similar material to cable blocks for attachment of push-pull gauge.

(4) Using push-pull gauge, pull on cable 49A until torque limiter ratchets. Note force in Figure 501. Return throttle to 12 o'clock position.

NOTE: Resistance to cable movement decreases suddenly when torque limiter ratchets.

(5) Repeat Paragraph 3.A.(4) for cables 50A, 53A and 54A.

(6) Determine slip test force:

(a) Slip test force equals force noted in Paragraph 3.A.(4) and Paragraph 3.A.(5) minus ten percent. (Figure 501)

B. Perform Slip Test With Minimum Forward Racked-In Load

(1) Position throttle levers to 12 o'clock position.

(a) Place tape adjacent to throttle levers, and mark tape at aft edge of throttle levers.

(2) Observe throttle lever movement during Paragraph 3.B.(3) and Paragraph 3.B.(4).

(a) If movement greater than 0.125 inch (3.2 mm) is observed when force is applied with push-pull gauge, autothrottle clutch is slipping.

(3) Test left throttle for slipping with minimum forward racked-in load:

(a) Position left throttle to idle, then back to alignment mark established in Paragraph 3.B.(1).

NOTE: It is important that the throttle lever travels forward only to establish forward racked-in load. If throttle lever travels further forward than alignment mark, position throttle to idle, then back to alignment mark.

(b) Using push-pull gauge, pull on cable 49A with force established in Paragraph 3.A.(6)(a). Note force and throttle lever movement.

(c) Position left throttle to idle, then back to alignment mark established in Paragraph 3.B.(1).

(d) Using push-pull gauge, pull on cable 50A with force established in Paragraph 3.A.(6)(a). Note force and throttle movement.

(e) Do Paragraph 3.B.(3)(a) through Paragraph 3.B.(3)(d) five times.

(4) Test right throttle for slipping with minimum forward racked-in load.

(a) Position right throttle to idle, then back to alignment mark established in Paragraph 3.B.(1).

NOTE: It is important that the throttle lever travels forward only to establish forward racked-in load. If throttle lever travels further forward than alignment mark, position throttle to idle, then back to alignment mark.

(b) Using push-pull gauge, pull on cable 53A with force established in Paragraph 3.A.(6)(a). Note force and throttle lever movement.

(c) Position right throttle to idle, then back to alignment mark established in Paragraph 3.B.(1).

(d) Using push-pull gauge, pull on cable 54A with force established in Paragraph 3.A.(6)(a). Note force and throttle lever movement.

(e) Do Paragraph 3.B.(4)(a) through Paragraph 3.B.(4)(d) five times.

C. Perform Slip Test With Minimum Aft Racked-In Load

(1) Observe throttle lever movement during Paragraph 3.C.(2) and Paragraph 3.C.(3).

(a) If movement greater than 0.125 inch (3.2 mm) is observed, autothrottle clutch is slipping.

(2) Test left throttle for slipping with minimum aft racked-in load:

(a) Position right throttle to idle, then back to alignment mark established in Paragraph 3.B.(1).

NOTE: It is important that throttle lever travels aft only, during this step to establish aft racked-in load. If throttle lever is positioned further aft than alignment mark, position throttle lever full forward, then back to alignment mark.

(b) Using push-pull gauge, pull on cable 49A with force established in Paragraph 3.A.(6)(a). Note force and throttle lever movement.

(c) Position left throttle to full forward, then back to alignment mark established in Paragraph 3.B.(1).

(d) Using push-pull gauge, pull on cable 50A with force established in Paragraph 3.A.(6)(a). Note force and throttle lever movement.

(e) Do Paragraph 3.C.(2)(a) through Paragraph 3.C.(2)(d) five times.

(3) Test right throttle for slipping with minimum aft racked-in load:

(a) Position right throttle to idle, then back to alignment mark established in Paragraph 3.B.(1).

NOTE: It is important that throttle lever travels aft only, during this step to establish aft racked-in load. If throttle lever is positioned further aft than alignment mark, position throttle lever full forward, then back to alignment mark.

(b) Using push-pull gauge, pull on cable 53A with force established in Paragraph 3.A.(6)(a). Note force and throttle movement.

(c) Position left throttle to full forward, then back to alignment mark established in Paragraph 3.B.(1).

(d) Using push-pull gauge, pull on cable 54A with force established in Paragraph 3.A.(6)(a). Note force and throttle lever movement.

(e) Do Paragraph 3.C.(3)(a) through Paragraph 3.C.(3)(d) five times.

(4) Remove cable blocks from cables and tape placed adjacent to throttle levers.

(5) Install forward cargo compartment ceiling panels 5151 and 5154. INTERNAL ACCESS DOORS, SUBJECT 06-31-00, Page 1)

AUTOTHROTTLE CLUTCH SLIP TEST DATA

Cable Number:	49A	50A	53A	54A
Throttle lever:	Left	Left	Right	Right
Direction of Movement:	Forward	Aft	Forward	Aft
Torque Limiter, Force per step A. (4). -------->				
Test Force per step A. (6). (A. (4) minus 10%) -------->				
Force and Lever movement per step B. (3). (b). and (d). B. (4). (b). and (d). (Forward Racked-In Load)	Force/ Movement	Force/ Movement	Force/ Movement	Force/ Movement
1. 2. 3. 4. 5.	/ / / / /	/ / / / /	/ / / / /	/ / / / /
Force and Lever movement per step C. (2). (b). and (d). C. (3). (b). and (d). (Aft Racked-In Load)	Force/ Movement	Force/ Movement	Force/ Movement	Force/ Movement
1. 2. 3. 4. 5.	/ / / / /	/ / / / /	/ / / / /	/ / / / /

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Autothrottle Clutch Slip Test Chart
Figure 501/76-11-04-990-808

FUEL SHUTOFF SYSTEM - TROUBLE SHOOTING

1. General

A. The following trouble shooting procedures cover both Douglas furnished system components and Pratt and Whitney engine fuel control components.

B. Substitute components which are known to be in good working condition to isolate trouble whenever possible.

C. Perform adjustment/test procedures as applicable for any component as outlined in Maintenance Practices.

D. Before performing trouble shooting procedures, consult the flight record book or any other data source for pertinent information to aid in isolation of cause for any malfunction.

NOTES:

A. MAKE TESTS OR REPLACE COMPONENTS IN THE ORDER SHOWN.

TROUBLE/SYMPTOM	POSSIBLE CAUSE. TEST OR REPLACE AS REQUIRED.										
	RUBBING CABLES OR GUARD PINS, MISALIGNED OR DEFECTIVE PULLEYS OR FAIR LEADS	PULLEY RUBBING ON BRACKET	IGNITION SWITCH BINDING AND RUBBING IN CAM GUIDE TUBES	IGNITION SWITCH HAS DIRT OR DEBRIS IN CAM GUIDE TUBES	TURNBUCKLE STRIKES FAIRLEAD	DEFECTIVE PULLEY OR BRACKET	BINDING COMPONENTS OR BEARING IN ENGINE CONTROL SHAFT ASSEMBLY OR CROSS SHAFT	DEFECTIVE FUEL CONTROL UNIT	PUSH-PULL CONTROL CONDUIT DAMAGED, KINKED OR ROUTED TOO SHARP	FOREIGN OBJECT OR RIGGING PIN IN CABLE DRUM OR CONTROL LINKAGE	TURNBUCKLES NOT RIGGED TO PROPER TENSION
A. EXCESSIVE FORCE REQUIRED TO ACTUATE THE FUEL SHUTOFF LEVER	1	2	3	4	5		7	6	8		
B. FUEL SHUTOFF SYSTEM JAMMED					6	3	2	5	4	1	
C. EXCESSIVE SLACK ON FUEL SHUTOFF LEVER						2					1

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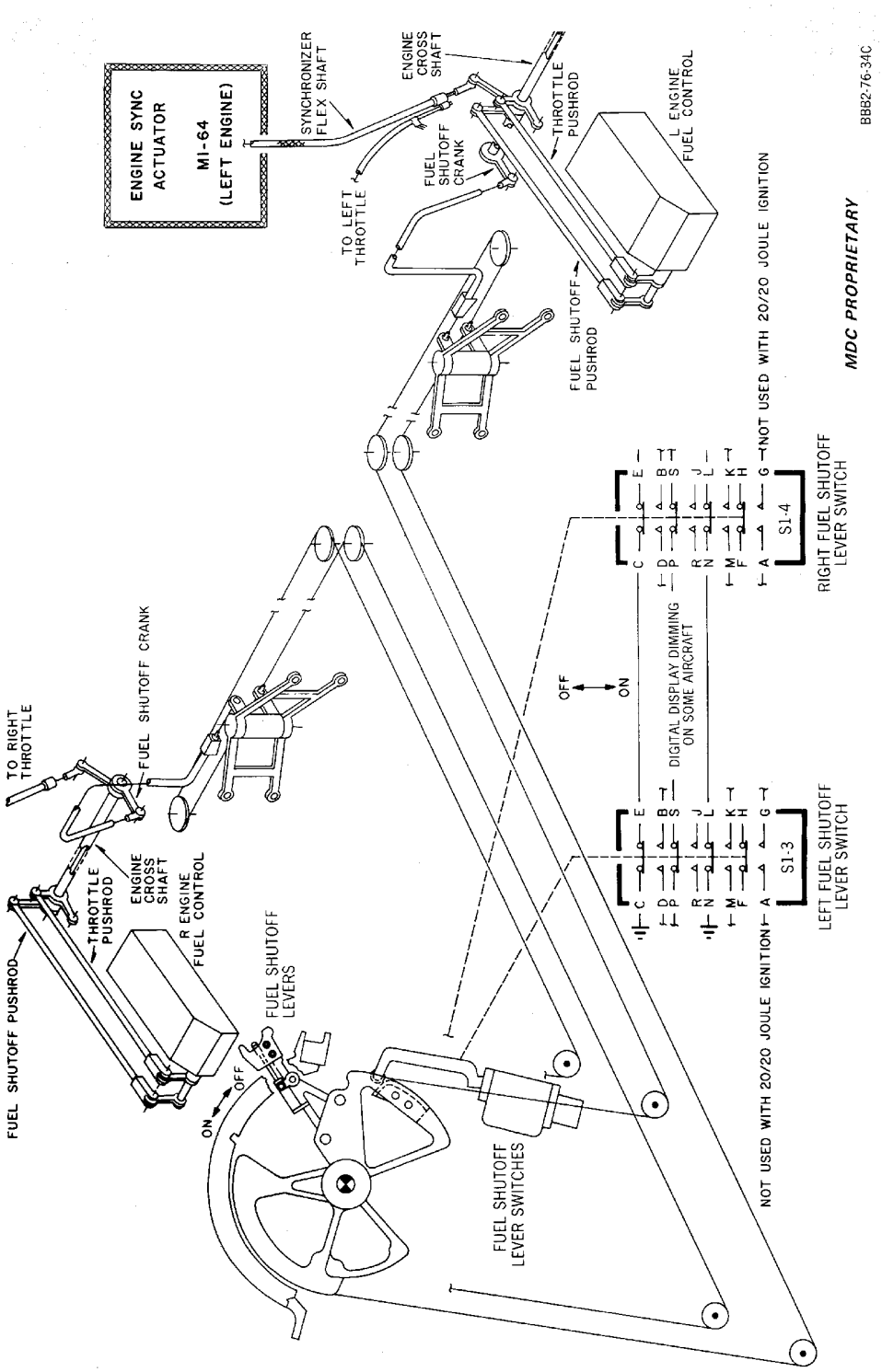
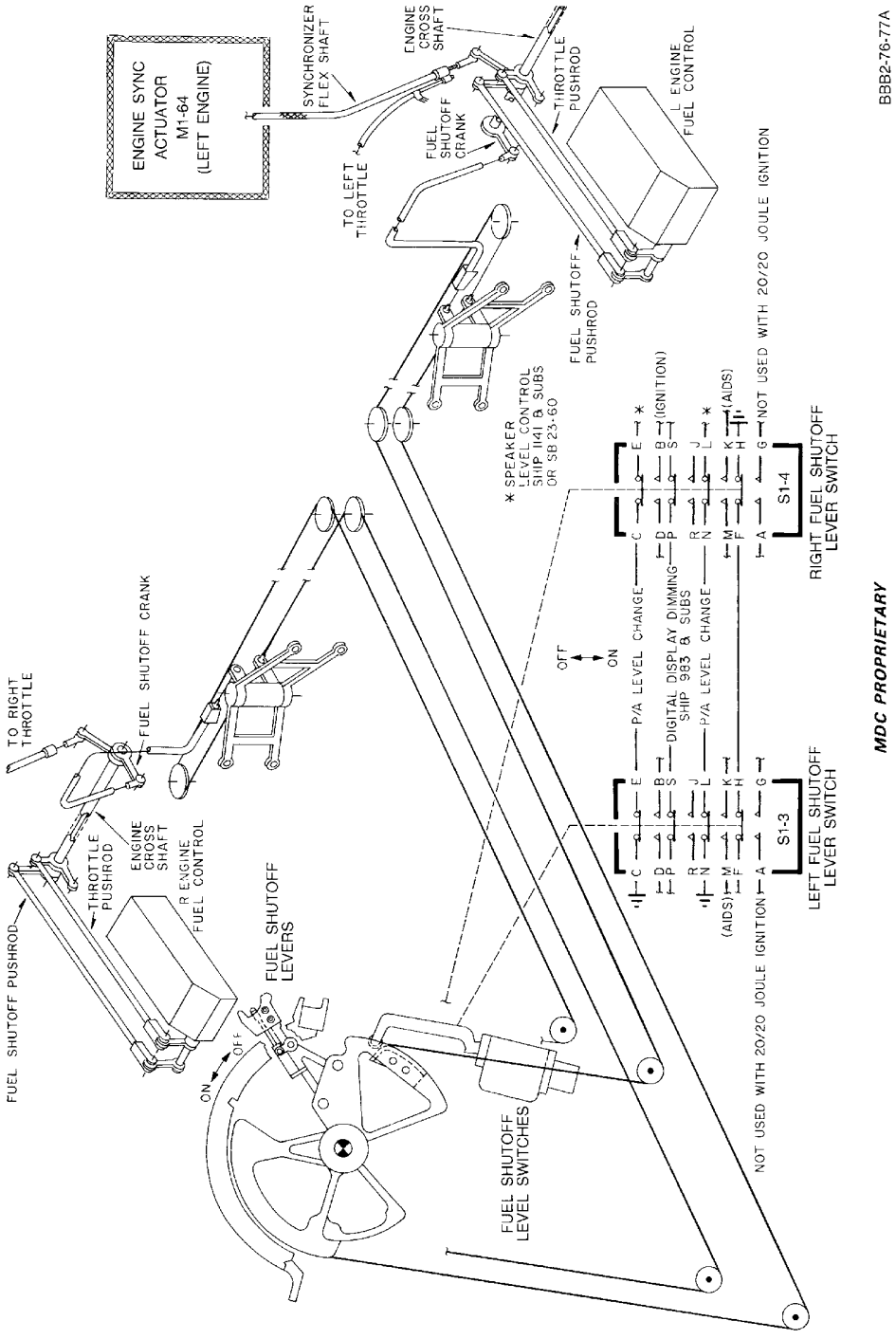
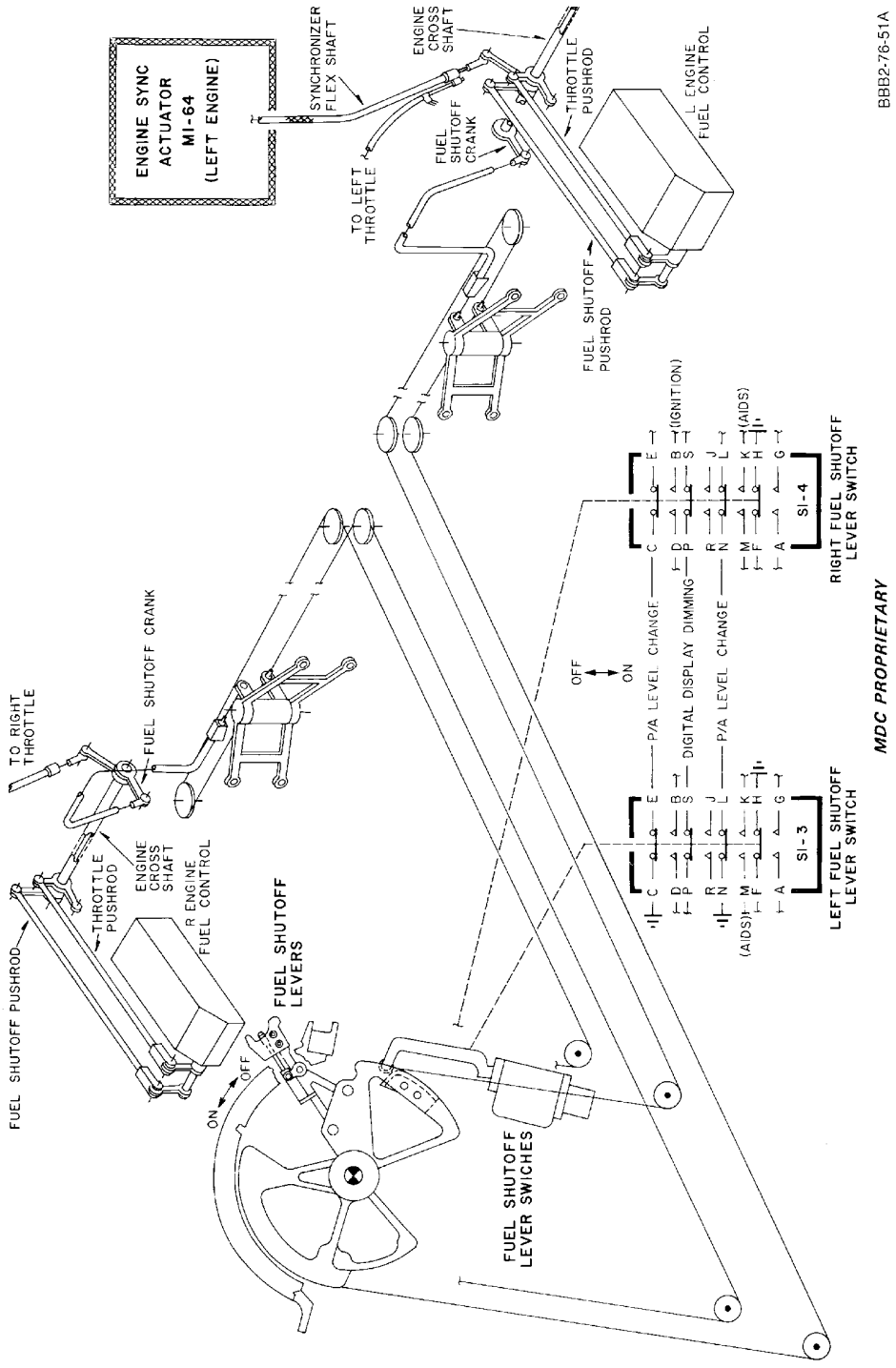
Fuel Shutoff System - Trouble Shooting Chart
Figure 101/76-12-00-990-801



Fuel Shutoff System - Schematic
Figure 102/76-12-00-990-802 (Sheet 1 of 3)



Fuel Shutoff System - Schematic
Figure 102/76-12-00-990-802 (Sheet 2 of 3)



Fuel Shutoff System - Schematic
Figure 102/76-12-00-990-802 (Sheet 3 of 3)

FUEL SHUTOFF SYSTEM - ADJUSTMENT/TEST

1. General

A. These procedures provide adjustment/test instruction for the complete fuel shutoff system. The adjustment procedures are divided into separate paragraphs to facilitate adjustment of a portion of a system.

NOTE: Cable has a flat internal sliding ribbon and will bend in one direction only.

CAUTION: USE EXTREME CARE WHEN WORKING WITH ENGINE PUSH-PULL CABLES. DO NOT BEND CABLE IN RADIUS SMALLER THAN 7 INCHES (177.8 MM) MINIMUM OR DAMAGE TO CABLE WILL RESULT.

B. When installing rig pins, the cable turnbuckles must be differentially adjusted to permit free installation of the pins during test procedures. If any force is required to remove or install the rig pin, the cable turnbuckle, linkage rod ends, or clevis ends must be readjusted to eliminate the binding.

C. The cable tension chart is listed in Figure 76-00-00-990-803. Rig pin designations are listed in Paragraph 2. under tools and equipment required. The numbers and letters enclosed by 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 airplane.

NOTE: In order to ensure consistent 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 outdoors, readings are to be taken during the time period between three (3) hours after sunset and one (1) hour after sunrise.

WARNING: TO PREVENT SERIOUS INJURY TO PERSONNEL MAKE CERTAIN FLIGHT COMPARTMENT THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION.

D. All control cables are adjusted and removed with the reverser system stowed. Before beginning adjustment or removal procedures, the thrust reverser control valve should be placed in the dump position and the safety pin installed.

WARNING: TO PREVENT INJURY TO PERSONNEL, EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN.

E. Access to engine area control cables is through forward lower cowl door.

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
Rig pin (4-6) 1/4 X 6 5/8, 1 required	
Rig pin (4-2) 1/4 X 2 5/8, 1 required	
Tensiometer (0 to 50 pound range)	

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

NOTE: Rig pin sizes are in inches (diameter X length; length = grip plus 5/8 inch).

3. **Adjustment/Test Fuselage Cable System**

A. Adjust Fuselage Cable System

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

(1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS BEEN DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6555 TO 7245 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

(3) Place fuel shutoff lever in full aft (off) position.

(4) In aft cargo compartment install rig pin (4-6) in rig pin hole (R-20) in fuel shutoff arm. (Figure 501, View B-B)

(5) Adjust fuel shutoff cable tension as follows:

NOTE: Fuel shutoff cable turnbuckles are accessible through ceiling access panels 5151C and 5156C in forward cargo compartment and through ceiling access panels 5730C and 5732C in aft cargo compartment.

(a) Obtain cable tension value for 1/16 inch (1.59 mm) cable from Figure 76-00-00-990-803 (example 16 pounds (1.8 N·m) at 70°F (21.6°C).

(b) Adjust fuel shutoff cable to maximum initial cable tension value obtained in Paragraph 3.A.(5)(a).

(c) Differentially adjust turnbuckles until rig pin can be freely removed and installed.

NOTE: Rig pin must not bind when installed through rig pin holes.

(6) Remove rig pin (4-6) in rig pin hole (R-20) from fuel shutoff arm.

(7) Safety all turnbuckles with clips.

(8) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

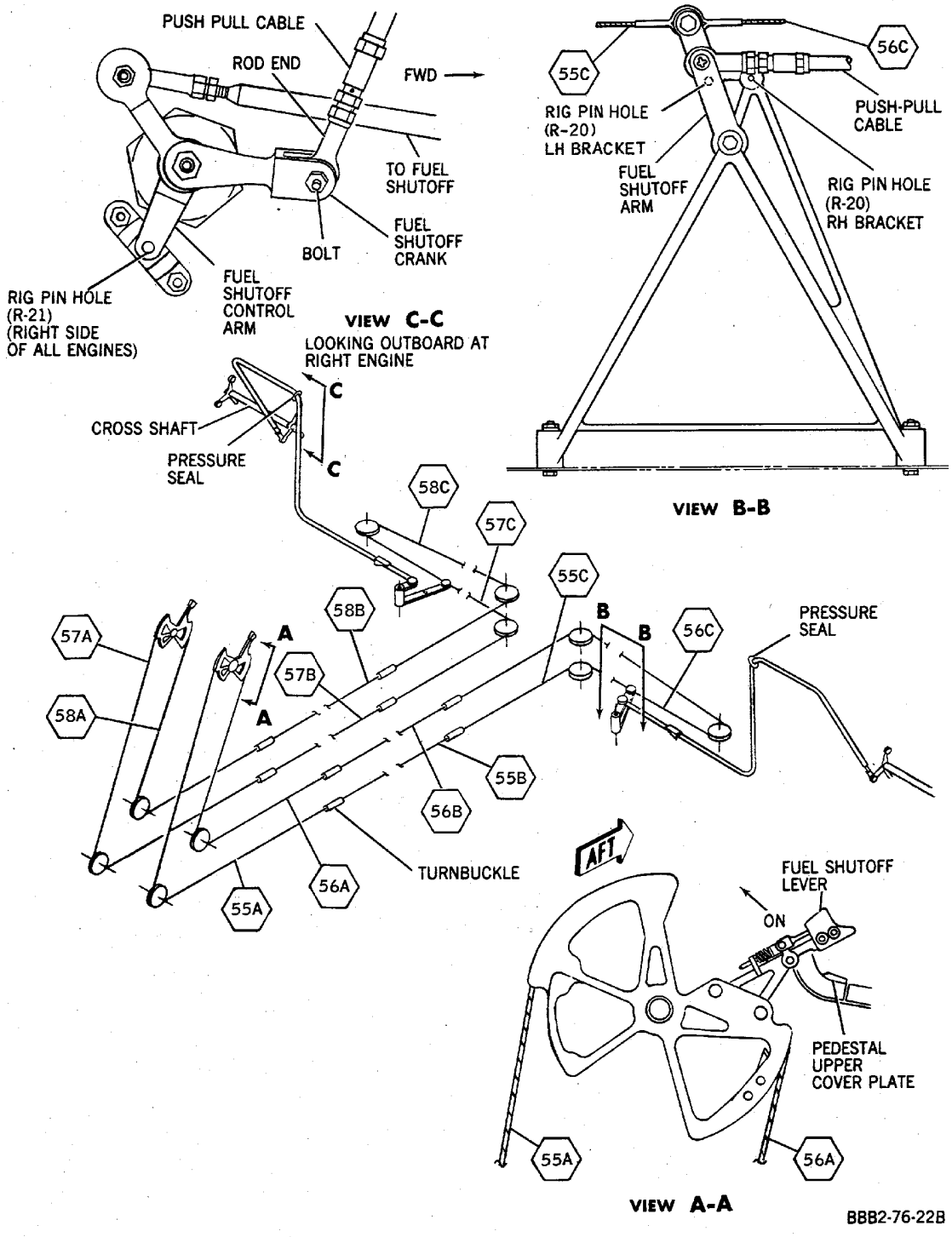
Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(9) Remove safety pin from thrust reverser control valve. Stow safety pin.



Fuel Shutoff System - Adjustment
Figure 501/76-12-00-990-803

4. Adjustment/Test Engine Cable Control System

A. Adjust Engine Cable Control System

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

(1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6555 TO 7245 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

(3) Remove bolt connecting push-pull cable to fuel shutoff crank at engine cross shaft.

(4) Remove bolt connecting push-pull cable to fuel shutoff arm in lower, aft outboard cargo compartment overhead. (Figure 501, View B-B)

(5) Check force required to start and maintain motion of push-pull control cable as follows:

(a) Disconnect push-pull cable from engine mount bracket.

(b) Move push-pull cable away from attach point at mount bracket, keeping fore and aft alignment with hole in bracket, until there is enough room for force scale.

(c) Slowly move cable and measure force required to push and pull cable over its entire travel. Force must be constant within 1/4 pound. (.112 Kg) and should not exceed 2 1/2 pounds (1.13 Kg).

(d) Check cable for free operation. Cable must move smoothly without ratchet, gritty or detent like feeling.

NOTE: If cable does not meet requirements outlined in Paragraph 4.A.(5)(c) and Paragraph 4.A.(5)(d), cable must be replaced.

(e) Install push-pull cable in engine mount bracket and install fitting.

(6) Install bolt connecting push-pull cable to fuel shutoff arm.

(7) In aft cargo compartment install rig pin (4-6) in rig pin hole (R-20) in fuel shutoff arm.

(8) Install rig pin (4-2) in rig pin hole (R-21) in fuel shutoff cross shaft control arm and rig pin bracket.

(9) Adjust rod end of push-pull cable until bolt can be freely removed and installed through fuel shutoff crank.

(10) Restrain rod end and tighten jamnut. Safety jamnut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

CAUTION: ADJUSTMENT OF PUSH-PULL CONTROL MUST BE MADE AT ROD ENDS ONLY.

(11) Check rod end witness hole to ensure sufficient threaded end engagement.

(12) Connect rod end to fuel shutoff crank at engine cross shaft. Safety nut with cotter pin.

(13) Remove all rig pins.

(14) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(15) Remove safety pin from thrust reverser control valve. Stow safety pin.

5. Adjustment/Test Quick Engine Change

CAUTION: EXERCISE CARE TO PREVENT ENGINE CROSS SHAFT SPLINE DAMAGE IF CRANKS ARE BEING REMOVED. WHEN REMOVING LEFT FUEL SHUTOFF OR INTERLOCK IDLER CRANKS, USE CARE TO PREVENT DAMAGE TO TEFLON SLEEVE BEARING IN IDLER CRANK. FUEL SHUTOFF PUSHROD BETWEEN CROSS SHAFT AND FUEL CONTROL (RIGHT SIDE OF ENGINE) IS PRE-ADJUSTED. DO NOT ALTER.

A. Adjust Quick Engine Change

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

(1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP

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

U	41	B1-2	ENGINE IGNITION RIGHT

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893

U	41	B1-423	ENGINE START VALVE RIGHT

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

U	42	B1-1	ENGINE IGNITION LEFT

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893

U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name

WJE ALL

K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

(2) Place thrust reverser control valve in dump position and install safety pin.

(3) Place fuel shutoff lever in full aft (off) position.

(4) Remove bolt connecting push-pull cable to fuel shutoff crank at engine cross shaft.

(5) Install rig pin (4-2) in rig pin hole (R-21) in fuel shutoff control arm and rig pin bracket.

(6) Adjust rod end of push-pull cable until bolt can be freely removed and installed.

(7) Restrain rod end and tighten jamnut. Safety jamnut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

CAUTION: ADJUSTMENT OF PUSH-PULL CONTROL MUST BE MADE AT ROD ENDS ONLY.

(8) Check rod end witness hole to ensure sufficient threaded end engagement.

(9) Connect rod end to fuel shutoff crank at engine cross shaft. Safety nut with cotter pin.

(10) Remove rig pin.

(11) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(12) Remove safety pin from thrust reverser control valve. Stow safety pin.

6. Adjustment/Test Engine Fuel Shutoff Control To Cross Shaft

A. Adjust Engine Fuel Control To Cross Shaft

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

(1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

(2) Place thrust reverser control valve in dump position and install safety pin.

(3) Place fuel shutoff lever in full aft (off) (detent) position.

NOTE: Rig pin hole (R-21) in cross shaft crank and accessory case rig pin bracket is 0.267 inch (6.78 mm) diameter and is oversize to rig pin (4-2) diameter of (0.250 inch (6.35 mm)).

(a) Insert 0.015(±0.005) inch (.38(±.12) mm) thick gage between fuel control shutoff lever lug and stop on fuel control body. (Figure 502, View B)

(b) Install rig pin (4-2) in rig pin hole (R-21) in cross shaft fuel shutoff control linkage arm and bracket. (Figure 502, View A-A)

(c) If necessary, to obtain rig pin alignment, loosen two nuts that hold rig pin hole bracket to engine accessory case and move bracket, as required, within clearance of stud holes to obtain smooth rig pin fit and maintain fuel control stop/lug clearance (0.015(±0.005) inch) (0.38(±.12) mm). (Figure 502, View A-A)

(d) Tighten two nuts on bracket when completed.

(4) If rig pin still will not fit into crank and bracket rig pin hole, adjust linkage by completing Paragraph 6.A.(4)(a) thorough Paragraph 6.A.(4)(f) as follows:

(a) Loosen jam nut on fuel shutoff push-pull cable rod end at engine cross shaft fuel shutoff crank. (Figure 502, View A-A)

(b) Adjust rod end of fuel shutoff push-pull control by rotating inner shaft by hand, as required, until rig pin (4-2) will fit through R-21 rig pin holes in crank and bracket, and that 0.015(±0.005) inch (.38(±.12) mm) clearance can be maintained with gage installed in Paragraph 6.A.(3)(a) between lug on fuel shutoff lever crank and stop on fuel control body. (Figure 502, View B)

(c) When gap dimensions have been set, tighten jam nut finger tight. Remove rig pin and gage from fuel shutoff controls.

(d) Cycle engine fuel shutoff control, as required, through several full travel (off-on-off) cycles.

(e) Install rig pin 4-2 at cross shaft crank and gage at fuel control crank stop/lug. Make certain that rig pin aligns within ±3/32 inch (±2.3 mm) of rig pin hole diameter and moves without binding.

(f) Restrain rod end and tighten jamnut. Safety jamnut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(5) Remove rig pin and thickness gage and make certain rig pin bracket hold down nuts are tight.

(6) Adjust rod end of fuel shutoff control linkage until 0.015(±0.005) inch (.38(±.12) mm) clearance is obtained between lug on crank and stop on fuel control body. (Figure 502, View B)

(7) Connect rod end to fuel shutoff control arm. Safety nut with cotter pin.

(8) Restrain rod end and tighten jamnut. Safety jamnut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(9) Remove rig pin.

(10) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

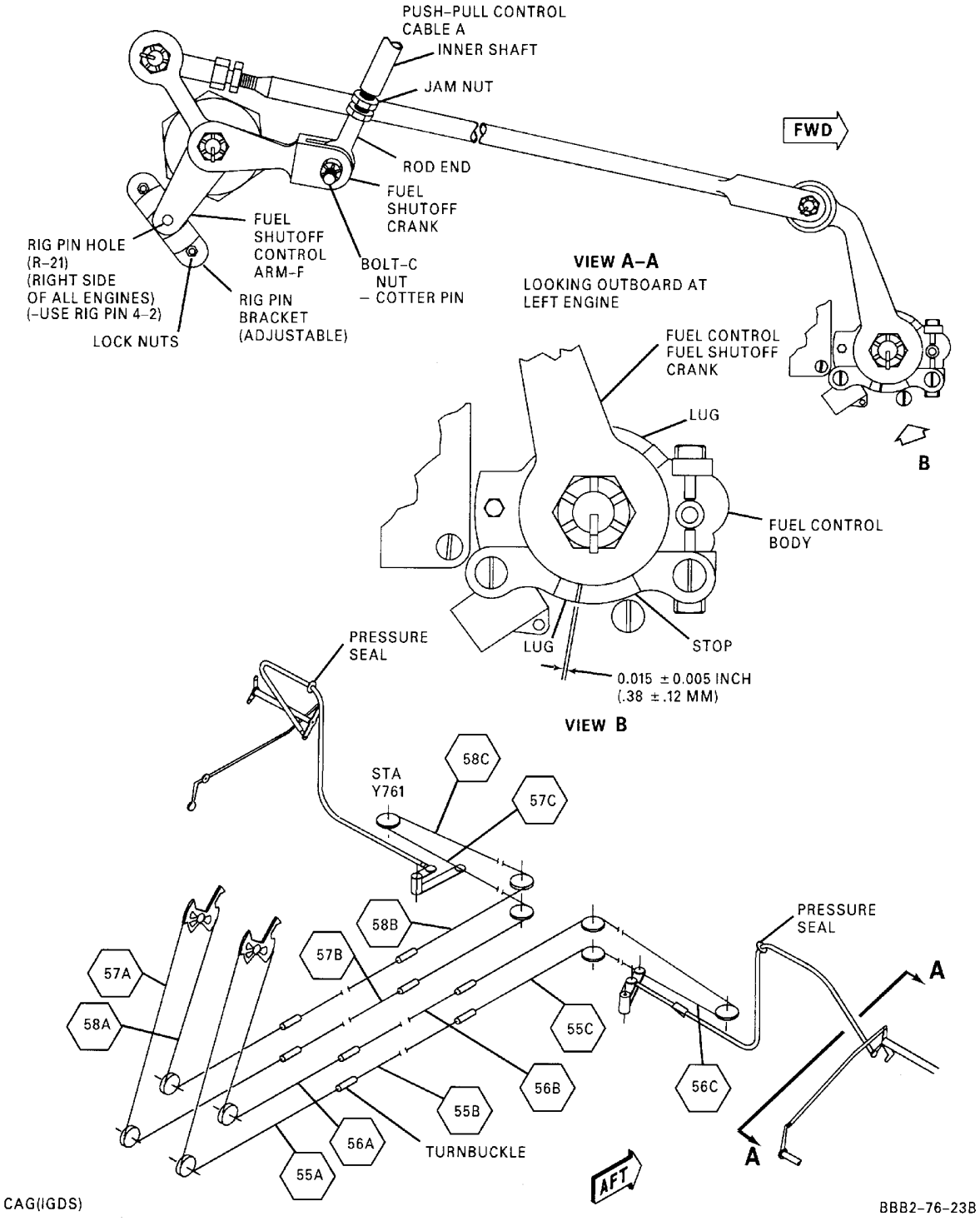
Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(11) Remove safety pin from thrust reverser control valve. Stow safety pin.



Engine Fuel Shutoff Control to Cross Shaft - Adjustment
Figure 502/76-12-00-990-804

7. Adjustment/Test Fuel Shutoff System

A. Test Fuel Shutoff System

(1) Move fuel shutoff lever from fuel on to fuel off detent position, to ensure full cable travel of system.

(2) Check that ignition switch is off when fuel shutoff lever is in off detent position.

(3) Check that ignition switches actuate when fuel shutoff levers are advanced 5/8 to 1 1/16 inch (15.8 mm to 26.9 mm) from fuel off detent as measured on surface of cover.

(4) Move fuel shutoff lever to full aft (off) position and check that rig pin holes (R-21) in fuel shutoff control arm alignment measures 0(±3/32) inch (±2.4 mm).

(5) Check that force required to move fuel shutoff lever in any direction when out of detent does not exceed 14 pounds (6.4 Kg).

8. Cable Assemblies

NOTE: Cable run numbers and segment letters listed below correspond to callouts in hexagonal symbols in Figure 501.

Table 502

Function	Cable Run Number	Segment Letter
Left engine fuel shutoff--Off	55 55 55	A B C
Left engine fuel shutoff--On	56 56 56	A B C
Right engine fuel shutoff--Off	57 57 57	A B C
Right engine fuel shutoff--On	58 58 58	A B C

FUEL SHUTOFF PUSH-PULL CONTROL CABLE - MAINTENANCE PRACTICES

1. General

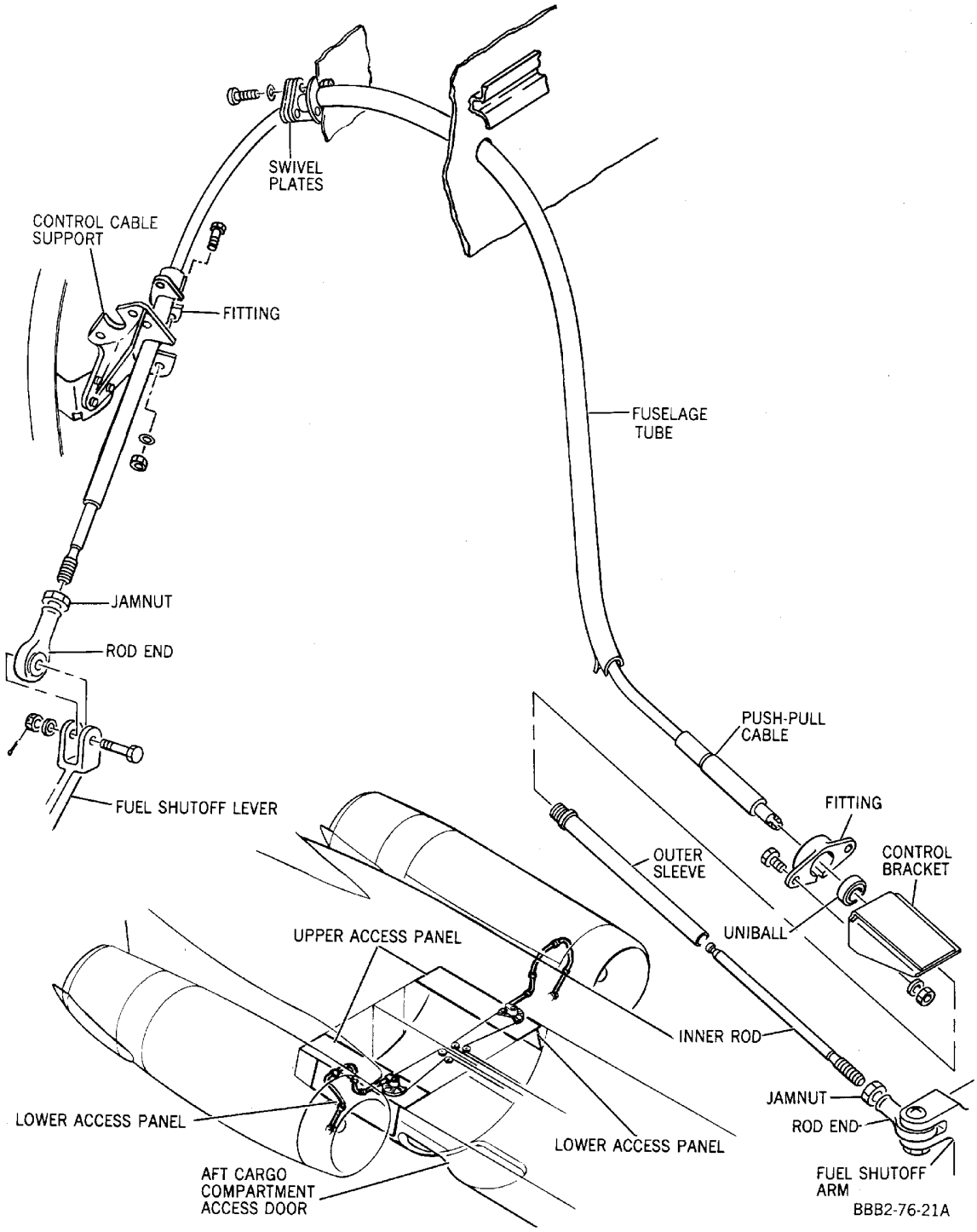
CAUTION: USE EXTREME CARE WHEN WORKING WITH ENGINE PUSH-PULL CABLES. DO NOT BEND PUSH-PULL CABLE IN RADIUS SMALLER THAN 7 INCHES (177.8 MM) MINIMUM OR DAMAGE TO CABLE WILL RESULT.

A. This maintenance practice provides removal/installation instructions for the fuel shutoff push-pull cable.

NOTE: Cable has a flat internal sliding ribbon and will bend in one plane only.

WARNING: TO PREVENT INJURY TO PERSONNEL, EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN.

B. The fuel shutoff push-pull cable is connected to the engine fuel shutoff lever and extends through the pylon to the fuel shutoff crank in the aft cargo compartment. Access to the engine fuel shutoff lever is through the forward lower engine cowl. Access to the fuel shutoff lever crank is through removal of aft cargo compartment aft upper left or right panel. The removal and installation procedures of the fuel shutoff push-pull control cable are identical for both engines as noted.



Fuel Shutoff Push-Pull Control Cable - Installation
Figure 201/76-12-01-990-801

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
Lockwire, NASM20995N32, DPM 684	Not Specified
Compound, sealing/locking Loctite #290, Grade R	Loctite Corp. Newington, CT
Sealant PR-1422	
Hunter Force Gage (0-30 lb) (0-13.6 kg)	
Rig pin (4-6) 1/4 X 6 5/8	
Rig pin (4-2) 1/4 X 2 5/8	

NOTE: Rig pin sizes are in inches (diameter X length; length = grip plus 5/8 inch).

3. Removal/Installation of Fuel Shutoff Push-Pull Control Cable

A. Remove Fuel Shutoff Push-Pull Control Cable

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

(1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6555 TO 7245 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

(3) Disassemble fuel shutoff push-pull cable at fuel shutoff arm as follows: (Figure 201)

(a) Restrain inner rod and loosen jamnut.

(b) Restrain outer sleeve and screw inner rod out of rod end.

(c) Restrain push-pull cable and screw outer sleeve from cable.

(d) Slide outer sleeve towards rod end and disengage inner rod from push-pull cable, remove outer sleeve and inner rod.

(e) Pull push-pull cable through control bracket and uniball.

(f) Remove fitting and uniball from control bracket.

(4) Tape exposed end of push-pull cable.

(5) Remove bolts attaching push-pull cable swivel plates to bulkhead.

(6) Disconnect push-pull cable rod end from fuel shutoff lever.

(7) Remove push-pull cable fitting from control cable support.

(8) Slide push-pull cable out of fuselage tube from engine end of cable.

(9) Remove tape from push-pull cable.

(10) Install uniball on push-pull control.

(11) Slide inner rod through outer sleeve and engage with push-pull control.

(12) Restrain push-pull control and connect outer sleeve.

B. Install Fuel Shutoff Push-Pull Control Cable

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

(1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT

WJE 415-427, 429, 861-866, 868, 869, 871-874, 891 (Continued)

(Continued)

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6555 TO 7245 KPA) (PRECHARGE PRESSURE).

(2) Make certain thrust reverser control valve is in dump position and safety pin is installed.

(3) Disassemble end of push-pull cable that goes to fuel shutoff crank as follows:

(a) Restrain push-pull cable and screw outer sleeve from cable.

(b) Slide outer sleeve clear and disengage inner rod from push-pull cable, remove outer sleeve and inner rod.

(c) Remove uniball from push-pull cable.

(d) Tape exposed end of push-pull cable.

CAUTION: DO NOT BEND PUSH-PULL CABLE IN RADIUS SMALLER THAN 7 INCHES (177.8 MM) MINIMUM OR DAMAGE TO CABLE WILL RESULT.

(4) Hold push-pull cable at approximately mid point. Cable will form a smooth arc in plane of flat metal ribbons.

NOTE: This will determine side of cable that will bend. The metal ribbons permit bending in one plane only and within that plane, resist bending in one direction and will not bend a full 360 degrees.

(5) Slide push-pull cable from engine through fuselage tube to fuel shutoff crank.

NOTE: Cable has a flat internal sliding ribbon and will bend in one plane only.

NOTE: Allow flexible casing to rotate internally during installation. Care should be exercised to avoid twisting cable on installation or forcing cable perpendicular to fuselage.

(6) Install push-pull cable in control cable support and temporarily install fitting.

(7) Remove tape from inboard end of push-pull cable.

NOTE: Allow end of push-pull cable to hang free.

(8) Cycle push-pull cable several times, then connect swivel plates to bulkhead. Tighten swivel plate bolts evenly and torque bolts 20 inch-pounds (2.3 N·m) maximum.

(9) Check force required to start and maintain motion of push-pull control cable as follows:

(a) Disconnect push-pull cable from control cable support.

(b) Move push-pull cable away from attach point at cable support, keeping fore and aft alignment with hole in support, until there is enough room for force scale.

(c) Slowly move cable and measure force required to push and pull cable over its entire travel. Force must be constant within 1/4 pound (.112 kg) and should not exceed 2 1/2 pounds (1.13 kg).

(d) Check cable for free operation. Cable must move smoothly without ratchet, gritty or detent like feeling.

NOTE: If cable does not meet requirements outlined in Paragraph 3.B.(9)(c) and Paragraph 3.B.(9)(d), cable must be replaced.

(e) Install push-pull cable in control cable support and install fitting.

(10) Install uniball on push-pull cable, thread cable through control bracket and install fitting.

NOTE: Uniball and fitting can be installed inside or outside control bracket, whichever is practical, to eliminate difficulty in connecting inboard end of push-pull cable.

(11) Slide inner rod through outer sleeve and engage rod with push-pull cable.

(12) Restrain push-pull cable and connect outer sleeve a minimum of 2 threads. Apply 1 drop Loctite Grade R to threads. Tighten outer sleeve to torque of 35 to 40 inch-pounds (3.9 to 4.5 N·m).

(13) Seal inboard swivel plate and tube with sealant.

(14) Install jamnuts on both ends of push-pull cable.

(15) Install rod end on push-pull cable at fuel shutoff lever.

(16) Install rig pin (4-2) in rig pin hole (R-21) in fuel shutoff lever at engine cross shaft.

(17) Install rig pin (4-6) in rig pin hole (R-20) in fuel shutoff arm.

(18) Connect push-pull cable at fuel shutoff arm as follows:

(a) Restrain outer sleeve and screw inner rod into rod end.

(b) Restrain inner rod and tighten jamnut. Safety jamnut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE:

Rod end witness hole should be checked to ensure sufficient cable engagement.

(19) Adjust rod end at fuel shutoff lever until bolt connecting rod end to lever can be freely removed and installed.

(20) Restrain rod end and tighten jamnut. Safety jamnut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Rod end witness hole should be checked to ensure sufficient cable engagement.

(21) Connect rod end to fuel shutoff lever. Safety nut with cotter pin.

(22) Remove all rig pins.

(23) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP

(Continued)

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(24) Remove safety pin from thrust reverser control valve. Stow safety pin.

4. Repair of Fuel Push-Pull Control Cable

A. Preparation

(1) Gain access to fuel push-pull control cable as necessary. (Paragraph 3.)

(2) Clean outer covering of cable with cloth dampened with water.

B. Repair

(1) Trim covers at bulkhead fitting ends to 1/4 inch, if required.

(2) Cut 3/4 inch Versafit heat shrink tubing, G60917 to length for each end of cable assembly to cover original Versafit heat shrink tubing, G60917 and overlap approximately 1/2 inch into caps.

(3) Heat shrink into place so that new covers are coincidental with old covers on inboard ends and extend 1/4 inch maximum into caps.

NOTE: Do not hide part markings.

NOTE: Approximate weight of cable will now be increased by approximately .02 lbs/foot but cable will still meet weight requirements. OD of covers on repaired cable to be .500 inch maximum.

(4) If removed, install fuel push-pull control cable. (Paragraph 3.)

EMERGENCY SHUTDOWN - DESCRIPTION AND OPERATION

1. General

A. The means for controlling the flow of fluids to the engine during emergency shutdown procedures are described in this section of the engine controls chapter. The emergency shutdown portion consists of fire control handles, a cable/pulley system with interconnecting linkage, an electrical indicating and actuating system, an audible warning system, fuel and hydraulic fire shutoff valves, and firex agent containers.

2. Emergency Shutdown

A. Description

(1) Each engine is equipped with an independent fire control handle mounted on the upper instrument panel. Lights within the handle will come on when an engine fire is detected. Pulling this control will shut off various plane systems in order to confine an existing fire to a local area. Turning the handles actuates a microswitch, fires a cartridge, and activates the fire extinguishing container. (Figure 1)

(2) Two amber indicator lights between the handles will indicate which container has been depleted.

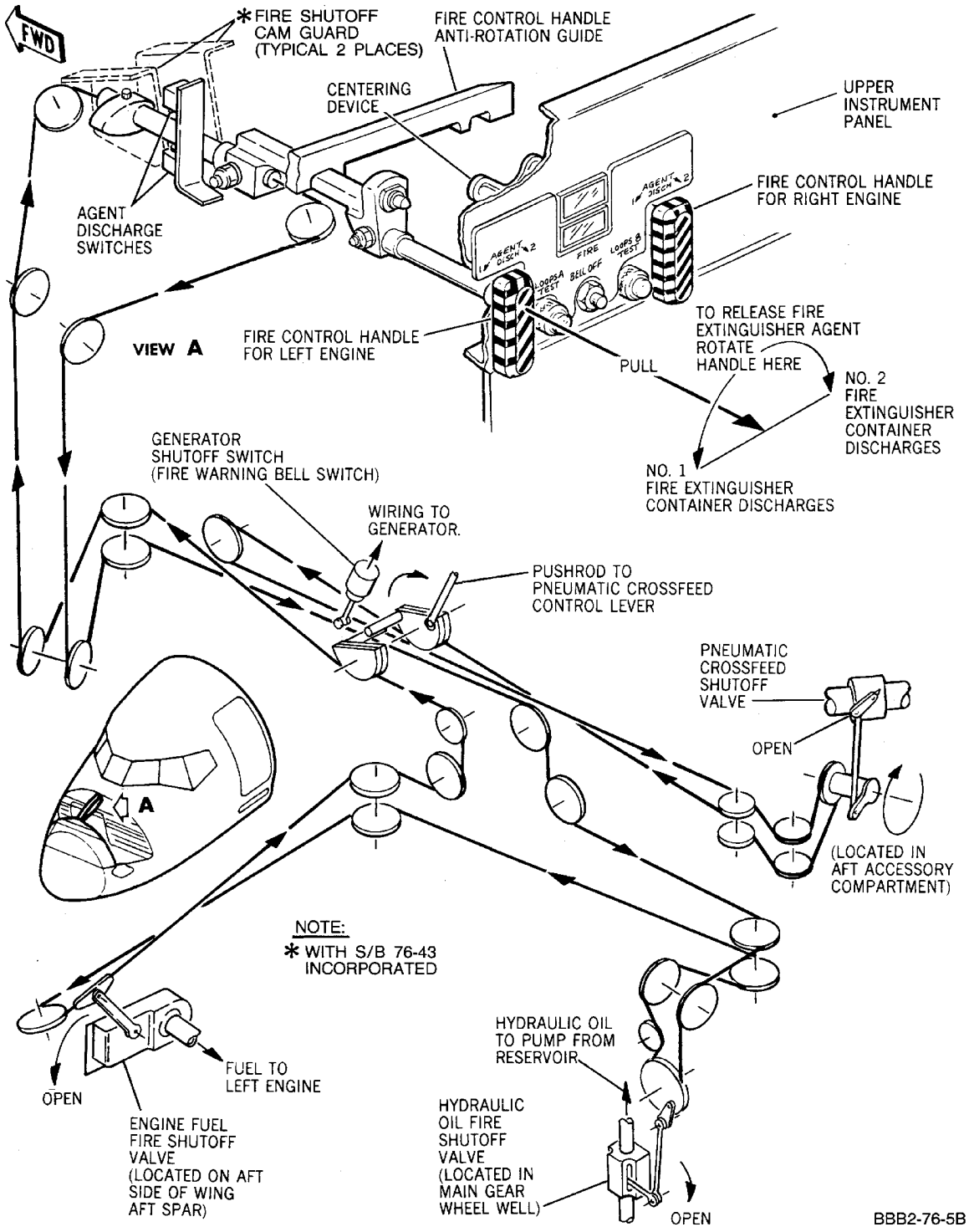
(3) The electrical circuit is protected by two circuit breakers located on dc transfer bus section of lower EPC panel.

B. Operation

(1) With the selected fire control handles in the full extended detent, the fuel fire shutoff valve located in the wing root, aft of the rear spar, and the hydraulic oil fire shutoff valve in the wheel well will close and restrict any additional fluid distribution. The pneumatic crossfeed valve located in aft accessory compartment, at the junction of the 8th- and 13th-stage bleed air ducting, will close and restrict any additional air distribution. After each operation of the emergency shutdown system the pneumatic crossfeed valve must be manually opened. For details pertaining to the pneumatic crossfeed valve, refer to CHAPTER 36. Extending the fire control handle will actuate the engine generator shutoff switch and silence the fire warning bell (generator shutoff switch circuitry controls the fire warning bell only when the fire control handles are extended). The engine generator shutoff switch is located at fuselage station 120.050, and is operated by cam action of the pneumatic crossfeed drum.

(2) A guide is incorporated for each fire control handle rod to prevent any rotation until the handle is in the full extended detent. Two microswitches are mounted at each handle rod to fire the fire extinguisher containers. Turning the handle counterclockwise will close a microswitch and fire the cartridges which in turn discharges fire extinguishing container number 1. Turning the handle clockwise will discharge container number 2. No sequence of engine or container selection is involved to fire the container cartridges. The number 2 container may or may not be fired before the number 1 container for either engine. The amber indicator light will come on when container pressure drops below 275 psi (1898 kPa). Once a container has been discharged, the agent will be completely depleted in that container.

(3) On aircraft with Service Bulletin (SB) 76-43 incorporated, a firex shutoff handle cam guard is installed adjacent to and inboard of each emergency fire control handle fire switch cam. These guards, in place, prevent incorrect installation of switch cams.



Emergency Shutdown System - Schematic
Figure 1/76-20-00-990-801

EMERGENCY SHUTDOWN SYSTEM - TROUBLE SHOOTING

1. General

CAUTION: DO NOT ROTATE FIRE CONTROL HANDLES. ROTATION OF FIRE CONTROL HANDLES WILL DISCHARGE FIRE EXTINGUISHER AGENT.

A. The following trouble shooting procedures cover only Douglas furnished system components.

B. Substitute components which are known to be in good working condition to isolate trouble whenever possible.

C. Before performing trouble shooting procedures, consult the flight record book or any other data source for pertinent information to aid in isolation of cause for any malfunction. (Figure 101)

NOTES:

A. MAKE TESTS OR REPLACE COMPONENTS IN THE ORDER SHOWN.

TROUBLE/SYMPTOM	POSSIBLE CAUSE. TEST OR REPLACE AS REQUIRED.										
	RUBBING CABLES OR GUARD PINS, MISALIGNED OR DEFECTIVE PULLEYS OR FAIRLEADS	DIRT OR DEBRIS ON FIRE CONTROL ACTUATOR HANDLE AT BUSHING AND/OR GUIDES	BINDING COMPONENTS OF FUEL SHUTOFF VALVE AT AFT SPAR	BINDING COMPONENTS OF HYDRAULIC SHUTOFF VALVE IN WHEEL WELL	FOREIGN OBJECT OR RIGGING PIN IN CABLE DRUM OR CONTROL LINKAGE	PULLEY RUBBING ON A BRACKET	TURNBUCKLE NOT RIGGED TO PROPER TENSION	DEFECTIVE PULLEY OR BRACKET	TURNBUCKLE STRIKES FAIRLEAD	FIRE CONTROL ACTUATOR HANDLE TWISTED BEFORE HANDLE IS COMPLETELY EXTENDED	BINDING COMPONENTS OF PNEUMATIC CROSSFEED VALVE IN AFT ACCESSORY COMPARTMENT
A. EXCESSIVE FORCE REQUIRED TO ACTUATE EMERGENCY SHUTDOWN SYSTEM	2	8	3	4		6			7	1	5
B. EMERGENCY SHUTDOWN SYSTEM JAMMED			3	4	1	2		6	7		5
C. EXCESSIVE SLACK ON FIRE CONTROL ACTUATOR HANDLE							1	2			

BBB2-76-6

Emergency Shutdown System - Trouble Shooting Chart
Figure 101/76-20-00-990-802

EMERGENCY SHUTDOWN SYSTEM - ADJUSTMENT/TEST

1. General

A. The following procedures apply to the complete system. The adjustment procedures are divided into separate paragraphs to facilitate adjustments of a portion of a system. When installing rig pins, the cable turnbuckles must be differentially adjusted to permit free installation of the pins during test procedures. If any force is required to remove or install the rig pin, the cable turnbuckle, linkage rod ends, or clevis ends must be readjusted to eliminate the binding. Do not spring the rig pin holes to obtain rig pin alignment.

B. The cable tension chart is listed in Figure 76-00-00-990-802. Rig pin designations are listed in Paragraph 2.. The numbers and letters enclosed by hexagon-shaped symbols shown in the adjustment diagrams correspond to cable run numbers and segments listed in Paragraph 6., at the end of this section. Each cable run number is posted adjacent to the corresponding cable in the airplane.

NOTE: In order to ensure consistent 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 outdoors, readings are to be taken during the time period between three (3) hours after sunset and one (1) hour after sunrise.

C. Immediately after the adjustment/test procedure is complete, check that all rig pins have been removed and that all applicable components have been safetied.

WARNING: TO PREVENT SERIOUS INJURY TO PERSONNEL MAKE CERTAIN FLIGHT COMPARTMENT THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION.

D. All control cables are adjusted and removed with the reverser system stowed; before beginning adjustment or removal procedures, check that the thrust reverser control valve is in the dump position and that the safety pin is installed.

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
Tensiometer (0 to 50 pound range)	
Rig pin (4-3) 1/4 X 3 5/8, 1 required	
Rig Pin (4-5) 1/4 X 5 5/8, 1 required	

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

NOTE: Rig pin sizes are in inches (diameter X length; length = grip plus 5/8 inch).

3. Adjustment/Test Fuselage Cable System

A. Adjust Fuselage Cable System

CAUTION: DO NOT ROTATE FIRE CONTROL HANDLES. ROTATION OF FIRE CONTROL HANDLES WILL DISCHARGE FIRE EXTINGUISHER AGENT.

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

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

(2) Verify that pneumatic crossfeed valve is open.

(3) Clamp fire control handle 0.265(±.015) inch (6.7 (±.38) mm) forward of fully extended position.

(4) Verify pneumatic crossfeed valve is closed.

(5) Insert rig pin (4-3) in rig pin hole (R-31) in fire shutoff drum and rig pin (4-5) in pin hole (R-32) in hydraulic shutoff valve drum.

(6) Adjust fire shutoff cable tension as follows:

NOTE: Fire shutoff cables are 1/16-inch (1.59 mm) diameter, but are tensioned to rig load of a 3/32 inch (2.38 mm) cable.

NOTE: Fire shutoff cable turnbuckles are located, forward of cockpit instrument panel access is through access door number 4201A, in forward cargo compartment access is through ceiling access panel 5163C and in left and right wheelwells.

(a) Obtain normal cable tension value for 3/32 cable from Figure 76-00-00-990-802 (example 33 to 39 pounds at 70°F (21.6°C).

(b) Adjust fire shutoff cable to maximum cable rig load obtained in Paragraph 3.A.(6)(a).

(c) Differentially adjust turnbuckles until rig pin can be freely removed and installed.

NOTE: Rig pin must not bind when installed through rig pin holes.

(7) Remove all rig pins.

(8) Safety all turnbuckles as required.

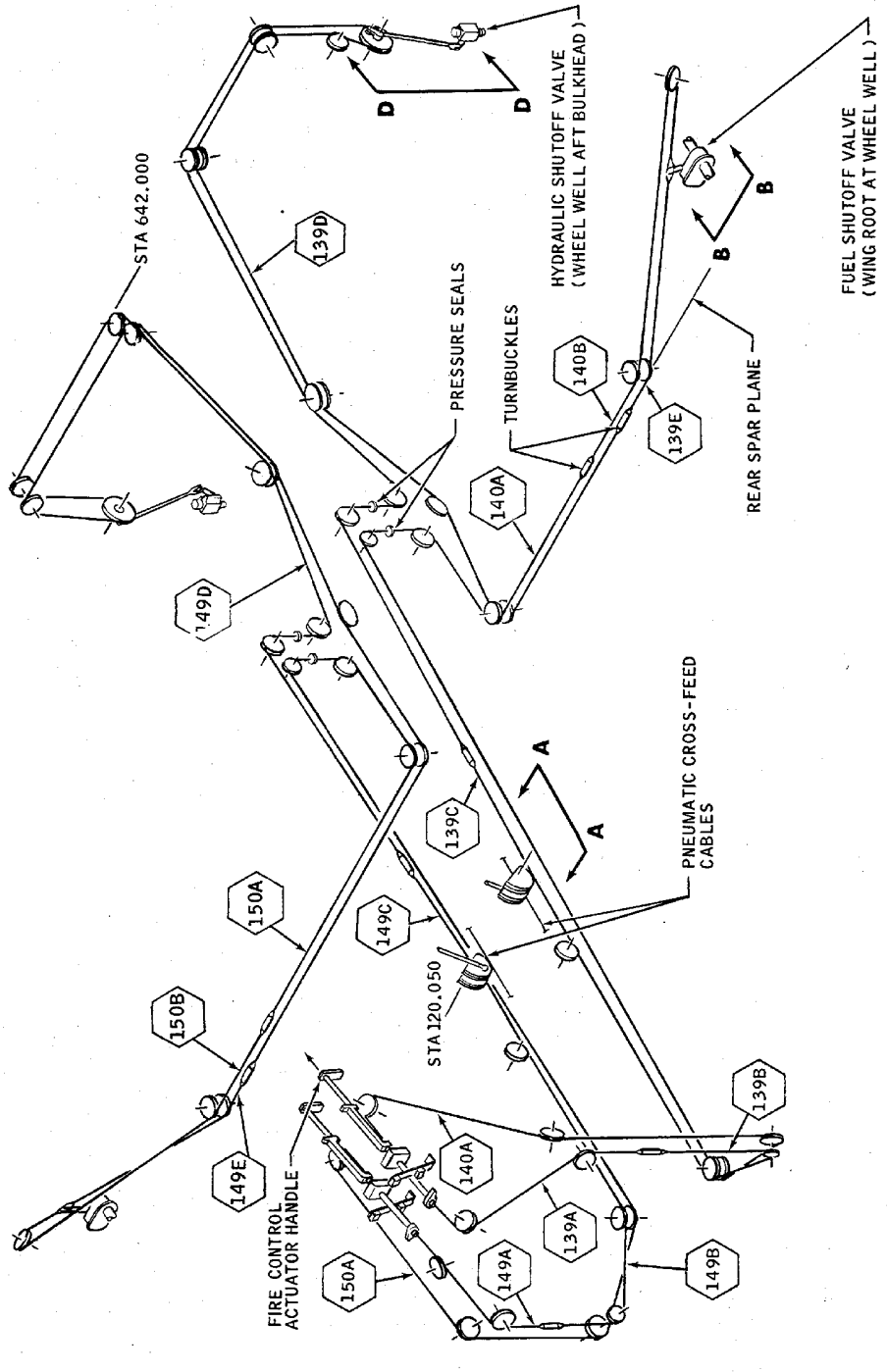
(9) Remove clamp from fire control handle and return system to normal position.

(10) Manually move pneumatic crossfeed valve to open position.

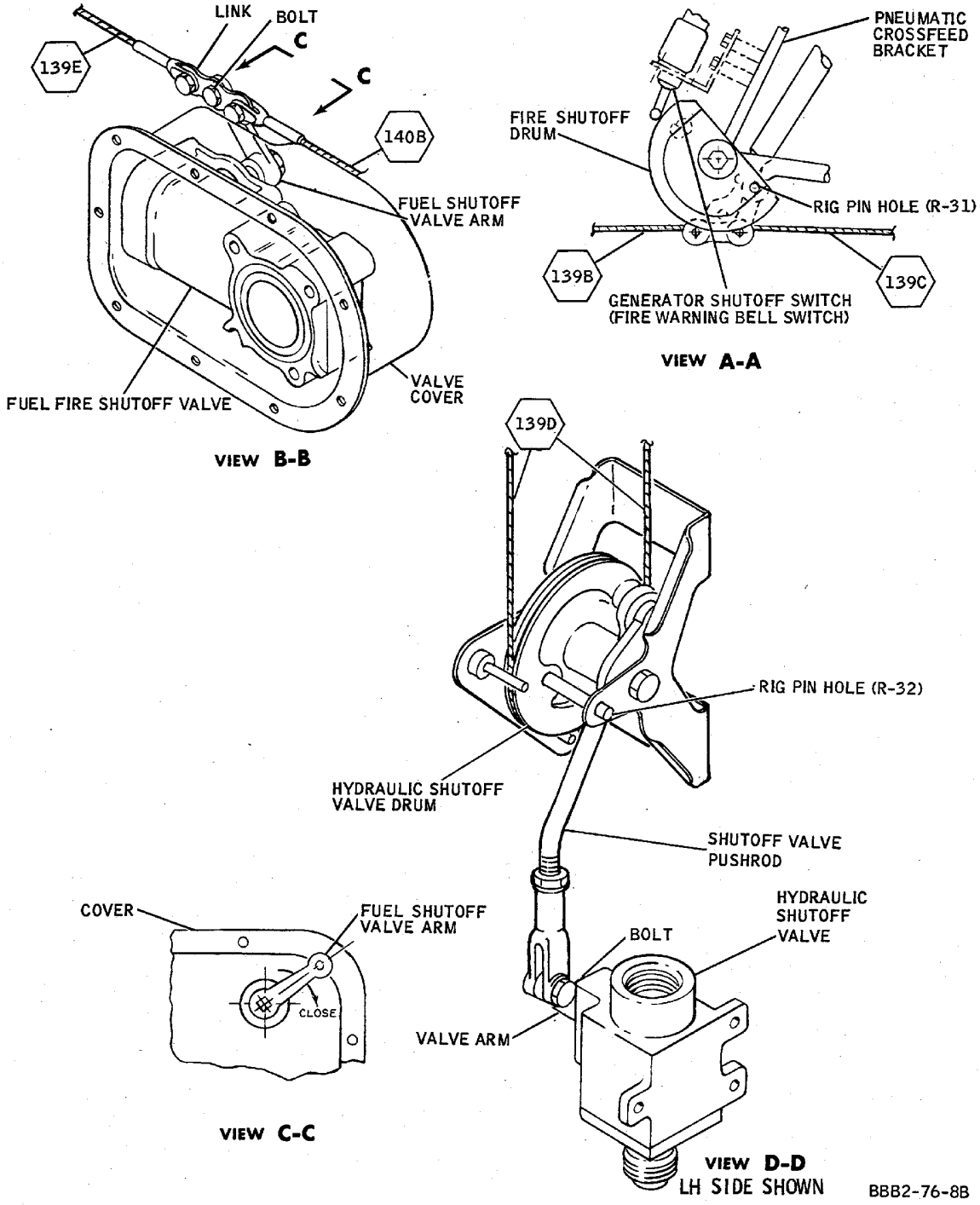
(11) Remove the safety tags and close these circuit breakers:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2



Emergency Shutdown System - Adjustment
Figure 501/76-20-00-990-803 (Sheet 1 of 2)



Emergency Shutdown System - Adjustment
Figure 501/76-20-00-990-803 (Sheet 2 of 2)

4. Adjustment/Test Fuel and Hydraulic Shutoff Valve Cable System

A. Adjust Fuel and Hydraulic Shutoff Valve Cable System

NOTE: Adjustment of the fuel shutoff cable system will not be required when the shutoff valve is removed and replaced without disconnecting the cables from the link.

CAUTION: DO NOT ROTATE FIRE CONTROL HANDLES. ROTATION OF FIRE CONTROL HANDLES WILL DISCHARGE FIRE EXTINGUISHER AGENT.

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

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

(2) Verify that cable link is properly attached to fuel shutoff valve arm.

(3) Verify pneumatic crossfeed valve is open.

(4) Clamp fire control handle 0.265(±.015) inch (6.7 (±.38) mm) forward of fully extended position.

(5) Verify that pneumatic crossfeed valve is closed.

(6) Insert rig pin (4-3) in rig pin hole (R-31) in fire shutoff drum and rig pin (4-5) in rig pin hole (R-32) in hydraulic shutoff valve drum.

(7) Remove bolt from arm of hydraulic shutoff valve.

(8) Place valve in closed position (arm against stop).

(9) Adjust length of pushrod until bolt can be freely removed and installed.

(10) Install bolt and safety pushrod with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(11) Remove bolt connecting fuel shutoff valve arm to cable link.

(12) Rotate arm clockwise to closed position (arm against closed position stop).

(13) Differentially adjust turnbuckles until bolt can be freely removed and installed.

NOTE: Turnbuckles are located in left and right wheelwells.

(14) Install bolt.

(15) Remove rig pins.

(16) Safety all turnbuckles as required.

(17) Remove clamp from fire shutoff handle and return system to normal position.

(18) Move pneumatic crossfeed valve to open position manually.

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

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

5. Adjustment/Test Emergency Shutdown System

A. Test Emergency Shutdown System

CAUTION: DO NOT ROTATE FIRE CONTROL HANDLES. ROTATION OF FIRE CONTROL HANDLES WILL DISCHARGE FIRE EXTINGUISHER AGENT.

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

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

(2) Pull fire control handle several times to ensure full travel of cable system.

(3) Place fire control handle in retracted position.

(4) Place pneumatic crossfeed lever in on position.

(5) Check that fuel fire shutoff valve is open.

(6) Check that hydraulic shutoff valve is open.

(7) Check that pneumatic crossfeed valve is open.

(8) Check that generator fire shutoff switch (SI97, left or SI98, right) is in open position by removing left or right (as required) generator control panel in E&E compartment. Check rack receptacle R5-443B, Pin 16 (left) or R5-444B, Pin 16 (right) for continuity to ground. There should be no continuity to ground. (MD-80 Wiring Diagrams 24-21-01, 24-21-02)

(9) Clamp or hold fire control handle in extended position.

(10) Check that hydraulic shutoff valve is closed.

(11) Check that fuel fire shutoff valve is closed, by checking valve arm is in closed position (arm against closed position stop).

(12) Check that pneumatic crossfeed valve is closed and handle is in off position.

(13) Check that generator fire shutoff switch is in closed position. There should be continuity from rack receptacle R5-443B, Pin 16 (left) or R5-444B, Pin 16 (right) to ground. (MD80 Wiring Diagrams 24-21-01 and 24-21-02)

(14) Remove clamp from fire control handle and return system to normal position.

(15) Move pneumatic crossfeed valve to open position manually.

(16) Move fire control handle to extended position. Force required to move fire control handle should not exceed 25 pounds (11.4 kg) at any position. Rotate fire control left and right to ensure ease of movement.

(17) Return system to normal position.

(18) Check that fuel shutoff valve is open.

(19) Check that hydraulic shutoff valve is open.

(20) Check that generator fire shutoff switch is open. There should be no continuity from rack receptacle R5-443B, Pin 16 (left) or R5-444B, Pin 16 (right) to ground. (MD80 Wiring Diagrams 24-21-01 and 24-21-02)

(21) Re-install left or right (as required) generator control panel and place associated generator control switch on cockpit overhead switch panel momentarily to reset position.

NOTE: When fire control handle is actuated, generator field circuit is opened. Generator control switch must be reset to close generator field circuit.

(22) Check that pneumatic crossfeed valve is closed.

(23) Move pneumatic valve to open position manually.

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

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

6. Cable Assemblies

NOTE: The cable run numbers and segment letters listed below correspond to callouts in hexagonal in Figure 501.

Function	Cable Run Number	Segment Letter
Fire shutoff left engine -- Operate	139 139 139 139 139	A B C D E
Fire shutoff left engine -- Normal	140 140	A B
Fire shutoff right engine -- Operate	149 149 149 149 149	A B C D E
Fire shutoff right engine -- Normal	150 150	A B

7. Adjustment/Test Extinguishing Circuits

A. Test Extinguishing Circuits. (PAGEBLOCK 26-20-00/201)

EMERGENCY SHUTDOWN SYSTEM - ADJUSTMENT/TEST

1. General

A. This procedure contains MSG-3 task card data.

TASK 76-20-00-710-801

2. Operational Check of the Engine Emergency Shutdown System

A. Prepare for an Operational Check of the Engine Emergency Shutdown System

SUBTASK 76-20-00-865-001

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.

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

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

B. Operational Check of the Engine Emergency Shutdown System

SUBTASK 76-20-00-710-001

(1) Pull fire control handle several times to ensure full travel of cable system.

SUBTASK 76-20-00-710-002

(2) Place fire control handle in retracted position.

(3) Place pneumatic crossfeed lever in on position.

(4) Check that fuel fire shutoff valve is open.

(5) Check that hydraulic shutoff valve is open.

(6) Check that pneumatic crossfeed valve is open.

(7) Check that generator fire shutoff switch (SI97, left or SI98, right) is in open position by removing left or right (as required) generator control panel in E&E compartment. Check rack receptacle R5-443B, Pin 16 (left) or R5-444B, Pin 16 (right) for continuity to ground. There should be no continuity to ground. (MD-80 Wiring Diagrams 24-21-01, 24-21-02)

SUBTASK 76-20-00-710-003

(8) Clamp or hold fire control handle in extended position.

(9) Check that hydraulic shutoff valve is closed.

(10) Check that fuel fire shutoff valve is closed, by checking valve arm is in closed position (arm against closed position stop).

(11) Check that pneumatic crossfeed valve is closed and handle is in off position.

(12) Check that generator fire shutoff switch is in closed position. There should be continuity from rack receptacle R5-443B, Pin 16 (left) or R5-444B, Pin 16 (right) to ground. (MD80 Wiring Diagrams 24-21-01 and 24-21-02)

SUBTASK 76-20-00-710-004

(13) Remove clamp from fire control handle and return system to normal position.

(14) Move pneumatic crossfeed valve to open position manually.

(15) Move fire control handle to extended position. Force required to move fire control handle should not exceed more than 25 pounds (11.4 kg) at any position. Rotate fire control left and right to ensure ease of movement.

SUBTASK 76-20-00-860-001

(16) Return system to normal position.

(17) Check that fuel shutoff valve is open.

(18) Check that hydraulic shutoff valve is open.

(19) Check that generator fire shutoff switch is open. There should be no continuity from rack receptacle R5-443B, Pin 16 (left) or R5-444B, Pin 16 (right) to ground. (MD80 Wiring Diagrams 24-21-01 and 24-21-02)

SUBTASK 76-20-00-840-001

(20) Re-install left or right (as required) generator control panel and place associated generator control switch on cockpit overhead switch panel momentarily to reset position.

NOTE: When fire control handle is actuated, generator field circuit is opened. Generator control switch must be reset to close generator field circuit.

(21) Check that pneumatic crossfeed valve is closed.

(22) Move pneumatic valve to open position manually.

C. Job Close-up

SUBTASK 76-20-00-865-002

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

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

——— END OF TASK ———

EMERGENCY SHUTDOWN SYSTEM - INSPECTION/CHECK

1. General

A. This procedure contains MSG-3 task card data.

TASK 76-20-00-211-801

2. Detailed Inspection of the Engine Emergency Shutdown System Cables

NOTE: This procedure is a scheduled maintenance task.

A. Equipment and Materials

Name and Number	Manufacturer
Clean, soft cloth	

B. Prepare for Detailed Inspection of Engine Emergency Shutdown System Cables

SUBTASK 76-20-00-010-001

(1) Open the ceiling panels in the FWD and AFT cargo compartments.

(2) Remove floor panels and seats as required over center wing section to facilitate maintenance.

C. Do a Detailed Inspection of the Engine Emergency Shutdown System Cables

SUBTASK 76-20-00-211-001

(1) Do a detailed inspection of the engine emergency shutdown system cables as follows: (Figure 601)

(a) Use a soft cloth to check for broken cable strands.

(b) Check cables for evidence of corrosion and wear.

(c) Check pulleys, fairleads and pressure seals for wear and damage.

(d) Check support brackets for evidence of cracking and presence of corrosion.

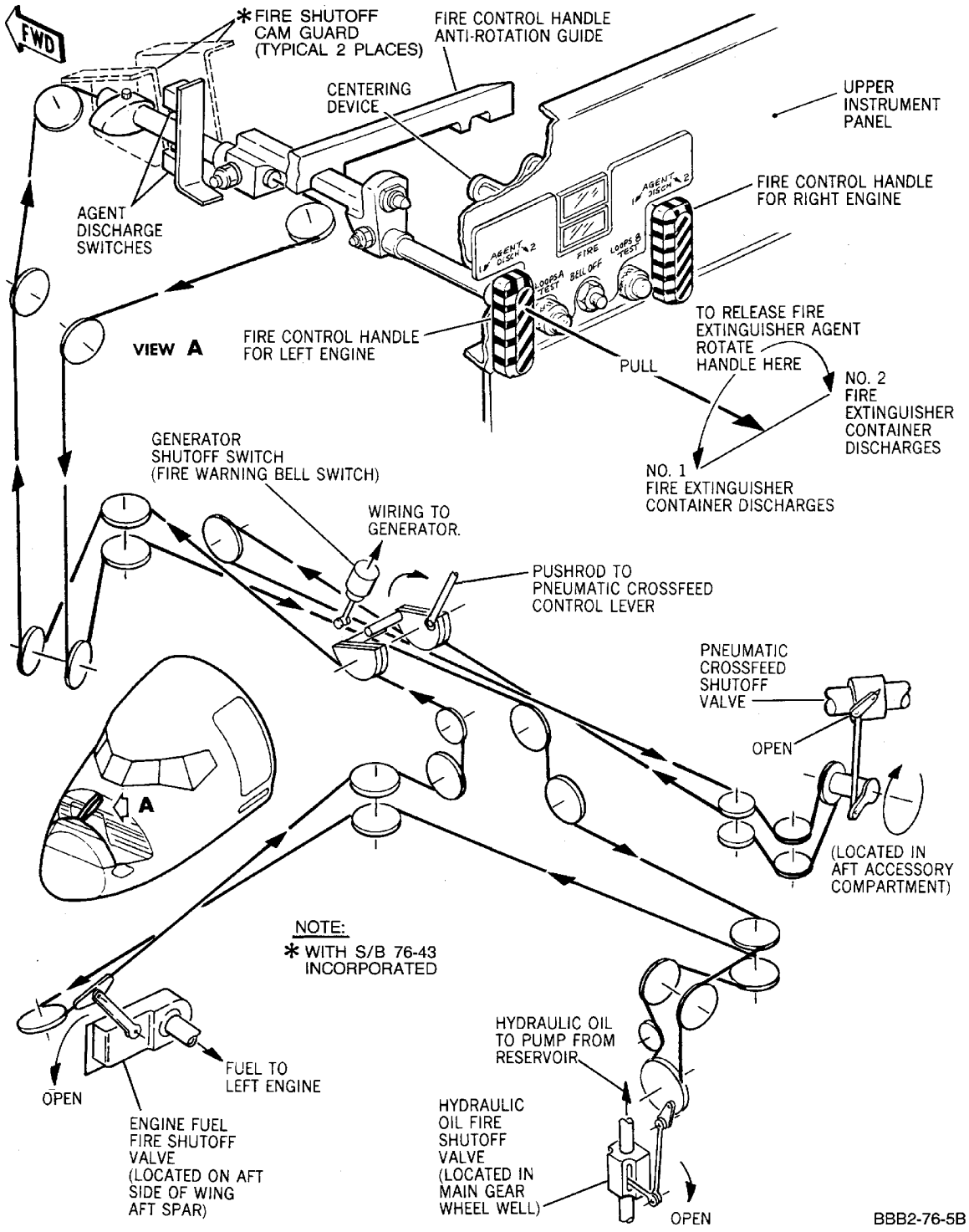
D. Job Close-up

SUBTASK 76-20-00-410-001

(1) Install floor panels and seats removed for this inspection.

(2) Install FWD and AFT cargo compartment ceiling panels removed for this inspection.

——— END OF TASK ———



Emergency Shutdown System - Schematic
Figure 601/76-20-00-990-804

FIRE CONTROL HANDLE - REMOVAL/INSTALLATION

1. General

CAUTION: DO NOT ROTATE FIRE CONTROL HANDLES. ROTATION OF FIRE CONTROL HANDLES WILL DISCHARGE FIRE EXTINGUISHER AGENT.

A. The first fire control handle position (handle extended) controls the fuel fire shutoff valve, hydraulic oil fire shut-off valve, pneumatic crossfeed valve, engine generator shutoff switch, fire warning bell, plus the electrical control necessary to discharge the fire extinguishing agent. The second fire control handle position (handle rotated in either direction) will discharge fire extinguisher agent. Fire extinguishing containers 1 and 2 are common to both left and right sides.

B. The removal and installation procedures are identical for each fire control handle.

C. Access to the system is through the forward accessory compartment and by movement of the center glareshield instrument panel to the aft detent.

2. Equipment and Materials

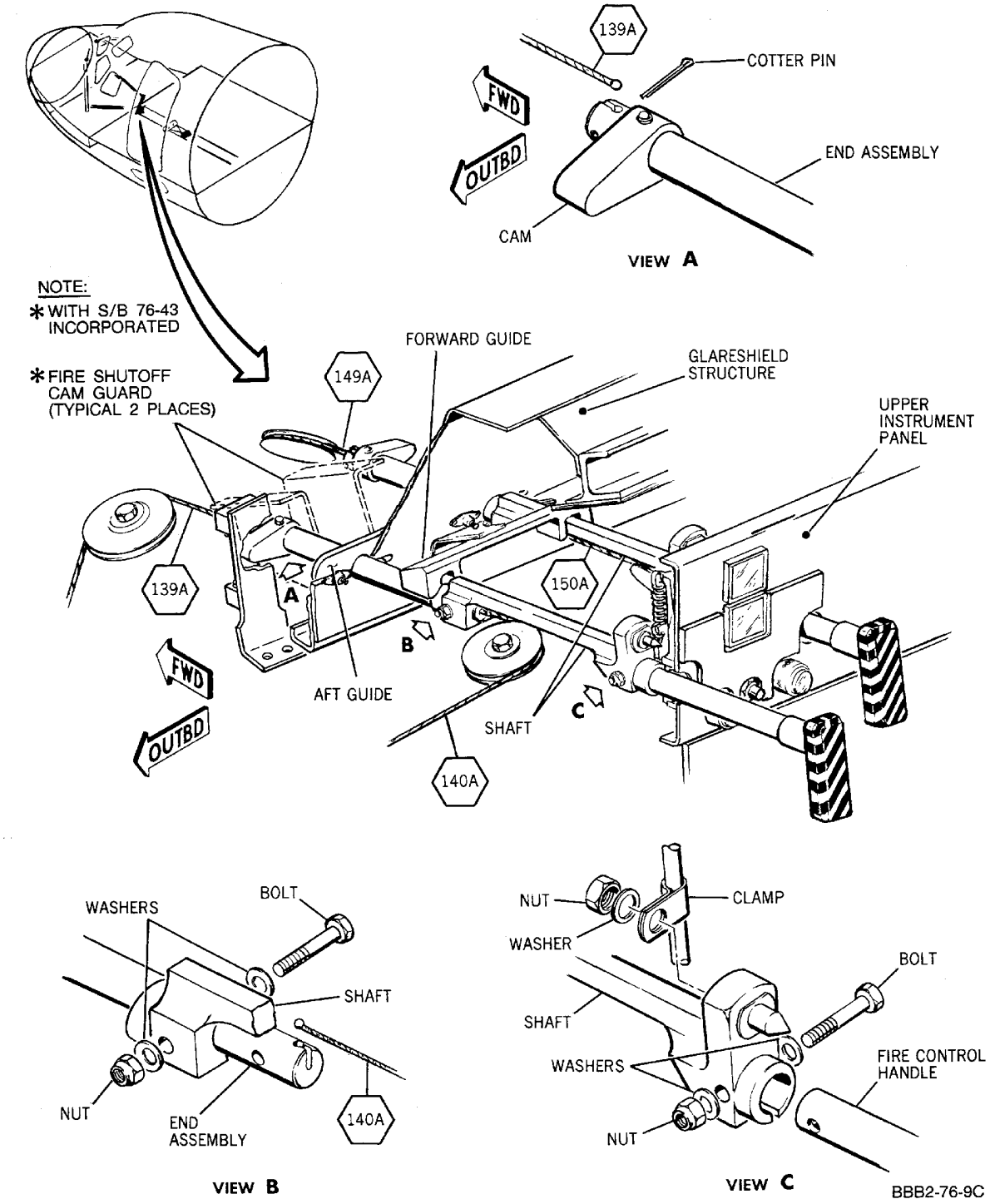
NOTE: Equivalent substitutes may be used instead of the following listed item:

NOTE: Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

Table 401

Name and Number	Manufacturer
Rig pin (4-3) 1/4 X 3 5/8, 1 required	

NOTE: Rig pin sizes are in inches (diameter X length; length = grip plus 5/8 inch).



Fire Control Handle - Installation
Figure 401/76-20-01-990-801

3. **Removal/Installation Fire Control Handle**

A. Remove Fire Control Handle

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

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

(2) Install rig pin (4-3) in rig pin hole (R-31) in fire shutoff drum located approximately at station 120.050.

(3) Unfasten center instrument panel below glareshield and slide to aft detent.

(4) Disconnect and remove clamp retaining electrical wiring to shaft.

(5) Disconnect electrical wiring from switch and fire control handle.

(6) Pull fire control handle to full extended position.

(7) Remove bolt connecting fire control handle to shaft.

(8) Remove handle.

(9) Remove bolt connecting shaft to end assembly.

(10) Slide end assembly forward through shaft to remove cable.

(11) Remove cable from forward end of end assembly.

(12) Slide shaft forward and off of end assembly. Slide shaft aft, to clear forward guide, and remove.

(13) Remove cotter pin from aft end of end assembly and remove cable.

(14) Slide end assembly aft, clearing aft guide, and remove.

B. Install Fire Control Handle

(1) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

NOTE: The following step is to ensure proper shaft and forward guide engagement to prevent premature rotation of fire control handle.

(2) Temporarily install end assembly, shaft and handle without cables attached to check following gaps and clearances.

(a) Check gap between upper surface of shaft and inner surface of forward guide is 0.030 to 0.090 inch (0.762 to 2.3 mm).

(b) Shim forward guide using washers at attaching bolts to obtain gap.

(c) Pull fire control handle until pin in shaft is just flush with aft surface of stop.

(d) Shaft must be inside of forward guide 0.120 inch (3.1 mm) minimum.

(e) Pull fire control handle full out; pin must be fully engaged inside stop.

(f) Gap between forward guide and shaft must be 0.030 inch (0.762 mm) minimum and handle must be able to rotate freely in either direction.

(3) Connect cable to aft end of end assembly and install cotter pin.

(4) Slide end assembly through aft guide.

(5) Slide shaft forward through guide, and then aft inserting end assembly into shaft.

(6) Install cable in forward end of end assembly.

CAUTION: MAKE CERTAIN THAT LOBE OF CAM ATTACHED TO FORWARD END OF SHAFT IS POINTED OUTBOARD, SUCH THAT LOBE WOULD ACTIVATE FIRE EXTINGUISHING AGENT DISCHARGE SWITCHES IF FIRE CONTROL HANDLE WERE PULLED AND ROTATED.

CAUTION: ON AIRCRAFT WITH SERVICE BULLETIN 76-43 (FIREX SWITCH CAM GUARD) INSTALLED, MAKE CERTAIN THAT SWITCH CAM LOBE IS INSTALLED POINTING OUTBOARD, AWAY FROM GUARD.

(7) Install bolt, washers and nut connecting shaft to end assembly. (Figure 401)

(8) Slide handle aft through glareshield opening and into shaft.

(9) Install bolt, washers and nut connecting handle to shaft.

(10) Connect electrical wiring to switch and fire control handle.

(11) Install clamp that retains electrical wiring to shaft.

(12) Slide center instrument panel forward and fasten.

(13) Remove rig pin.

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

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

(15) Perform adjustment/test procedures for emergency shutdown system. (SUBJECT 76-20-00, SUBJECT 26-00-00 and SUBJECT 26-20-00)