CHAPTER

76

ENGINE CONTROLS

Learjet

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* Asterisk indicates pages revised, added, or deleted by current revision. The portion of the text affected by the current revision is indicated by a vertical line in the outer margin of the page.

RECORD OF TEMPORARY REVISIONS

TEMP REV NO	DESCRIPTION	ISSUE DATE	ATP REV DATE	INSERT BY	DATE REMOVED	REV INCOR	REMOVE BY
76-1-2	REMOVED						

Record of Temporary Revisions

Rev. No.	Date Inserted	Date Removed	Page Number	Rev. No.	Date Inserted	Date Removed	Page Number
76-1	Apr 9/75	Oct 1/75 Rev 4	76-10-02 Page 203				
76-2	Aug 7/81	Apr 30/82 Rev 27	76-10-02 Page 204				

POWER CONTROL - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The engine is equipped with an automatic control system and is provided with a manual backup system. A remotely located electronic computer senses the demands of the engine and inlet air pressure and temperature to maintain proper engine operation. This system consists of the electronic computer, a solenoid controller valve (solenoid controller), and a modulating and shutoff (surge bleed) valve.

B. On Aircraft not equipped with thrust reversers, two thrust levers, located on the center pedestal, control engine power by regulation of each engine fuel control unit. The thrust levers are connected to the fuel control units by cables. Positive stops are provided in the throttle quadrant to retain the thrust levers in the CUTOFF position and prevent inadvertent reduction of thrust below the IDLE position. Landing gear aural warning switches are located in the center pedestal. The switches will cause the warning horn to sound at approximately 68% fan (N_1) rpm when the landing gear is in the up position.

C. On Aircraft equipped with thrust reversers, two thrust levers with pivoted thrust reverser levers are located on the center pedestal. When the thrust reverser levers are in the stow position, the thrust levers control engine power by regulation of each engine fuel control unit. During reverse thrust operations, the thrust levers are in the IDLE position and the thrust reverser levers control engine power by regulation of each engine fuel control unit. The thrust levers and thrust reverser levers are connected to the fuel control units by cables. Positive stops are provided in the throttle quadrant to retain the thrust levers in the CUTOFF position and to prevent inadvertent reduction of thrust below the IDLE position. With the thrust levers in the IDLE position, a lockout solenoid and pawl prevent application of reverse thrust above 45% N_1 until the thrust reversers are deployed. Landing gear aural warning switches, located in the center pedestal, will cause the warning horn to sound at approximately 68% fan (N_1) rpm when the landing gear is in the up position.

D. On Aircraft 35-002 thru 35-122, 35-124 thru 35-136, and 36-002 thru 36-034 not equipped with thrust reversers, three-piece throttle cables to each engine are used to transmit the thrust lever settings to the engine. Each forward cable is routed from the pedestal under the center floorboard to frame 15. The second cable is coupled to the forward cable and routed through the keel beam into the tailcone area. The third cable is connected and routed through the pylon to the engine.

E. On Aircraft 35-123, 35-137 and subsequent, 36-035 and subsequent, and prior aircraft equipped with thrust reversers, two-piece throttle cables to each engine are used to transmit the thrust lever settings to the engine. Each forward throttle cable is routed from the pedestal under the center floorboard to frame 15. The aft throttle cable is coupled to the forward throttle cable and is routed through the keel beam, through the tailcone area, and through the pylon to the engine.

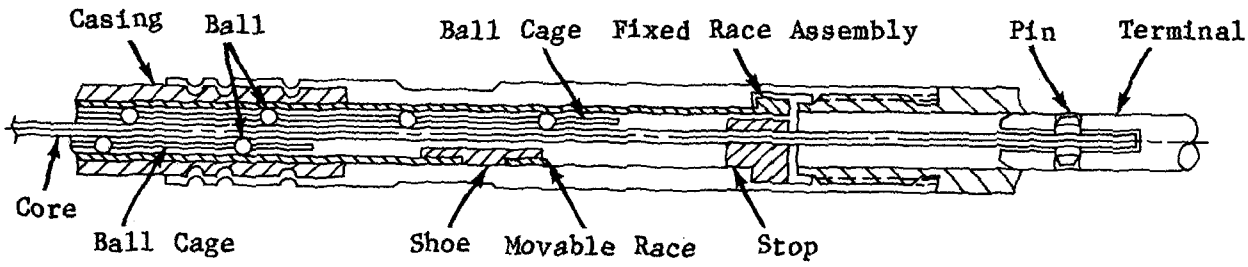
F. On Aircraft 35-067 and subsequent and 36-018 and subsequent, the aircraft is equipped with an engine synchronizer system. The engines can be synchronized in either fan or turbine modes. The synchronizer system switches are located on the center pedestal adjacent to the thrust levers.

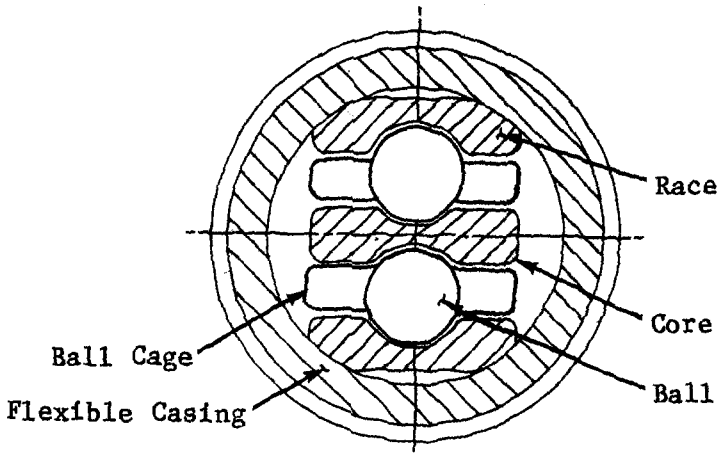
G. **Component Description**

(1) Throttle Cables (See figure 1.)

(a) On Aircraft 35-002 thru 35-136 except 35-123 and Aircraft 36-002 thru 36-034, the forward and center throttle cables are self-contained action/reaction cables consisting of an inner race (core) held between two outer races by a series of balls, all contained in a flexible metal casing. One of the two outer races is fixed while the other is movable. The inner race (core) is the action member that transmits the linear motion, while the fixed race transmits the reaction to the primary end fitting attach point. The aft throttle cables are helix-wound cables terminating in control box assemblies.

(b) On Aircraft 35-124, 35-137 and Subsequent, 36-035 and Subsequent and prior Aircraft equipped with thrust reversers, the forward and aft throttle cables are self-contained atcion/reaction cables consisting of an inner race (core) held between two outer races by a series of balls, all contained in a flexible metal casing. One of the two outer races is fixed while the other is movable. The inner race (core) is the active member that transmits the linear motion, while the fixed race transmits the reaction to the primary end fitting. The aft throttle cables are connected to control box assemblies containing a segment of helix-wound cable.





Throttle Cable
Figure 1

1. ADJUSTMENT/TEST

A. Throttle Control System Adjustment (See figure 201.)

NOTE: The idle stop must be rigged properly to ensure thrust reverser deployment under all conditions. In particular, engine spoolup must be adequate for deployment of both thrust reversers when one engine's bleed air is turned off.

(1) Rig Idle Stop Position

(a) Open tailcone access door and remove aircraft batteries.
(b) Remove carpet and center floorboards from aircraft.
(c) Remove engine nacelle lower cowl and pylon access cover.
(d) Remove power control assembly from fuel control unit.
(e) Torque required to rotate fuel control unit shall be 8 inch-pounds.
(f) Gain access to throttle cable in pedestal and loosen throttle cable clamps.
(g) Remove nylon screw from side of fuel control unit rigging pin hole.
(h) Rotate fuel control unit shaft to 20 degree setting and install rigging pin.

NOTE: Fuel control unit shaft may be rotated to a maximum of 25 degrees if necessary to ensure proper thrust reverser operation with one engine's bleed air turned off.

(i) Set thrust levers to IDLE.
(j) On *Aircraft 35-002 thru 35-122, 35-124 thru 35-136, and 36-002 thru 36-034 not equipped with thrust reversers*, adjust micro-adjust turnbuckle to its midtravel position. Adjust micro-adjust turnbuckle, if necessary, to install power control assembly on fuel control unit.
(k) On *Aircraft 35-123, 35-137 and subsequent, 36-035 and subsequent and prior aircraft equipped with thrust reversers*, adjustment of control quadrant turnbuckle may be necessary to install power control assembly on fuel control unit.
(l) Secure power control assembly with attaching parts and install safety wire.
(m) On *Aircraft 35-064 thru 35-122, 35-124 thru 35-136, and 36-018 thru 36-034*, install support halves and secure with clamps.
(n) Remove rigging pin and cycle thrust levers several times through full travel to establish natural cable routing.
(o) Tighten clamps, securing entire cable length, but do not restrict cable movement.
(p) Remove spent travel tube from power control assembly.
(q) Set thrust levers to MAX THRUST stop.
(r) On *Aircraft 35-002 thru 35-122, 35-124 thru 35-136 and 36-002 thru 36-034 not equipped with thrust reversers*, movable element should protrude 0.12 inch minimum. If not, adjust jamnut shown in detail E to allow 0.12 inch dimension at power control assembly.
(s) On *Aircraft 35-123, 35-137 and subsequent, 36-035 and subsequent, and prior aircraft equipped with thrust reversers*, movable element should be recessed 0.25 inch maximum in power control assembly. Adjust throttle quadrant turnbuckle to allow correct dimension in power control assembly.
(t) Install spent motion tube and power control assembly. Secure with attaching parts and install safety wire.
(u) On *Aircraft 35-002 thru 35-122, 35-124 thru 35-136, and 36-002 thru 36-034 not equipped with thrust reversers*, install safety wire on micro-adjust turnbuckle.
(v) Install nylon screw in rigging pin hole.

(2) Align Thrust Levers *(Aircraft 35-002 thru 35-025, 35-027, 35-029, 35-030 and 36-002 thru 36-013)* (See figure 202.)
   (a) Set both thrust levers to MAX THRUST and check that levers align within 0.12 inch. Measure at center of knobs.
   (b) The thrust lever with minimum clearance between lever and forward end of idle stop assembly will be used to align other lever.
   (c) Remove cotter pin, washer, and pin that secures throttle cable to thrust lever to be adjusted.

      NOTE: Turn stud in a CW motion to increase thrust lever travel and in a CCW motion to decrease travel.

   (d) Turn stud as required to align thrust levers within 0.12 inch measured at center of knobs. Temporarily secure throttle cable to clutch adapter and check alignment.
   (e) Repeat as necessary to align thrust levers.
   (f) Install throttle cable and secure with pin, washer, and cotter pin.

(3) Align Thrust Levers *(Aircraft 35-026, 35-028, 35-031 thru 35-071, 35-073 thru 35-079 and 36-014 thru 35-020)*
   (a) No adjustment of thrust lever alignment is provided.

(4) Align Thrust Levers *(Aircraft 35-072, 35-080 and subsequent, 36-021 and subsequent and prior aircraft equipped with thrust reversers)* (See figure 202.)
   (a) Set both thrust levers to MAX THRUST and check that levers align within 0.12 inch. Measure at center of knobs.

      NOTE: Determine which thrust lever has minimum clearance with forward end of idle stop assembly and use this lever as master.

   (b) If levers do not align, adjust throttle quadrant turnbuckle corresponding to thrust lever furthest from idle stop.
   (c) Secure jamnuts on turnbuckle. Install safety wire on all jamnuts.

(5) Rig Full Throttle Travel
   (a) Set thrust levers to MAX THRUST and verify the following:
      1) Fuel control unit shaft rotation as visible through sight glass is 117 degrees minimum to 122 degrees maximum.
      2) Minimum clearance between forward edge of thrust lever nearest idle stop and forward end of idle stop is 0.06 inch.
   (b) Set thrust levers to CUTOFF and verify the following:
      1) Fuel control unit shaft rotation is -2 degrees minimum to 5 degrees maximum.
      2) Minimum clearance between aft edge of thrust lever and aft end of idle stop is 0.06 inch.

(c) Install pedestal cover and position throttle at travel extremes. Minimum clearance between lever and pedestal cover at lever's forward and aft travel extremes shall be 0.06 inch.

(6) Check Throttle Cable Friction.

(a) Assure that throttle cable system is completely rigged.

(b) Using a spring scale, measure load required to move thrust lever from IDLE to MAX THRUST. Measure load required to move lever back to IDLE. Load shall not exceed 6 pounds.

(c) Install all previously removed access panels, floorboards, carpet, and nacelle covers.

(d) Install aircraft batteries and close tailcone access door.

B. Landing Gear Aural Warning and Ignition Switch Adjustment (Aircraft 35-002 thru 35-071, 35-073 thru 35-079, and 36-002 thru 36-020 Not equipped with thrust reversers) (See figure 203.)

NOTE: The following adjustment procedures are typical for LH and RH aural warning and ignition switches.

(1) Gain access to landing gear and ignition switches. (Refer to 76-10-02.)

(2) Set LH thrust lever to IDLE.

NOTE: Do not bend switch actuator lever to obtain switch adjustment.

(3) Adjust LH landing gear and LH ignition switches until switches are closed (continuity between C and N.C. positions of each switch).

(4) Slowly retard thrust lever and check that switches open (continuity between C and N.O.) at 17° to 18° on fuel control unit shaft protractor.

(5) Slowly advance thrust lever and check that switches are closed at IDLE.

(6) Continue to advance thrust lever. Switches shall remain closed until 76° to 85° is reached on fuel control unit shaft protractor.

(7) Repeat steps (2) through (6) using RH thrust lever and RH landing gear and RH ignition switches.

C. Throttle Switch Adjustment (See figure 203.)

NOTE: The following adjustment procedure is effective for Aircraft 35-002 thru 35-009 and 36-002 thru 36-006.

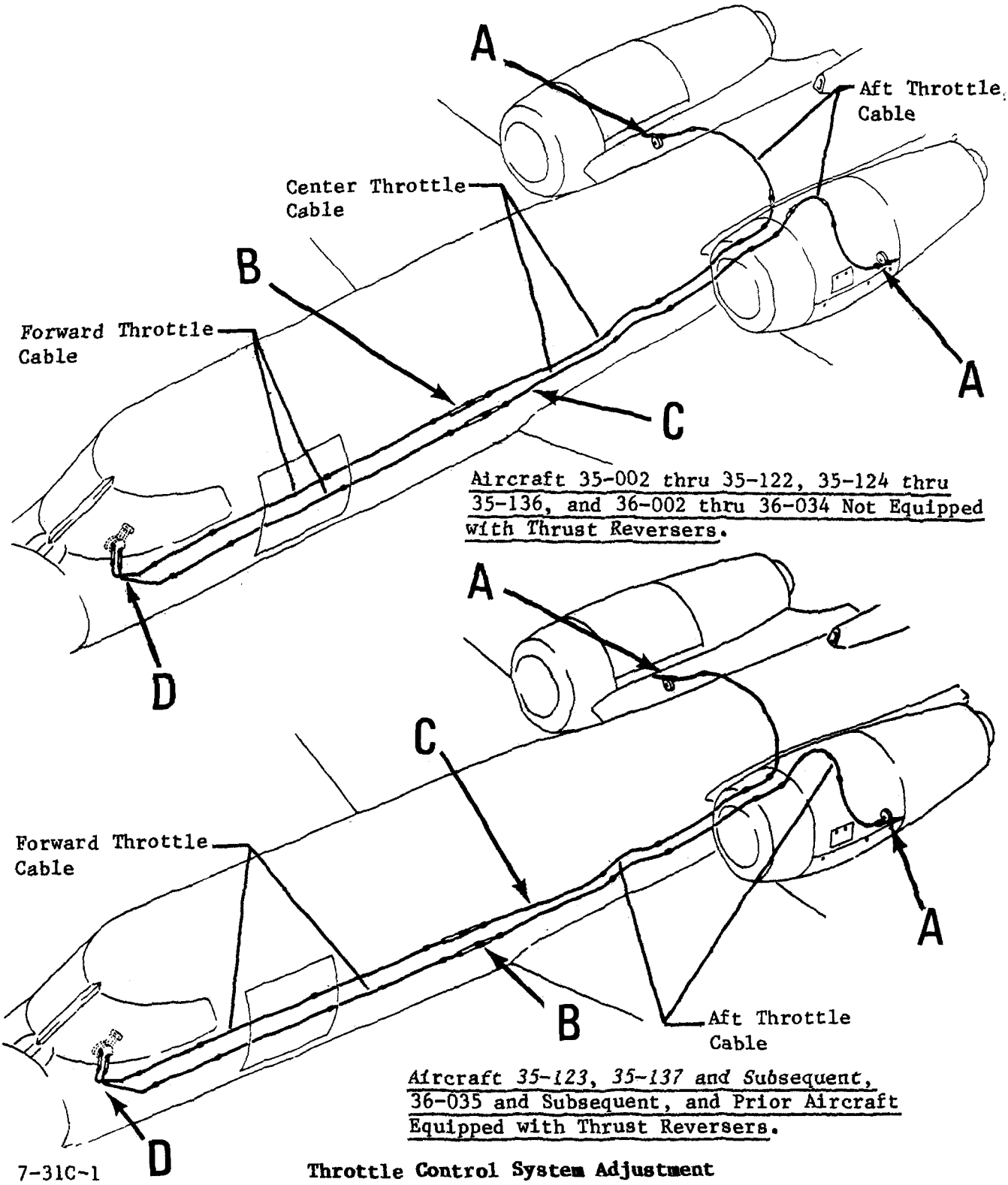
(1) Advance LH thrust lever until 107° setting is obtained on fuel control unit shaft protractor.

(2) Adjust LH throttle switch (SW 615) until switch is closed (continuity between C and N.C.).

(3) Retard thrust lever to IDLE and then advance. Throttle switch shall close between 105° and 109° on shaft protractor.

(4) Continue to advance thrust lever to MAX THRUST; throttle switch shall remain closed.

(5) Repeat steps (1) through (4) using RH thrust lever.



7-31C-1

Throttle Control System Adjustment
Figure 201 (Sheet 1 of 5)

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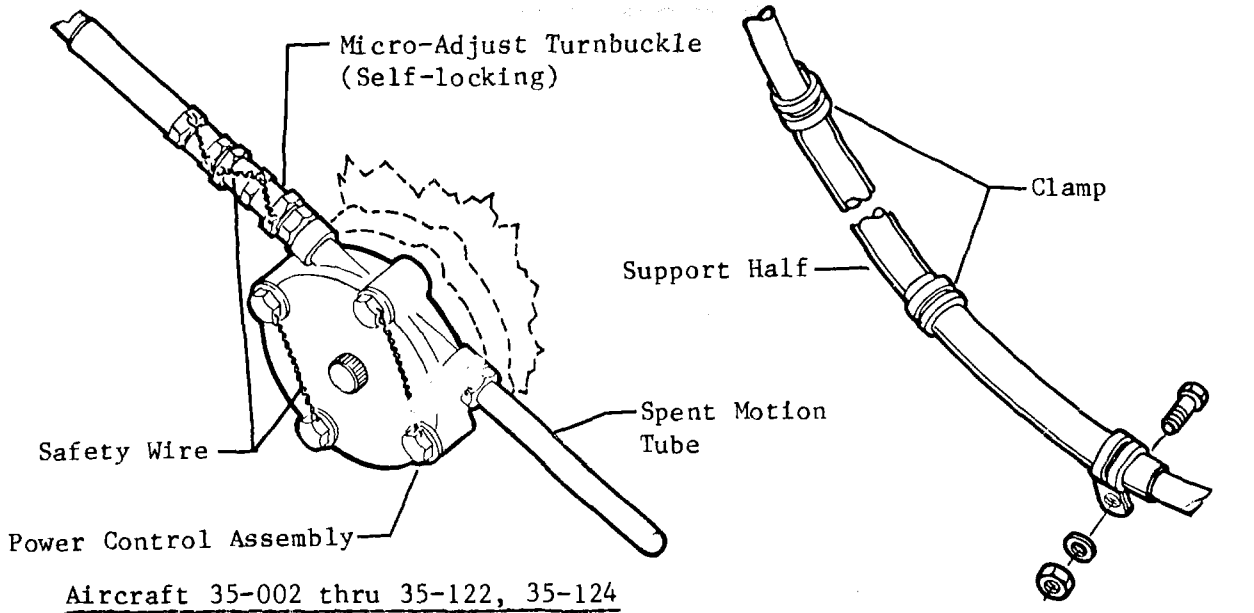
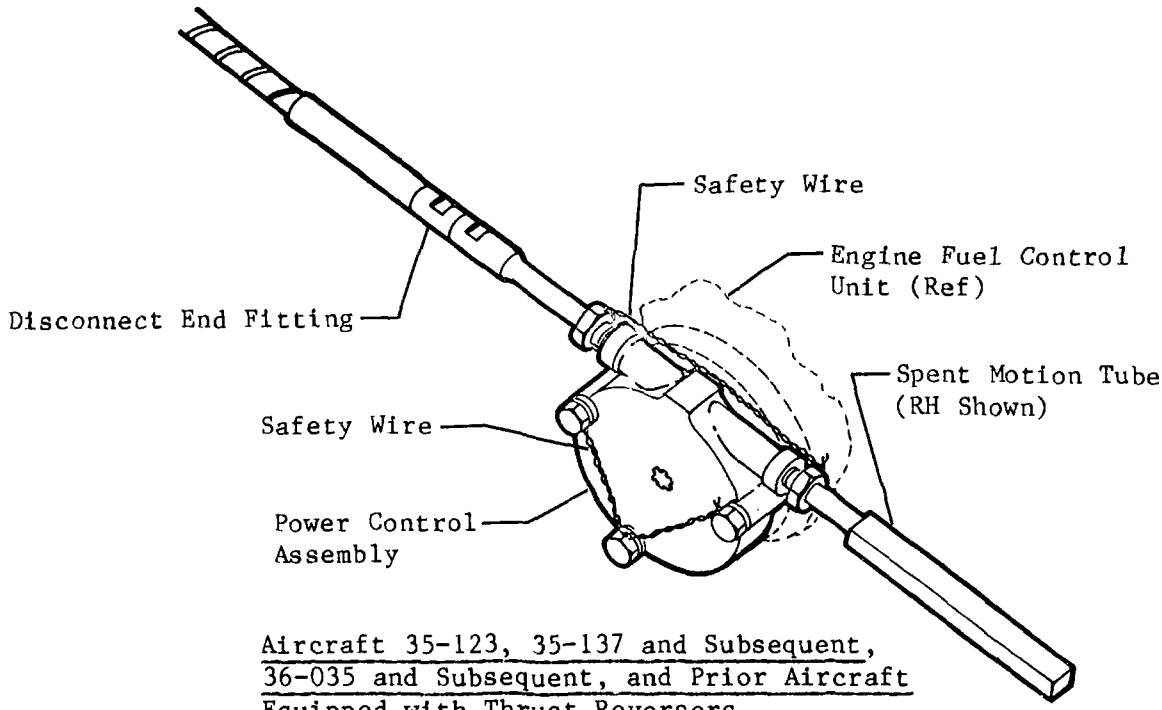
MM-99
Disk 523



Aircraft 35-002 thru 35-122, 35-124 thru 35-136, and 36-002 thru 36-034 Not Equipped with Thrust Reversers.

Aircraft 35-064 thru 35-122, 35-124 thru 35-136, 36-018 thru 36-034.

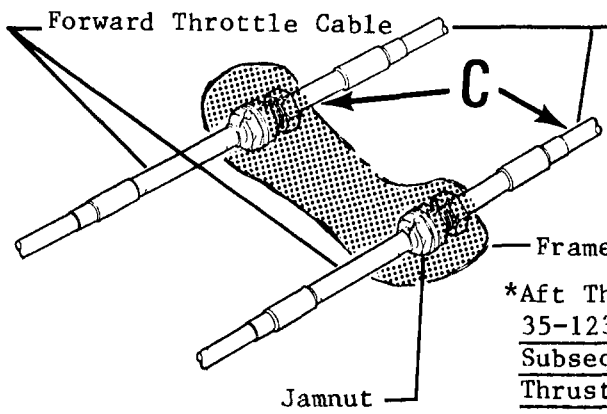


Aircraft 35-123, 35-137 and Subsequent, 36-035 and Subsequent, and Prior Aircraft Equipped with Thrust Reversers.

Detail A

7-31C-2

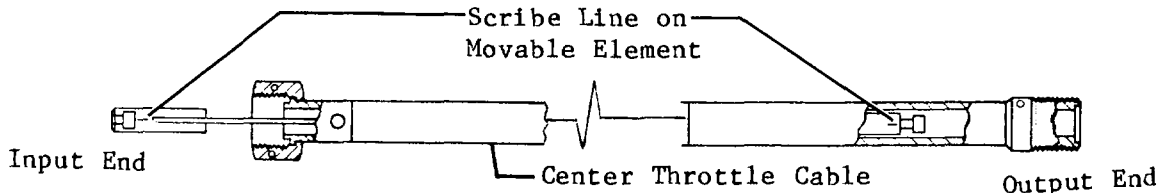
Throttle Control System Adjustment
Figure 201 (Sheet 2 of 5)



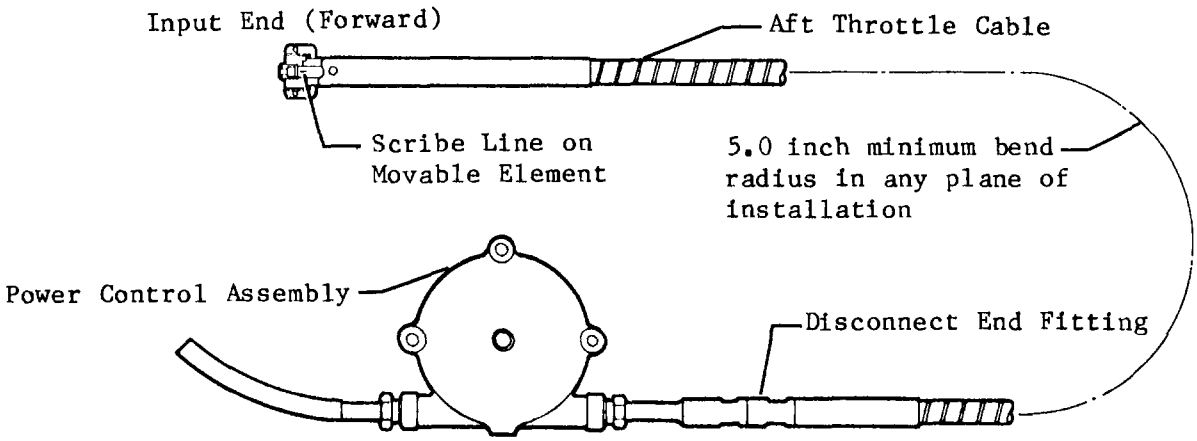
*Aft Throttle Cables Effective on Aircraft 35-123, 35-137 and Subsequent, 36-035 and Subsequent, and Prior Aircraft Equipped with Thrust Reversers

**Center Throttle Cables Effective on Aircraft 35-002 thru 35-136, and 36-002 thru 35-136, and 36-002 thru 36-034 Not Equipped with Thrust Reversers

Detail B



Aircraft 35-002 thru 35-122, 35-124 thru 35-136, and 36-002 thru 36-034 Not Equipped with Thrust Reversers

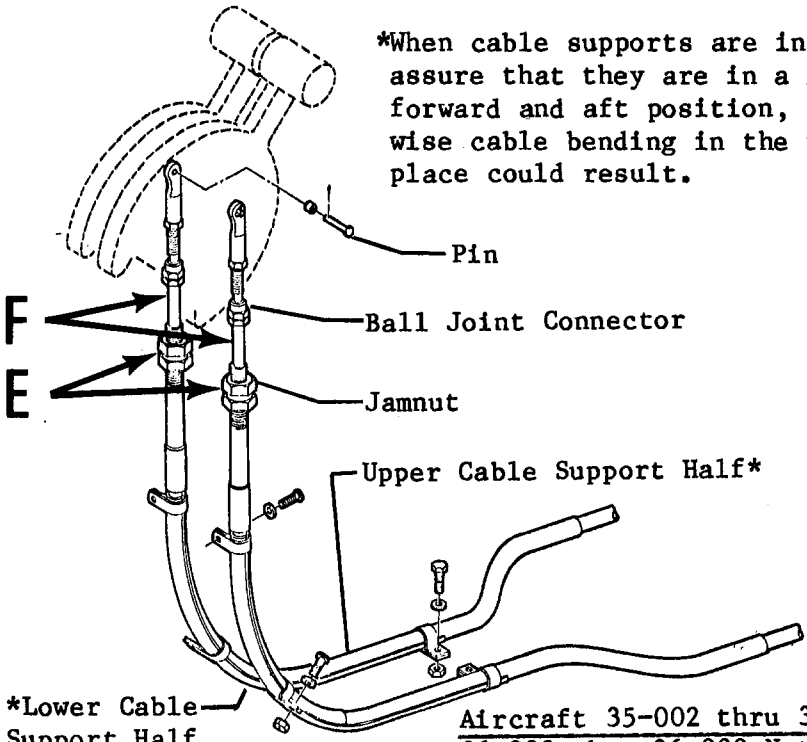


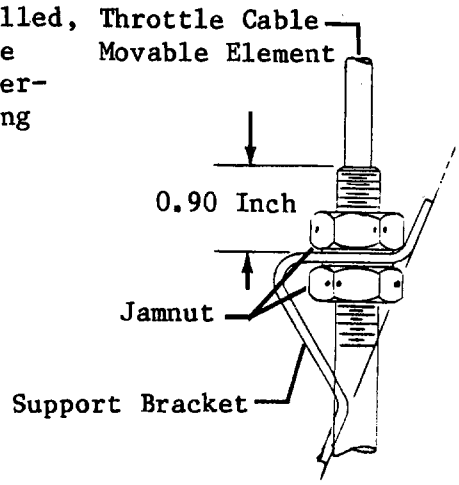
Aircraft 35-123, 35-137 and Subsequent, 35-035 and Subsequent, and Prior Aircraft Equipped with Thrust Reversers

Detail C

B7-31C-3
C7-34A

Throttle Control System Adjustment
Figure 201 (Sheet 3 of 5)

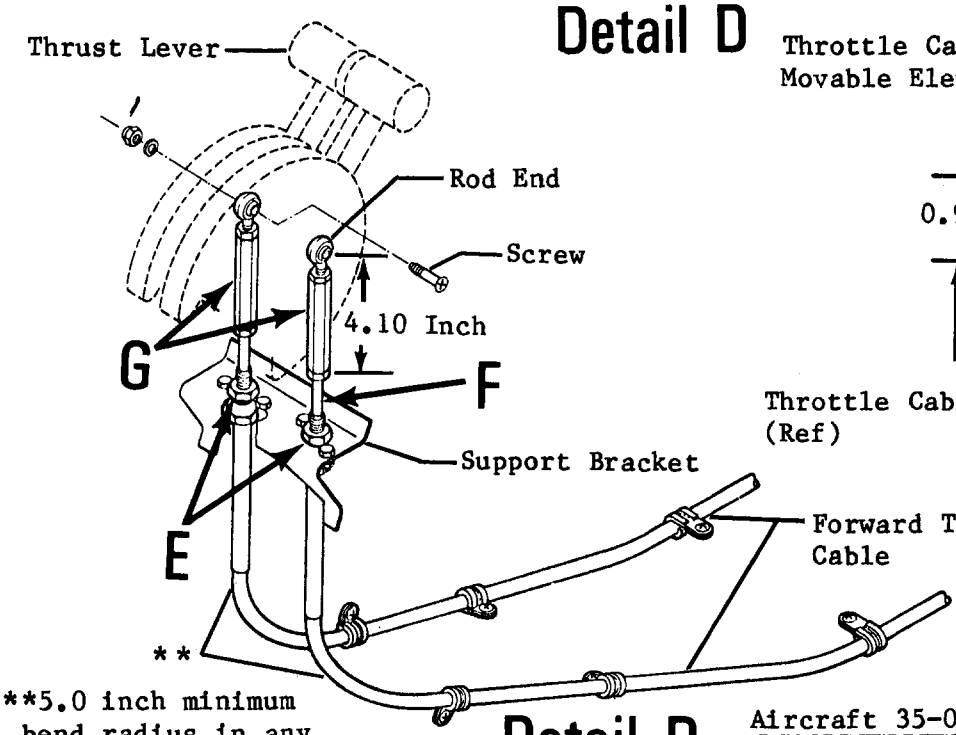


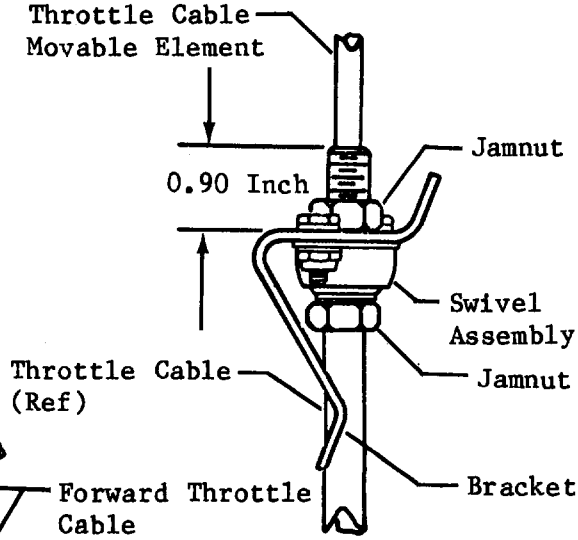


Detail E

Aircraft 35-002 thru 35-071, 35-073 thru 35-079, and 36-002 thru 36-020 Not Equipped with Thrust Reversers

Detail D





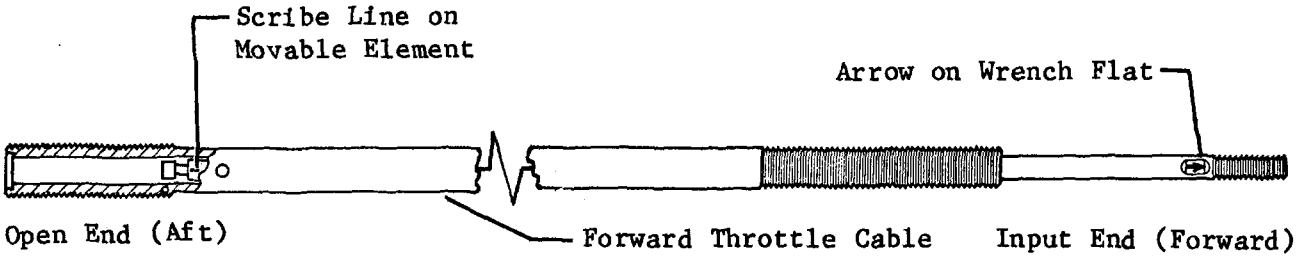
Detail E

Detail D

Aircraft 35-072, 35-080 and Subsequent and 36-021 and Subsequent

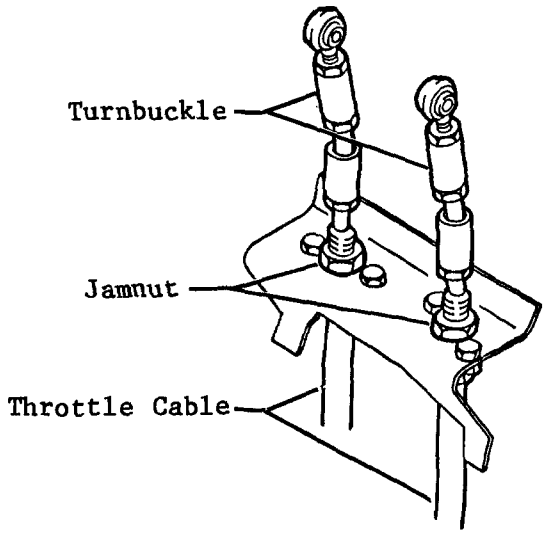
**5.0 inch minimum bend radius in any plane of installation
7-31C-3
7-31C-2

Throttle Control System Adjustment
Figure 201 (Sheet 4 of 5)



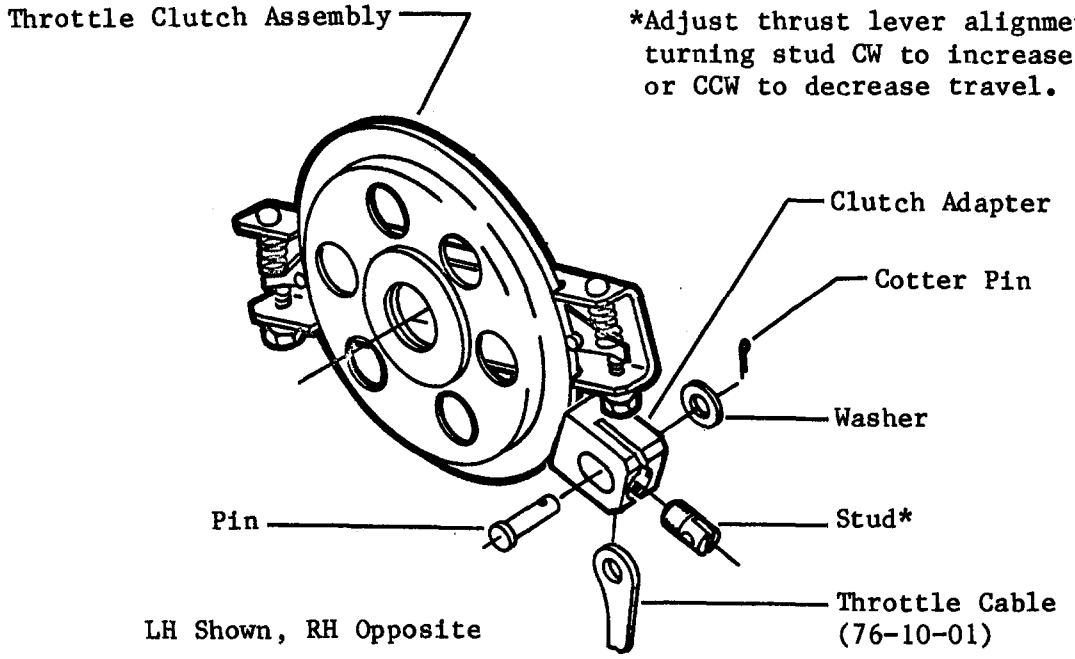
Aircraft 35-002 and Subsequent and 36-002 and Subsequent

Detail F

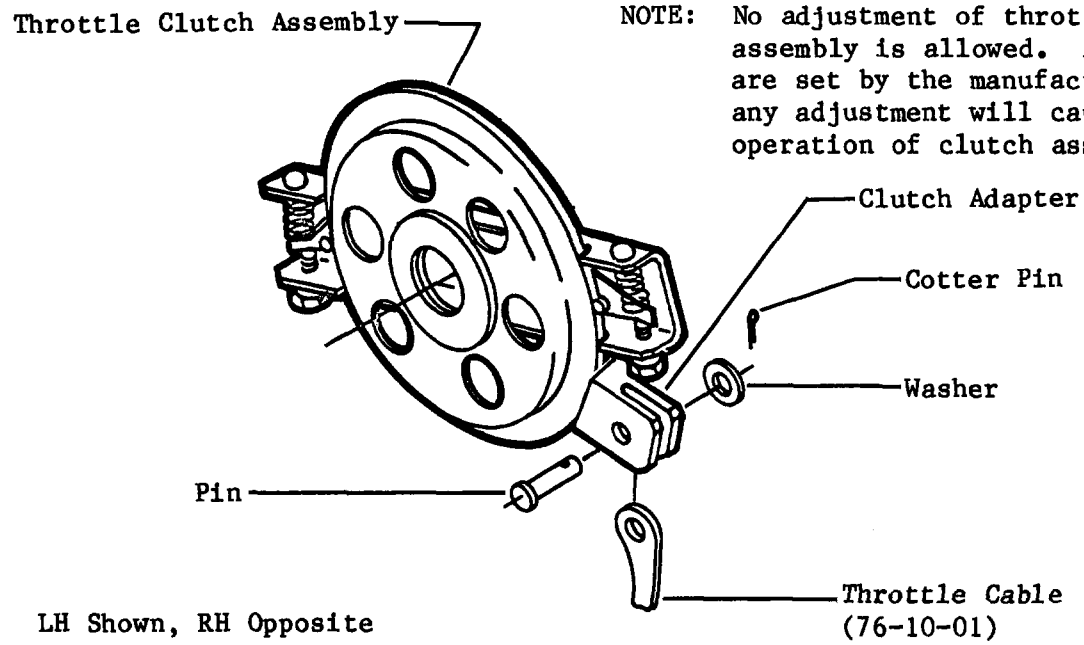


Aircraft 35-166 and Subsequent and 36-039 and Subsequent
Equipped with Thrust Reversers

Detail G

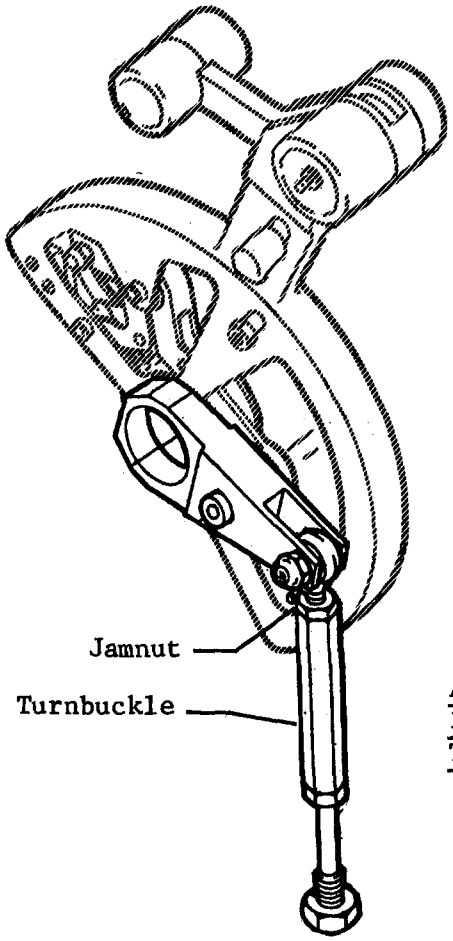


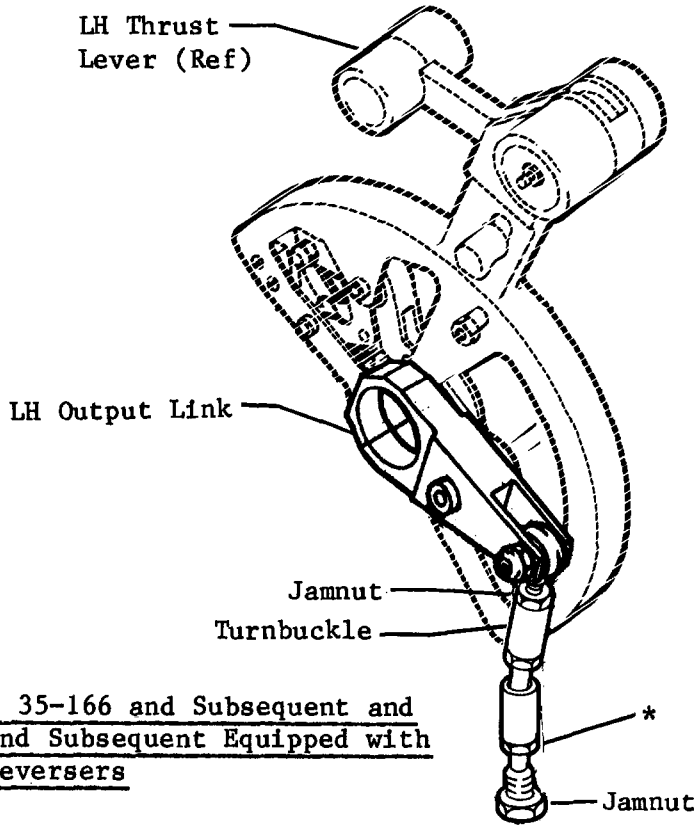
Aircraft 35-002 thru 35-025, 35-027, 35-029, 35-030 and 36-002 thru 36-013



Aircraft 35-026, 35-028, 35-031 thru 35-071, 35-073 thru 35-079 and 36-014 thru 36-020

Thrust Lever Alignment
Figure 202 (Sheet 1 of 2)



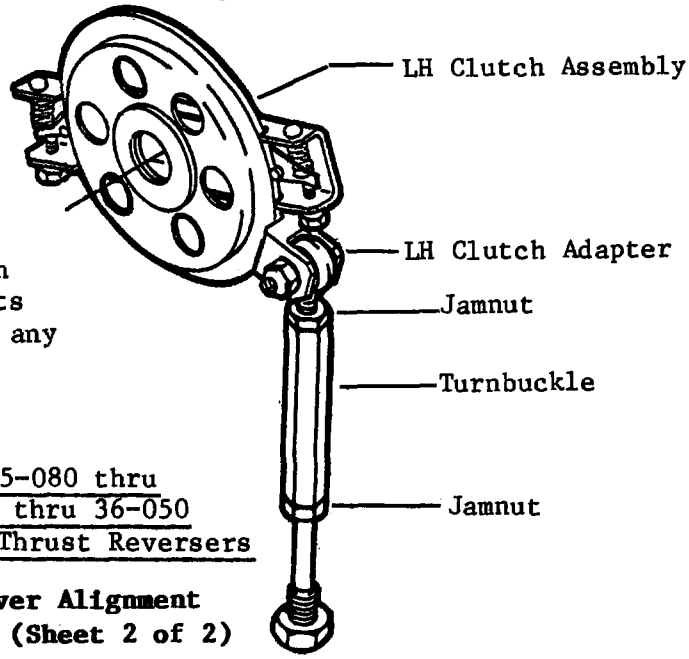


Aircraft 35-166 and Subsequent and 36-039 and Subsequent Equipped with Thrust Reversers

*Ensure that cable assembly is engaged 0.35 inch minimum in turnbuckle

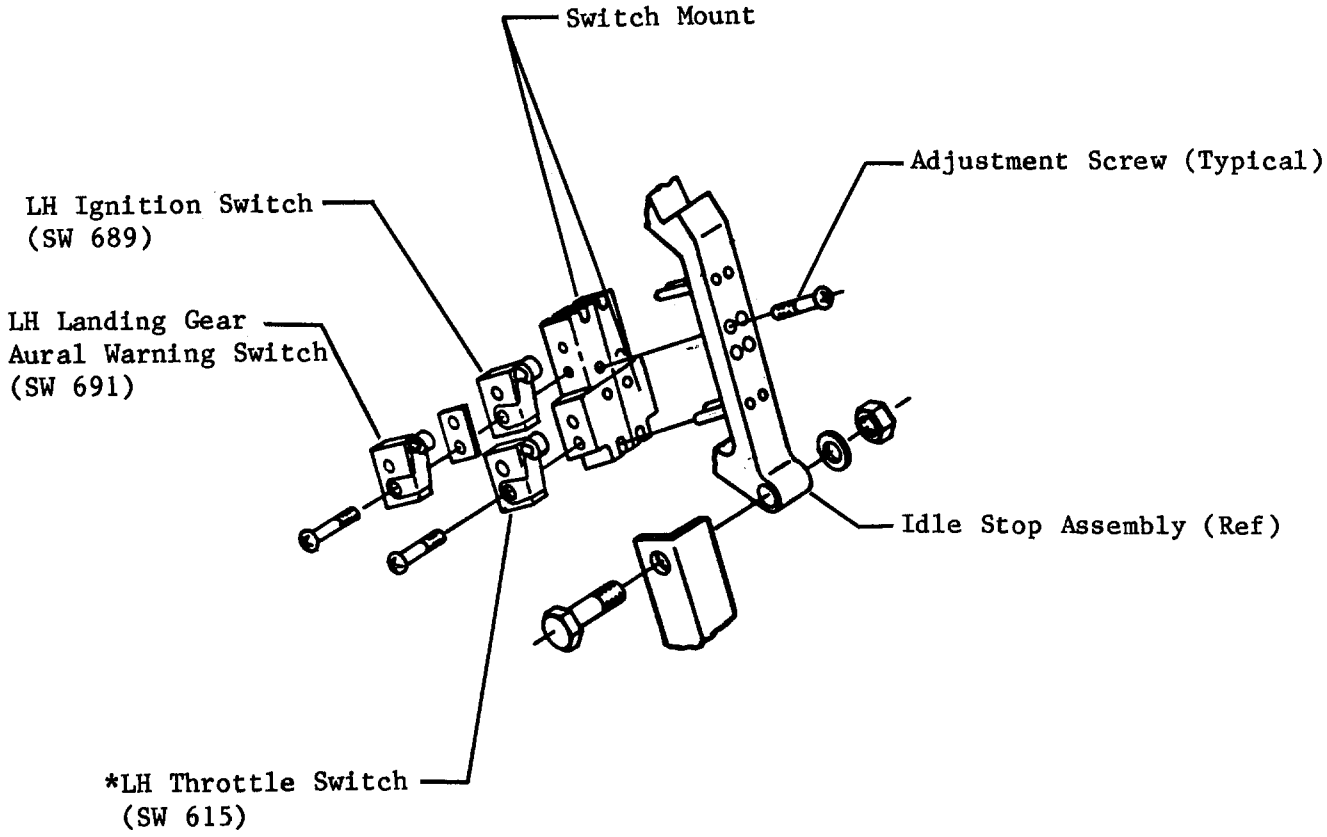
Aircraft 35-072, 35-080 thru 35-165, and 36-021 thru 36-038 Equipped with Thrust Reversers and 35-454 and Subsequent and 36-041 and Subsequent Not Equipped with Thrust Reversers

NOTE: No adjustment of throttle clutch assembly is allowed. Adjustments are set by the manufacturer and any adjustment will cause improper operation of clutch assembly.



Aircraft 35-072, 35-080 thru 35-453, and 36-021 thru 36-050 Not Equipped with Thrust Reversers

Thrust Lever Alignment
Figure 202 (Sheet 2 of 2)



*Effective Aircraft 35-002 thru 35-009 and 36-002 thru 36-006

Landing Gear Aural Warning and Ignition Switch Adjustment
Figure 203

(6) Install previously removed pedestal cover and access cover. (Refer to 76-10-02.)

D. Landing Gear Aural Warning and Ignition Switch Adjustment (Aircraft 35-072, 35-080 and subsequent, 36-021 and subsequent and prior aircraft equipped with thrust reversers) (See figure 204.)

(1) Remove attaching parts and cover from throttle quadrant. (Refer to 76-10-02.)

(2) Remove access plug from LH and RH pedestal cover to gain access to switches.

(3) Set thrust levers to IDLE and install quadrant protractor between thrust levers so that IDLE scribe mark on protractor is aligned with aft edge of thrust lever.

(4) Adjust LH switches.

(a) Loosen set screw and set aft edge of LH thrust lever to 14.5° position on quadrant protractor.

(b) Using a screwdriver, rotate switch shaft CCW through actuator range until landing gear and ignition switches open (no continuity between N.O. and C) and tighten set screw.

(c) Slowly cycle LH thrust lever from CUTOFF to MAX THRUST and return. Verify that:

1) Landing gear switch (outboard switch deck) is closed (continuity between N.O. and C.) between IDLE and 14.5° above IDLE.

2) Ignition switch (inboard switch deck) is closed (continuity between N.O. and C.) between 14.5° above IDLE and -5° below IDLE.

(d) If switches remain actuated (closed) beyond 14.5° above IDLE, rotate switch body CW until switches open.

(e) If switches open before reaching 14.5° above IDLE, rotate switch body CCW until switches close.

(f) If landing gear switch actuates below IDLE, loosen upper locking screws and turn upper adjusting screw CCW until switch opens.

(g) If landing gear switch actuates above IDLE, loosen upper locking screws and turn upper adjusting screw CW until switch actuates.

(h) If ignition switch actuates below -5° below IDLE, loosen upper locking screws and turn upper adjusting screw CCW until switch opens.

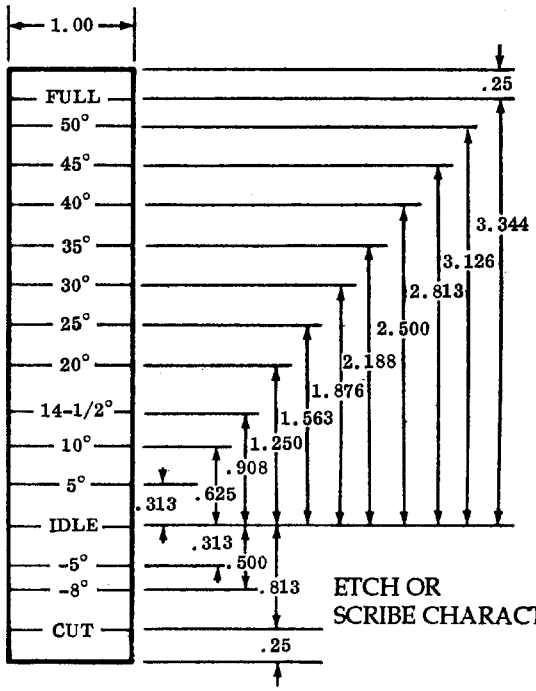
(i) If ignition switch actuates above -5° below IDLE, loosen upper locking screws and turn upper adjusting screw CW until switch actuates.

(j) Secure locking screws and verify step (4,c).

(5) Adjust RH switches.

(a) Loosen setscrew and set aft edge of RH thrust lever to 14.5° position on quadrant protractor.

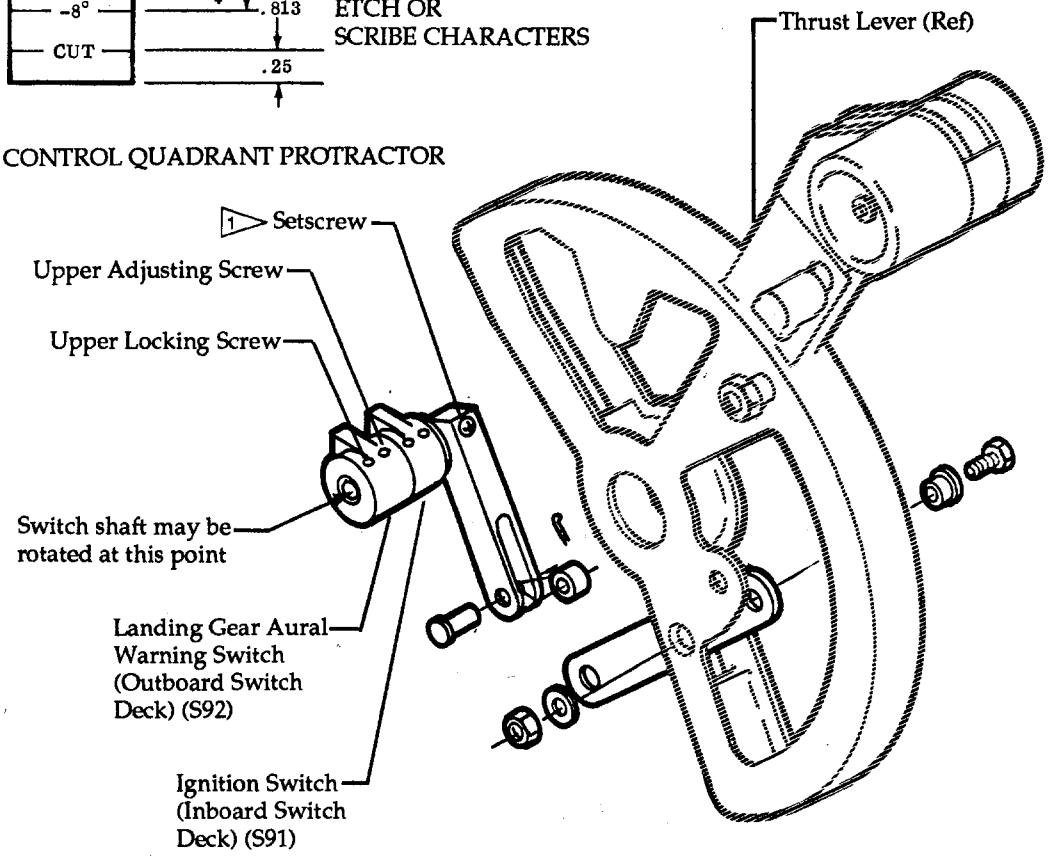
(b) Using a screwdriver, rotate switch shaft CW through actuation range until landing gear and ignition switches open (no continuity between N.O. and C.) and tighten setscrew.



CONTROL QUADRANT PROTRACTOR

NOTE: Fabricate protractor from any desired material per dimensions shown. Bend protractor (3.55 inch radius) to match pedestal.

1 On *Aircraft 35-672 and Subsequent and 36-064 and Subsequent*, the set screw is located on top of lever.



LH SHOWN, RH OPPOSITE

Landing Gear Aural Warning Switch and Ignition Switch Adjustment and Control Quadrant Protractor
Figure 204

(c) Slowly cycle RH thrust lever from CUTOFF to MAX THRUST and return. Verify that:
   1) Landing gear switch (outboard switch deck) is closed (continuity between N.O. and C) between IDLE and 14.5° above IDLE.
   2) Ignition switch (inboard switch deck) is closed (continuity between N.O. and C) between -5° below IDLE and 14.5° above IDLE.

(d) If switches remain actuated beyond 14.5° above IDLE, rotate switch body CCW until switches open.

(e) If switches open before reaching 14.5° above IDLE, rotate switch body CW until switches close.

(f) If landing gear switch actuates below IDLE, loosen upper locking screws and turn upper adjusting screw CW until switch opens.

(g) If landing gear switch actuates above IDLE, loosen upper locking screws and turn upper adjusting screws CCW until switch actuates.

(h) If ignition switch actuates below -5° below IDLE, loosen upper locking screws and turn adjusting screw CCW until switch opens.

(i) If ignition switch actuates above -5° below IDLE, loosen upper locking screws and turn upper adjusting screw CW until switch actuates.

(j) Secure locking screws and verify step (5, c).

(k) Install previously removed pedestal covers and access plugs. (Refer to 76-10-02.)

THROTTLE CABLE - MAINTENANCE PRACTICES

1. CONTROL CABLE HANDLING AND INSTALLATION PRECAUTIONS

A. Maintenance personnel should familiarize themselves with the following precautions before removal or installation of the throttle control cables.

(1) Pliers or similar devices should not be used to grip the control cable.

(2) Wrenches are to be used on wrench flats to prevent twisting of the control cable when torquing jamnuts or attaching hardware.

(3) Minimum bend radius of control cable is five inches in the direction of the arrow on the wrench flat.

(4) Do not attempt bends opposite plane of arrow as cable binding will result and possible damage to the cable could result.

(5) Do not lubricate the control cable.

(6) Do not force sliding member against internal stops.

(7) All clamps should be tigtened firmly. Clamps are for support only and overtightening could result in binding.

(8) Do not force cable connections. Use finger pressure only.

2. REMOVAL/INSTALLATION

NOTE: The following removal and installation procedures are identical for both throttle cables.

A. **Remove Throttle Cable** (Aircraft 35-002 thru 35-071, 35-073 thru 35-079; 36-002 thru 36-020 not equipped with thrust reversers) (See figure 201.)

CAUTION: IT IS EXTREMELY IMPORTANT THAT THROTTLE CABLE BE HANDLED AS A DELICATE INSTRUMENT. BENDING OF CABLE OPPOSITE PLANE OF ARROW COULD RESULT IN DAMAGE TO CABLE AND JAMMING OF THROTTLE.

(1) Lower tailcone access door and remove aircraft batteries.

(2) Remove carpet and center floorboards from aircraft.

(3) Remove engine nacelle lower cowl and pylon access covers.

(4) Remove sealant from throttle cable and guide assembly. On Aircraft 35-064 thru 35-071, 35-073 thru 35-079 and 36-018 thru 36-020, loosen clamps securing cable support halves and remove support halves.

(5) Remove safety wire, bolts, and washers securing power control assembly to engine fuel control unit.

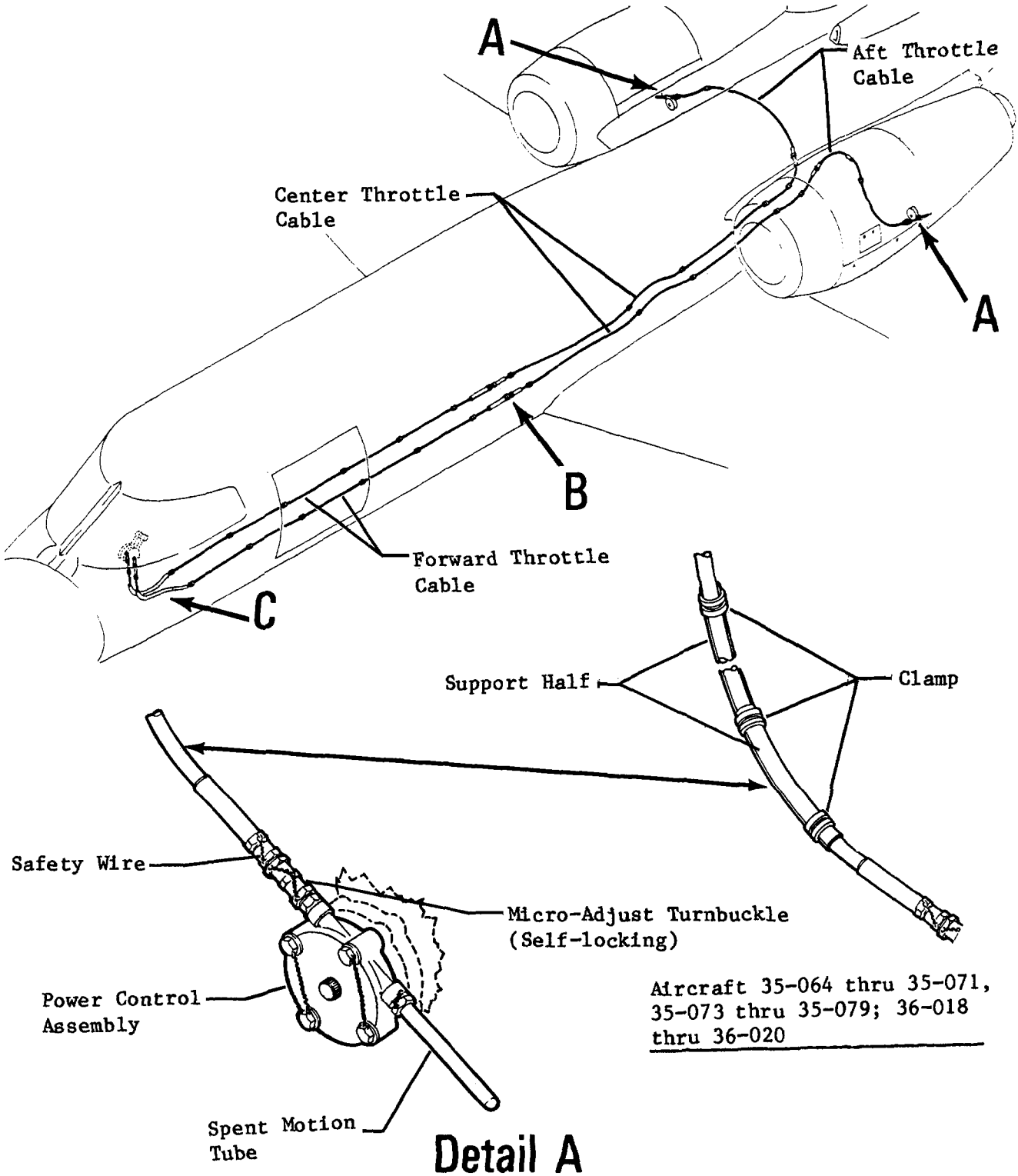
(6) Remove attaching parts and clamp securing cable to engine.

(7) Remove safety wire and disconnect aft cable assembly from center cable assembly at coupling nut.

(8) Remove aft control cable through pylon.

(9) Remove lower access along keel beam to gain access to cable installation.

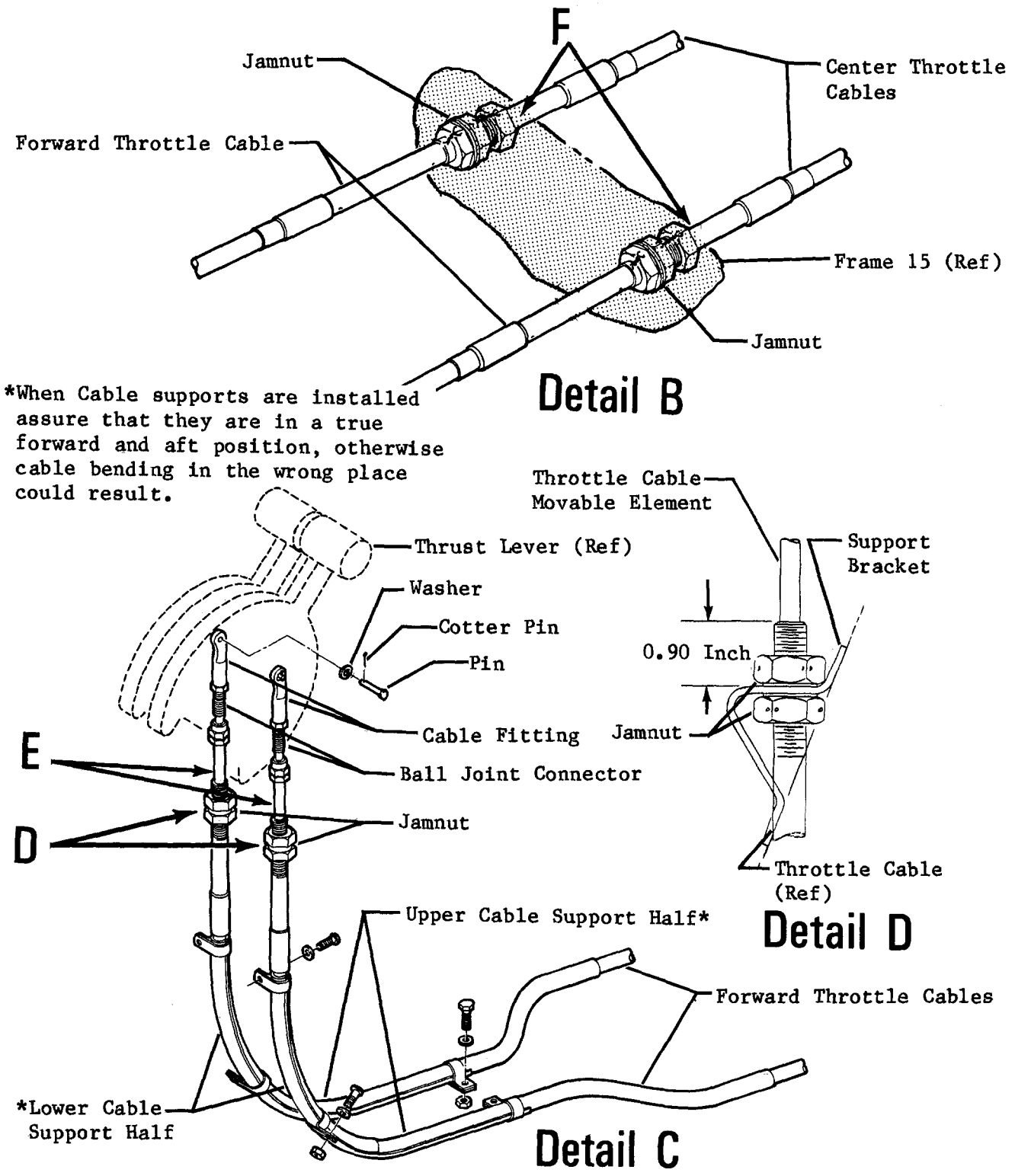
(10) Remove safety wire and loosen coupling nut. Disengage center cable from forward cable.



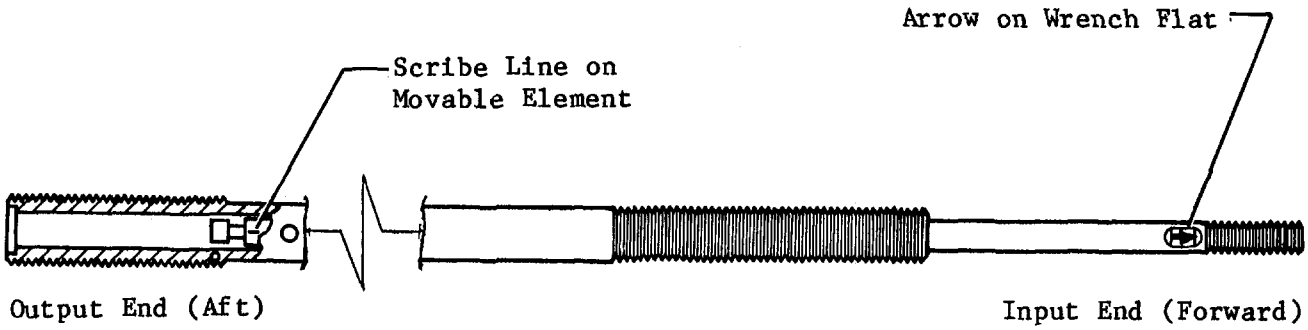
Aircraft 35-064 thru 35-071, 35-073 thru 35-079; 36-018 thru 36-020

Detail A

Throttle Cable Installation
Figure 201 (Sheet 1 of 3)

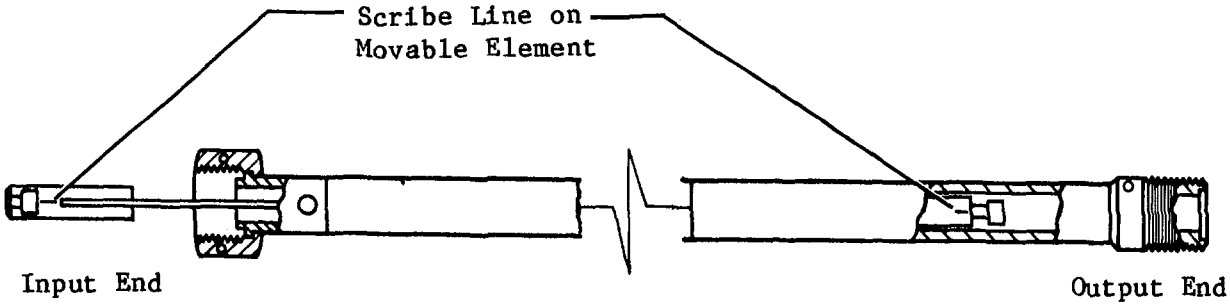


Throttle Cable Installation
Figure 201 (Sheet 2 of 3)



Forward Throttle Cable

Detail E



Center Throttle Cable

Detail F

Throttle Cable Installation
Figure 201 (Sheet 3 of 3)

(11) Remove clamps and center cable from aircraft. Remove center cable by threading cable from aircraft at frame 15.
(12) Loosen and remove jamnuts at frame 15.
(13) Remove equipment from aft pedestal. (Refer to Chapter 31.)
(14) Remove safety wire; loosen and remove upper jamnut.
(15) Remove attaching parts, clamps and upper and lower support halves from cable.
(16) Remove cotter pin, spacer and pin securing cable end fitting to clutch adapter.
(17) Remove ball joint connector upper jamnut from cable.
(18) Remove attaching parts and clamps securing cable at frames 9, 11, 13, 13D, 13B and 14.
(19) At frame 15, pull cable forward sufficiently to allow removal of remaining jamnut.
(20) Insert cable through frame 15 after jamnut is removed and remove cable from aircraft through frame 15 until forward end of cable clears pedestal.
(21) Remove remaining jamnut at forward end of cable.
(22) Remove cable from aircraft.

B. Install Throttle Cable (Aircraft 35-002 thru 35-071, 35-073 thru 35-079; 36-002 thru 36-020; not equipped with thrust reversers) (See figure 201.)

CAUTION: WHEN ROUTING CONTROL CABLE, ASSURE THAT ARROW OR WRENCH FLAT FACES UP (TOWARD CABIN ROOF). THIS WILL ASSURE THAT THE CABLE BEND WILL BE IN THE DIRECTION OF THE ARROW WHEN CABLE IS INSERTED IN PEDESTAL.

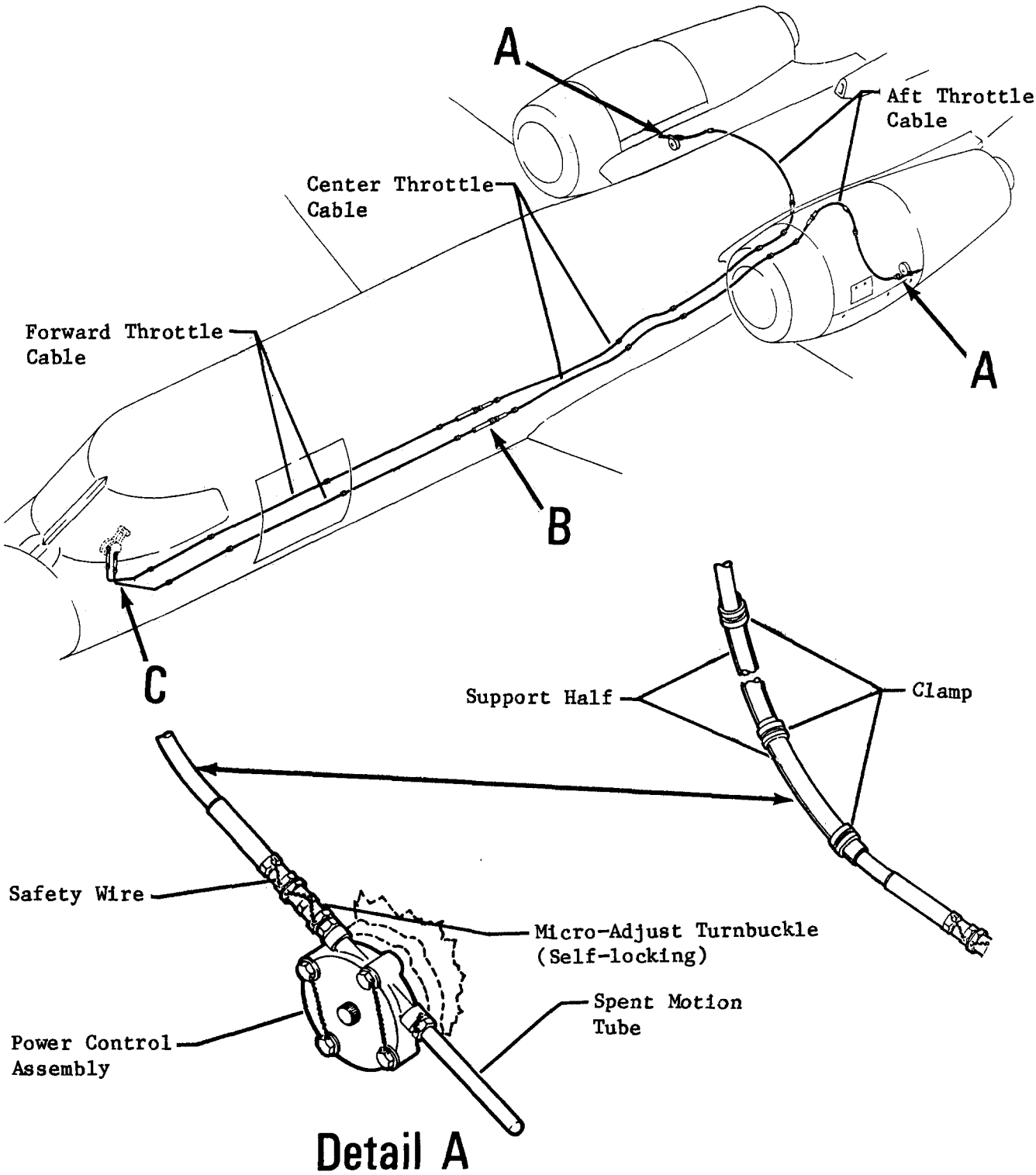
(1) Install forward cable by routing cable through frame 15 forward to control pedestal.
(2) Install one jamnut on forward end of cable and insert cable through pedestal support structure.
(3) Install remaining jamnut and ball joint connector. Do not tighten at this time.
(4) Pull end of forward cable through frame 15 keeping in mind the direction of bend. Install jamnut and insert cable back through frame 15.
(5) Install remaining jamnut on forward cable. Do not tighten jamnuts at this time. Install clamps and secure throttle cable to aircraft structure.
(6) Install center cable assembly by feeding cable aft from frame 15. Allow aft end of center cable to lie flat across tailcone access opening.
(7) Assure that scribe marks are aligned, engage movable element of forward and center cable assemblies, and secure with coupling nut.
(8) Adjust jamnuts at forward end of cable to obtain 0.90 inch dimension. (See detail D.)
(9) Tighten jamnuts and safety wire.
(10) Install ball joint connector on end of movable portion of cable; ensure maximum thread engagement. Tighten jamnuts and install safety wire.

(11) Set thrust lever to CUTOFF and position throttle cable so that ball joint jamnuts are seated on cable housing.
(12) Install cable end fitting and adjust until hole in end fitting is 0.12 inch from alignment with hole in clutch adapter. Tighten jamnut and install safety wire.
(13) Extend movable portion of cable and connect end fitting to clutch adapter with attaching parts.
(14) Install upper and lower cable supports.
(15) Install aft cable by routing cable through pylon from engine compartment. Clamp cable in position.
(16) With aft end of center cable lying flat across tailcone access door, pull movable portion of aft cable from its housing sufficiently to allow connection to center cable while in a flat plane.
(17) Engage movable portions of center and aft cable.
(18) Feed movable portion of aft cable back into its housing, thus forming upward bend in center cable.
(19) When center cable is in position, secure center and aft cables with coupling nut. Install safety wire on coupling nut.
(20) Adjust throttle control system. (See 76-10-00.)
(21) Secure cable and support halves with clamps.
(22) Install spent motion tube and safety wire.
(23) Install safety wire on micro-adjust turnbuckle.
(24) Install nylon screw to cover rigging hole.
(25) Apply sealant to both ends of pylon cable guide assembly.
(26) Install all previously removed access panels, floorboards, carpet, and nacelle cowls.
(27) Install aircraft batteries and close tailcone access door.

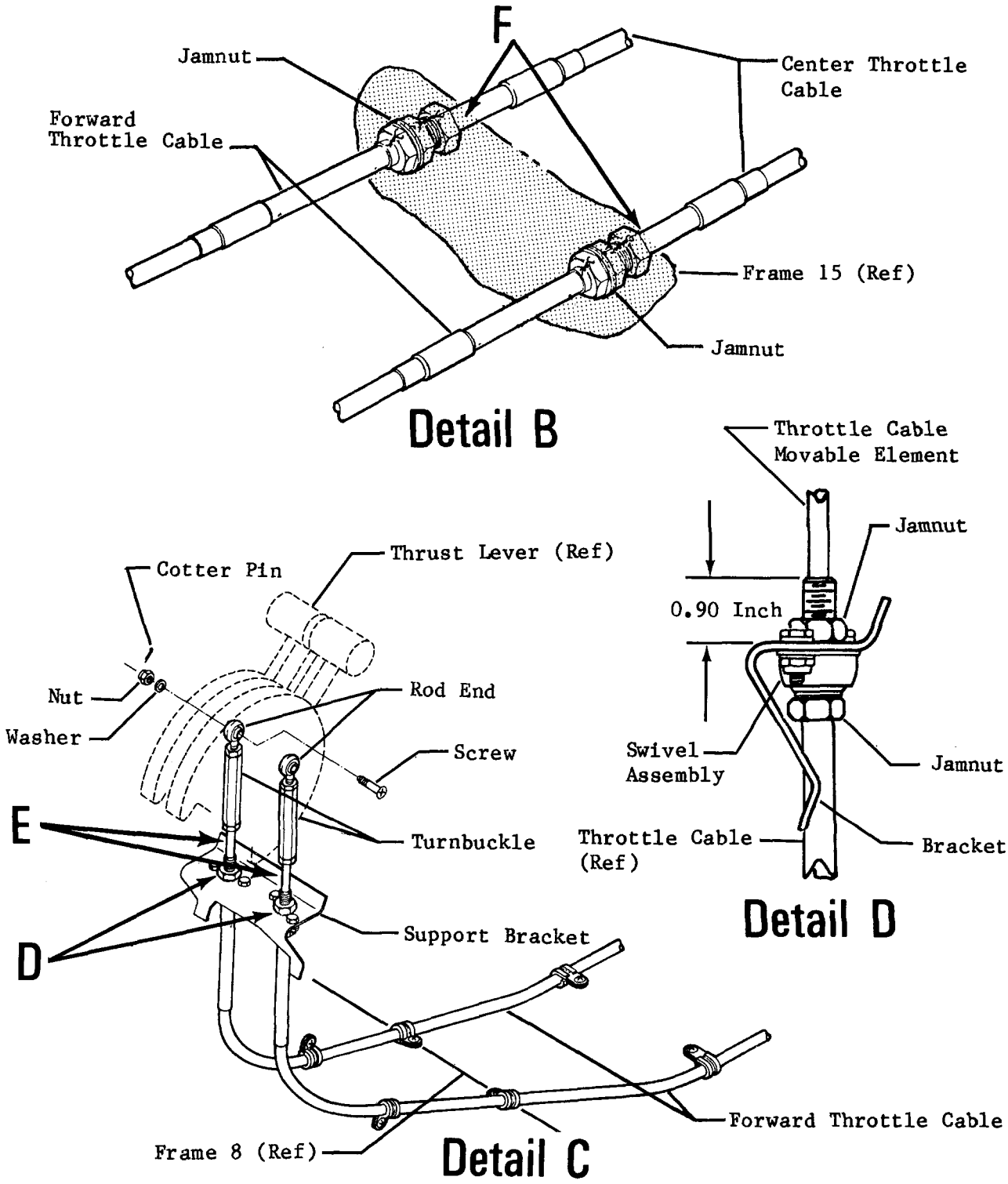
C. **Remove Throttle Cable** (Aircraft 35-072, 35-080 thru 35-122, 35-124 thru 35-136; 36-021 thru 36-034 not equipped with thrust reversers) (See figure 202.)

CAUTION: IT IS EXTREMELY IMPORTANT THAT THROTTLE CABLE BE HANDLED AS A DELICATE INSTRUMENT. BENDING OF CABLE OPPOSITE PLANE OF ARROW COULD RESULT IN DAMAGE TO CABLE AND JAMMING OF THROTTLE.

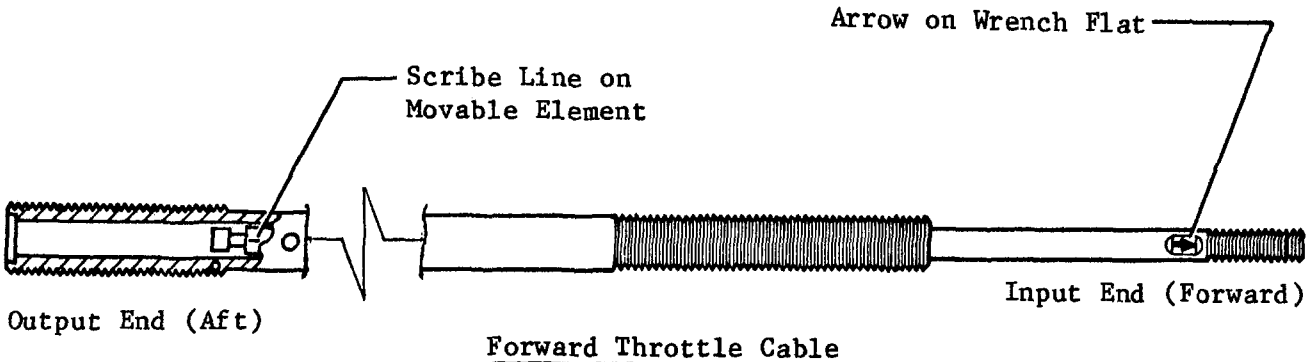
(1) Open tailcone access door and remove batteries from aircraft. (Refer to Chapter 24.)
(2) Remove carpet and center floorboards from aircraft.
(3) Remove engine nacelle lower cowl and pylon access covers.
(4) Remove sealant from throttle cable and guide assembly, loosen clamps securing cable support halves, and remove support halves.
(5) Remove safety wire, bolts, and washers that secure power control assembly to engine fuel control unit.
(6) Remove attaching parts and clamps that secure control cable to engine.
(7) Remove safety wire from coupling nut and disconnect aft cable asesmbly from center cable assembly.
(8) Remove aft control cable by threading control from tailcone out through pylon.



Throttle Cable Installation
Figure 202 (Sheet 1 of 3)

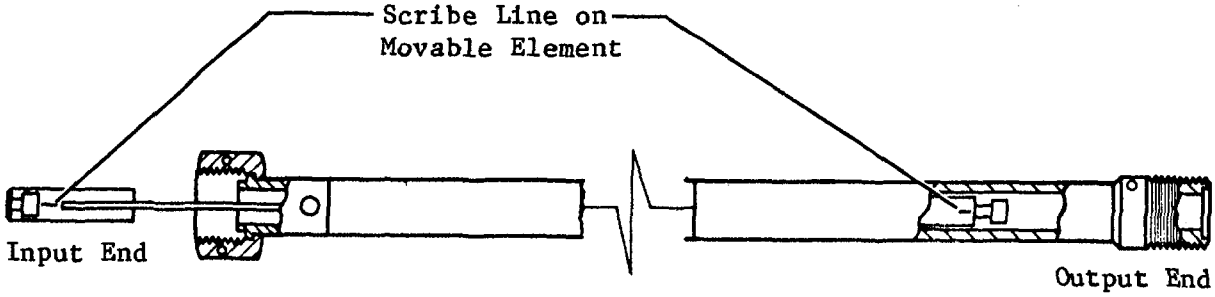


Throttle Cable Installation
Figure 202 (Sheet 2 of 3)



Forward Throttle Cable

Detail E



Center Throttle Cable

Detail F

Throttle Cable Installation
Figure 202 (Sheet 3 of 3)

(9) Remove lower access panels along keel beam to gain access to center cable installation.
(10) Remove attaching parts and clamps securing center control cable.
(11) Remove safety wire and loosen coupling nuts. Disengage center control from forward control cable.
(12) Remove center control cable from aircraft by threading cable forward and out lower side of fuselage at frame 15.
(13) Remove equipment as required from aft pedestal to gain access to forward control cable installation.
(14) Remove safety wire and loosen lower turnbuckle jamnut. Remove turnbuckle between throttle quadrant rod end and threaded end of movable element in forward throttle cable.
(15) Remove safety wire and loosen and remove upper jamnut securing forward end of control cable to cable support assembly.
(16) Remove floorboards to gain access to forward control cable.
(17) Remove attaching parts and clamps securing forward control cable.
(18) Remove safety wire and jamnut from aft side of frame 15.
(19) Pull control forward through frame 15 just far enough to allow removal of remaining jamnut.
(20) Remove remaining jamnut and feed cable back through frame 15.
(21) Feed cable through frame until forward end of cable is clear of swivels in the pedestal support bracket.
(22) Remove remaining jamnut from forward end of control cable.
(23) Remove cable by threading cable aft through frame 15 and out lower side of aircraft.

D. **Install Throttle Cable** (Aircraft 35-072, 35-080 thru 35-122, 35-124 thru 35-136; 36-021 thru 36-034; not equipped with thrust reversers) (See figure 202.)

CAUTION: WHEN ROUTING CONTROL CABLE, ASSURE THAT ARROW ON WRENCH FLAT FACES UP (TOWARD CABIN ROOF). THIS WILL ASSURE THAT CABLE BEND WILL BE IN DIRECTION OF ARROW WHEN CABLE IS INSERTED IN PEDESTAL.

(1) Install forward control cable by routing cable through frame 15 forward to center pedestal.
(2) Pull aft end of cable through frame 15 and install jamnut, and install cable back through frame 15. Install jamnut on aft side of frame 15 and tighten jamnuts.
(3) Beginning at frame 15, work forward cable into position and clamp lightly. Allow cable to rotate internally during process.
(4) Install jamnut on forward end of forward cable and run jamnut down as far as possible.
(5) Install forward end of forward cable through support bracket and swivel assembly and install a second jamnut on forward end of forward cable.
(6) Adjust jamnuts until 0.90-inch dimension (figure 202, detail D) is obtained, then secure jamnuts.

(7) Install center cable by routing cable aft from frame 15 into tailcone area.
(8) Ensure that scribe marks are aligned and engage movable elements of forward and center cables. Secure coupling nut on center cable and install safety wire.
(9) Starting at frame 15, work center cable into position and clamp lightly. Allow cable to rotate internally during process.
(10) Install jamnut on threaded end of movable element (forward cable).
(11) Install turnbuckle between threaded end of movable element and throttle quadrant rod end. Adjust turnbuckle to obtain a 4.10-inch dimension between rod end attach hole and lower turnbuckle jamnut.

CAUTION: ENSURE THAT STOPS ON QUADRANT ASSEMBLY PREVENT BALL BEARING CABLE FROM BOTTOMING ON ITS INTERNAL STOPS.

(12) Secure turnbuckle jamnuts and install safety wire.
(13) Install aft cable assembly by routing cable through pylon from engine compartment. Clamp cable into position.

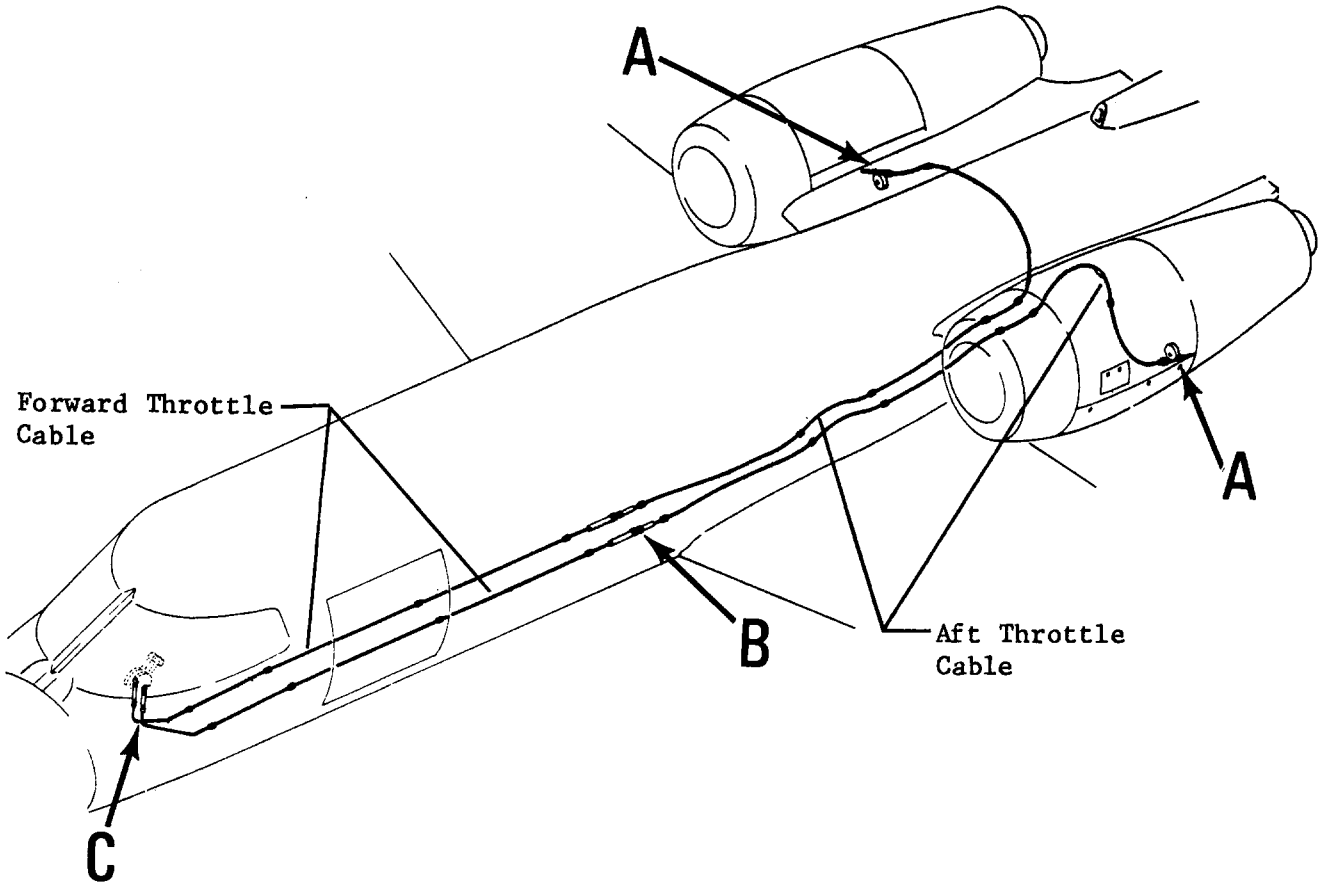
NOTE: Maintain a straight line between cable and control box for approximately 3 inches.

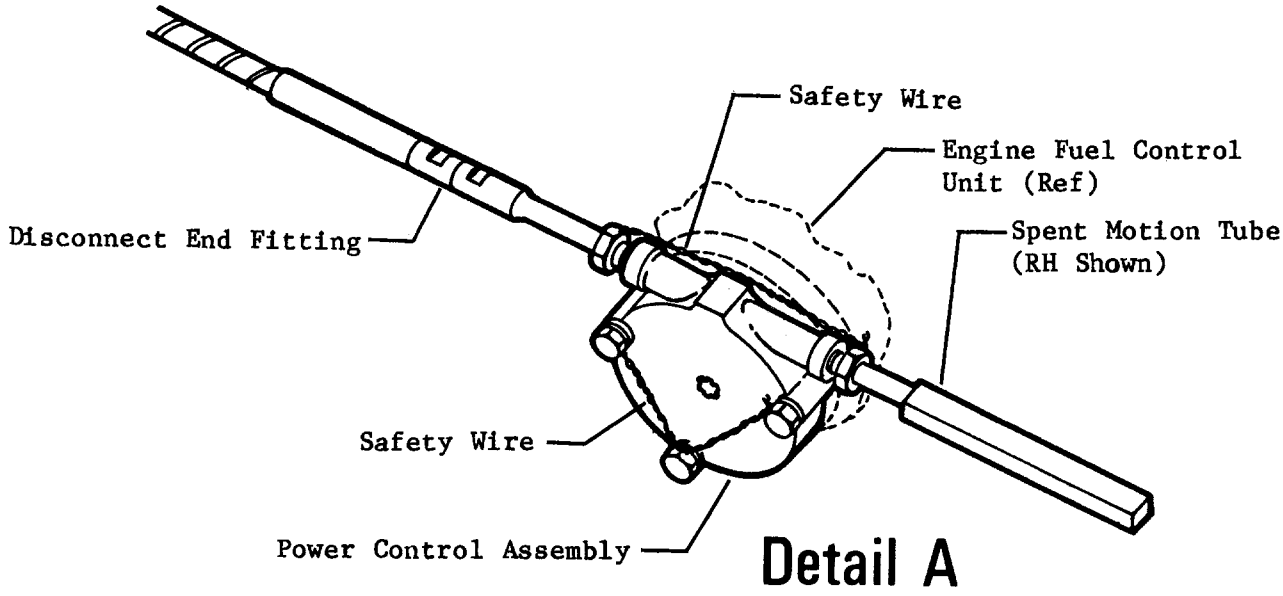
(14) Ensure that scribe line on movable element of center cable is up when center cable is flat. Engage moving elements of center and aft cables, secure cables with coupling nut and safety wire.
(15) Adjust throttle control system (76-10-00).
(16) Install spent motion tube and safety wire.
(17) Install safety wire on micro-adjust turnbuckle.
(18) Install nylon screw in rigging pin hole.
(19) Apply sealant to both ends of cable guide assembly.
(20) Install all previously removed access panels, floorboards, carpets and nacelle covers.
(21) Install aircraft batteries and close tailcone access door.

E. Remove Throttle Cable (Aircraft 35-123, 35-137 and subsequent, 36-035 and subsequent, and prior aircraft equipped with thrust reversers) (See figure 203.)

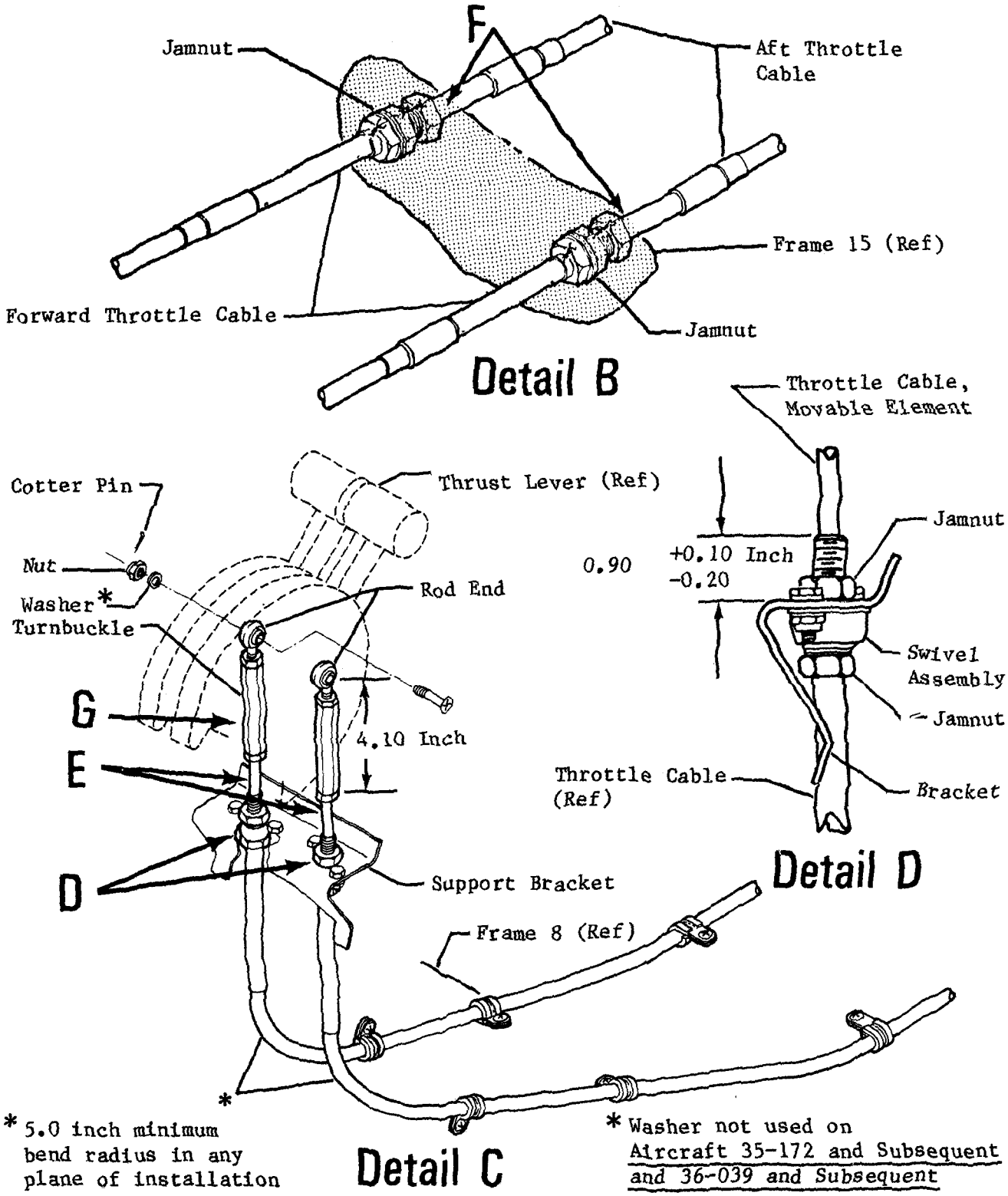
CAUTION: IT IS EXTREMELY IMPORTANT THAT THROTTLE CABLE BE HANDLED AS A DELICATE INSTRUMENT. BENDING OF CABLE OPPOSITE THE ARROW COULD RESULT IN DAMAGE TO THE CABLE AND JAMMING OF THE THROTTLE.

(1) Lower tailcone access door and remove batteries from aircraft. (Refer to Chapter 24.)
(2) Remove lower access panels along keel beam to gain access to throttle cables.
(3) Remove lower engine nacelle cover and pylon access covers.
(4) Remove carpet and center floorboards from aircraft.





Throttle Cable Installation
Figure 203 (Sheet 1 of 4)

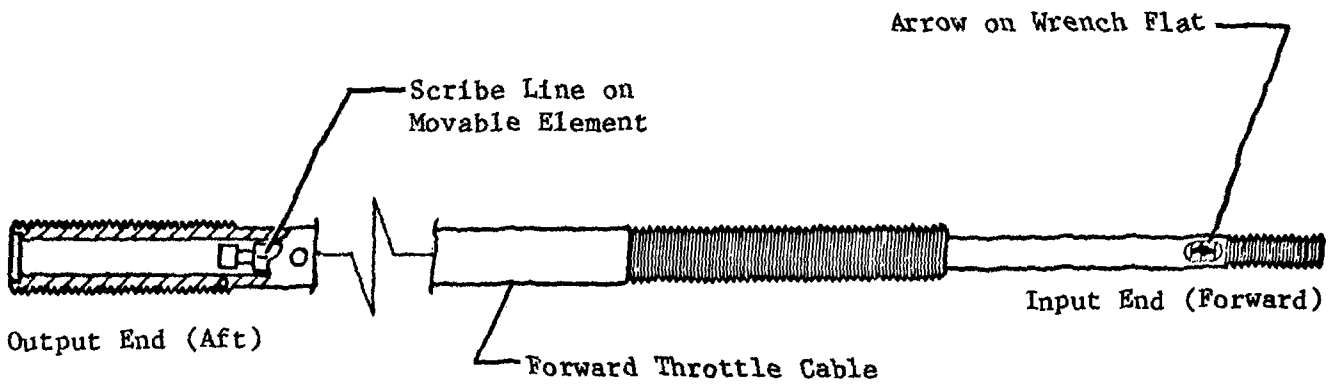


* 5.0 inch minimum bend radius in any plane of installation

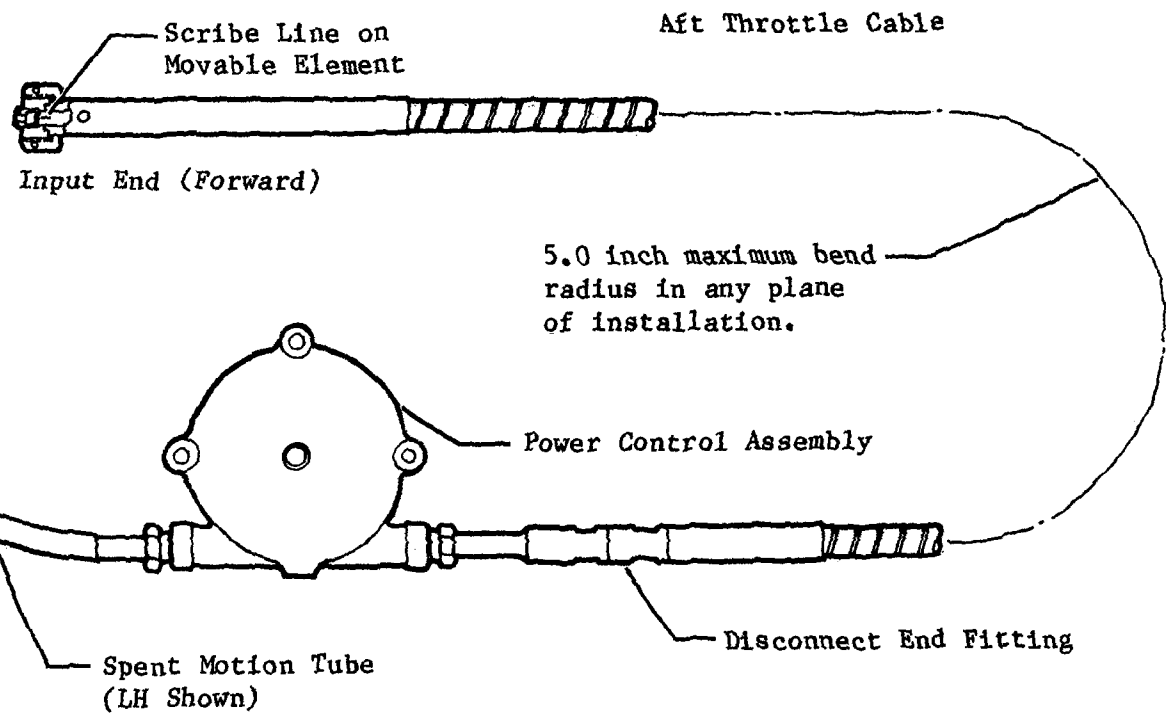
* Washer not used on Aircraft 35-172 and Subsequent and 36-039 and Subsequent

7-31C-2

Throttle Cable Installation
Figure 203 (Sheet 2 of 4)



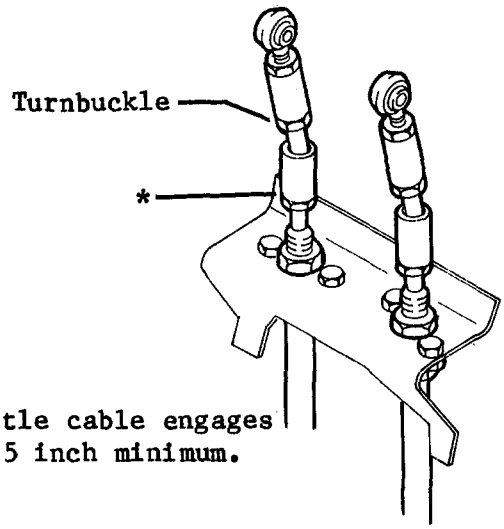
Detail E



Detail F

Throttle Cable Installation
Figure 203 *(Sheet 3 of 4)*

EFFECTIVITY: **35-123, 35-137 and Subsequent**
36-035 and Subsequent and prior aircraft
MM-99
Disk 525



*Ensure that throttle cable engages in turnbuckle 0.35 inch minimum.

Aircraft 35-166 and Subsequent and 36-039 and Subsequent

Detail G

Throttle Cable Installation
Figure 203 (Sheet 4 of 4)

(5) Remove equipment from aft pedestal as required to gain access to forward control cable installation.
(6) Remove sealant from throttle cable guide assembly where cable enters nacelle.
(7) Remove safety wire, bolts, and washers securing power control box to engine.
(8) Remove power control assembly from aft throttle cable at the disconnect end fitting. Disconnect helix-wound cable in control box assembly from movable element in aft throttle cable assembly.
(9) Loosen all clamps that secure throttle cables to aircraft.
(10) Remove safety wire from coupling nut at frame 15 and disconnect aft throttle cable from forward throttle cable.
(11) Remove aft throttle cable from aircraft by threading cable forward and out lower side of fuselage at frame 15.
(12) Remove safety wire and loosen lower turnbuckle jamnut. Remove turnbuckle between throttle quadrant rod end and threaded end of movable element in forward throttle cable.
(13) Remove safety wire and jamnut from aft side of frame 15.
(14) Pull throttle cable forward through frame 15 just far enough to allow removal of remaining jamnut.
(15) Remove remaining jamnut and feed cable back through frame 15.
(16) Remove upper jamnut that secures forward end of throttle cable to support bracket and swivel assembly.
(17) Feed cable through frame 15 until forward end of cable is clear of support bracket and swivel assembly.
(18) Remove remaining jamnut from forward end of throttle cable.
(19) Remove throttle cable by threading cable through frame 15 and out of keel beam access openings.

F. Install Throttle Cable (Aircraft 35-123, 35-137 and subsequent, 36-035 and subsequent, and prior aircraft equipped with thrust reversers) (See figure 203.)

CAUTION: WHEN ROUTING CONTROL CABLES, ASSURE THAT ARROW ON WRENCH FLAT FACES UP (TOWARD CABIN ROOF). THIS WILL ASSURE THAT CABLE BEND WILL BE IN DIRECTION OF ARROW WHEN CABLE IS INSERTED IN PEDESTAL. BENDING OF CABLE OPPOSITE PLANE OF ARROW COULD RESULT IN BINDING AND DAMAGE TO CABLE. MINIMUM BEND RADIUS IN ANY PLANE OF INSTALLATION SHALL BE 5.0 INCHES.

(1) Install forward cable by routing cable through frame 15 forward to center pedestal.
(2) Pull aft end of forward cable through frame 15 and install jamnut; install cable back through frame 15. Install jamnut on aft side of frame 15 and tighten jamnuts.
(3) Beginning at frame 15, work forward cable into position and clamp lightly. Allow cable to rotate internally during process.
(4) Install jamnut on forward end of forward cable and run jamnut down as far as possible.

(5) Install forward end of forward cable through support bracket and swivel assembly and install a second jamnut on forward end of forward cable.
(6) Adjust jamnuts until 0.90 (+0.10/-0.20) inch dimension (figure 203, detail D) is obtained, then secure jamnuts.
(7) Remove power control assembly from aft throttle cable at disconnect end fitting. Disconnect helix-wound cable in power control assembly from movable element in throttle cable assembly.
(8) Install aft throttle cable by routing cable aft from frame 15, through keel beam, tailcone, and pylon into nacelle.
(9) Ensure that scribe marks are aligned on inside of cable bend. Engage movable elements of forward and aft cables. Secure coupling nut on aft cable and install safety wire.
(10) Install jamnut on threaded end of movable element (forward cable).
(11) Install turnbuckle between threaded end of movable element and throttle quadrant rod end. *On Aircraft 35-123, 35-137 thru 35-165 and 36-035 thru 36-038*, adjust turnbuckle to obtain 4.10 inch nominal dimension between rod end attach hole and lower turnbuckle jamnut. *On Aircraft 35-166 and Subsequent and 36-039 and Subsequent*, ensure that rod engages in lower end of turnbuckle 0.35 inch minimum.

CAUTION: WRENCHES SHALL BE USED ON WRENCH FLATS OF END FITTINGS AND TERMINAL ENDS TO PREVENT TWISTING OF CABLE WHEN TORQUING NUTS OR ATTACHING HARDWARE. CHECK TO ENSURE THAT STOPS ON QUADRANT ASSEMBLY PREVENT BALL BEARING CABLE FROM BOTTOMING ON ITS INTERNAL LIMITS.

(12) Secure turnbuckle jamnuts and install safety wire.
(13) Beginning at frame 15, work aft cable into position and clamp tightly. Allow cable to rotate internally during process.
(14) Connect helix-wound cable in power control assembly to movable element in aft throttle cable and install power control assembly on aft throttle cable.
(15) Adjust throttle control system. (Refer to 76-10-00.)
(16) Install spent motion tube and safety wire.
(17) Install safety wire on turnbuckle at control quadrant.
(18) Install nylon screw in rigging pin hole.
(19) Apply sealant to both ends of cable guide assembly.
(20) Install all previously removed access panels, floorboards, carpets, and nacelle cowls.
(21) Install aircraft batteries and close tailcone access door.

3. APPROVED REPAIRS

A. Moisture Dryout Procedure (Teleflex Control Cable only)

NOTE: When a Teleflex control cable is found to be difficult or impossible to move, preferred action is removal of the control cable assembly and its return to Teleflex Aerospace for examination and repair.

(1) Gain access to control cable assembly as required per applicable procedures under step 2. Removal/Installation, this section.
(2) Disconnect suspect control cable at each end.
(3) Remove any seal nuts, boots, or other devices covering opening at control cable ends.

WARNING: **DO NOT USE MOISTURE DISPLACING PRODUCTS OR LIGHTWEIGHT OIL TO ACCOMPLISH MOISTURE REMOVAL OR TO REPLACE LUBRICATION, DAMAGE MAY RESULT TO CONTROL CABLE ASSEMBLY AND FLIGHT SAFETY MAY BE JEOPARDIZED.**

(4) Obtain a source of dry nitrogen with a two-stage regulator and a pressure gage calibrated from 0 to 25 psig.
(5) Connect a length of rubber hose (of appropriate inside diameter to snuggly fit over control cable end and nitrogen regulator) between one end of control cable and nitrogen source.

NOTE: Ensure that the equipment used to introduce nitrogen into control cable is clean and free of any foreign matter.

CAUTION: **DRY NITROGEN MUST FLOW THROUGH THE CONTROL CABLE TO BE EFFECTIVE. DO NOT EXCEED 5 PSIG OF PRESSURE OR DAMAGE TO CONTROL CABLE MAY RESULT.**

(6) Induce flow of nitrogen through control cable at a pressure not to exceed 5 psig. Maintain nitrogen flow for a period of one hour. Ensure that nitrogen exists at opposite (open) end of control cable.
(7) Turn off nitrogen source and remove rubber hose from control cable.
(8) Evaluate control cable operation. If operation is satisfactory, install control cable. If operation is not satisfactory, replace control cable.

WARNING: **DO NOT USE MOISTURE DISPLACING PRODUCTS OR LIGHTWEIGHT OIL TO ACCOMPLISH MOISTURE REMOVAL OR TO REPLACE LUBRICATION, DAMAGE MAY RESULT TO CONTROL CABLE ASSEMBLY AND FLIGHT SAFETY MAY BE JEOPARDIZED.**

(9) Clean and install all items previously removed from control cable ends.
(10) Reconnect control cable ends.
(11) Perform Adjustment/Test of Throttle Control System. (Refer to 76-10-00.)
(12) Install items previously removed to gain access to control cable assembly.
(13) Restore aircraft to normal.

1. REMOVAL/INSTALLATION

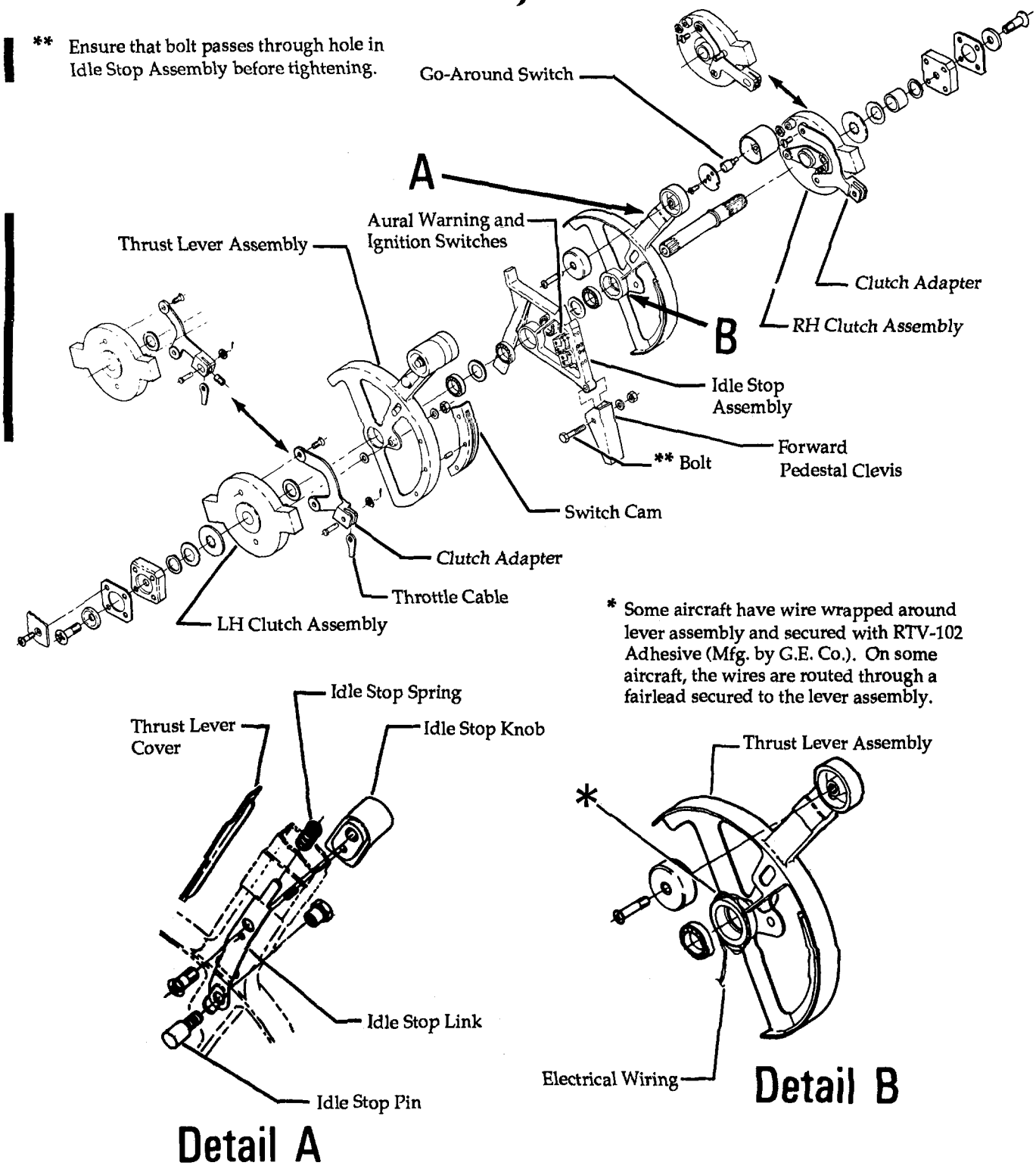
NOTE: The following removal/installation procedures apply to aircraft not equipped with thrust reversers. Refer to Chapter 78 for thrust reverser throttle quadrant maintenance practices.

A. Remove Throttle Quadrant (See figure 201.)
   (1) Remove electrical power from aircraft.
   (2) Remove pilot's and copilot's crew seats.
   (3) Remove left and right side panels from pedestal.
   (4) Remove top forward pedestal panel.
   (5) Remove emergency brake control knob.
   (6) Remove flap switch control knob.
   (7) Remove flap switch position indicator.
   (8) Disconnect go-around switch electrical connector.
   (9) Remove thrust lever knobs and go-around switch.
   (10) On *Aircraft 35-067 and subsequent and 36-018 and subsequent*, remove engine synchronizer switches from support bracket.
   (11) On *Aircraft 35-002 thru 35-071, 35-073 thru 35-079 and 36-002 thru 36-020*, remove landing gear aural warning and ignition switches from switch mount on idle stop assembly.
   (12) On *Aircraft 35-002 thru 35-009 and 36-002 thru 36-006*, remove throttle switch from switch mount.
   (13) Remove attaching parts and idle stop assembly from pedestal structure.
   (14) On *Aircraft 35-072, 35-080 and subsequent and 36-021 and subsequent*, remove aural warning and ignition switch actuator arms from control links.
   (15) Remove attaching parts and throttle cables from clutch adapters or output links.
   (16) Remove pedestal cover.
   (17) Remove attaching parts and throttle quadrant from pedestal, making certain not to damage electrical wiring.

B. Install Throttle Quadrant (See figure 201.)

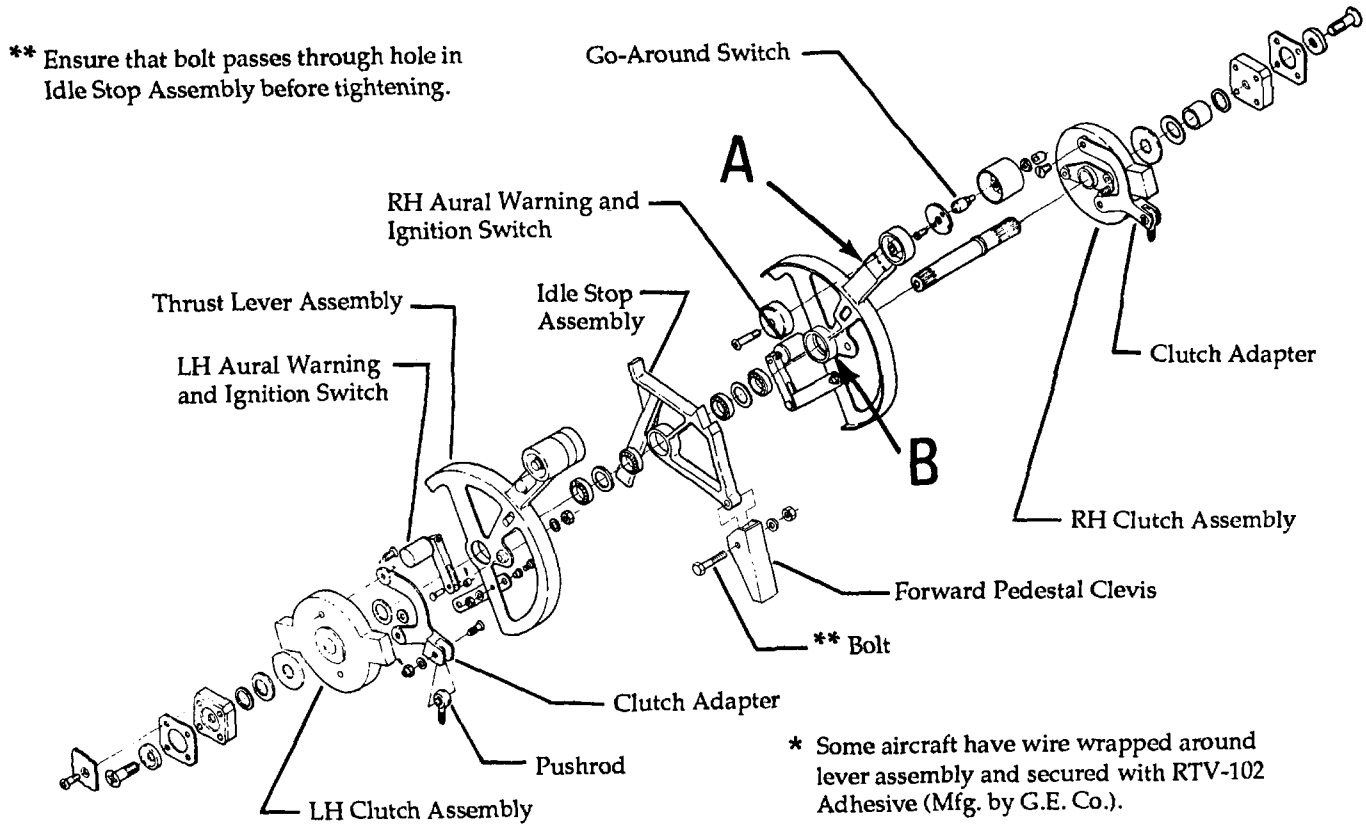
NOTE: When installing throttle quadrant assembly, ensure that bolt through forward pedestal clevis also passes through hole in idle stop assembly (*Aircraft 35-002 thru 35-453 and 36-002 thru 36-050*) or fixed cam and idle stop assembly (*Aircraft 35-454 and subsequent and 36-051 and subsequent*).

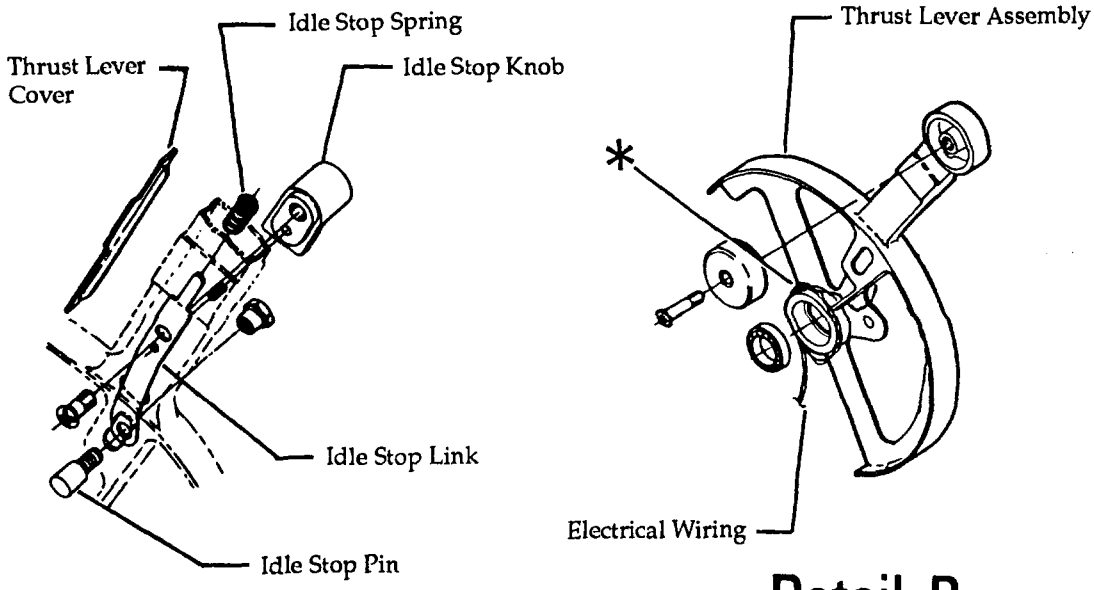
   (1) Install throttle quadrant in pedestal and secure with attaching parts.
   (2) Install pedestal cover and secure with attaching parts.
   (3) Install throttle cables on clutch adapters or output links and secure with attaching parts.
   (4) On *Aircraft 35-072, 35-080 and subsequent, and 36-021 and subsequent*, install aural warning and ignition switch actuator arms on control links.
   (5) Install idle stop assembly on pedestal structure and secure with attaching parts.
   (6) On *Aircraft 35-002 thru 35-071, 35-073 thru 35-079, and 36-002 thru 36-020*, install aural warning and ignition switches on switch mount on idle stop assembly and secure with attaching parts.



2-12C-1
A2-12C-2

Throttle Quadrant Assembly
Figure 201 (Sheet 1 of 4)





2-12C-1
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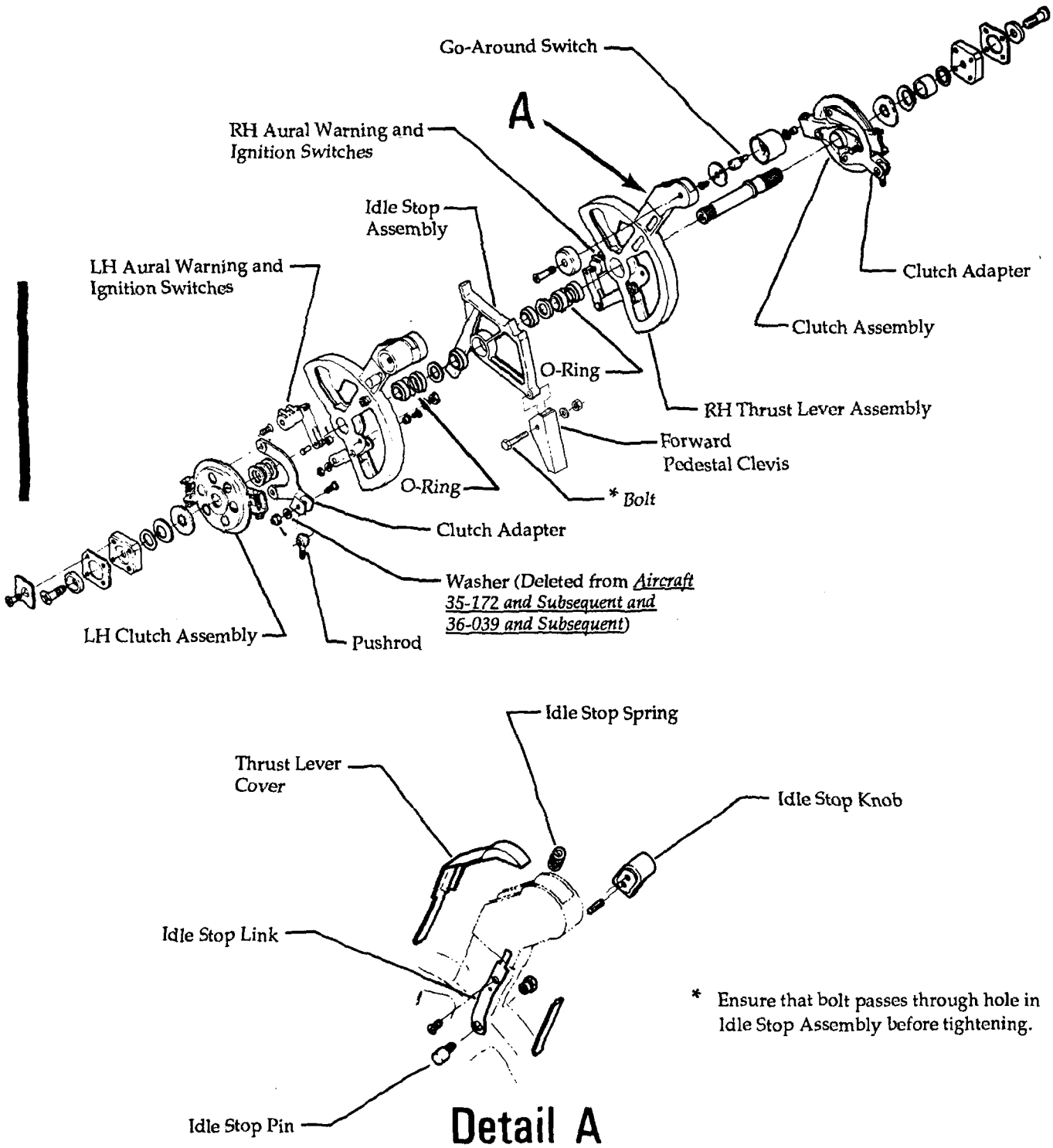
Throttle Quadrant Assembly
Figure 201 (Sheet 2 of 4)



2-12C-1
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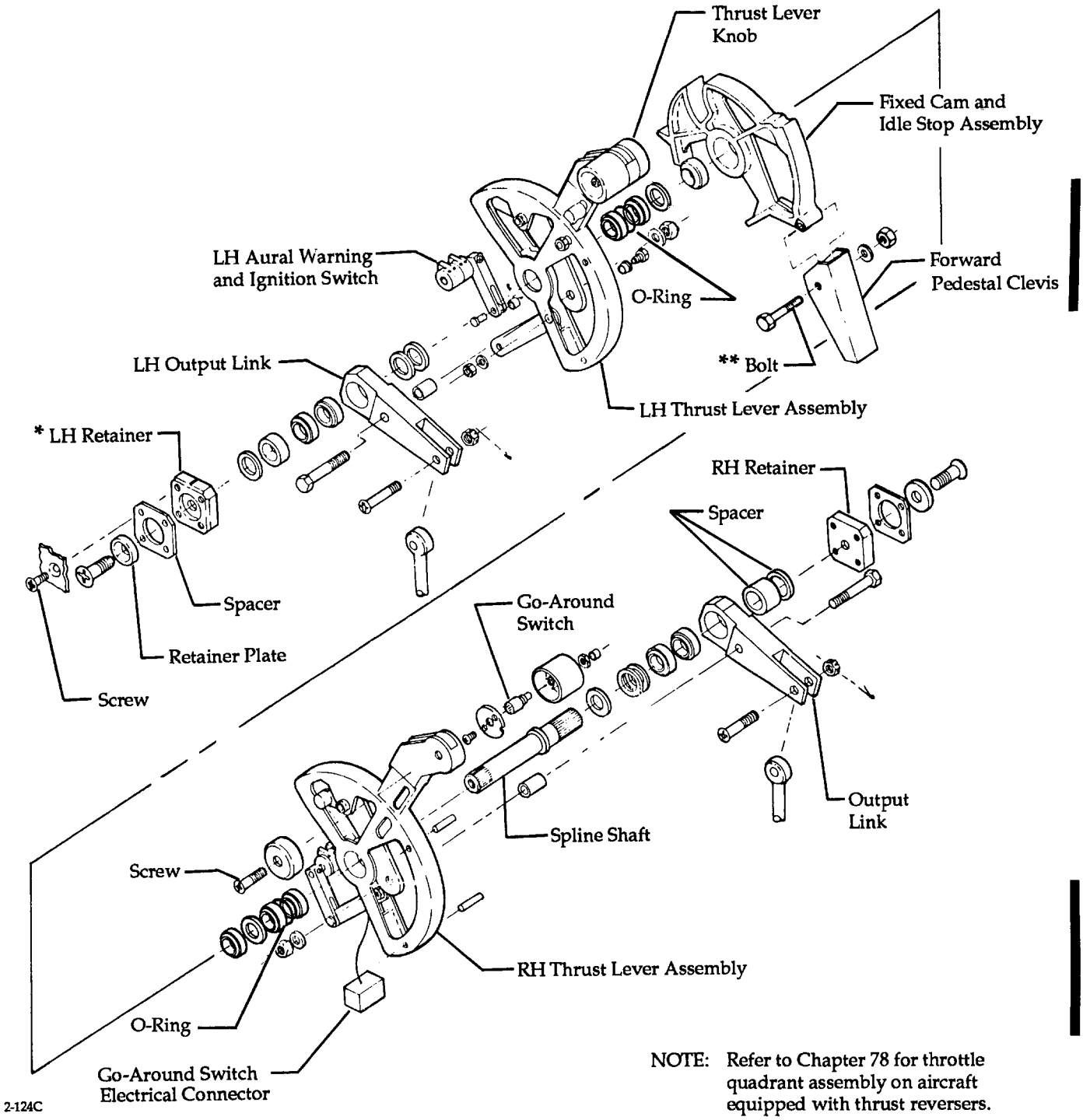
Throttle Quadrant Assembly
Figure 201 (Sheet 3 of 4)



NOTE: Refer to Chapter 78 for throttle quadrant assembly on aircraft equipped with thrust reversers.

Throttle Quadrant Assembly
Figure 201 (Sheet 4 of 4)

EFFECTIVITY: 35-454 AND SUBSEQUENT AND 36-051 AND SUBSEQUENT
NOT EQUIPPED WITH THRUST REVERSERS

(7) On *Aircraft 35-002 thru 35-009 and 36-002 thru 36-006*, install throttle switch on switch mount and secure with attaching parts.
(8) On *Aircraft 35-067 and Subsequent and 36-018 and Subsequent*, install engine synchronizer switches on support bracket and secure with attaching parts.
(9) Install go-around switch and thrust lever knobs.
(10) Connect go-around switch electrical connector.
(11) Install flap switch position indicator.
(12) Install flap switch control knob.
(13) Install emergency brake control knob.
(14) Install top forward pedestal panel.
(15) Install left and right side panels on pedestal.
(16) Install pilot's and copilot's crew seats.
(17) Restore electrical power to aircraft.

FUEL COMPUTER - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The LH and RH fuel computers are installed in the tailcone equipment section between FS 524 and FS 542 (frames 28 and 29). A drain valve is installed for each computer and is used to drain moisture that may accumulate in the PT_2 sense line. On Aircraft 35-002 thru 35-573, 35-575 thru 35-579 and 35-589 thru 35-609; 36-002 thru 36-053 and 36-055, the drain valves used in the fuel computer sense lines are the same type used in the pitot and static systems. (Refer to Chapter 34 for drain valve maintenance practices.) On Aircraft 35-574, 35-580 thru 35-588 and 35-610 and Subsequent and 36-054, 36-056 and Subsequent, refer to 76-11-01 for drain valve maintenance practices. Both fuel computers are controlled by switches on the pilot's switch panel.

B. The fuel computers must be adjusted if replaced or if an engine is changed.

2. OPERATION

A. The electronic fuel computers perform governing, limiting, and scheduling functions in response to engine inputs and flight conditions. For further information on the engine power controls, refer to the Engine Maintenance Manual.

FUEL COMPUTER - MAINTENANCE PRACTICES

1. Removal/Installation

CAUTION: WHENEVER THE FUEL COMPUTER IS REMOVED OR REPLACED, AN HF RADIO RADIATION INTERFERENCE TEST MUST BE PERFORMED. (REFER TO CHAPTER 23.)

A. Remove Fuel Computer (See Figure 201.)
   (1) Open tailcone access door.
   (2) Remove safety wire and disconnect electrical connector from computer.
   (3) Disconnect PT2 sense line from computer. Cap exposed openings.
   (4) Loosen hold-down clamps and remove computer from aircraft.

B. Install Fuel Computer (See Figure 201.)
   (1) Install fuel computer and secure with hold-down clamps.

CAUTION: ON *AIRCRAFT MODIFIED PER AAK 76-4, "DRAG CHUTE INSTALLATION"*, THE PT2 MOISTURE DRAIN VALVE LINE MUST BE TRIMMED FLUSH WITH AIRCRAFT SKIN.

   (2) Remove caps and connect PT2 sense line.
   (3) Connect electrical connector to computer. Hand tighten electrical connectors sufficient to ensure that connectors are properly seated and safety wire.
   (4) Perform leakage test of PT2 sense lines and fuel computers.
   (5) Perform Radio Radiation Interference Test. (Refer to Chapter 23.)
   (6) Close tailcone access door.

2. Adjustment/Test

A. Leak Test PT2 Sense Lines and Fuel Computer

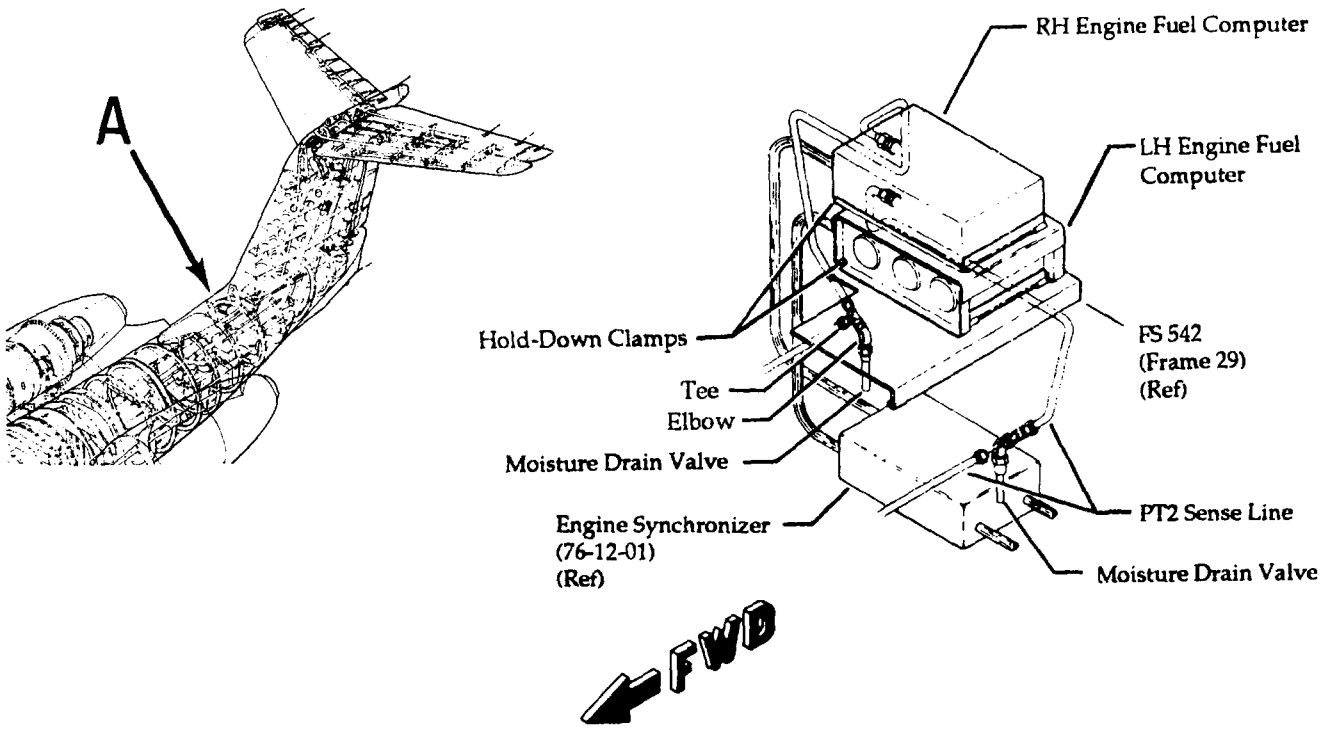
NOTE: Perform the PT2 sense line leakage test when any connections between fuel computer and PT2 sensor have been disconnected, when either component has been replaced, or when a leak in the PT2 sense line is suspected. Test each side separately.

   (1) Ensure that all lines are properly installed between fuel computer and PT2 sensor.
   (2) Disconnect PT2 sense line at PT2 sensor and at fuel computer. Cap sense line opening in PT2 sensor and fuel computer to prevent contamination of either component. Plug fuel computer end of PT2 sense line with 0.25 inch aluminum tubing plug and torque 40 to 65 inch-pounds.
   (3) Attach pitot-static test set (Barfield 1811 F or equivalent) to PT2 sensor end of PT2 sense line.

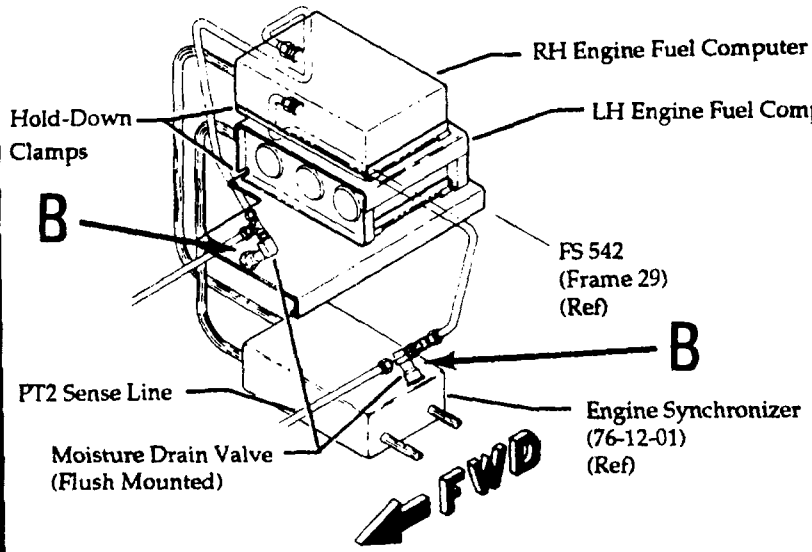
CAUTION: RATE OF PRESSURE APPLICATION SHOULD NOT INCREASE MORE THAN 20 KNOTS PER SECOND AS INDICATED BY AIRSPEED INDICATOR ON PITOT-STATIC TEST SET.

   (4) Slowly apply pressure to test setup with pitot-static test set, until airspeed indicator on test set indicates 450 knots. Stabilize test setup pressure at 450 knots and close pressure valve on test set.
   (5) Pressure should not drop more than one knot per minute as indicated by airspeed indicator on test set.

CAUTION: RATE OF PRESSURE APPLICATION SHOULD NOT DECREASE MORE THAN 20 KNOTS PER SECOND AS INDICATED BY AIRSPEED INDICATOR ON PITOT-STATIC TEST SET.

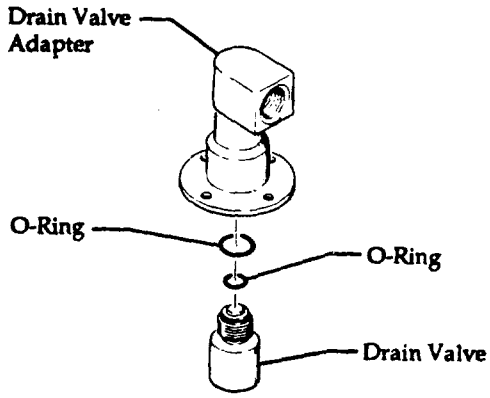


(Aircraft 35-002 thru 35-573, 35-575 thru 35-579, 35-589 thru 35-609, 36-002 thru 36-053, and 36-055)



(Aircraft 35-574, 35-580 thru 35-588, 35-610 and Subsequent, 36-054, 36-056 and Subsequent)

Detail A



Detail B

A12-51D

Fuel Computer Installation
Figure 201

EFFECTIVITY: NOTED

(6) Depressurize test setup.
(7) If PT2 sense line pressure loss is greater than one knot per minute, prepare a leak test soap solution and apply to each fitting of PT2 sense line and around connections of pitot-static test set.

WARNING: DO NOT ATTEMPT TO TIGHTEN LEAKING FITTINGS WITH TEST SET-UP PRESSURIZED AS FITTINGS MAY BREAK, INJURING PERSONNEL AND DAMAGING INSTRUMENTS AND AIRCRAFT.

CAUTION: RATE OF PRESSURE APPLICATION SHOULD NOT INCREASE MORE THAN 20 KNOTS PER SECOND AS INDICATED BY AIRSPEED INDICATOR ON PITOT-STATIC TEST SET.

(8) Pressurize test setup to 450 knots and observe each connection for signs of leaks (bubbles).

CAUTION: RATE OF DEPRESSURIZATION SHOULD NOT DECREASE MORE THAN 20 KNOTS PER SECOND AS INDICATED BY AIRSPEED INDICATOR ON PITOT-STATIC TEST SET.

(9) Depressurize test setup, clean soap solution from PT2 sense line, and retighten fittings. Repeat steps (2) thru (8) until leakage is less than one knot per minute.
(10) Remove plug from fuel computer and connect PT2 sense line to computer with PT2 sensor end of line connected to pitot-static test set.

CAUTION: RATE OF PRESSURE APPLICATION SHOULD NOT INCREASE MORE THAN 20 KNOTS PER SECOND AS INDICATED BY AIRSPEED INDICATOR ON PITOT-STATIC TEST SET.

(11) Slowly apply pressure to test setup until airspeed indicator on pitot-static test set indicates 350 knots. Allow test setup pressure to stabilize at 350 knots and close pitot-static test set pressure valve.
(12) Test setup pressure drop shall be less than five knots in five minutes as indicated on airspeed indicator on pitot-static test set.

CAUTION: RATE OF DEPRESSURIZATION SHOULD NOT DECREASE MORE THAN 20 KNOTS PER SECOND AS INDICATED BY AIRSPEED INDICATOR ON PITOT-STATIC TEST SET.

(13) Slowly depressurize test setup.

CAUTION: DO NOT OVERTORQUE PT2 SENSE LINE FITTINGS.

(14) If pressure loss is more than five knots in five minutes, retighten fuel computer attach fitting. Do not overtighten. Repeat steps (10) thru (14) until pressure loss is within tolerance.
(15) Remove pitot-static test set pressure line from PT2 sense line.
(16) Remove cap from PT2 sensor and install sense line.
(17) Torque tubing fittings 40 to 65 inch-pounds.
(18) Remove test equipment from aircraft.

B. Electronic Fuel Computer Specific Gravity Adjustment (See Figure 202.)

WARNING: ENGINE SURGES MAY OCCUR IF SPECIFIC GRAVITY ADJUSTMENT IS NOT SET TO POSITION LISTED FOR TYPE OF FUEL BEING USED.

(1) If Engine Log Book contains specific gravity setting requirements for each approved fuel, follow Engine Log Book.
(2) If a specific gravity setting requirement for each approved fuel is not entered in Engine Log Book, the following specific gravity settings are required for different fuels being used.

NOTE: Recommended setting of fuel adjustment for various fuels is listed in Figure 202. Clockwise movement of fuel adjustment knob will decrease (shorten) engine acceleration time. Counterclockwise movement of fuel adjustment knob will increase (lengthen) engine acceleration time. Excessive clockwise adjustment is undesirable since it may result in engine compressor instability (surge) during rapid power lever advance. Excessive counterclockwise adjustment is also undesirable in that it may reduce engine acceleration capability to an undesirable extent and may result in lean blowout.

Jet A, Jet A-1, and JP-5 .....Position 5*
Jet B and JP-4 .....Position 6*
50% or More AvGas.....Position 7*

* A fuel adjustment setting of up to one click in either direction from recommended fuel adjustment (Figure 202) is allowable to compensate for individual engine characteristics or installation effects.

(3) If computer adjustments are necessary, open tailcone access door and gain access to electronic fuel computer.
(4) If required, install specific gravity adjustment knob.

NOTE: On some aircraft, specific gravity adjustment knob is stowed in fly-away kit.

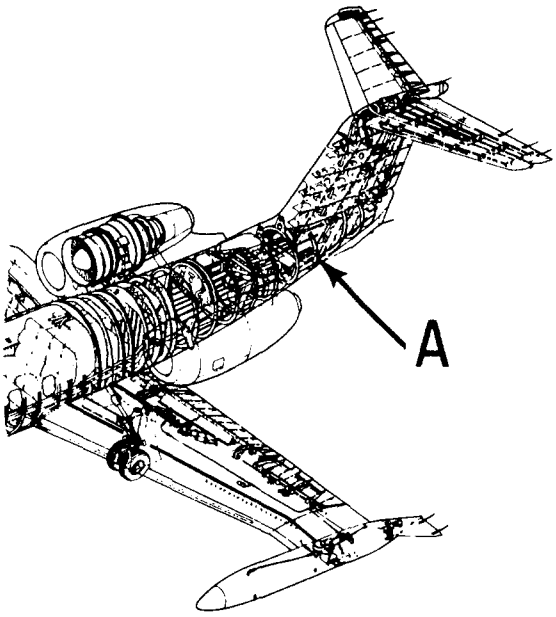
(5) Turn knob to desired specific gravity setting.
(6) If required, remove knob and stow in fly-away kit.
(7) Enter specific gravity setting in Engine Log Book for future reference.
(8) Close tailcone access door.

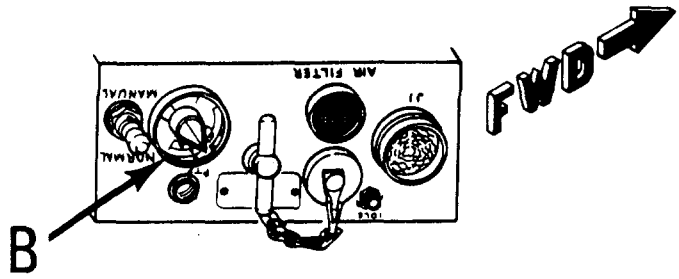
C. Functional Test of Fuel Computer-Procedure A (See Figure 203.) (Refer to step 2.D. for Alternate Procedure B.)
(1) Tools and Equipment

NAME	PART NUMBER	MANUFACTURER	USE
Multimeter	Model 260	Simpson Electric Co. Elgin, IL	Circuit test.
25 ft. Test Cable Assembly - AWG 20 wire		Fabricate Locally	To mate with fuel computer.

NOTE: The following test applies to LH and RH fuel computers.

(2) Gain access to fuel computers and remove electrical power from aircraft.
(3) Uncap fuel computer J2 electrical receptacle and connect test assembly to fuel computer J2 receptacle.
(4) Measure resistance, using ohmmeter, between the following pins on test assembly.
(a) Manual mode solenoid: connect + lead to pin 22 and - lead to pin 25. Resistance shall be 45 (±5) ohms.

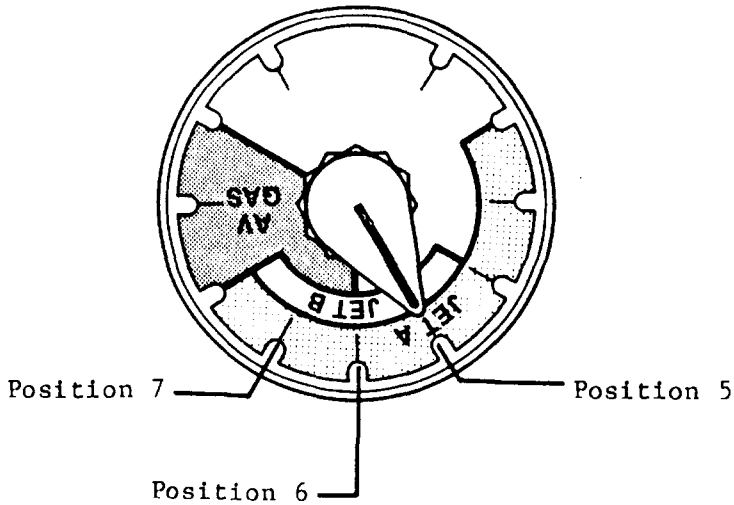




(FUEL COMPUTER CONTROLS)

(AS VIEWED FROM TAILCONE)

Detail A



Detail B

Electronic Fuel Computer Specific Gravity Settings
Figure 202

(b) Overspeed solenoid: connect + lead to pin 1 and - lead to pin 25. Resistance shall be 45 (±5) ohms.
(c) 50 percent speed switch: connect + lead to pin 4 and - lead to pin 2. Resistance shall be 270 to 30K ohms maximum.
(d) Bleed valve solenoid (A): Resistance between pins 22 and 21 shall be 40 (±5) ohms.
(e) Bleed valve solenoid (B): Resistance between pins 22 and 19 shall be 40 (±5) ohms.
(f) N1 monopole: Resistance at 70° (±20°)F between pins 7 and 25 shall be 125 (±25) ohms with Skurka transducer or 145 (±20) ohms with Garrett transducer.
(g) N2 monopole: Resistance between pins 9 and 25 shall be 1050 (+250) ohms.

(5) Measure voltage between the following pins on test cable assembly. Restore electrical power to aircraft and set Fuel Computer Switches to L and R.
(a) Set applicable thrust lever to IDLE. Voltage between pins 8 and 25 shall be -3 (±1.0) vdc.
(b) Set applicable thrust lever to MAX THRUST. Voltage between pins 53 and 25 shall be 5 (±1) vdc.
(c) Set thrust lever to IDLE. Voltage between pins 34 and 25 shall be -3 (±1) vdc decreasing to -5 (±1) vdc as lever is moved from IDLE to MAX.

NOTE: Perform steps (d), (e), and (f) with engines running.

(d) Set thrust lever to IDLE. Voltage between pins 19 and 25 shall be 1.5 (±0.5) vdc. Voltage between pins 21 and 25 shall be 28 (+4.0, -10.0) vdc.
(e) Set thrust lever above IDLE. Voltage between pins 19 and 25 shall be 28 (+4, -10) vdc. Voltage between pins 21 and 25 shall be 1.5 (±0.5) vdc.
(f) When ITT reads above 204°C, voltage between pins 25 and 35 shall be -2.5 (±1.0) vdc and voltage between pins 25 and 38 shall be -2.5 (±1.0) vdc.
(g) Disconnect test cable assembly.

(6) If computer readings are not within specified limits, replace computer.
(7) Connect electrical connector to fuel computer and close tailcone access door.

D. Functional Test of Fuel Computer-Procedure B
(1) Tools and Equipment

NAME	PART NUMBER	MANUFACTURER	USE
GTEC Tester	316688-1-1	Garrett Turbine Engine Company	Verify circuits.
GTEC Breakout Box	916718-1	Garrett Turbine Engine Company	Identify faulty circuits.

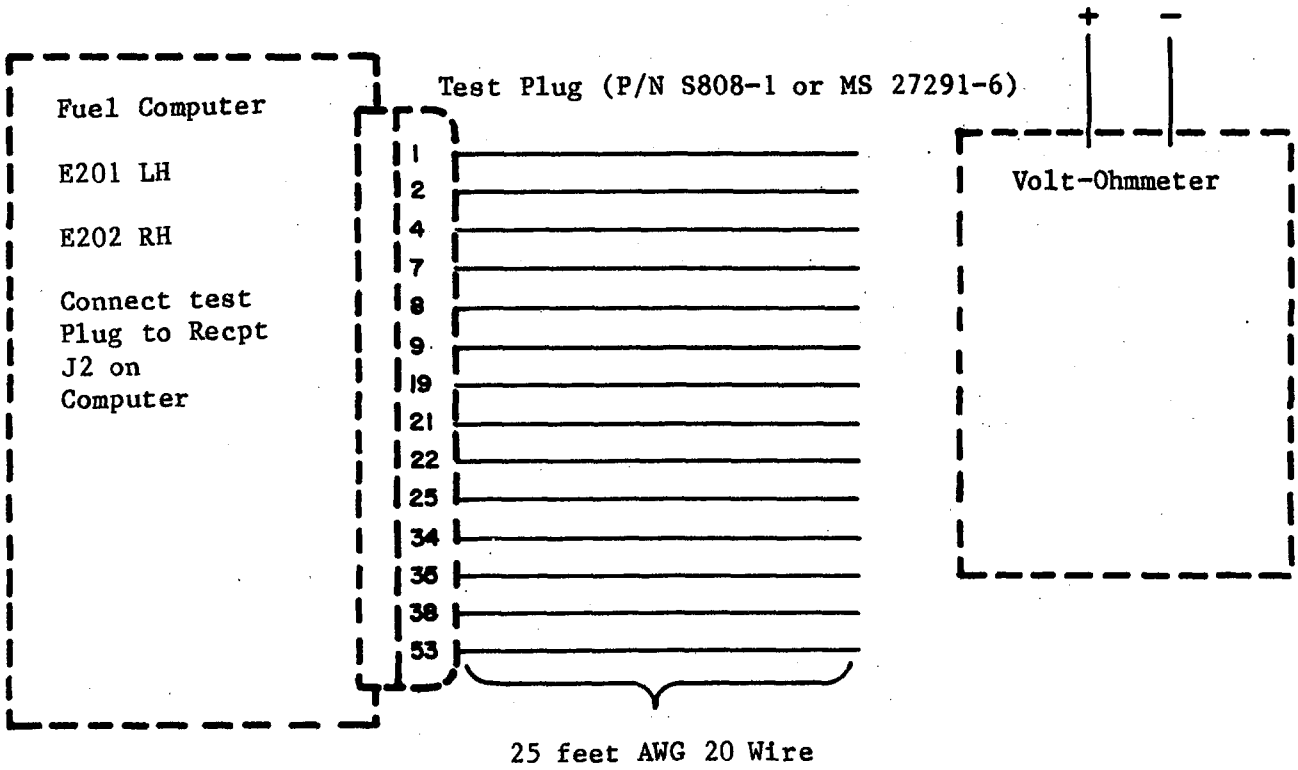
(2) Gain access to fuel computers and remove electrical power from aircraft.
(3) Install tester in place of LH computer.
(4) Restore power to aircraft, set SPR Switch on pilot's switch panel to OFF, and set LH Fuel Computer Switch to L.

NOTE: All fault lamps on tester may be illuminated prior to step (5).

(5) Depress RESET on tester.

NOTE: Faults are indicated by sonalert (while a fault exists) and by a latched indicator lamp. Lamps will remain latched until RESET is depressed again.

(6) If tester circuit or lamp integrity is in doubt, induce a fault by depressing button adjacent to indicator lamp and observe lamp and sonalert.



CAUTION: **DO NOT CONNECT WIRES TO PINS NOT DESIGNATED. AVOID SHORTING OR GROUNDING.**

Fuel Computer Test Cable Assembly
Figure 203

(7) Investigate and correct any faulty condition prior to installing LH computer. Do not overlook grounded wires as a cause for a fault.

NOTE:
- The GTEC breakout box, when connected in place of the tester, permits direct access to the faulty circuit.
- Refer to Table 201 for normal resistance values.

(8) Remove electrical power from aircraft and install LH computer.
(9) Repeat steps D.(3) thru D.(8) using RH computer.
(10) If computer readings are not within specified limits, replace computer.

Circuit	Pins of GTEC Breakout Box P/N 916718-1	Resistance (ohms)
SOL A	Pins 3 - 49	40 ± 5
SOL B	Pins 15 - 16	40 ± 5
M/M	Pins 35 - 55	45 ± 5
O/S	Pins 1 - 2	45 ± 5
T.M.	Pins 24 - 25 & 26 - 27	200
T5	Pins 33 - 34	Less than 20
T2	Pins 10 - 11	550
P/L	Pins 18 - 19	20K
Flight Descent	Pins 13 - 18	5K
SPR Switch Off	Pins 28 - 29	Open
N1	Pins 6 - 7	See Note
N2	Pins 8 - 9	1050 ± 250
50 % (45 %) Speed Sw.	Pins 45 - 50	270 to 30K

NOTE: 160 (±30) ohms at 70 (±20) °F with Garrett Transducer installed.
125 (±25) ohms at 70 (±20) °F with Skurka Transducer installed.

Normal Resistance Values
Table 201

3. Inspection/Check

A. Inspect Fuel Computer Air Filter
(1) The engine manufacturer recommends that fuel computer air filter be cleaned and/or replaced at certain engine operation intervals.
(2) Refer to Engine Maintenance Manual for cleaning procedures and current inspection intervals.

B. Functional Check of Fuel Computer ITT Signal Portion of Wiring Harness

NOTE: Perform functional check in accordance with the current inspection interval specified in Chapter 5.

(1) On *Aircraft 35-002 thru 35-066 and 36-002 thru 36-017 not modified per AAK 86-5, "Replacement of Interstage Turbine Temperature (ITT) Harness Connectors"*, disconnect electrical connectors and verify wiring continuity as follows:
(a) P357-33 to P107-A, continuity.
(b) P357-34 to P107-B, continuity.
(c) P358-33 to P108-A, continuity.

(d) P358-34 to P108-B, continuity.
(e) P357-33 to P107-B, no continuity.
(f) P358-33 to P108-B, no continuity.
(g) Connect electrical connectors P107 and P108. Verify that no continuity exists between P357-33, P357-34, P358-33 and P358-34 and aircraft ground.

(2) On *Aircraft 35-002 thru 35-066 and 36-002 thru 36-017 modified per AAK 86-5, "Replacement of Interstage Turbine Temperature (ITT) Harness Connectors"*, disconnect electrical connectors and verify wiring continuity as follows:
(a) P357-33 to P107-2, continuity.
(b) P357-34 to P107-1, continuity.
(c) P358-33 to P108-2, continuity.
(d) P358-34 to P108-1, continuity.
(e) P357-33 to P107-1, no continuity.
(f) P358-33 to P108-1, no continuity.
(g) Connect electrical connectors P107 and P108. Verify that no continuity exists between P357-33, P357-34, P358-33 and P358-34 and aircraft ground.

(3) On *Aircraft 35-067 and Subsequent and 36-018 and Subsequent not modified per AAK 86-5, "Replacement of Interstage Turbine Temperature (ITT) Harness Connectors"*, disconnect electrical connectors and verify wiring as follows:
(a) P925-33 to P107-A, continuity.
(b) P925-34 to P107-B, continuity.
(c) P926-33 to P108-A, continuity.
(d) P926-34 to P108-B, continuity.
(e) P925-33 to P107-B, no continuity.
(f) P926-33 to P108-B, no continuity.
(g) Connect electrical connectors P107 and P108. Verify that no continuity exists between P925-33, P925-34, P926-33 and P926-34 and aircraft ground.

(4) On *Aircraft 35-067 and Subsequent and 36-018 and Subsequent modified per AAK 86-5, "Replacement of Interstage Turbine Temperature (ITT) Harness Connectors"*, disconnect electrical connectors and verify wiring as follows:
(a) P925-33 to P107-2, continuity.
(b) P925-34 to P107-1, continuity.
(c) P926-33 to P108-2, continuity.
(d) P926-34 to P108-1, continuity.
(e) P925-33 to P107-1, no continuity.
(f) P926-33 to P108-1, no continuity.
(g) Connect electrical connectors P107 and P108. Verify that no continuity exists between P925-33, P925-34, P926-33 and P926-34 and aircraft ground.

4. Approved Repairs

A. Drain Valve O-ring Replacement (See Figure 201.)
(1) Insert a 0.375 square head socket in drain valve adapter and unscrew drain valve from drain valve adapter.
(2) Depress drain valve to expose O-ring.
(3) Remove O-ring from drain valve plunger.
(4) Inspect drain valve plunger groove for scratches, burrs, or foreign matter.
(5) Install new O-ring on plunger.
(6) Check condition of remaining drain valve O-ring, replace if necessary.
(7) Insert drain valve in drain valve adapter and tighten.
(8) Perform leak test of PT2 sense lines and fuel computers. (Refer to Adjustment/Test, this section.)

ENGINE SYNCHRONIZER SYSTEM - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The engine synchronizer system includes the following components:

(1) An engine synchronizer installed in the tailcone at FS 542, adjacent to the fuel computers.

(2) An Engine Synchronizer Switch and a Synchronizer Selector Switch. Both switches are located on the pedestal adjacent to the thrust levers.

(3) A synchronizer indicator located on the pilot's instrument panel.

(4) An ENG SYNC annunciator (amber) on the glareshield warning light panel.

(5) A LH or RH FUEL CMPTR circuit breaker which supplies 28 vdc to the synchronizer system when the LH or RH Fuel Computer Switches are set to L or R.

B. The system increases or decreases RH engine fan (N_1) or turbine (N_2) speed to correspond to LH engine speed.

2. OPERATION

A. The engine synchronizer is controlled by the Engine Synchronizer Switch, which controls +28 vdc power to the system, and by the Synchronizer Select Switch, which selects engine tachometer outputs, fan speed (N_1), or turbine speed (N_2) to be used as inputs and operates as follows:

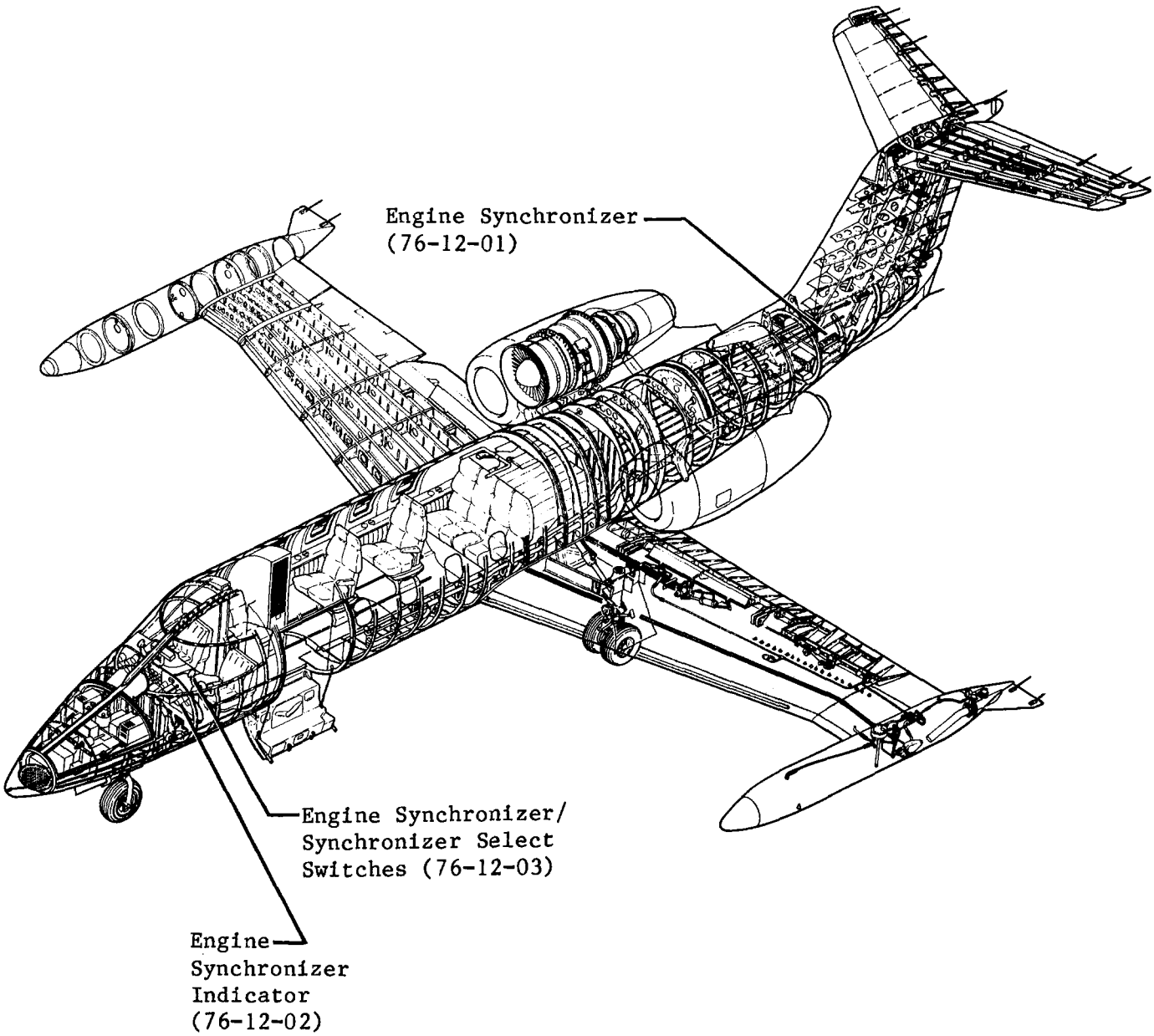
(1) The engine synchronizer operates in response to electrical inputs from each engine. The LH engine is the master and the RH engine is the slave. The electrical input signals are processed by the synchronizer, which compares signals from both engines. A trim (output) signal from the synchronizer is sent to the fuel computer of the slave engine to alter engine speed so that the slave engine will be synchronized with the master engine.

(2) The control range of the synchronizer is $\pm 2.5\%$ N_2 maximum and is variable with thrust lever settings.

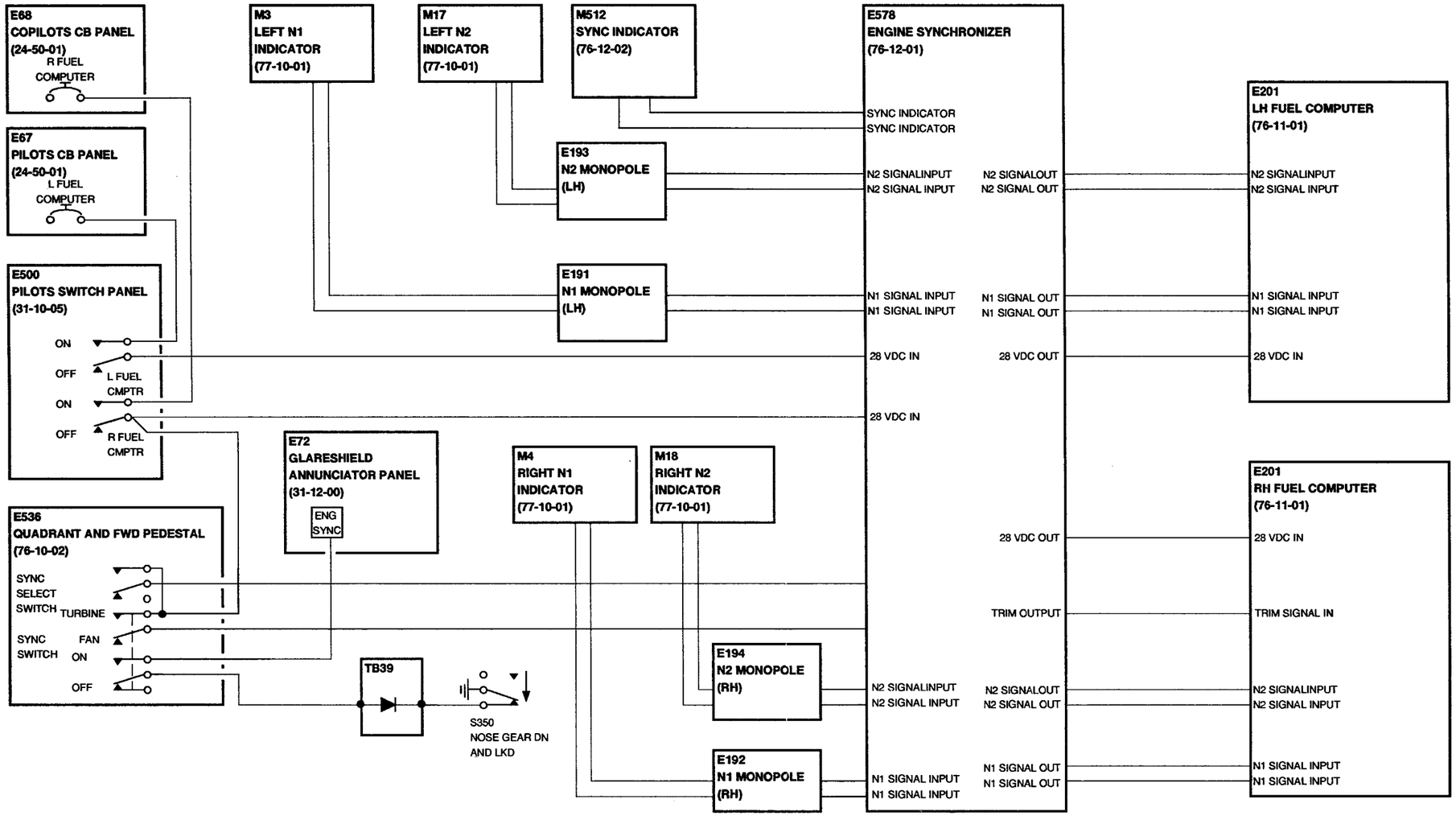
(3) The synchronizer indicator gives an indication of the RH engine performance (SLOW-SYNC-FAST) as compared to the left engine performance. The synchronizer indicator provides an indication of right engine performance regardless of Synchronizer Switch position (providing the right engine fuel computer is operating) which allows the pilot to synchronize the engine manually to within the $\pm 2.5\%$ N_2 tolerance prior to activating the engine synchronizer. If the RH engine fuel computer is not operating, the synchronizer indicator will have a false indication of SYNC. It is for this reason that, each time the synchronizer indicator has a SYNC indication, the operator should check the R FUEL CMPTR warning light to ensure that the RH engine fuel computer is operating properly.

(4) The ENG SYNC annunciator (amber) will illuminate when the landing gear are down and the Engine Synchronizer Switch is set to SYNC.

B. For further information on the engine synchronizer, refer to manufacturer's publication listed under Supplemental Publications in the Introduction to this manual.



Engine Synchronizer System Component Locator
Figure 1



Engine Synchronizer Electrical Schematic
Figure 2

ENGINE SYNCHRONIZER SYSTEM - MAINTENANCE PRACTICES

1. **INSPECTION/CHECK**

A. Operationally Check Engine Synchronizer System.

NOTE: The system shall be operationally checked after completion of system maintenance or whenever system accuracy is in question.

(1) Assure that throttle system is properly rigged.
(2) Start engines in accordance with approved Airplane Flight Manual and stabilize at IDLE. Note RH N_2 rpm.
(3) Set Synchronizer Selector Switch to TURB and Engine Synchronizer Switch to SYNC.
(4) Set LH throttle to IDLE CUTOFF. While LH engine is spooling down, verify that RH N_2 rpm does not decrease more than 1% below N_2 rpm noted in step A.(2).

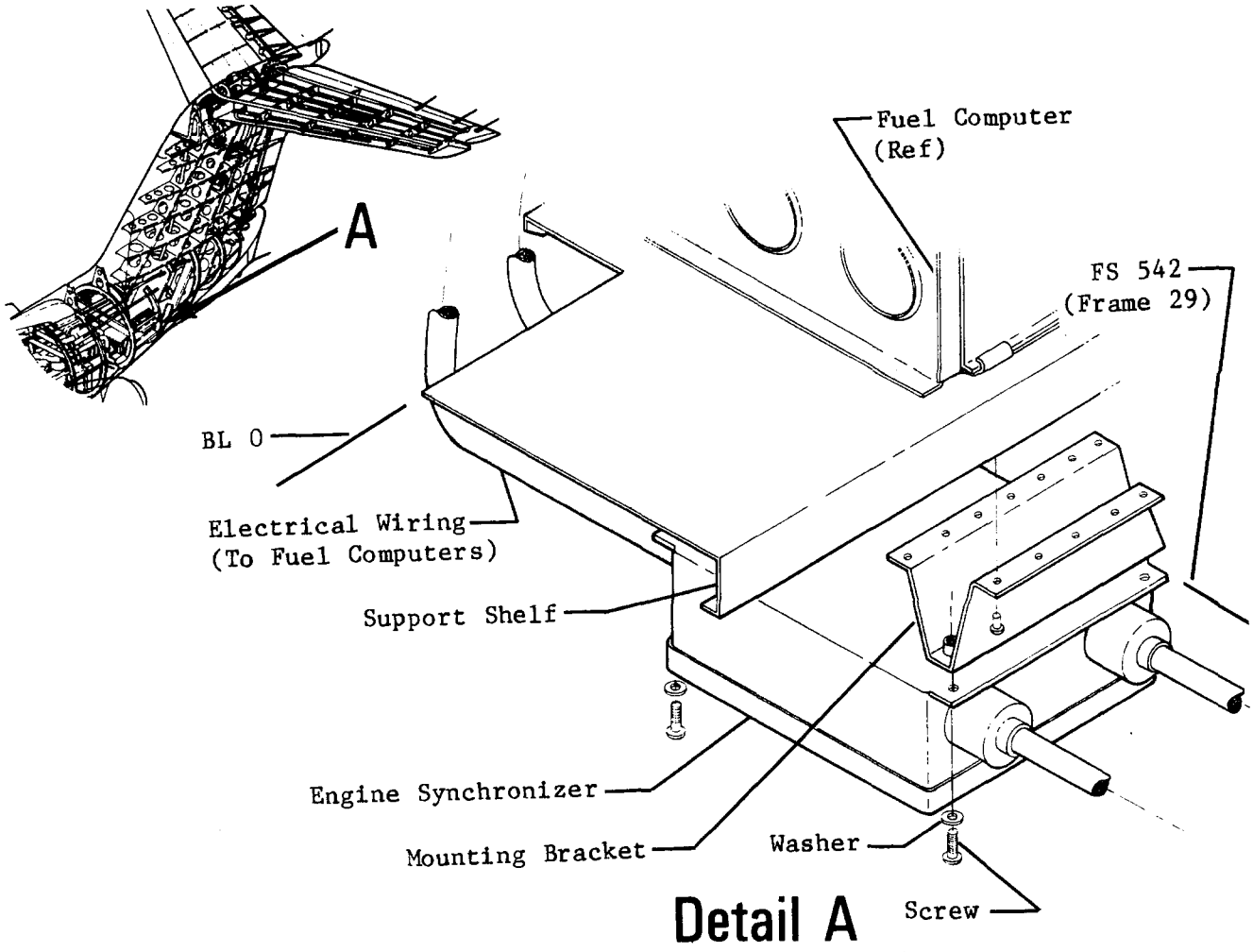
NOTE: LH engine spool down shall be from stabilized idle N_2 to 10% N_2 rpm.

(5) With Synchronizer Selector Switch at TURB and RH engine at IDLE, set Engine Synchronizer Switch to OFF and restart LH engine in accordance with approved Airplane Flight Manual.
(6) Advance LH engine to approximately 75% turbine speed.
(7) Set Engine Synchronizer Switch to SYNC and verify that RH engine turbine speed increases 2 to 3% and that engine synchronizer indicator pointer is at maximum SLOW position.
(8) With Synchronizer Selector Switch at TURB, set LH engine at IDLE and Engine Synchronizer Switch to OFF.
(9) Advance RH engine to approximately 75% turbine speed.
(10) Set Engine Synchronizer Switch to SYNC and verify that RH engine turbine speed decreases 2 to 3% and that engine synchronizer indicator pointer is at maximum FAST position.
(11) Set Engine Synchronizer Switch to OFF and advance RH engine to takeoff power.
(12) Set Engine Synchronizer Switch to SYNC and verify that RH engine turbine speed decreases less than 0.5%.
(13) With Synchronizer Selector Switch at TURB, set Engine Synchronizer Switch to OFF.
(14) Adjust LH engine to approximately 75% turbine speed and RH engine to approximately 77% turbine speed.
(15) Set Engine Synchronizer Switch to SYNC and verify that engine synchronizer indicator pointer moves to SYNC position.
(16) Set Engine Synchronizer Switch to OFF and adjust RH engine to approximately 73% turbine speed.
(17) Set Engine Synchronizer Switch to SYNC and verify that engine synchronizer indicator pointer moves to SYNC position.

(18) Adjust RH engine to approximately 70% turbine speed and verify that there is no noticeable change in LH engine turbine speed and that engine synchronizer indicator pointer indicates RH SLOW.
(19) Set Synchronizer Selector Switch to FAN and Engine Synchronizer Switch to OFF.
(20) Adjust LH engine to approximately 50% N_1 speed and RH engine to approximately 52% N_1 speed.
(21) Set Engine Synchronizer Switch to SYNC and verify that engine synchronizer indicator pointer moves to SYNC position.
(22) Adjust RH engine to approximately 48% N_1 speed and verify that there is no noticeable change in LH engine N_1 speed and that engine synchronizer indicator pointer indicates RH SLOW.
(23) Set Engine Synchronizer Switch to OFF.
(24) If engine synchronizer system does not check out within limits, refer to manufacturer's publication listed under Supplemental Publications in the Introduction to this manual.
(25) Shut engines down observing normal engine shutdown procedures.

ENGINE SYNCHRONIZER - MAINTENANCE PRACTICES

1. **Removal/Installation**
   A. Remove Synchronizer (See figure 201.)
      (1) Remove electrical power from aircraft.
      (2) Open tailcone access door.
      (3) Disconnect electrical connector from synchronizer.
      (4) Remove attaching parts and engine synchronizer from aircraft.
   B. Install Synchronizer (See figure 201.)
      (1) Holding synchronizer box adjacent to mounting brackets, connect electrical connectors to synchronizer box.
      (2) Position synchronizer box on mounting brackets and secure with attaching parts.
      (3) Restore electrical power to aircraft.
      (4) Perform Operational Check of Engine Synchronizer System. (Refer to 76-12-00.)
      (5) Close tailcone access door.
      (6) Return aircraft to normal.

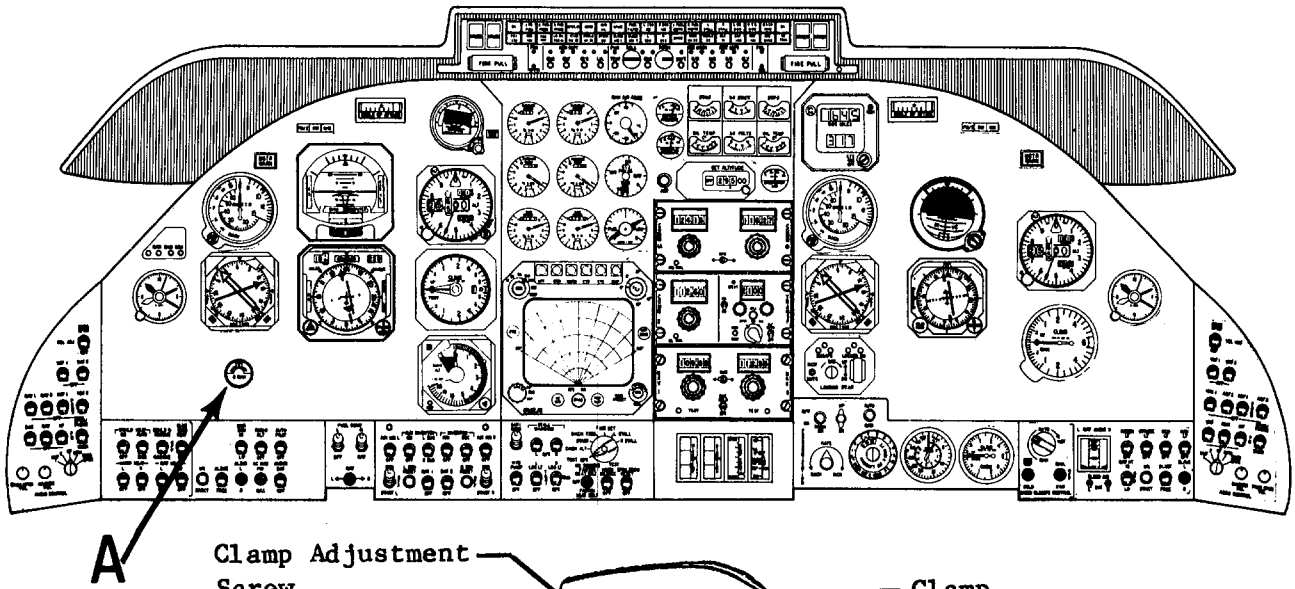


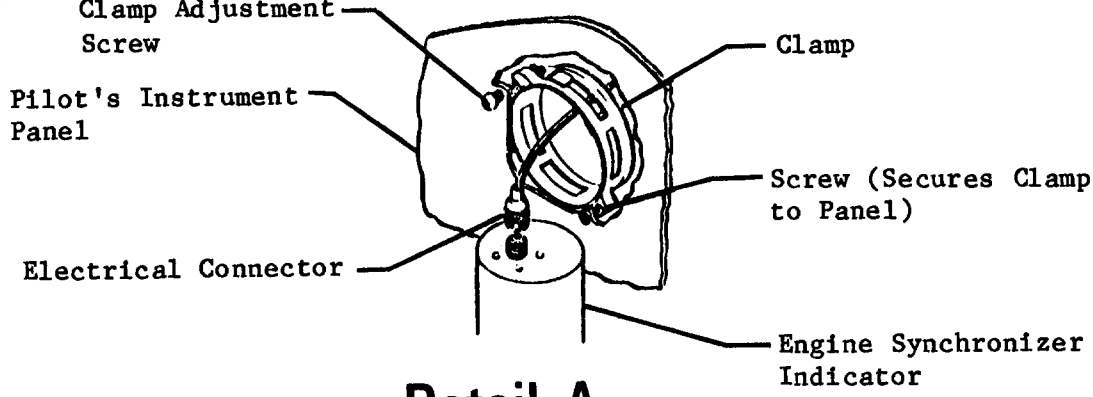
A9-313B

Engine Synchronizer Installation
Figure 201

ENGINE SYNCHRONIZER INDICATOR - MAINTENANCE PRACTICES

1. **REMOVAL/INSTALLATION**
   - **A. Remove Indicator** (See figure 201.)
     - (1) Remove attaching parts and overlay from panel.
     - (2) Loosen instrument clamp adjustment screw.
     - (3) Pull indicator forward out of panel sufficiently to gain access to electrical connector.
     - (4) Disconnect electrical connector and remove indicator from aircraft.
   - **B. Install Indicator** (See figure 201.)
     - (1) Connect electrical connector to indicator.
     - (2) Position indicator in panel and tighten instrument clamp adjustment screw.
     - (3) Install overlay and secure with attaching parts.





Detail A

Engine Synchronizer Indicator Installation
Figure 201

ENGINE SYNCHRONIZER/SYNCHRONIZER SELECT SWITCHES - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: Removal and installation procedures for both switches are identical.

A. Remove Engine Synchronizer/Synchronizer Select Switches (See figure 201.)

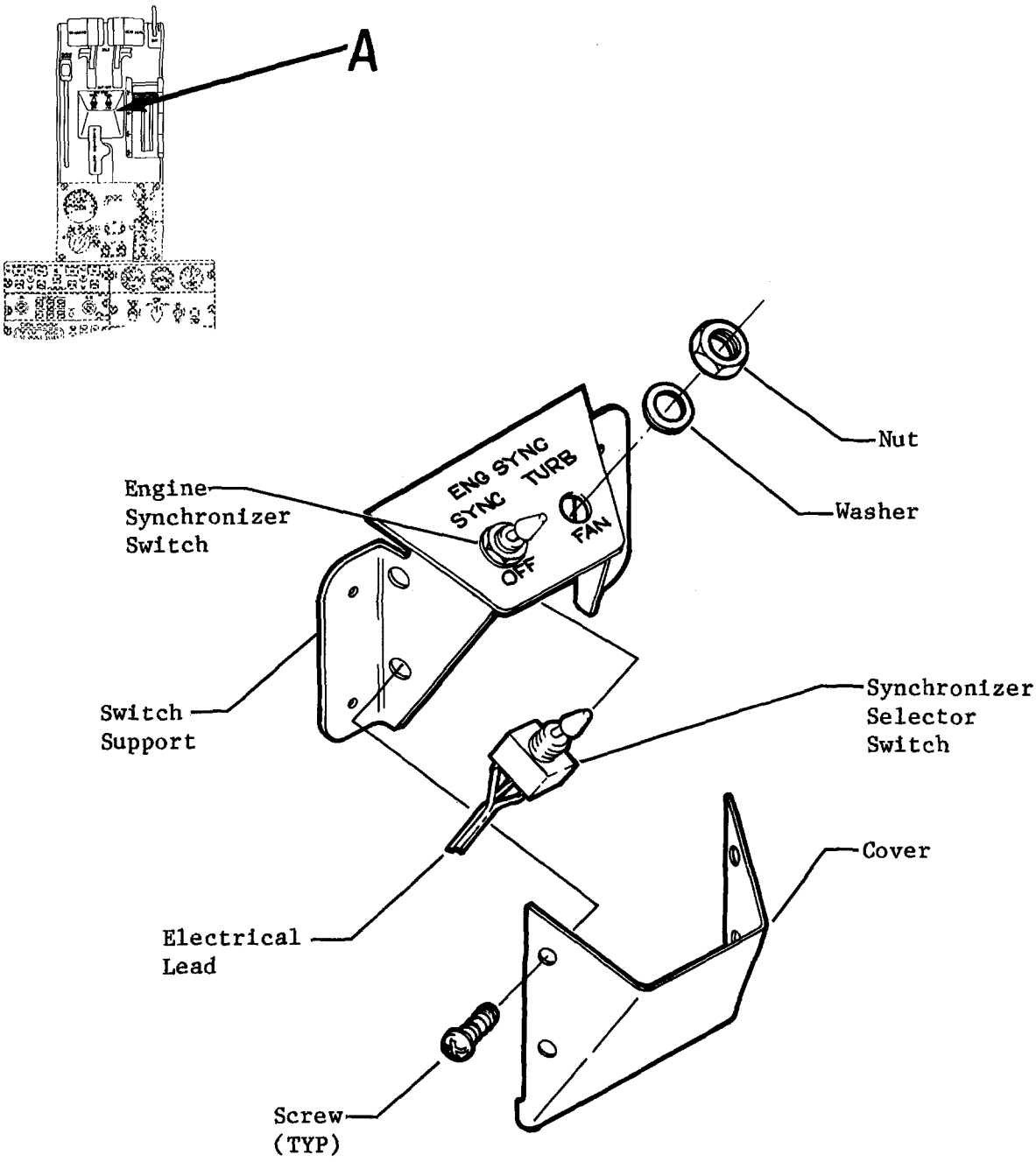
(1) Remove electrical power from aircraft.
(2) Remove attaching screws securing cover to switch support.
(3) Slide cover down and away from switch support and remove from aircraft.
(4) Remove attaching parts securing switch to switch support.
(5) Pull switch down from switch support and position switch a sufficient distance out and away from pedestal face.
(6) Disconnect and identify electrical leads from switch and remove switch from aircraft.

B. Install Engine Synchronizer/Synchronizer Select Switches (See figure 201.)

(1) Position switch near electrical leads, identify and connect electrical leads to switch.
(2) Position switch on switch support and secure with attaching parts.
(3) Position cover on switch support and secure with attaching screws.

NOTE: Ensure electrical leads are well back in switch support and that cover does not pinch electrical leads.

(4) Restore electrical power to aircraft.
(5) Restore aircraft to normal.



(TYPICAL)

Detail A

16-75A **Engine Synchronizer/Synchronizer Select Switches Installation**
Figure 201

EFFECTIVITY: 35-067 and Subsequent
36-018 and Subsequent