ATP INDEX

Aircraft Technical Publishers
101 South Hill Drive
Brisbane, CA 94005

Customer Service
6AM-5PM PST M-F
(800)227-4610

ATP Grid Index to Manufacturer's Publications:

Learjet Corp.
CF700 Thrust Reverser for Falcon 20 Series Aircraft
Maintenance Manual

*** End of Index ***

MFG.

INTRO

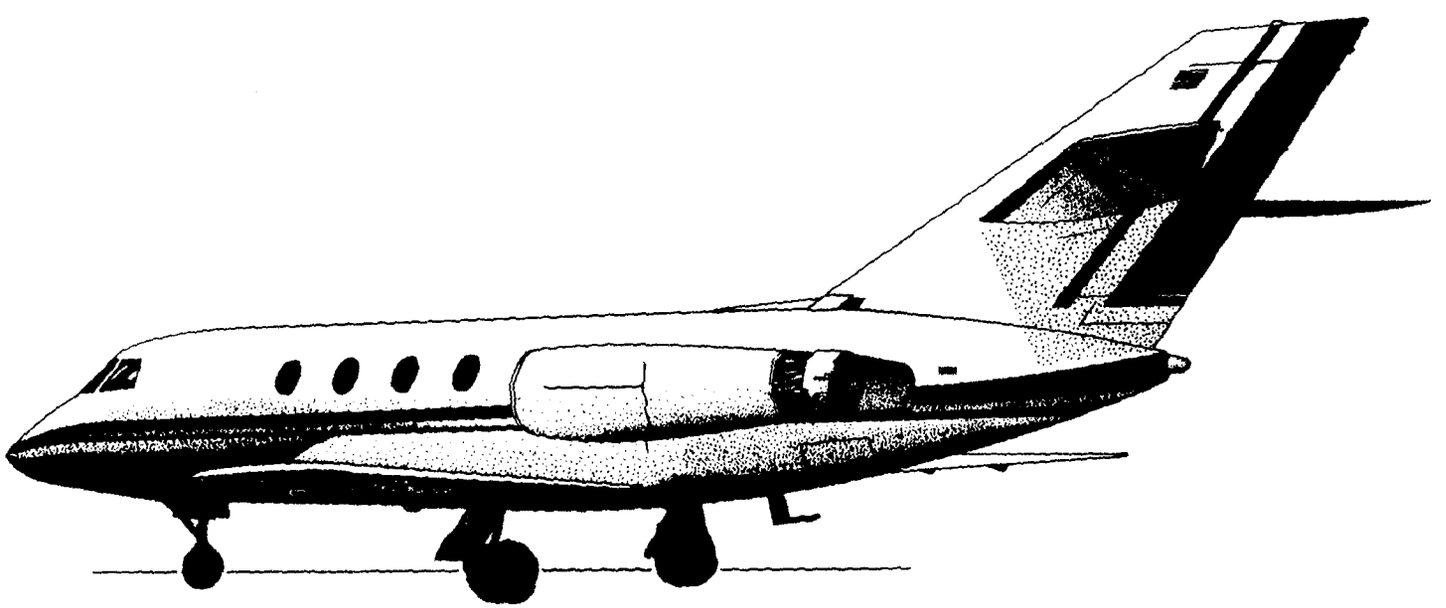
Learjet

Thrust Reverser Maintenance Manual

DASSAULT FALCON 20 INSTALLATION

Part No. 232-20000

(Formerly Aeronca)



NOTE: This is a complete re-issue and supersedes all previous 78-30 Maintenance Manual publications for the CF700 thrust reverser system installed on Falcon 20 series aircraft.

78-30

March 1, 1995

SAFETY ADVISORY

WARNING: BEFORE USING ANY OF THE MATERIALS CALLED OUT IN THIS PUBLICATION, BE AWARE OF ALL HANDLING, STORAGE AND DISPOSAL PRECAUTIONS RECOMMENDED BY THE MANUFACTURER OR SUPPLIER. FAILURE TO COMPLY WITH THE MANUFACTURERS OR SUPPLIERS RECOMMENDATIONS MAY RESULT IN PERSONAL INJURY OR DISEASE.

This publication describes physical and chemical processes which may require the use of chemicals, solvents, paints, and other commercially available materials. The user of this publication should obtain the Material Safety Data Sheets (OSHA Form 20 or equivalent) from the manufacturers or suppliers of the materials to be used. The user must become completely familiar with the manufacturer/supplier information and adhere to the procedures, recommendations, warnings and cautions set forth for the safe use, handling, storage, and disposal of the materials.

RECORD OF REVISIONS

MFG REV NO	DESCRIPTION	ISSUE DATE	ATP REV DATE	INSERTED BY
	REISSUE	02-01-83	05-20-85	ATP/RJ
	REISSUE	03-01-95	01-25-96	ATP/JLD

Record of Revisions	Date of Issue	Insertion Date	By	Record of Revisions	Date of Issue	Insertion Date	By

RECORD OF TEMPORARY REVISIONS

TEMP REV NO	DESCRIPTION	ISSUE DATE	ATP REV DATE	INSERTED BY	DATE REMOVED	REV INCORP	REMOVED BY
78-1	78-30-00:204	08/27/99	11/04/99	ATP/KS			
78-2	78-30-04:204	"	"	"			
78-3	78-30-04:208	"	"	"			
78-4	78-30-09:2	"	"	"			

Rev. No.	Date Inserted	Date Removed	Page Number	Rev. No.	Date Inserted	Date Removed	Page Number
78-1	11/04/99		78-30-00 204				
78-2	"		78-30-04 204				
78-3	"		78-30-04 208				
78-4	"		78-30-09 2				

Learjet Inc.

One Learjet Way, Wichita, KS 67209-2942
P.O. Box 7707, Wichita, KS 67277-7707
Phone (316) 946-2000

May 11, 1995

TO: Holders of Learjet (Aeronca) Falcon 20 Thrust Reverser Maintenance Manual

SUBJECT: Reissue dated March 1, 1995

This Maintenance Manual is being reissued in its entirety to replace Maintenance Manual dated 1 February, 1983.

Direct any questions concerning distribution (changes in address, quantities, etc.) to Learjet Inc., P.O. Box 7707, Wichita, Kansas 67277-7707. Attn: Technical Data Control Center (MS 71). Telephone (316) 946-2393. FAX (316) 946-2580.

Alan Gonia
Manager,
Technical Publications

Chapter Section Subject	Page	Date
TITLE		Mar 1/95
Squawk Sheet		
Rec. of Rev.	1	Mar 1/95
Rec. of Temp Rev.	1	Mar 1/95
Safety Advisory	1	Mar 1/95
78-List of Serv. Pub.	1	Mar 1/95
78-List of Serv. Pub.	2	Mar 1/95
78-List of Serv. Pub.	3	Mar 1/95
78-List of Eff. Pgs.	1	Mar 1/95
78-List of Eff. Pgs.	2	Mar 1/95
78-Contents	1	Mar 1/95
78-Contents	2	Mar 1/95
78-Contents	3	Mar 1/95
78-Contents	4	Mar 1/95
78-Contents	5	Mar 1/95
78-Contents	6	Mar 1/95
78-Contents	7	Mar 1/95
78-List of Illus.	1	Mar 1/95
78-List of Illus.	2	Mar 1/95
78-List of Illus.	3	Mar 1/95
78-List of Illus.	4	Mar 1/95
78-List of Tables	1	Mar 1/95
78-Foreword	1	Mar 1/95
78-30-00	1	Mar 1/95
78-30-00	2	Mar 1/95
78-30-00	3	Mar 1/95
78-30-00	4	Mar 1/95
78-30-00	5	Mar 1/95
78-30-00	6	Mar 1/95
78-30-00	7	Mar 1/95
78-30-00	8	Mar 1/95
78-30-00	9	Mar 1/95
78-30-00	10	Mar 1/95
78-30-00	11	Mar 1/95
78-30-00	12	Mar 1/95
78-30-00	13	Mar 1/95
78-30-00	14	Mar 1/95
78-30-00	15	Mar 1/95
78-30-00	16	Mar 1/95
78-30-00	101	Mar 1/95
78-30-00	102	Mar 1/95
78-30-00	103	Mar 1/95
78-30-00	104	Mar 1/95
78-30-00	105	Mar 1/95
78-30-00	106	Mar 1/95
78-30-00	107	Mar 1/95
78-30-00	108	Mar 1/95
78-30-00	109	Mar 1/95
78-30-00	110	Mar 1/95
78-30-00	111	Mar 1/95
78-30-00	112	Mar 1/95
78-30-00	201	Mar 1/95
78-30-00	202	Mar 1/95
78-30-00	203	Mar 1/95
78-30-00	204	Mar 1/95
78-30-00	205	Mar 1/95
78-30-00	206	Mar 1/95
78-30-00	207	Mar 1/95
78-30-00	208	Mar 1/95
78-30-00	209	Mar 1/95
78-30-00	210	Mar 1/95
78-30-00	211	Mar 1/95
78-30-00	212	Mar 1/95
78-30-00	213	Mar 1/95
78-30-00	214	Mar 1/95
78-30-00	215	Mar 1/95
78-30-00	216	Mar 1/95
78-30-00	217	Mar 1/95
78-30-00	218	Mar 1/95
78-30-00	219	Mar 1/95
78-30-00	220	Mar 1/95
78-30-00	221	Mar 1/95
78-30-00	222	Mar 1/95
78-30-00	223	Mar 1/95
78-30-00	224	Mar 1/95
78-30-00	225	Mar 1/95
78-30-00	226	Mar 1/95
78-30-00	227	Mar 1/95
78-30-01	1	Mar 1/95
78-30-01	201	Mar 1/95
78-30-01	202	Mar 1/95
78-30-01	203	Mar 1/95
78-30-01	204	Mar 1/95
78-30-01	205	Mar 1/95
78-30-01	205	Mar 1/95
78-30-01	207	Mar 1/95
78-30-02	1	Mar 1/95
78-30-02	2	Mar 1/95
78-30-02	3	Mar 1/95
78-30-02	4	Mar 1/95
78-30-02	5	Mar 1/95
78-30-02	6	Mar 1/95
78-30-02	201	Mar 1/95
78-30-02	202	Mar 1/95
78-30-02	203	Mar 1/95
78-30-02	204	Mar 1/95
78-30-03	1	Mar 1/95
78-30-03	201	Mar 1/95
78-30-03	202	Mar 1/95
78-30-03	203	Mar 1/95
78-30-04	1	Mar 1/95
78-30-04	2	Mar 1/95

Chapter Section Subject	Page	Date
78-30-04	201	Mar 1/95
78-30-04	202	Mar 1/95
78-30-04	203	Mar 1/95
78-30-04	204	Mar 1/95
78-30-04	205	Mar 1/95
78-30-04	206	Mar 1/95
78-30-04	207	Mar 1/95
78-30-04	208	Mar 1/95
78-30-04	209	Mar 1/95
78-30-04	210	Mar 1/95
78-30-04	211	Mar 1/95
78-30-04	212	Mar 1/95
78-30-04	213	Mar 1/95
78-30-04	214	Mar 1/95
78-30-04	215	Mar 1/95
78-30-04	216	Mar 1/95
78-30-04	217	Mar 1/95
78-30-04	218	Mar 1/95
78-30-04	219	Mar 1/95
78-30-04	220	Mar 1/95
78-30-04	221	Mar 1/95
78-30-04	222	Mar 1/95
78-30-04	223	Mar 1/95
78-30-04	224	Mar 1/95
78-30-05	1	Mar 1/95
78-30-05	201	Mar 1/95
78-30-05	202	Mar 1/95
78-30-05	203	Mar 1/95
78-30-05	204	Mar 1/95
78-30-05	205	Mar 1/95
78-30-05	206	Mar 1/95
78-30-05	207	Mar 1/95
78-30-05	208	Mar 1/95
78-30-05	209	Mar 1/95
78-30-05	210	Mar 1/95
78-30-06	1	Mar 1/95
78-30-06	2	Mar 1/95
78-30-06	3	Mar 1/95
78-30-06	4	Mar 1/95
78-30-06	5	Mar 1/95
78-30-06	201	Mar 1/95
78-30-06	202	Mar 1/95
78-30-06	203	Mar 1/95
78-30-06	204	Mar 1/95
78-30-06	205	Mar 1/95
78-30-07	1	Mar 1/95
78-30-07	201	Mar 1/95
78-30-07	202	Mar 1/95
78-30-07	203	Mar 1/95
78-30-07	204	Mar 1/95
78-30-08	1	Mar 1/95
78-30-08	2	Mar 1/95
78-30-08	201	Mar 1/95
78-30-08	202	Mar 1/95
78-30-08	203	Mar 1/95
78-30-08	204	Mar 1/95
78-30-08	205	Mar 1/95
78-30-09	1	Mar 1/95
78-30-09	2	Mar 1/95
78-30-09	201	Mar 1/95
78-30-09	203	Mar 1/95
78-30-09	204	Mar 1/95
78-30-09	205	Mar 1/95
78-30-10	1	Mar 1/95
78-30-10	2	Mar 1/95
78-30-10	201	Mar 1/95
78-30-10	202	Mar 1/95
78-30-10	203	Mar 1/95
78-30-10	204	Mar 1/95
78-30-11	1	Mar 1/95
78-30-11	2	Mar 1/95
78-30-11	201	Mar 1/95
78-30-12	1	Mar 1/95
78-30-12	2	Mar 1/95
78-30-12	201	Mar 1/95
78-30-12	202	Mar 1/95
78-30-13	1	Mar 1/95
78-30-13	2	Mar 1/95
78-30-13	3	Mar 1/95
78-30-13	201	Mar 1/95
78-30-13	202	Mar 1/95
78-30-13	203	Mar 1/95
78-30-13	204	Mar 1/95
78-30-13	205	Mar 1/95
78-30-13	206	Mar 1/95
78-30-14	1	Mar 1/95
78-30-14	2	Mar 1/95
78-30-14	201	Mar 1/95
78-30-15	1	Mar 1/95
78-30-15	2	Mar 1/95
78-30-15	201	Mar 1/95
78-30-16	1	Mar 1/95
78-30-16	201	Mar 1/95
78-30-16	202	Mar 1/95

APPLICABLE CONTENT OF LISTED SERVICE PUBLICATIONS IS INCORPORATED IN THE TEXT OF THIS PUBLICATION.

SERVICE BULLETIN LIST

SERVICE BULLETINS	TITLE	DATE	EFFECTIVITY THRUST REVERSER S/N
SB-78-30-001	Pneumatic Latch Assembly, replacement of	18 Oct 72	001 Thru 006
SB-78-30-002	Blocker Door Fittings and replacement of	11 Jan 73	001 Thru 006
*SL-78-30-003	Prevention of Rack Over-Travel	29 Mar 73	001 Thru 023, 025
SB-78-30-004A	Latch Assembly, replacement of pivot hardware, deletion of spring steel washers, and rework of lever arm	15 Jul 73	001 Thru 050
SB-78-30-005	Inboard Safe Dispatch Bolt Replacement	20 Feb 73	001 Thru 022 (except 019)
*SL-78-30-006	Inspection of Welds	28 Mar 73	001 Thru 029
SB-78-30-007B	Retention of Lever Arms 232-20257 & 232-20258	23 Apr 74	001 Thru 095
SB-78-30-008	Replacing Existing Rivets with AF007M Rivets	23 Apr 74	086 Thru 122
SB-78-30-009	AiResearch Service 1180-Recommendations and supplemental data	30 Jul 74	Transmits AiResearch Bulletin

* Released as service letter 1973

SERVICE BULLETIN LIST (Continued)

SERVICE BULLETINS	TITLE	DATE	EFFECTIVITY THRUST REVERSER S/N
SB-F20-78-30-010B	Blocker Door Actuator Link Lever Assemblies P/N's 232-20258-507 & 508, replacement of	15 Jan 77	001 Thru 205
SB-F20-78-30-011	Translating Beam Assemblies, P/N 232-20215. To ensure positive retension of NAS 1352C06-8 screws attaching part number 232-20289 guide pins. Inspection and rework instructions	15 Jan 77	001 Thru 188, 191, 198
SL-F20-78-30-012	Throttle Assembly - Inspection and replacement of mechanical interlocks, rub-strips, and latch operating springs - instructions for	31 Jan 79	001 Thru 157 (approximate effectivity)
SB-F20-78-30-013	Replacement of Throttle Assembly Auxiliary Lever Brass Rods	1 Dec 85	Throttle Assy 232-20104-1, -17, -21

SERVICE LETTERS

SERVICE LETTERS	TITLE	DATE
SL-F20-001	Falcon 20 Thrust Reverser System Pneumatic Actuator, replacement of feedback piston to prevent binding of feedback linkage described by AiResearch Service Bulletin 126372-78-1132	30 Oct 73
SL-F20-002	Field installation of Nozzle Exit Adapters P/N's 232-20288-1 & 501	1 Feb 74
SL-F20-003	Sequencing Latch	25 Jun 74
SL-F20-004	Falcon 20 Thrust Reverser System Pneumatic Actuator Assembly - Loose Timing Gears	3 Jul 74

SERVICE CHANGES

SERVICE CHANGES	TITLE	DATE	KIT NO.
SC-F20-001	Product Improvement - Reinforcement of 232-20101-59 Bracket	1 Jan 79	232-012A
SC-F20-002	Product Improvement - Replacement of P/N 3230113-3 Nulling Cable, P/N 3230137-1 Cursor, P/N 3230135 -1 Bearings, and NAS 1352C06-8 Guide Pin attaching screws and installation of 232-20459-1 Rack Aft travel stops	1 Jan 79	232-013-2, -3, -4, -5
SC-F20-003	Product Improvement - Relocation of P/N 232-20286 Bleed Valves	1 Jan 79	232-014
SC-F20-004A	Product Improvement - Replacement of 232-20355 Deploy Signal Switches and replacement of 232-20356 Pneumatic Latch Mounted Switches	13 Feb 81	232-015-1, -2
SC-F20-005A	Product Improvement - Incorporation of Ground/Shop Air Adaptors	1 Dec 80	232-016
SC-F20-006	Product Improvement - Addition of Deploy Signal Switch Access Doors	1 Jan 79	232-017
SC-F20-007	Product Improvement Converting - 232-20104-1 Throttle Assemblies to the 232-20104-21 Configuration - Note: Applies to the T/R S/N 001 thru 057	1 Jan 79	232-018
SC-F20-008	Product Improvement - Addition of Stow Stops	1 Jan 79	232-019

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS

LIST OF TABLES

FOREWORD

Information contained in Learjet (formerly Aeronca) publication 78-30, dated March 1, 1995, includes a system physical and operational description, a fault isolation section and maintenance practices for both subassembly and total system servicing, removal/installation, adjustment/test, inspection/check, approved repairs, and cleaning procedures for the thrust reverser system, part number 232-20000.

This is a complete re-issue and supersedes all previous 78-30-01 Maintenance Manual publications for the CF700 thrust reverser system installed on Falcon 20 series aircraft. The applicable section of the Aircraft Maintenance Manual, Illustrated Parts Catalog (IPC), 78-31, or Wiring Manual, should be referenced for detailed information pertaining to the thrust reverser system and components, other than those contained in the aft nacelle section, of this manual.

CHAPTER

78

EXHAUST

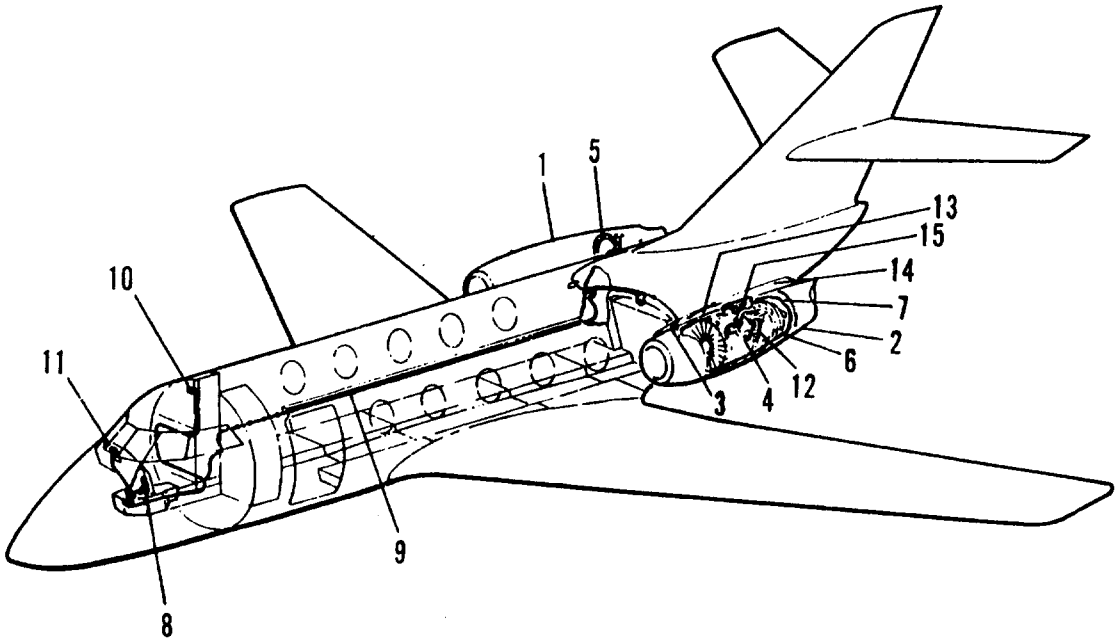
CF700 THRUST REVERSER SYSTEM - DESCRIPTION AND OPERATION

1. Description. The complete CF700 Thrust Reverser System (see Figure 1) as installed on the Dassault Falcon 20 aircraft, functions on cockpit command to reverse the direction of the engine exhaust gases during the aircraft landing roll. This action generates reverse thrust which greatly shortens the landing roll and increases service life of the aircraft brakes. The system uses 28 vdc power from the aircraft non-shed electrical system for reverser control and engine bleed air for power to deploy (reverse thrust) and stow (forward thrust) the translating structure as selected by the cockpit crew. The system is designed for use only with the aircraft on ground and when not in use (stowed) functions as the engine secondary exhaust nozzle. An indication system is incorporated into the system to advise the cockpit crew of reverser system position/status.

A. System Components:

NOTE: For reference of frame structure see Figure 1, of Chapter 78-30-13.

Component	Function	Location
Throttle Assembly	Provides mechanical and electrical controls to operate reverser system.	Center pedestal in cockpit (Figure 2)
Safety System	Prevents stowing of reverser at high engine power settings.	Throttle shaft in pylons (Figure 3)
Aft Nacelle	Serves as aft engine nacelle as well as houses reverser actuation components and supports the translating structure	Bolted to the mount ring attached to the engine fan frame (Figure 4)
Pneumatic Actuator	Changes pneumatic power to rotational torque to drive pinion gearboxes	Aft nacelle 6 o'clock between frame 4 & 5
Flexible Drive Shafts	Transmit rotary torque from pneumatic actuator to pinion gearboxes	Aft nacelle runs pneumatic actuator inboard and outboard pinion gearboxes (Figure 4)
Pinion Gearboxes	Changes rotary motion from flex shafts to linear motion to drive gear racks and supports translating beams	Mounted at 3 and 9 o'clock in the aft nacelle just forward of frame 6,Figure 4



1. REVERSER INSTALLATION
2. REVERSER INSTALLATION
3. PYLON ASSEMBLY
4. AIR-LINE INSTALLATION
5. FRAME ASSEMBLY
6. FRAME ASSEMBLY
7. TAILPIPE ASSEMBLY
8. CONTROL INSTALLATION
9. ELECTRICAL INSTALLATION
10. PANEL MODIFICATION
11. SUB PANEL MODIFICATION
12. BRACKET MODIFICATION
13. PYLON MODIFICATION
14. FAIRING ASSEMBLY
15. SAFETY SYSTEM INSTALLATION

Figure 1 - CF700 Thrust Reverser Installation

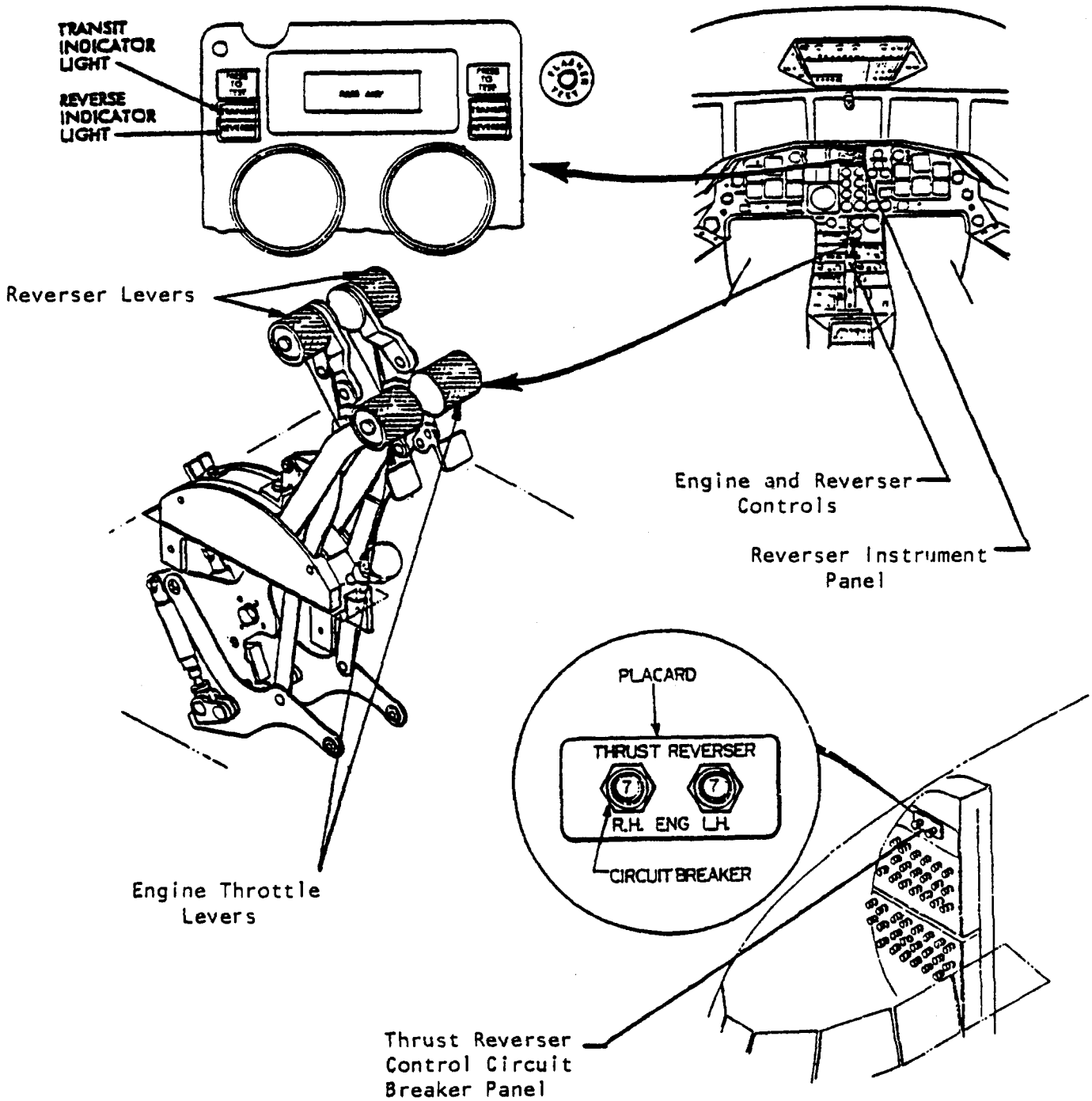


Figure 2 - Cockpit Controls and Instrumentation

Component	Function	Location
Translating Beams	Support and provide bearing surface for translating structure to deploy and stow	Mounted at 3 and 9 o'clock on translating structure (Figure 4)
Gear Racks	Driven by pinion gears to deploy translating structure and actuate blocker doors	Integral part of translating beams (Figure 4)
Latch Control Valves	Controls operation of pneumatic latches	Mounted aft nacelle 6 o'clock between frame 4 and 5 (Figure 6)
Pneumatic Latches	Locks translating beams in stowed position when reverse thrust is not selected	Mounted aft nacelle just aft of frame 5 at 2:30 and 9:30 o'clock position (Figure 4)
Pneumatic Latch Mounted Switches	Provides switching of circuitry for proper operation and indication of thrust reverser system	Mounted atop each pneumatic latch assembly (Figure 4)
Sequence Latches	Locks or unlocks gear racks to translating beams at proper times during reverse thrust operation	Mounted to the forward end of each translating beam (Figure 4)
Deploy Switches	Provides circuitry for proper indication and throttle interlock release	Mounted on outboard pinion gearboxes (Figure 201,78-30-08)
Bleed Valves	Prevents stowing reversers at high power settings by bleeding operating air from pneumatic actuator poppet valve	Mounted in the aft nacelle at 6 o'clock between frame 4 & 5 (Figure 6)
Pressure Switches	Functions in conjunction with bleed valves to prevent stowing reversers at high power settings	Mounted in the aft nacelle at 6 o'clock between frame 4 & 5 (Figure 6)
Indication System	Provides cockpit crew with thrust reverser system status/position	Mounted on the forward center aircraft instrument panel (Figure 2)

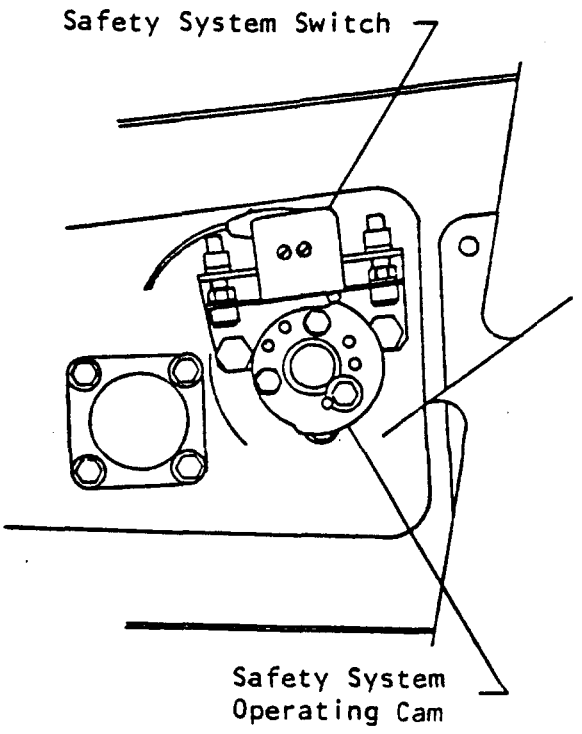


Figure 3 - Safety System - Pylon Components

2. System Operation. (Figure 5)

A. Operating Cycle. A complete thrust reverser system operating cycle consists of four stages: system stowed, translating structures moving toward the deployed position, system deployed, and translating structures moving toward the stowed position. Electrical control power for the engine bleed air driven system is obtained from the aircraft 28-volt non-shed DC system.

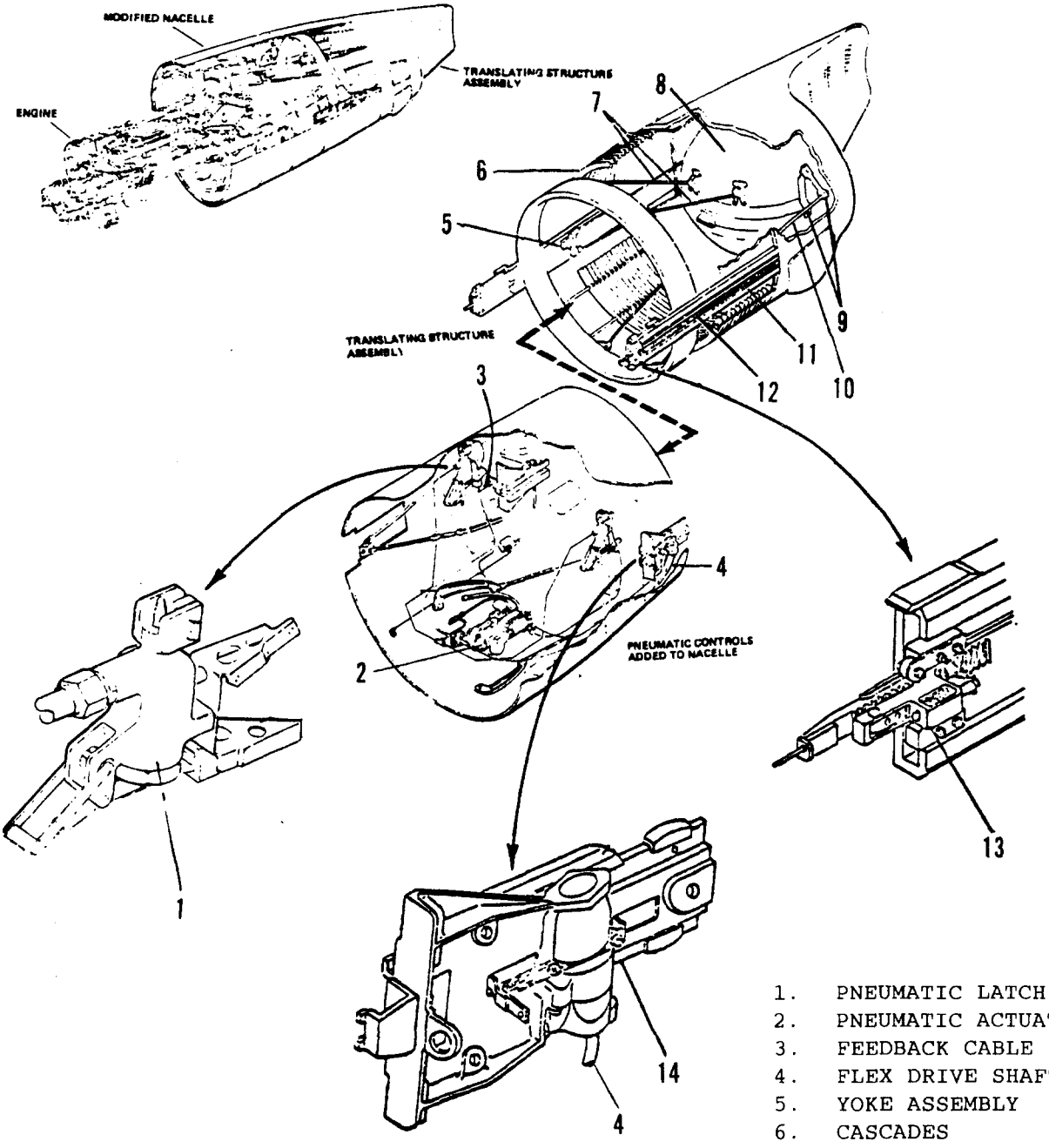
(1) System Stowed. (Figure 7) The thrust reverser lever assembly is locked (system cannot be actuated) with the main throttle lever in any position other than idle. The translating structures are locked in the stowed position by the pneumatic latches (over-centered latch rollers are engaged in the beam detents). The inlet pressure regulator solenoid valve is in the off position and the pneumatic latch solenoid valve is closed. Refer to Figures 4 and 6 for component locations.

(2) Translating Structures Moving Toward Deployed Position. (Figure 8) The reverser actuation links are positioned to clear the mechanical lockouts with the main throttles on the idle stop. With the throttles at idle, raising the reverser lever assemblies actuates the thrust re

verser switch assemblies mounted on the main throttle lever. This action completes circuits to illuminate the TRANSIT lights and energizes the pneumatic actuator inlet pressure regulator solenoid valves which admit engine bleed air to the pneumatic actuator air motor. Simultaneously, circuits are completed to energize the pneumatic latch solenoid valves which allows engine bleed air to the pneumatic latches. Pressurizing the pneumatic latches causes the latch rollers to withdraw from the beam detents which also repositions the latch mounted switches completing circuits to the deploy coils of the directional control solenoid valves. This action allows engine bleed air to pressurize the directional control actuator piston which shifts to the deploy mode allowing the engine bleed air previously supplied to the inlet pressure regulator solenoid valves to now drive the pneumatic actuator air motors in the deploy direction. The flexible drive shafts connected to the pneumatic actuator now drive the pinion gearboxes which in turn drive the translating beams to move the translating structure toward deploy. Continued up and aft movement of the reverse lever assemblies, until the stop levers contact the reverse control lever detents, accelerates the engines to the 65-percent reverse idle setting. The translating structure continues in the deploy direction until the sequencing latch and catch function to stop aft movement of the complete translating structure and unlock the racks from the translating beams. The racks continue 5-1/2 inches in the deploy direction to close the blocker doors through action of rack-mounted mechanical linkage.

(3) Deployed Position. (Figures 9 & 10) As the racks approach the fully deployed position, a stop on the forward end of the inboard rack engages a mechanical push-pull cable linkage and, during the last increment of rack travel, pulls the follow-up cables aft to bring the actuator directional controls toward neutral. This action first slows and then stops the actuators. The final segment of aft rack travel also moves pins on the forward end of the outboard racks on to levers/arms to actuate the deploy limit/signal switches. The signal switches, located on the outboard side of the outboard racks, complete circuits, illuminating the REVERSE lights and extinguishing the TRANSIT light as well as energizing the lock-out solenoids. The lock-out solenoids retract the stop levers out of the reverser control lever detents and permit additional up and aft motion of the reverser lever assemblies for operating the reversers at power settings from 65 percent N1 RPM reverse idle to 97.5 percent N1 RPM maximum reverse.

(4) Translating Structures Moving Toward Stow. (Figure 11) Returning the reverser lever assemblies to the stowed position reduces engine speed to forward thrust idle RPM. As the levers are moved forward and down, the motion of the actuation links and reverser control levers operates the throttle-mounted switch assemblies, completing circuits initiating reverser stow action. The directional control solenoids are energized to port engine bleed air to the stow side of the directional control pistons and position the directional control valves



1. PNEUMATIC LATCH
2. PNEUMATIC ACTUATOR
3. FEEDBACK CABLE
4. FLEX DRIVE SHAFT
5. YOKE ASSEMBLY
6. CASCADES
7. TENSION LINK
8. BLOCKER DOOR
9. LEVER ASSEMBLIES
10. OPERATING ROD
11. TRANSLATING BEAM
12. RACK
13. SEQUENCING LATCH
14. PINION GEAR BOX

Figure 4 - Nacelle Installations

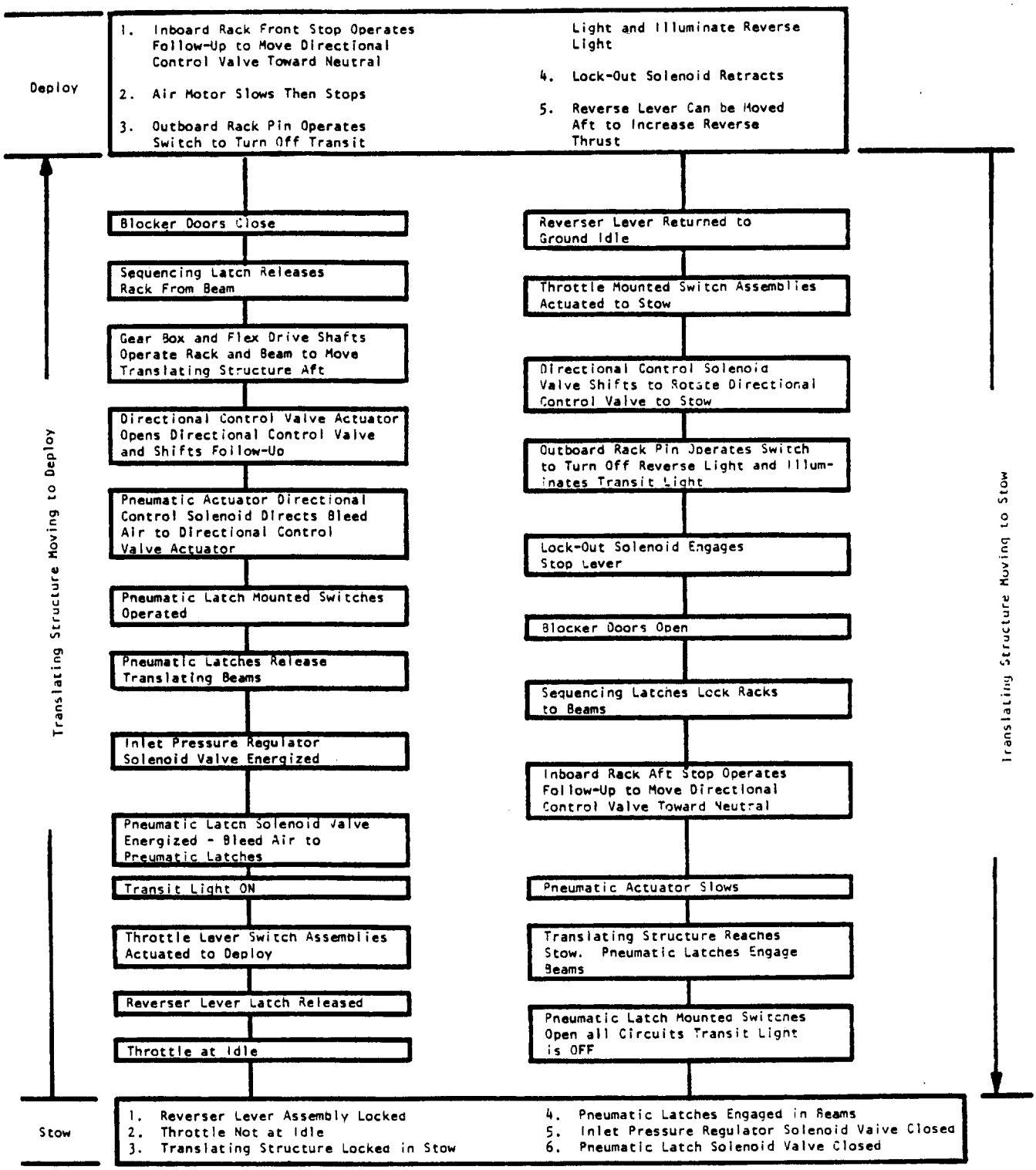


Figure 5 - Thrust Reverser System Operating Cycle

for actuator operation in the stow mode. The inlet pressure regulator solenoid valves are energized, admitting engine bleed air to the actuator air motors. The actuators now operate to move the translating structures in the stow direction.

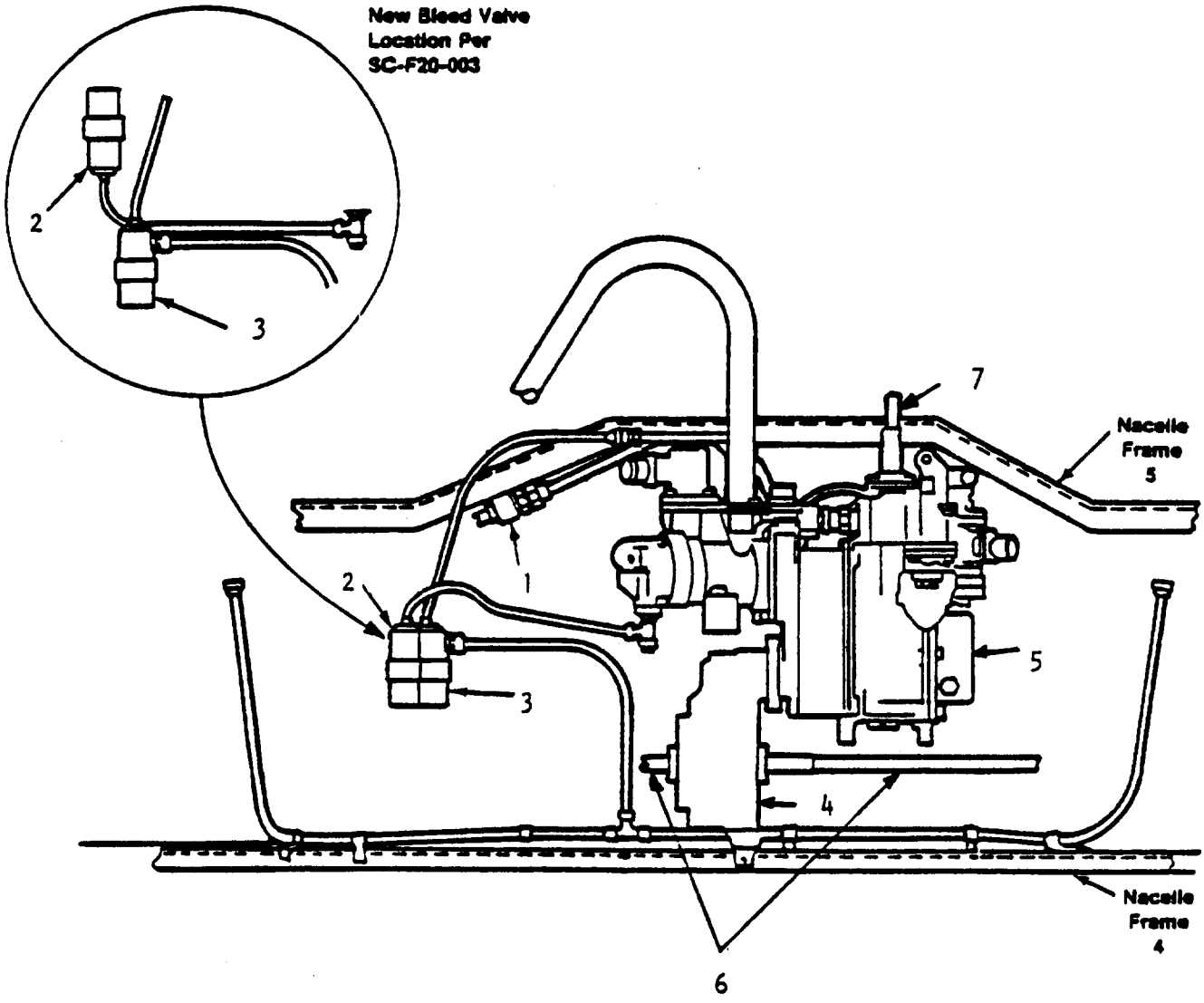
Initial forward rack motion moves the actuating pins on the outboard racks off the deploy switch actuating levers which breaks the circuits to the REVERSE lights and completes circuits to the TRANSIT lights. At the same time, the lock-out solenoids are de-energized allowing the spring-loaded lock-out solenoid plungers to extend which moves the stop levers into the reverser control lever detents.

The first 5-1/2 inches of forward rack motion causes the blocker doors to open to the forward thrust or full-faired position through the action of rack-to-door connected linkage. As the racks enter the sequencing latches, cam surfaces on the rack forward ends rotate the latch blocking arms clear of the latch fingers and cause the latches to move out of the catches, engage the rack detents, and lock the racks to the beams. The translating structures now move toward the stowed position as one-piece units.

As the translating structures approach the fully stowed position, the rear stops on the inboard racks engage the mechanical push-pull cable linkages and, during the last increment of rack travel, push the follow-up cables forward to bring the actuator directional controls toward neutral. This action slows but does not stop the actuators. When the pneumatic latch rollers seat in the rack detents, latch operation repositions the latch-mounted switches to open all power circuits to the nacelle-mounted reverser units and the TRANSIT indicators.

B. Auto Stow. (Figure 12) The thrust reverser electrical system incorporates provisions for an automatically initiated stow command should either of the pneumatic latches become unlocked uncommanded. This is accomplished by the pneumatic latch mounted switch on the unlocked pneumatic latch completing circuits to energize the stow coil of the directional control valve and the regulator solenoid valve of the pneumatic actuator. This action supplies air to the pneumatic actuator air motor and it drives in the stow direction to lock the affected latch. Once the latch is locked again, the reverser returns to the stowed and locked configuration shown in Figure 6. During the time the unlocked conditions exists, the TRANSIT light will be illuminated and if the condition persists over 2 seconds, the light will flash due to the flasher being energized.

C. Safety (80% Reverse Power Cut-Off) System Operation. (Figure 3) The safety system functions to prevent unit movement towards stow at high engine power settings. The system cams, installed on the throttle shafts in the pylons, operate the throttle position limit switches as the throttles reach the 80-percent position to energize the bleed-off solenoid valve. The open valve bleeds air pressure from the regulator poppet valve, causing the poppet valve to close and shut off air to the actuator air motor.



1. PRESSURE SWITCH
2. BLEED-OFF SOLENOID VALVE
3. PNEUMATIC LATCH SOLENOID VALVE
4. SPUR GEARBOX
5. PNEUMATIC ACTUATOR
6 FLEXIBLE DRIVE SHAFTS
7. FOLLOW-UP CABLE

Figure 6 - Aft Nacelle Mounted Components

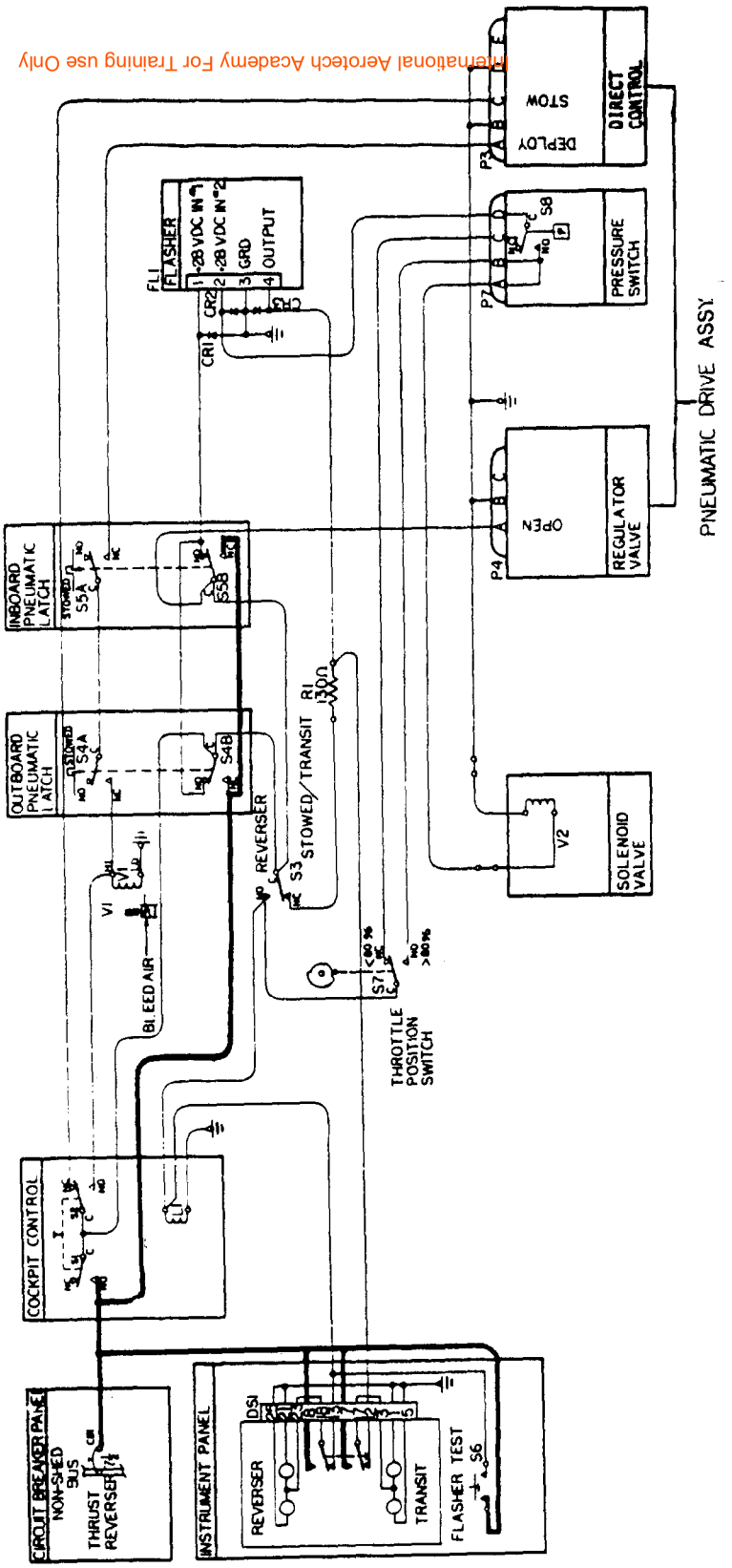


Figure 7 - Electrical Schematic - Armed - Unit Stowed and Locked

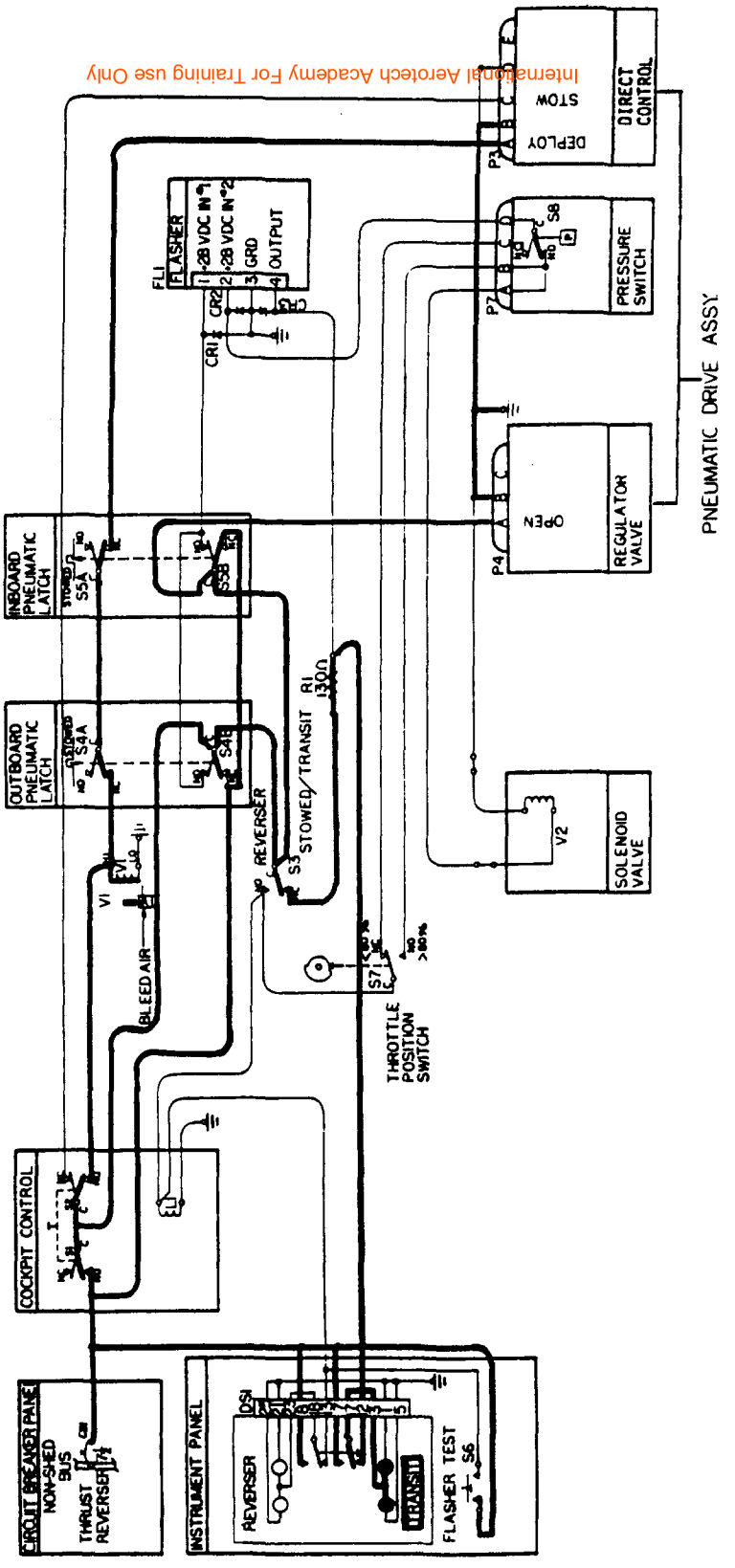


Figure 8 - Electrical Schematic - Deploy - Translating Aft

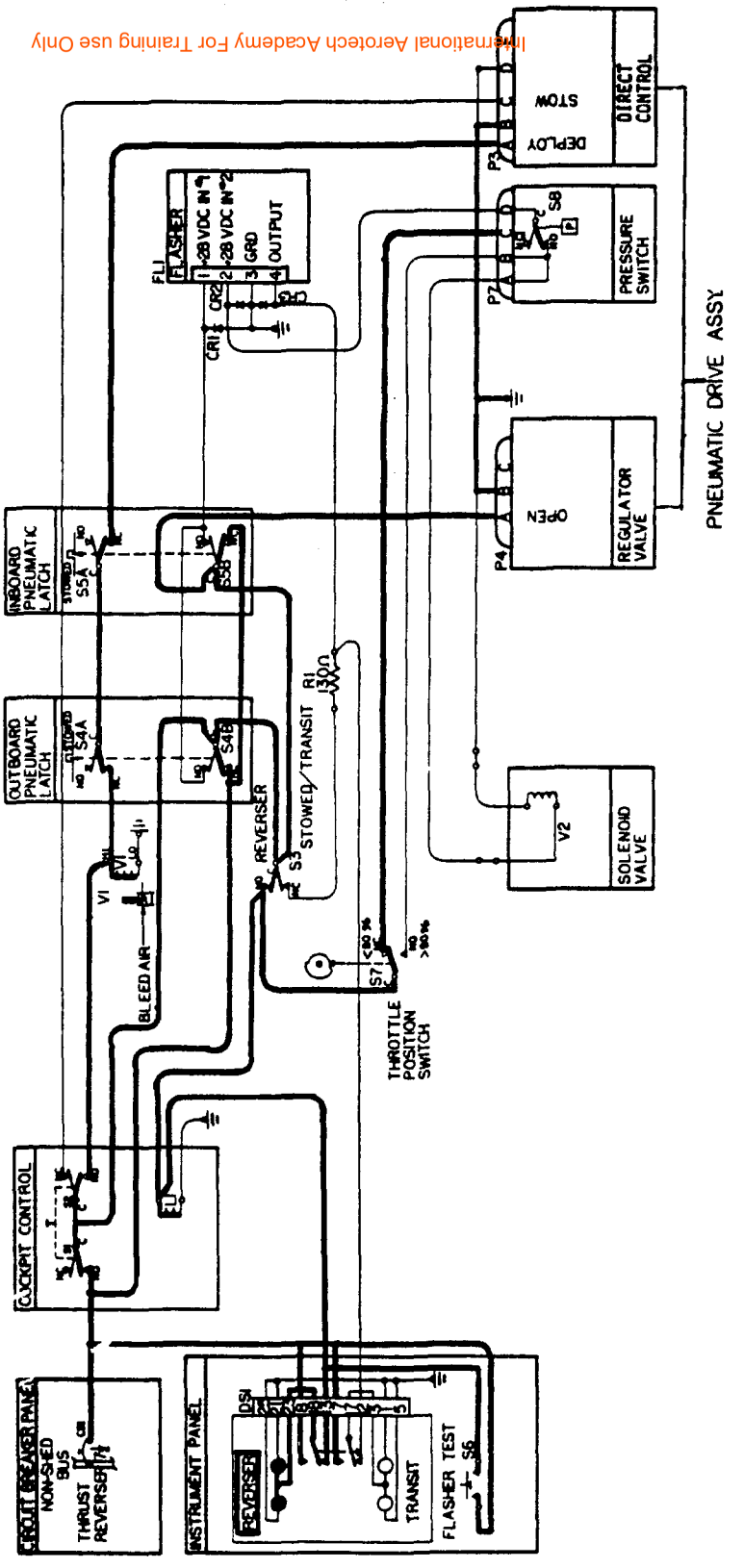


Figure 9. Electrical Schematic - Reverse Thrust - Unit Fully Deployed

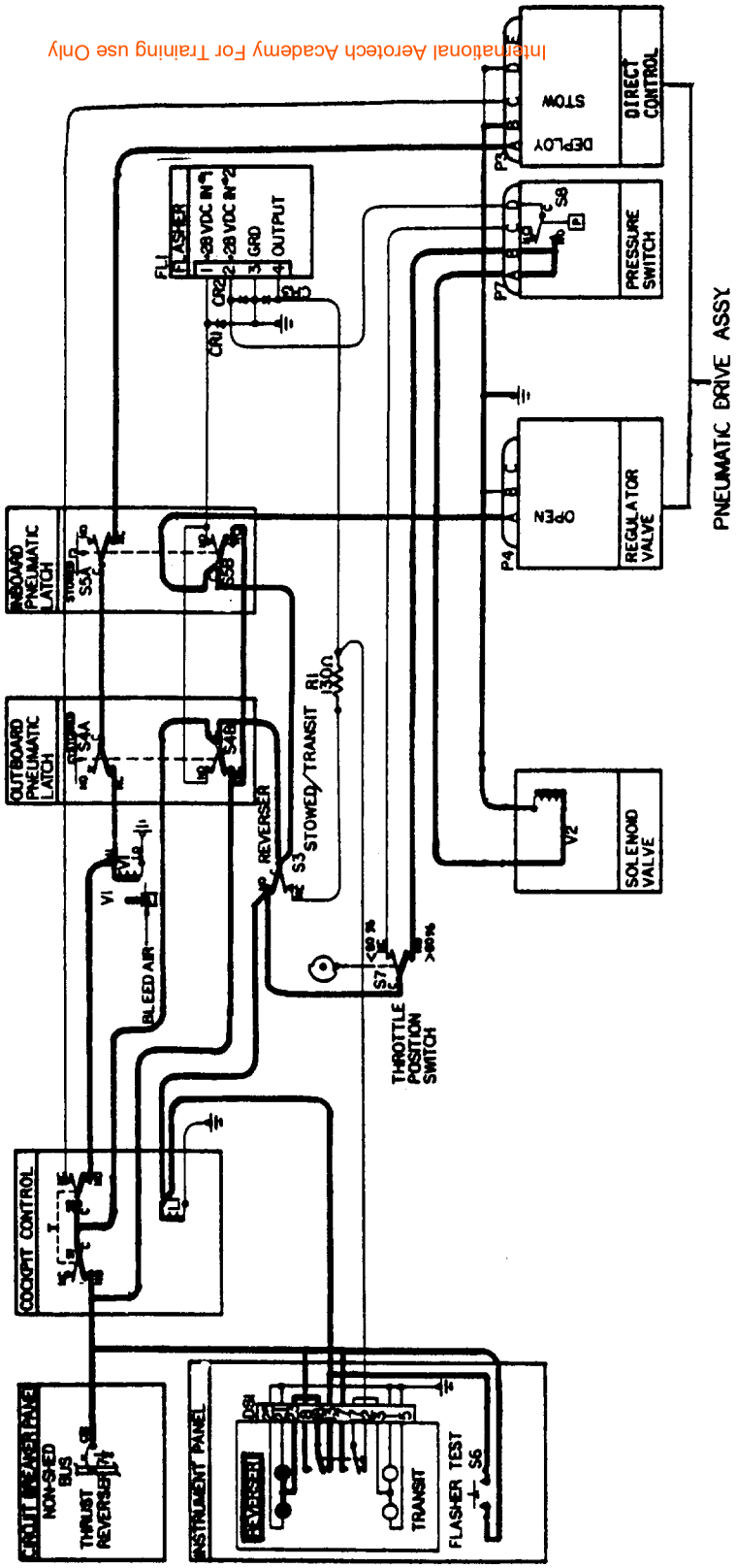


Figure 10 - Electrical Schematic - Max Reverse (Above 80% Throttle Setting)

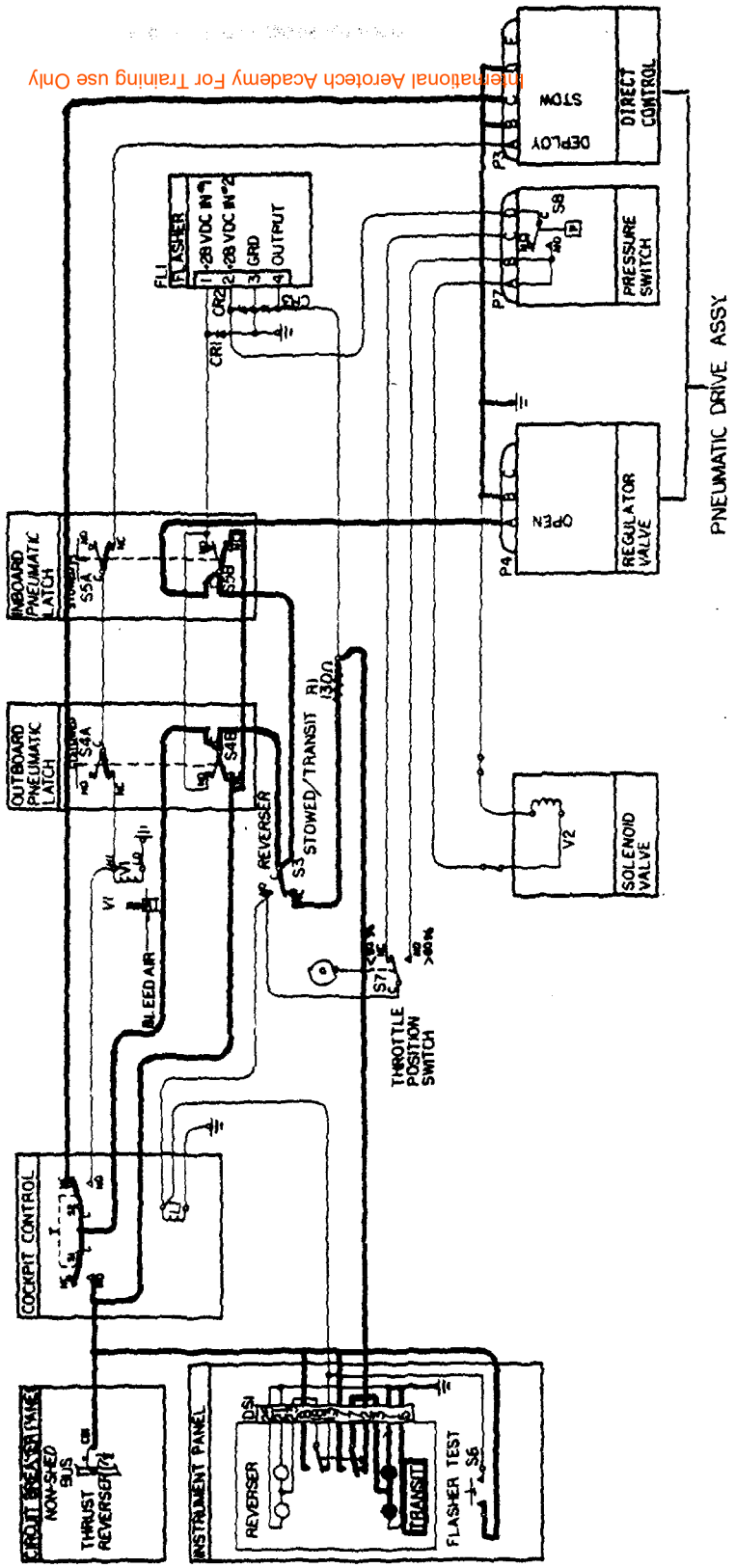


Figure 11 - Electrical Schematic - Stow Command - Translation Toward Stow

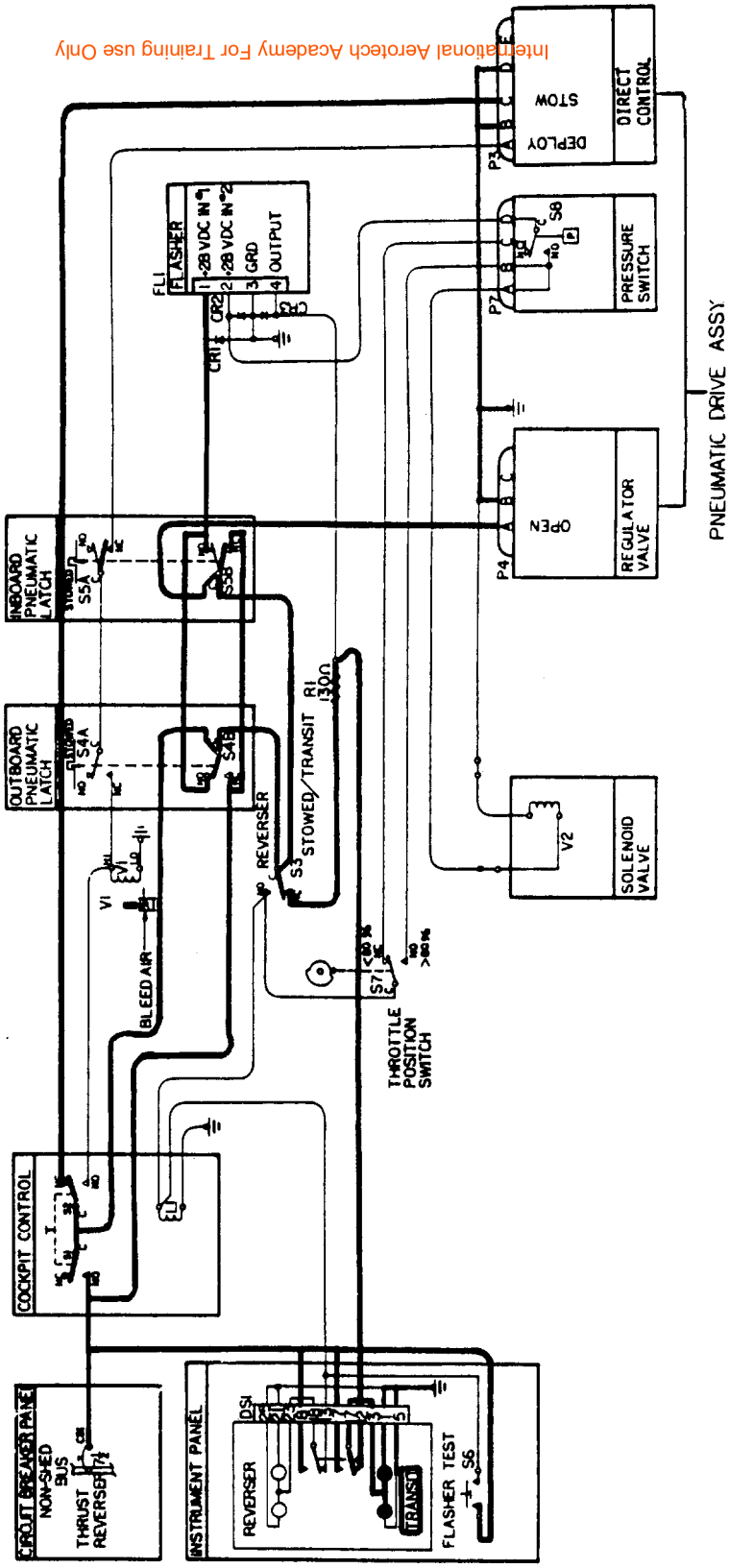


Figure 12 - Electrical Schematic - Auto Stow

FAULT ISOLATION INFORMATION

1. General. Below are tabular listings of observed malfunctions, possible causes, verification procedures, and corrective actions covering faults which can occur in each phase of a complete thrust reverser cycle. The following listings lead through a systematic approach to fault isolation and corrective action. The listing of a specific malfunction does not imply the malfunction is probable. This section also contains the complete system wiring diagram, (Figure 101).

2. System Malfunctions:

A. Unit/system does not move toward the deployed position when thrust reverser lever(s) is/are raised to the first stop. All indicator lights are " OFF " .

Possible Cause	To Verify	Corrective Action
1. Unit/system circuit breaker(s) pulled or tripped.	1. Visually check circuit breaker position(s).	1. Reset circuit breaker(s).
2. Actuating switch, mounted on power control lever assembly(ies), defective (Switch S1).	2. Refer to wiring diagram and perform continuity check(s) to isolate defective component.	2. Replace defective switch.
3. Defective circuit breaker.	3. Compare circuit breaker output and voltage available from the 28-volt non-shed system. If voltages are not identical, accomplish corrective action.	3. Replace defective circuit breaker.
4. Shorted or open in power circuit.	4. Refer to wiring diagram and perform fault continuity check(s) to isolate defective component.	4. Repair wiring

B. Unit/system does not move toward the deployed position when thrust reverser lever(s) is/are raised to the first stop. Transit signal (yellow) is "ON" and, after two seconds, flashes.

Possible Cause	To Verify	Corrective Action
1. Actuating switch, mounted on power control lever assembly(ies) defective (Switch S2)	1. Refer to wiring diagram and perform continuity check(s) to isolate defective component.	1. Replace defective limit switch.
2. Latch control valve (V1) failed	2. With V1 failed (open solenoid circuit) neither pneumatic latch will operate. Test by applying 28 vdc across V1/wire harness connections.	2. Replace valve V1.

Possible Cause	To Verify	Corrective Action
3. Trapped pneumatic latch	3. With unit in stow, check for specified clearance between pneumatic latch roller and beam detent ramp.	3. Reposition latch as required to obtain correct clearance.

NOTE: A trapped latch condition may be indicative of a prior rack overrun. Reference Section J, of this listing for data.

4. Defective pneumatic latch.	4. Check for damaged or disconnected air lines. With shop air and 28 vdc connected to the unit, select deploy and check that both latches pull at a maximum of 5 psi applied pressure.	4. Replace defective latch if operating pressure is greater than 5 psi.
5. Misadjusted or defective pneumatic latch mounted Switch S4 or S5.	5. Check switch adjustment in accordance with instructions contained in Section 3 of this publication. Refer to wiring diagram and perform a functional check on the pneumatic latch mounted switches.	5. Readjust or replace switch.

C. Transit light fails to illuminate.

Possible Cause	To Verify	Corrective Action
1. Defective lamp	1. Substitute known good lamp.	1. Replace lamp.
2. Misadjusted or defective pneumatic latch mounted switch.	2. Adjust switch in accordance with instructions provided in this publication. If this adjustment does not effect a correction refer to wiring diagram and perform a switch function check.	2. Readjust or replace switch.
3. Shorted or open circuit	3. Refer to wiring diagram and perform wiring continuity checks as required to isolate faulty circuit.	3. Repair or replace

D. Incomplete deploy. Reverse indicator lamp is "OFF" and transit light is "ON".

Possible Cause	To Verify	Corrective Action
1. Actuation system failed in transit.	1. Perform checks II.E, F, G, J, K, and L.	1. Replace defective actuator.

Possible Cause	To Verify	Corrective Action
2. Defective air motor latching solenoid.	2. Disconnect P3 and apply 28 vdc across Pins A & B (deploy) and Pins C & B (stow) to check solenoid operation.	2. Replace defective actuator.
3. Defective regulator valve solenoid.	3. Disconnect P4 and apply 28 vdc to solenoid Pins A & B to check solenoid operation.	3. Replace defective valve.
4. Sheared spur gearbox drive shaft or defective spur gearbox.	4. Remove the flex shaft ends from the spur gearbox. Apply shop air and electrical power to the unit. Visually check for rotation of the shaft spline sockets in both the deploy and stow directions. If sockets do not rotate, remove the spur gearbox and check for a sheared drive shaft.	4. Replace spur gearbox and/or drive shaft. Manually cycle the unit to check for possible jam before reinstalling the flex shaft splines in the gearbox.
5. Defective flex shaft, rack, or pinion gearbox.	5. Remove the flex shaft ends from the spur gearbox and manually cycle the unit. If the unit either will not translate, or if translation requires undue force, remove the unit from the aircraft and inspect the mechanical components to determine cause of jam.	5. Replace defective components and rerig the unit before installation.

E. Abnormal operation with system fully deployed. Power setting cannot be increased above idle (65 percent N1) reverse. Green "REVERSE" signal is "ON" and yellow "TRANSIT" signal is "OFF".

Possible Cause	To Verify	Corrective Action
1. Operator is applying an aft pressure to the power control levers and trapping the throttle stops. Prevents solenoid(s) from retracting to clear the stops.	1. Recycle the system. Lift reverser levers to first stop and remove all aft pressure from both power control and reverser levers until green "REVERSE" lights are on. With both "REVERSE" lights on, move reverser levers aft to increase power setting.	1. Do not apply aft pressure until both "REVERSE" lights are on (Note: Do not increase power setting above idle reverse (65 percent N1) and do not remain in reverse for more than two seconds with the aircraft static).

Possible Cause	To Verify	Corrective Action
2. Lock-out solenoids are misadjusted. Length of solenoid plunger in the coil field is not sufficient to effect a plunger retraction.	2. Depress the test switch and slowly lift the throttle stop (manually). If the solenoid retracts the plunger as the stop is lifted, apply corrective action.	2. Adjust spacing between the bottom of the solenoid plunger and the flange below the threaded plunger to stop connecting link to specified dimensions.
3. Throttle stop and/ or throttle burred/ gouged at contact point.	3. Visually inspect the contact surfaces.	3. Clean up burred areas using crocus cloth.
4. Lock-out solenoid circuitry shorted or open.	4. Refer to system wiring diagram and perform continuity and voltage level checks as required to isolate cause of failure.	4. Repair/replace defective circuitry.
5. Lock-out solenoid(s) failed.	5. Remove solenoid(s) and check for correct electrical characteristics and freedom of operation.	5. Replace solenoid(s) not meeting electrical criteria and/or having nicked or burred plunger(s) or bore(s).

F. Abnormal operation with system at deploy. Blocker doors not in contact with each other when green "REVERSE" indicator is on and yellow "TRANSIT" indicator is off.

Possible Cause	To Verify	Corrective Action
1. Too many or too few spacer washers installed on the forward end of the inboard rack (controls the actuator cut-off point by positioning of the follow-up system stop).	1. Cycle the unit and observe whether: Condition 1)the blocker doors come together and then open, or Condition 2) do not completely close.	1. Note: The addition or removal of one washer alters the blocker door position approximately one inch. For condition 1), remove washers as required. For condition 2), add washers as required.

G. Abnormal operation with system at deploy. Green "REVERSE" light on and yellow "TRANSIT" light flashing.

Possible Cause	To Verify	Corrective Action
1. Regulator bleed solenoid failed.	1. No bleed air thru exhaust ports and solenoid does not shift with 28 vdc applied.	1. Replace actuator.
2. Safety system solenoid valve not functioning.	2. Perform safety system check.	2. Replace solenoid valve.

H. System will not stow on command. Green "REVERSE" signal is "ON" and the yellow "TRANSIT" signal is "OFF".

Possible Cause	To Verify	Corrective Action
1. Throttle position Switch S7 defective.	1. Refer to system wiring diagram and perform functional check of Switch S7.	1. Replace S7 if functioning improperly.
2. Throttle Switch S2 defective.	2. Refer to system wiring diagram and perform functional check of Switch S2.	2. Replace S2 if not functioning properly.
3. Solenoid Valve V2 defective.	3. Apply 28 vdc to V2 pins. If V2 does not operate (audible), apply corrective action.	3. Replace actuator.
4. Defective actuator regulator.	4. Bleed air flow thru sensing selector, in excess of specified volume and/or damaged follow-up cable bracket indicates defective actuator regulator.	4. Change actuator.
5. Defective P35. latching solenoid.	5. Refer to the system wiring diagram and perform a P3 functional test. Apply 28 vdc across Pins A & B (deploy) and Pins C & D (stow). Check for audible indication of solenoid operation.	5. Replace the actuator unit if solenoid does not function correctly.
6. Defective P4 regulator solenoid.	6. Refer to the system wiring diagram and perform P4 functional check. Check that solenoid opens with 28 vdc applied to Pins A & D and closes with power removed.	6. Replace the actuator unit if solenoid does not function correctly.
7. Defective wiring harness.	7. Refer to system wiring diagram and perform continuity checks as required to isolate defect.	7. Repair or replace defective harness component.

I. Incomplete stow. Green "REVERSE" signal is off and yellow "TRANSIT" light is "ON". Stow movement is stopped with translating structure aft of full stow.

Possible Cause	To Verify	Corrective Action
1. Sequencing latch jammed.	1. If the blocker doors have not fully stowed, determine the position of the racks with respect to the sequencing latches. If either rack/latch has not properly engaged, remove the unit and accomplish corrective action.	1. With the unit removed from the aircraft, check for obvious causes for sequencing latch malfunction. Remove the flex shaft ends from the spur gearbox and hand translate the unit to check latch function. Inspect all latch and rack parts for damage. Rerig the unit before reinstallation.
2. Lever arm pivot weld broken	2. Inspect inboard blocker door lever arm welds, visible inside reverser exhaust nozzle, for evidence of cracking.	2. Replace cracked lever arms and re-rig unit

J. Stow cycle stopped with translating structure three to six inches aft of full stow (applicable to Ship Sets 001 through 023 and 025 not having Service Bulletin 78-30-003 incorporated).

Possible Cause	To Verify	Corrective Action
1. Racks have traveled aft to the extent of having disengaged pinion gears on last deploy cycle.	1. Remove unit from the aircraft. Inspect all rack, beam, sequencing latch, and follow-up system components for damage.	1. Replace all damaged components and install Kit 78-30-003. Rerig the system before reinstallation.

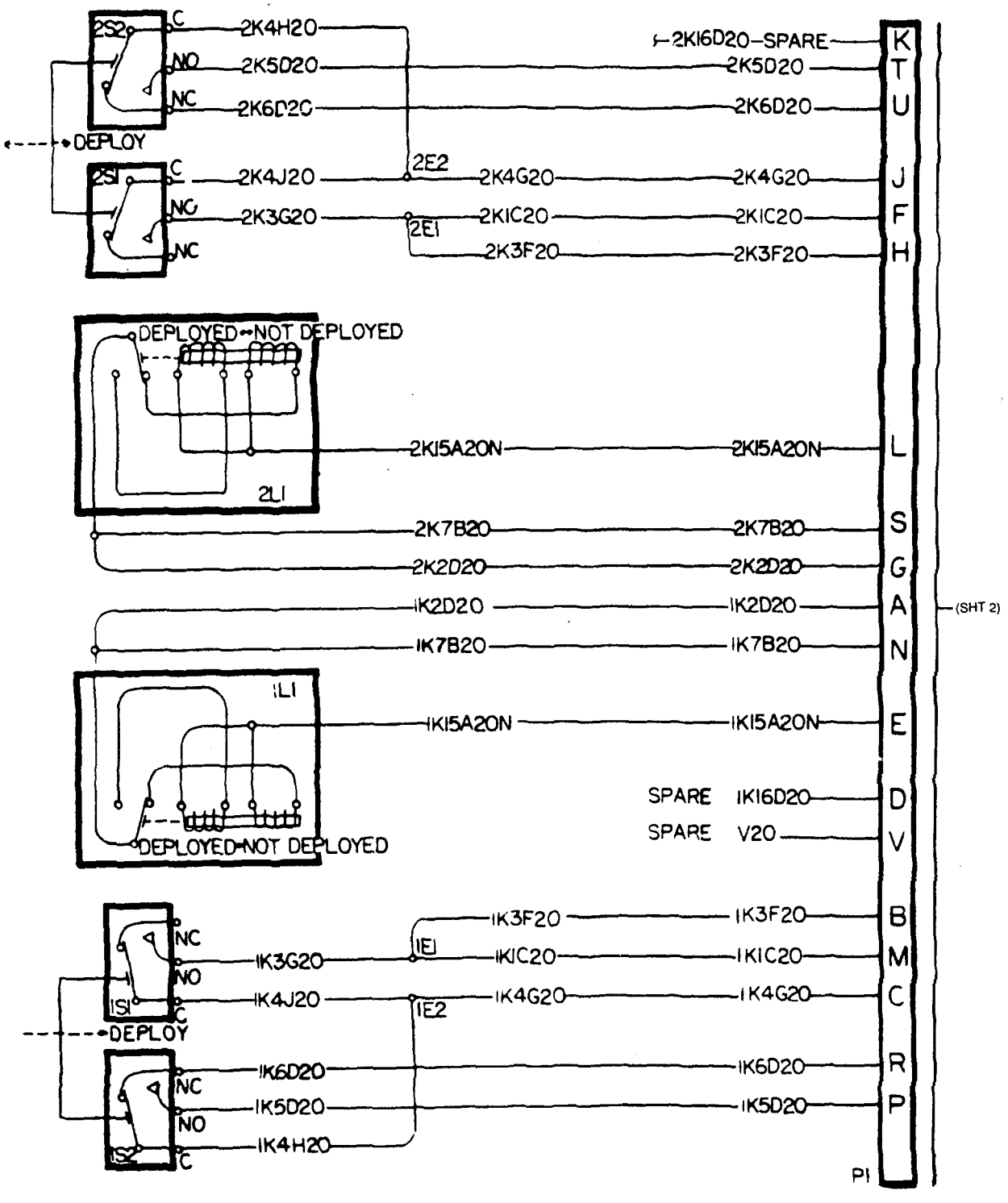


Figure 101 (Sheet 1 of 6) - Complete System Wiring Diagram (Thrust Reverser)

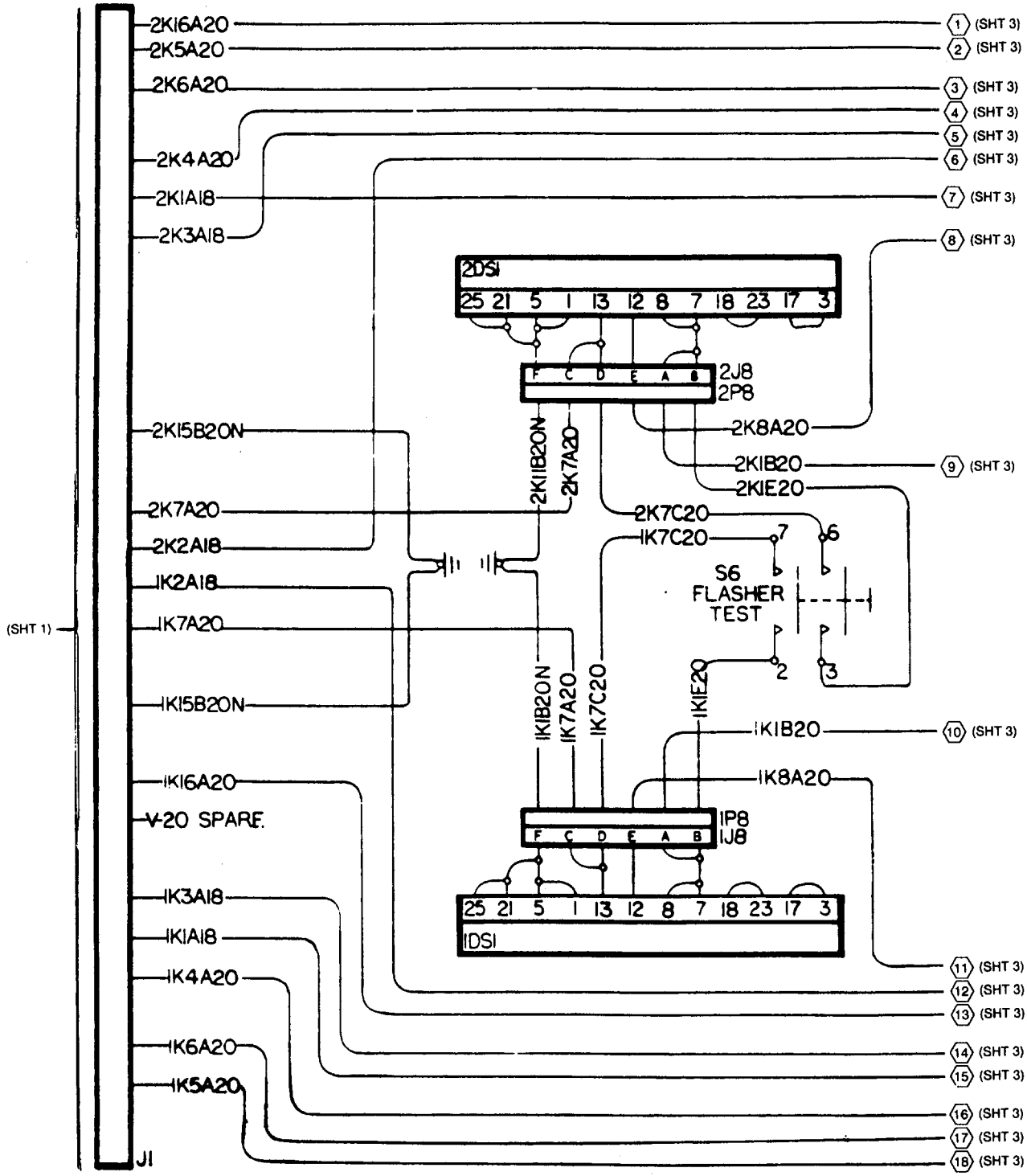


Figure 101 (Sheet 2 of 6) - Complete System Wiring Diagram (Thrust Reverser)

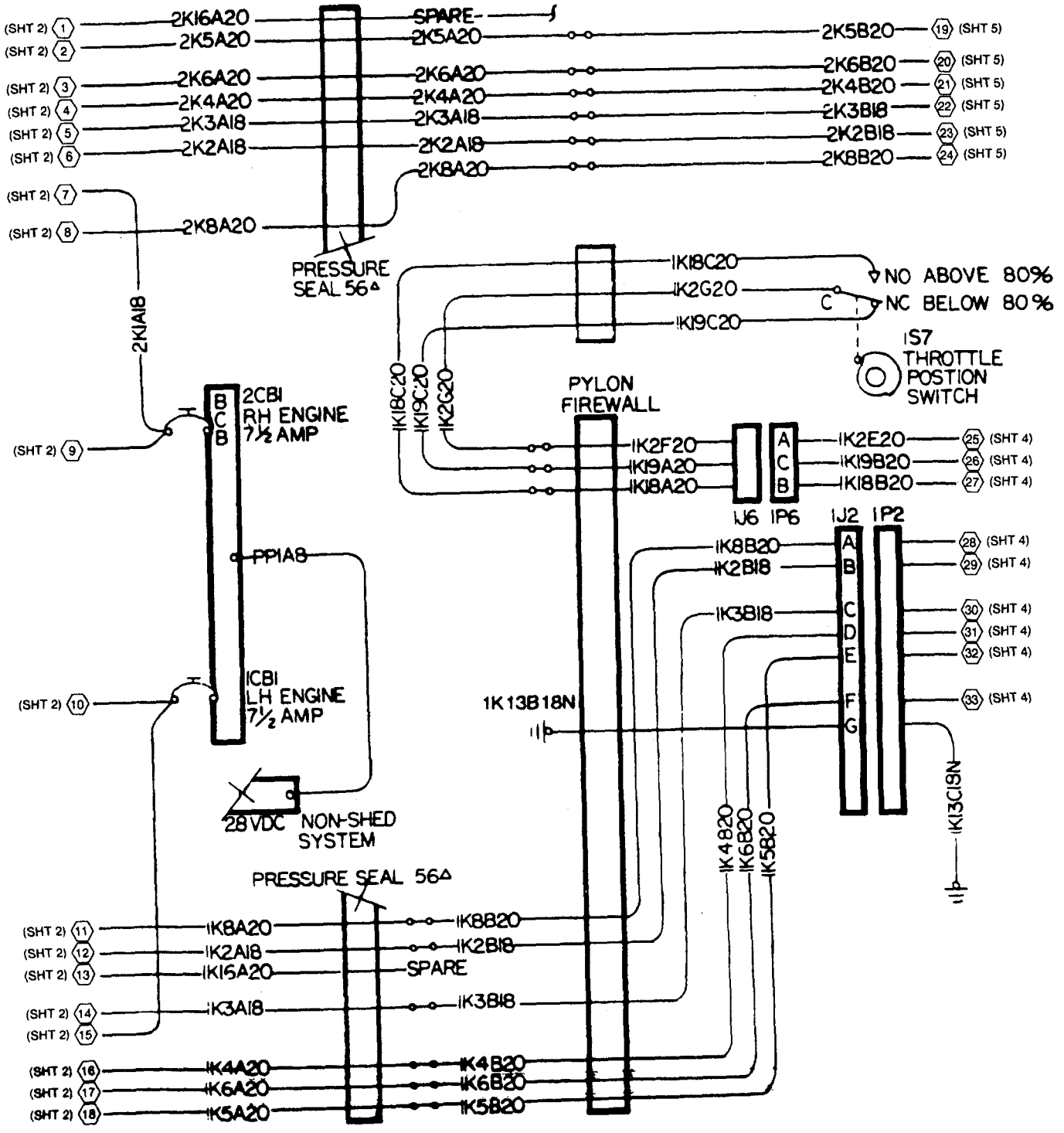


Figure 101 (Sheet 3 of 6) - Complete System Wiring Diagram (Thrust Reverser)

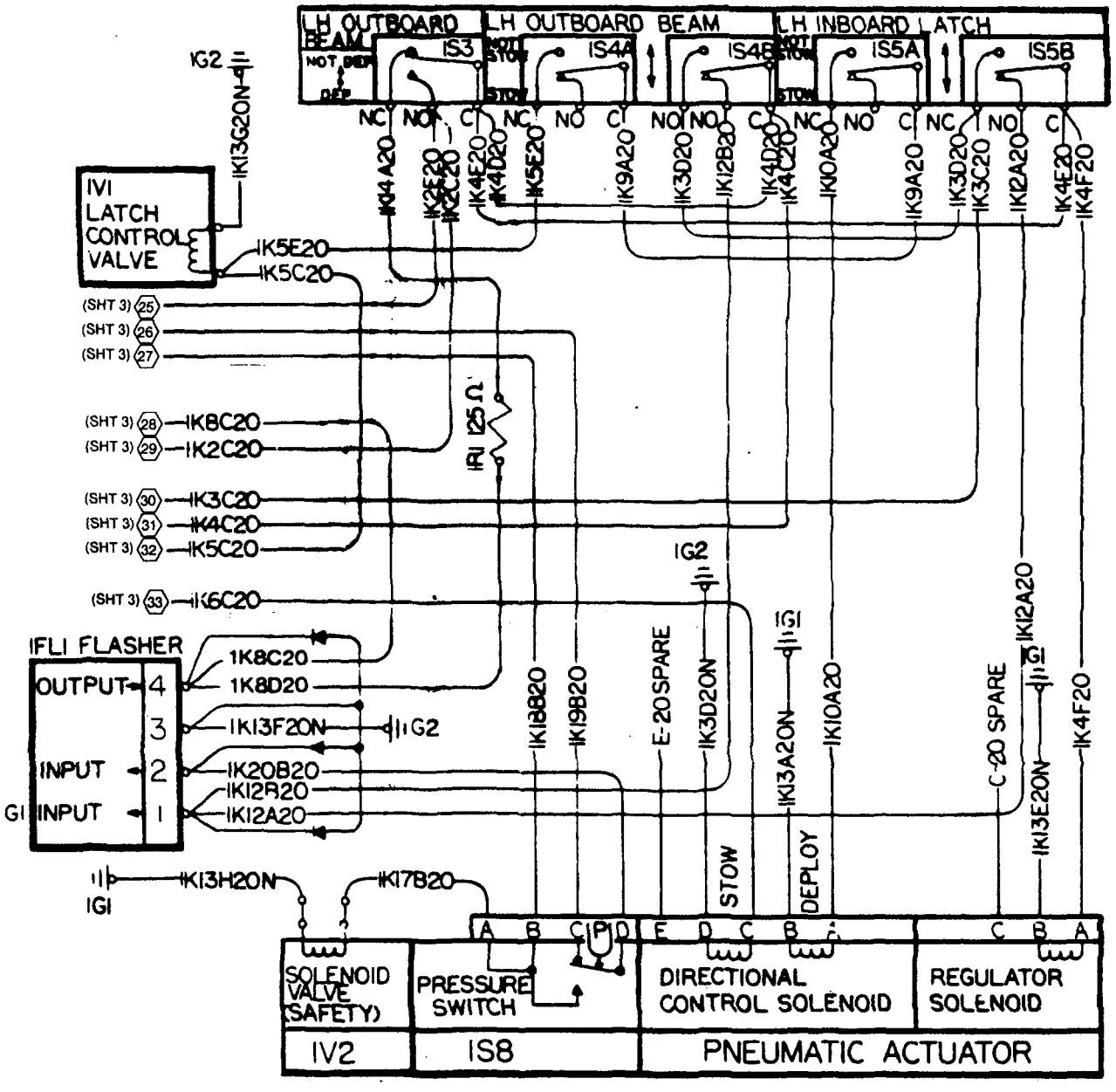


Figure 101 (Sheet 4 of 6) - Complete System Wiring Diagram (Thrust Reverser)

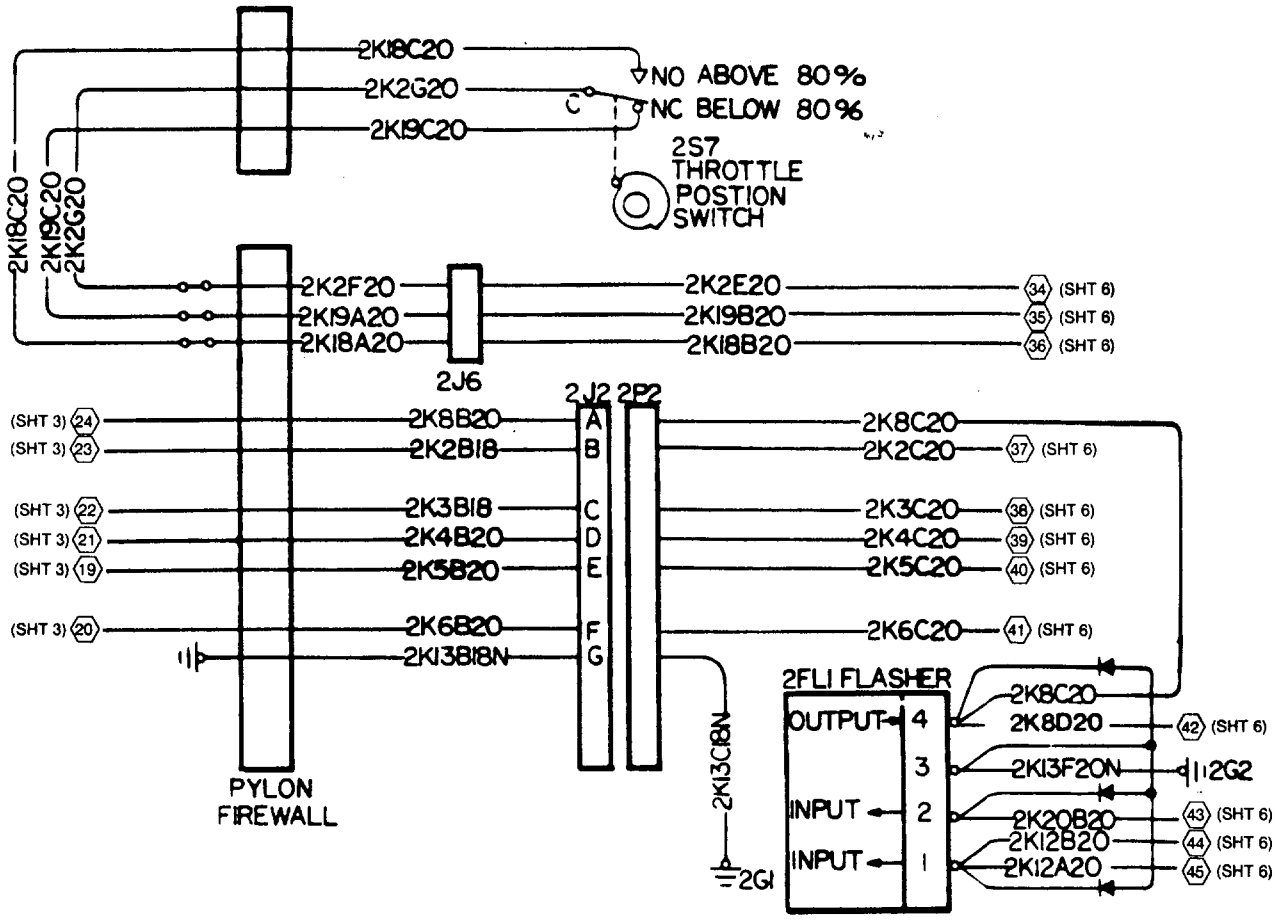


Figure 101 (Sheet 5 of 6) - Complete System Wiring Diagram (Thrust Reverser)

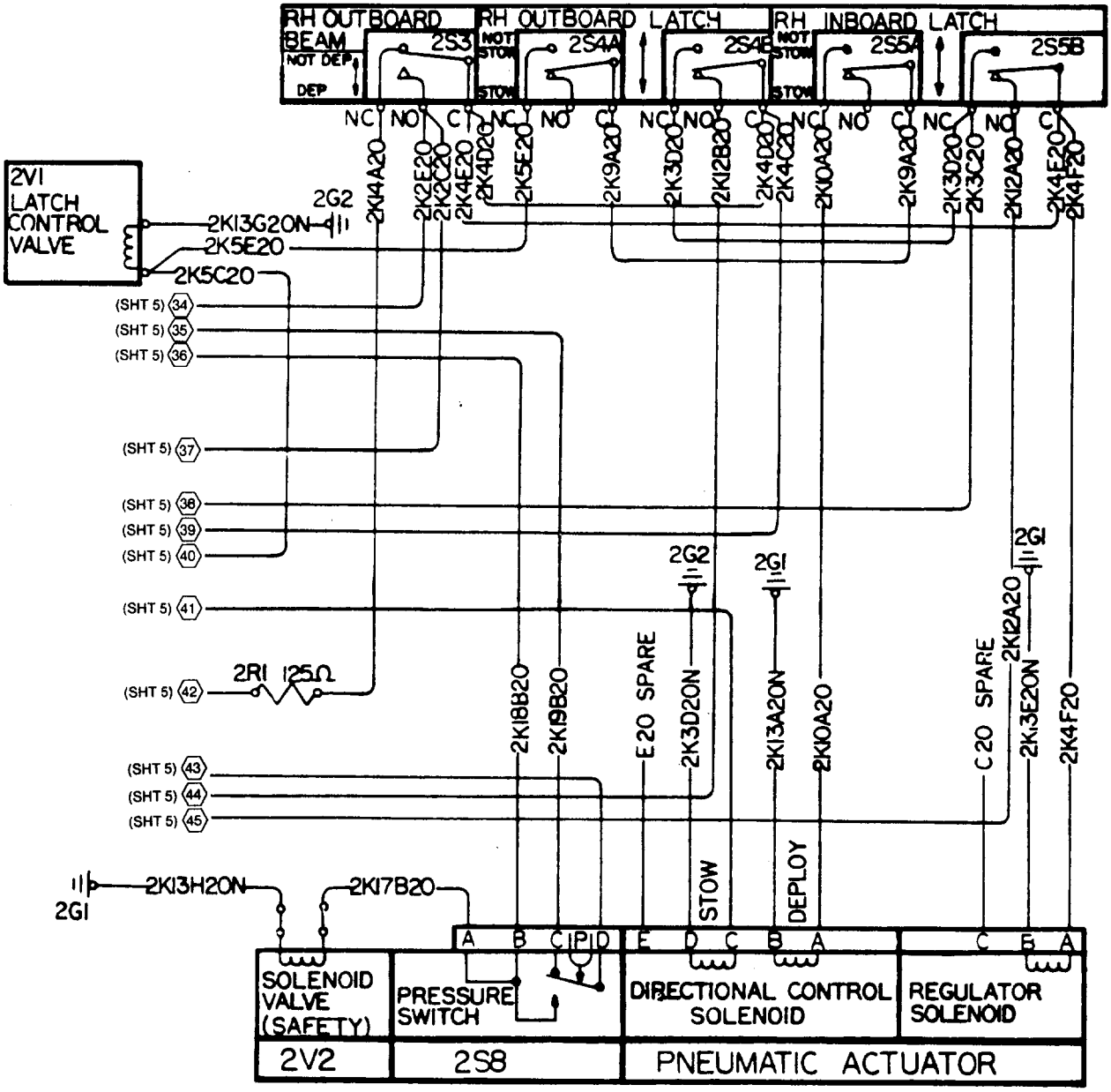


Figure 101 (Sheet 6 of 6) - Complete System Wiring Diagram (Thrust Reverser)

Thrust Reverser System - Maintenance Practices

1. General. The following instructions concern maintenance of the Dassault Falcon 20 Thrust Reverser System while the reverser is installed on the aircraft. To remove and replace the majority of components, the aft nacelle/thrust reverser must be removed from the aircraft in order to gain access. The reverser system must be serviced and inspected periodically to maintain it in sound operating condition. Refer to Paragraphs 4 and 6 of this chapter/section for servicing and inspection information.

2. Reverser Translation. On occasion it may be necessary for troubleshooting, inspection or maintenance purposes, to translate the reverser system without operating the engines. Translating the unit without engine power may be accomplished by:

   A. Remove the lower inboard access panel to gain access to the pneumatic actuator air supply line.

   B. Disconnect and remove the short segment of the air supply line between the Wiggins couplings (see Figure 201).

      NOTE: On reversers modified by Service Change SC-F20-005A, a ground/shop air adapter precludes the necessity to remove the short air supply line (see Figure 201).

   C. Connect an external air supply capable of 10 cfm at 15 psig to the air supply line to the pneumatic actuator. See Figure 202 for air supply/hook-up recommendations.

   D. Electrical power (28-volt DC) to operate the system may be supplied by:

      (1) Normal 28-volt DC aircraft power supply system.

      (2) Using special test set AST 2860 and disconnecting the two Cannon connectors located just inside and forward of the lower inboard access door to hook up the test set (see Figure 203).

   E. Deploy the reverser by:

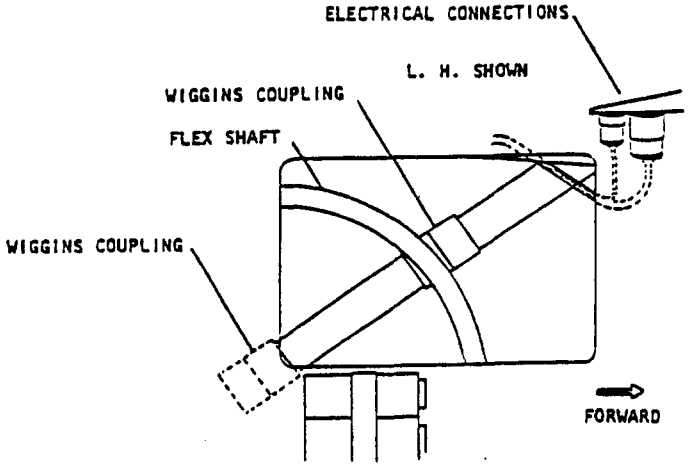
      (1) Raising the reverser lever if the aircraft power system is used.

      (2) Selecting "Deploy" if test set is used.

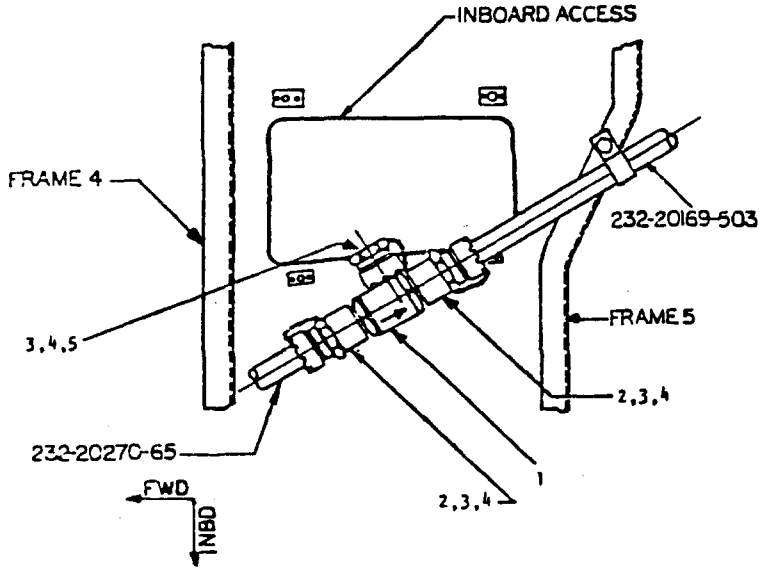
3. Thrust Reverser Deactivating/Lockout. In the event of thrust reverser(s) malfunction making it impractical and/or unsafe for reverser operation, the aircraft may be continued in operation provided the affected reverser(s) is deactivated per the following procedure.

   NOTE: It is mandatory that both steps be followed to disable and lock-out both reversers.

   A. Disengage the circuit breaker(s) of the affected reverser(s) and placard to prevent inadvertent re-engagement.



L.H. NACELLE (LOOKING UP)



R.H. NACELLE (LOOKING DOWN)

LEGEND			
ITEM NO.	PART NO.	NOMENCLATURE	QTY. PER NACELLE
1	2S2594A	CHECK VALVE	1
2	3766C12D	ADAPTER ASSY.	2
3	MS9068-21D	O-RING	3
4	MS20995C32	LOCKWIRE	24 INCHES
5	3630-12D	CAP ASSY.	1

Figure 201 - Thrust Reverser Nacelle Air And Electrical Connections

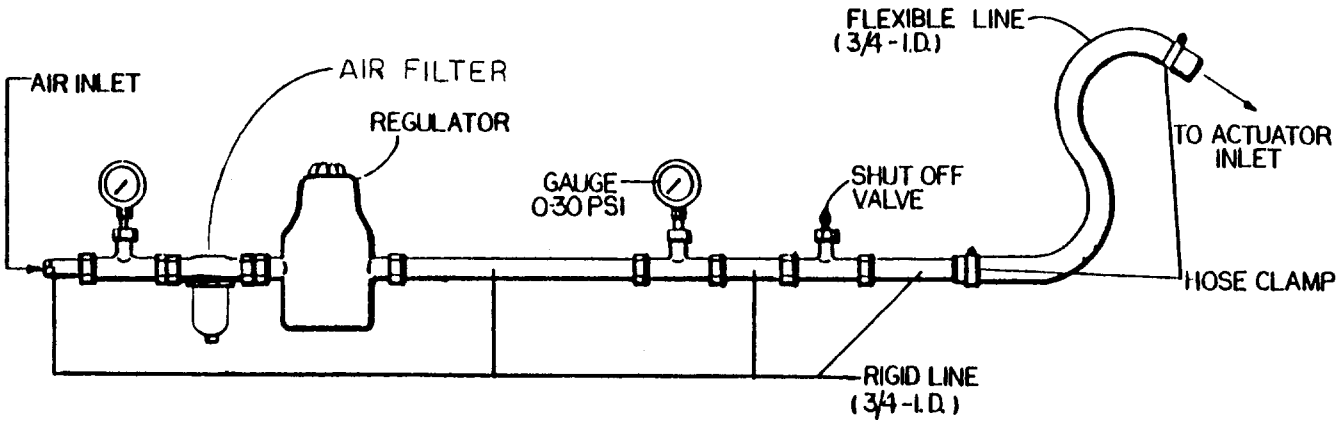


Figure 202 - Ground Test Air Supply

TEMPORARY REVISION NO. 78-1

MANUAL AFFECTED: Learjet (Aeronca) Falcon 20 Thrust Reverser Maintenance Manual.

FILING INSTRUCTIONS: Insert adjacent to 78-30-00, page 204, dated March 1, 1995 and retain until further notice.

REASON: Change lubricant call-out due to discontinued product (GS-3).

INSTRUCTIONS: Revise "Thrust Reverser Lubrication" section as follows:

THRUST REVERSER LUBRICATION

COMPONENT/SERVICE	LUBRICANT	LUBE INTERVAL
A. Translating Beams and Gear Racks	Lilly Industries P/N 5791C90003 or P/N 5791C90004	Every 200 Hours

(1) With the thrust reversers deployed, apply Lilly Industries dry film lubricant P/N 5791C90003 or P/N 5791C90004 to the exposed aft portion of the beams and racks. The lubricant is available from Lilly Industries, 210 E. Alondra Boulevard, Gardena, CA 90248.

NOTE: At 400 Hour and engine Hot Section Inspection (HSI) intervals, where reversers are removed, it will be possible to lube the entire beams and racks.

B. Sequence Latches	Lilly Industries P/N 5791C90003 or P/N 5791C90004	Every 400 Hours and Engine HSI

(1) Apply Lilly Industries dry film lubricant P/N 5791C90003 or P/N 5791C90004 to all moving parts of the sequence latches. With sequence latches installed on beams, it is recommended that a nozzle and spout (long straw) be used to direct the lubricant more accurately.

NOTE: Sequence latches will be removed from the beams at the engine hot section inspection interval providing a better opportunity to thoroughly clean and lubricate them.

COMPONENT/SERVICE	LUBRICANT	LUBE INTERVAL
C. Flexible Drive Shafts	Refer to current QPL-21164	Every Engine HSI

(1) Remove flexible drive shafts and lubricate per 78-30-07.

D. Pneumatic Latches	Lilly Industries P/N 5791C90003 or P/N 5791C90004	Every 400 Hours

(1) Apply Lilly Industries dry film lubricant P/N 5791C90003 or P/N 5791C90004 to pivot points of beam locking lever, locking lever retaining arm, and the latch piston shaft.

NOTE: As a temporary measure for sticking pneumatic latches, they may be lubricated by spraying Permatex No. 81246 Silicone Lube or equivalent lubricant into the air inlet port. Permatex No. 81246 lubricant may be obtained from: Watkins Inc., 711 W. 24th St., Wichita, KS 67203. Replace sticking latches at the earliest opportunity.

E. Actuation Hardware (Operating Rods, Pivot Links, and Outer Lever Arms)	Lilly Industries P/N 5791C90003 or P/N 5791C90004	Every 200 Hours

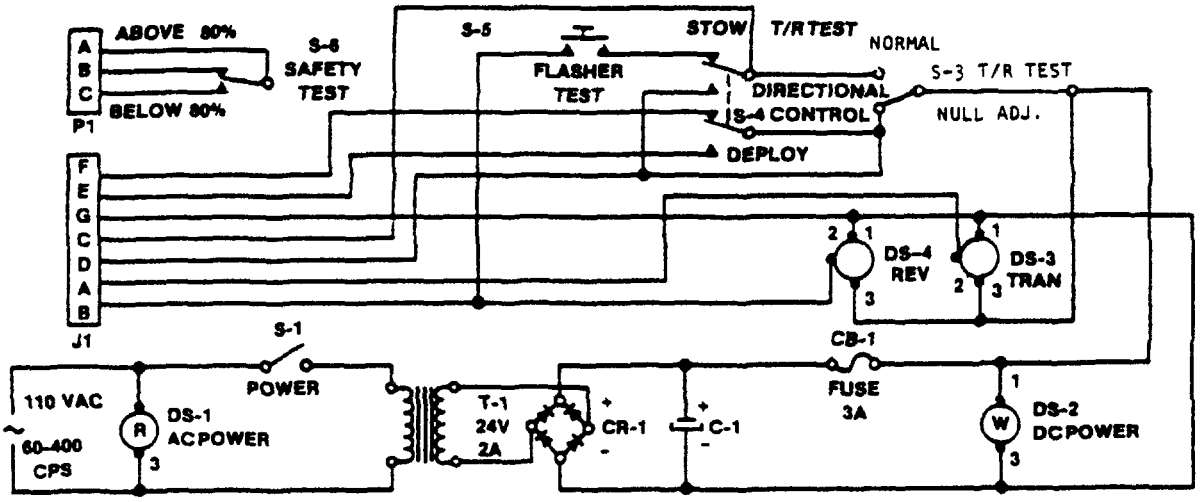
(1) Apply Lilly Industries dry film lubricant P/N 5791C90003 or P/N 5791C90004 at pivot points of operating rods, pivot links, and outer lever arms using a nozzle with spout (long straw) to reach hardware.

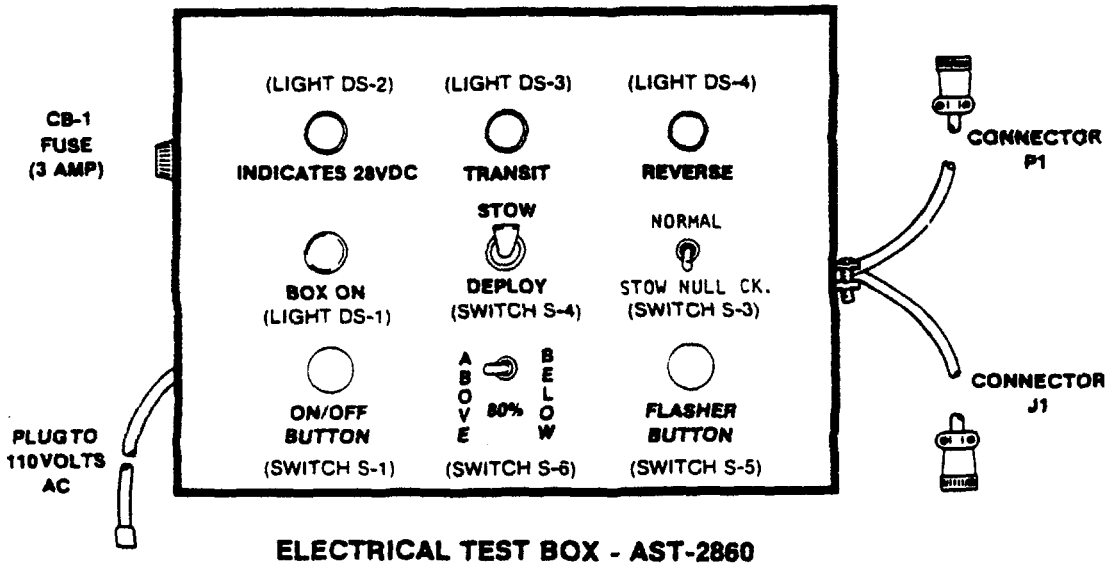
NOTE: Access to outer lever arm can only be attained at the engine hot section inspection interval when the aft fairings are removed unless the translating structure is positioned full aft with blocker doors fully stowed.

F. Tailpipe Bushings	Lilly Industries P/N 5791C90003 or P/N 5791C90004	Every 200 Hours

(1) Apply Lilly Industries dry film lubricant P/N 5791C90003 or P/N 5791C90004 to tailpipe bushings using a nozzle with spout (long straw) to reach bushings with aft fairings installed.

C-1	500M 50 WVDC	J-1	MS3100E-18S-1S-F80
CB-1	3A	P-1	MS3100E-14S-7P-F80
CR-1	P/N 50F04L-C (INTERNATIONAL RECTIFIER), 1 REQUIRED	S-1	SPST
DS-1	110 VT NEON LAMP -RED	S-3	SPDT
DS-2	P/N 812-1030-0972-506 WHITE WITH 327 LAMP (DIALIGHT)	S-4	DPDT -CENTER OFF
DS-3	P/N 812-1030-0972-506 AMBER WITH 327 LAMP (DIALIGHT)	S-5	PUSH ON (MOMENTARY)
DS-4	P/N 812-1030-0972-506 GREEN WITH 327 LAMP (DIALIGHT)	S-6	SPDT (MOMENTARY IN ABOVE 80% POSITION)
		T-1	110-120 VAC INPUT .24V 2 AMP OUTPUT





ELECTRICAL TEST BOX - AST-2860

Figure 203 - Special Tool, Electrical Test Box

B. After ensuring that the reverser(s) is/are fully stowed, install safe dispatch bolts as follows:

(1) Install the short safe dispatch bolt(s) through the 1/2 inch diameter hole(s) located on the aft nacelle outboard centerline just forward of the translating fairing. The bolt(s) must extend into the retention notches machined into the translating beams and must not be torqued more than 15 inch pounds after bottoming out. Proper engagement of bolt(s) may be checked by measuring depth from nacelle skin surface to bottom of notch in beam prior to installation of bolt(s).

NOTE: On reversers equipped with deploy switch access panels, the 1/2 inch diameter hole(s) will be located in the panel.

(2) Install the long safe dispatch bolt(s) through the 1/2 inch diameter hole(s) located approximately three inches above the inboard centerline and three inches forward of the translating fairing. Ensure proper engagement and torque as stated in (1) above.

4. Servicing. To maintain the thrust reverser system at peak operating efficiency, requirements exist to lubricate certain components at specified intervals. These intervals coincide with aircraft inspection intervals of 200 and 400 hours. Those components requiring lubrication, type of lubricant and lubrication frequency are listed below. At 200 hours the reverser will not be removed from the aircraft and therefore it is recommended reversers be deployed just prior to engine shutdown to provide maximum accessibility to actuation hardware.

THRUST REVERSER LUBRICATION

COMPONENT/SERVICE	LUBRICANT	LUBE INTERVAL
A. Translating Beams and Gear Racks.	GS-3	Every 200 Hours

With the reversers deployed, apply GS-3 to the exposed aft portion of the beams and racks. GS-3 is available from RAM chemicals, 210 E. Alondra Blvd., Gardena, California 90249.

NOTE: At 400 Hour and engine Hot Section Inspection (HSI) intervals, where reversers are removed, it will be possible to lube entire beams and racks.

B. Sequence Latches.	GS-3	Every 400 Hours and Engine HSI

Apply GS-3 to all moving parts of the sequence latches. With sequence latches installed on beams, it is recommended that a nozzle and spout (long straw) be used to direct GS-3 more accurately.

NOTE: Sequence latches will be removed from the beams at the engine hot section inspection interval providing a better opportunity to thoroughly clean and lubricate them.

C. Flexible Drive Shafts.	Refer to current (QPL-21164)	Every Engine HSI

Remove flexible drive shafts and relubricate per 78-30-07.

D. Pneumatic Latches.	GS-3	Every 400 Hours

Apply GS-3 to pivot points of beam locking lever, locking lever retaining arm and the latch piston shaft.

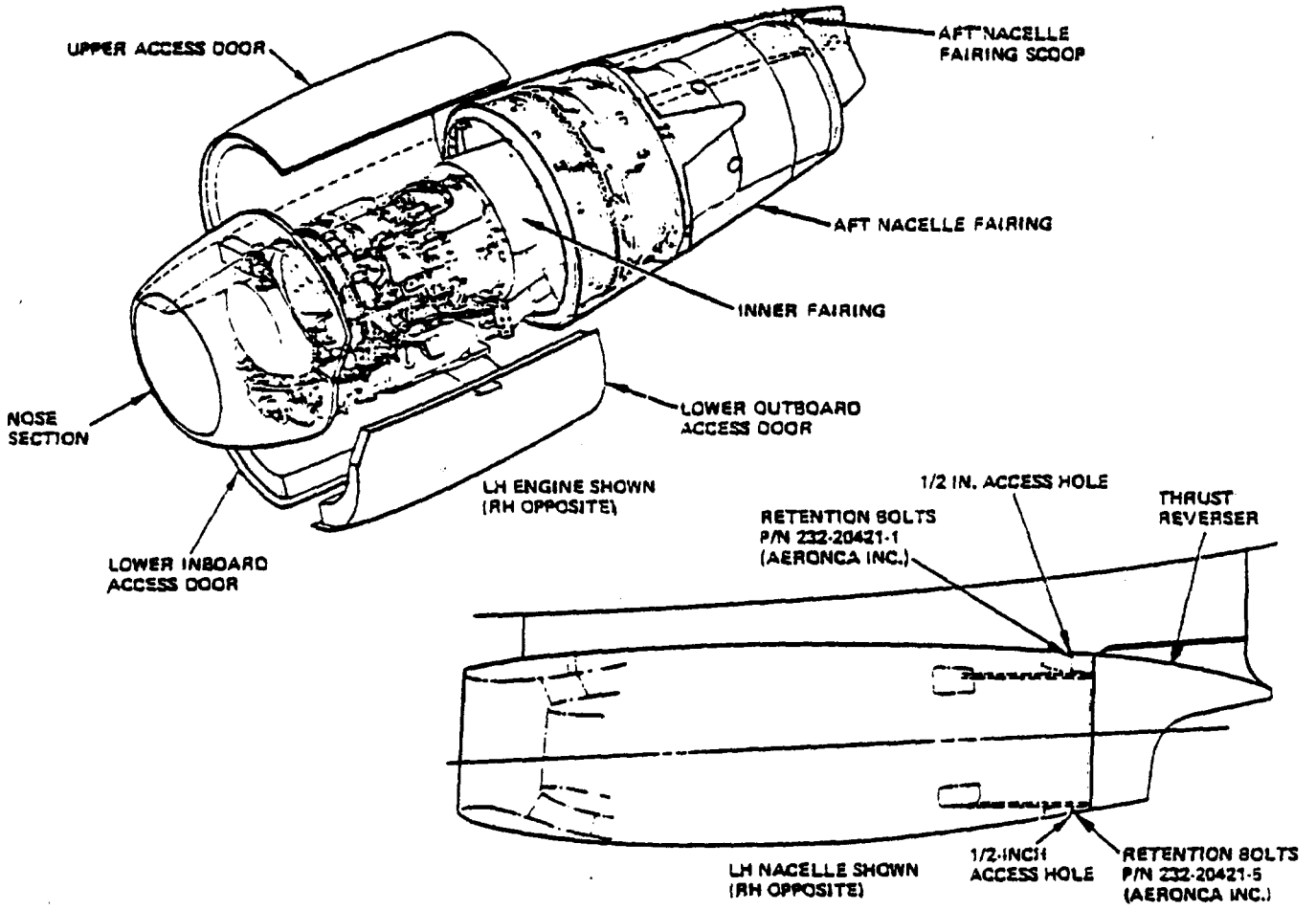


Figure 204 - Engine And Aft Nacelle

NOTE: As a temporary measure for sticking pneumatic latches, they may be lubricated by spraying Permatex No.81246 Silicone Lube or equivalent lubricant into the air inlet port. Permatex No. 81246 may be obtained from: Watkins Inc., 711 W.24th St., Wichita, KS 67203. Replace sticking latches at the earliest opportunity.

E. Actuation Hardware.(Operating Rods, Pivot Links and Outer Lever Arms) GS-3 Every 200 Hours

Apply GS-3 at pivot points of operating rods, pivot links, and outer lever arms using a nozzle with spout (long straw) to reach hardware.

NOTE: Access to outer lever arm can only be attained at the engine hot section inspection interval when the aft fairings are removed unless the translating structure is positioned full aft with blocker doors fully stowed.

F. Tailpipe Bushings. GS-3 Every 200 Hours

Apply GS-3 to tailpipe bushings using a nozzle with spout (long straw) to reach bushings with aft fairings installed.

G. Centering Pads. Every 400 Hours

Apply Hi-Temp C5-A Anti-Seize, Fel-Pro Inc., Skokie, IL, to the entire unit.

H. Turnbuckles. WD-40 Every 400 Hours

Apply WD-40 to the threads of each turnbuckle.(WD-40 is commercially available)

I. Pneumatic Actuators.(Oil Filled) P/N 126372-3-1 Series 1, 2, and 4 MIL-L-7808 Every 200 Hours

(1) Check and top-off oil level to 75 cc's (Refer to 78-30-06 for servicing instructions) with MIL-L-7808 oil.

NOTE: If evidence of leakage exists, or oil loss approaches 25 cc's, the servicing interval should be more frequent.

(2) Oil change is required every 600 hours.

(3) Pneumatic actuators other than the part numbers specified above a grease-packed and require no servicing between overhauls.

5. Removal/Installation.

A. Removal.

Remove the thrust reverser system nacelle installations as follows:

(1) Remove the four access panels (see Figure 205) from the aft nacelle.

(2) Remove the short segment of the engine to actuator bleed air line, between the Wiggins couplings, through the lower inboard access door (see Figure 201).

NOTE: On reversers modified by Service Change SC-F20-005A, a ground/shop air adapter precludes the necessity to remove the short air supply line by simply removing the cap assembly from the adapter (Item 5, Figure 201).

(3) Connect an external air supply, capable of 10 cfm at 15 psig, to the actuator assembly (aft) end of the open bleed air supply line. See (Figure 202) for air supply/hook-up recommendations.

(4) Energize the aircraft 28-volt DC system.

(5) Raise the reverser lever to the deploy position.

(6) Open the external air supply shut-off valve to move the thrust reverser toward the deploy position.

(7) Close the shut-off valve to stop translation toward deploy when the reverser has moved 12 to 14 inches from full stow. Blocker doors should still be in the forward thrust (full faired) position and the forward ring at the aft edge of the nacelle structure.

(8) De-energize the aircraft 28-volt DC system.

(9) Disconnect the 7-wire and the 3-wire Cannon connectors located just forward of the lower inboard access door.

(10) Remove four turnbuckle locks and the nuts, washers, bolts, and bushings connecting the forward end of the turnbuckles to the tension straps (see Figure 206). Loosen the turnbuckles as required to free the attaching hardware.

(11) Loosen the four jack pads (see Figure 205) bearing on the rear engine mount ring by turning them in a clockwise direction (left-hand threads).

(12) Remove the hardware attaching the aft nacelle to the engine ring and the upper and lower safety (hanger) bolts (see Figure 205).

(13) Remove the thrust reverser assembly from the aircraft and place in a locally fabricated maintenance stand such as shown (Figure 207).

B. Installation.

Install the thrust reverser assembly onto the aircraft as follows:

(1) Accomplish the following pre-installation steps prior to removing the reverser assembly from the maintenance stand for installation.

(a) Partially deploy the reverser (12 to 14 inches) to position forward ring of translating structure at the edge of the aft nacelle with the blocker doors in the stowed position (fully faired).

(b) Electrical connectors should be outside the aft nacelle (through the access door).

(c) Tape or tie the turnbuckle tension rods in position against the rub strips on the aft engine ring.

(2) Carefully slide the reverser assembly over the tailpipe and while moving it forward, keep the translating structure centered around the tailpipe. Just prior to the aft nacelle contacting the aft engine ring, rotate the forward end to align the nutplates in the aft nacelle with the mounting holes in the aft engine ring.

(3) Secure the reverser assembly to the aft engine ring with the attachment screws and tighten each centering jack to obtain approximate centering of tailpipe within the translating structure.

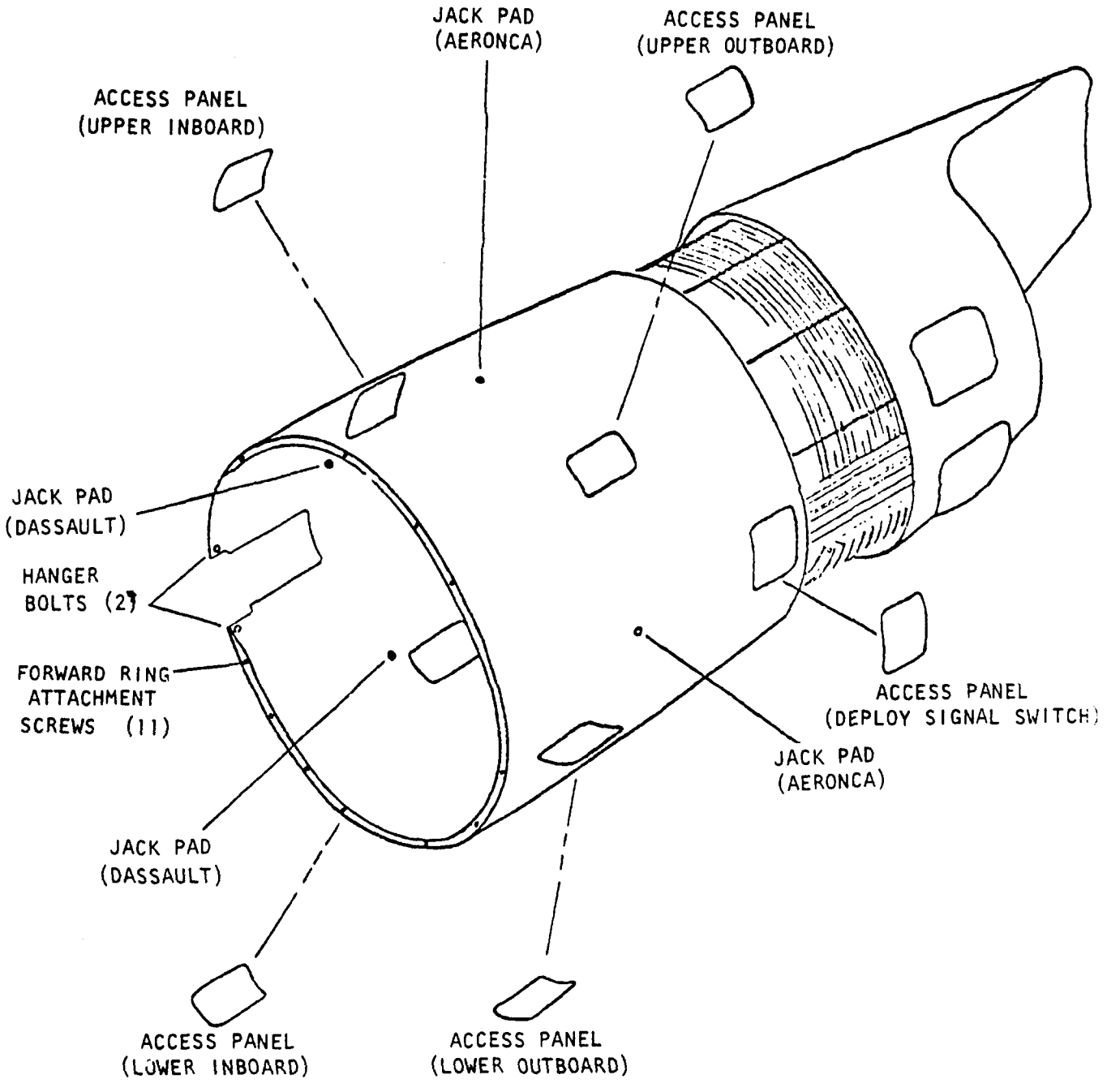


Figure 205 - Aft Nacelle Access, Positioning, And External Attachments

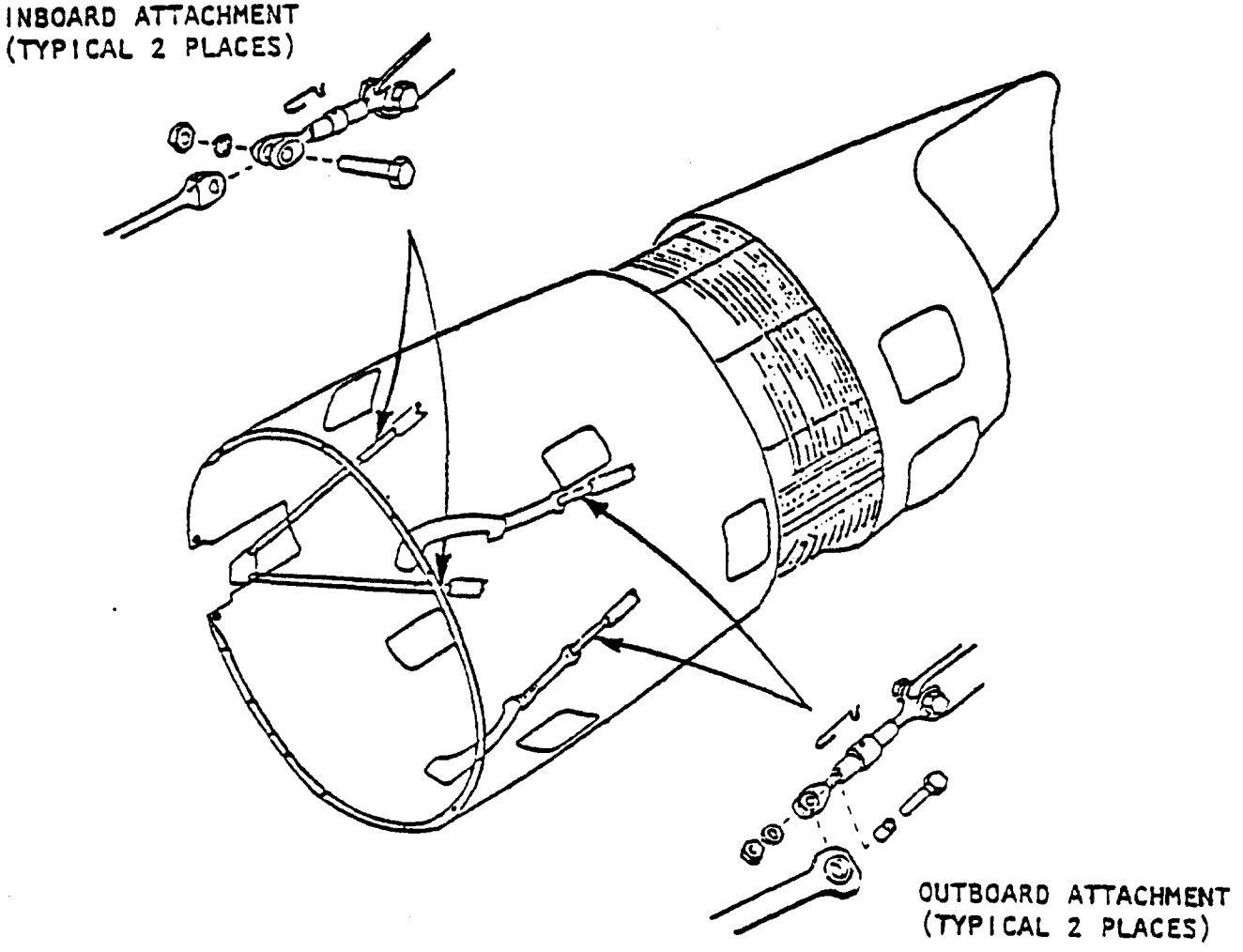


Figure 206 - Aft Nacelle Internal Attachments

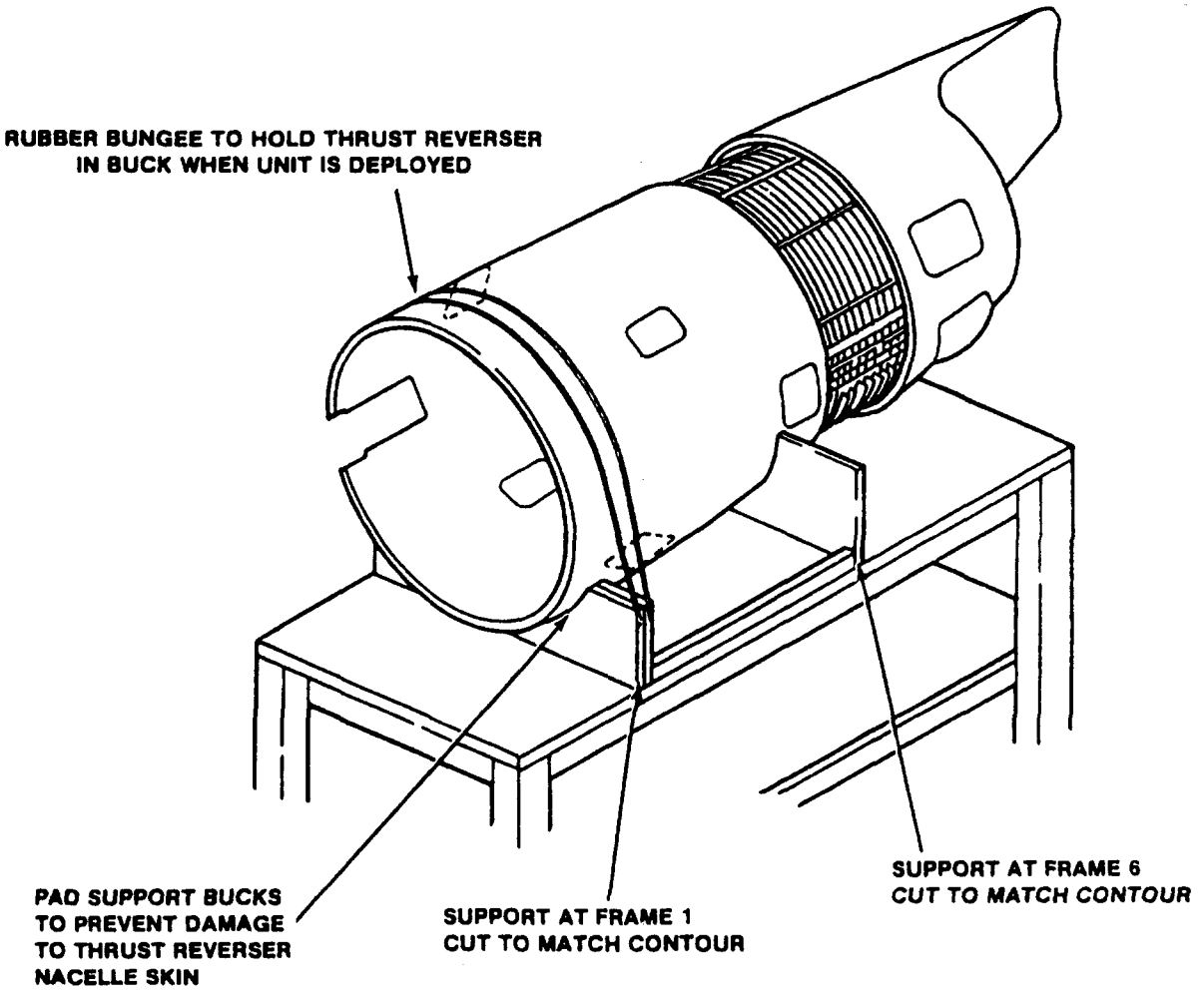


Figure 207 - Aft Nacelle/Thrust Reverser In Maintenance Stand

(4) Connect an external air supply as shown in Figures 201 and 202.

(5) Apply 28 vdc power to the reverser either by the normal aircraft electrical system or by using the test box shown in (Figure 203).

(6) Select "Stow" either by placing the reverse lever down, or by the "Stow" switch on the test box. Slowly open the air supply shut-off valve to allow the translating structure to move toward the "Stow" position. Close the air shut-off valve to stop movement when the blocker door forward edges are in the same vertical plane as the aft edge of the tailpipe.

(7) Readjust the four centering jacks to obtain a 0.150 inch min. clearance between the tailpipe and the nacelle assembly as well as insuring proper blocker door to tailpipe seal alignment to avoid tearing the seal.

(8) Slowly open the air supply shut-off valve to continue translation toward stow. Close the air supply shut-off valve to stop movement when the leading edges of the blocker doors are forward of the tailpipe aft edge but prior to seal contact.

(9) Readjust the centering jacks to maintain the dimensions of Step (7) and also to obtain 0.150-inch min. clearance between the tailpipe and upper and lower blocker doors.

(10) Open the air supply shutoff valve and fully stow the translating structure. Check for contact of translating structure with tailpipe seal. Close air supply shutoff valve.

(11) Check that the centering jacks are at least finger tight and tighten another 1/4 turn.

(12) Select "Deploy" by either raising the reverse lever or with the "Deploy" switch of the test box. Open air supply shut-off valve and deploy reverser. Close air supply shut-off valve and repeat Steps (6) through (11).

(13) With the thrust reverser in the stowed position, reconnect the four turnbuckles to the tension straps. Tighten the turnbuckles until all slack is removed from the tension rods and there is 1/4 inch (1/8 inch either side of the centerline) total lateral movement with thumb pressure applied to the side of the turnbuckle barrel at the rod to turnbuckle connections. Install the turnbuckle locks.

(14) Cycle the unit several times and recheck all clearances. Adjust clearances as required.

(15) Disconnect the external air supply and reconnect the engine to actuator air line. Safety the Wiggins connectors. On reversers incorporating Service Change SC-F20-005A, disconnect external air supply and reinstall safety cap on ground/shop air adaptor.

(16) Disconnect the test box if used and reconnect and safety the electrical connectors.

(17) Reinstall all access panels.

6. Adjustment/Test. The following adjustment/tests are required after installation of the thrust reverser assembly on the aircraft:

A. Pre-Adjustment/TestRequirements.

(1) Move aircraft to run-up area.

(2) Apply brakes and chock wheels.

(3) "Pull" both thrust reverser system circuit breakers.

(4) Start/operate both engines.

NOTE: All adjustments/tests are accomplished on one reverser at a time unless otherwise specified. Complete all adjustments/ tests on first unit prior to starting on the second reverser.

B. Thrust Reverser Controls Operational Check and Adjustment.

(1) Check throttle alignment in forward thrust by moving the engine throttles to the 60-70% N1 RPM range. Re-rig engine throttles if any mismatch exists prior to accomplishing any reverse thrust adjustments.

(2) With the engine operating at idle (46% N1 RPM), squeeze the reverser lever latch and raise the reverser lever.

(3) Continue raising the reverser lever until movement is restrained by engaging the reverse idle stop and stabilize at this power setting for a minimum of two minutes.

(4) Check that "Reverse Idle" is 65-70% N1 RPM. If not, adjust the stop lever screw (see 78-30-01, Figure 402) to obtain the proper reverse idle RPM.

(5) Return the reverse lever to forward thrust idle and repeat Steps (2) through (4) as required to accurately set the reverse idle stop at 65-70% N1 RPM.

NOTE: Since the reverser is not actually deploying, it has been determined that it is best to set the RPM at one to two percent above desired setting to obtain desired results when the reverser is re-activated.

(6) Stabilize the engine at idle (46% N1 RPM) for 30 seconds.

(7) Raise the reverse lever while manually lifting the reverse idle stop lever to allow the reverse lever to be pulled to the "Max Reverse" position to obtain 97.5% N1 RPM.

(8) Stabilize at "Max Reverse" position for 30 seconds and adjust max reverse RPM stop (see Figure 208) by loosening the two holding screws on the main throttle lever and while holding the stop housing, adjust the stop to contact the actuation link assembly and retighten stop housing screws.

(9) Return reverse lever to "Reverse Idle" position and allow the engine to stabilize for two minutes.

(10) Repeat Steps (6) through (9) checking to ensure that when the reverse lever contacts the "Max Reverse" stop that 97.5% N1 RPM is obtained. Readjust stop as required.

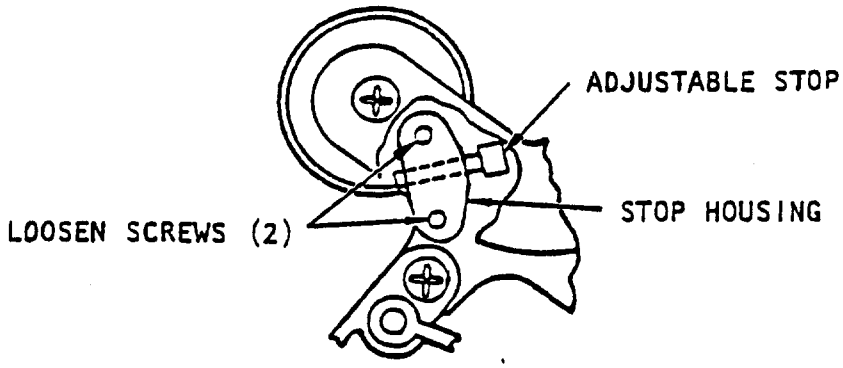


Figure 208 - Maximum Reverse RPM Stop Adjustment

CAUTION: DUE TO EXHAUST GAS REINGESTION, POSSIBLE FOD AND PAINT DAMAGE, REVERSERS ARE NEVER OPERATED AT POWER SETTINGS ABOVE "REVERSE IDLE" WITH THE AIRCRAFT STATIC. THEREFORE "MAX REVERSE" WITH THRUST REVERSERS OPERATIONAL CAN ONLY BE CHECKED OUT ON LANDING AFTER FLIGHT.

(11) Repeat Steps (2) through (10) for second reverser.

(12) Engage the appropriate circuit breaker, check the press-to-test lights for the unit to be adjusted, and momentarily depress the test switch to assure that both lights operate and that the lock-out solenoid is energized.

(13) With the engines stabilized at "Idle" (46% N1 RPM), squeeze the reverse lever latches and raise the reverse levers to the interlock ("Reverse Idle") position noting that the yellow "Transit" lights come on immediately and remain on until the reversers are fully deployed when the green "Reverse" lights come on and the "Transit" lights go out. Maximum allowable time from "Transit" light on to "Transit" light out/"Reverse" light on is two seconds.

NOTE: If reversers do not simultaneously deploy, it will be necessary to readjust the limit switches in the pedestal per 78-30-01, Approved Repairs, Paragraph 4.B and Figure 203.

(14) As soon as the green "Reverse" lights come on, return the reverse levers to the stow position and observe that the "Transit" lights come on as the "Reverse" lights go out and the "Transit" lights remain on until the reversers are stowed and locked. Maximum allowable time to stow ("Transit" lights on) is three seconds.

NOTE: On the average, most reversers stow in two to two and one-half seconds with system adjusted and operating properly.

(15) Position an observer to note operation of the blocker doors as the reverser reaches full deploy. Accomplish check on one reverser at a time.

(16) Deploy and stow the reverser. Check with the observer regarding blocker door operation. At full deploy, the blocker doors should make edge-to-edge contact. If the blocker doors fail to close completely or close and then bounce open slightly, proceed as follows:

(a) Remove upper inboard access panel to gain access to the forward end of the inboard rack.

NOTE: This adjustment can be made with the reverser stowed and the engine operating.

(b) Install one spacer washer under the 232-20396 actuator for each inch of door gap.

(c) Recheck blocker door operation by recycling the reverser after adjustment.

(d) Reinstall upper inboard access panel after satisfactory blocker door operation is obtained.

(17) Repeat the above step for second reverser.

7. Inspection/Check. The thrust reverser system requires inspection concurrent with the 200/400 hour aircraft inspection intervals and any defects noted, corrected or repaired as necessary. The 200 hour inspection is a general visual inspection conducted with the reverser installed on the aircraft but with the reverser deployed to provide maximum accessibility to actuation hardware. At the 400 hour interval, a more detailed inspection is required and it is recommended that the reverser be removed from the aircraft. Additionally at each engine hot section inspection, when the reversers are removed from the aircraft, the translating structure is separated from the aft nacelle and the reverser is given a thorough detailed inspection to include checking/rigging. Refer to Table 1 for a comprehensive listing of the inspection/test requirements, maximum serviceable limits and disposition of defective hardware.

THRUST REVERSER INSPECTION REQUIREMENTS TABLE 1

INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	DISPOSITION	INTERVAL HOURS 200*	400**	1000
1. Aft Nacelle					
A. Structure for:					
(1) Skin cracks in:					
(a) Outer nacelle skins	None allowed	Repair per Advisory Circular AC43.13-1	X	X	X
(b) Access panels	None allowed	Replace panel or repair per AC43.13-1	X	X	X
(2) Loose or missing rivets	None allowed	Replace rivets	X	X	X
(3) Loose or missing screws	None allowed	Tighten or replace screws	X	X	X
(4) Damaged or missing nut plates	None allowed	Replace nut plates	X	X	X
(5) Dents and general condition	Operators discretion	Repair in accordance with good finishing practices	X	X	X
B. Electrical harnesses for:					
(1) Loose connectors	None allowed	Tighten or replace connectors		X	X
(2) Chafing	None allowed	Reposition harness to eliminate chafing		X	X
(3) Condition of sleeving and wire insulation	No cracking, brittleness or exposed wire allowed.	Repair or replace damage sleeving or wire insulation		X	X
(4) Loose or damaged clamps	None allowed	Tighten or replace clamps		X	X
C. Pneumatic plumbing for:					
(1) Loose B-nut fittings	None allowed	Tighten or replace fittings		X	X
(2) Chafing	None allowed	Reposition lines to eliminate chafing		X	X
(3) Loose or damaged clamps	None allowed	Tighten or replace clamps		X	X
(4) Cracked, kinked, or collapsed lines	None allowed	Replace line		X	X
D. Pneumatic latches for:					
(1) Free piston movement	No binding allowed, spring action returns piston smoothly	Replace pneumatic latch		X	X
(2) Security of electrical switches	Must be secure	Tighten mounting screws		X	X
(3) Loose latch mount screws	None allowed	Tighten mounting screws		X	X
(4) Spring action of locking lever *retaining arm*	Must return freely	Replace pneumatic latch		X	X
(5) Condition of latch lever rollers	Must rotate freely	Replace pneumatic latch		X	X
(6) Cracks	None allowed	Replace pneumatic latch		X	X
E. Pinion gearboxes for:					
(1) Loose gearbox mount screws	None allowed	Tighten mount screw		X	X
(2) Damaged or missing gear teeth	Burnished teeth acceptable. No damaged, missing or worn teeth allowed.	Contact Learjet Inc. Thrust Reverser Department for specific repair instructions		X	X
(3) Freedom of gear rotation	Must rotate freely	Contact Learjet Inc. Thrust Reverser Department for specific repair instructions			X
(4) *Worn steel vespel slipper* bearings	*None allowed*	*Replace vespel bearings per* Section 78-30-08.		X	X
(5) Worn plastic vespel slipper bearings	None allowed	Replace plate Must meet criteria (See Section 78-30-08)		X	X
F. Flexible drive shafts for:					
(1) Condition of casings	See section 78-30-07	Per Section 78-30-07		X	X
(2) Condition of cores	See section 78-30-07	Per section 78-30-07			X
(3) Loose mount screws	None allowed	Tighten mount screws		X	X

* May not exceed 220 hours.
** May not exceed 440 hours.

THRUST REVERSER INSPECTION REQUIREMENTS TABLE 1

INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	DISPOSITION	INTERVAL HOURS 200*	400**	1000
G. Pneumatic actuator for:					
(1) Freedom of movement of DCV actuator piston	No binding allowed	Replace pneumatic actuator		X	X
(2) Freedom of movement of rotors. (Check both directions with manual drive.)	Must turn freely	Replace pneumatic actuator			X
2. Engine Tailpipe					
A. Sheet metal structure for:					
(1) Cracks	None allowed	Repair per engine manual SEI-187	X	X	X
(2) Dents in:					
(a) Bolt flange mating surface	None allowed	Repair per engine manual SEI-187		X	X
(3) Dents and bulges in:					
(a) The area within 30 inches of bolt flange	Any number not over 0.25 inch deep	Cold work to original contour. Fluorescent penetrant inspect		X	X
(b) The area 30 to 40 inches from bolt flange	Any number 0.06 inch deep	Cold work to original contour. Fluorescent penetrant inspect	X	X	X
(4) Scratches and nicks	Any number 0.005 inch deep	Repair per engine manual SEI-187	X	X	X
B. Aft Seal					
(1) Loose or missing rivets	None allowed	Replace rivets	X	X	X
(2) Torn or damaged seal	None allowed	Repair or replace per 78-30-16	X	X	X
3. Throttle Assembly					
A. Freedom of movement	No binding allowed	Repair or adjust to eliminate binding	X	X	X
B. Mechanical interlocks for proper function	Per 78-30-01	N/A	X	X	X
4. Translating Structure					
NOTE: The translating structure is required to be separated from the aft nacelle at the engine HSI interval.					
A. Cascade assembly for:					
(1) Cracked or broken tension straps	None allowed	Contact Learjet for specific repair instructions	X	X	X
(2) Cracked or broken cascade vanes	None allowed	Stop drill and weld using Inconel Welding Electrode 112, Inconel Filler Metal 625 or equivalent	X		X
(3) Cracked tension frames	None allowed	Repair per standard sheet metal repair procedure. Weld repair using Inconel 625 wire per AMS 5837	X	X	X
(4) Condition of pivot link attach fittings	No cracks allowed. No elliptical wear allowed in link attach hole.	Replace fitting	X	X	X
(5) Cracks in blocker panels 1 inch in length or	Cracks may not exceed stop drilled. If out of limits extend to edge of blocker plate or run into attaching hardware holes	Cracks within serviceable limits may be replace blocker plate	X	X	X
(6) Damaged flexure plates	None allowed	Contact Learjet for specific repair instructions			X X
(7) Gap under ends of elliptical spacer washers	0.020 max	Inspect for broken tension straps and retorque per sequence in Section 78-30-04. Tack welding small and large elliptical washers to cascade vane per MIL-STD-2219 is permissible up to a maximum of 6 locations (See Figure 217)			X
(8) Proper torque of tension straps	35 in.lbs. minimum	Retorque tension straps to 48 in.lbs. per sequence shown in Section 78-30-04. Run sequence three times.			X

* May not exceed 220 hours.
** May not exceed 440 hours.

THRUST REVERSER INSPECTION REQUIREMENTS TABLE 1

	INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	DISPOSITION	INTERVAL HOURS 200*	400**	1000
B.	Tailpipe for:					
	NOTE: At the engine hot section inspection interval the aft fairing and Blocker Doors are required to be removed for a more detailed inspection of the tailpipe.					
(1)	Loose or missing rivets	None allowed	Replace rivets (Monel material)	X	X	X
(2)	Cracks in:					
	(a) Torque boxes and beam attach structure	None allowed	Stop drill and weld cracks using welding wire per AMS 5813. Tailpipe material is PH15-7-7Mo			X
	(b) Main structure	None allowed	Stop drill and weld cracks using welding wire per AMS 5813 .		X	X
	(c) Forward flange	None allowed	Contact Learjet for specific repair instructions		X	X
(3)	Evidence of abrasive wear in "pockets"	None allowed	Correct rubbing by chamfering pivot link attach clevis on blocker door to limits in Section 78-30-04. Contact Learjet for specific repair instructions of pockets.		X	X
(4)	Check Tailpipe torque box bushings	Silver plate missing	Replace bushing			X
	NOTE: The Blocker Doors are required to be removed at HSI interval.					
C.	Blocker doors for:					
(1)	Cracks in door skin (except pivot pin attach area)	None allowed	Weld using welding wire per AMS 5832 Material is Inconel 718. Cracks in pivot pin attach area require door replacement	X	X	X
(2)	Loose or missing rivets	None allowed	Replace rivets	X	X	X
(3)	Evidence of contact on mating "lip" with pivot links	None allowed	Trim lip per Section 78-30-04	X	X	X
(4)	Condition of pivot link attach clevises	No cracks allowed Must be secure	Replace clevises	X	X	X
(5)	Condition of pivot link attach holes	No cracks allowed	Must meet dimensional criteria of Figure 211			X
(6)	Replace all P/N 232-20250-13 Spring washers	None allowed	Replace all spring washers			X
(7)	Check condition of Pivot Pin Stud	None allowed	Must meet dimensional criteria of Figure 211			X
(8)	Condition of pivot pin fittings	No cracks or damage allowed. Must be secure	Replace or secure pin fittings	X	X	X
(9)	Condition of pivot pin bearing	No silver plate missing	Replace bearing			X
(10)	Replace all D6-4 spring washers (4 each)					
D.	Gear racks for:					
(1)	Damaged, worn or broken teeth	None allowed	Contact Learjet for specific allowables	X	X	X
(2)	Loose fore or aft actuators as applicable	None allowed	Tighten or replace gear rack if inserts are damaged	X	X	X
(3)	Loose yoke base or yoke attach screws	None allowed. Yoke base must be perpendicular to rack.	Tighten	X	X	X
(4)	Condition of ramps.	No burrs allowed. No hard-coat separation allowed.	Must meet dimensional criteria of Figure 218		X	X
	NOTE: Rack damage is indicative of a prior unit malfunction. Also Inspect sequence latches, pinion gearboxes, catches, and flex drive shafts for damage.					

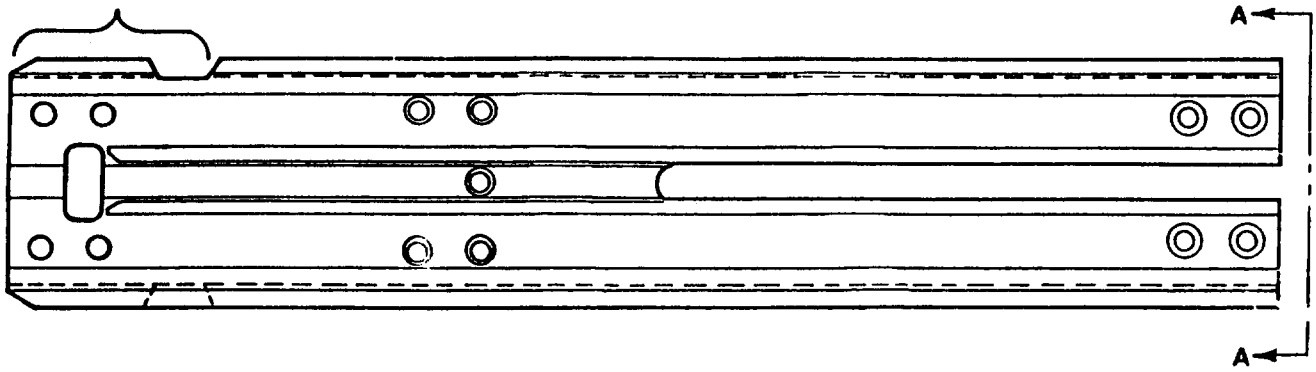
* May not exceed 220 hours.
** May not exceed 440 hours.

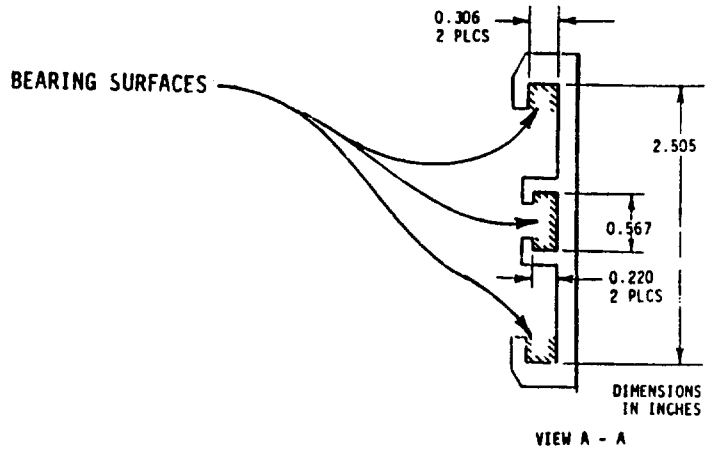
THRUST REVERSER INSPECTION REQUIREMENTS TABLE 1

	INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	DISPOSITION	INTERVAL HOURS 200*	400**	1000
E.	Translating beam for:					
(1)	Nicks or galling in hard-coat areas	Must meet dimension and inspection criteria, Figure 209	Replace beam	X	X	X
(2)	Loose mount screws	None allowed	Tighten or replace	X	X	X
(3)	Loose stow stops	None allowed	Tighten or replace	X	X	X
(4)	Excessive wear in locking notch	0 .020 maximum	Replace beam		X	X
F.	Sequence latches for:					
	NOTE: At engine hot section inspection intervals, the sequence latches will be removed from beams for a more detailed inspection.					
(l)	Loose mount screws	None allowed	Tighten or replace		X	
(2)	Freedom of movement of pivoting blocker arm. (System stowed) Use small common screwdriver to move pivot arm.	Must not bind and spring action must return arm sharply.	Replace or adjust pivoting blocker arm		X	X
(3)	Condition of stop housing	Must meet dimensional criteria of Figure 212	Replace stop housing			X
G.	Actuation hardware (operating rods, pivot links and inner and outer lever arms) for:					
(l)	Loose attaching hardware	None allowed	Tighten or replace	X	X	X
(2)	Bending or distortion (See Figure 4-4)	Only pivot links may be straightened	Replace affected item	X	X	X
(3)	Elliptical wear in attachment holes. May be checked by applying manual fore and aft torque with blocker doors closed.	None allowed	Replace worn hardware		X	X
(4)	Condition of outer lever arms	Must meet dimensional criteria of Figure 213	Replace outer lever arm			X
(5)	Condition of inner lever arms	Must meet dimensional criteria of Figures 214 and 215	Replace inner lever arm			X
(6)	Condition of clevis	Must meet dimensional criteria of Figure 216	Replace clevis			X
H.	Aft fairing for:					
(1)	Cracked skin	None allowed	Repair standard procedure	X	X	X
(2)	Cracks in attachment angles or frame tabs	None allowed				X
(3)	Condition of metal blisters	No cracks, tears or punctures allowed Dents allowed if they do not contact operating linkages	Replace damaged blisters. Repair dents with Metalset A4 filler. Replace blisters where dents contact linkage			X
(4)	Loose or missing insulators	None allowed	Replace or repair			X
(5)	Loose or missing rivets	None allowed	Relace rivets			X
(6)	Damaged or stripped nutplates	None allowed	Replace nutplates			X
5.	Reverser Assembly					
A.	Check rigging and re-rig translating	Per 78-30-04	N/A			X
B.	Re-time flex shafts and final rig reverser after installing translating structure into aft nacelle	Per 78-30-05	N/A			X
C.	Perform operational checks	Per 78-30-00	N/A			X
D.	Perform on aircraft final adjustment	Per 78-30-00	N/A			X

* May not exceed 220 hours.
** May not exceed 440 hours.

PNEUMATIC LATCH CONTACT AREA





Inspect bearing surfaces as detailed in View A-A for nicks, wear, galling, scratches or gouges. Refer to View A-A for basic dimension. Damage or wear beyond noted dimensions must not exceed 0.015 inch in depth for a 2.00 inch length, 0.010 inch in depth for a 6.00 inch length, or 0.006 inch in depth for the entire length. Blend in any raised surfaces in damaged areas. Replace beams if limits are exceeded.

Wear in the locking notch (pneumatic latch roller contact area) must not exceed 0.020 inch in depth.

NOTE:
- Excessive wear of beam can be caused by accumulation of abrasives due to lack of or incorrect lubrication.
- In pneumatic latch contact area only, dress out nicks, galling, etc. Apply Lubri-Bond dry film lubricant by first cleaning area with MEK and then applying Lubri-Bond dry film lubricant and allowing it to dry. Lubri-Bond dry film lubricant may only be used in the pneumatic latch contact area.
- Lubri-Bond is a product of E/M Corp., P.O. Box 2200, West Lafayette, Indiana 47906.

Figure 209 - Translation Beam Inspection Criteria

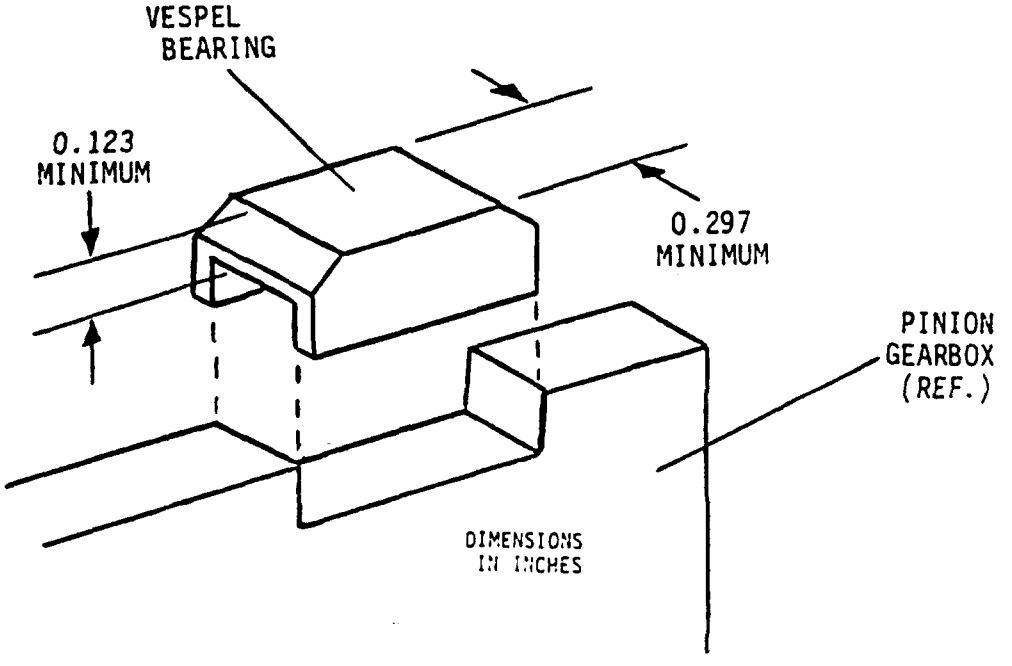


Figure 210 - Vespel Bearing and DPI Pivot Arm Dimensional Limits

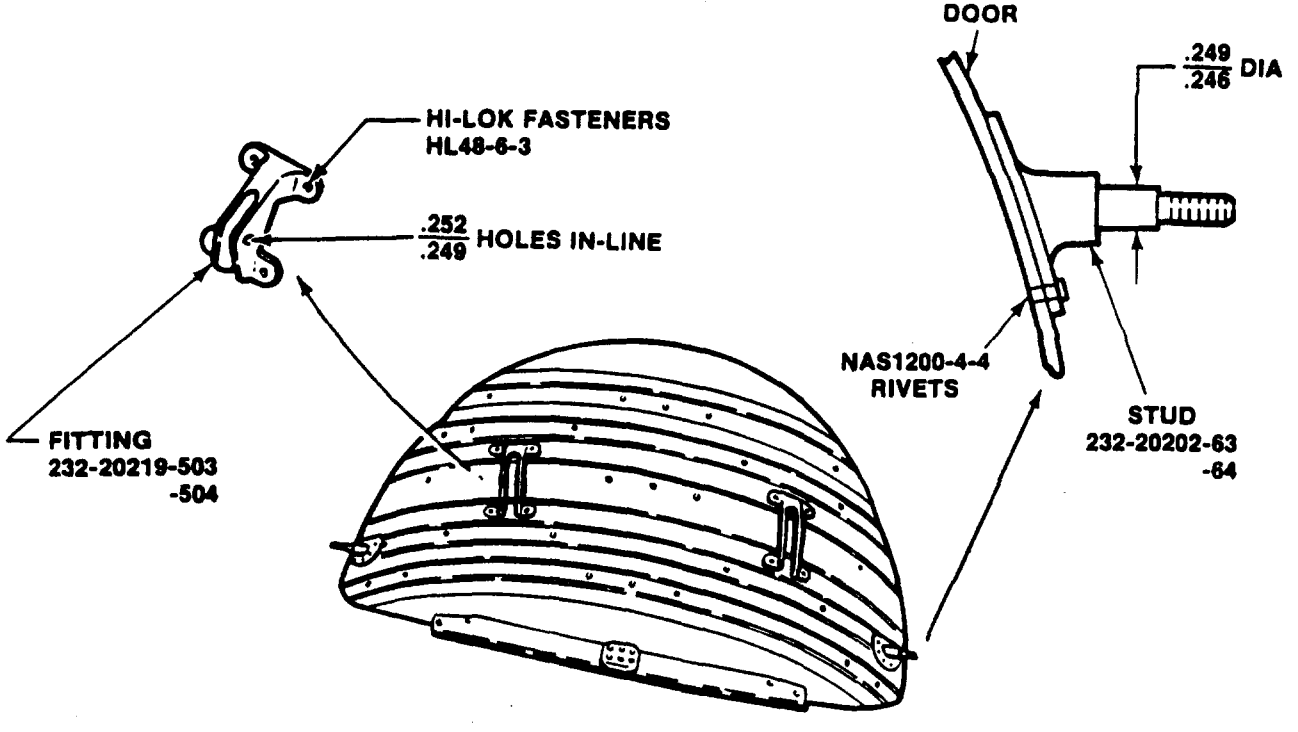


Figure 211 - Translating Structure Blocker Door Assembly

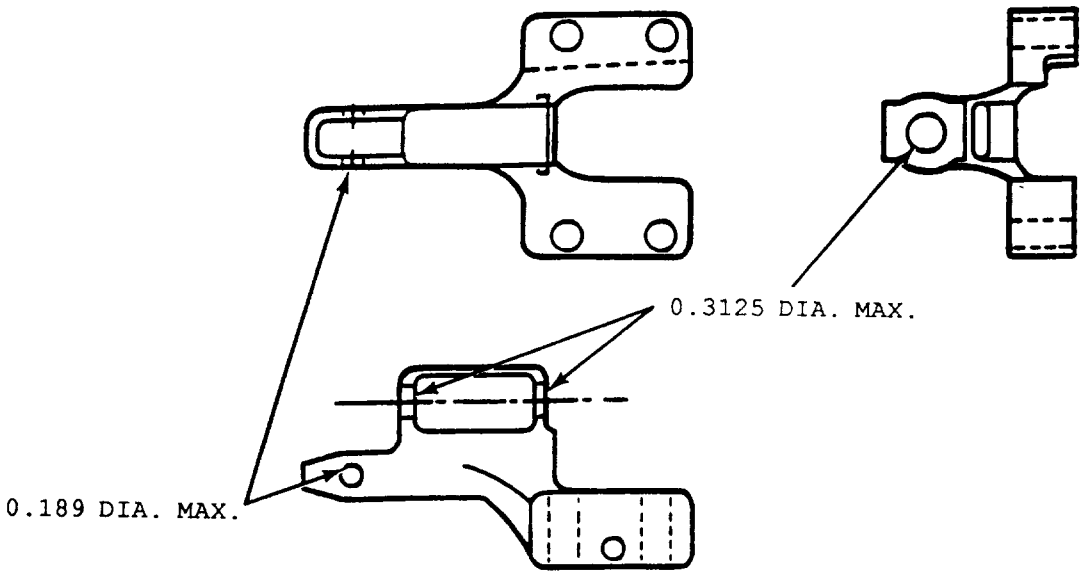
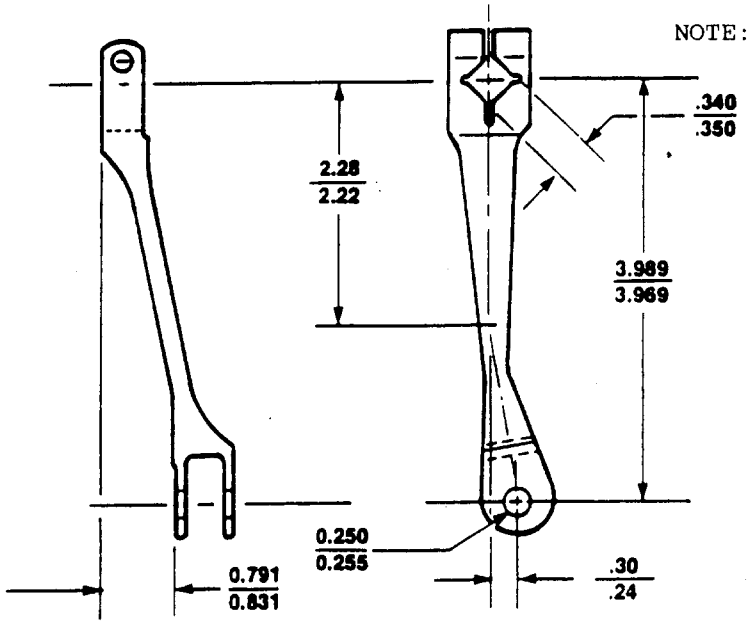
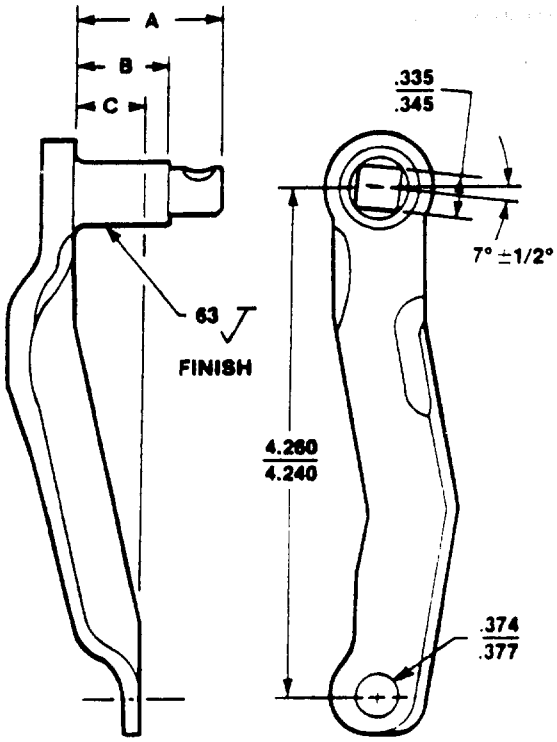


Figure 212 - Stop Housing Inspection Criteria



NOTE: A local manufacture check fixture may be fabricated to assist in dimensional inspection of offset and to determine if part has been twisted or distorted.

Figure 213 - Outer Lever Arm P/N 232-20257-1, -2



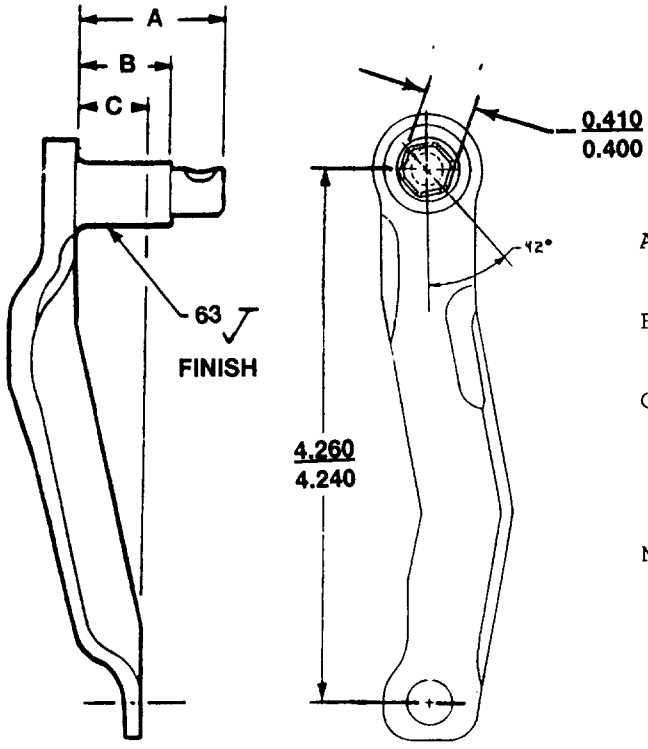
A = 1.262 / 1.268

B = 0.812 / 0.818

C = 0.460 / 0.480

NOTE: A local manufacture check fixture may be fabricated to assist in dimensional inspection of offset and to determine if part has been twisted or distorted.

Figure 214 - Inner Lever Arm P/N 232-20258-511, -512



A = 1.262 / 1.268

B = 0.812 / 0.818

C = 0.460 / 0.480

NOTE: A local manufacture check fixture may be fabricated to assist in dimensional inspection of offset and to determine if part has been twisted or distorted.

Figure 215 - Inner Lever Arm P/N 232-20258-513, -514

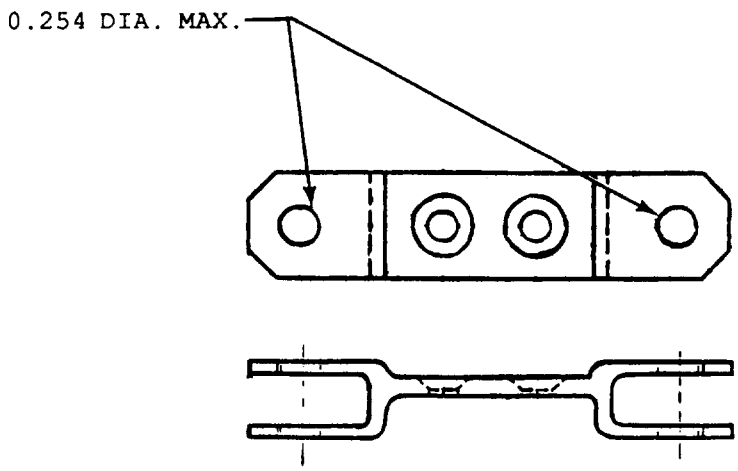
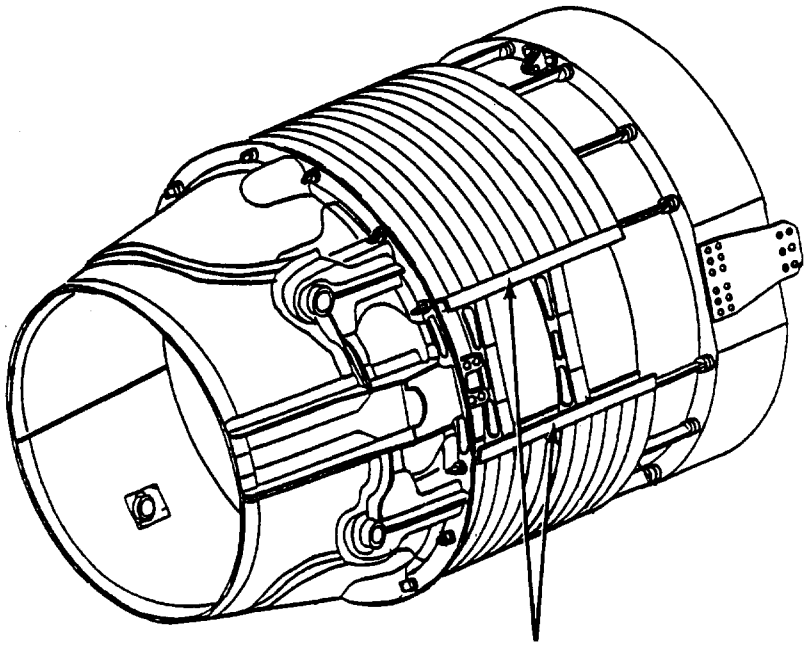
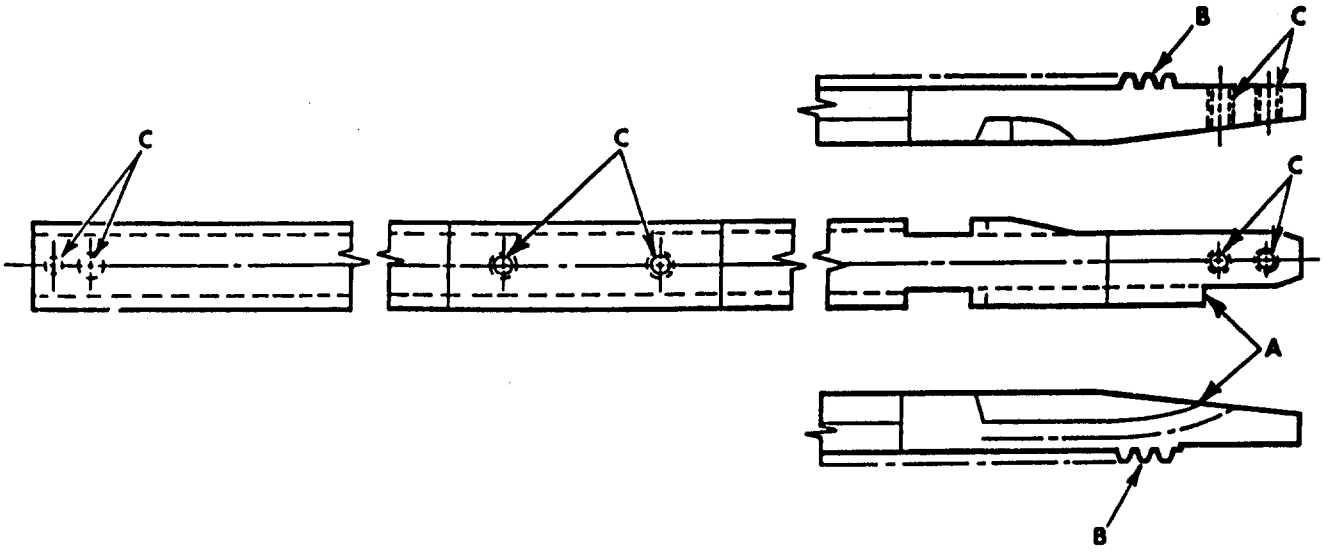


Figure 216 - Clevis Inspection Criteria



A maximum of six small and large elliptical spacer washers may be tack welded, per MIL-STD-2219, to the cascade vane in this area only to repair gaps under ends of elliptical spacer washers.

Figure 217 - Cascade Vane Repair Limitations



A Inspect leading edge of ram for burrs and chipping of the hard coating and excessive wear. Contact Learjet Field Service if damaged or assistance is required to determine excessive wear. Inspect remainder of ramp surface for condition of hard coat. Contact Learjet Field Service if separation of hard coat is discovered.

B Inspect rack teeth for heavy wear patterns, chipping, and excessive wear. Replace rack if any one of these conditions exist.

C Inspect inserts for damage and security. Replace as required.

Figure 218 - Gear Rack Inspection Criteria

8. Cleaning /Painting.

A. Cleaning. When necessary to clean the thrust reverser, use the solvents listed in Table 2 or equivalent and follow the instructions given below.

WARNING: CLEANING SOLVENTS ARE BOTH TOXIC AND FLAMMABLE. AVOID UNNECESSARY OR PROLONGED CONTACT WITH THE SKIN AND KEEP AWAY FROM ALL SOURCES OF IGNITION. USE ONLY IN A WELL VENTILATED AREA.

Table 2 Cleaning Solvents

Cleaning Agent	Manufacturer
Dry Cleaning Solvent P-D-680	Commercially Available
Methyl Ethyl Ketone TT-M-261D	Commercially Available
Ethyl Alcohol O-E-00760C	Commercially Available

(1) Complete Thrust Reverser Assembly.

(a) The entire reverser assembly (except electrical parts) may be cleaned using P-D-680. Loosen caked dirt and/or carbon deposits using a stiff bristle, non-metallic brush. Air dry with dehumidified, filtered air at 20 psig maximum.

CAUTION:

- COVER PNEUMATIC ACTUATOR DCV EXHAUST OPENING TO PREVENT CLEANING AGENT FROM ENTERING THE ACTUATOR. ON THE RIGHT HAND REVERSER DO NOT APPLY OR ALLOW CLEANING AGENT TO STAND ON THE TOP OF THE PNEUMATIC LATCHES AS IT WILL LEAK INTO THE LATCH CAUSING POSSIBLE DAMAGE.
- COVER PNEUMATIC ACTUATOR DCV EXHAUST OPENINGS TO PREVENT CLEANING AGENT FROM ENTERING THE ACTUATOR. ON THE RIGHT HAND REVERSER DO NOT APPLY OR ALLOW CLEANING AGENT TO STAND ON THE TOP OF THE PNEUMATIC LATCHES AS IT WILL LEAK INTO THE LATCH CAUSING POSSIBLE DAMAGE.

(2) Metal Component Parts.

(a) Individual metal component parts removed from the reverser may be cleaned with P-D-680 or methyl ethyl ketone TT-M-261. Dry with a lint-free cloth.

CAUTION: ENSURE THAT SOLVENT IS APPLIED ONLY TO THE EXTERIOR SURFACES OF THE PNEUMATIC ACTUATOR, PNEUMATIC LATCHES, FLEXIBLE DRIVE SHAFTS AND PINION GEARBOXES.

(3) Electrical Parts.

(a) Electrical contacts (terminals, unpainted grounding surfaces, pins) should be cleaned using ethyl alcohol O-E-00760C and coarse paper toweling.

(4) Nacelle Exterior.

(a) Refer to cleaning instructions provided by the manufacturer of the paint used on the aircraft.

B. Painting.

(1) Nacelle Interior.

(a) Touch-up and/or repaint the nacelle interior with corrosive inhibiting primer conforming to Military Specification MIL-TTP-1757 and thoroughly air dry.

(2) Nacelle Exterior.

(a) Painting of the nacelle exterior should be done using instructions provided by the manufacturer of the paint being applied.

Throttle Assembly - Description and Operation

1. Description. The dual pedestal-mounted engine controls,(see Figure 1) incorporate the thrust reverser control components. Each throttle lever assembly includes a main throttle lever and latch, an auxiliary (reverser) throttle lever and latch, an actuation link assembly, a reverser control lever, a stop lever, an interlock (lock-out) solenoid, and two adjustable RPM stops. Each throttle assembly also incorporates two electrical control switches wired into a single harness as well as an electrical lock-out solenoid to prevent selecting engine power settings above 65-percent N1 RPM until the reversers are fully deployed. Mechanical interlocks also prevent commanded reverse thrust with the main throttles in any position other than idle.

2. Operation. To select reverse thrust, the main throttles are first retarded to the idle stops. Then, by squeezing the auxiliary (reverse) lever latches, the reverse levers may be raised until they contact the lockout panels. At this position the reverse levers are restrained from advancing engine power until the reversers are fully deployed. Simultaneously with raising the reverse levers, electrical circuits are completed through the limit switch assembly on the main throttle lever to several system components which cause the reverser to deploy (see Figure 202). As the reverser reaches full deploy, circuitry is complete through the deploy signal switch to energize and retract the lock-out solenoids which now allows the reverse levers to be moved further aft. This action advances the engine N1 RPM from "Reverse Idle" (65-percent N1) to any desired reverse thrust level with 97.5-percent N1 being "Max Reverse Thrust". When reverse thrust is no longer required, the reversers may be stowed by pushing the reverse levers completely down to re-engage the reverse lever latches. This action completes circuitry through the main throttle limit switch assembly to system components to drive the reverser to stow.

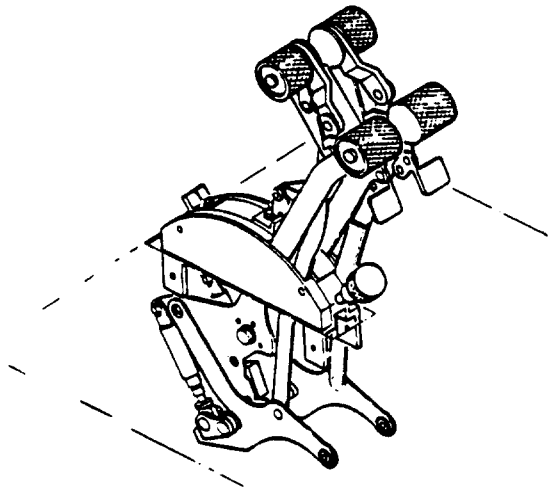


Figure 1 - Engine Controls - Pedestal

Throttle Assembly - Maintenance Practices

1. General. Maintenance of the throttle assembly consists of removal/installation, adjustment/test and approved repairs. Access to throttle assembly is accomplished by removing access panels on each side of the center control pedestal.

2. Removal/Installation. (See Figure 201.)

   A. Removal.

      (1) Refer to applicable section of aircraft maintenance manual for instructions to remove access panels.

      (2) Disconnect the electrical connector P1 from the pedestal framework.

      (3) Disconnect the push-pull rods from the engine throttle actuation cranks.

      (4) Remove attaching hardware securing the longitudinal frame members to the instrument panel.

      (5) Remove attaching hardware securing the throttle assembly to the longitudinal frame members (includes electrical harness retaining clips).

      (6) Spread the longitudinal frame members as necessary to allow lifting the throttle assembly up and out of the pedestal.

      CAUTION: DO NOT SPREAD FRAME MEMBERS MORE THAN ABSOLUTELY NECESSARY TO REMOVE THROTTLE ASSEMBLY.

   B. Installation.

      (1) Prior to installation of throttle assembly, accomplish pre-installation adjustments per Paragraph 4.B. of 78-30-01. (See Figure 201)

      CAUTION: CHECK/ADJUSTMENT IS MANDATORY WHETHER OR NOT THE THROTTLE ASSEMBLY HAS BEEN DISASSEMBLED, ASSEMBLIES HAVING LESS THAN MINIMUM SPECIFIED PLUNGER PRE-TRAVEL COULD CAUSE UNCOMMANDED DEPLOYMENT OF REVERSER.

      (2) Remove plunger pre-travel inspection tag (if attached).

      (3) Spread longitudinal frame members of pedestal sufficiently to slide throttle assembly into the pedestal and secure with attaching hardware, (See Figure 201).

      (4) Re-install attaching hardware securing longitudinal frame to the instrument panel.

      (5) Re-connect the push pull rods to the engine throttle actuation cranks.

      (6) Route and secure throttle electrical harness and reconnect P1 plug.

      (7) Leave access panels off until all required adjustments are made during functional checkout of throttle system per Section 78-30-00.

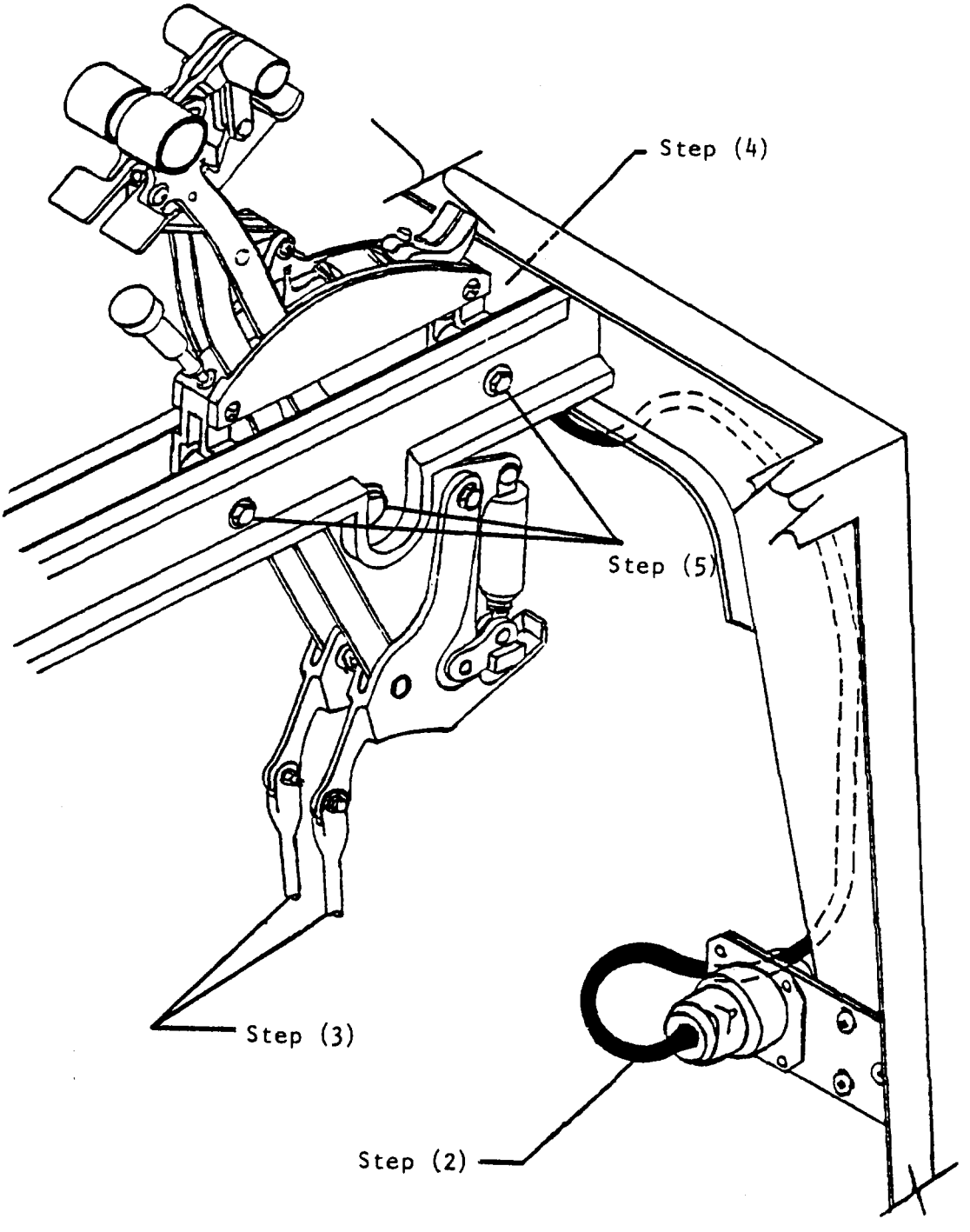


Figure 201 - Cockpit Control Removal

3. Adjustment/Check. Final adjustment of the throttle assembly is accomplished with the assembly installed in the aircraft while performing a functional test of the reverser system. Refer to Adjustment/Check section of 78-30-00 for adjustments to reverser controls with engine operating.

   Static adjustments to be made are as follows:

   A. Lock-Out Solenoid Adjustment. This adjustment can be made with the throttle assemblies installed in the aircraft.

      (1) With the lock-out solenoid de-energized, adjust the length of the lock-out solenoid plunger (see Figure 203) to ensure that the stop lever rides the inboard cam surface of the control lever.

      (2) With the reverse lever raised to the interlock position, depress the "Flasher Test" switch with power applied to the aircraft electrical system. The lock-out solenoid should energize and retract the stop lever to now allow the reverse lever to be raised to "Max Reverse". Adjust length of lock-out solenoid plunger if necessary to allow stop lever to just clear the "Reverse Idle" detent.

         CAUTION: LOCK-OUT SOLENOID OVERHEATING MAY OCCUR WHICH APPRECIABLY SHORTENS SOLENOID LIFE IF ANY OF THE FOLLOWING CONDITIONS EXIST:

         - INADEQUATE PLUNGER/BORE ADJUSTMENT WITH SOLENOID ENERGIZED.
         - EXCESSIVE AFT PRESSURE EXERTED ON REVERSE LEVERS AT "REVERSE IDLE" BEFORE SOLENOID IS ENERGIZED.
         - SOLENOID IS DE-ENERGIZED WITH REVERSE LEVERS SET ABOVE 65 PERCENT N1 RPM ALLOWING PLUNGERS TO FALL BELOW OPERATING LEVER DETENT BASE.

   B. Reverser Control Limit Switch Adjustment. This adjustment can only be made with the throttle assemblies removed from the aircraft.

      (1) Refer to Paragraph 4.B (10), (12), and (13) and Figures 203 and 204 for adjustment procedure.

4. Approved Repairs.

   A. Replacement of Lock-Out Solenoid. Replace defective lock-out solenoid as follows:

      (1) Remove throttle assemblies from center pedestal per Paragraph 2.A.

      (2) Using Figure 202 as a guide for disassembly, remove screws (1) and separate plate (2) from the quadrant for the affected throttle assembly.

      (3) Separate affected throttle assembly from friction lock and carefully turn it over to expose inboard side.

         CAUTION: EXERCISE EXTREME CARE TO AVOID DAMAGING THE ELECTRICAL HARNESS.

      (4) Cut the solenoid wires just as they enter the potted area located above the forward end of the switch housing (16).

      (5) Remove cotter keys (24 & 27), washers (25 & 28), clevis pins (26 & 29) and remove solenoid from throttle assembly.

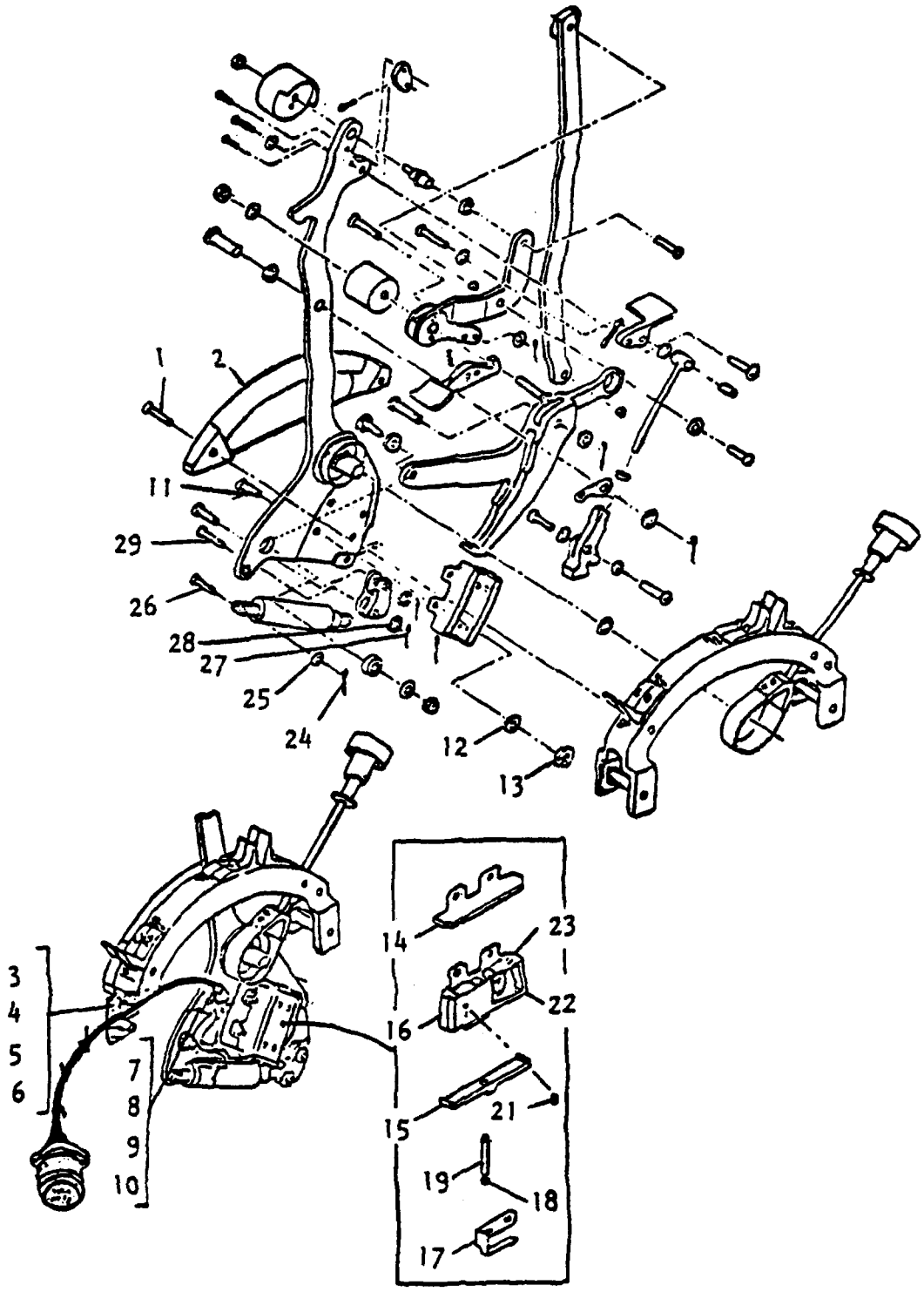


Figure 202 - Switch And/Or Actuating Arm Replacement

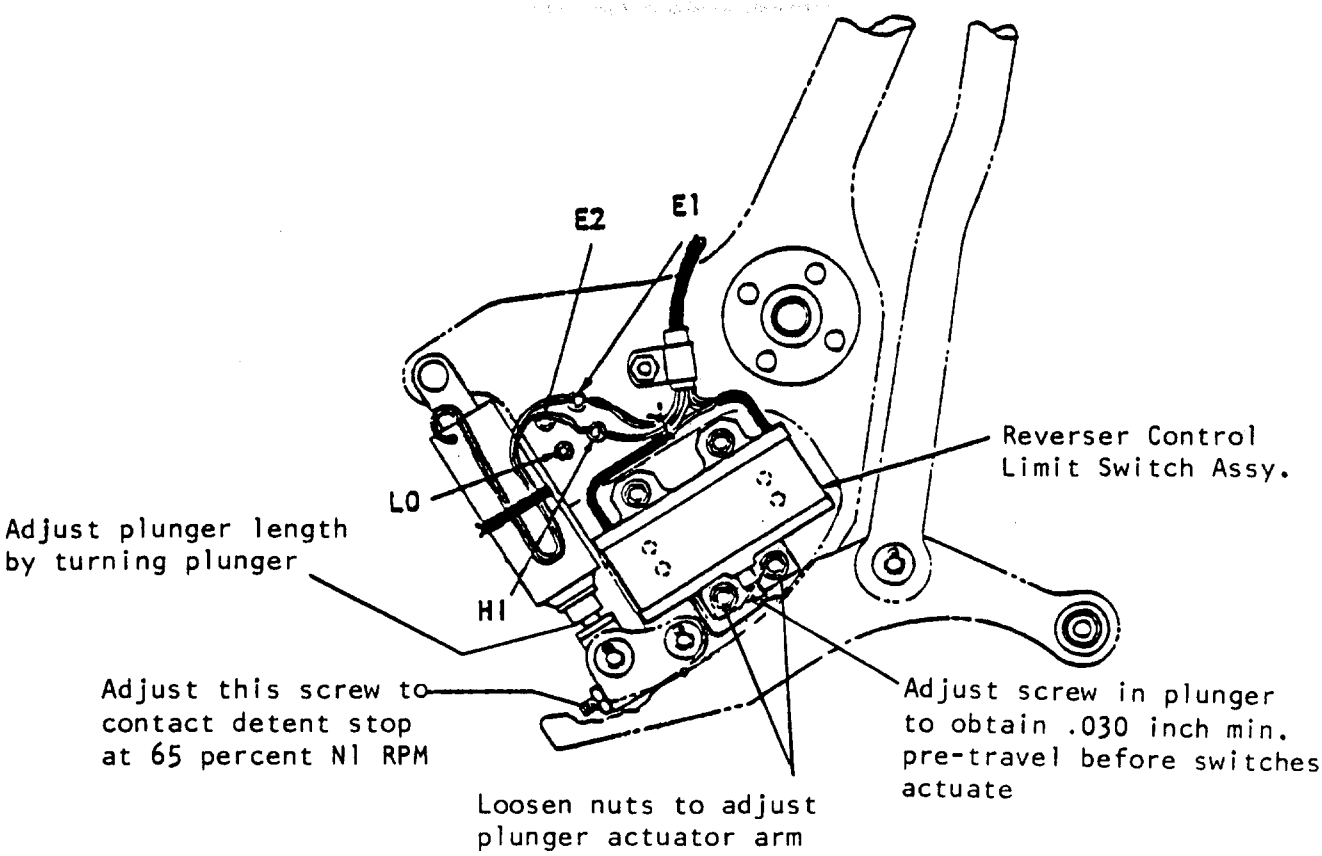
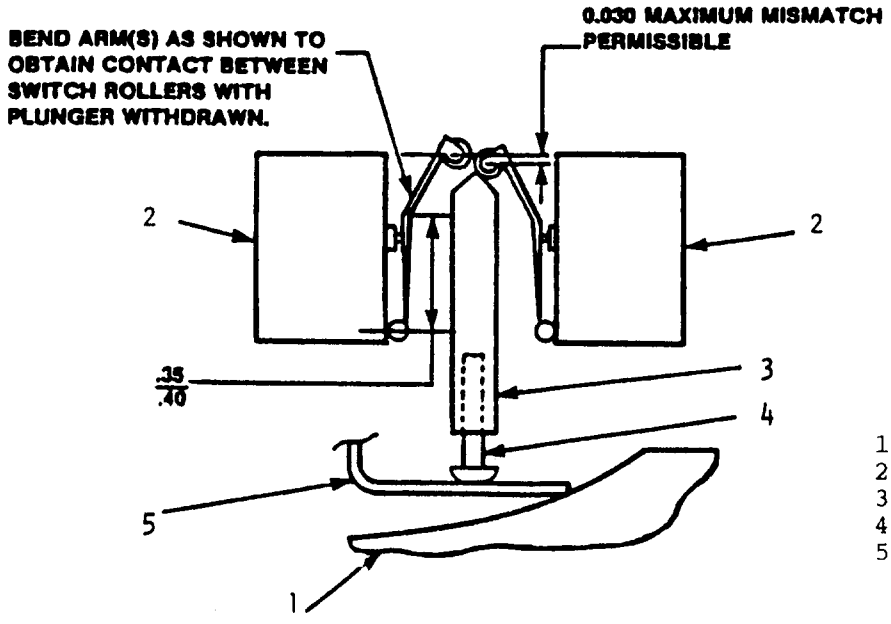


Figure 203 - Reverser Control Adjustments



1. LEVER
2. SWITCHES
3. PLUNGER
4. SCREW
5. ACTUATOR ARM

Figure 204 - Actuating Switch Adjustment

(6) Carefully remove potting from the stand-off terminals E1, E2, HI and LO, see Figure 203.

(7) Tie wires of replacement solenoid around the barrel as shown in Figure 203.

(8) Locate replacement solenoid on throttle assembly and secure with hardware removed in Step (5) using new cotter keys.

(9) Refer to Figure 203 for wire routing and 78-30-00 Figure 101 connection data. Use solder conforming to Federal Specification QQ-S-571 (Non Flux Type 60-40) and minimum necessary heat to attach wires to appropriate stand-off pins.

(10) Pot terminals E1, E2, HI and LO using silicon rubber per specification MIL-S-23586C, Type III, Class II, Grade A, or equivalent. Allow potting to cure before proceeding to the next step.

NOTE: To simplify potting process, a locally fabricated mold coated with a parting agent may be used. Max height of mold is 0.30 inch.

(11) Locate throttle assembly to friction lock and reinstall plate (2) with screws (1).

(12) Reinstall throttle assemblies into center pedestal per Paragraph 2.B.

B. Replacement of Switch and/or Actuating Arm. Replace defective component as follows:

(1) Remove throttle assemblies from center pedestal per Paragraph 2.A.

(2) Using Figure 202 as a guide for disassembly, remove screws (1) and separate plate (2) from the quadrant for the affected throttle assembly.

(3) Separate affected throttle assembly from friction lock and carefully turn it over to expose inboard side.

(4) Remove nuts (3 & 9), washers (4 & 8), screws (5 & 7) and separate clamps (6 & 10) from the electrical harness.

(5) Remove nuts (13), washers (12), screws (11) and separate switch assembly with actuator arm (17) from throttle assembly.

(6) Separate plates (14 & 15) along with plunger assembly (18 & 19) from switch housing (16). DO NOT remove screw (18) from plunger (19) unless required because of damage or wear.

(7) Remove the four screws (21) and separate the switch actuating arms (22) and switches (23) from the housing (16).

(8) Refer to 78-30-00 (Figure 101) for wiring data. Disconnect and connect wires one at a time to minimize the possibility of error. Solder all connections using solder meeting the requirements of Federal Specification QQ-S-571 (Non Flux Type 60-40) or equivalent and with minimum applied heat. Pot switch connections with silicon rubber per MIL-S-23586C, Type II or III, Class 2, Grade A.

CAUTION: DO NOT EXERT UNNECESSARY PRESSURE OR PULL AGAINST THE WIRING HARNESS. SOLDERED CONNECTIONS E1, E2, AND HI (POTTED AREA JUST ABOVE THE FORWARD END OF THE SWITCH HOUSING) CAN EASILY BE BROKEN.

(9) Refer to Figure 204 for switch actuating arm dimensional data and install the switches (23) and actuator (22) into the switch housing (16) using the four screws (21).

(10) Position the plate (15) on the switch housing (16) and slip the plunger (18 & 19) through the plate into the housing insuring it freely. Observe through the top of the switch housing that the beveled edges of the plunger contact the switch actuating arm rollers as shown in Figure 204 and install plate (14). Locate the plunger actuator (17) against the plate (15) and while holding the plunger position, temporarily secure the assembled parts to the control lever using screws (11), washers (12), and nuts (13).

CAUTION: EXERCISE CARE WHEN MANUALLY OPERATING PLUNGER AND DO NOT ROTATE PLUNGER. THE SWITCHES CAN BE DAMAGED IF THE PLUNGER IS FORCED TOO FAR OR IS ROTATED.

(11) Install attaching hardware for electrical harness previously removed in Step 4.

(12) Adjust the plunger assembly (18 & 19) to obtain the pre-travel specified in Figure 203. Accomplish adjustment by removing assembled switches/housing/plates/actuator from the control lever and adjusting the position of the screw (18) as required. Repeat as necessary until specified pre-travel is obtained.

(13) Adjust the plunger actuator arm (fore and aft position) to obtain switch actuation (two audible clicks) as soon as possible after releasing the reverser latch and slowly raising the reverser lever toward the interlock position. Tighten and torque attaching hardware after adjustment.

CAUTION: TO PREVENT INADVERTENT DEPLOYMENT ENSURE PLUNGER HAS 0.030 INCH PRE-TRAVEL WITH REVERSE LEVER IN STOW.

NOTE: It is desirable to have 1/8 - 1/4 inch reverse lever travel after the second switch actuates prior to reaching the interlock stop.

(14) Locate throttle assembly onto friction lock in quadrant and install plate (2) with screws (1) removed in Step 2.

(15) Install throttle assemblies into center pedestal per Paragraph 2.B.

Thrust Reverser Indication System - Description and Operation

1. Description. The Thrust Reverser Indication System (see Figure 1) for the Falcon 20 installation, advises the cockpit crew with position/status of each reverser. This is accomplished by means of two press-to-test indicator lights for each reverser, mounted on the center instrument panel (see 78-30-00, Figure 2). The amber "Transit" light should illuminate anytime the reverser is in any position other than fully stowed or deployed. In some cases the "Transit" light may flash with the reverser fully stowed or deployed, indicating a system fault which will be discussed in Paragraph 2 below. The green "Reverse" light should illuminate anytime the reverser is fully deployed. The indication system uses 28-volt DC power supplied by the aircraft non-shed bus which also supplies power for reverser control circuits. On some Falcon 20 aircraft the indication system described above has been incorporated into the aircraft Master Warning Panel. In these cases refer to the applicable chapter of the aircraft maintenance and/or wiring manuals for description and wiring data respectively.

2. Operation. To gain a clear understanding of the indication system during reverser operation, refer to 78-30-00, (Figures 7-11) in conjunction with the following text.

   When the reverser systems are stowed and locked see 78-30-00 (Figure 7), no indicator lights are illuminated. With the main throttles at idle, raising the reverse levers to command reverse completes a circuit (see 78-30-00 Figure 8) through the throttle-mounted limit switch S1 ("NO" to "C") to the "C" terminal of the outboard pneumatic latch-mounted switch S4B. From there it is routed to the deploy signal switch S3 ("C" to "NC") and on to illuminate the "TRANSIT" light. Simultaneously as the pneumatic latches unlock, the latch-mounted switches are repositioned and circuitry is complete through S4B and S5B ("NC" to "C") on to the deploy signal switch S3 ("C" to "NC") to illuminate the "Transit" light.

   The "Transit" light will remain illuminated until the reverser is fully deployed at which time the deploy signal switch S3 is repositioned (see 78-30-00 Figure 9) to complete a circuit through the "C" to "NO" terminals to the "HI" terminal of the lock-out solenoid L1 and on to illuminate the "REVERSE" light. At the same time the circuit is completed to turn on the "REVERSE" light, the circuit is broken to turn off the "TRANSIT" light.

   The "REVERSE" light will remain illuminated until the reverser is commanded to stow and then the indications will be the reverse sequence of the above described actions.

   Also incorporated into the indication system is a flasher unit which when activated during specific system faults causes the "TRANSIT" light to flash. The flashing "TRANSIT" light basically is informing the cockpit crew of a "reverser unsafe" condition and if possible the reverser should be stowed. There are three conditions of abnormal reverser component operation that will cause the "TRANSIT" light to flash. Refer to Figures 3-4 along with the following text to clearly understand what malfunctions can cause a flashing "TRANSIT" light.

   A. Upon deploy command, one or both pneumatic latches remain in the locked position (See Figure 2).

      In this situation the reverser will not deploy since no circuit is available to energize the deploy coil of the directional control solenoid valve. Regardless of whether one or both pneumatic latches remain locked, circuitry will be complete to energize the pneumatic actuator regulator valve which now supplies air to the air motor. This action also provides air to the directional control solenoid valve but since it is receiving no signal it remains in the last position selected which was stow. Therefore air is directed to the stow side of the directional control actuator which in turn positions the

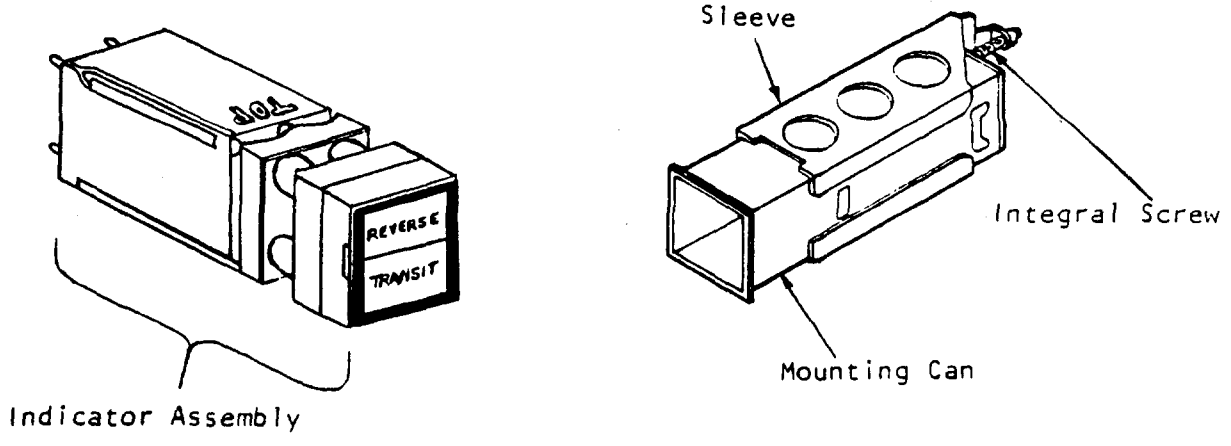


Figure 1 - Thrust Reverser Indicator and Mount Assembly

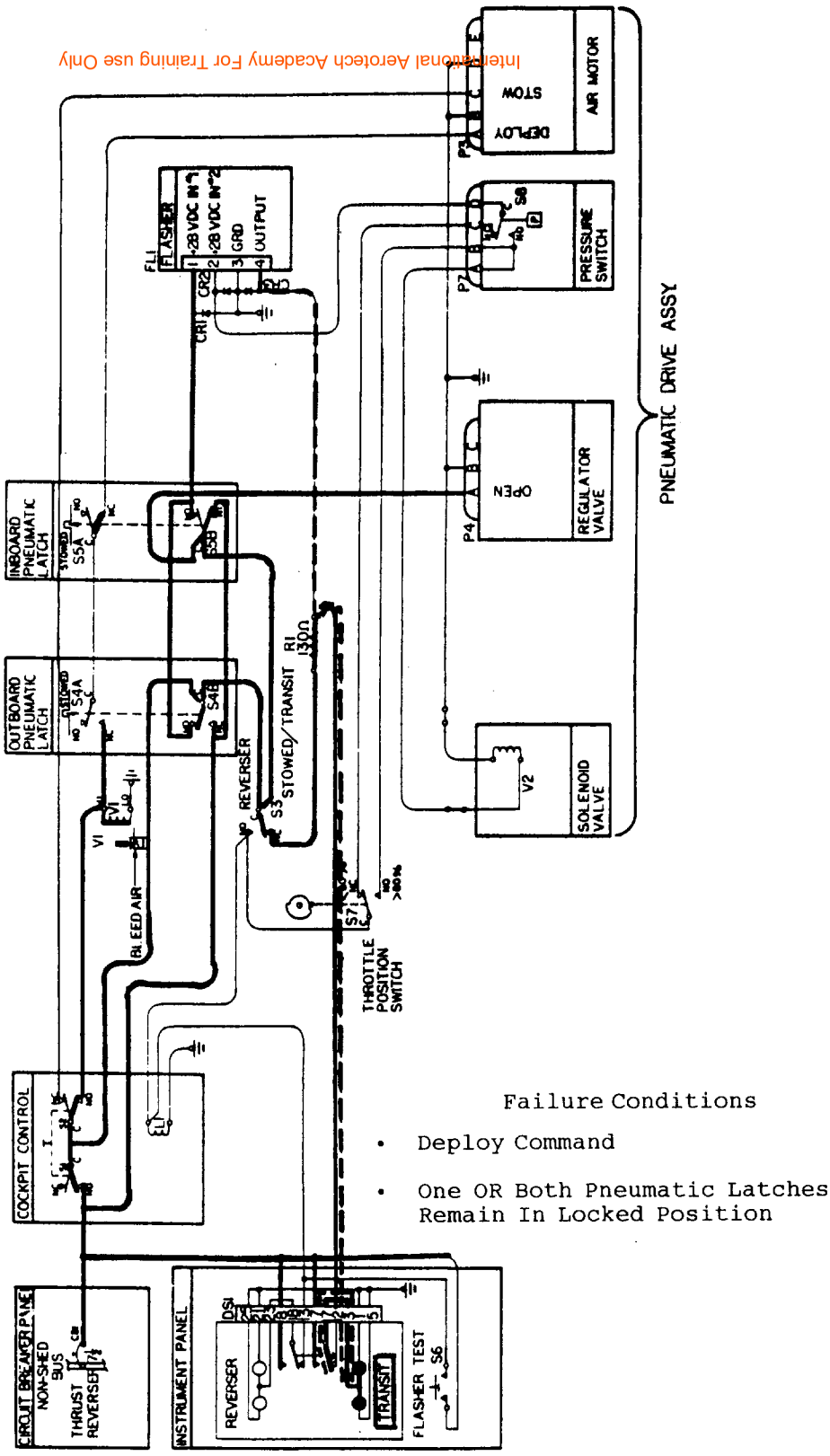
directional control valve to direct air through the air motor in the stow direction. However since the reverser is already at stow, the air motor cannot drive it any further, so the air motor stalls out. The flashing "Transit" light (bright over dim) results from circuitry complete through the throttle mounted limit switches S1 and S2 to pneumatic latch mounted switches S4B and S5B ("C" terminals) to the deploy signal switch S3 ("C" to "NC") and on to illuminate (steady low intensity) "TRANSIT" light. To cause the flashing effect (bright over dim), simultaneously circuits are complete through S4B and S5B ("C" to "NO") to the flasher unit FL1 (IN #1). After a 2 second delay the flasher output (4) is a pulsating 28-volt DC to the "TRANSIT" light which causes it to flash (bright over dim). This indication will be present until the reverse levers are placed to stow.

B. Required air pressure (6#) not available at pressure switch with reverser fully deployed (See Figure 3).

In this situation the reverser has deployed normally which illuminated the green "REVERSE" light but for some reason 6# of air pressure is not available to actuate the pressure switch P7 or the pressure switch has failed. This results in the possibility of stowing the reverser at high power. This could cause severe asymmetrical thrust conditions because the pressure switch failed to complete the circuit to the solenoid bleed valve which would pneumatically shutdown the regulator valve until the stow command is given. To alert the cockpit crew circuitry is complete through the pressure switch P7 ("NO" to "C") to the flasher FL1 (IN #2). After 2 seconds a pulsating output is generated and sent on to the "Transit" light to give a flashing (bright-off-bright) signal.

C. Air supply still available at air motor with max reverse power setting (See Figure 4).

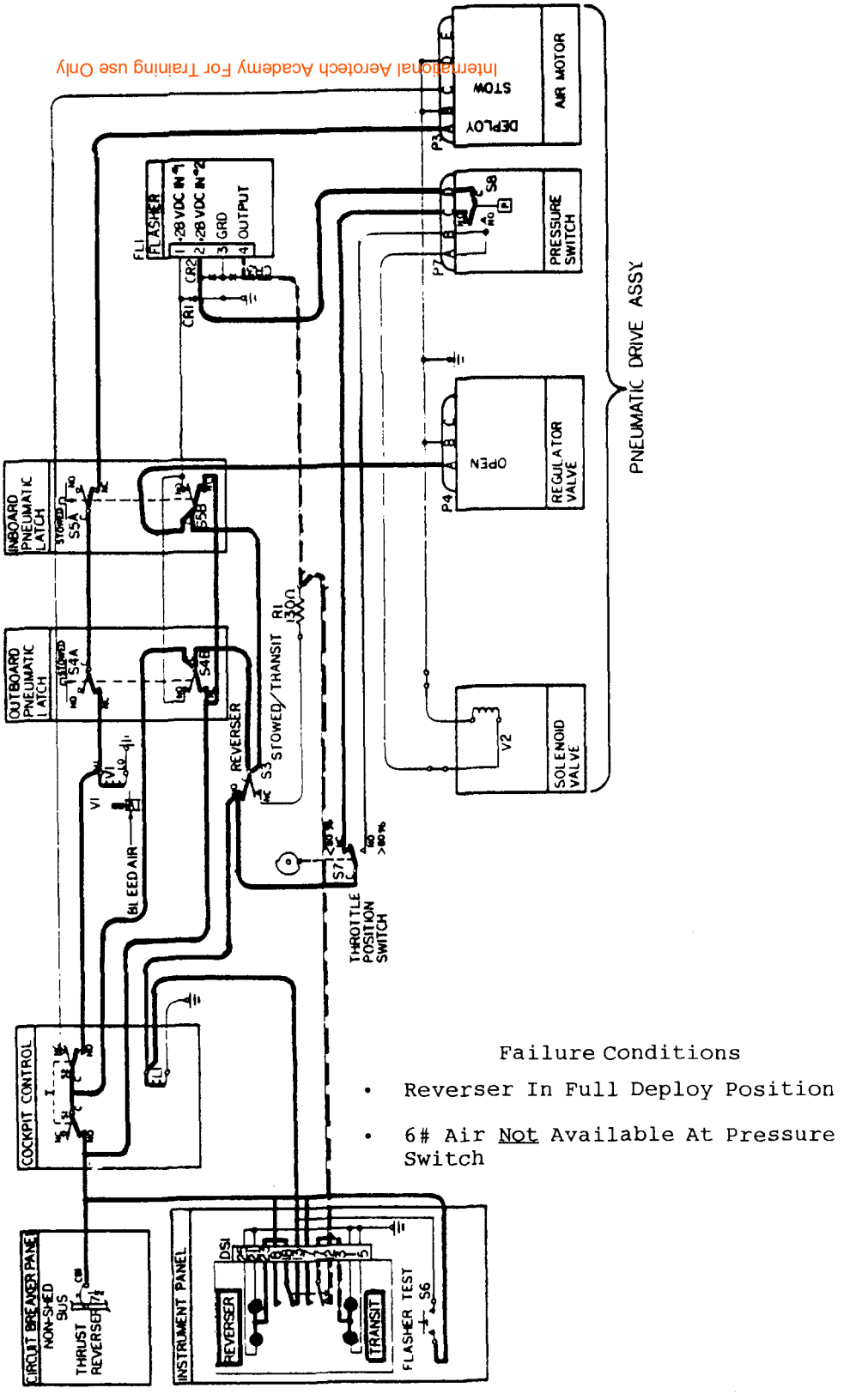
In this situation the reverser has deployed normally, the pressure switch S7 actuated normally but as the engine is accelerated above 80% RPM N1 a flashing "Transit" light (bright-off-bright) is illuminated. This indicates that although the pressure switch S7 actuated properly, the solenoid bleed valve failed in the closed position thereby keeping the air motor "armed" with air since the regulator valve remains open. This again could result in stowing the reverser at high power settings which might create severe asymmetrical thrust conditions. To signal the cockpit crew that this condition exists, circuitry is complete through the "NO" terminal of the deploy signal switch S3, through the throttle position switch 57 ("C" to "NO" > 80%), through the pressure switch P7("N0" to "C") and on to the flasher FL1 (IN #1). After 2 seconds the flasher generates a pulsating output to cause the "Transit" light to flash (bright-off-bright). This condition will exist until the reversers are returned to the stowed position or engine RPM is decreased to below 80% N1.



Failure Conditions

- Deploy Command
- One OR Both Pneumatic Latches Remain In Locked Position

Figure 2 - Electrical Schematic, Failure Condition



Failure Conditions

- Reverser In Full Deploy Position
- 6# Air Not Available At Pressure Switch

Figure 3 - Electrical Schematic, Failure Condition

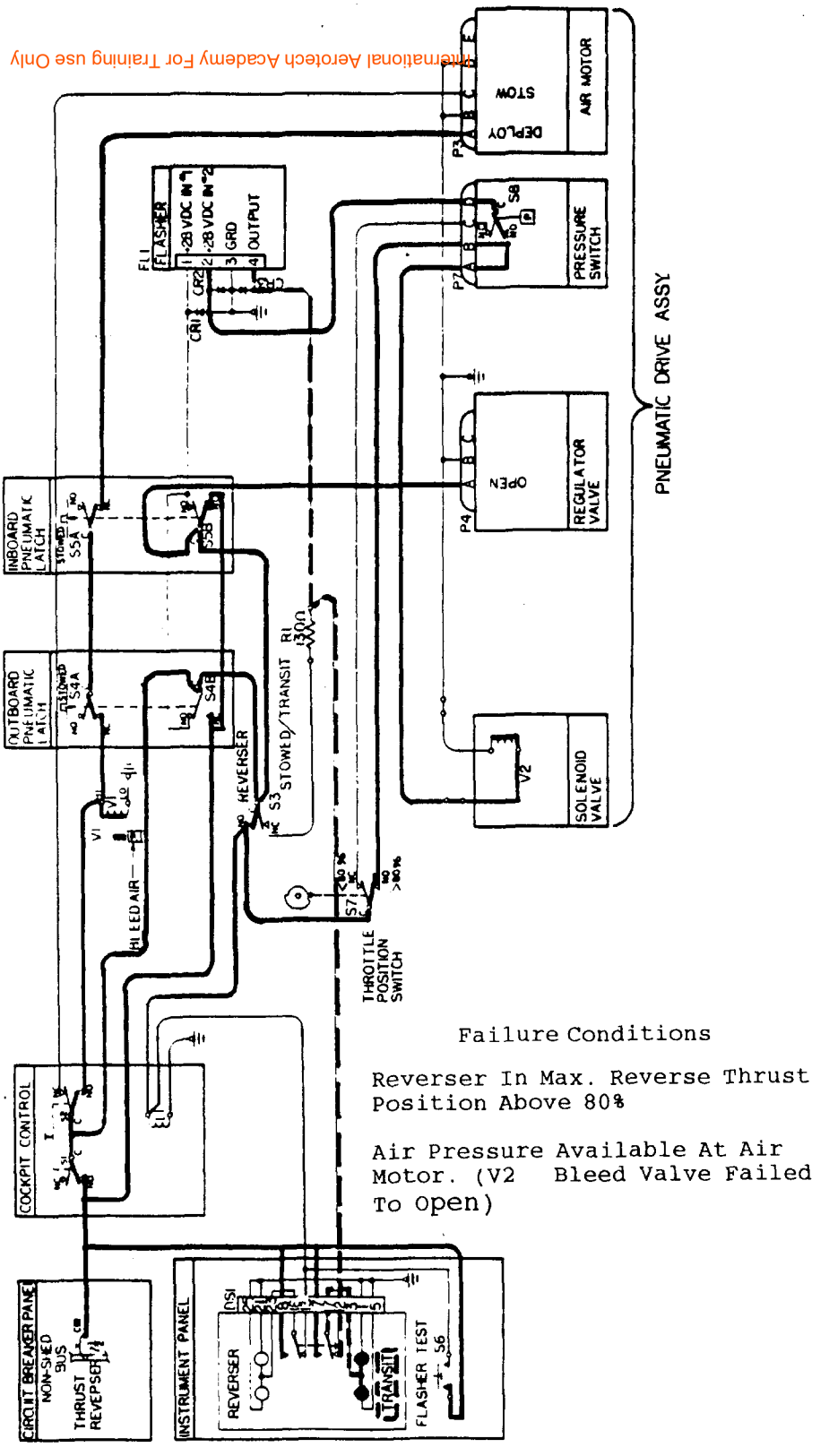


Figure 4 - Electrical Schematic, Failure Condition

1. General. Maintenance of the indication system consists of removal/installation and adjustment/test.

2. Removal/Installation.

A. Indicator (See Figure 1).

(1) Removal.

(a) Pull out indicator face to expose locking screw on right center of the unit.

(b) Turn locking screw counterclockwise to unlock the indicator and replace the indicator face.

(c) Pull indicator out of the mounting can.

(2) Installation.

(a) Pull out indicator face and slide indicator into mounting can.

(b) Turn locking screw at right center of indicator housing to secure unit in mounting can.

(c) Replace indicator face.

B. Mounting Can With Harness.

(1) Removal.

(a) Remove indicator per 2.A.(1) above.

(b) Remove instrument panel per applicable aircraft maintenance manual.

(c) Disconnect electrical connector of short indicator harness.

(d) Loosen and remove integral mounting screw to allow mounting can to separate from the sleeve.

(e) Push mounting can out of the face of the instrument panel.

(2) Installation.

(a) Push the mounting can through the instrument panel from the forward side.

(b) Slide the sleeve over the mounting can and tighten integral screw to draw the sleeve and the mounting can up tight against the instrument panel.

(c) Connect the electrical connector and install the instrument panel per applicable aircraft manual.

(d) Install the indicator into the instrument panel per 2.A.(2) above.

3. Adjustment/Test.

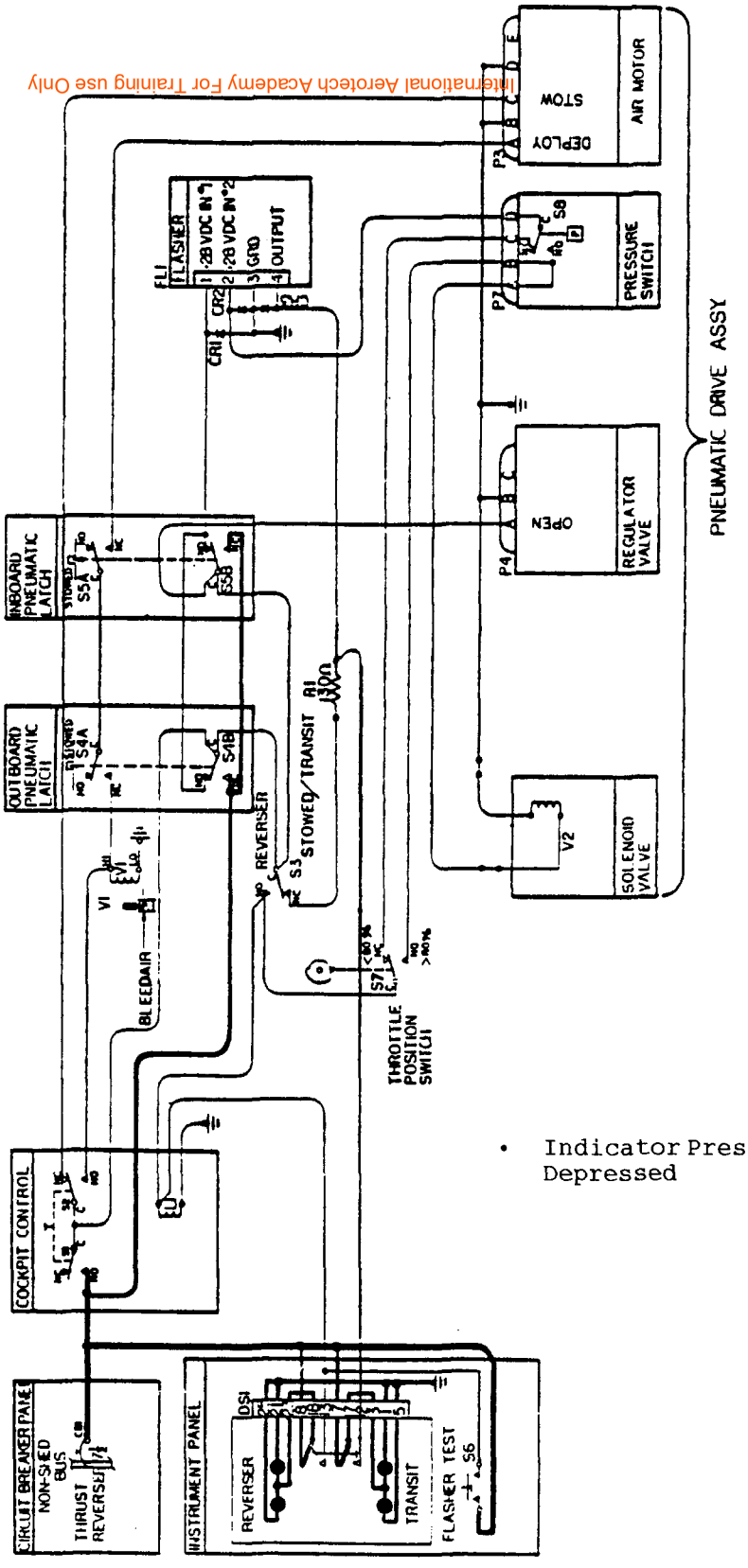
A. Test.

(1) Indicator Press-to-Test (See Figure 201).

(a) By pressing in on the face of the indicator, circuits are complete to ground which illuminates both "Reverse" and "Transit" lights steady.

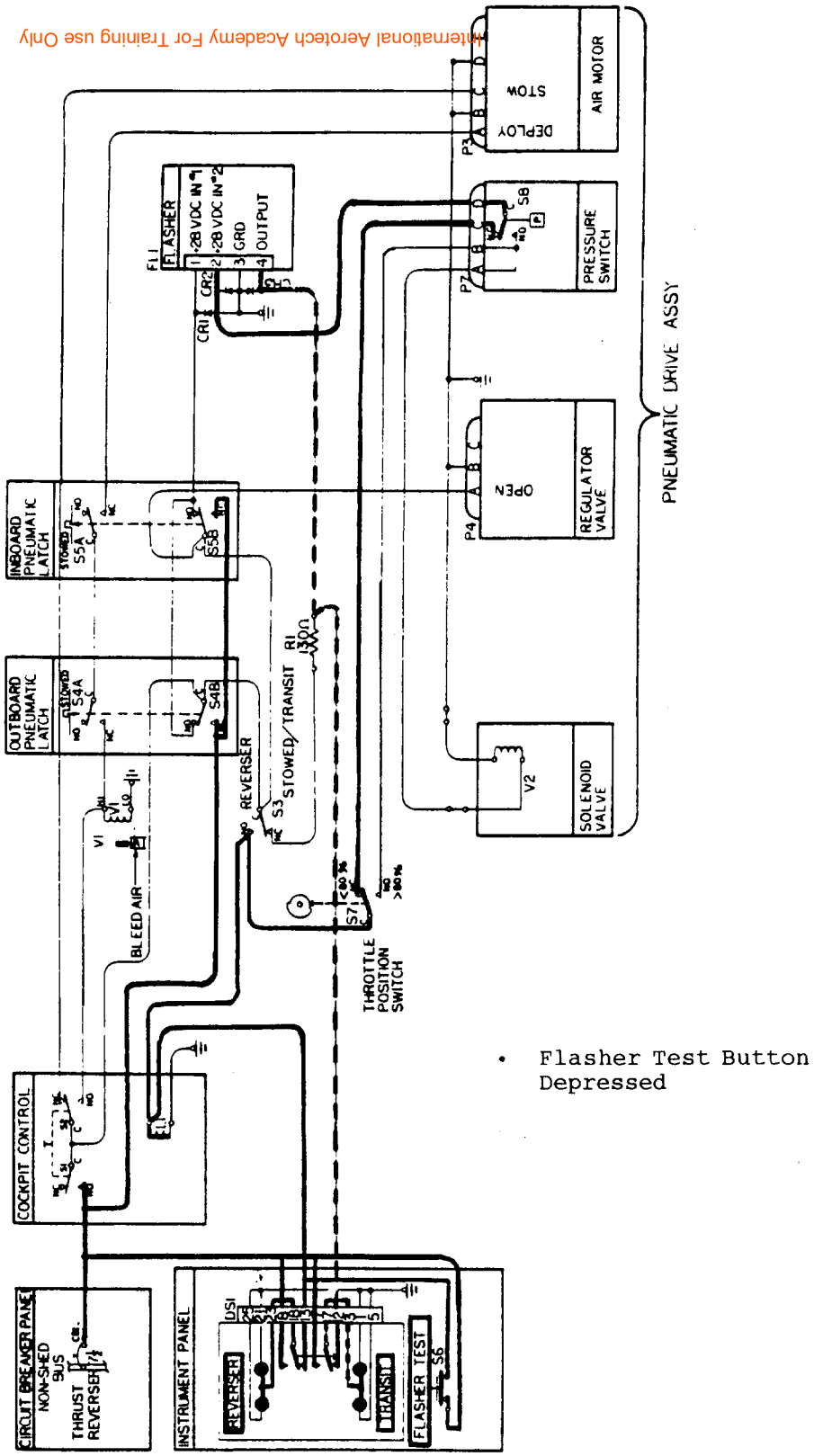
(2) Flasher Press-to-Test (See Figure 201).

(a) By pressing the "Flasher Test" button located on the center instrument panel, circuits are complete to cause the "Reverse" light to illuminate steady and the "Transit" light to flash (bright-off-bright).



- Indicator Press-To-Test Depressed

Figure 201 - Electrical Schematic, Indicator Press-To-Test



• Flasher Test Button Depressed

Figure 202 - Electrical Schematic, Flasher Test Button

Safety System - Description and Operation

1. Description. The safety system is designed to prevent the thrust reverser from possibly stowing (uncommanded) with the engine at high power resulting in a dangerous asymmetrical thrust condition. The system consists of components mounted to the pylon as well as some installed on the engine throttle shaft at the aircraft to engine disconnect point. The components mounted to the pylon are the 80% switch and bracket assembly (includes the electrical harness) with attaching hardware. Components installed on the throttle shaft are a cam, an actuator and a clamp along with attaching hardware. The system installation is shown in Figure 201.

2. Operation. The safety system functions to prevent reverser translation to stow at high engine power settings by denying the pneumatic actuator of high pressure bleed air needed for its operation. This is accomplished through the cam mounted on the engine throttle shaft actuating the 80% limit switch at engine power settings greater than 80% N1 RPM. This action completes a circuit to energize the bleed-off solenoid valve opening it to bleed off air pressure from the regulator poppet valve of the pneumatic actuator. This causes the poppet valve to close which shuts off the air supply to the air motor of the pneumatic actuator. As N1 RPM falls below 80%, the bleed-off valve is de-energized which allows air pressure to re-open the poppet valve allowing air to the air motor again.

Safety System - Maintenance Practices

1. General. Maintenance of the safety system consists of removal/installation, inspection/check, and adjustment/test. Access to the safety system is made by opening and removing the lower inboard engine cowl door.

2. Removal/Installation, (See Figure 201)

   A. Removal.

      (1) Refer to the applicable chapter of the aircraft maintenance manual to remove the lower inboard engine cowl door.

      (2) Remove screws (1, Figure 201), washer (2), and pin (3). Slide cam (4) on throttle mechanical linkage to facilitate disassembly and removal of other parts.

      (3) Remove nut (5), washer (6), screw (7) and separate throttle mechanical linkage. Remove clamp (8), hub (9), and cam (4).

      (4) Remove nuts (10), washers (11), and screws (12). Separate bracket (19) from bracket (18), remove screw (13) and lift off switch (14).

      (5) Remove nuts (15), washers (16), bolts (17), and lift off brackets (18, 19).

   B. Installation.

      (1) Secure bracket (18) to modified pylon with nuts (15), washers (16), and bolts (17).

      (2) Secure switch (14) in bracket (19) with screws (13).

      (3) Secure bracket (19) to bracket (18) with nuts (10), washers (11) and screws (12). Do not tighten nuts and screws.

      (4) Position cam (4), hub (9), and clamp (8) on throttle mechanical linkage. Position hub so it is aligned with screw holes in linkage. Install nut (5), washer (6) and screw (7).

      (5) Secure cam (4) with screws (1), washer (2), and pin (3). Do not safety wire screws until Adjustment/Test is accomplished.

3. Adjustment/Test.

   A. After installation the safety system must be adjusted as follows:

      (1) Set switch (14) to actuate 0.030(±0.005) inch from high point of cam (4) by adjusting screws (12) into bracket (18). Secure screws with nuts (10) and washers (11) when proper dimension is obtained.

      (2) Start both engines and stabilize at idle (46% N1 RPM) for two minutes.

      (3) Slowly advance throttle levers forward until 80% N1 RPM is obtained and stabilize at this RPM for two minutes. Mark position of the throttle levers on the throttle quadrant.

      (4) Return throttle levers to idle and then repeat step (3) to verify 80% N1 RPM throttle position as marked on quadrant.

      (5) Shut down engines.

(6) With engines shut down, advance throttle levers to marked 80 percent N1 RPM position. Secure throttle levers with throttle friction lock.

(7) Loosen screws (1) and rotate cam (4) until switch (14) roller is at a point where cam just actuates the switch. Tighten screws (1).

(8) Return throttle levers to idle position and then advance them to marked 80 percent N1 RPM position on quadrant. During this step, check that switch (14) actuates within ±3° of cam centerline as shown in Figure 202.

(9) Remove screw (1) and drill 0.069-0.071 inch hole through pilot hole (as shown in Figure 203) in cam (4) and through hub (9). Insert pin (3) into hole. Install washer (2) and screw (1).

CAUTION: EXERCISE CARE TO AVOID DRILLING INTO THE THROTTLE LINKAGE.

(10) If actuation of switch (14) meets requirements of Step (8), safety wire screws (1) with MS20995C32 in accordance with Military Specification MS33540. If switch actuation requirements are not met, repeat Steps (7), (8), and (10).

(11) Install and close inboard lower engine cowl door per aircraft maintenance manual.

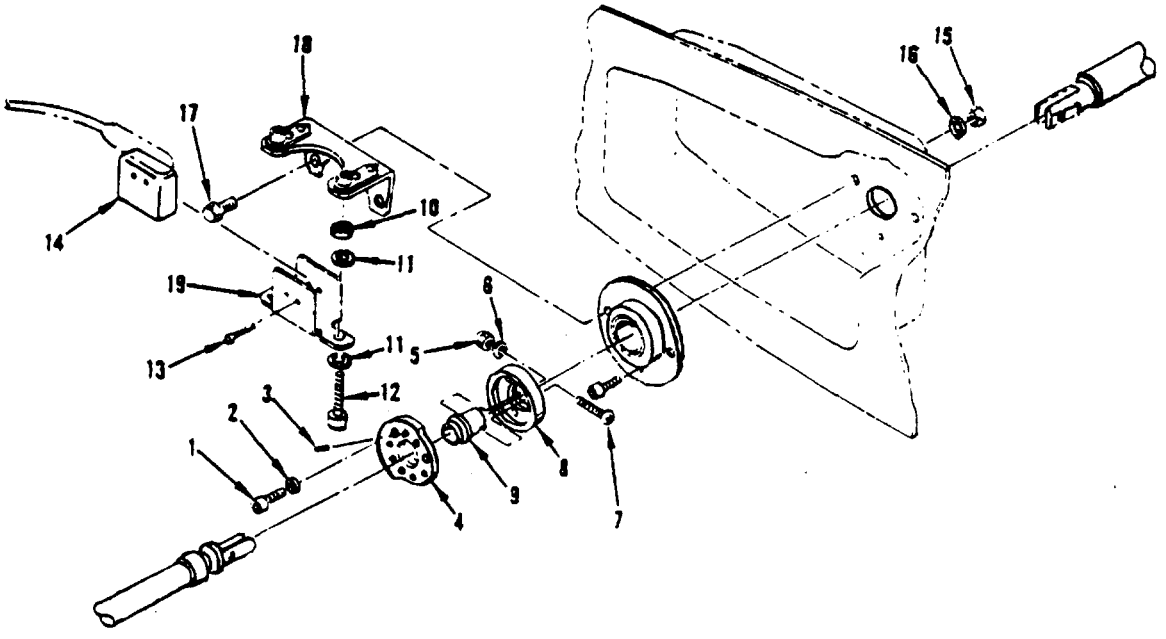


Figure 201 - System Safety Installation

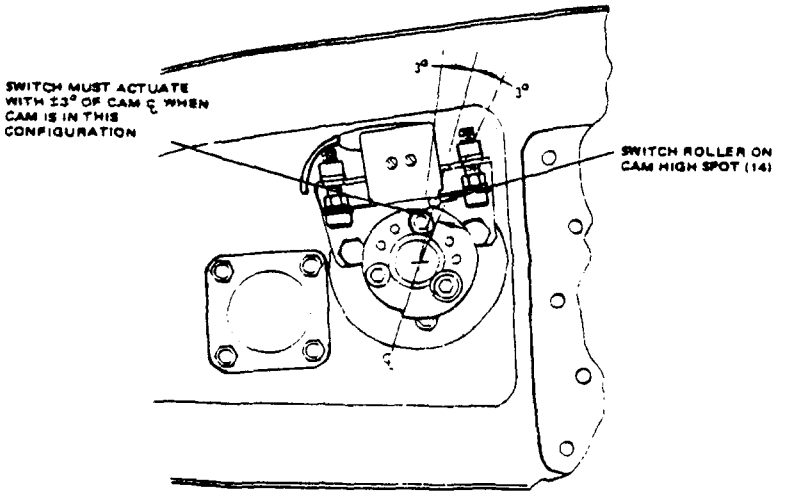


Figure 202 - Throttle Position Limit Switch Actuation Requirements

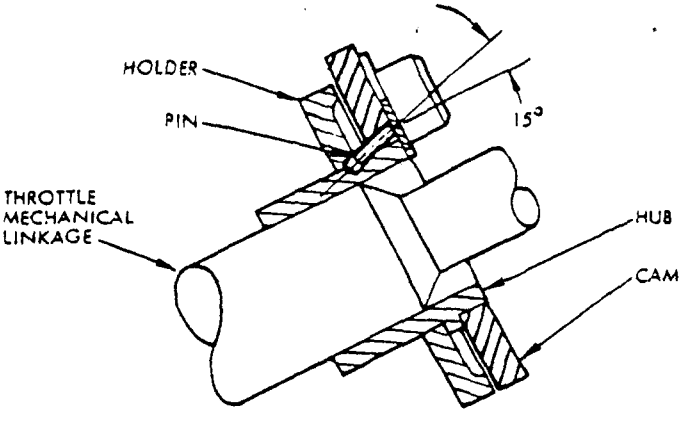


Figure 203 - Pin Installation Requirements

Translating Structure - Description and Operation

1. Description. The translating structure (Figure 1) consists of the necessary hardware to function on command to reverse the direction of engine exhaust gases to provide the reverse thrust action. Major assemblies which comprise the translating structure are a cascade assembly (Figure 1, Item 1), two translating beams (2) with associated gear racks (3) and sequence latch assemblies (4), two yoke assemblies (5) with associated yoke to lever links (6) and actuation levers (outer 7, inner 8) and two clam shell type blocker doors (9). The thrust reverser tailpipe (not shown) is attached to the aft end of the translating structure and enclosed by the aft fairing (10).

1. CASCADE ASSEMBLY
2. TRANSLATION BEAMS
3. GEAR RACK
4. SEQUENCE LATCH
5. YOKE ASSEMBLY
6. LEVER LINKS
7. OUTER LEVER ARM
8. INNER LEVER ARM
9. BLOCKER DOORS
10. AFT FAIRING

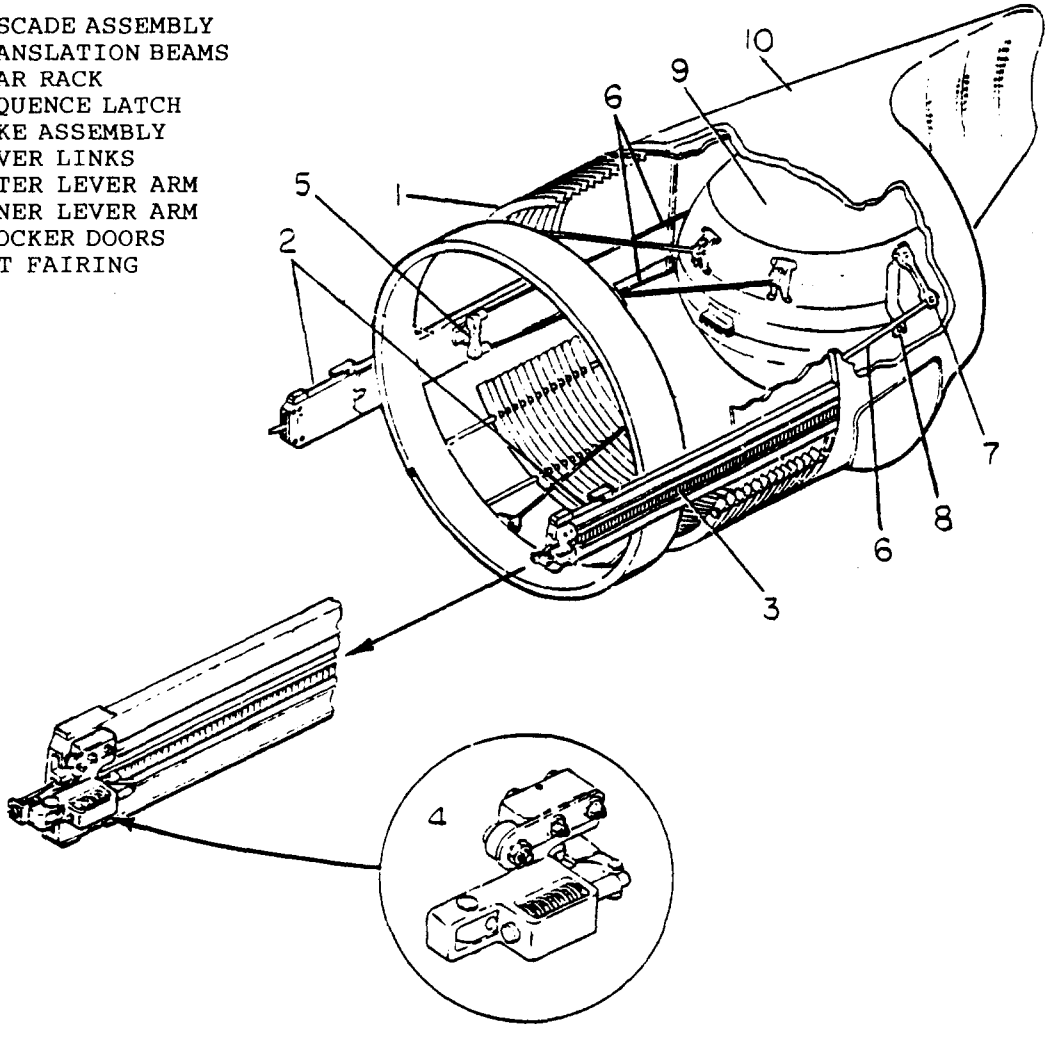


Figure 1 - Translating Structure

2. Operation. With the thrust reverser stowed, the translating structure is housed inside the aft nacelle with the aft fairing forming the rear most portion of the engine nacelle. Upon cockpit command the translating structure is deployed with the pinion gearboxes mounted in the aft nacelle driving the gear racks/ translating beams aft. As the translating structure reaches its deployed position, the sequence latches on the forward ends of the beams contact their respective catches to cause the gear racks to be released from the beams. The gear racks travel five and one-half more inches which causes the blocker doors to close. This is accomplished through the action of the yoke assemblies which are attached to the gear racks, driving the yoke to lever links (operating rods) and actuation levers (inner and outer) to pivot the blocker doors into the exhaust stream deflecting the gases through the cascade assembly to generate the reverse thrust. At the end of the deploy stroke, the pneumatic drive air is turned off by the action of the null (feedback) cable. The feedback cable is activated by an actuator at the forward end of the rack contacting and moving a slider (cursor) to which the cable is attached. There is also physical contact as the blocker doors come together which stop further movement. When the stow command is selected, the translating structure functions opposite from the above sequence. A rack actuator contacts the cursor from the aft end closing the air off to the air motor. A positive stow stop is provided at the aft end of the beam.

Translating Structure - Maintenance Practices

1. General. Maintenance of the translating structure consists of removal/installation, adjustment/test and approved repairs. To accomplish maintenance of the translating structure it is recommended that the structure be separated from the aft nacelle to provide maximum accessibility to hardware.

2. Removal/Installation.

A. Removal.

(1) Refer to Maintenance Practices 78-30-00 and remove thrust reverser assembly from the aircraft and place assembly in work stand.

NOTE: It is recommended that the translating structure be placed in a support stand any time assembly is removed from the aft nacelle.

(2) Separation of Translating Structure. With the nacelle installation positioned and secured on the workstand, partially stow the unit approximately three inches aft of the pneumatic latches and separate the translating structure from the nacelle installation as follows:

(a) Remove nut (25, Figure 201) from the end of the inboard gear rack (29).

(b) Remove actuator bracket (26), washers (27), and spacer (28), if present, from end of inboard rack (29).

(c) Remove the inboard and outboard sequencing latches (4, 30) from their respective beams by removing eight screws (6, 7), washers (3, 31), and nuts (2, 32) securing them to their beams. Identify each latch assembly for re-installation in the original location.

(d) Remove pin (S) from end of outboard rack (8).

(e) Remove four screws (12, 18) and washers (11, 19) securing the flanges (14, 16) of the flex drive shafts (13, 17) to the pneumatic actuator spur gearbox (15). Pull the flex drive shafts out of the spur gearbox.

(f) Manually push the translating structure aft and off the pinion gears.

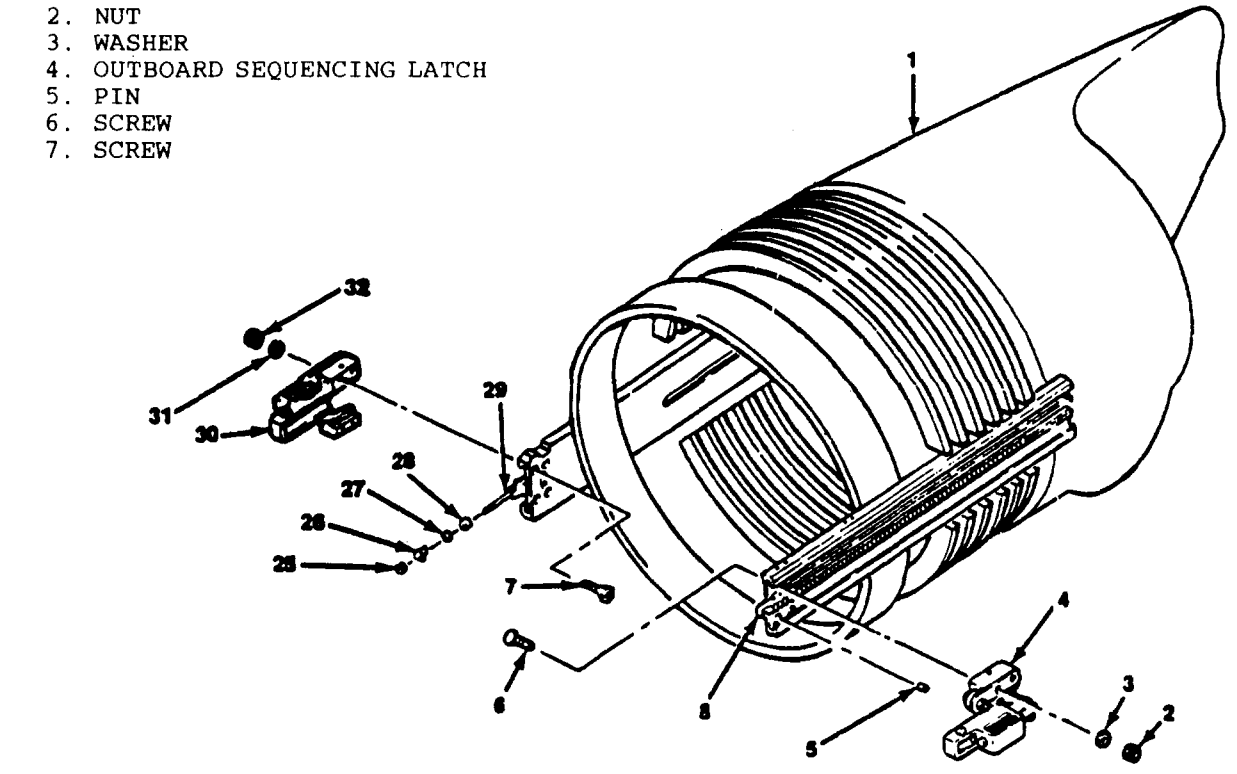
CAUTION: THE TRANSLATING STRUCTURE MUST BE SUPPORTED AS THE RACKS SEPARATE FROM THE PINION GEARS. THE UNIT WEIGHS APPROXIMATELY 100 POUNDS.

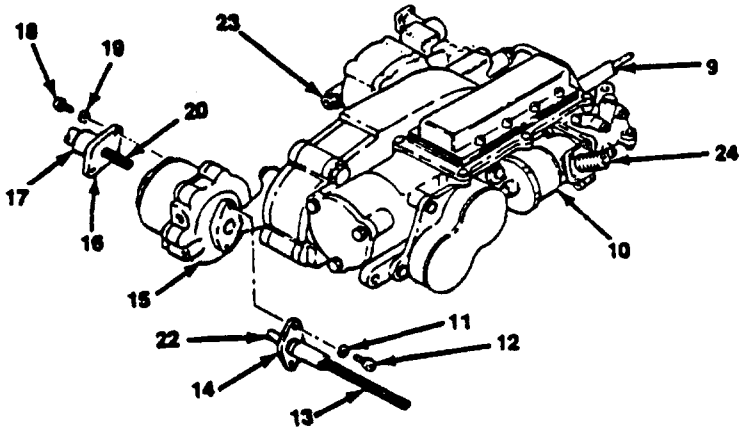
(3) Separation of Aft Fairing (Sugar Scoop). Separate the aft fairing (sugar scoop) from the translating structure as follows:

(a) Separate angle assembly (3), (Figure 202) from the sugar scoop and tailpipe by removing two bolts (12) attaching the angle to the reverser tailpipe and the two screws (1) and washers (2) securing the angle ends to the sugar scoop.

(b) Remove nut (11) and washer (10) from aft longeron assembly (7).

1. TRANSLATING STRUCTURE
2. NUT
3. WASHER
4. OUTBOARD SEQUENCING LATCH
5. PIN
6. SCREW
7. SCREW





8. OUTBOARD RACK
9. NULLING CABLE
10. PNEUMATIC ACTUATOR
11. WASHER
12. SCREW
13. OUTBOARD FLEX DRIVE SHAFT
14. FLANGE
15. SPUR GEARBOX
16. FLANGE
17. INBOARD FLEX DRIVE SHAFT
18. SCREW
19. WASHER
20. INBOARD FLEX DRIVE SHAFT HEX
21. SPECIAL TOOL, AST 2851 (VESPEL SLIPPER RETAINER)*
22. OUTBOARD FLEX DRIVE SHAFT HEX
23. ELECTRICAL CONNECTOR
24. ELECTRICAL CONNECTOR
25. NUT
26. ACTUATOR BRACKET
27. WASHER
28. SPACER
29. INBOARD RACK
30. INBOARD SEQUENCING LATCH
31. WASHER
32. NUT

* See Figure 202, Section 78-30-08

Figure 201 - Translating Structure Removal

(c) Remove the four cap screws (16) and washers (15) (see sugar scoop bolt arrangement) securing the sugar scoop to the translating structure. Shims (14) are located at each cap screw mounting. Retain for reassembly.

NOTE: Spacing/positioning of the aft fairing with respect to the aft nacelle is controlled by shim stacks at each screw location. In order to avoid dropping the shims and, as a result, having to accomplish a series of trial fits to determine correct shim stack thickness at each location, the attaching screws should be backed out incrementally and the scoop pulled aft a corresponding distance until the number and thickness of shims at each location can be determined.

(d) Pull the sugar scoop off the reverser tailpipe. It weighs approximately 20 pounds.

(e) Remove nut (9) and washer (6, 8) and remove the longeron from the sugar scoop.

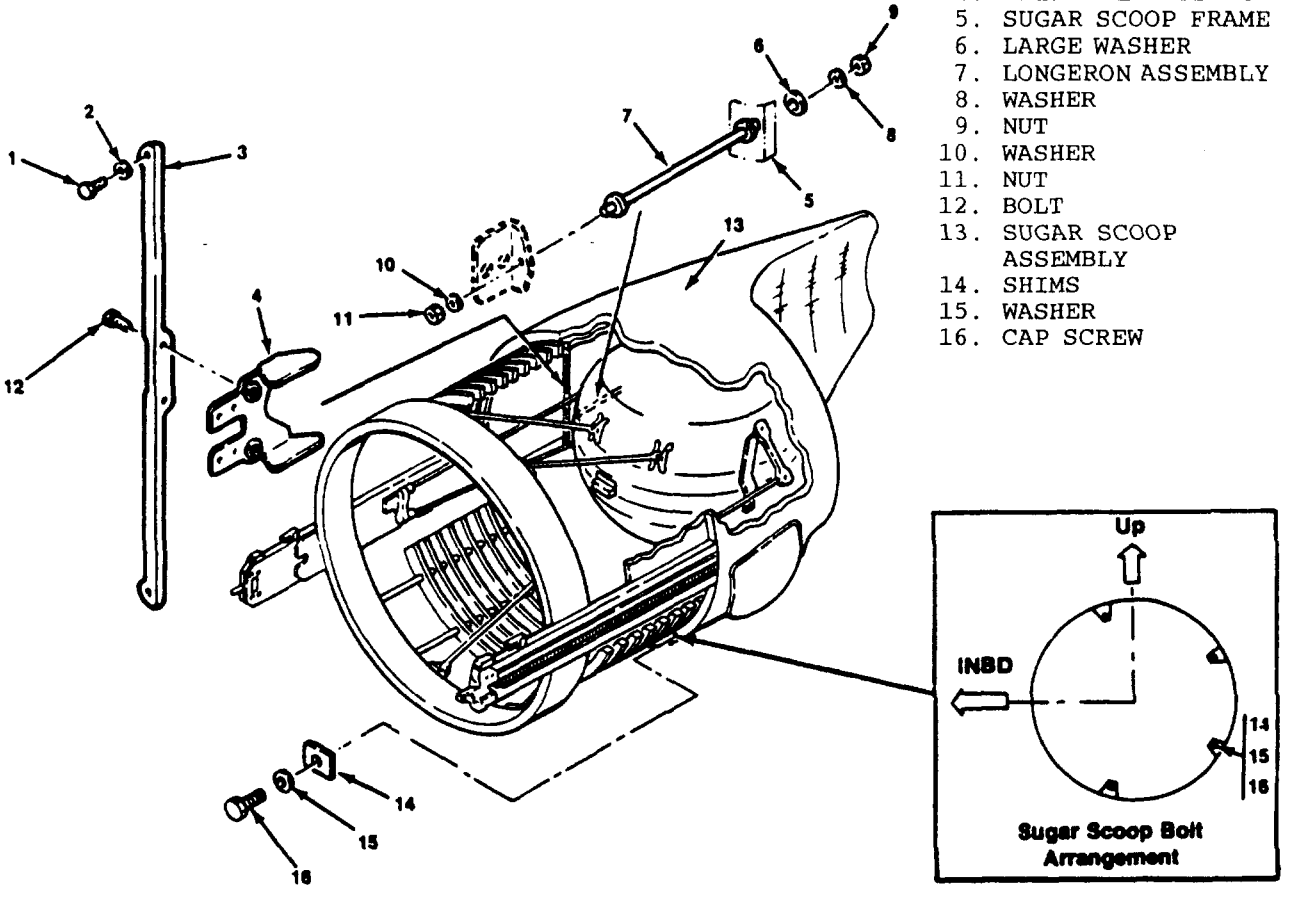


Figure 202 - Sugar Scoop Removal

TEMPORARY REVISION NO. 78-2

MANUAL AFFECTED: Learjet (Aeronca) Falcon 20 Thrust Reverser Maintenance Manual.

FILING INSTRUCTIONS: Insert adjacent to 78-30-04, page 204, dated March 1, 1995 and retain until further notice.

REASON: Change lubricant call-out due to discontinued product (GS-3).

INSTRUCTIONS: Revise the Caution and 2.B.(1)(c) as follows:

(c) Lubricate the translating structure beam bearing surfaces and gear racks with multiple coats of Lilly Industries dry film lubricant P/N 5791C90003 or P/N 5791C90004.

CAUTION: ALWAYS USE A DRY FILM LUBRICANT IN THE TRANSLATING STRUCTURE. IF A WET LUBRICANT WERE USED, IT COULD PICK UP PARTICLES FROM THE EXHAUST GASES. THE WET LUBRICANT WOULD THEN ACT AS AN ABRASIVE AND CAUSE EXCESSIVE WEAR IN THE MOVING JOINTS.

B. Installation.

Complete all aft nacelle repairs, and rigging (as required) before installing the translating structure.

(1) Installation into Nacelle.

(a) Remove the flex drive shafts from the spur gearbox per A.(2),(e) if they are not already removed.

(b) In units equipped with 121468-3-1A and -4-1A pinion gearboxes, position the 3233190 "Vespel" slipper bearings on the pinion gearboxes (four per gearbox) and install the retaining tools to prevent loss/damage during translating structure installation. Do not use wax or grease. See Figure 202 Section 78-30-08.

(c) Lubricate the translating structure beam bearing surfaces and gear racks with multiple coats of RAM GS-3.

CAUTION: ALWAYS USE RAM GS-3 LUBRICANT IN THE TRANSLATING STRUCTURE. IF A WET LUBRICANT WERE USED IT COULD PICK UP PARTICLES FROM THE EXHAUST GASES. THE WET LUBRICANT WOULD THEN ACT AS AN ABRASIVE AND CAUSE EXCESSIVE WEAR IN THE MOVING JOINTS.

(d) Place the blocker doors in the deployed position and clamp the doors closed. (Clamp on the door bearing tabs.)

(e) Slide the translating structure onto the pinion gearboxes. Make certain that the translating structure beams surround the Vespel slippers as the translating structure moves forward. Remove the retaining tools as the "Vespel" slipper bearings are covered by the beams. See Figure 202, Section 78-30-08.

(f) Maintain forward pressure on the translating structure and continue sliding forward until the gear racks have engaged the pinion gears and the forward ring is well inside the aft nacelle.

(g) Remove the blocker door clamp and, while applying forward pressure to the translating structure, force the blocker doors to the forward thrust or full stowed position.

(h) Install spacer (28, Figure 201), if required to clear weld bend, onto end of inboard rack.

CAUTION: SPACER MUST BE INSTALLED WITH COUNTERSUNK END AFT.

(i) Install washer (27) and actuator bracket (26) on inboard rack and secure with nut (25). Torque nut to 4 to 5 inch-pounds.

(j) Install pin(s) in outboard rack.

(2) Refer to Maintenance Practices of Section 78-30-05, Paragraph 3, to properly align and rig the translating section into the nacelle.

(3) Sugar Scoop Installation. Install the sugar scoop per the following:

(a) Install longeron assembly (7, Figure 202) into sugar scoop frame (5). Install large washer (6) and washer (8), secure with nut (9).

(b) Place sugar scoop in position, guiding longeron through hole in tailpipe flange. Install shims (14) as required (see insert) and washer (15). Secure with cap screw (16). Use shims removed during disassembly. Make certain to install them in the same location. Secure longeron to tailpipe flange with washer (10) and nut (11).

(c) Place angle assembly (3) in position. Secure to tailpipe fitting (4) with two bolts (12).

(d) Secure top and bottom of angle assembly with a screw (1) and washer (2).

(e) Translate the translating structure forward and ensure the aft nacelle and sugar scoop are true within .000 to .030. Re-shim as necessary using shims (14).

3. Adjustment/Test. The following procedures should be used to pre-adjust and/or check the operating mechanism for proper blocker door operation before the translating section is installed into the aft nacelle.

A. Abbreviated Check Procedure.(Tolerances purposely relaxed for normal parts wear)

(1) Support the blocker doors in their maximum open position with the special tool AST 2859 (Figure 204) or with an equivalent prop. Clamp the racks to the beams.

NOTE: Use soft shims between the rack and beam and the clamp faces to protect the plated metal surfaces.

(2) Assure the A and B measurements (Figure 204) are within the prescribed limits.

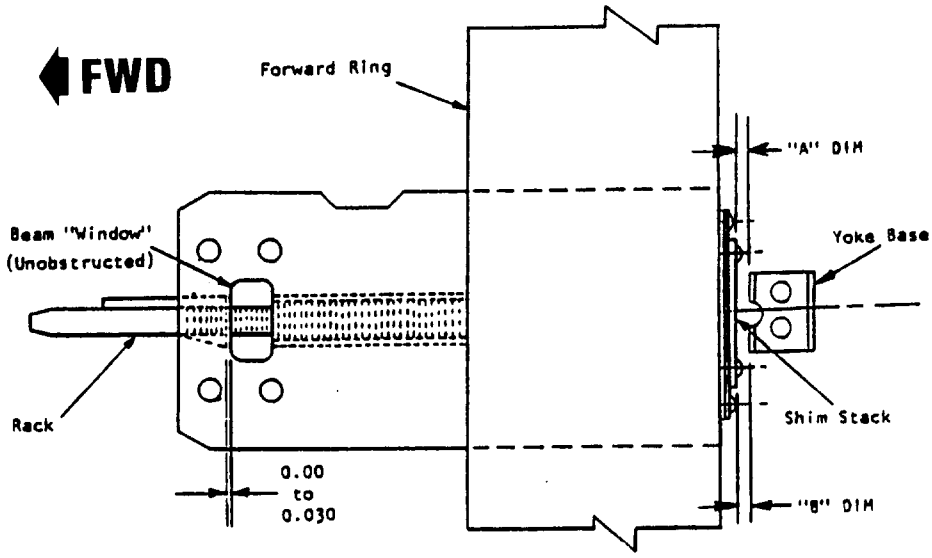


Figure 203 - Rack To Beam Alignment

(3) Check the "window" in both beams and assure the rack inboard forward edge aligns per Figure 203 to the forward edge of the beam.

(4) Using a feeler gauge, measure the gap at the top and the bottom of each yoke base to the forward ring. Allowable gap is 0.005 to 0.040 inch but to ensure parallelism between each yoke base and the forward ring, the maximum difference between top and bottom measurements at each side is 0.010 inch (see Figure 203). Maximum gap difference allowable side-to-side is 0.020 inch. See Paragraph B.(15) and Figure 208 for more information.

(5) Remove clamps and vertical prop and close the blocker doors by simultaneous force application on each rack. Check that doors mate within the limits defined in (Figure 205).

(6) Apply simultaneous application of approximately five pound forward pulling force on each of the two racks. Assure the blocker doors return to the stowed position.

(7) If any of the tests are not satisfactory, refer to the following procedures (B) for appropriate solutions.

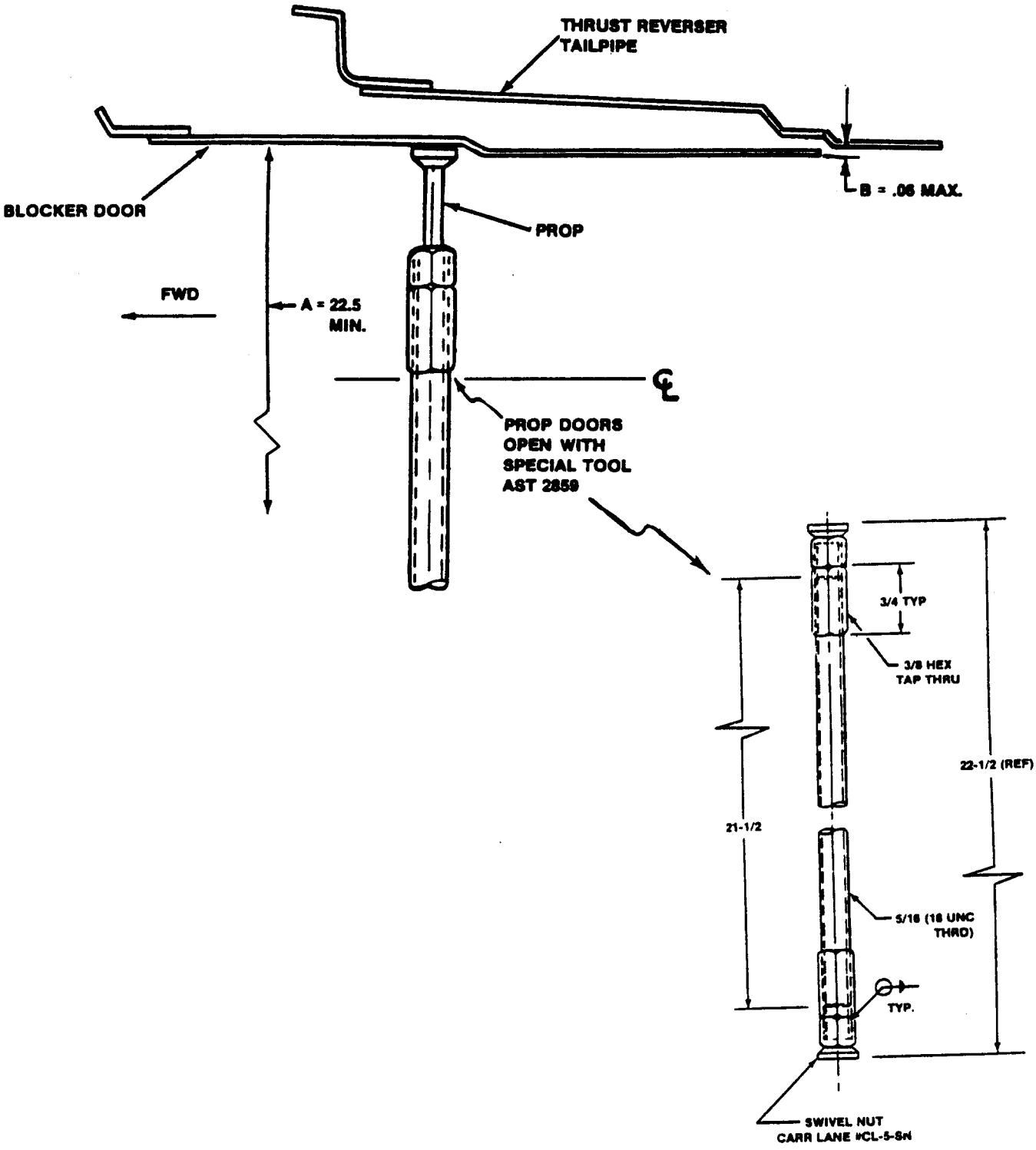


Figure 204 - Propping Blocker Doors

TEMPORARY REVISION NO. 78-3

MANUAL AFFECTED: Learjet (Aeronca) Falcon 20 Thrust Reverser Maintenance Manual.

FILING INSTRUCTIONS: Insert adjacent to 78-30-04, page 208, dated March 1, 1995 and retain until further notice.

REASON: Change lubricant call-out due to discontinued product (GS-3).

INSTRUCTIONS: Revise paragraph 3.B.(11) as follows:

(11) Remove the rack-to-beam holding clamps and the blocker door support and lubricate all pivoting joints of blocker door linkage system with Lilly Industries dry film lubricant P/N 5791C90003 or P/N 5791C90004.

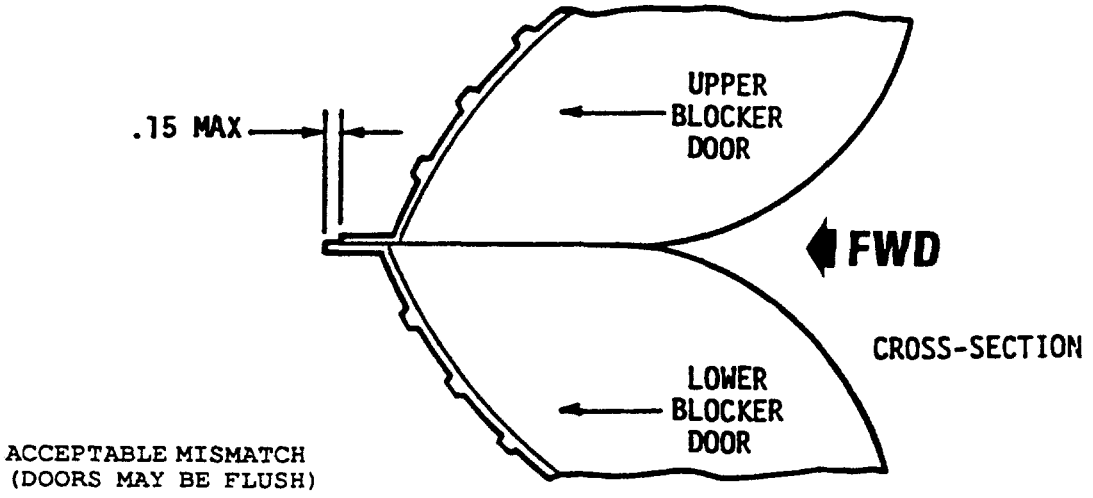


Figure 205 - Blocker Door Mating Requirements

B. Translating Structure Rigging.

Accomplish initial translating structure rigging with the structure separated from the aft nacelle and as follows:

(1) Remove the two screws (28, Figure 206) attaching each yoke to the yoke bases and plates (shims).

(2) Remove the cotter keys, washers (24, 26) and clevis pins (23) attaching the yoke to lever links (18, 31) to the clevises (25) (four places - two each clevis).

(3) Remove the nuts (36), washers (37, 39), spring washers (38), screws (43) and bushings (44) attaching the tension rods (33) to the forward ring fittings.

(4) Remove and discard the yoke stop bolts and locknuts if installed.

NOTE: Unit Serial Nos. 001 through 035 were delivered with yoke stop bolts installed. Service Bulletin 78-30-003 directed removed and discarded even if the balance of 78-70-003 is not incorporated.

(5) Position the racks to align the rack sequencing latch detents with the beam window (see Figure 206). It may be necessary to remove the forward ring shims to achieve position (see Figure 208). Clamp the racks to the beams to maintain relative positions.

NOTE: Use wood or plastic shims between the rack and beam and the clamp faces to protect the plated metal surfaces.

(6) Support the blocker doors in their maximum open position with special tool AST 2859, or equivalent, between the doors to act as a prop (see Figure 204). Check to make sure that dimension "A" measured at the forward edge of the door skins on the vertical centerline, as shown in the figure is at least 22.5 inches or greater to assure adequate clearance with the outboard fan duct seal when the blocker doors are open.

NOTE: On early, low-serial-numbered units, the blocker door opening was specified as 22.375 inches and could not be increased due to interference between the blocker door mating tabs and the cascade rings. Where tab/ring interference is encountered, rework the cascade ring by bending the ring aft, through the full width of the tab, to clear the tab and permit the specified opening.

(7) With the blocker doors supported as shown in Figure 204 check to make sure that dimension "B" measured between the inside surface of the doors at their aft edges, and the inside surface of the thrust reverser tailpipe is less than 0.0625 inches.

(8) Adjust the length of the tension links (33, 34, 35) for best fit to the ring mounted fittings. Reinstall the bushing (44), screws (43), washers (37, 39), and nuts (36) attaching the tension links to the forward ring mounted fittings. Determine the number of D6-1 spring washers (38) required for each location as follows:

(a) With all parts except the D6-1 spring washers (38) installed at each location, measure the end-play in each hardware stack-up.

(b) For end-play from 0.012 to 0.030 inch, install two, nested, D6-1 washers.

(c) For end-play from 0.030 to 0.050 inch, install five, nested D6-1 washers.

(d) Torque to 10 to 14 inch-pounds.

(9) Attach yoke clevises (25) and shim to base with screws (28). Torque to 5 to 7 inch-pounds.

(10) Adjust length of link assemblies (18, 19, 20, and 29, 30, 31) to mate with yoke clevis (25) and temporarily attach the links to the clevises using pins (23), washers and cotter pin. Make certain the heads of the pins are on the beam side of the yoke.

NOTE: Do not turn the rod ends so far so to open the link assembly witness holes. If length required cannot be achieved without opening the holes, the links must be replaced.

(11) Remove the rack-to-beam holding clamps and the blocker door support and lubricate all pivoting joints of blocker door linkage system with RAM GS-3.

1. BLOCKER DOOR STUD
2. WASHER
3. INNER LEVER
4. TAILPIPE HOUSING
5. SPRING WASHER
6. BOLT
7. NUT
8. NUT
9. WASHER
10. OUTER LEVER
11. SPRING WASHER
12. WASHER
13. BOLT
14. SPRING WASHER
15. BUSHING
16. NUT
17. COTTER PIN
18. TUBE-YOKE-TO-LEVER LINK
19. NUT
20. ROD END BEARING
21. YOKE BASE
22. SHIM
23. PIN
24. WASHER
25. YOKE CLEVIS
26. WASHER
27. COTTER PIN
28. SCREW
29. ROD END BEARING
30. NUT
31. TUBE-YOKE-TO-LEVER LINK
32. BOLT
33. TENSION LINK
34. NUT
35. ROD END
36. NUT
37. WASHER
38. SPRING WASHER
39. WASHER
40. WASHER
41. SCREW
42. FITTING
43. SCREW
44. SPACER
45. WASHER
46. NUT
47. NUT
48. WASHER
49. CLEVIS FITTING
50. SPACER
51. WASHER

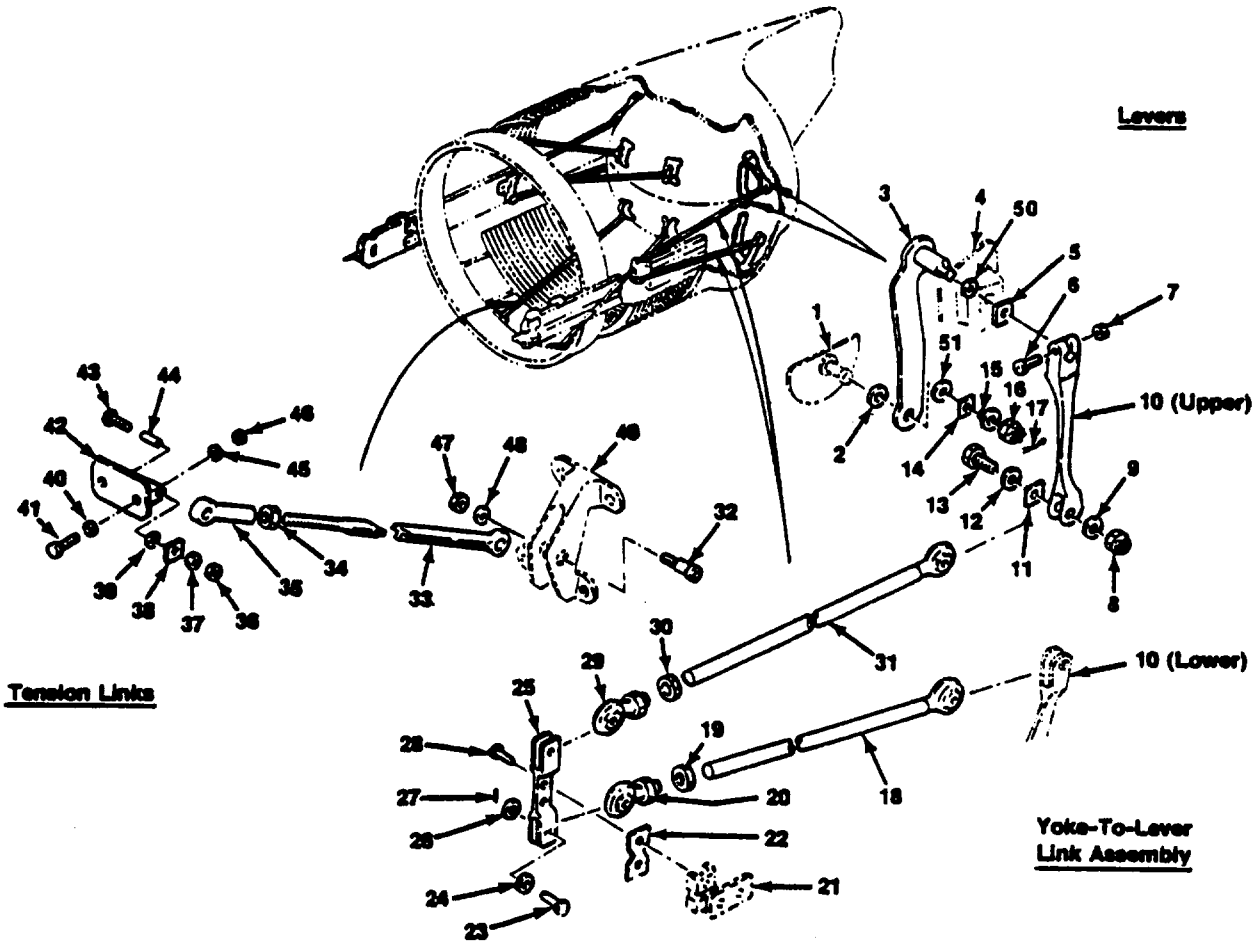


Figure 206 - Tension Links and Yoke-to-Lever Assemblies, Exploded View

(12) Check that simultaneous application of a five pound force in either the aft (deploy) or forward (stow) direction will rotate the doors to the full deploy or stow position. Where a force greater than five pounds is required to cycle the blocker doors:

(a) Recheck the tension link lengths for proper fit to the forward ring mounted fittings.

(b) Check that the yoke to lever links are not binding in either the clevis or the outer actuation link levers. Remove interfering material as required to obtain clearance.

(c) Check that the yoke to lever links are not in contact with structure/frames throughout their full travel range and sweep. Where contact binding occurs, repeat the Step B.5 clamping operation, disconnect the binding links from the yoke clevis, hand-form the link to achieve clearance, and readjust length to again fit the clevis.

(d) Check that the inner lever arms are not binding on either the reverser nozzle or the blocker doors. Remove material as required to achieve free operation. Refer to Procedure E, inner lever arm replacement.

(e) Check for overtorque of the nuts securing the levers to the blocker door mounted pivots. Check by:

- Removing the cotter keys, loosening the nuts, retightening the nuts to 20 inch-pounds torque, and backing off to align the first nut castellation with the pivot cotter key bores.

- Install a new cotter key (four places).

(13) Check that the "lips" on the forward edge of the blocker doors do not contact the tension rods. Remove material from the door "lips" as required to obtain clearance.

(14) Check and adjust the door lip mismatch as follows:

(a) Check the door mismatch shown in (Figure 205). If the mismatch is greater than 0.15 inch, the linkage must be adjusted. Adjustment of the linkage may effect the clearances and/or the beam window alignment. Use adjustment guide per Figure 207 and the following procedures to correct a door mismatch.

(b) Either equally lengthen both yoke-to-lever links of forward-most door and/or shorten both yoke-to-lever links of aft-most door to obtain mismatch within the allowable limit. Verify that the dimensional requirements of Figure 204 are met. If these requirements cannot be met, proceed with the following steps.

(c) Equally shorten both tension links of aft-most door to achieve the 0.15 inch maximum mismatch.

(d) Recheck to ensure that the blocker door clearance requirements shown in Figure 204 are still met.

(e) If blocker door clearance requirements are not correct per Figure 204 equally lengthen the inboard and outboard yoke-to-lever links of forward-most door and/or equally shorten the links of aft-most door.

(f) Repeat steps (1) through (5) as often as necessary to achieve the required clearance and mating requirements shown in both Figures 204 and 205.

(g) After achieving the required dimension of blocker door clearance and mismatch, recheck the rack detent to forward edge of beam window alignment.

(h) If additional adjustment of the rack to beam window is required, prop blocker doors open, and adjust inboard upper and lower operating rods an equal amount to achieve the required alignment of rack-to-beam window. Adjust outboard rack and beam window adjustment in the same manner if required.

(15) Measure and adjust the forward ring-to-yoke clearance as follows:

(a) Fully stow the unit and install the door prop. Align and clamp the rack to the beams.

(b) Measure the yoke-to-ring clearance as shown in Figure 208. The clearance must be within 0.010 to 0.030 inch and the inboard and outboard measurement must be within 0.010 inch of each other. If not within tolerance, bumper plates must be added.

(c) To add bumper plates, measure the mismatch and select a bumper plate or combination of plates from the following table to achieve the required clearance.

TABLE 1 - Bumper Plate Dimensions

Part Number	Thickness
232-20450-17 (or PA6421)	0.012
232-20450-19 (or PA6422)	0.020
232-20450-7	0.032

(d) Unclamp the racks, remove the door prop and push the doors open. Install new bumper plate (2, Figure 208)(or combination of plates) using Dow Corning DC93-076 adhesive on all metal-to-metal surfaces. Use drive rivets to secure bumper plates in position on forward ring. Ensure that no portion of the pumper plate(s) extend past ring edge.

(e) Restow the unit and check the clearance.

NOTE: At the same time the yoke base to forward ring gap measurement is made, check to ensure that both yoke base mounting screws are safetied and torque striped. Yoke base mounting screws are to be torqued to 24 in. lbs.

(16) Check and adjust the door to tailpipe clearance as follows:

(a) Measure the clearance between the aft edge of blocker doors and thrust reverser tailpipe during blocker door rotation. The clearance must be at least 0.12 inch. If not, trim aft edge of blocker door to obtain required minimum clearance.

ADJUSTMENTS SHOWN BELOW ARE TYPICAL FOR BOTH UPPER AND LOWER BLOCKER DOORS

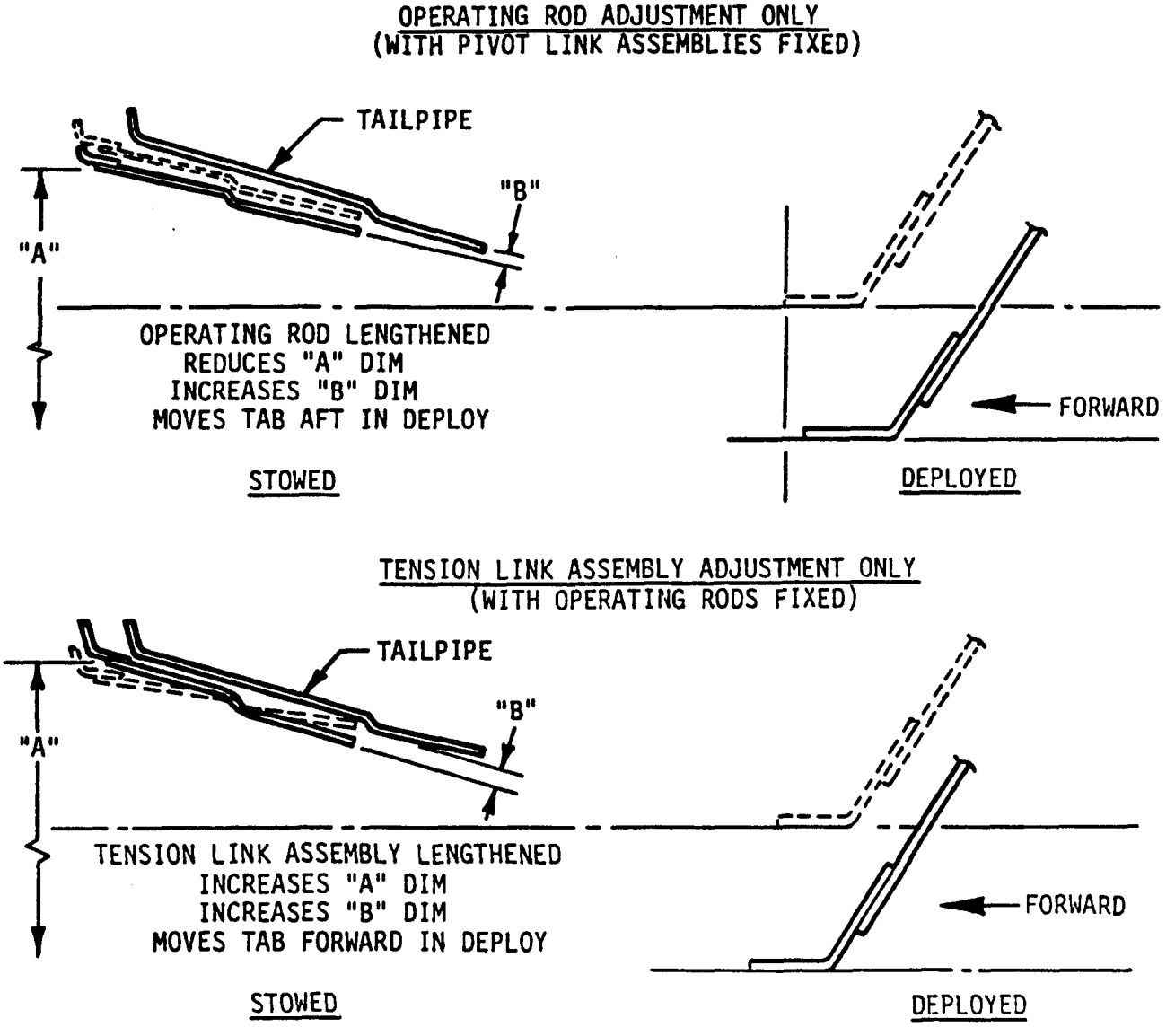


Figure 207 - Blocker Door Positioning Adjustment Guide

(b) Check that the lips on the forward edge of blocker doors do not contact the cascade turning vanes. Bend material at the blocker door tabs or form cascade vanes as required.

C. Field Installation of Nozzle Exit Adapters.

Accomplish exit area adapter installation as follows:

(1) Deploy the reverser.

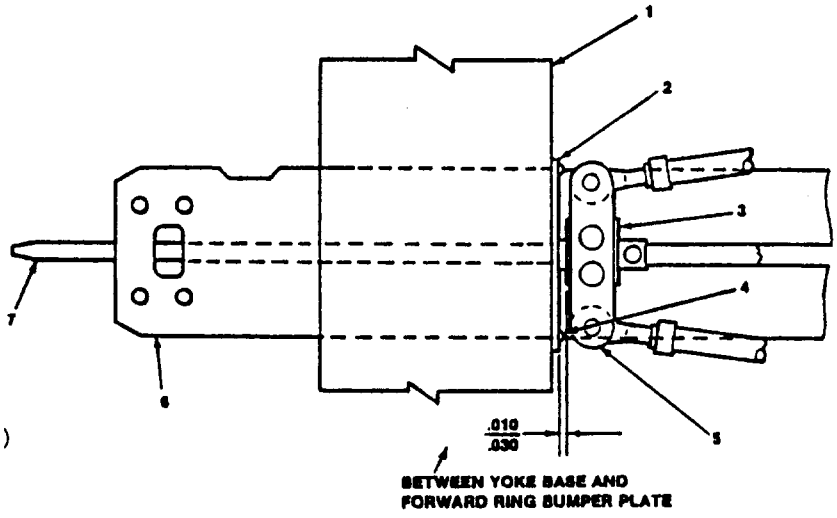
(2) Disconnect the nacelle aft fairing (sugar scoop) per Removal/ Installation instructions, Paragraph 2(3). Do not, however, remove the sugar scoop at this time.

(3) Pull the sugar scoop rearward, as necessary, to determine the location of the 232-20185 clips with respect to the reverser tailpipe. Mark the clip locations on the reverser tailpipe in the nozzle area. AF 007M44-3 rivets are used under the clips. Rivets at clip locations are installed double flushed with external head heights not exceeding 0.012 inch. See Figure 209 for clip locations.

(4) Pull the sugar scoop rearward to clear the reverser nozzle. Use care not to catch/bend the mounting pads on the nozzle or blocker door operating linkage.

(5) Position the adapter in the reverser exit nozzle as shown in Figure 209. Do not trim to achieve the 0.00 to 0.06 gap at 6 o'clock at this time.

(6) Use the adapter pilot holes to locate rivet points on the reverser nozzle and, starting at the 12 o'clock position, pilot drill, open to size, and install either AF 007M443 or -4 rivets as required. Drill, size, and install rivets in succession. Do not pilot drill the entire circumference before installing rivets.



1. FORWARD RING
2. BUMPER PLATE (SHIMS)
3. YOKE BASE
4. DEUTSCH DRIVE RIVET
5. YOKE CLEVIS
6. BEAM
7. RACK

Figure 208 - Yoke-to-Forward Ring Bumper Plate Clearance

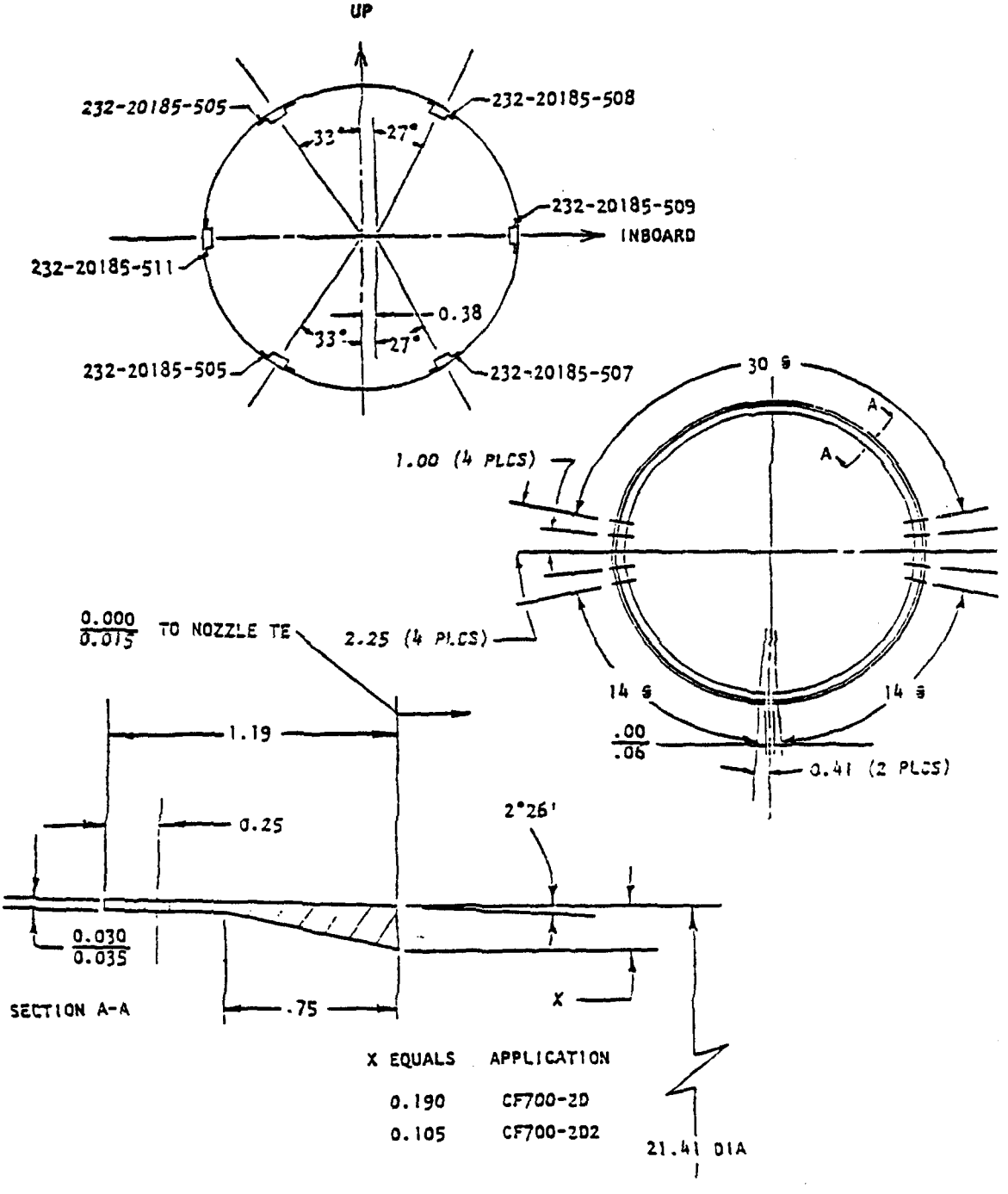


Figure 209 - Adapter Ring Installation

(7) Final trim the adapter to the 0.00 to 0.06 dimension after the upper 180 degrees of the adapter has been riveted in place. Adapter may be restrained to match contour and hold dimensions shown in Figure 209 in determining trim line location.

(8) Reinstall the aft fairing by reversing the removal process.

D. Torquing Tension Straps.

Maintenance of torque levels on the cascade tension straps is required to hold alignment of the cascade assembly. Loss of, or inability to maintain torque on a single strap may be an indication the strap is broken. Retorque the cascade tension straps per the following:

(1) Utilize a torque wrench and a modified vise grip pliers per Figure 210 to apply torque to the tension straps.

(2) Apply torque in the sequence shown up to 48 inch pounds. Repeat the sequence 3 times. Lightly tap the cascade assembly with a rubber mallet between each sequence. After the final torque the cascade should retain 35 inch pounds.

4. Inspection/Check.

Refer to Inspection/Check, 78-30-00 and comply with defined requirements.

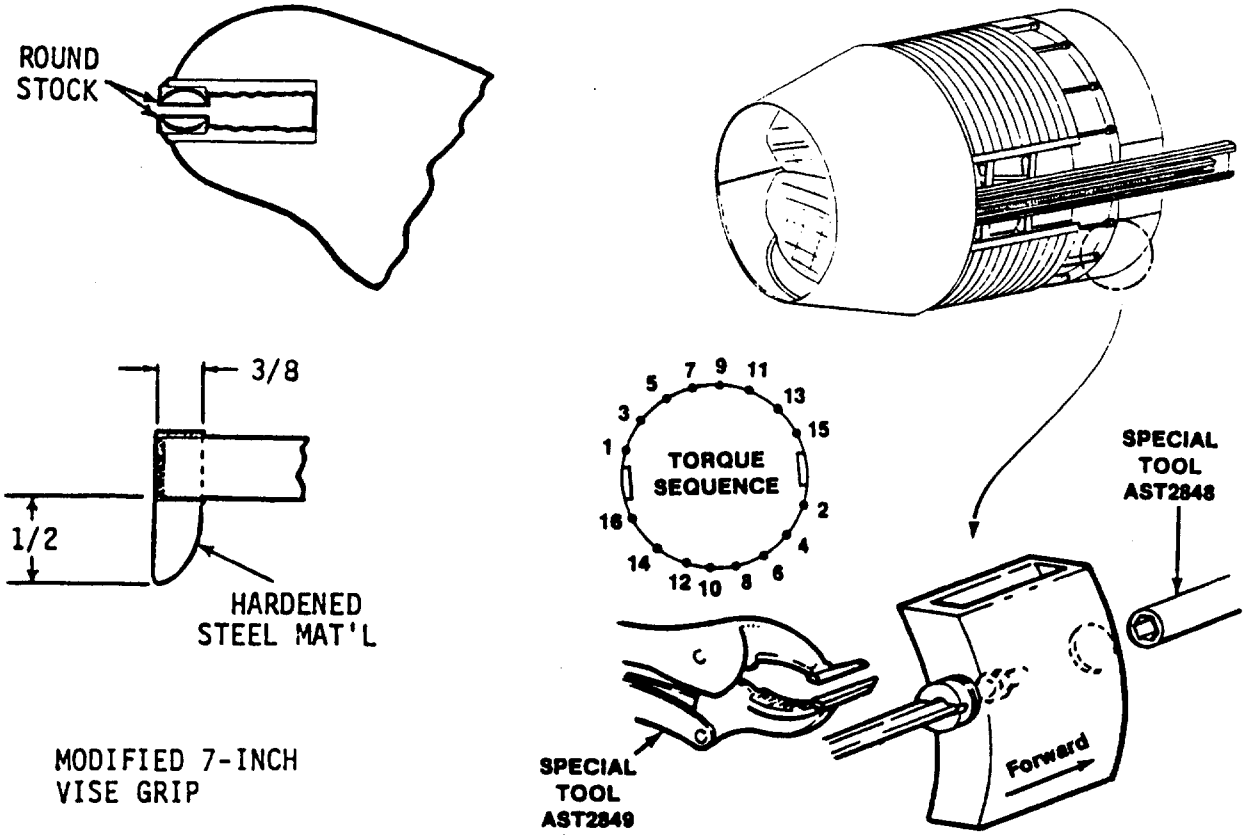


Figure 210 - Torquing Tension Straps

5. Servicing.

Refer to Servicing, 78-30-00, and maintain as outlined.

6. Approved Repairs.

A. Replacement of a Gear Rack.

(1) Remove the translating section for access per Removal/Installation instructions, Section A(2).

(2) Remove the sugar scoop per Removal/Installation instructions, Section A(3).

(3) Disconnect the yoke clevis (25, Figure 206) from the yoke base by removing the two screws (28). Do not disturb the yoke to lever links (18, 31).

(4) Remove the appropriate rack stops (16, 38, Figure 211) incorporated by SC-F20-002, by removing screws (20, 36) and nuts (17, 37).

(5) Remove the appropriate beam stow stops (12, 33) incorporated by SC-F20-008 by removing the bolts (14, 35) and washers (13, 34).

(6) Remove the appropriate two aft beam screws (4, 5) and pull slightly outward on the aft end of the beam. Remove the shims (7, 8) (if present) and identify.

(7) Slide the rack aft and out of the beam while holding the beam away from the tailpipe.

(8) Remove the yoke base (9, 15) by removing the screws (11, 27) and washers (10, 28).

(9) Remove the inboard rack aft actuator (2) by removing bolt (1).

(10) Inspect all removed hardware and replace damaged or bent components as required.

(11) Reverse procedures 7, 8, and 9 to reinstall rack. Be sure yoke base mounting screws have been torqued to 24 in. lbs., safety wired, and torque striped prior to rack installation.

(12) Reinstall the exact shims (7, 8) removed and the two aft beam screws. Reinstall the identically located stow stops (12, 33) and rack stops (16, 38) torque stripe all bolts and nuts.

(13) Reinstall the yoke clevis (25, Figure 206) with assembled yoke to lever links (18, 31).

(14) Check the translation section rigging per Abbreviated Check Procedure, Section 3A.

(15) Reinstall the sugar scoop and translating section per Section 2, Removal/Installation.

B. Replacement of a Beam.

(1) Remove the translating section for access per Removal/Installation instructions, Section 2.

(2) Remove sugar scoop per Removal/Installation instructions, Section 2.

(3) Remove the four outer screws (23, 30, Figure 211), nuts (21, 32) and washers (22, 31) from the forward end of the beam.

(4) Disconnect the yoke clevis (5, Figure 206) from the yoke base by removing the two screws (1). Do not disturb the yoke to lever links.

(5) Remove the rack stop (16, 38, Figure 211) and the stow stops (12, 33) if applicable. (Stow stops installed SC-F20-008; rack stops installed SC-F20-002.) Remove screws (14, 35) and washers (13, 34).

(6) Remove the remaining two aft beam screws (4, 5) and pull the beam slightly outward recovering any shims (7, 8) and sliding the rack aft and out of the beam.

(7) Remove the remaining forward beam screw (23, 30), nut and washer and remove the beam.

(8) Remove the beam alignment pin (25, 26) and the beam stop (24) (outboard beam only).

(9) Carefully inspect the rack and yoke base, the alignment pin and beam stop and all hardware. Replace defective components or hardware as required.

(10) Install the new beam reversing the above removal procedure(s). Utilize the same shims in the same locations during installation.

(11) After completing beam installation, refer to Section 3A, Abbreviated Check Procedure, to assure proper rigging.

(12) Reinstall the sugar scoop and translating section per Section 2B.

C. Replacement of a Yoke Base.

(1) Refer to Section 6A, Replacement of a Gear Rack, for replacement instructions.

D. Replacement of a Yoke to Lever Link.

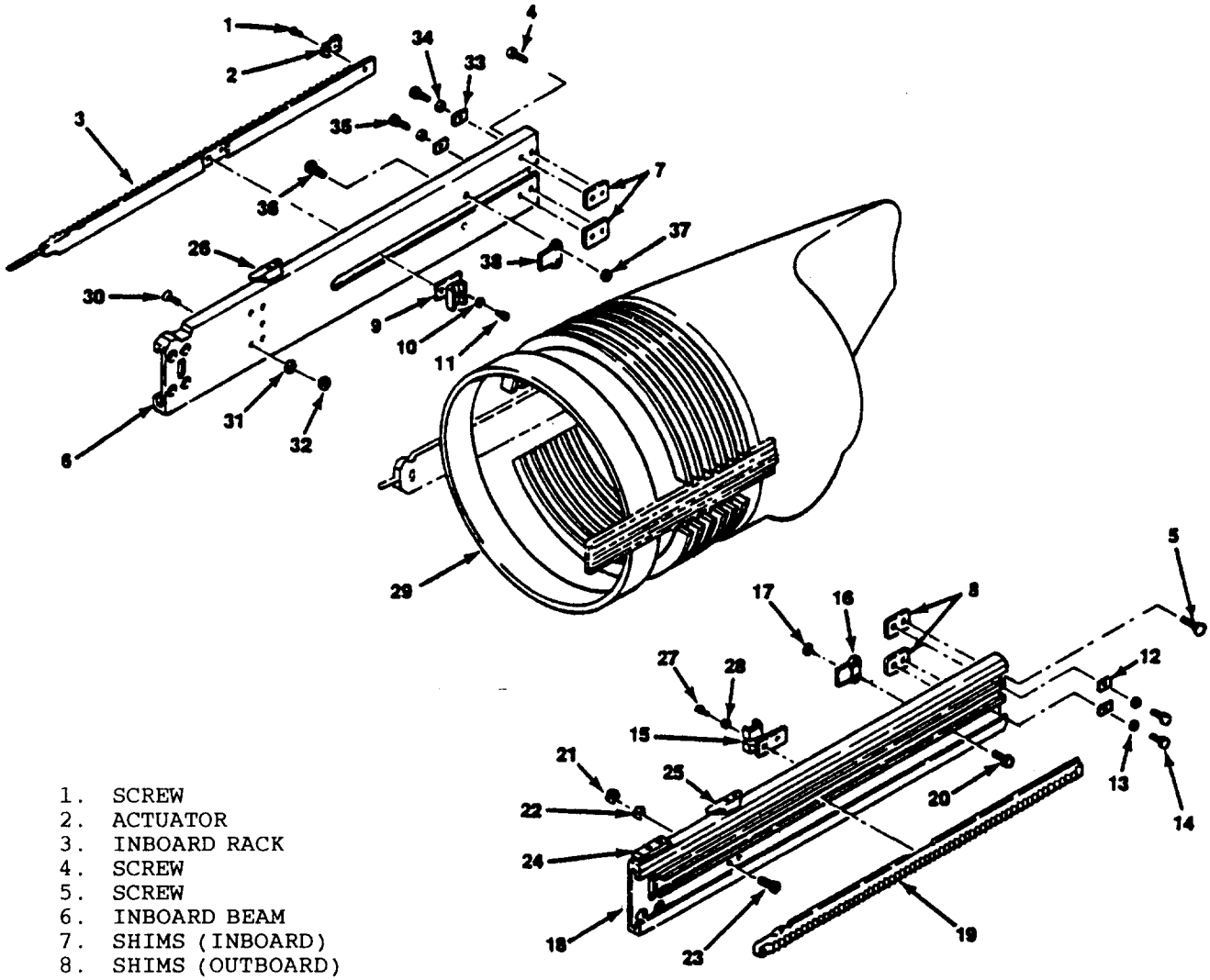
It is possible to remove and replace a yoke to lever link without removing the translating section from the aft nacelle but it is not recommended as the translating section rigging and operation may be affected. To check the rigging, the translating section is required to be removed.

(1) Remove the translating section and sugar scoop per Removal/Installation instructions, Section 2.

(2) Disconnect the yoke clevis (25, Figure 206) by removing the two screws (28).

(3) Disconnect and remove both yoke to lever links (18, 31) with rod end bearings (20, 29) and locknut (19, 30) intact. Disconnect links from the outer lever arm (10) and the yoke clevis.

NOTE: It may be necessary to adjust the blocker doors to an intermediate position to remove the retaining bolt (13) from the outer lever arm.



1. SCREW
2. ACTUATOR
3. INBOARD RACK
4. SCREW
5. SCREW
6. INBOARD BEAM
7. SHIMS (INBOARD)
8. SHIMS (OUTBOARD)
9. YOKE BASE
10. WASHER
11. SCREW
12. STOW STOP (UPPER, LOWER) (SC-F20-008)
13. WASHER
14. BOLT
15. YOKE BASE
16. RACK STOP (SC-F20-002)
17. NUT
18. OUTBOARD BEAM
19. OUTBOARD RACK
20. SCREW
21. NUT
22. WASHER
23. SCREW
24. BEAM STOP
25. ALIGNMENT PIN (OUTBOARD)
26. ALIGNMENT PIN (INBOARD)
27. SCREW
28. WASHER
29. TRANSLATING STRUCTURE
30. SCREW
31. WASHER
32. NUT
33. STOW STOP (UPPER, LOWER) (SC-F20-008)
34. WASHER
35. BOLT
36. SCREW
37. NUT
38. RACK STOP (SC-F20-002)

Figure 211 - Racks and Beams, Exploded View

(4) Adjust the length of the new link and rod end bearing assembly to equal the length of the link and bearing assembly being replaced.

NOTE: In instances where the link being replaced can not be used as a pattern, set the length of the new link assembly equal to the link assembly to be reused.

(5) Install the new link assembly and the link assembly being reused. Attach to the outer lever arms (10) and the yoke clevis (25).

(6) Reinstall the yoke clevis (25) assuring the shim (22) is properly in place.

(7) Refer to Section 3A, Abbreviated Check Procedures to check the translating section rigging.

(8) Replace the translating section and sugar scoop per Removal/Installation instruction, Section 2.

E. Replacement of an Inner Lever Arm.

(1) Deploy the thrust reverser.

(2) Remove the sugar scoop per Removal/Installation instructions, Section 2.

(3) On the affected blocker door, release the forward end of the tension link assemblies (33, 34, 35, Figure 206) (two places) by removing nuts (36), washers (37, 39), D6-1 spring washers (38), screws (43), and spacers (44) attaching each tension link assembly to the ring mounted fitting. Do not alter tension link assembly length adjustments.

(4) Remove the nuts (7), bolts (6), and spring washers (5) (two places) attaching the outer and inner lever assemblies. Remove outer levers on both inboard and outboard side of blocker doors.

(5) Hand rotate the blocker door to gain access to the appropriate inner lever arm blocker door attachment. Remove the key (17), nut (16), bushing (15), spring washer (14) and washers (51, 2) from the blocker door to lever arm attach point.

(6) Remove the lever assembly (3) and the spacer (50).

(7) Install new lever arm with a new spacer (50). Attach to blocker door reversing earlier procedure.

(8) A minimum clearance of 0.003 inch is required between the installed 232-20258 lever arms and the forward edge of the rectangular openings in the reverser nozzle with the reverser extended and the blocker doors in the forward thrust or full-open position (see Figure 212). When required, obtain clearance as follows:

(a) Determine point or length of arm contacting sheet metal through the operating arc.

(b) Remove the arm and remove material from the arm to obtain the required clearance. Limits to which material may be removed are shown in Figure 213.

(c) Polish area from which material has been removed to obtain 63 micro-inch or better finish.

(9) Reinstall the outer lever arms reversing the earlier procedure. Reconnect blocker door tension link assemblies using the same washers, spring washers, nuts, screws and spacers removed earlier. Replace the sugar scoop assembly per Removal/Installation instruction, Section 2.

F. Replacement of an Outer Lever Arm.

(1) Deploy the thrust reverser. Clamp the blocker doors center tabs together.

(2) Remove sugar scoop per Removal/Installation instruction, Section 2.

(3) Remove nut (8, Figure 206), washers (9, 12), spring washer (11) and bolt (13) to separate the yoke to lever link.

(4) Remove the nut (7) and bolt (6) to remove the outer lever arm.

(5) Reassemble the system in reverse order to the disassembly procedure. It should not be necessary to adjust the length of the link assembly to exactly line up with the outer lever arm clevis. If the link assembly does require adjustment, the translating section will require rerigging.

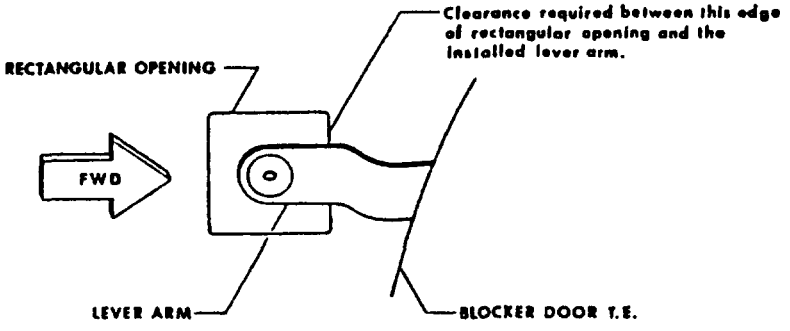


Figure 212 - Inner Lever Arm/Nozzle Clearance

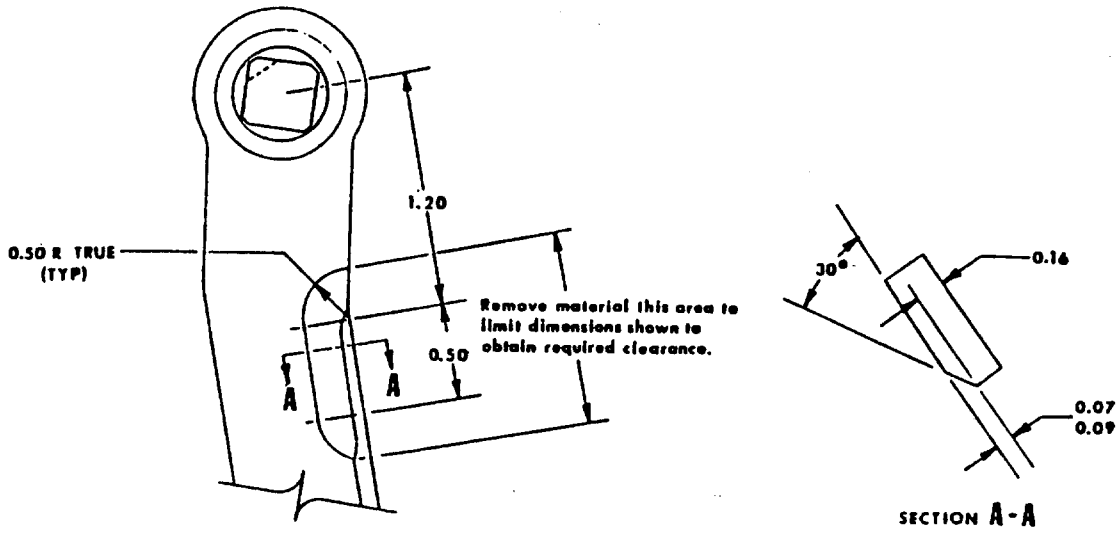


Figure 213 - Inner Lever Arm Material Removal

G. Replacement of a Tension (Pivot) Link.

NOTE: It is possible to remove and replace the tension link without removing the translating section from the aft nacelle but, it is not recommended as the translating section rigging may be affected. To check the rigging requires removal of the translating section.

(1) Remove the translating section and sugar scoop per Removal/Installation instructions, Section 2.

(2) Move the blocker doors to the deployed position and clamp the center tabs together.

(3) Clamp the beams and racks together.

(4) Remove the tension link assembly (33, 34, 35, Figure 206). Retain and identify the attachment hardware.

(5) Install jam nut (34) and rod end (35) on tension link (33). Do not tighten.

(6) Insert tension link in position in clevis fitting (49) and secure with bolt (32), washer (48) and nut (47). Torque nuts to 20 inch-pounds. Ensure clearance in clevis as given in the following table:

Table 2 End Play Shimming

End Play Inches	D6-1 Spring Washers Required	Solid Washers Required
0.012 - 0.030	2 nested	None
0.030 - 0.050	5 nested	None
0.050 - 0.074	2	One Between Washers

(7) Adjust length of the tension link (33) for best fit, and install spacer (44) in fitting (42). Secure forward end to fitting (42) with screw (43), washer (39), washers (38, 37) and nut (36). Adjust for end play per previous table. Torque to 10 to 14 inch-pounds.

(8) Release clamps and check translating section rigging per Abbreviated Check Procedure, Section 3A.

(9) Reinstall sugar scoop and translating section per Removal/ Installation, Section 2.

H. Replacement of a Blocker Door.

(1) Remove the translating section and sugar scoop per Removal/ Installation, Section 2.

(2) Disconnect the tension links from the blocker door by removing nuts (47, Figure 206) washers (48) and bolts (32) and any D6-1 spring washers. Remove the link from the clevis.

(3) Remove the cotter pins (17), the castle nuts (16), the bushings (15), spring washers (14), and washer (51).

(4) Work the inner lever arms off the blocker door stud (1) and remove the door. Remove washer (2).

NOTE: It is recommended if SB-F20-78-30-010B has not been incorporated it be incorporated at this time.

(5) Refer to Figure 206 for relative parts location when installing inner levers on blocker doors. Refer to Figure 214 for correct parts stack-up per SB-F20-78-30-010B. All four inner levers must be installed in the same manner.

(6) Install washer (2) over blocker door studs. Work the blocker door in place so that the blocker door studs (1) protrude through the lever holes.

(7) Install washer (51) spring washer (14) and bushing (15) over blocker door stud. Secure inner levers to blocker door stud with castellated nut (16). Torque nut to 20 inch-pounds. Install cotter pin (17). If necessary, back off nut just enough to insert cotter pin.

(8) Reconnect the tension links to the blocker door clevis fitting (49) with the bolts (32), washers (48), nuts (47) and D6-1 spring washers (if applicable) removed earlier.

(9) Rotate the doors several times and check that the lips on the forward edge of the blocker doors do not contact the door to ring tension links (33). Remove material from the lips as required to obtain clearance. Blend the reworked area.

(10) Check and adjust the door to tailpipe clearance as follows:

(a) Measure the clearance between the aft edge of blocker doors and thrust reverser tailpipe during blocker door rotation. The clearance must be at least .12 inch. If not, trim aft edge of blocker door to obtain required minimum clearance.

(b) Check that the lips on the forward edge of blocker doors do not contact the cascade turning vanes. Bend material at the blocker door tabs or form cascade vanes as required.

(11) Check translating section rigging per Abbreviated Check Procedure, Section 3A.

(12) Reinstall sugar scoop and translating section per Removal/Installation, Section 2.

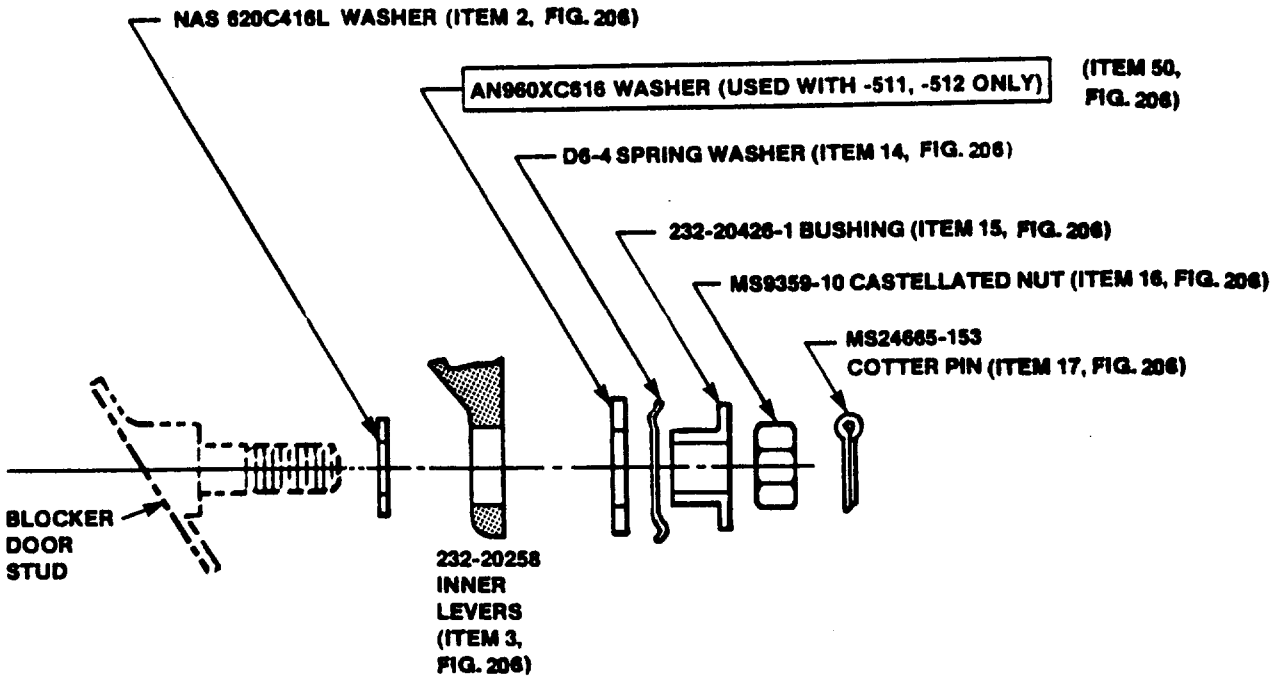


Figure 214 - Inner Lever Installation Hardware

Aft Nacelle - Description and Operation

1. Description. The aft nacelle serves not only to cowl the rear (aft fan) section of the engine but also supports and houses the translating structure of the thrust reverser. In addition, the aft nacelle also houses thrust reverser actuation components to include the pneumatic actuator, flexible drive shaft, pinion gearboxes, pneumatic latches, bleed-off valve, pressure switch, pneumatic latch solenoid valve with associated pneumatic plumbing and electrical cabling.

2. Operation. The aft nacelle is basically a structural member of the engine nacelle and does not perform any direct function during thrust reverser operation. Refer to 78-30-00 for operation of the complete reverser system or to the applicable chapter/section pertaining to operation of individual actuation components.

Aft Nacelle - Maintenance Practices

1. General. Maintenance of the aft nacelle consists of removal/installation and adjustment/check. Servicing, inspection/check and cleaning/painting is covered under Thrust Reverser System 78-30-00.

2. Removal/Installation. Procedures for removing/installing the aft nacelle are the same as those given for removing/installing the thrust reverser. Refer to Maintenance Practices of 78-30-00 for the procedure.

   NOTE: Since the translating structure is housed within the aft nacelle, it will be removed/installed concurrently with the aft nacelle. Refer to Maintenance Practices of 78-30-04 for instructions to remove/install the translating section from/into the aft nacelle.

3. Adjustment/Test. The following procedures should be accomplished anytime the translating structure is removed/installed from/into the aft nacelle.

   A. Pinion Gearbox to Catch Shimming (Figure 201). This procedure ensures that both sequence latches contact their respective catches simultaneously within 0.016 inches of each other.

      (1) Refer to Maintenance Practices of 78-30-04 to install translating structure into the aft nacelle.

      (2) Temporarily disassemble the sequence latches, insuring that piece parts of each latch are kept together for later reassembly. Install the sequence latch stop housings on the forward end of each translating beam. If not previously marked, mark the stop housings "Inboard" or "Outboard" as applicable.

      (3) Grasp the translating structure at the top and bottom centerline and pull straight aft. Ensure no side pull is exerted.

      (4) Stop pulling when either stop housing just contacts its respective pinion gearbox. If both stop housings contact their pinion gearboxes simultaneously, proceed to Paragraph 3.B.

      (5) Where one stop housing contacts its respective pinion gearbox, mark the translating beam on the opposite side for position.

      (6) Continue to pull aft until the other stop housing contacts its pinion gearbox and again mark the beam previously marked in Step (5).

      (7) Measure the distance between the two marks. If the distance is 0.016 inch or less, no shims are required and proceed to Paragraph 3.B. where the distance is greater than 0.016 inch, accomplish the steps listed below.

      (8) If a shim is required on the outboard side, one step shim (Item 3, Figure 201) must be installed under the catch on the outboard gearbox.

         NOTE: The step shim is required to provide a flat surface to mount the outboard catch.

      (9) Calculate the remaining shimming required under the catches of both inboard and outboard pinion gearboxes to obtain 0.016 inch or less side-to-side difference. Use shim (Item 4, Figure 201) for additional shimming.

      (10) Repeat Steps (3) through (7) to verify that contact from side-to-side is 0.016 inch or less. If not re-shim as required.

B. Establishing Sequence Latch Pin-to-Catch Relationship. This procedure ensures that the sequence latch pins contact the catches properly so that the pins never extend inboard of the inboard edge of the catches. Pin selection is critical to the proper operation of the sequence latches and must be made with great care. The procedure is the same for both sequence latches and only a single sequence latch will be addressed in the text.

(1) Hand translate the translating structure forward and remove the sequence latch stop housing temporarily installed in 3.A.(2).

(2) Using parallel blocks (L.S. Starrett No. 154C or equivalent) and micrometer, measure the distance between the inboard surface of the catch and the outboard surface of the rack teeth as shown in Figure 202. Record this dimension as X.

1. INBOARD PINION GEARBOX
2. OUTBOARD PINION GEARBOX
3. STEP SHIM (0.063) (OUTBOARD ONLY) 45-12292-9
4. SHIMS (0.032) (USE AS REQUIRED, INBOARD AND OUTBOARD) 45-12292-7
5. CATCH
6. WASHERS
7. SCREW
8. SCREW
9. CATCH

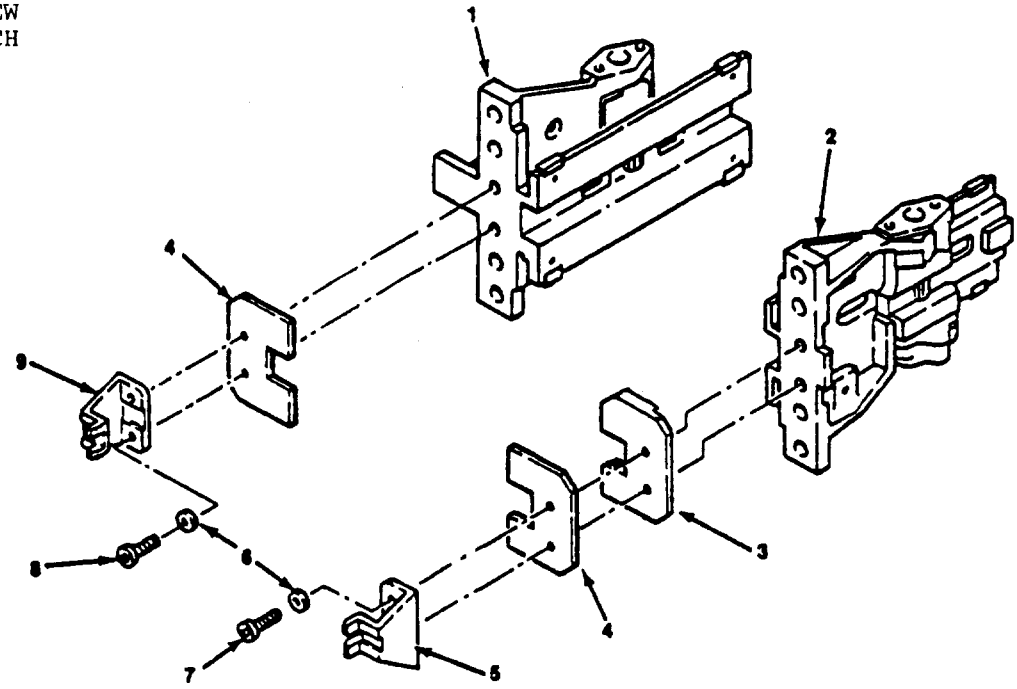


Figure 201 - Pinion Gearbox Catch Shimming

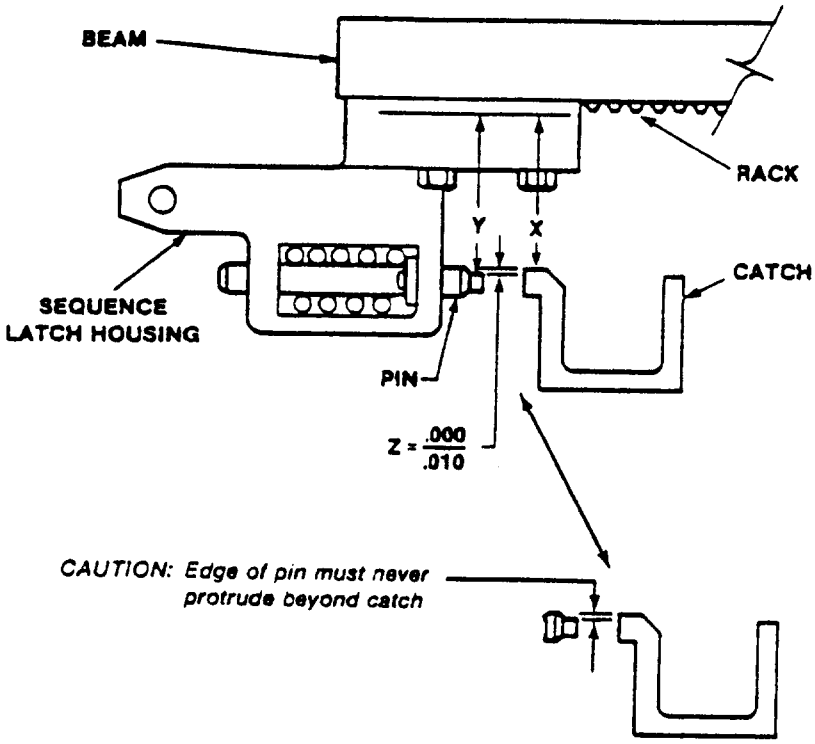


Figure 202 - Pin/Catch Relationship

(3) Temporarily assemble a 0.230 inch diameter pin, spring, washer into the sequence latch and secure with a cotter pin. The 0.230 inch pin is used as a trial pin and it may be determined later that a larger pin is required.

(4) Install the partially assembled stop housing onto the beam. Again use the parallel blocks and micrometer to measure the distance from the inboard side of the small diameter end of the pin to the outboard surface of the rack teeth. Record this dimension as Y.

(5) Subtract dimension X from dimension Y to obtain dimension Z. If dimension Z is 0.000 to 0.010 inch, the 0.230 inch diameter pin is the correct size. If dimension Z is greater than 0.010 inch, refer to Table 1 to select a larger diameter pin and repeat Steps (3) through (5) until dimension Z is 0.000 to 0.010 inch.

CAUTION: THE INBOARD SURFACE OF THE SMALL DIAMETER OF THE PIN MUST NEVER PROTRUDE BEYOND THE INBOARD SURFACE OF THE CATCH.

Table 1 - Sequence Latch Pin Reference

Pin Diameter	Pin Part Number
0.230	232-20209-17
0.250	232-20209-19
0.270	232-20209-21
0.290	232-20209-23
0.312	232-20209-25

(6) If the small diameter of the pin protrudes beyond inboard surface of the catch, a small adjustment may be made by loosening the catch fasteners and slightly repositioning the catch.

(7) Repeat Steps (1) through (6) for opposite sequence latch.

(8) Remove partially assembled sequence latches and complete assembly per Maintenance Practices 78-30-09.

(9) Install assembled sequence latches to beams and ensure that the installed sequence latches meet the dimensional requirements of Figure 203.

C. Flexible Drive Shaft Alignment. This procedure ensures that the two flex shafts are properly aligned (timed) to permit the stop housings to engage the pinion gearboxes simultaneously and to prevent excessively preloading the flex shafts.

(1) Prop the blocker doors open using the locally manufactured special tool AST 2859 (see 78-30-04, Figure 204) and adjust as necessary to obtain 22.5 inch opening at the blocker door leading edge. Verify that each yoke base to forward ring gap is 0.020(±0.010) with no more than 0.010 inch difference side-to-side. If not, translating structure rigging must be checked and adjusted per 78-30-04.

(2) Grasp translating structure at top and bottom centerline and pull straight aft until sequence latch stop housings just contact their respective pinion gearboxes/shims.

(3) Insert splined end of outboard flex drive shaft into outboard pinion gearbox but do not secure. Insert the hex end of the outboard flex drive shaft into the spur gearbox using a 5/16-inch allen wrench to turn the opposite side of the spur gearbox until the hex end slips in easily. Do not secure.

(4) Insert hex end of inboard flex drive shaft into the spur gearbox but do not secure. With no torque applied to either flex shaft and aft acting force maintained, try for a slip fit of the splined end of the inboard flex shaft into the inboard pinion gearbox. If the splined end will not slip in easily, pull the hex end from the spur gearbox and rotate one flat. Insert hex end back into spur gearbox and again try for slip fit of splined end into pinion gearbox. If necessary, work through all six hex flats until slip fit is obtained at the inboard pinion gearbox.

CAUTION: DO NOT PRELOAD THE FLEXIBLE DRIVE SHAFTS.

(5) Remove both flex shaft ends from the spur gearbox and insert into locally manufactured special tool AST 2852, shown in Figure 204.

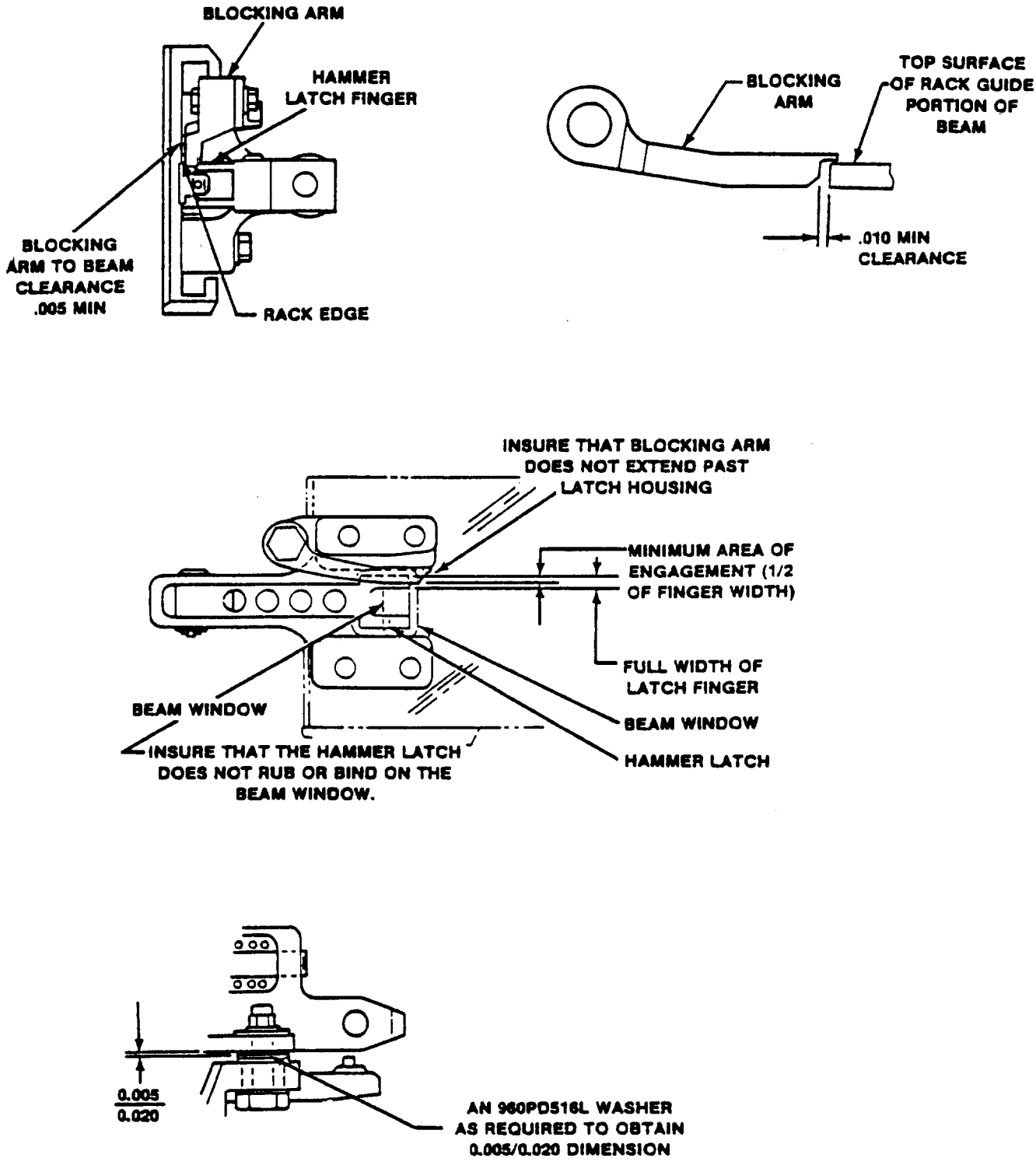
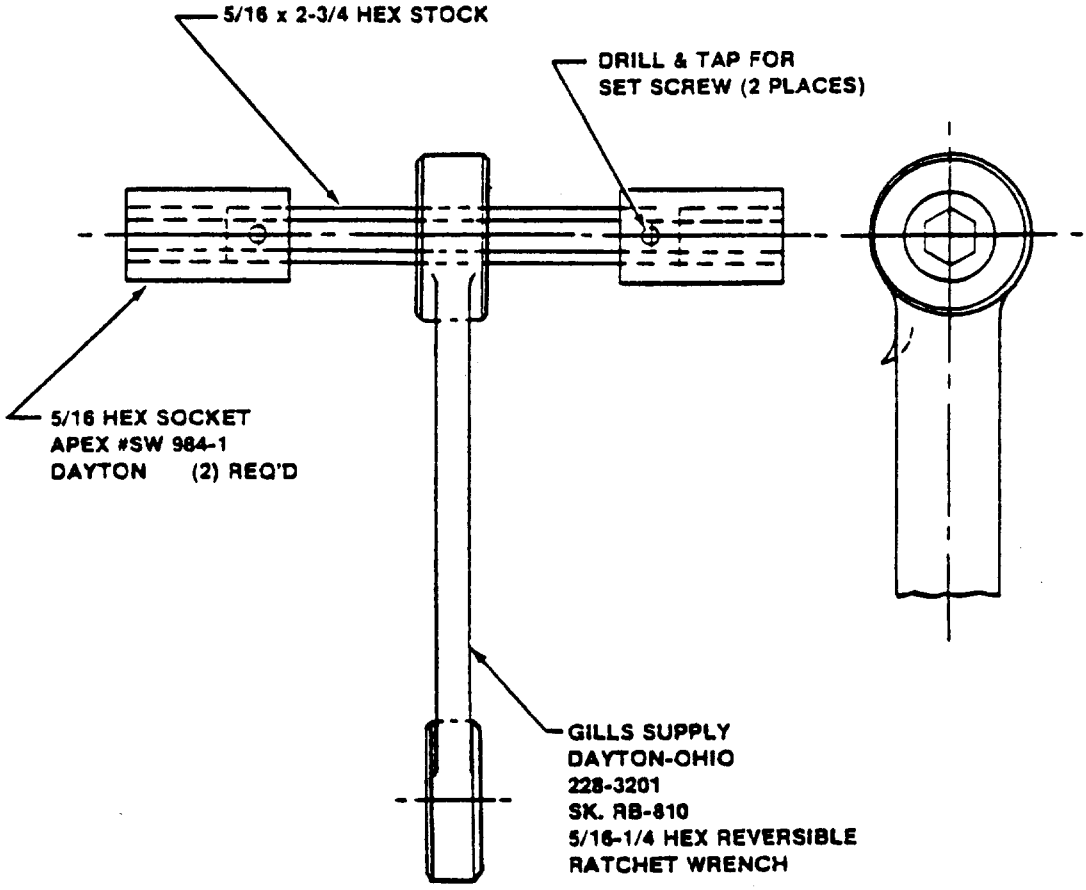


Figure 203 - Sequencing Latch Inspection/ Shimming Data



NOTE: SOCKET HEX FROM
SIDE TO SIDE MUST BE
PERFECTLY ALIGNED

SOCKET RATCHET WRENCH
FOR HAND INSTALLATION - AST-2852

Figure 204 - Special Tool, AST 2852

(6) Manually translate the translating structure toward stow a short distance and then reverse direction to drive the translating structure toward deploy. Stop manual translation just as the stop housings contact their respective pinion gearboxes/shims within 0.016 inch of each other.

(7) If the stop housings do not contact simultaneously or within 0.016 inch of each other, the flex drive shafts are not properly aligned (timed). Repeat Steps (1) through (6) until stop housing to pinion gearbox/shim contact is within tolerance.

(8) Remove the blocker door prop and pull translating structure aft until the sequence latch stop housings just contact their respective pinion gearboxes/shims. Using the manual translation tool AST 2852, apply a slight stow torque (take up linkage slack/freeplay) but do not translate unit. Check to ensure that the yoke base to forward ring gap is equal within 0.010 inch side-to-side.

(9) Manually translate the translating structure forward and aft several times while closely observing for smooth operation and that it translates straight with no side kick. Steps (8) and (9) further verify that the flex drive shafts are aligned (timed) properly.

(10) Remove manual translation tool and insert both hex ends of flex shafts into spur gearbox. Complete installation of flex shafts per Maintenance Practices, 78-30-07.

D. Nulling Cable Adjustment. This procedure ensures that the air supply to the pneumatic actuator air motor is shut-off as the unit reaches full deploy or full stow to prevent damage to actuation hardware.

(1) Connect electrical test box AST 2860 (see 78-30-00, Figure 203) and shop air (see 78-30-00, Figures 201 and 202) to the reverser.

(2) Adjust pressure regulator to apply 6(±1) psig air pressure to pneumatic actuator and turn on electrical power to test box.

(3) Place the T/R Test (S-3) switch in the "Normal" position and the Directional Control (S-4) switch in the "STOW" position. Translate the translating structure to the fully stowed position.

(4) Place the T/R Test (S-3) switch in the "STOW NULL CK" position and using a mirror, observe the position of the directional control valve in the exhaust port opening located in the lower, aft end of the pneumatic actuator (see Figure 205).

(5) The valve opening should be located at the top of the exhaust port and should be 0.020 to 0.050 inch with final stow flow air pressure of 12 (±1) psig applied. If necessary, use special tool AST 2853 (see Figure 206) to adjust the nulling cable outer casing jam nuts at the pinion gearbox to move the outer casing forward or aft as required to achieve proper valve location and opening size.

NOTE: If proper position of valve cannot be achieved using the outer casing jam nuts, additional adjustment may be made using the smaller jam nuts at the cable to cursor attach point. Maintain the cursor attach point as close to the center of the cables threaded area as possible. Access to adjustments for nulling cable can only be achieved with the translating structure deployed.

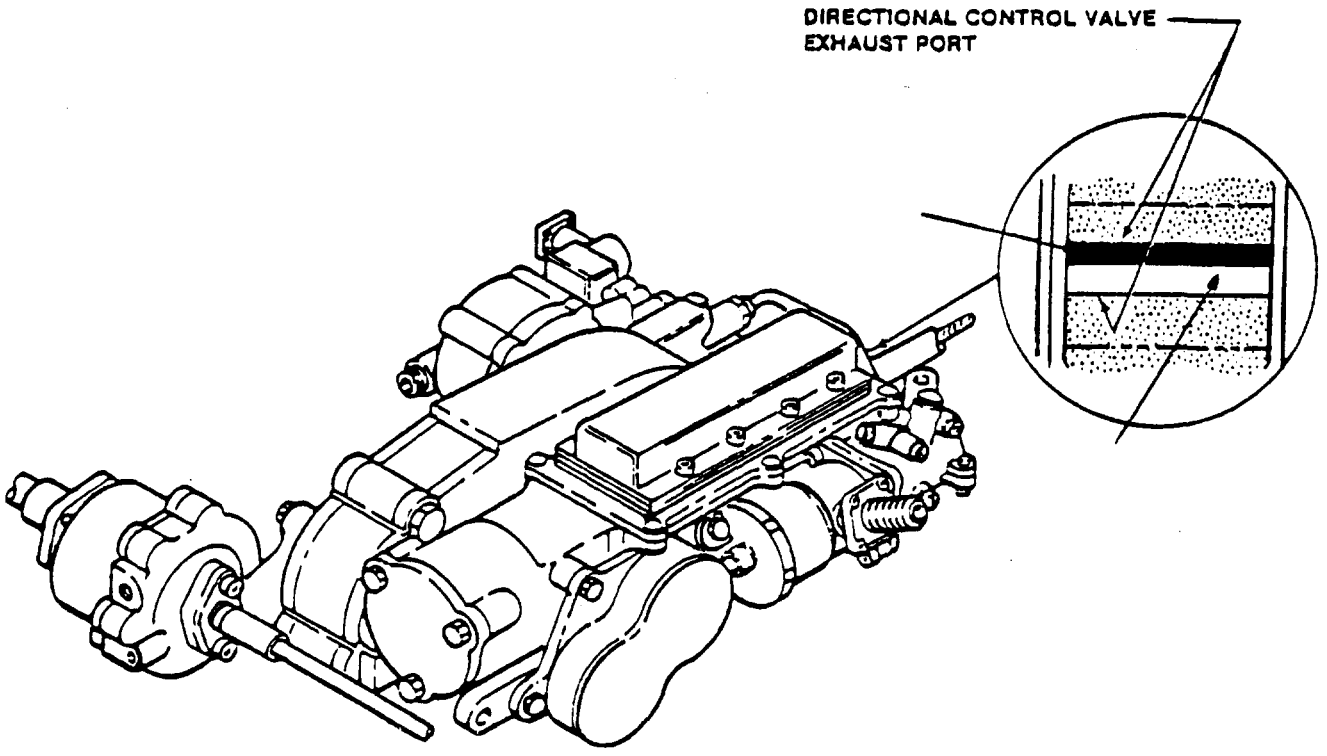


Figure 205 - Null Cable Final Adjustment of Directional Control Valve

(6) Place T/R Test (S-3) switch in the "Normal" position and the Directional Control (S-4) switch to "Deploy". Translate the translating structure to the fully deployed position.

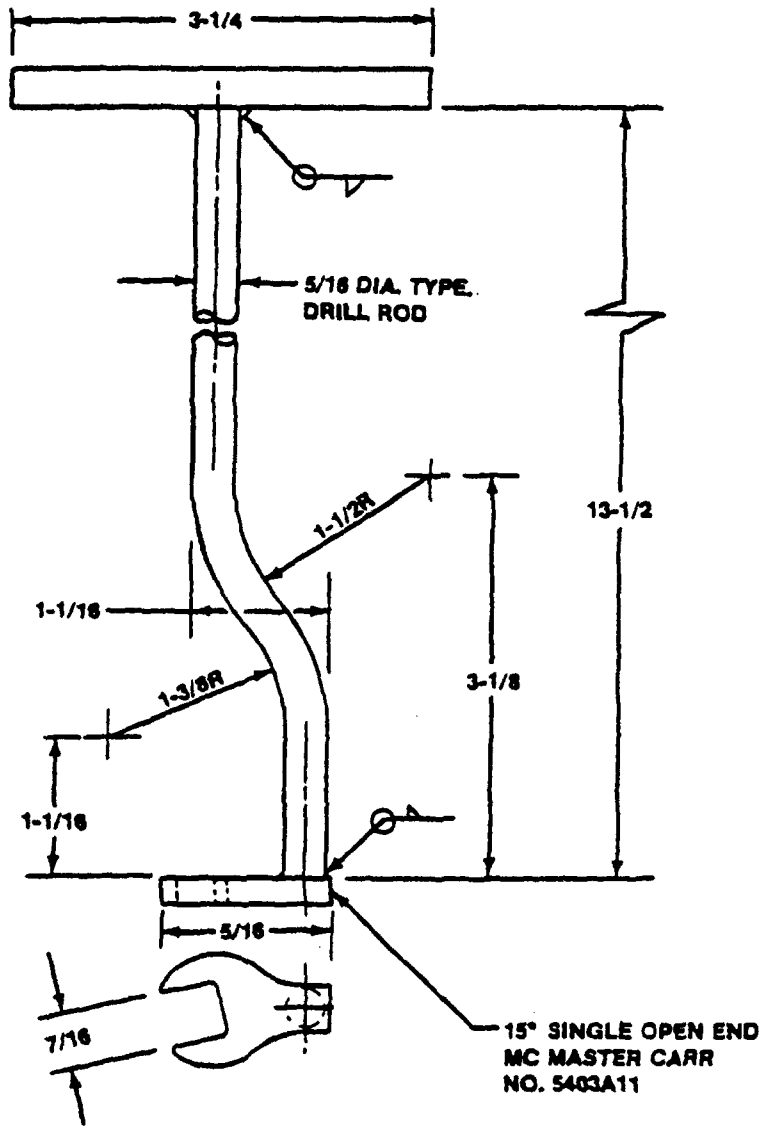
(7) Using a mirror, check to see that the directional control valve is closed or nearly closed (0.00 to 0.020 inch) and that the valve has traveled downward to where the opening (if any) is at the bottom. Adjust nulling cable outer casing jam nuts to achieve required valve position dimensions.

(8) There are other situations that require further adjustment to the nulling system by adding or subtracting washers between the actuator bracket and the forward end of the inboard rack. Listed below are some examples.

(a) If the blocker doors do not fully close during deploy, remove one washer for each inch of space between the blocker doors.

(b) If the blocker doors fully close and then re-open, add one washer for each inch of space between the blocker doors.

(c) If the directional control valve opening at the exhaust port exceeds the specified opening (0.020 to 0.050 inch at top; 0.00 to 0.020 inch at bottom), remove enough washers to achieve specified opening.



OPEN END "T" WRENCH
FOR NULL CABLE ADJUST - AST-2853

Figure 206 - Special Tool, AST-2853

(9) Increase air pressure to 12 psig and deploy, then stow the translating structure. Observe during the translation that air pressure is 10 (±2) psig minimum.

(10) Repeat Steps (3) through (7) to recheck previously made nulling system adjustments.

(11) Increase air pressure to 25 to 30 psig (flow pressure during translation) and repeat Steps (6) and (7). Recheck adjustments only in deploy and adjust as necessary by adding or removing washers between actuator bracket and the forward end of the inboard rack.

CAUTION: DO NOT STOW TRANSLATING STRUCTURE WITH AIR PRESSURE ABOVE 12 (±1) PSIG.

(12) Adjustment of the nulling system is correct if the specified directional control valve opening and proper blocker door operation are achieved with 12 (±1) psig used to stow and 25-30 psig used to deploy.

(13) Tighten, torque and resafety null system adjustments.

Pneumatic Actuator Assembly - Description and Operation

1. Description. The pneumatic actuator assembly (see Figure 1) is mounted in the aft nacelle at the 6 o'clock position just forward of the translating structure. The actuator assembly includes an air pressure regulator/shutoff section, a directional control section and an air motor; all integrated to provide rotational force to deploy and stow the reverser on cockpit command, The pneumatic actuator assembly uses engine bleed air as its power source and electrical signals from cockpit controls determine when and in what direction the actuator operates. A spur gearbox is mounted to the output drive of the actuator to reduce output speed of the air motor and to transmit the rotational force through flexible drive shafts to the pinion gearboxes.

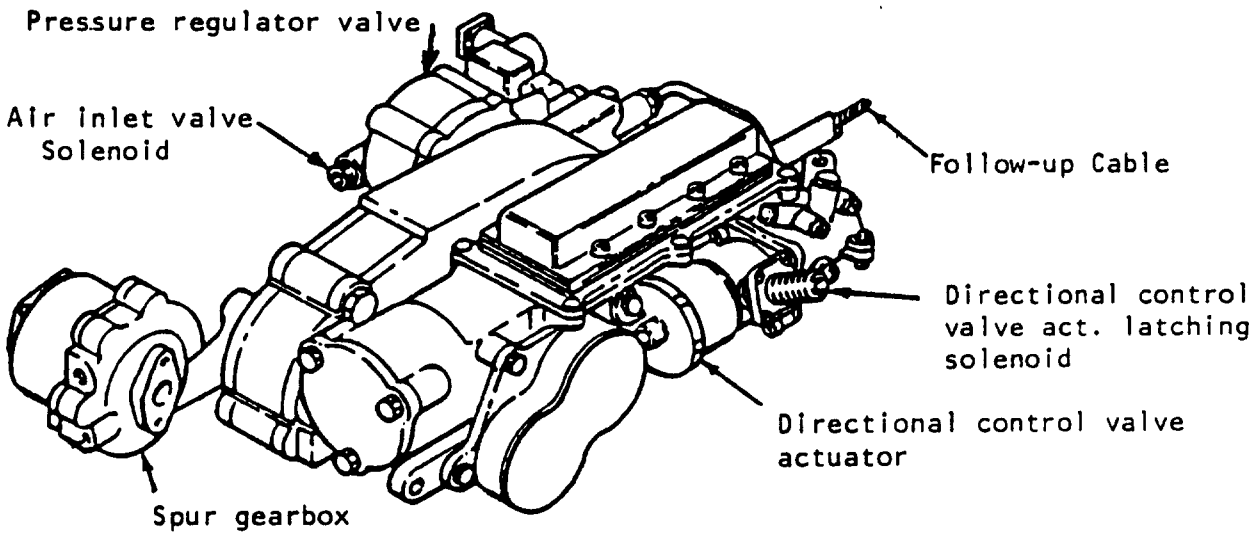


Figure 1 - Pneumatic Actuator Assembly

2. Operation. The operation of the pneumatic actuator assembly is discussed in greater detail by breaking the text out into the functions of each subassembly of the actuator.

   A. Pneumatic Actuator Assembly - Electrical Control (Figure 2)

   The electrically operated directional control (latching) solenoid and inlet regulator valve control the pneumatic actuator assembly. Lifting the reverser lever assemblies (selecting deploy) completes deploy signal circuits through throttle-mounted switches S1 and S2 (between switch Terminals "C" and "NO"). In the deploy mode, the regulator valve opens on completion of control circuits routed through pneumatic latch operated switches S4B and S5B (switch Terminal "C") and the inlet regulator valve to ground. Operation of the pneumatic latches (refer to 78-30-10 and 78-30-11) repositions the pneumatic latch-mounted switches S4A and S5A, completing the directional control solenoid deploy signal Terminals "A" (deploy command input) and "B" (deploy

signal ground). The two-position directional control (latching) solenoid deploy coil is now energized to shift the solenoid to the deploy position. Once the translating structure starts to move aft, all circuit switches are mechanically held in position keeping the solenoid deploy coil energized until the reverser lever assemblies are returned to the full forward and down position. Placing the reverser lever assemblies in the "down" position (selecting stow) completes stow signal circuits routed through pneumatic latch-mounted switch S4B (Terminals "C" and "NC"), and directional control (latching) solenoid Terminals "C" (stow command input) and "D" (stow signal ground). The two-position directional control (latching) solenoid stow coil is now energized to shift the solenoid to the stow position. The circuit switches are mechanically held in position, keeping the solenoid stow coil energized until either the spring-loaded pneumatic latch drops into the beam detent to open the circuit at S4B or the reverser levers are again raised to the deploy position. In the stow mode, the regulator valve opens on completion of control circuits routed pneumatic latch-mounted switch S5B (Terminals "C" and "NC") and the inlet regulator valve (Terminals "C" and "NC") and the inlet regulator valve (Terminals "A" and "B") to ground. The valve remains energized (switch mechanically held) until the spring-loaded pneumatic latch is forced into the beam detent to open the circuit at S5B. For complete system wiring data, see 78-30-00, Figure 101.

B. Pneumatic Actuator Assembly - Directional Control Section (Figure 3)

The electrically positioned directional control, (latching) solenoid, (refer to Paragraph 2.A. above for control circuit data) includes a spool-type air valve. The valve spool, an extension of the solenoid core shaft, route directional control valve (DCV) chamber air pressure to the DCV actuator (piston), in response to the latching solenoid command signal, to move the position to either the deploy (extend) or stow (retract) position. Through mechanical linkage, the DCV actuator rotates the DCV to establish the air motor section inlet/exhaust porting corresponding to the solenoid command signal and shifts the follow-up mechanism to pick up the correct rack-mounted actuator (stop) to mechanically force the DCV toward null near the end of the rack stroke. The DCV bleed-off reference regulator tees into the DCV chamber to solenoid/air valve supply line between the solenoid/air valve and a 0.030 inch in-line orifice. The regulator limits pressure applied to the solenoid/air valve and DCV actuator to 12(±2) psig range established by the regulator, but the actuator will function to rotate the DCV and shift the follow-up mechanism with a minimum of 5-1/2(±0.1) psig applied. In normal operation, a stow command causes the DCV to rotate and fully open the exhaust port in a clockwise direction, as viewed from the directional control side of the pneumatic actuator assembly, and the follow-up mechanism to move full aft. As the rack nears the end of the stow stroke, the stop on the aft end of the rack picks up the aft finger of the slider bracket and, through the follow-up cable, slider box, feedback arm, forces the DCV toward null (ccw rotation) to slow the pneumatic actuator assembly. A deploy command causes the DCV to rotate in a ccw direction and fully open the exhaust port while moving the follow-up mechanism full forward. As the rack nears the end of the deploy stroke, the stop on the front end of the rack picks up the forward finger of the slider bracket and, through the follow-up cable, slider box, and feedback arm, forces the DCV toward null (cw rotation) to slow the pneumatic actuator assembly.

C. Pneumatic Actuator Assembly - Regulator Section (Figure 3)

Opening the inlet valve (refer to Paragraph 2.A. above for valve control data) applies engine bleed air pressure to the poppet actuator above the diaphragm and to the poppet bleed-off reference regulator inlet. The poppet opens (cracks) when pressure above the diaphragm reaches 3.5 psig to admit engine bleed air to the DCV chamber. Pressure above the diaphragm continues

to rise and the poppet continues moving in the open direction until DCV chamber pressure reaches 17-19 psig. With DCV chamber pressure in the 17-19 psig range, the sensing selector opens to admit DCV chamber air to the poppet actuator below the diaphragm. Air pressure applied to the poppet actuator below the diaphragm works in conjunction with the poppet return spring to offset pressure applied above the diaphragm and move the poppet toward the closed position. As the poppet moves toward the closed position, DCV chamber pressure is reduced. DCV chamber pressure continues to fall until a minimum level of 12 psig is reached. At 12 psig DCV chamber pressure, the sensing selector is fully closed and the poppet actuator chamber below the diaphragm is vented to atmosphere through the 0.040-inch orifice in the sensing selector. Pressure applied above the diaphragm is limited to 20(±5) psig by the poppet bleed-off reference regulator. At pressures above 20(±5) psig level, the regulator opens to vent over-pressure. The regulator is also connected pneumatically to the bleed-off solenoid valve described in Paragraphs 3.3 and 3.5. Note that the 0.040-inch sensing selector orifice permits a continuous 0.03 lb./min. bleed from the poppet actuator chamber below the diaphragm to atmosphere. In normal operation, DCV chamber pressure is maintained in the minimum 12, maximum 17-19 psig range by continuous poppet modulation controlled by sensing selector action.

D. Pneumatic Actuator Assembly - Air Motor and Output (Figure 3)

In the deploy mode, engine bleed air pressure routed from the DCV chamber through the DCV to the air motor drives the air motor to rotate the output shaft in a cw direction, as viewed from the directional control side of the pneumatic actuator assembly. Rotation is ccw in the stow mode. The air motor is connected to the spur gearbox by a torque (dog bone) shaft. The spur gearbox flex shaft sockets rotate ccw in the deploy mode, as viewed from the actuator assembly directional control side, and cw in the stow mode. Spur gearbox output torque is transmitted to the rack driving pinion gearboxes through the two flex drive shafts. The air motor begins rotation as applied pressure is increased from 0 at 5-1/2(±1/2) psig, with an output torque of 1-1/2 inch-pounds. At maximum motor speed of 14,000 to 16,000 RPM, torque output is 140 inch-pounds total. Spur gearbox output is 290-330 RPM.

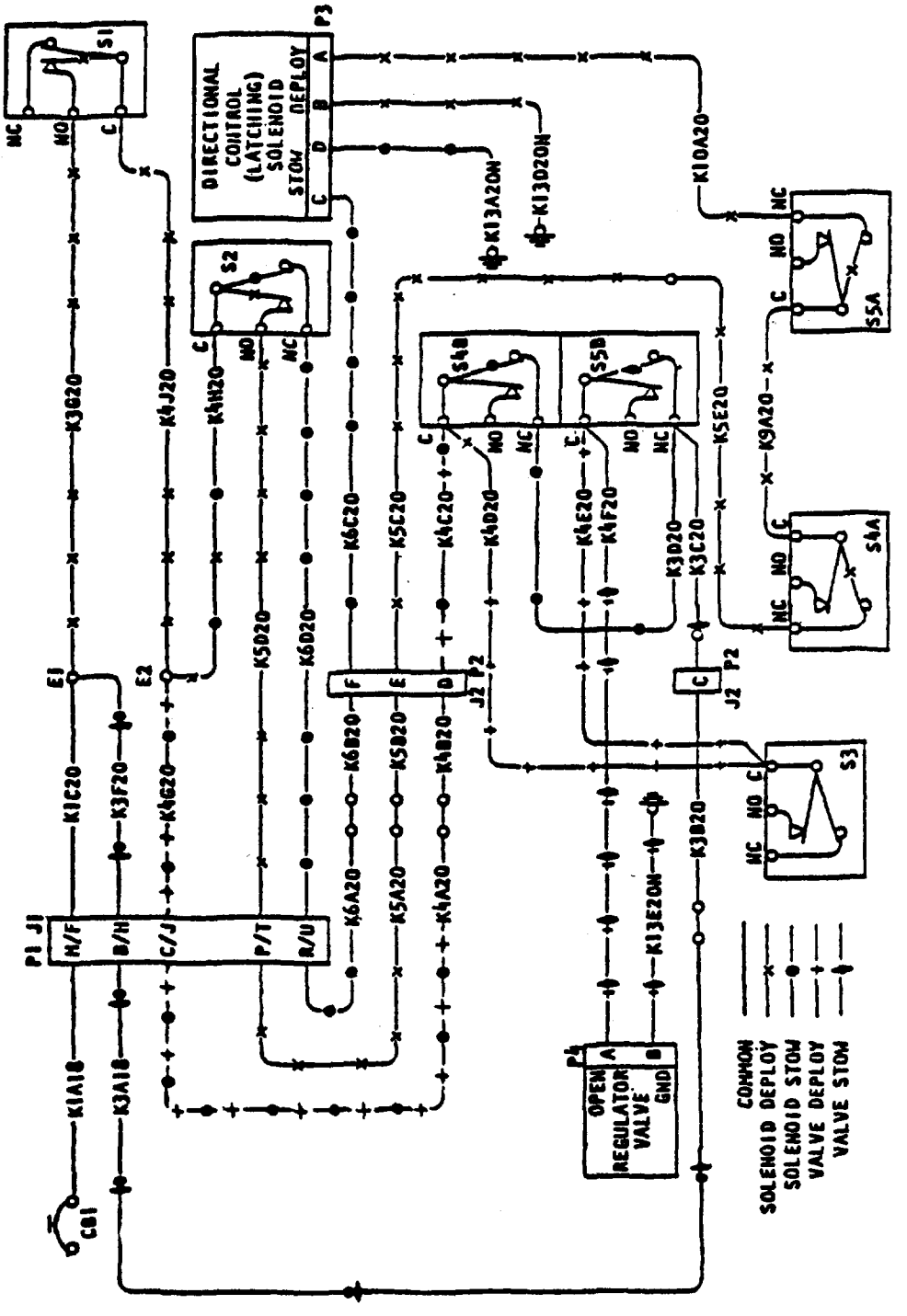


Figure 2 - Pneumatic Acuator Assembly - Electric Control Circuits

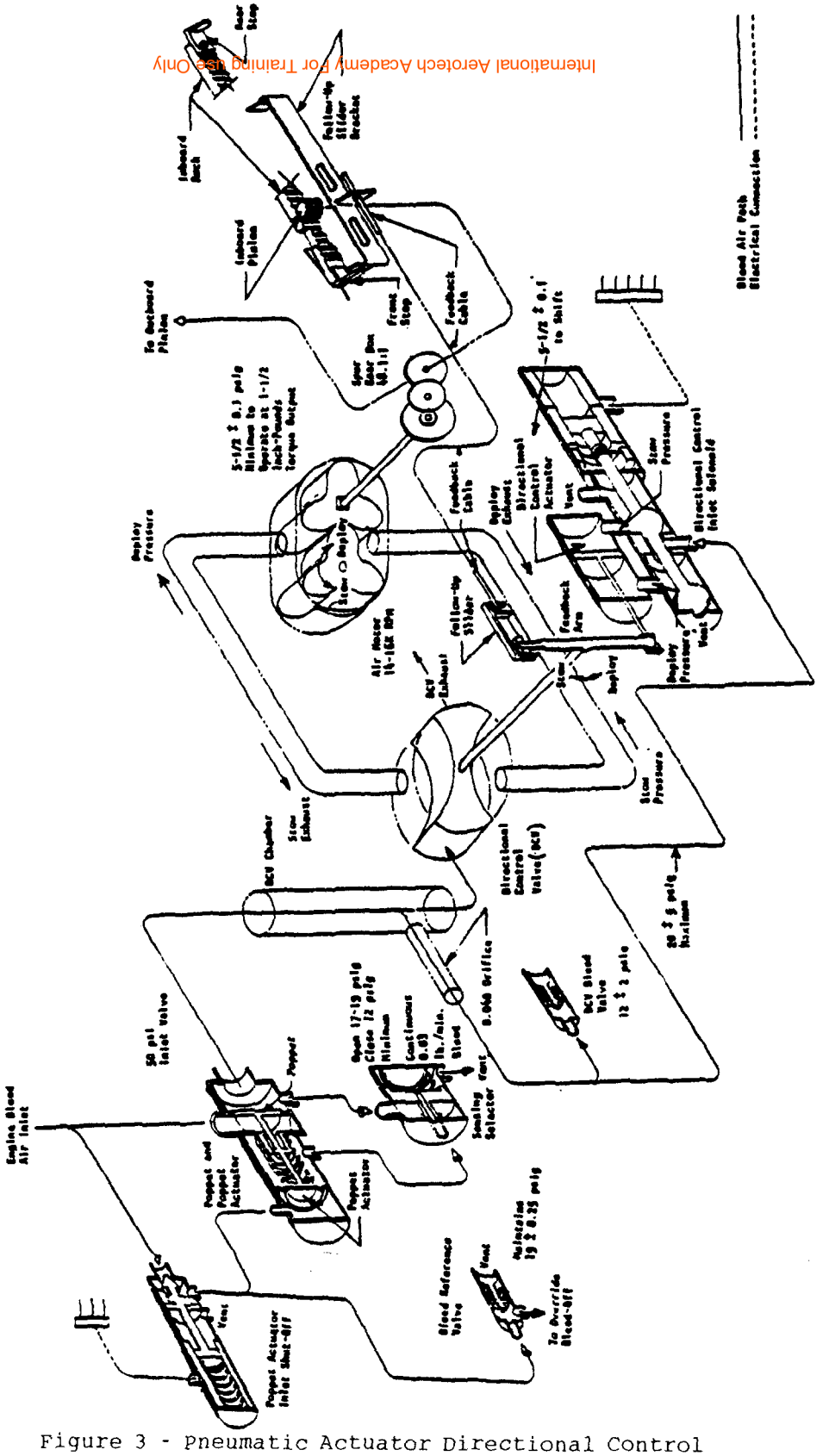


Figure 3 - Pneumatic Actuator Directional Control

ORIGINAL
As Received By
ATP

Pneumatic Actuator Assembly - Maintenance Practices

1. General. Maintenance of the pneumatic actuator consists of servicing, removal/installation, adjustment/test and approved repairs.

2. Servicing. Pneumatic actuator assemblies, P/N 126372-3-1, Series 1, 2 and are oil-filled and require periodic oil level checks as specified in 78-30-00 Maintenance Practices. Pneumatic actuator assemblies, P/N 126372-3-1, Series 3, 5, 6 and 7 and P/N 126372-4-1, Series 1 through 5 are grease packed which are only relubed at overhaul intervals.

   A. Checking Oil Level.

      (1) Remove lower aft nacelle access panels to gain access to pneumatic actuator.

      (2) Remove oil fill/drain port cap from actuator. (See Figure 201).

      (3) Locally fabricate a dipstick with a 1/16-inch diameter drill rod and mark it from end at 1-1/16 and 1-1/8 inch depths.

      (4) Insert dipstick into open fill/drain port. Remove and observe oil level indicated on dipstick. If actuator is properly serviced with 75 cc's of engine oil (MIL-L-7808), oil level should fall between two marks (1-1/16 and 1-1/8 inch) on dipstick. Add oil as necessary.

      (5) Reinstall oil fill/drain port cap on actuator.

      (6) Reinstall access panels.

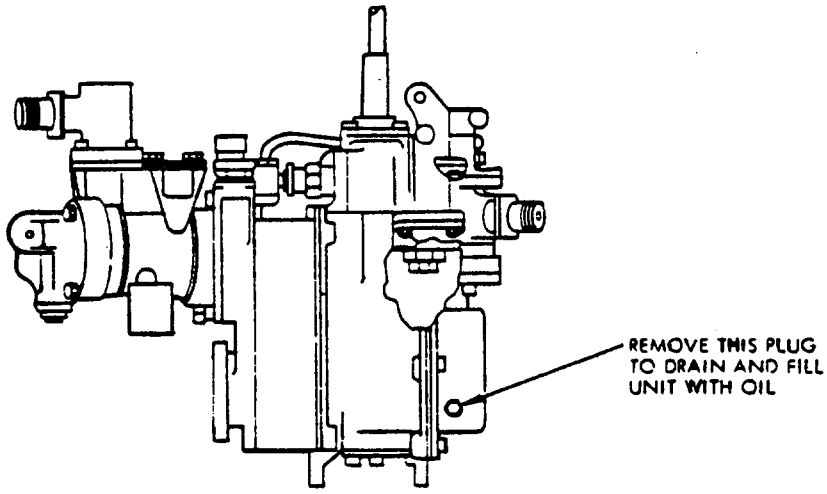


Figure 201 - Servicing Pneumatic Actuator Assembly

B. Changing Oil (Every 600 Hours).

(1) Remove thrust reverser/aft nacelle from aircraft per Maintenance Practices 78-30-00.

(2) Remove pneumatic actuator from aft nacelle per Removal/Installation 78-30-06.

(3) Remove oil fill/drain port cap from actuator and drain oil from actuator.

(4) Refill actuator with 75 cc's of engine oil (MIL-L-7808) and reinstall oil fill/drain cap.

(5) Reinstall pneumatic actuator into aft nacelle per Removal/Installation 78-30-06.

(6) Reinstall thrust reverser/aft nacelle onto aircraft per Removal/Installation 78-30-00.

3. Removal/Installation.

A. Removal (See Figure 202).

(1) Remove thrust reverser/aft nacelle from aircraft per Removal/Installation 78-30-00.

(2) Disconnect nulling cable (14) at cursor (4) on inboard pinion gearbox (5) by removing aft jam nut (3) and slide cable forward out of cursor.

(3) Remove aft jam nut (2) securing nulling cable housing to pinion gearbox and slide nulling cable assembly out of inboard pinion gearbox mounting bracket.

(4) Remove clamps securing nulling cable to aft nacelle structure and pull cable through rubber grommet in frame 5.

NOTE: The nulling cable is considered a part of the pneumatic actuator and need not be separated from the actuator.

(5) Disconnect two electrical connectors (15 and 22).

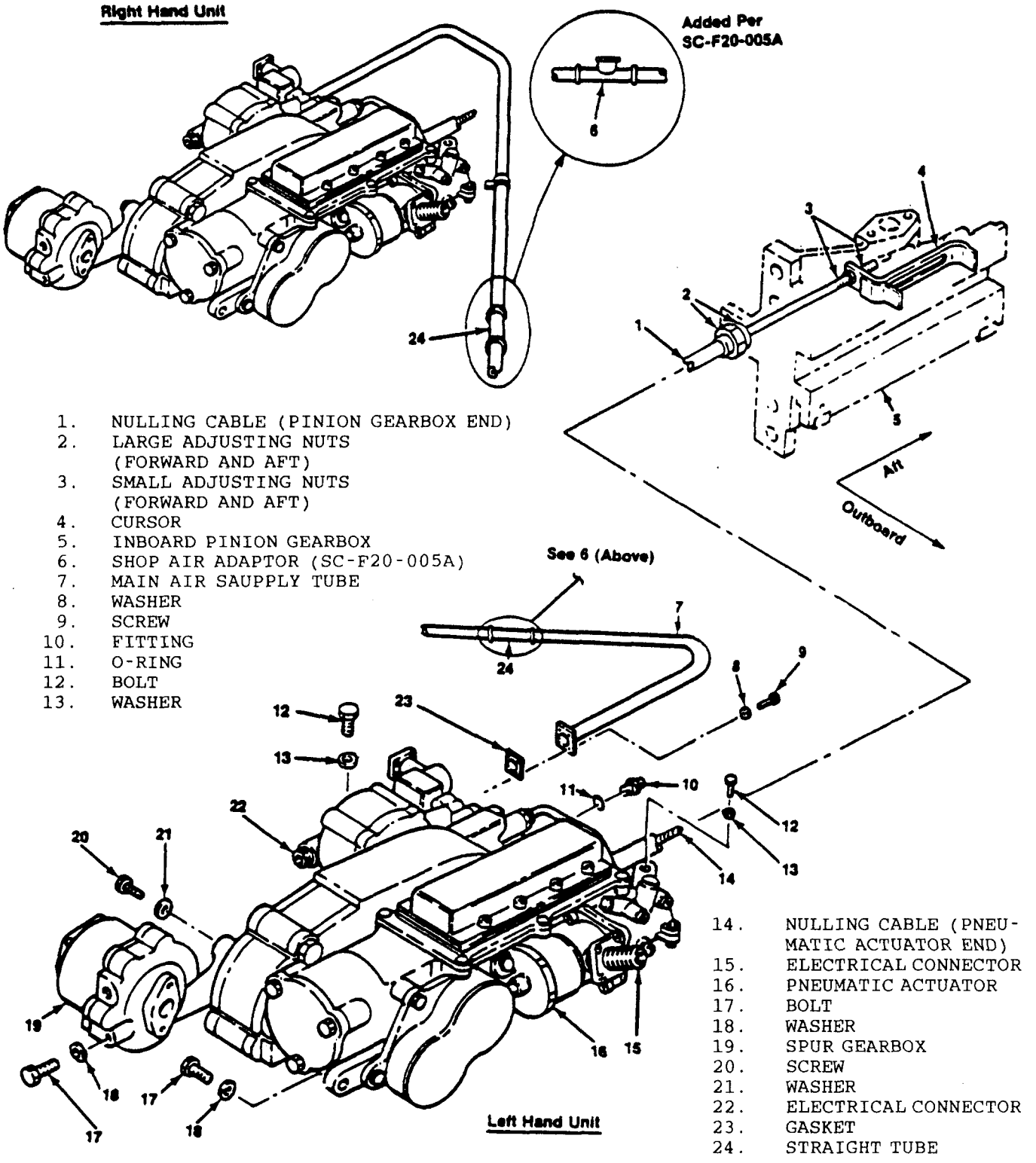
(6) Disconnect two small bleed air lines (Figure 203, Items 8 and 11) at pneumatic actuator.

(7) Disconnect main air supply line (7) by removing four attaching screws and washers (8 and 9).

(8) Remove flexible drive shafts at spur gearbox.

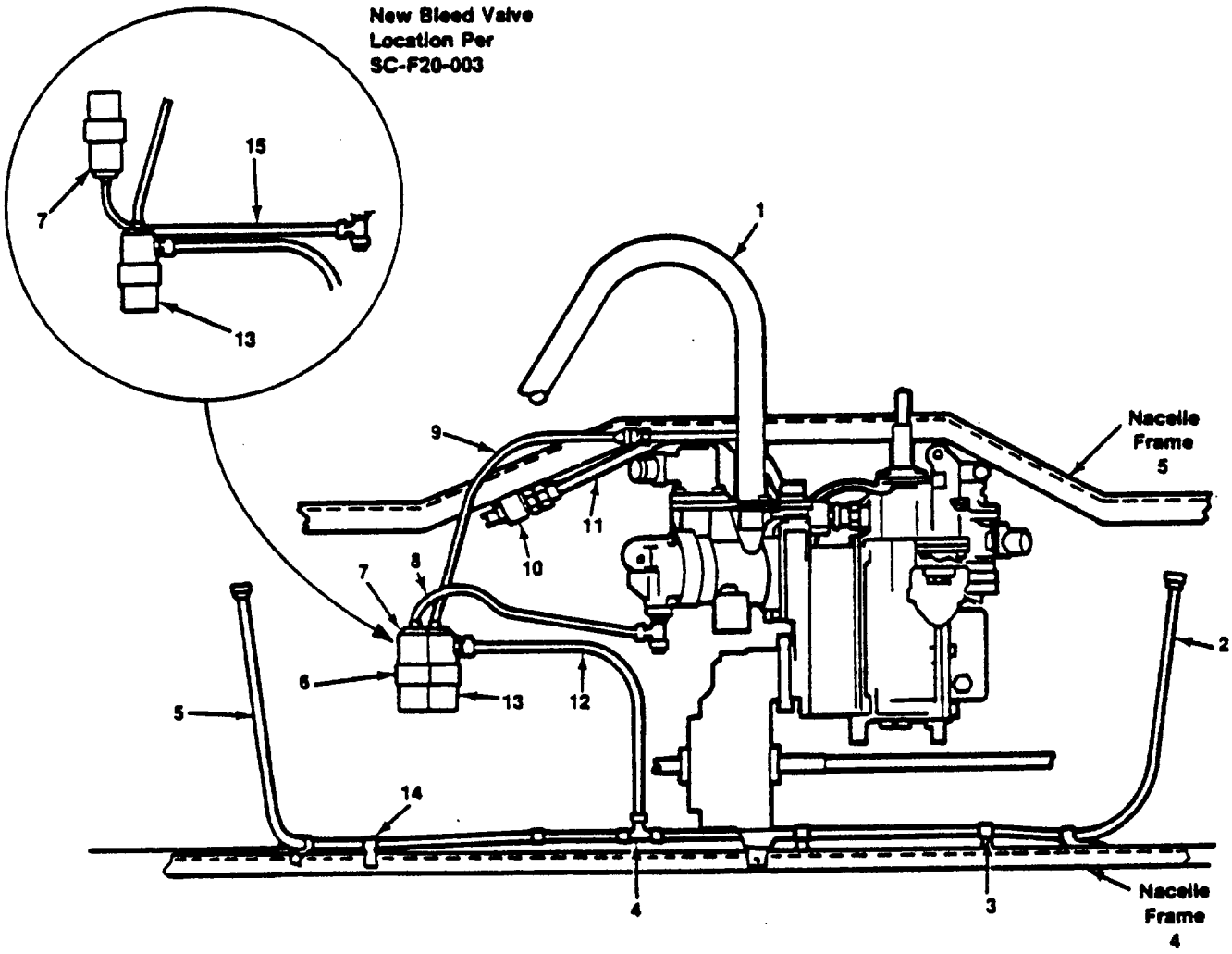
(9) Remove four screws (17 and 12) and washers (18 and 13) securing pneumatic actuator to aft nacelle structure and lift actuator out.

(10) If pneumatic actuator is to be replaced by a new unit, separate spur gearbox from actuator by removing four attaching bolts (20) and washers (21).



1. NULLING CABLE (PINION GEARBOX END)
2. LARGE ADJUSTING NUTS (FORWARD AND AFT)
3. SMALL ADJUSTING NUTS (FORWARD AND AFT)
4. CURSOR
5. INBOARD PINION GEARBOX
6. SHOP AIR ADAPTOR (SC-F20-005A)
7. MAIN AIR SAUPPLY TUBE
8. WASHER
9. SCREW
10. FITTING
11. O-RING
12. BOLT
13. WASHER
14. NULLING CABLE (PNEUMATIC ACTUATOR END)
15. ELECTRICAL CONNECTOR
16. PNEUMATIC ACTUATOR
17. BOLT
18. WASHER
19. SPUR GEARBOX
20. SCREW
21. WASHER
22. ELECTRICAL CONNECTOR
23. GASKET
24. STRAIGHT TUBE

Figure 202 - Pneumatic Actuator, Spur Gearbox and Nulling Cable Assembly



1. MAIN AIR SUPPLY TUBE
2. AIR LINE-OUTBOARD PNEUMATIC LATCH TO TEE CONNECTOR
3. HOLD-DOWN CLAMPS
4. TEE CONNECTOR
5. AIR LINE-INBOARD PNEUMATIC LATCH TO TEE CONNECTOR
6. CLAMP
7. BLEED VALVE
8. AIR LINE-BLEED VALVE TO PNEUMATIC ACTUATOR
9. AIR LINE-SOLENOID TO MAIN AIR TUBE
10. PRESSURE SWITCH
11. AIR LINE-PRESSURE SWITCH TO AIR PNEUMATIC ACTUATOR
12. AIR LINE-SOLENOID TO TEE
13. SOLENOID-LATCH CONTROL
14. HOLD-DOWN CLAMPS
15. AIR LINE-RELOCATED BLEED VALVE PER SC-F20-003

Figure 203 - Air Lines

B. Installation (See Figure 202).

(1) Mate spur gearbox to pneumatic actuator and secure with attaching bolts (20) and washers (21).

(2) Place pneumatic actuator assembly into aft nacelle and secure using mount bolts (12 and 17) with washers (13 and 18).

(3) Install new gasket (23) and connect main air supply line (7) to pneumatic actuator using attaching screws (9) with washers (8).

(4) Connect and tighten small air lines (7 and 11) to pneumatic actuator.

(5) Connect, tighten and safety two electrical connectors (15 and 22).

(6) Thread nulling cable assembly through rubber grommet in frame 5 and secure to inboard pinion gearbox bracket with two large jam nuts (2).

(7) Insert inner cable into cursor (4) on inboard pinion gearbox and secure with small jam nuts (3).

(8) Secure nulling cable assembly to aft nacelle structure with hold down clamps.

(9) Install flexible drive shafts into spur gearbox. If hex ends of flex shafts do not slip in without preloading (twisting) shafts, then flex drive shafts must be aligned (timed) per Adjustment/Test 78-30-05.

(10) Perform nulling cable adjustment per Adjustment Test 78-30-06.

(11) Reinstall thrust reverser/aft nacelle onto aircraft per Removal/Installation 78-30-00.

(12) Perform operational check of thrust reverser system per Adjustment/Test 78-30-00.

4. Approved Repairs.

A. Replacement of the Spur Gearbox (See Figure 202).

(1) Remove thrust reverser/aft nacelle from aircraft per Removal/Installation 78-30-00.

(2) Remove bolt (17) with washer (18) securing/supporting spur gearbox to aft nacelle structure.

(3) Remove flex drive shafts from spur gearbox per Removal/Installation 78-30-07.

(4) Remove four bolts (20) with washers (21) and separate spur gearbox from pneumatic actuator.

(5) Mate replacement spur gearbox with pneumatic actuator and secure with four attaching bolts (20) and washers (21).

(6) Install bolt (17) with washer (18) through support bracket into spur gearbox.

(7) Refer to Maintenance Practices 78-30-05 to install and align (time) flex drive shafts.

(8) Install thrust reverser/aft nacelle onto aircraft per Removal/Installation 78-30-00.

Flexible Drive Shaft Assembly - Description and Operation

1. Description. The flexible drive shaft assembly consists of a casing (inner and outer) which is stationary and surrounds the core, which is the moveable portion of the assembly (see Figure 1). The outer casing is constructed of wire braid with a 2 over 2 basket weave incorporating a mounting flange on each end. The inner casing is lined with Teflon and impregnated with five percent graphite. The core is constructed of music wire with one end having a hexagonal drive while the other end has a 13 point spline drive. The hex end engages the spur gearbox on the pneumatic actuator and the splined end engages the pinion gearbox. The flex drive shaft can be used on either inboard or outboard position.

2. Operation. The function of the flexible drive shaft assembly is simply to transmit rotary force from the spur gearbox mounted on the pneumatic actuator to the pinion gearbox anytime the pneumatic actuator air motor is in operation.

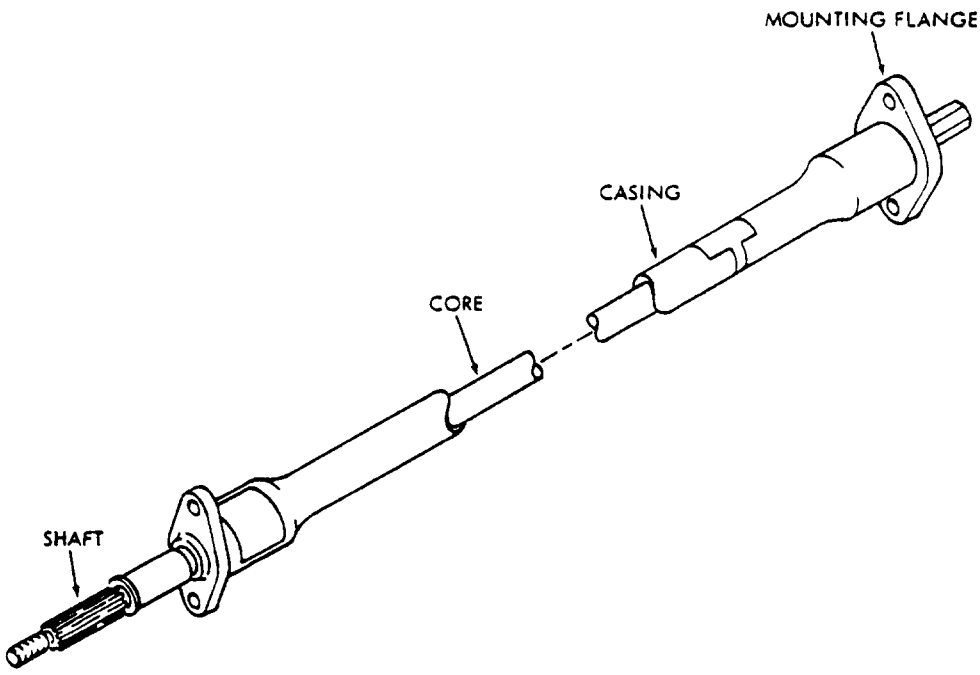


Figure 1 - Flexible Shaft Assembly

Flexible Drive Shaft Assembly - Maintenance Practices

1. General. Maintenance of the flexible drive shaft assembly consists of servicing, removal/installation and inspection/check.

2. Servicing.

   A. It is recommended that at engine hot section inspections that the flexible drive shafts be removed, inspected and relubricated per the following procedure.

      (1) Remove flex drive shafts per Removal/Installation.

      (2) Remove core from casing assembly and inspect per Inspection/Check.

      (3) Wipe core with a clean, lint-free cloth to remove old lubricant, DO NOT DEGREASE.

      (4) Apply a clean layer of grease (MIL-G-21164 or MIL-G-23827) and reinstall the core into the casing.

Table 1 - MIL-G-21164 Lubricants
(for reference only)

MANUFACTURER'S DESIGNATION	MANUFACTURER'S NAME AND ADDRESS
Castrolease MSA(C)	Distributed by: Burmah-Castrol, Inc. Continental Plaza 401 Hackensack Ave. Hackensack, NJ 07601 Manufactured by: Royal Lubricants Co. East Hanover, NJ 07936
Everlube 211-C Moly Grease	E/M Lubricants, Inc. 6940 Farmdale Avenue No.Hollywood, CA 91605
Royco 64C	Royal Lubricants Co. River Road East Hanover, NJ 07939
Aeroshell Grease 17	Shell Oil Company One Shell Plaza P.O. Box 2563 Houston, TX 77001 Plant: International Lubricant Corp. P.O. Box 51118 New Orleans, LA 70150

(5) Reinstall the flex drive shaft per Removal/Installation.

IMPORTANT: The current Qualified Products List (QPL) for Specification MIL-G-21164 lists the lubricants given in Table 1 - MIL-G-21164 Lubricants. The operator is cautioned, however, that additions or deletions to the QPL may be issued at any time and without notice. For this reason, data is provided for reference only. The operator should properly examine the most recently issued QPL to identify currently acceptable lubricants.

3. Removal/Installation. The removal/installation procedures are identical for inboard and outboard flex drive shafts (see Figure 201).

A. Removal.

(1) Remove thrust reverser/aft nacelle from aircraft per Removal/Installation 78-30-00.

(2) Remove lockpin fitting (3) by removing screws (1) and washers (2).

(3) Through top of inboard or outboard pinion gearbox (12 or 13), remove nut (4) and washer (5) securing core of flex drive shaft (6) in inboard or outboard pinion gearbox.

(4) Remove flex drive shaft (6) from inboard or outboard pinion gearbox (12 or 13) by removing screws (8) with washers (7) and pulling the flex shaft out of the pinion gearbox.

(5) Remove flex drive shaft (6) from pneumatic actuator (spur gearbox) (11) by removing screws (9) with washers (10) and pulling flex drive shaft out of pneumatic actuator (spur gearbox).

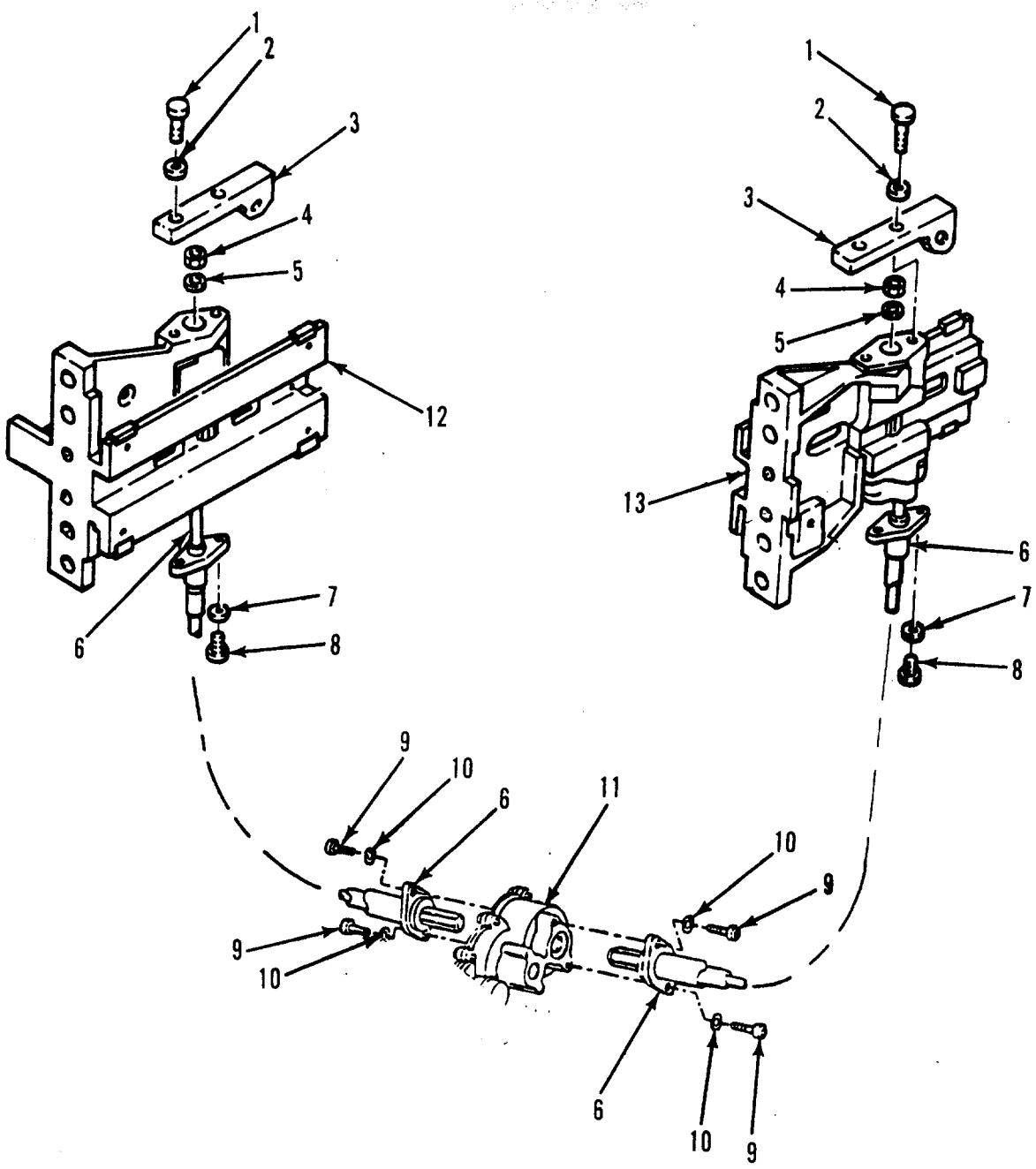
B. Installation. (See Figure 201.)

(1) Temporarily slide hex end of flex drive shaft (6) into pneumatic actuator (spur gearbox) (11) but do not secure.

(2) Perform flex drive shaft alignment (timing) procedure per Maintenance Practices 78-30-05 Paragraph 3.C.

(3) Secure flex drive shafts (6) to pneumatic actuator (spur gearbox) (11) and inboard or outboard pinion gearboxes (12 or 13) with attaching screws (8, 9) and washers (7, 10).

(4) Install lockpin fitting (3) and secure with screw (1) and washer (2).



1. SCREW
2. WASHER
3. LOCKPIN FITTING
4. NUT
5. WASHER
6. FLEX DRIVE SHAFT
7. WASHER
8. SCREW
9. SCREW
10. WASHER
11. PNEUMATIC ACTUATOR (SPUR GEARBOX)
12. INBOARD PINION GEARBOX
13. OUTBOARD PINION GEARBOX

Figure 201 - Flex Drive Shaft Installation

4. Inspection/Check.

A. Visual (Shaft Installed).

(1) Inspect outer casing for signs of black rings around the casing which indicates the inner casing is worn through, permitting lubricant to leak out. Replace shaft.

(2) Inspect outer casing wire braid for evidence of twisting indicating an overload condition. Replace shaft assembly if outer housing is twisted more than 30 degrees.

(3) Inspect outer casing for evidence of hot spots or discolored areas indicating excessive friction or wear and the shaft assembly should be replaced.

(4) Inspect outer casing attaching flanges/collars for cracks and replace if cracks are noted.

(5) Inspect outer casing for broken wire braids and replace any having three adjacent wires broken at any location or two adjacent wires broken at more than one location within a one-foot length.

B. Visual (Shaft Removed)

(1) Repeat above inspection requirements.

(2) Remove core from outer casing and inspect as follows:

(a) Replace shafts having any broken core wires.

(b) Replace shafts with core wires showing separation/spacing discontinuities

(c) Replace shafts with core wires showing evidence of frictional wear.

(d) Relube core before reinstallation into outer casing if still serviceable after inspection.

Pinion Gearbox - Description and Operation

1. Description. A pinion gearbox (see Figure 1) is mounted at the 3 and 9 o'clock position on frame 6 of the aft nacelle. Each pinion gearbox incorporates a pinion gear which mates with the gear racks on each side of the translating structure to drive the translating structure to deploy when reverse thrust is required. The pinion gearboxes also support the translating structure and provide bearings (slipper) on which the translating beams slide during translation. The inboard and outboard pinion gearboxes cannot be interchanged because the inboard pinion gearbox has a nulling cable mount bracket cast into it and also provisions to mount a cursor. The cursor functions to position the nulling cable relative to gear rack travel.

2. Operation. During thrust reverser operation, the pinion gearboxes receive a rotary input from the two flexible drive shafts being driven by the spur gearbox of the pneumatic actuator. The pinion gears in turn change the rotary motion to a linear motion to drive the gear racks which at this point are locked to the translating beams which causes the translating structure to deploy. After the translating structure reaches full deploy, the sequence latches mounted on the forward end of the beams engage their respective catches mounted on the forward face of the pinion gearboxes. This unlocks the gear racks from the beams and the pinion gears continue to drive the gear racks for another five and one half inches to rotate the blocker doors into the exhaust gas stream. To shut the system down as the blocker doors close, the cursor is repositioned by an actuator tab on the forward end of the inboard gear rack. This in turn re-positions the nulling cable to "null" the directional control valve which shuts down the pneumatic actuator to prevent over driving the actuation system. The operation of the pinion gearboxes in the stow direction is essentially the reverse of that stated for deploy.

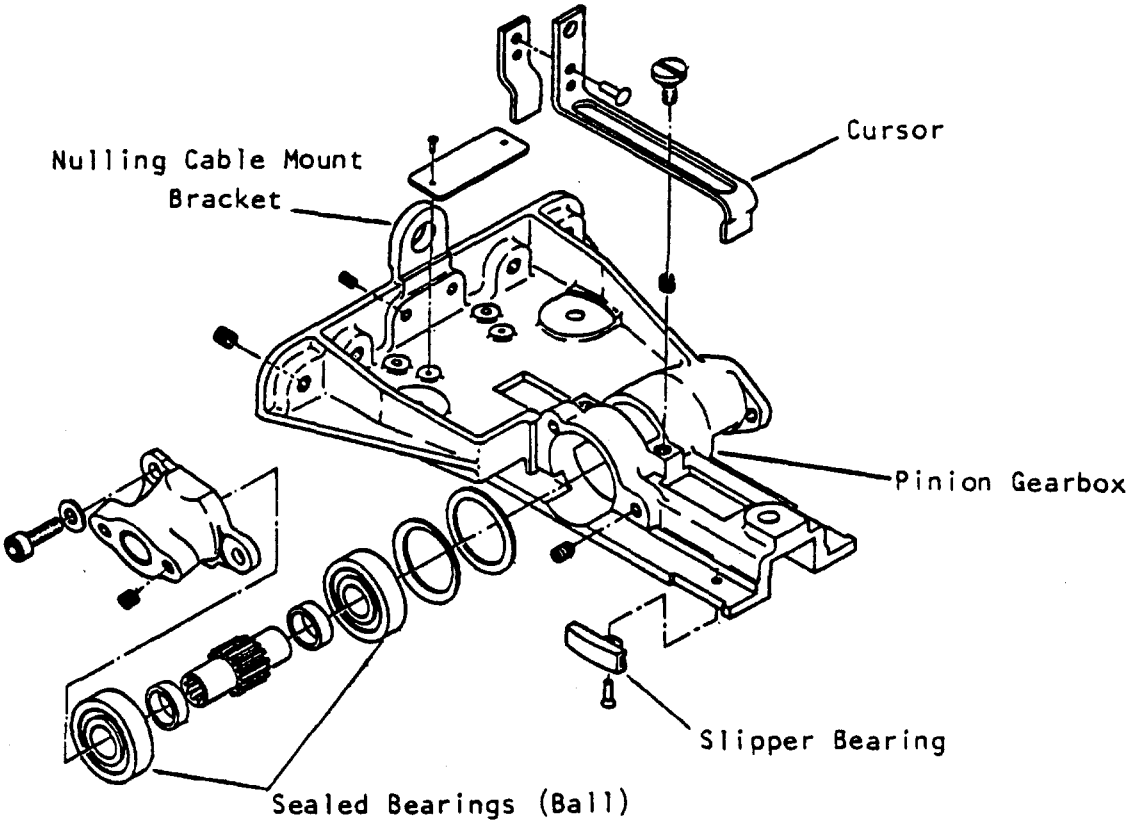


Figure 1 - Pinion Gearbox Assembly (Inboard Shown)

Pinion Gearbox - Maintenance Practices

1. General. Maintenance of pinion gearboxes consists of removal/installation inspection/check and approved repairs.

2. Removal/Installation. (See Figure 201.)

   A. Removal of Inboard Pinion Gearbox.

      (1) Remove thrust reverser/aft nacelle from aircraft per Removal/Installation 78-30-00.

      (2) Remove translating structure from aft nacelle per Removal/Installation 78-30-04.

      (3) Remove lockpin fitting (3) from inboard pinion gearbox by removing two attaching screws (1) with washers (2).

      (4) Remove locknut (48) and washer (47) from flexible drive shaft splined into pinion gearbox.

      (5) Remove two screws (41) and washers (42) securing flex shaft assembly (43) to pinion gearbox and separate flex shaft assembly from pinion gearbox.

      (6) Disconnect and remove nulling cable assembly from pinion gearbox by removing aft jam nut from cable mounting bracket as well as jam nut from cable-to-cursor attach point.

      (7) Remove four bolts (23) and washers (22) attaching pinion gearbox to frame 6 aft nacelle fittings and one screw (8) and washer (4) securing aft end of pinion gearbox to nacelle mounting bracket (40).

      NOTE: When removing the pinion gearbox from the aft nacelle, record the number of shims (21) between pinion gearbox and frame fittings as well as number of washers (shims, 4) between pinion gearbox and nacelle mounting bracket for later reinstallation.

   B. Removal of Outboard Pinion Gearbox.

      (1) Remove thrust reverser/aft nacelle from aircraft per Removal/Installation 78-30-00.

      (2) Remove translating structure from aft nacelle per Removal/Installation 78-30-04.

      (3) Remove lockpin fitting from outboard pinion gearbox by removing two screws (9) and washers (10).

      (4) Remove locknut (49) and washer (50) from flexible drive shaft splined into pinion gearbox.

      (5) Remove two screws (17) and washers (16) securing flex shaft assembly (15) to pinion gearbox and separate flex shaft assembly from pinion gearbox.

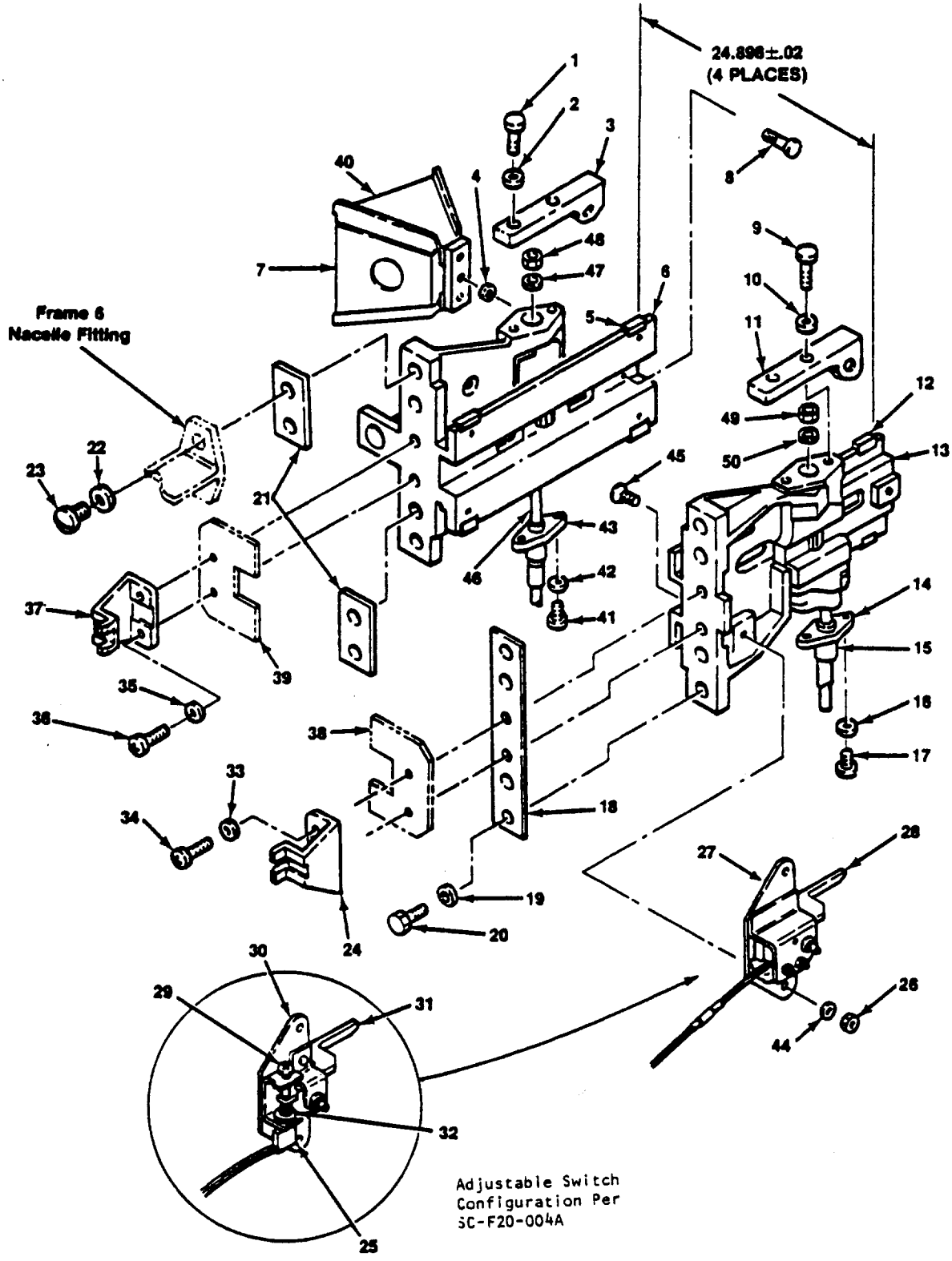


Figure 201 - Pinion Gearbox Disassembly (Sheet 1 of 2)

1. SCREW
2. WASHER
3. LOCKPIN FITTING
4. SHIMMING WASHER
5. VESPEL SLIPPER
6. INBOARD PINION GEARBOX
7. REINFORCEMENT BRACKET
8. SCREW
9. SCREW
10. WASHER
11. LOCKPIN FITTING
12. VESPEL SLIPPER
13. OUTBOARD PINION GEARBOX
14. FLANGE
15. OUTBOARD FLEX DRIVE SHAFT
16. WASHER
17. SCREW
18. SHIM
19. WASHER
20. BOLT
21. SHIM
22. WASHER
23. BOLT
24. CATCH
25. ADJUSTABLE SWITCH
26. NUT
27. SWITCH BRACKET
28. ACTUATING LEVER
29. ADJUSTMENT SCREW
30. SWITCH BRACKET
31. ACTUATING LEVER
32. ADJUSTING NUTS
33. WASHER
34. SCREW
35. WASHER
36. SCREW
37. CATCH
38. SHIM
39. SHIM
40. NACELLE MOUNTING BRACKET
41. SCREW
42. WASHER
43. FLANGE
44. WASHER
45. HI-LOK (HL21-8-4)
46. INBOARD FLEX DRIVE SHAFT
47. WASHER
48. NUT
49. NUT
50. WASHER

Figure 201 - Pinion Gearbox Disassembly (Sheet 2 of 2)

(6) Remove deploy switch and bracket assembly from outboard pinion gearbox by removing two HI-LOKS (45), washers (44), and nuts (26).

(7) Remove four bolts (20) and washers (19) attaching pinion gearbox to frame 6 aft nacelle fittings.

NOTE: Record shims (18), including direction, used between the pinion gearbox and the nacelle fittings.

C. Installation of Inboard Pinion Gearbox.

(1) Place inboard pinion gearbox and shims (21, recorded at removal) on aft nacelle frame 6 fittings and secure with four bolts (23) and washers (22).

(2) Secure inboard pinion gearbox on aft end to nacelle mount bracket (40) with screw (8) and shimming washer(s) (4, recorded at removal).

(3) Using inside micrometers, measure distance (four places) between inside surfaces of slipper bearings (5) from inboard to outboard pinion gearboxes. This distance at each location should be 24.898 (±0.020) inches. Add or subtract shimming washers (4) to obtain correct measurements.

NOTE: For accurate measurements, ensure the aft nacelle is properly supported as shown in 78-30-00, Maintenance Practices, Figure 207, and do not lean on the aft nacelle when making measurements.

(4) To ensure parallelism between inboard and outboard pinion gearboxes, four individual measurements should be within 0.010 inch of each other and still fall within 24.898 (±0.020) inch criteria. If necessary, add or subtract shims (18) under outboard pinion gearbox to satisfy above dimensional requirements.

(5) Install nulling cable outer casing to mounting bracket on inboard pinion gearbox adjusting two jam nuts to center outer casing in bracket and connect cable to cursor adjustin jam nuts to center threads at attach point.

(6) Install translating structure into aft nacelle per 78-30-04, Removal/Installation, and perform rigging and checkout of aft nacelle per 78-30-05, Adjustment/Test.

(7) Install thrust reverser/aft nacelle onto aircraft per 78-30-00, Removal/Installation.

D. Installation of Outboard Pinion Gearbox.

(1) Place outboard pinion gearbox with shim(s) (18, recorded at removal) on aft nacelle frame 6 fittings and secure with four bolts (20) and washers (19).

(2) Repeat steps (3) and (4) per Paragraph 2.C. above.

(3) Install deploy switch and bracket assembly (27 or 30) onto outboard pinion gearbox and secure with two HI-LOKS (45), washers (44), and nuts (26).

(4) Repeat steps (6) and (7) per Paragraph 2.C. above.

3. Inspection/Check. Inspect pinion gearboxes per criteria listed in 78-30-00, Inspection/Test.

4. Approved Repairs.

A. Replacement of Steel Slipper Bearings (P/N 3230135-1).

(1) With pinion gearboxes removed from aft nacelle, drill out/remove slipper bearing retaining rivets from pinion gearboxes.

(2) Remove slipper bearings from pinion gearboxes.

(3) Clean bearing seat areas with methyl ethyl ketone (MEK) using a Scotchbrite pad and removing all residue from seats as well as surrounding profile area.

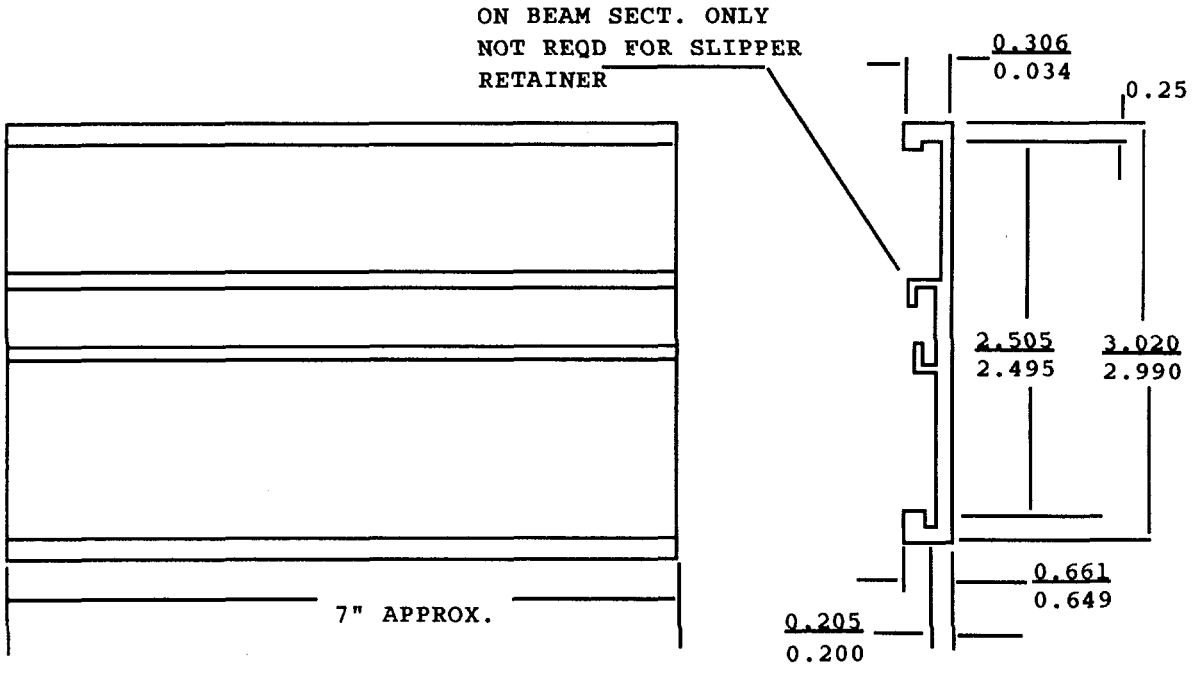
(4) Coat cleaned slipper bearing seat area and rivet holes with Iridite 14-2.

(5) Reinstall pinion gearboxes per 2.C. and D. above.

(6) Install new "Vespel" slipper bearings onto pinion gearboxes and retain in position using special tool AST-2851 shown in Figure 202.

CAUTION: DO NOT USE WAX OR GREASE TO RETAIN "VESPEL" BEARINGS ON THE PINION GEARBOX.

The vespel slippers, located on both pinion gearboxes must be retained in position during translating structure installation. The retainer can be local manufacture, or may be easily fabricated by using a section of thrust reverser beam stock.



(MAY BE MADE FROM A SECTION OF THRUST REVERSER BEAM. OPTIONAL TO MACHINE FROM ALUM BAR).(2 REQD)

VESPEL SLIPPER RETAINER - AST-2851

Figure 202 - Special Tool, AST-2851

Sequence Latch Assembly - Description and Operation

1. Description. A sequence latch assembly (see Figure 1) is mounted on the forward end of each translating beam. The major subassemblies of the sequence latch assembly are the stop housing, latch, pin and pivoting blocker arm.

2. Operation. With the thrust reverser stowed, the sequence latches lock the gear racks to the translating beams. When the thrust reverser is deployed, the gear racks and translating beams are driven aft until the sequence latch pins contact the catches mounted on the forward end of the pinion gearboxes. The catches force the pins forward into the stop housings and allow the gear racks, (which are still being driven aft), to force the latches outboard, unlocking the gear racks from the translation beams and behind the catches, to hold the beams stationary to the pinion gearboxes. The gear racks continue to move aft allowing the spring loaded pivoting blocker arm to move into the beam window to hold the latch in the unlocked position.

   When the reverser is stowed, the rack is driven forward by the pinion gears opening, (stowing) the blocker doors. The beams remain secured to the pinion gearboxes until the gear racks move into the beam "window" area. At this point the gear racks perform several functions. As the rack moves forward, two ramps built into the racks, function to rotate the pivoting blocker arms out of the blocking position as well as pushing the latch fingers deeper into the catch.

   As the rack detents move into alignment with the beam "window", the latches are forced inboard out of the catches by the action of the latch roller going around the beveled aft side of the catch. The latches then go through the rack detents, into the beam "windows", once again locking the racks to the beams for the remainder of the stow cycle. The spring loaded pin separates from the catch and holds the latch in the locked position.

TEMPORARY REVISION NO. 78-4

MANUAL AFFECTED: Learjet (Aeronca) Falcon 20 Thrust Reverser Maintenance Manual.

FILING INSTRUCTIONS: Insert adjacent to 78-30-09, page 2, dated March 1, 1995 and retain until further notice.

REASON: Change lubricant call-out due to discontinued product (GS-3).

INSTRUCTIONS: Revise the Caution in paragraph 2. as follows:

2. Servicing

CAUTION: USE ONLY LILLY INDUSTRIES DRY FILM LUBRICANT P/N 5791C90003 OR P/N 5791C90004 ON THE SEQUENCE LATCHES.

A. The lubrication requirements for sequence latches are listed in Servicing, 78-30-00. In addition, the assemblies should be lubricated any time they are removed/installed.

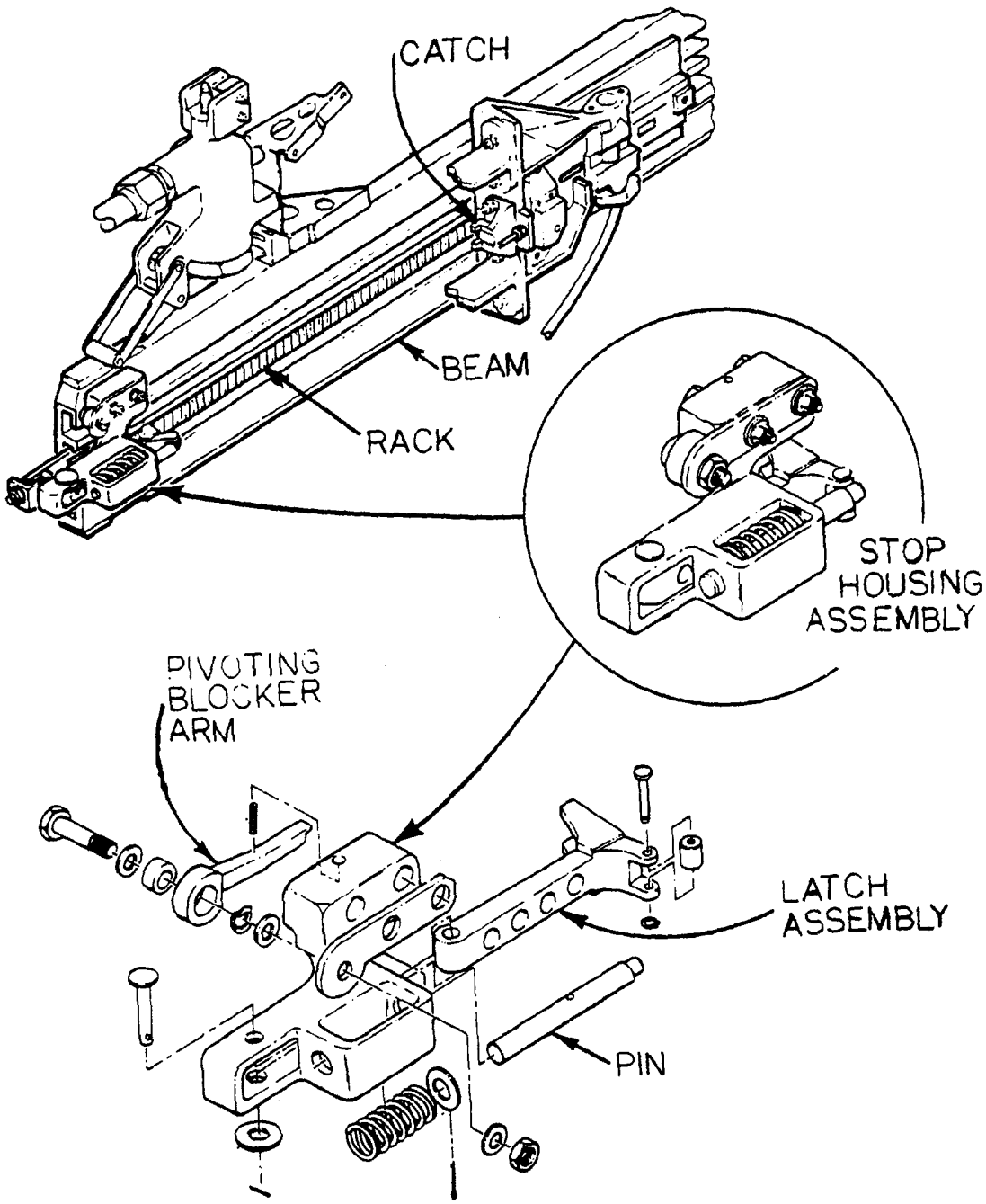


Figure 1 - Sequencing Latch

Sequence Latch Assembly - Maintenance Practices

1. General. Maintenance of the sequence latch assemblies consists of servicing, removal/installation, adjustment/test, inspection/check, approved repairs, and retrofit instructions. Each section contains instructions for the different configurations.

2. Servicing. The lubrication requirements for sequence latches are listed in Servicing, 78-30-00. In addition, the assemblies should be lubricated any time they are removed/installed.

   CAUTION: USE ONLY SPECIFIED LUBRICANT RAM GS-3 ON SEQUENCE LATCHES.

3. Removal/Installation.

   A. Removal.

      (1) Remove thrust reverser/aft nacelle from aircraft per Removal/Installation, 78-30-00.

      (2) Stow reverser using:

         (a) External air and power per Removal/Installation, 78-30-00.

         (b) Manual drive special tool AST 2852 per Adjustment/Test, 78-30-05, Paragraph 3.C.(5).

      (3) Refer to Figure 201 and remove nuts, washers, and screws securing sequence latch to beam and remove assembly from beam.

         NOTE: If the same sequence latch is to be reinstalled, ensure that the stop housing is marked "Inboard" or "Outboard" as applicable along with the thrust reverser serial number.

   B. Installation.

      (1) If the same sequence latch removed is being reinstalled, then simply install the four screws, washers and nuts removed in step (3) above.

         CAUTION:
         - HOLD THE PIVOTING BLOCKER ARM FULLY DEPRESSED WHEN LOCATING THE ASSEMBLY ON THE BEAM TO ASSURE THE HOUSING IS FLUSH WITH THE BEAM TO AVOID DAMAGE TO THE PIVOTING BLOCKER ARM OR STOP HOUSING WHEN TIGHTENING ATTACHING HARDWARE.
         - ENSURE THAT THE CRITERIA OF FIGURE 203 IN MAINTENANCE PRACTICES, 78-30-05 IS MET AND THE PIVOTING BLOCKER ARM OPERATES SMOOTHLY.
         - INSTALL THE TWO LONGER ATTACHING SCREWS ON THE PIVOTING BLOCKER ARM SIDE OF THE STOP HOUSING.

4. Adjustment/Test. After installation of a sequence latch assembly, accomplish the following:

   A. Observe pivoting blocker arm for freedom of movement and correct installation per Figure 203. If pivoting blocker arm travel is binding and/or clearances of Figure 203 cannot be obtained remove pivoting blocker arm assembly for inspection. Pivoting blocker arm retainer should be flat and bolt and arm should not be bent.

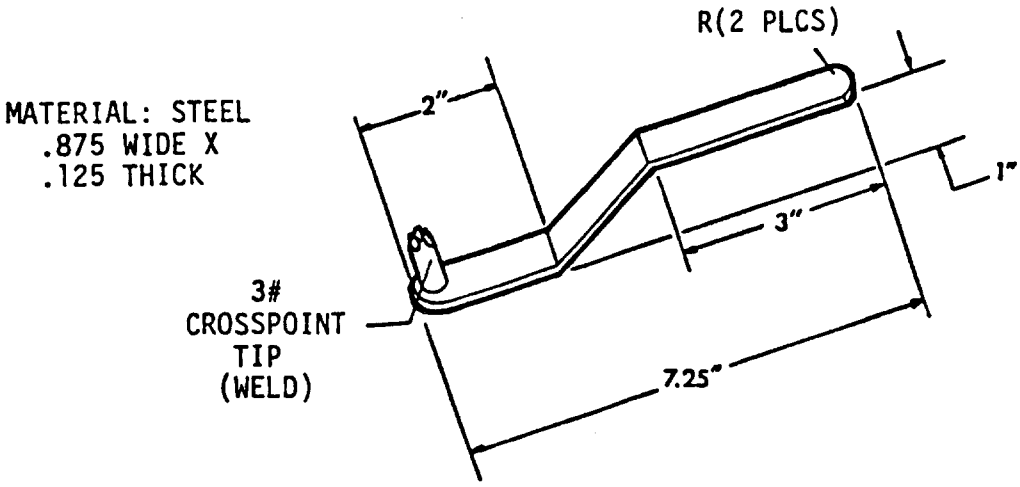
B. Sequence latch pins are select fit to maintain a minimum of 0.010 inch clearance between inboard edge of catch and aft end of pin. If respective translating beam, pinion gearbox or catch was disturbed during maintenance or repair activity, dimensions must be checked per "Establishing Sequence Latch Pin-to-Catch Relationship" under Adjustment/Test section of Chapter 78-30-08.

C. Perform "Pinion Gearbox to Catch Shimming" procedure under Adjustment/Test section of Chapter 78-30-08.

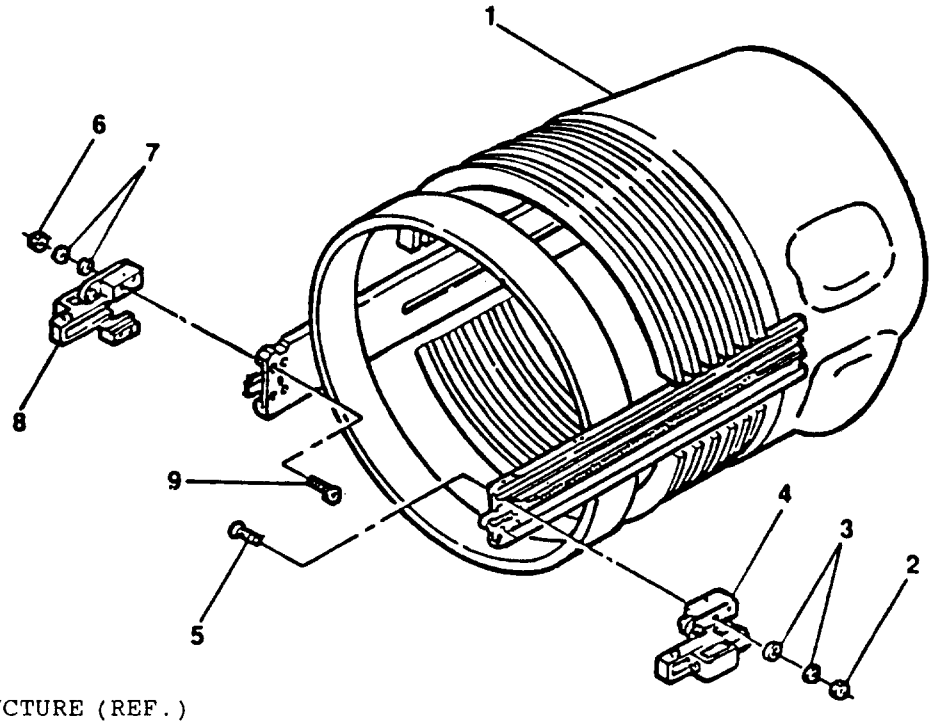
D. Hand-crank to translate unit through several cycles, observing that sequence latch assemblies operate free and smooth as well as satisfy requirements of Figure 207.

5. Inspection/Check. At specified inspection intervals sequence latches are visually inspected per inspection/check criteria of Chapter 78-30-00. It is also recommended that anytime sequence latches are removed from translating beams and disassembled for any reason that they be given a detailed inspection.

6. Approved Repairs. Any worn damaged or broken piece parts of sequence latch assembly may be replaced using Figure 205 as a guide for parts relationship. Refer to applicable Illustrated Parts Catalog for part number identification.

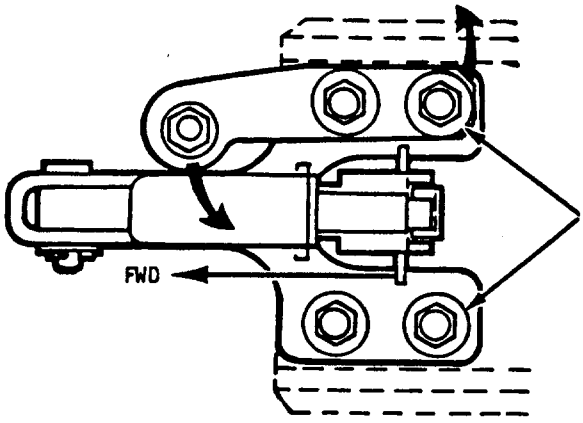


SEQUENCE LATCH TOOL - AST 2866



1. TRANSLATING STRUCTURE (REF.)
2. NUT
3. WASHER
4. SEQUENCE LATCH (OUTBOARD)
5. SCREW
6. NUT
7. WASHER
8. SEQUENCE LATCH (INBOARD)
9. SCREW

Figure 201 - Sequence Latch Removal

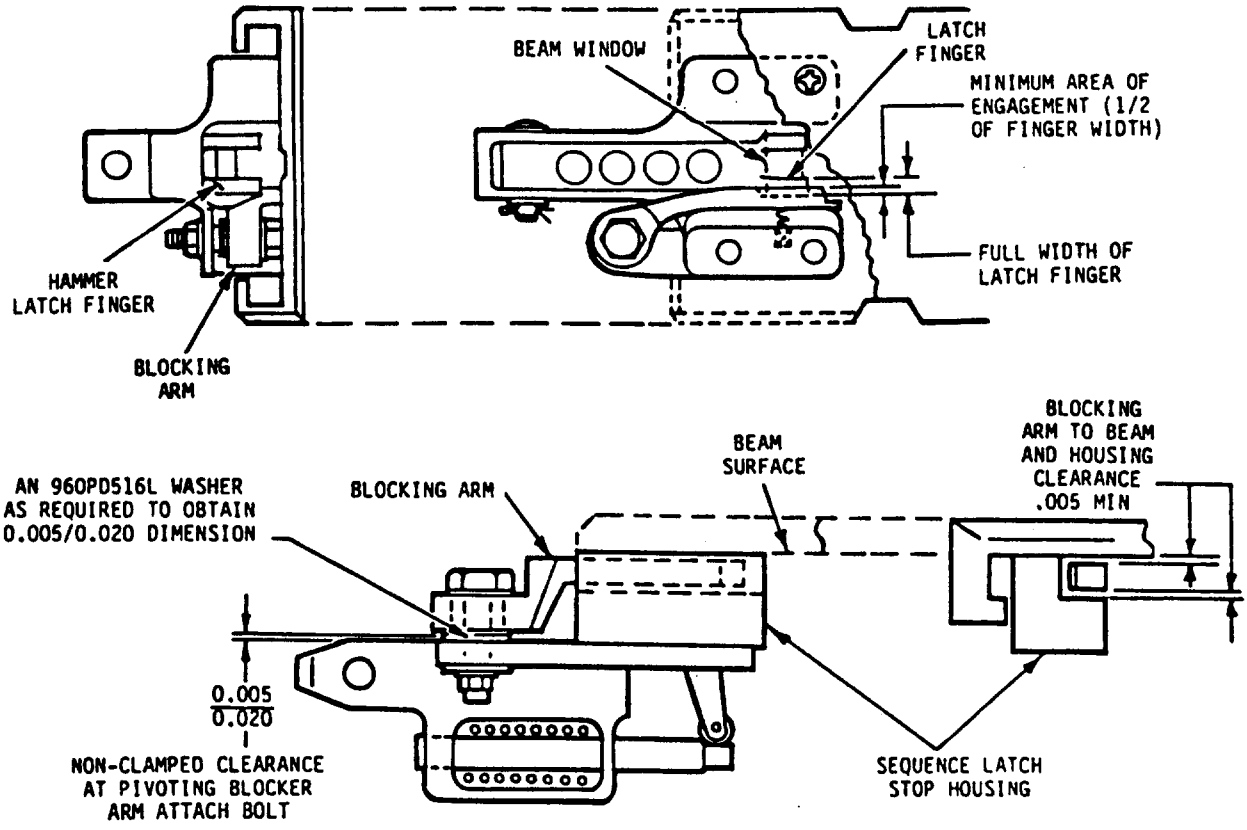


Final torque securing nuts with stop housing full forward on beam and pivoting blocker arm retainer rotated full counter clockwise.

Ensure the washers under the sequence latch aft securing nuts DO NOT protrude beyond the latch housing. Trim O.D. of washers as required.

NOTE: Sliding blocker assembly not shown in this figure. See Figure 6 for details.

Figure 202 - Sequence Latch Installation



NOTE: SLIDING BLOCKER ASSEMBLY NOT SHOWN IN THIS FIGURE. SEE FIGURE 6 FOR DETAILS.

Figure 203 - Pivoting Blocker Arm Installation

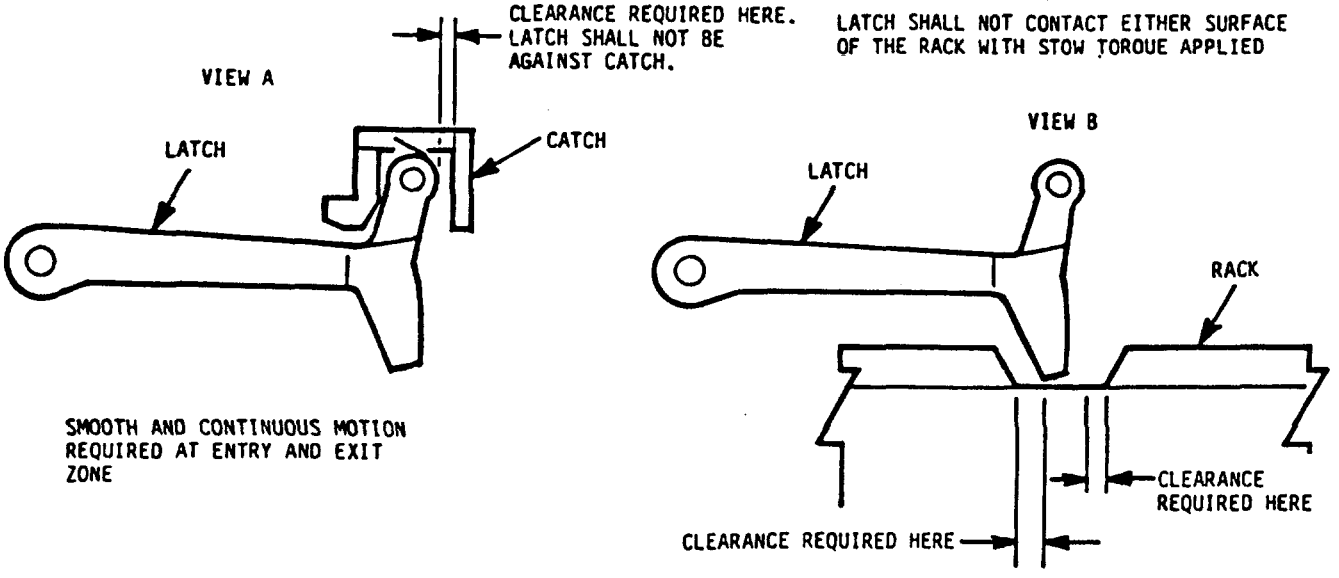
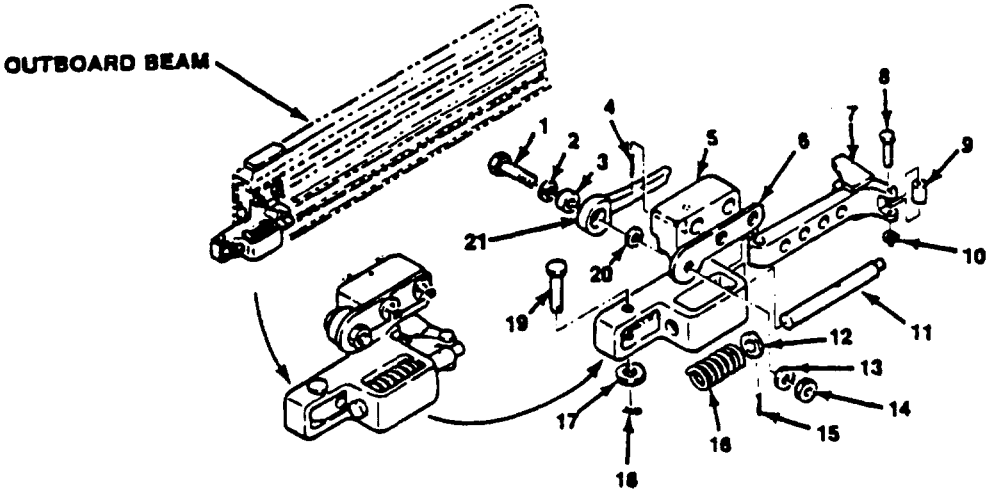


Figure 204 - Latch Clearance Requirements



1.	BOLT	8.	PIN	15.	COTTER PIN
2.	WASHER	9.	ROLLER	16.	SPRING
3.	BUSHING	10.	SNAP RING	17.	WASHER
4.	SPRING	11.	PIN	18.	COTTER PIN
5.	HOUSING	12.	WASHER	19.	PIN
6.	RETAINER	13.	WASHER	20.	WASHER (SHIMMING)
7.	HAMMER LATCH	14.	NUT	21.	LEVER

Figure 205 - Sequence Latch Assembly

Pneumatic Latch - Description and Operation

1. Description. A pneumatic latch (see Figure 1) is mounted in the aft nacelle at approximately 10 and 2 o'clock positions for the left-hand reverser and 8 and 4 o'clock positions (inverted) for the right-hand reverser. Each pneumatic latch consists of a spring-loaded actuator (piston type) which positions an angled latching lever. The latching lever functions to lock the reverser in stow when not required by creating an overcenter relationship of the latch lever to the beam latch stop. A retaining lever functions to retain the latch lever in the unlocked position during commanded deploy.

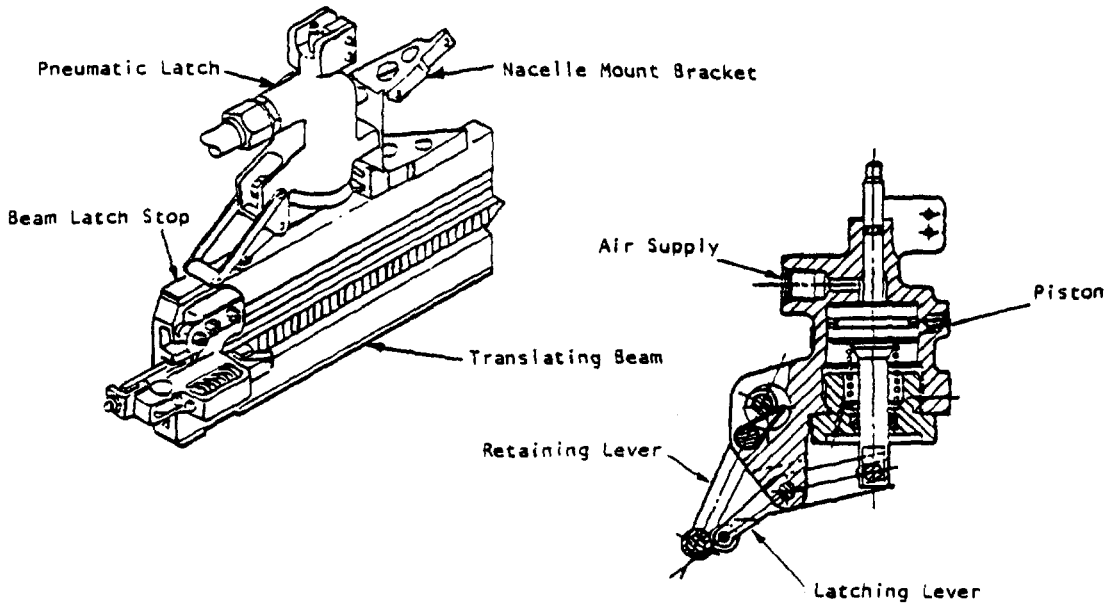


Figure 1 - Pneumatic Latch Installation (Outboard Shown)

2. Operation. When the reverser is commanded to deploy, 28 vdc is sent to the latch control solenoid valve which opens and allows engine bleed air to both pneumatic latches. When the air pressure exceeds 5(±1) psig the spring force is overcome and the piston strokes downward toward the translating beam. This causes the latching lever to pivot upward away from the beam latch stop allowing the rollers to move on top of the retaining lever rollers which can now move aft to retain the latching lever in the unlatched position (see Figure 2). The translating beams now are free to move aft to full deploy. When stow is selected, power is removed from the latch control solenoid valve which now vents the engine bleed air from the top of the pistons. However, the pneumatic latches are retained in the unlatched position until the translating beams move forward to stow and trip the retaining levers. This releases the latch levers and the spring forces the pistons up, to move the latch levers down behind the beam latch stops, locking the reversers in stow.

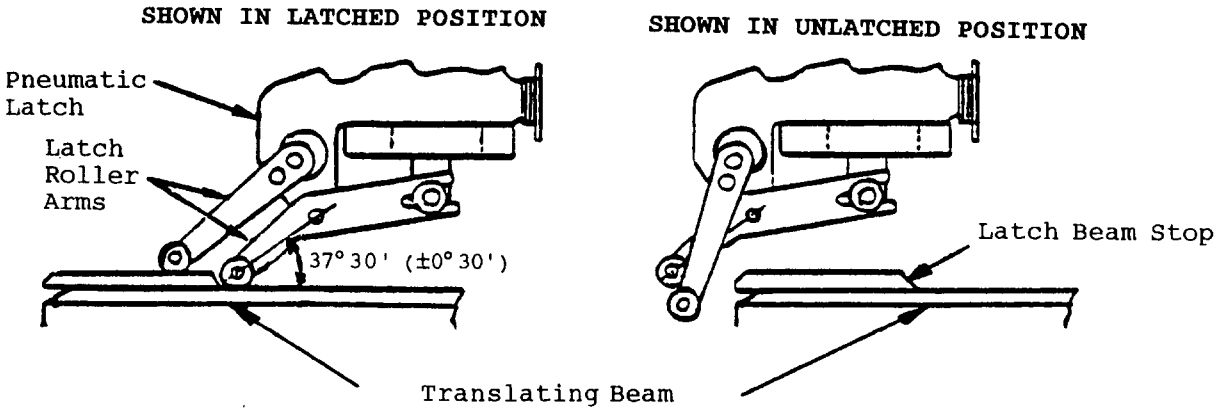


Figure 2 - Pneumatic Latch Positions

Pneumatic Latch - Maintenance Practices

1. General. Maintenance of the pneumatic latches consists of servicing, removal/installation, and inspection/check.

2. Servicing. At specified intervals, parts of the pneumatic latches are required to be serviced. Refer to Servicing, 78-30-00, for lubrication interval and lubricant to be used.

3. Removal/Installation.

A. Removal (See Figure 201).

(1) Remove thrust reverser/aft nacelle from aircraft per Removal/Installation, 78-30-00.

(2) Disconnect pneumatic supply tube from union (17).

(3) Remove the pneumatic latch mounted switches as follows:

(a) For reversers without product improved switches, remove the two nuts (9) and screws (8) securing the latch mounted switches (7) and remove the switches from the latch.

(b) For reversers with product improved switches (SC-F20-004A), remove the aft jam nut (2) and slide switch (1) out of mounting bracket. If new pneumatic latch is to be installed, drill out six attaching rivets from switch mounting bracket to remove bracket for installation on new latch.

(4) Remove the three cap screws (12) securing the pneumatic latch to the nacelle structure (15). During removal, note the number of shimming washers (13) between the pneumatic latch and mount bracket at each of the three locations for later installation.

B. Installation.

(1) Place the pneumatic latch on the nacelle mount bracket (Figure 201,15) and secure with the three cap screws (12) and washer (11).

NOTE: At each of the three mounting screw locations, install the shimming washers (13) previously noted during removal.

(2) Install the pneumatic latch mount switch(es) as follows:

(a) For reversers without product improved switches, install the two switches (7) on the pneumatic latch and secure with the two screws (9) and nuts (8). Refer to Adjustment/Test, 78-30-13, for procedure to adjust the pneumatic latch mounted switch.

(3) If not already stowed, stow the reverser using:

(a) External air and power per removal/Installation, 78-30-00.

(b) Manual drive special tool AST 2852 per adjustment/Test, 78-30-05, paragraph 3.C.(5).

(4) Use special tool AST 2897 (Figure 202) to check the angle of the latching lever to the beam surface as shown in Figure 203 and ensure that the distance between the latch lever rollers and beam latch stop meets the dimensions also shown in Figure 203. Add or subtract shimming washers as required to satisfy both linear and angular dimensions.

1. SWITCH
2. ADJUSTING NUTS - SWITCH
3. KEYWAY WASHER - SWITCH
4. ROLLER - SWITCH
5. PLUNGER - SWITCH
6. BRACKET
7. SWITCHES
8. NUT
9. SCREW
10. PNEUMATIC LATCH
11. WASHER
12. CAP SCREW
13. SHIMMING WASHERS
14. ANTI-TEMPER WIRE
15. NACELLE STRUCTURE
16. PLUNGER - PISTON
17. UNION - AIR SUPPLY

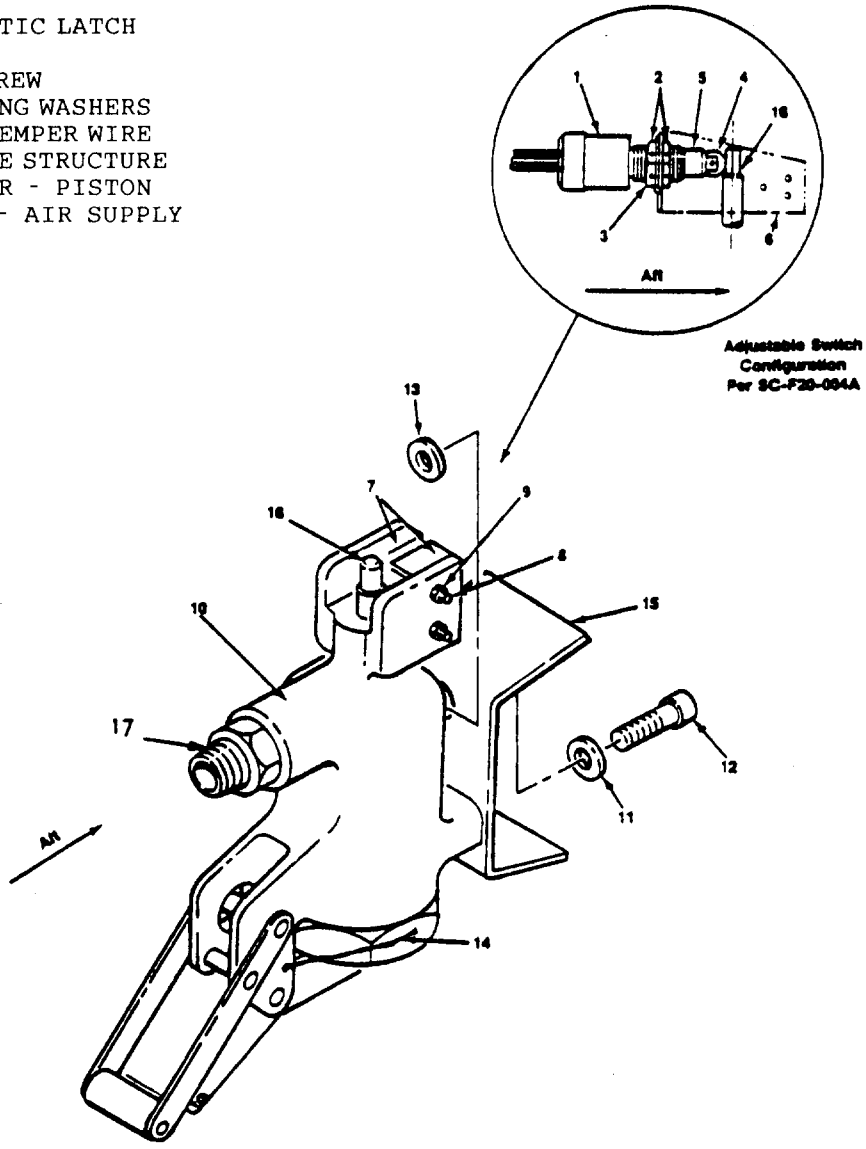
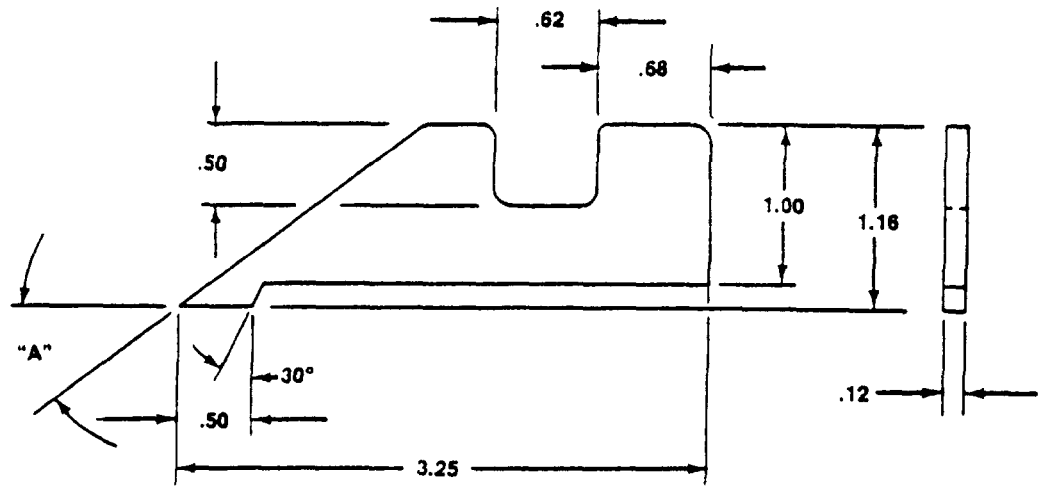
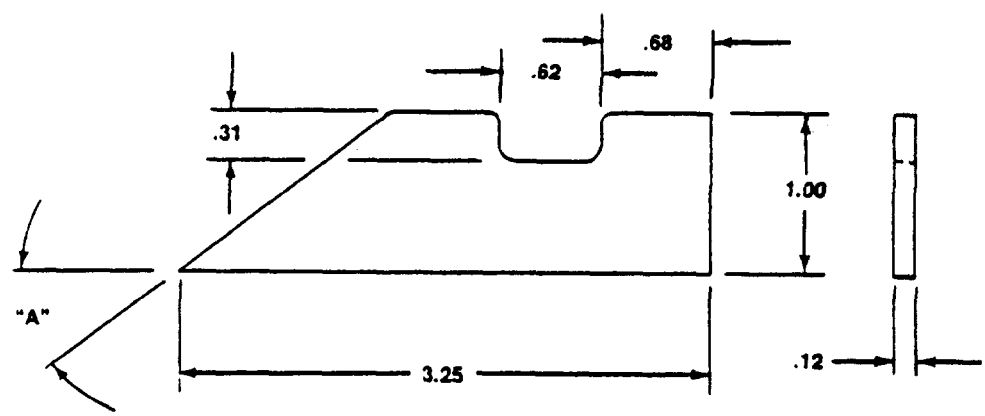


Figure 201 - Pneumatic Latch Removal



INBD. SIDE
-01 "A" 37° LOW TOL.
-02 "A" 38° HIGH TOL.



OUTBD SIDE
-03 "A" 37° LOW TOL.
-04 "A" 38° HIGH TOL.

Figure 202 - Pneumatic Latch Positioning Check Tool - AST 2897

(5) Cycle the reverser through several cycles using the test box AST 2860 and external air. Observe pneumatic latch operation to ensure that the latch levers are fully retracted and retained in the unlatched position with the reverser deployed. On stow cycle ensure beam latch stop trips retaining lever to release latching lever and ensure dimensions of Figure 203 are satisfied with reverser fully stowed.

(6) Install thrust reverser/aft nacelle on aircraft per Removal/Installation, 78-30-00.

4. Inspection/Check. At specified intervals the reverser system is required to be inspected. Refer to Inspection/Check, Table 1, 78-30-00, for criteria used when inspecting the pneumatic latches.

1. CAP SCREWS (3 PLACES)
2. WASHERS
3. SHIMMING WASHERS (UPPER, ONE PLACE)
4. SHIMMING WASHERS (LOWER, TWO PLACES)

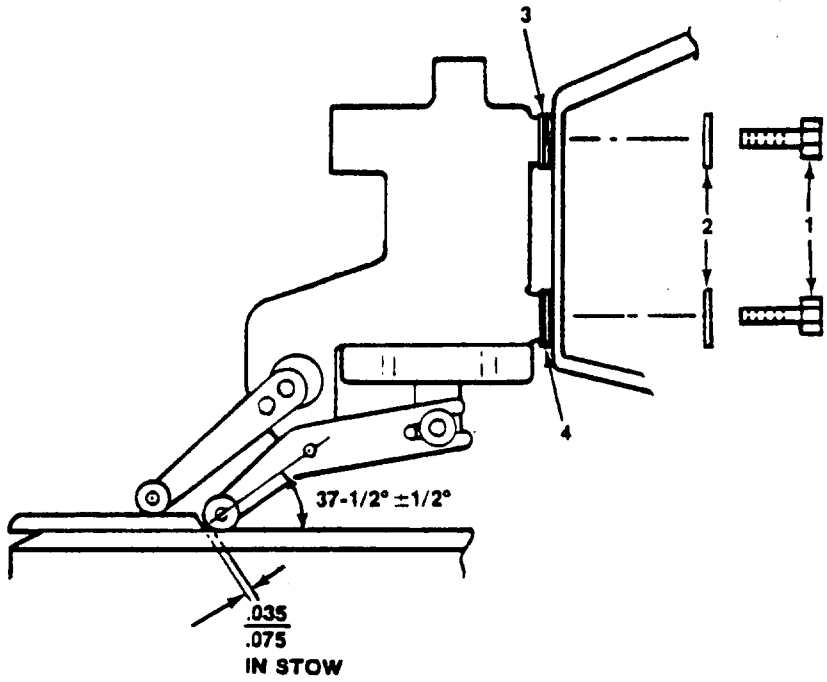


Figure 203 - Pneumatic Latch Positioning

Pneumatic Latch Control Solenoid Valve - Description and Operation

1. Description. The pneumatic latch control solenoid valve is mounted at approximately the 6 o'clock position in the aft nacelle (see Figure 6, 78-30-00) between frames 4 and 5. The valve assembly (see Figure 1) primarily consists of a solenoid, a plunger, and a valve module. The valve is "hard-wired" into the electrical harness.

2. Operation. The pneumatic latch control solenoid valve is energized with 28 vdc as deploy circuits (see Figure 2) are completed when the thrust reverser levers are raised to the "Reverse Idle" position. Energizing the solenoid causes the plunger to be drawn into the coil which depresses the stem of the valve module allowing engine bleed air to enter the latch control valve. At the same time the plunger opened the valve module, it closed off the vent port so the air can only go to the pneumatic latches. The solenoid remains energized until the thrust reverse levers are pushed down to the forward thrust (stowed) position. This de-energizes the latch control solenoid which allows engine bleed air to push the plunger off its seat allowing the valve module to close. Simultaneously, the air that was pressurizing the pneumatic latches can escape out the vent port to atmosphere.

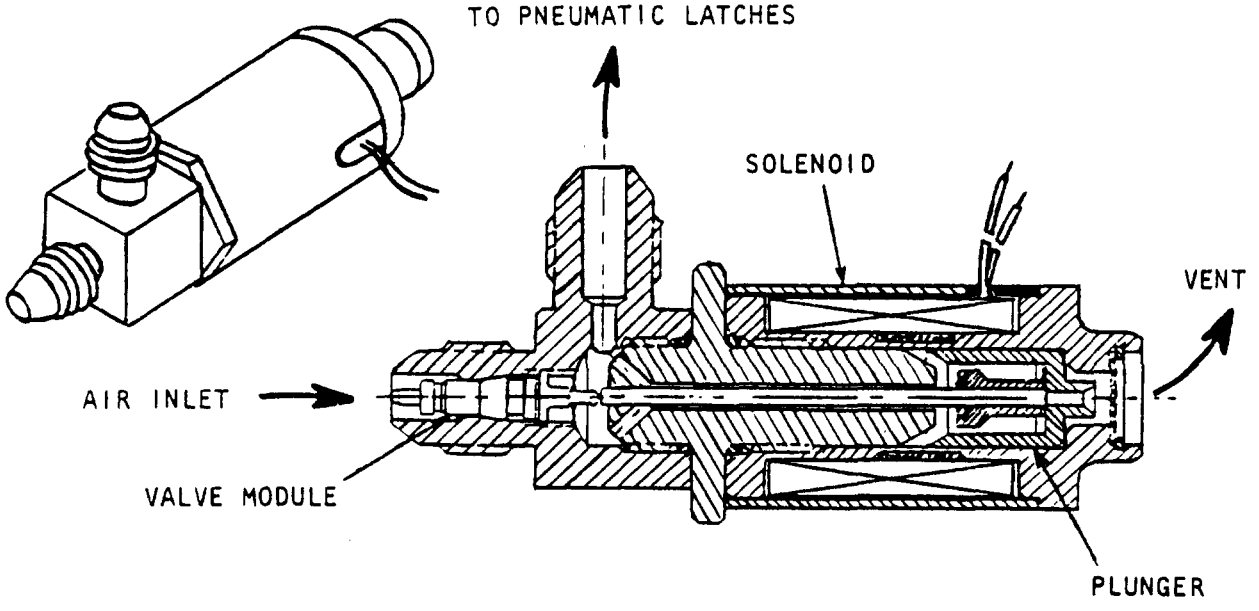


Figure 1 - Pnuematic Latch Control Solenoid Valve

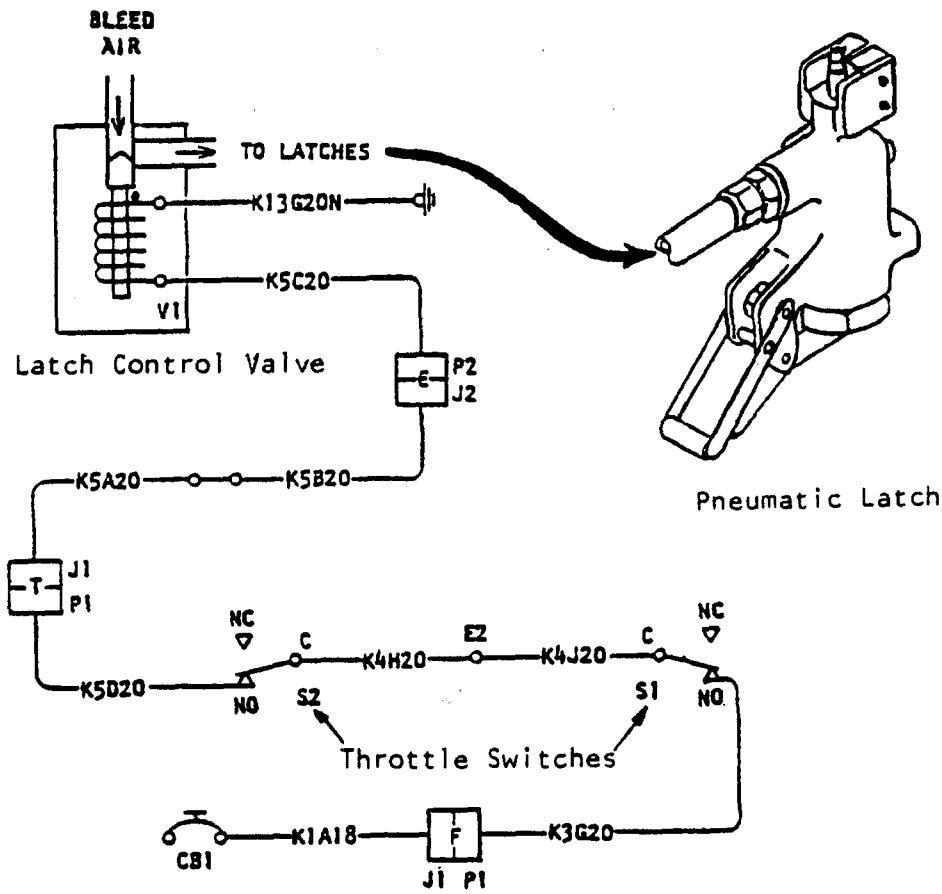


Figure 2 - Pneumatic Latch Control Solenoid Valve (Electrical Circuit)

Pneumatic Latch Control Solenoid Valve - Maintenance Practices

1. General. Maintenance of the pneumatic latch control solenoid valve is limited to removal/installation.

2. Removal/Installation. It is possible to gain access to the pneumatic latch control solenoid valve without removing the thrust reverser from the aircraft by going through the lower right turnbuckle access panel. However, if time permits and to avoid damage to either the pneumatic tubing or the electrical harness, it is recommended to use the following procedure.

   A. Removal.

      (1) Remove thrust reverser/aft nacelle from the aircraft per Removal/ Installation, 78-30-00.

      (2) Disconnect pneumatic tubing (inlet and outlet) from the latch control valve.

      (3) Cut wires as close to old switch as possible to make splicing in new latch control valve easier.

      (4) Remove nut, washer, bolt, and clamp to remove latch control valve from the aft nacelle.

   B. Installation.

      (1) Splice new latch control valve electrical wires into wiring harness observing wire numbers shown in Figure 101, 78-30-00. Cover connections with electrical tape or heat shrinkable sleeving.

      (2) Install and secure latch control valve into aft nacelle using the clamp, bolt, washer and nut removed in step (4) above.

      (3) Connect pneumatic tubing (inlet and outlet) to latch control valve.

      (4) To verify proper operation of latch control valve, use test box AST 2860 and external air source per Maintenance Practices, 78-30-00, Paragraph 2, to cycle reverser to deploy and stow several times. Observe pneumatic latch operation to ensure they unlatch and are retained unlatched during deploy and that they properly latch during stow.

      (5) Install thrust reverser/aft nacelle on aircraft per Removal/ Installation, 78-30-00.

Bleed-off Solenoid Valve - Description and Operation

1. Description. The bleed-off solenoid valve (see Figure 1), is mounted at the 6 o'clock position in the aft nacelle between frames 4 and 5. In later production units and older units complying with SC-F20-003, the bleed valve has been repositioned (see Figure 6, 78-30-00). The primary component parts of the bleed-off solenoid valve are the bobbin (solenoid), plunger, valve module, and inlet fitting. The valve functions as a component part of the safety system which prevents stowing the reverser at engine power settings above 80% N1.

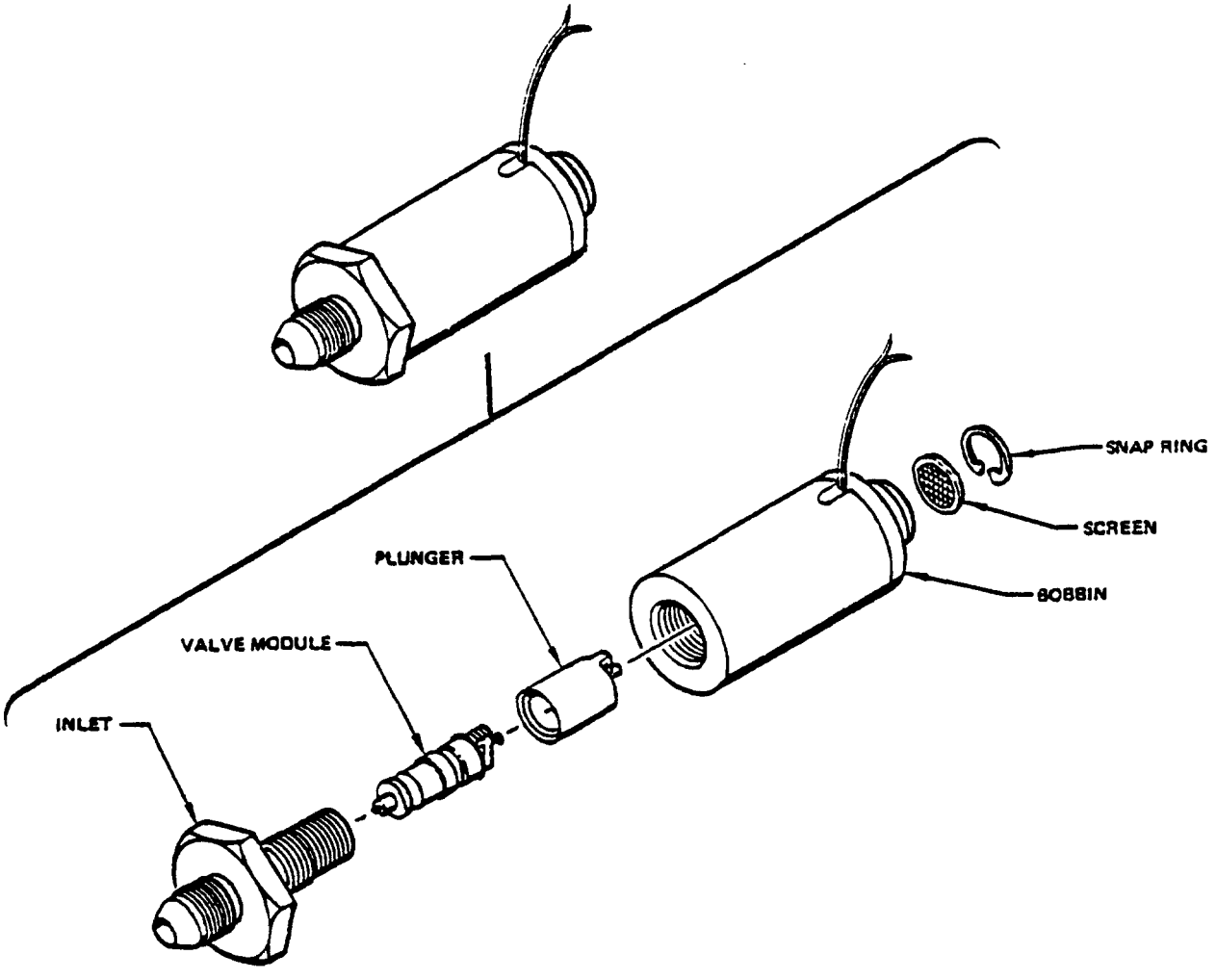


Figure 1 - Bleed-off Solenoid Valve

2. Operation. As part of the safety system designed to prevent fault caused stowing of the reverser at engine power settings above 80% N1 rpm, the bleed-off solenoid valve functions to deny the air motor of operating air. This is accomplished by electrically energizing the bleed-off solenoid valve (see Figure 9, 78-30-00) which vents servo air from the pneumatic actuator pressure regulator valve causing the inlet poppet to close. Power to energize the bleed-off valve passes through the pneumatic latch mounted switches (S4B and S5B, "N.C." to "C"), the deploy switch (S3, "C" to "N.O."), the safety switch (S7, "C" to "N.O."), the pressure switch (P7, B to A) to the bleed-off valve. With the solenoid energized, the plunger is drawn into the coil, depressing the valve module to open it and vent the servo air to atmosphere with resulting inlet poppet valve closure.

   If the bleed-off solenoid valve fails to open with the reverser deployed and engine power above 80% N1 rpm, the cockpit crew will be alerted by a flashing "Transit" light (see Figure 4, 78-30-02). This is caused due to air supply still being available to the air motor which in turn causes the pressure switch to be pressurized completing a circuit through it ("N.O." to "C") and on to the flasher (FL1). After 2 seconds the flasher generates a pulsating output to cause the "Transit" light to flash (bright-off-bright). The cockpit crew should recognize this as an unsafe condition and reduce power on the affected engine to below 80% N1 rpm.

   As stow is selected, the bleed valve is de-energized so that the servo air pushes the plunger back allowing the valve module to close to cease the venting operation.

Bleed-off Solenoid Valve - Maintenance Practices

1. General. Maintenance of the bleed-off solenoid valve consists of removal/installation and cleaning.

2. Removal/Installation. Access to the bleed-off solenoid valve can be achieved with the thrust reverser installed on the aircraft by going through the lower right turnbuckle access panel. However if time permits and to avoid damage to the pneumatic tubing and electrical harness, it is recommended that the following procedure be used.

   A. Removal.

      (1) Remove thrust reverser/aft nacelle from the aircraft per 78-30-00 Removal/Installation .

      (2) Disconnect the pneumatic tube from the bleed-off solenoid valve.

      (3) Cut wires as close to old valve as possible.

      (4) Remove nut, washer, bolt and clamp and remove valve from aft nacelle.

   B. Installation.

      (1) Splice wires of new bleed-off solenoid valve into electrical harness observing wire numbers shown in Figure 101, 78-30-00.

      (2) Place clamp around valve body and secure in aft nacelle using bolt, washer and nut removed in step (4) above.

      (3) Connect pneumatic tube to bleed-off solenoid valve.

      (4) Use test box AST 2860 and an external source of air to checkout bleed-off solenoid valve for proper operation as follows:

         (a) Select "Deploy" with switch S-4 and observe that maximum deploy time is 2 seconds.

         (b) At full deploy, select "Above 80%" with switch S-6 and verify with your hand that air is venting from the bleed-off solenoid valve. Further observe that only the "Reverse" light is illuminated.

         (c) Select "Stow" with switch S-4 and observe that reverser will not stow.

         (d) Select "Below 80%" and observe that reverser stows in maximum time of 3 seconds.

      (5) Install thrust reverser/aft nacelle per Removal/Installation, 78-30-00.

3. Cleaning. In early production reversers not incorporating the provisions of SC-F20-003, the bleed-off solenoid valves have failed due to contaminants being blown into the vent port since it faces forward. It is permissible to disassemble the bleed-off solenoid valve to possibly restore the valve to service by cleaning using the following procedure.

A. Bleed-off Solenoid Valve Cleaning Procedure.

(1) Remove thrust reverser/aft nacelle from aircraft per Removal/ Installation, 78-30-00.

(2) Disconnect pneumatic tube from bleed-off solenoid valve.

(3) Remove bleed-off solenoid valve from aft nacelle by removing the nut, washer, bolt and clamp but do not cut electrical wires.

(4) Hold the valve body with rubber cushioned pliers to avoid damage and remove inlet fitting from valve. Remove plunger, snap ring and screen from valve body.

CAUTION: EXERCISE EXTREME CARE WHEN DISASSEMBLING BLEED-OFF SOLENOID VALVE TO AVOID DAMAGING ELECTRICAL WIRES TO SOLENOID.

(5) Clean the valve body bore using a lint-free, clean cloth wetted with isopropyl alcohol and allow to air dry before reassembly.

(6) Clean all parts separated from the valve with isopropyl alcohol and allow to air dry before reassembly.

(7) Reassemble the bleed-off solenoid valve insuring that rubber cushioned pliers are used to hold the valve body to avoid damage.

(8) Reinstall bleed-off solenoid valve into aft nacelle and secure using clamp, bolt, washer and nut removed in step (3) above.

(9) Reconnect pneumatic tube to bleed-off solenoid valve.

(10) Check proper operation per 2.B.(4) above. If valve functions properly, proceed to step (11) below. If valve still is unserviceable, remove and replace per 2.A. and 2.B. above.

(11) Install thrust reverser/aft nacelle onto the aircraft per Removal/ Installation, 78-30-00.

Thrust Reverser Electrical System - Description and Operation

1. Description. The electrical system for the complete aircraft thrust reverser system consists of twelve wiring harnesses, all interfacing as required to provide necessary power supply, reverser control and cockpit instrumentation. In some cases, harnesses are coupled together with Cannon electrical connectors and others are spliced together. Refer to the electrical diagram (Figure 101, 78-30-00) for information regarding wiring and connector identification numbers. Since the wiring harnesses installed in the airframe rarely develop faults requiring maintenance action, this chapter will address primarily to the electrical harness installed in the thrust reverser/aft nacelle (see Figure 1). For information regarding other electrical circuitry, refer to Chapters 78-30-01, 78-30-02, or 78-30-03 as applicable. The wiring harness in the thrust reverser/aft nacelle integrates all the components housed in the aft nacelle and provides the necessary circuitry for thrust reverser operation. The harness assembly is one piece with the wire bundles being covered with heat shrunk sleeving for protection. As indicated by Figure 1, there are some of the reverser indication and control switches that are classified as part of the wire harness since on early production reversers they are connected to the harness wires by solder and potted for protection. Later production reversers and reversers incorporating SC-F20-004A have improved switches installed which are jam-nut adjustable. The pneumatic latch mounted switches and the deploy switch will be discussed in this chapter. For information regarding the flasher, refer to 78-30-14.

2. Operation. The operation of the thrust reverser in general was discussed in 78-30-00, Operation. This chapter elaborates in more detail how the circuitry powers, controls, and indicates reverser operation. In conjunction with the text, use the electrical schematics (Figures 7-11, 78-30-00) to gain an understanding of the thrust reverser/aft nacelle wiring harnesses function during thrust reverser operation.

   A. Stowed and Locked (Figure 7, 78-30-00).

      With the thrust reverser stowed and locked, the only power to the wire harness comes into the reverser disconnect at pin C and goes to the pneumatic latch mounted switches (S4B and S5B, "N.C." terminals). This power is available in case of a fault related pneumatic latch unlock and will actuate the Auto Stow function to be discussed later.

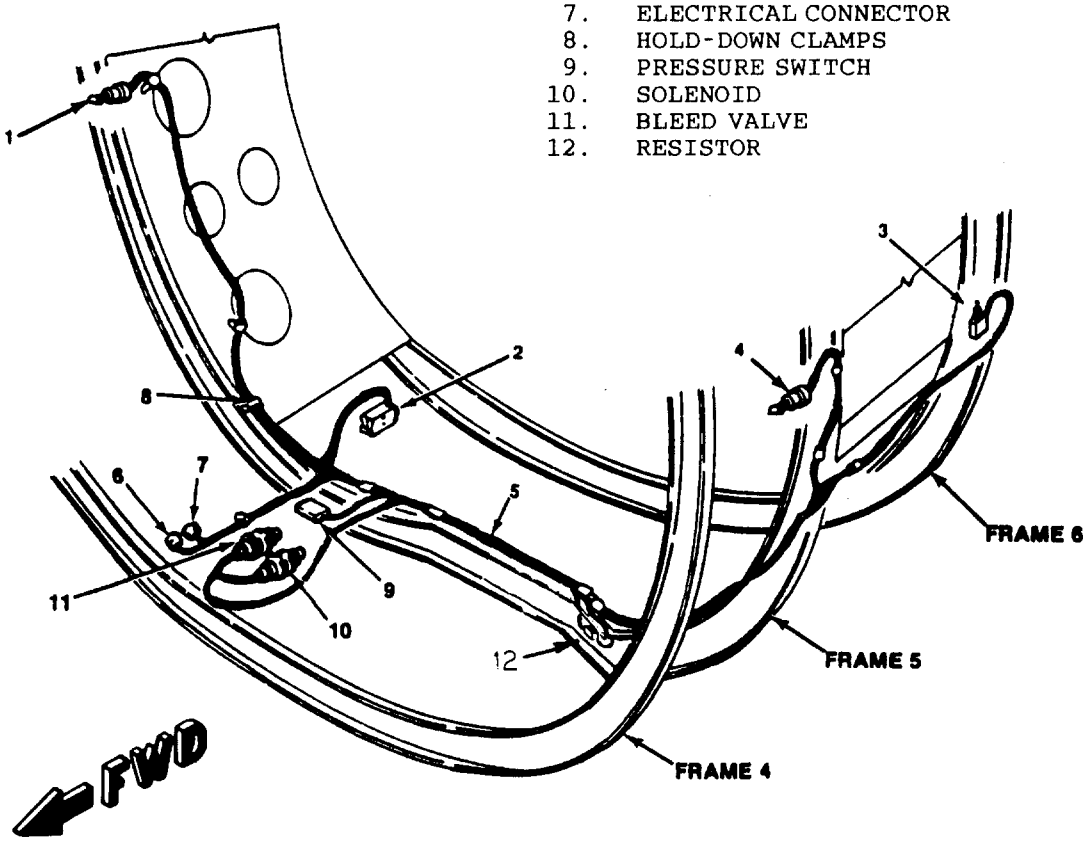
   B. Deploy Command - Translating Aft (Figure 8, 78-30-00).

      With the reverse levers raised to the "Reverse Idle" (lockout detent), power is now routed through pin E of the reverser disconnect to the pneumatic latch control solenoid valve. Energizing pin E opens the valve which allows engine bleed air to pressurize the pneumatic latches. The latch piston moves, retracting the latch levers from the beam stops and unlocking the translating beams. Simultaneously, as the pneumatic latches unlock, the latch mounted switches reposition and power flows through S4A and S4B ("N.C." to "C" terminals) and to pin A of the connector on the directional control actuator solenoid valve to prime the air motor to drive in the deploy direction when air is supplied. A branch circuit provides power through pin D of the reverser disconnect to the "C" terminal of the pneumatic latch switch (S4B), to the "C" terminal of the deploy switch (S3), to the "C" terminal of pneumatic latch switch (S5B). Power flows on to pin A of the pneumatic regulator valve solenoid (P4) which opens the valve to allow engine bleed air to the air motor which drives in the deploy direction, moving the translating structure toward deploy. As current flowed to the deploy switch (S3), it passes through it ("C" to "N.C.") to energize the "Transit" light. A 130 ohm resistor in the transit light circuit mutes the indicator output.

C. Fully Deployed - Below 80% N1 (Figure 9, 78-30-00).

When the translating structure reaches full deploy, an actuating pin on the outboard gear rack repositions the deploy switch (S3) which breaks the circuit to the "Transit" light. Simultaneously a circuit is completed through the deploy switch ("C" to "N.O.") to energize the "Reverse" light. A separate circuit in the deploy switch energizes a solenoid coil (L1) to withdraw the throttle lockout allowing the throttle to be advanced for high reverse power. Also a branch circuit from the deploy switch flows current to the throttle position switch (S7, "C" to "N.C.") and on to deadend at pin C of the pressure switch (P7).

1. INBOARD PNEUMATIC LATCH SWITCH
2. FLASHER
3. DEPLOY SWITCH
4. OUTBOARD PNEUMATIC LATCH SWITCH
5. WIRING HARNESS
6. ELECTRICAL CONNECTOR
7. ELECTRICAL CONNECTOR
8. HOLD-DOWN CLAMPS
9. PRESSURE SWITCH
10. SOLENOID
11. BLEED VALVE
12. RESISTOR



NOTE: Wire harness consists of items 1 through 8 & 12. Items 9, 10, 11 shown for clarity only.

Figure 1 - Electrical Wiring Harness Assembly

D. Max Reverse Thrust - Above 80% N1 (Figure 10, 78-30-00).

As the reverse levers are raised to increase reverse thrust, the throttle position switch (S7) is repositioned as power is increased above 80% N1 rpm. This completes a circuit through the throttle position switch (S7, "C" to "N.O.") and in to the pressure switch (P7) through pin B to the "N.O." terminal. A branch circuit also leaves the pressure switch through pin A to energize the bleed-off solenoid valve. The circuit to pin C of the pressure switch is broken by the repositioning of the throttle position switch.

E. Stow Command - Translating Toward Stow (Figure 11, 78-30-00).

With a stow command, power is provided through pin C of the reverser electrical disconnect to the pneumatic latch switches (S4B and S5B, "N.C." terminals). Even though the pneumatic latch control solenoid valve is de-energized, the pneumatic latches are mechanically held unlocked and therefore circuits are complete through the latch switches (S4B and S5B, "N.C." to "C"). From the "C" terminals of the latch switches, three branch circuits further distribute power. The first sends power back through pin D of the reverser electrical disconnect to the throttle switches (S1 and S2). Power deadends at the "N.C." terminal of the S1 switch but can flow through the S2 switch ("C" to "N.C."), through pin F of the reverser electrical disconnect and on to pin C of the directional control actuator solenoid valve. This primes the pneumatic actuator air motor to drive in the stow direction when engine bleed air is supplied. The second branch circuit provides power to pin A of the pneumatic actuator regulator solenoid valve to open it which allows engine bleed air to drive the air motor and hence the translating structure toward stow. The third branch circuit provides power through the deploy switch (S3, "C" to "N.C.") to turn on the "Transit" light steady. Again, the light is dim since the power must flow through the 130 ohm resistor. Once the translating structure is fully stowed, the pneumatic latches are mechanically released to extend to the "locked" position repositioning the latch switches and breaking the circuits through S4B and S5B. The system then is returned to the stowed and locked configuration (Figure 7).

F. Auto Stow (Figure 12, 78-30-00).

Anytime a pneumatic latch becomes "unlocked" (uncommanded), circuitry is completed through the affected latch switch to energize the same components that were energized with a stow command. The exception is that power will also flow through the unaffected latch switch "C" to "N.O." which energizes the flasher. If after 2 seconds, the malfunctioning pneumatic latch has not "relocked" the "Transit" light will begin to flash (bright-dim-bright) as long as the condition persists. Other malfunctions that cause an input to the flasher unit are discussed in 78-30-02 and 78-30-14, Operation.

Electrical System - Maintenance Practices

1. General. Maintenance of the electrical system consists of removal/installation, adjustment/test, inspection/check and approved repairs.

2. Removal/Installation. To remove and install wiring harnesses of the thrust reverser system which are part of the airframe installation, refer to the applicable aircraft maintenance manual for information regarding access provisions. This manual will only address the procedure for removal/installation of the wiring harness installed in the aft nacelle.

   A. Removal.

      (1) Remove thrust reverser/aft nacelle from the aircraft per 78-30-00, Removal/Installation.

      (2) Separate the translating structure from the aft nacelle per 78-30-04, Removal/Installation.

      (3) Remove all hold-down clamps securing the harness in the aft nacelle.

      (4) Remove the electrical connector from the pressure switch, and the two connectors from the pneumatic actuator.

      (5) Remove the pneumatic latch switches from the pneumatic latches by:

         (a) On early production reversers not incorporating SC-F20-004A, remove the two nuts and screws (see Figure 201, 78-30-10) securing the switches to the latches and lift switches out.

         (b) On early production reversers incorporating SC-F20-004A and later production reversers with improved switches installed (see Figure 201, 78-30-10), remove the switches by removing the aft jam-nut and removing the switch from the mounting bracket.

      (6) Remove the deploy switch from the outboard pinion gearbox by:

         (a) On early production reversers not incorporating SC-F20-004A, remove the deploy switch by removing the two nuts, washers and screws (see Figure 201, 78-30-08) securing the mounting bracket to the outboard pinion gearbox. Removing the mounting bracket from the gearbox gives access to remove the two nuts, washers and screws securing the switch to the mounting bracket and remove switch from bracket.

         (b) On early production reversers incorporating SC-F20-004A and later production reversers with improved deploy switches installed, remove the deploy switch by removing the mounting bracket (see Figure 201, 78-30-08) as stated in (a) above. Remove switch from bracket by removing the innermost jam-nut and backing the switch out of the bracket.

      (7) Remove the resistor from frame 5 (Figure 1) by removing the two nuts, lock washers, washers and screws.

      (8) Remove the flasher unit from the mounting bracket by removing the three nuts from the flasher mounting studs (see Figure 1, 78-30-14) and also remove the seven ground wires by removing the two self-locking nuts and lifting the connection terminals off of the mounting screws.

(9) Remove the bleed-off solenoid valve and the pneumatic latch control solenoid valve by removing the nut, washer and screw to the aft nacelle stringer.

NOTE: If the same harness is not to be reinstalled, it will be necessary to cut the wires going to both the bleed-off solenoid valve and the latch control solenoid valve to be spliced into the replacement harness. Be sure to leave plenty of wire on valves for ease of splicing.

(10) Remove wiring harness from aft nacelle.

B. Installation.

(1) Place wiring harness in aft nacelle and temporarily install a few hold-down clamps to secure harness in position.

(2) Install the bleed-off solenoid valve and the pneumatic latch control solenoid valve into the aft nacelle and secure with clamps, screw, washer and nut.

NOTE: On reversers incorporating SC-F20-003, the bleed-off solenoid valve will have separate mounting provisions (see Figure 6, 78-30-00).

(3) Splice wires of bleed-off solenoid valve and pneumatic latch control solenoid valve into wiring harness. Use Figure 101, 78-30-00, for wiring number identification. Cover each splice with heat-shrink tubing or wrap with electrical tape. Cover total splice with heat-shrink tubing or electrical tape.

(4) Introduce the flasher unit into the aft nacelle and secure with three nuts on the mounting studs. Attach the seven ground wire connectors to the two mounting screws and secure with two self-locking nuts.

(5) Install the resistor on frame 5 and secure with the two screws, washers, lock-washers and nuts removed in Step (7) above.

(6) Connect Cannon connectors to the pressure switch, pneumatic actuator regulator valve and directional control valve.

(7) Install the pneumatic latch switches onto the pneumatic latches by:

(a) On early production reversers not incorporating SC-F20-004A, pre-adjust the pre-soldered and potted switches before installation per Figure 201. Install the switches onto the pneumatic latches and secure with the two screws and nuts removed in Step (7)(a) above (see Figure 201, 78-30-10). Adjust installed switches per Adjustment/Test of this chapter after installation of translating structure.

(b) On early production reversers incorporating SC-F20-004A and later production reversers with improved latch switch provisions, install the switches into the pneumatic latch switch mount bracket (see Figure 201, 78-30-10) and secure using the adjusting jam-nuts. Adjust switches per Adjustment/Test of this chapter after translating structure is installed.

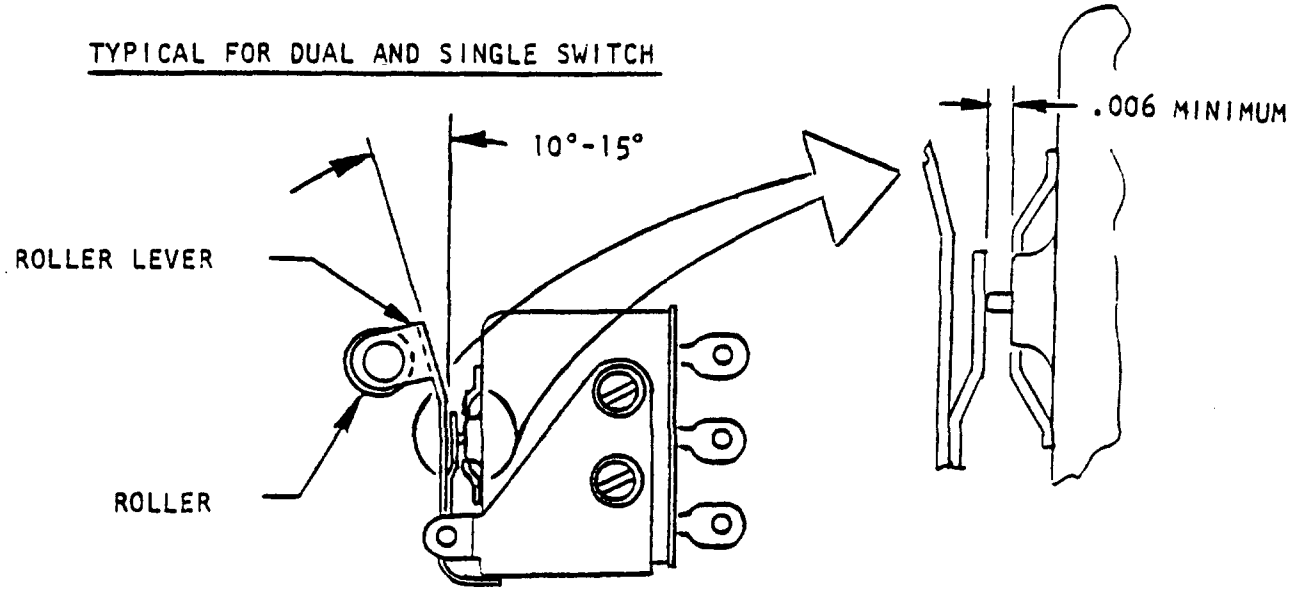


Figure 201 - Pneumatic Latch Switch Pre-adjustment

(8) Install the deploy switch onto the outboard pinion gearbox by:

(a) On early production reversers not incorporating SC-F20-004A or SC-F20-006, the translation section must be removed to install the deploy switch (see Section 78-30-04 for removal instructions). Preadjust switch per Figure 201. Install the deploy switch into the mounting bracket with the two screws, washers and nuts removed in Step (6)(a). Adjust the switch to "paddle" contact using a screwdriver technique similar to Figure 202. The switch is properly adjusted when the actuator "paddle" has no play and moves to actuate the switch as soon as pressure is applied. Mount the switch and bracket onto the pinion gearbox and secure with screws, washers and nuts removed in Step (6)(a). Check deploy switch per Adjustment/Test of this chapter after installing translating structure.

(b) On reversers not incorporating SC-F20-004A but having the deploy switch access door, SC-F20-006, incorporated, the switch and switch bracket may be installed with the thrust reverser mounted on the engine and the translating structure in place.

(c) On early production reversers incorporating SC-F20-004A and on later production reversers with improved switching provision but not incorporating the deploy switch access door, SC-F20-006, the translation section must be removed to install the deploy switch. Install the deploy switch into the mounting bracket with the two adjusting jam-nuts. Adjust and safety wire jam-nuts. The switch is properly adjusted when the actuator paddle has no play and moves to actuate the switch as soon as pressure is applied. Install the switch and bracket onto the outboard

pinion gearbox and secure with the two screws, washers and nuts removed in Step (6)(a) (see Figure 201, 78-30-08). Check deploy switch per Adjustment/Test of this chapter after installing translating section.

(d) On reversers incorporating both SC-F20-004A and SC-F20-006 or production reversers with the improved switch and the switch access door, the switch assembly may be installed with the thrust reverser mounted on the engine and the translating section installed.

(9) Final install all hold-down clamps removed in Step A(3) above.

(10) Install translating structure into aft nacelle per 78-30-04, Removal/Installation.

(11) Install thrust reverser/aft nacelle onto aircraft per 78-30-00, Removal/Installation.

3. Adjustment/Test.

A. Adjustment of Pneumatic Latch Switches (Original Configuration).

(1) Check/adjust that the switches operate (two distinct clicks) as the latch plunger is manually depressed into the latch body. When plunger is released, spring action should extend the plunger and the two clicks should be heard again. Adjust as required per Figure 202.

(2) Check that applying forward or aft pressure to the latch plunger in both depressed and extended positions does not operate switches. Adjust tabs as required to obtain switch operation only through vertical movement of the plunger.

(3) Check to ensure that the switches remain actuated (switch plunger depressed) when the pneumatic latches are unlocked with latching lever retained by the retaining lever (see Figure 2 78-30-10).

B. Adjustment of Pneumatic Latch Switches (Product Improved).

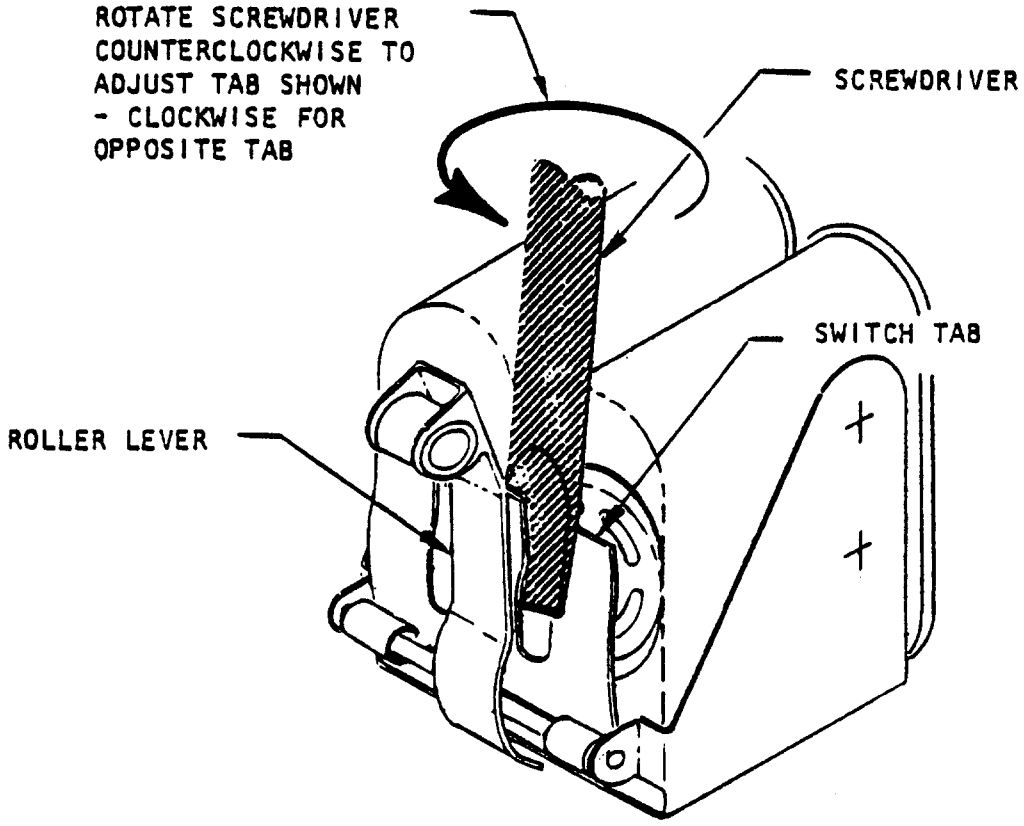
(1) With the pneumatic latch manually "unlocked" (plunger depressed), adjust the position of the switch by using the two jam-nuts (see Figure 203). The switch is properly adjusted when the actuating roller just contacts the small diameter of the plunger.

(2) Use the test box AST-2860 and 6 (±1) psig shop air per Removal/Installation, 78-30-00.

(3) Select deploy and observe for proper sequence of "Transit" and "Reverse" lights. Select stow and check for proper light sequence again. If necessary, slightly adjust switch position to obtain proper sequence.

(4) Check that applying fore and aft pressure to the plunger while it is extended or depressed does not cause the switch to actuate. If necessary, adjust switch position.

(5) With the pneumatic latch levers retained in the unlocked position and no shop air applied, ensure that the latch switches are not actuated (plunger extended).



DUAL SWITCH INSTALLATION

Figure 202 - Latch Mounted Switch Assembly Adjustment

(6) Cycle the reverser to deploy and stow several times. Ensure that the latch switches are actuated with repeatable accuracy.

(7) Tighten and lockwire jam-nuts.

C. Check Deploy Switch Function.

(1) Connect the electrical test box (Figure 203, 78-30-00) and a shop air supply to the thrust reverser. With the air supply turned off, electrically request deploy, then slowly open the manual air valve to gradually move the translating section toward deploy. Monitor the operation of the deploy switch via the "Deploy" light on the test box as the blocker door closes.

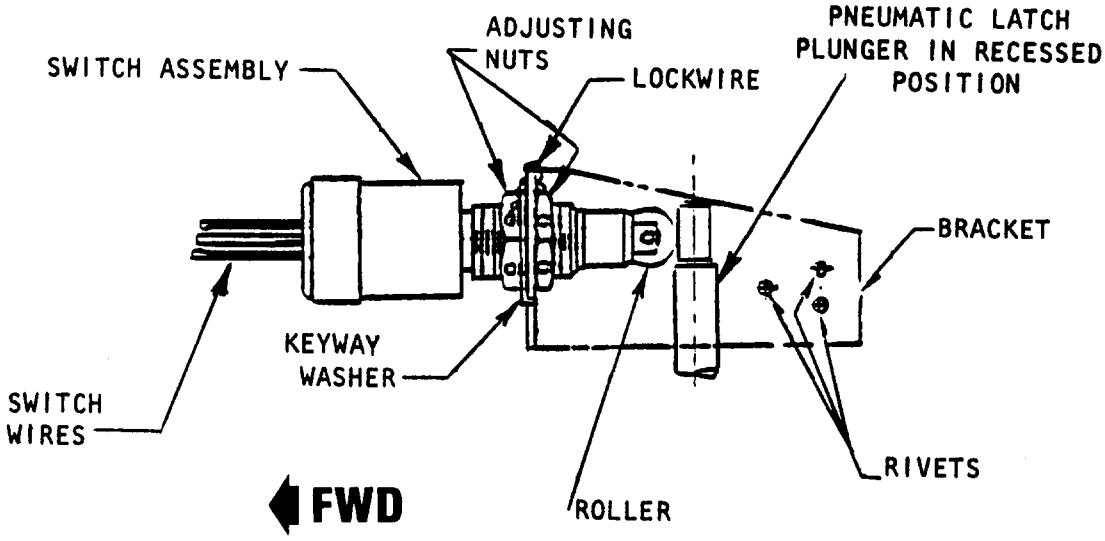


Figure 203 - Pneumatic Latch Switch Adjustment

(2) Grasp the top and bottom of the tailpipe and pull aft. Note the "Deploy" light remains constant. Move the tailpipe up and down right to left and note the "Deploy" light remains constant.

(3) Electrically select stow. Note "Deploy" light extinguishes as the blocker door opens and the "Transient" light goes on. Repeat, selecting deploy, then stow several times while assuring appropriate indication on the "Transient" and "Deploy" lights. If the deploy light operates improperly or if it is intermittent during Item C, (2) test, re-adjust as required to obtain proper switch sequencing.

Flasher - Description and Operation

1. Description. The flasher unit (see Figure 1) is mounted in the aft nacelle at approximately the 7 o'clock position on a bracket located between frames 5 and 6. The flasher unit is a solid-state, hermetically sealed, transistorized switch device that converts a steady 28 vdc input into an intermittent 28 volt DC output with a flashing rate of 120 cpm. The flasher has the capability to receive two separate inputs and all inputs/outputs are solder/potted connections.

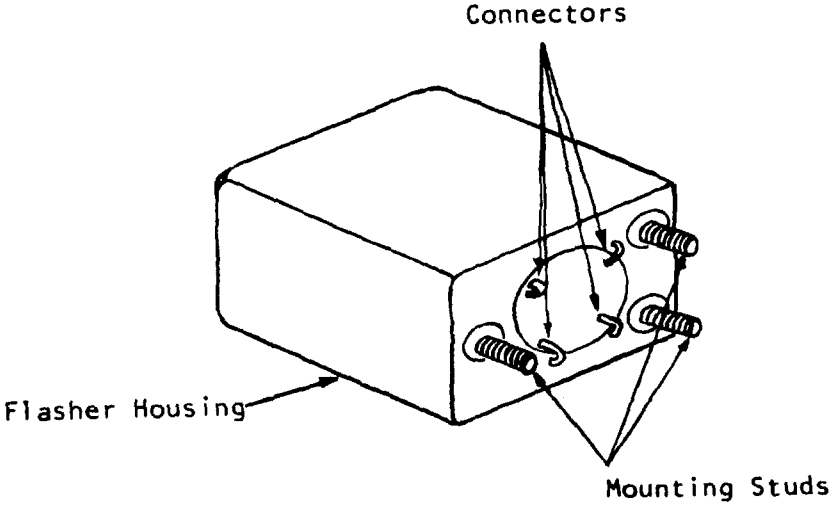


Figure 1 - Flasher Unit

2. Operation. The flasher functions to flash the "Transit" light in the cockpit whenever an unsafe condition exists requiring the reverser to be stowed if possible. Inputs to the No.1 terminal of the flasher are associated with malfunctions of the pneumatic latches with the reverser stowed or commanded to deploy and are separately discussed below.

A. One or Both Pneumatic Latches "Unlock" - Reverser Stowed.

This situation activates the Auto Stow function discussed in 78-30-00, Operation and illustrated in Figure 11 of the same chapter/section. The input to No. 1 terminal of the flasher results from circuits being completed through the pneumatic latch switch(es) (S4B or S5B) "N.C." to "C" contacts. The "Transit" light immediately illuminates steady and if the "unlock" condition persists more than 2 seconds, the light would begin to flash (bright-dim-bright) until the malfunctioning pneumatic latch "locks" again.

B. One or Both Pneumatic Latches Remain "Locked" - Deploy Commanded.

This situation prevents the reverser from deploying which could result in asymmetrical thrust if the other engine is advanced to high power in reverse. The circuit to the No. 1 terminal of the flasher is the same as for the above malfunction and the indication will be the same. Refer to 78-30-02, Operation for discussion of the circuitry and Figure 2, 78-30-02 for illustration of the circuitry.

Inputs to the No. 2 terminal of the flasher are associated with malfunctions of components used in the Safety System. These possible malfunctions will occur when the reverser is deployed and are discussed in Operation, 78-30-02 and illustrated in Figures 3 and 4 of the same chapter/section. The different malfunctions are listed and summarized below.

C. Air Pressure Not Available at Pressure Switch - Below 80% N1.

Under these circumstances, it could result that the reverser might not be able to be stowed on command since this would tend to indicate that the poppet valve of the pneumatic actuator is closed, thus not providing an air supply to the air motor. However, it could also mean that the pneumatic tube to the pressure switch is ruptured or the pressure switch itself has failed in the "no pressure" position. In the last two cases the reverser would stow but in all cases the "Transit" light flashes (bright-off-bright).

D. Air Pressure Available at Pressure Switch - Above 80% N1.

Under these circumstances, it could result in an asymmetrical thrust condition beyond aircraft aerodynamic control should a fault induced stow command occur. To cause this malfunction, either the bleed-off solenoid valve has failed closed or an open circuit exists between pin B of the pressure switch and the bleed-off solenoid valve. However it could be that the poppet valve has failed in the open position keeping an air supply available to the air motor. In all cases the "Transit" light would flash (bright-off-bright).

Flasher - Maintenance Practices

1. General.

Maintenance of the flasher unit is limited to removal/installation.

2. Removal/Installation.

A. Removal.

(1) Remove the thrust reverser/aft nacelle from the aircraft per 78-30-00, Removal/Installation.

(2) Cut electrical wires as close to flasher as possible.

(3) Remove three nuts from the mounting studs of the flasher and remove the flasher from the aft nacelle mounting bracket.

B. Installation.

(1) Place flasher onto aft nacelle mounting bracket and secure in place with three nuts removed in step (3) above.

(2) Using wiring diagram (Figure 101, 78-30-00), splice pre-connected/ pre-potted wires of the replacement flasher to the previously cut wires of the electrical harness observing wire numbers marked on both flasher wires and the harness wires. Cover splice connection with electrical tape or heat-shrinkable sleeving.

NOTE: It may be necessary to split harness sleeving to see wire numbers.

(3) Checkout new flasher operation by using electrical test box AST 2860 along with shop air per 78-30-00, Adjustment/Test.

(4) Install the thrust reverser/aft nacelle onto the aircraft per 78-30-00, Removal/Installation .

Pressure Switch - Description and Operation

1. Description. The pressure switch, (see Figure 1) is mounted in the aft nacelle at approximately the 6:30 o'clock position on the forward side of frame 5. The pressure switch is a sealed assembly incorporating a single-pole, double-throw switch actuated by engine bleed air pressure working on a spring-loaded diaphragm mechanism. The pressure switch also incorporates a screw-on electrical connector for ease of replacement and trouble shooting.

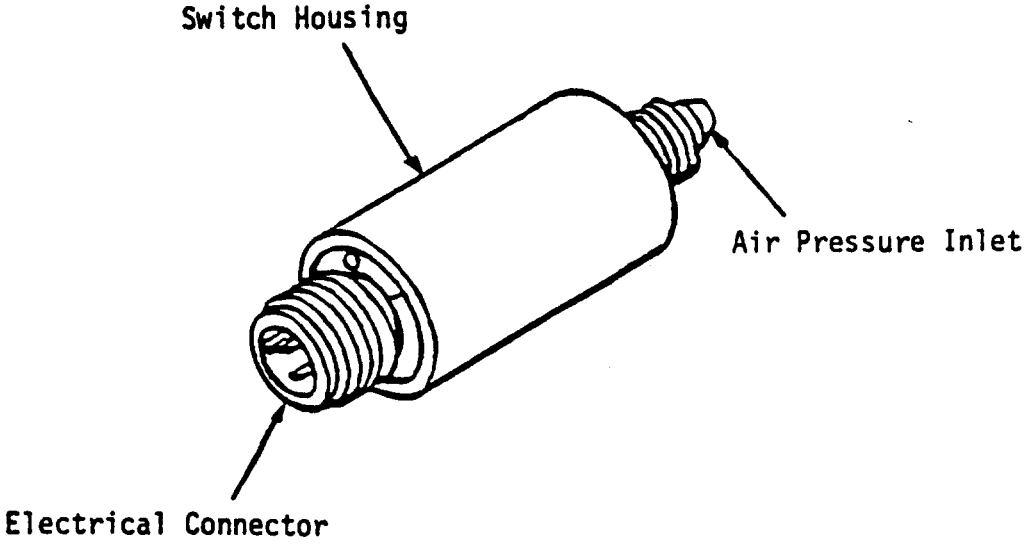


Figure 1 - Pressure Switch

2. Operation. The pressure switch functions to cause the "Transit" light to flash indicating an unsafe condition exists whenever there is air available to the pneumatic actuator air motor with the reverser deployed and engine power above 80% N1 rpm. Under these circumstances, a fault caused stow command could generate an asymmetrical thrust condition beyond the aircraft aerodynamic control. The pressure switch senses the air pressure on the downstream side of the air inlet valve of the pneumatic actuator just before the inlet to the pneumatic actuator air motor. Use Figures 8 and 9, 78-30-00, and following text to understand the function of the pressure switch in the safety system. With the reverser fully deployed, circuits are completed to provide power to pin C of the pressure

switch and with air pressure at 6(±1) psig, the pressure switch S8 positions "N.O." to "C" so power simply dead ends. As reverse thrust is increased above 80% N1 rpm, circuits are complete through pins B and A to energize the bleed-off solenoid valve V2. This action causes the air supply to be shut off and as the air pressure decreases through 3 psig, the pressure switch repositions to "N.C." to "C".

Refer to Figures 3 and 4, 78-30-02, for examples of malfunctions of the pressure switch that would show up as a flashing "Transit" light. In Figure 3 the situation depicts a failed pressure switch in a zero pressure mode or a broken pneumatic line to the pressure switch resulting in zero pressure. In Figure 4, either the pressure switch has failed to the pressurized (6[±1] psig) or the bleed-off solenoid valve has failed to open which would have shut the air supply off to the air motor.

Pressure Switch - Maintenance Practices

1. General. Maintenance of the pressure switch is limited to removal/installation.

2. Removal/Installation. It is possible to gain access to the pressure switch by going through the lower right-hand turnbuckle access panel. However, if time permits and to avoid damage to pneumatic plumbing and electrical harnesses, it is recommended that the following procedure be used.

   A. Removal.

      (1) Remove the thrust reverser/aft nacelle from the aircraft per 78-30-00, Removal/Installation.

      (2) Disconnect the pneumatic tube to the pressure switch.

      (3) Disconnect the electrical connector from the pressure switch.

      (4) Remove the pressure switch from the aft nacelle by removing the attaching hardware (nut, washer, spacer, bolt and clamp).

   B. Installation.

      (1) Place the pressure switch into the aft nacelle and secure with clamp, bolt, spacer, washer and nut removed in step (4) above.

      (2) Connect electrical connector to pressure switch.

      (3) Connect pneumatic tube to pressure switch.

      (4) To checkout pressure switch for proper operation, use test box AST 2860 and shop air per 78-30-00, Maintenance Practices, to cycle reverser to deploy and observe the following:

         (a) With the reverser fully deployed and "Below 80%" selected, only the "Reverse" light should be illuminated. If the "Transit" light begins to flash after 2 seconds, there is either low (< 6 (±1) psig) air pressure at the pressure switch or the pressure switch has failed in the less than 6 (±1) psig position.

         (b) With the reverser fully deployed and "Above 80%" selected, only the "Reverse" light should be illuminated and air should be venting from the bleed-off solenoid valve. If the "Transit" light begins to flash after 2 seconds, then the pressure switch has failed to the greater than 6 (±1) psig position or the poppet valve in the pneumatic actuator has failed in the open position.

      (5) Install thrust reverser/aft nacelle onto aircraft per 78-30-00, Removal/Installation.

Engine Tailpipe - Description and Operation

1. Description. The engine tailpipe used on aircraft equipped with thrust reversers is modified by shortening the tailpipe and adding a pressure seal around the outside diameter at the aft end (see Figure 1). The tailpipe mounts to the aft flange of the fan frame interfaces with the thrust reverser tailpipe and blocker doors at the aft end.

2. Operation. The engine tailpipe functions as a mixer nozzle to direct engine primary (core) and secondary (fan) exhaust gases to the thrust reverser tailpipe. The pressure seal around the outer diameter of the aft end serves to prevent exhaust gases from leaking into and pressurizing the aft nacelle with the thrust reverser stowed.

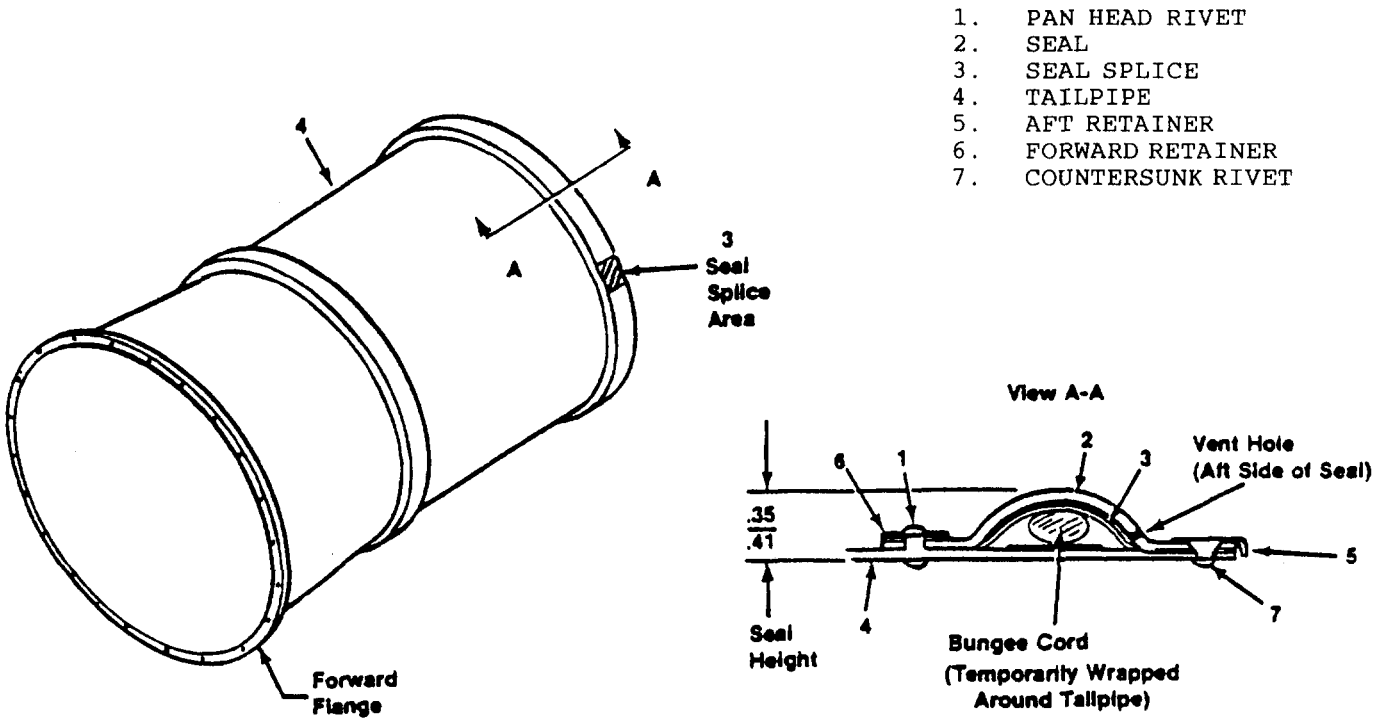


Figure 1 - Engine Tailpipe

Engine Tailpipe - Maintenance Practices

1. General. Maintenance to the engine tailpipe consists of removal/installation and approved repairs.

2. Removal/Installation.

   A. Removal.

      (1) Remove aft nacelle/thrust reverser per 78-30-00, Maintenance Practices.

      (2) Disconnect EPR manifold.

      (3) Remove attaching hardware securing tailpipe to fan frame case aft flange and remove tailpipe.

   B. Installation.

      (1) Locate tailpipe to fan frame case aft flange and secure using attaching screws.

         NOTE: Ensure tailpipe is properly indexed by observing that the tailpipe is canted outboard and that the EPR probe is at the 1 o'clock position.

      (2) Connect EPR manifold.

      (3) Install aft nacelle/thrust reverser per 78-30-00, Maintenance Practices.

3. Approved Repairs.

   A. Replacement of Tailpipe Seal.

      (1) Carefully remove attaching rivets to avoid enlarging the 0.128-0.1285 inch diameter holes and remove the retainers and old seal.

         NOTE: Match-mark retainers prior to removal to ensure they are reinstalled in the same position.

      (2) To install replacement seal, wrap a length of 1/4 inch bungee cord midway between the forward and aft rivet hole lines. The bungee cord establishes the required seal height of 0.35 to 0.41 inch.

      (3) Locate replacement seal (Figure 1, Item 2) around the tailpipe, over the bungee cord and cut length, so that the ends butt together.

      (4) Remove the seal and bond the ends together with the thin seal splice (Figure 1, Item 3). Use Dow Corning 93-076 RTV adhesive and 204 primer per manufacturer's instructions.

      (5) Use a leather punch to punch vent holes through the aft end of the replacement seal at approximately every 10 inches.

(6) Again locate seal with vent holes facing aft onto the tailpipe and place aft seal retainer in position, observing match-mark. Temporarily secure retainer in position with Cleco's and back drill to match holes in seal with holes in engine tailpipe and retainer.

NOTE: There are two configurations of aft seal retainers. See Figure 1 for applicable installation data.

(7) Locate forward seal retainer in position, observing match-mark. Temporarily secure retainer in position with Cleco's and back drill to match holes in seal with holes in engine tailpipe and retainer.

(8) Remove both seal retainers, the seal and the bungee cord.

(9) Reinstall seal and seal retainers. Secure with applicable rivets based on seal configuration.

B. Minor Repairs to Tailpipe Seal.

(1) Repair minor longitudinal cuts/tears and wear through the outer surface by covering with Dow Corning 93-076 RTV using 204 primer per manufacturer's instructions.

C. Sheet Metal Repairs.

(1) Refer to Engine Maintenance Manual SEI-187 for detailed limits and repair procedures.