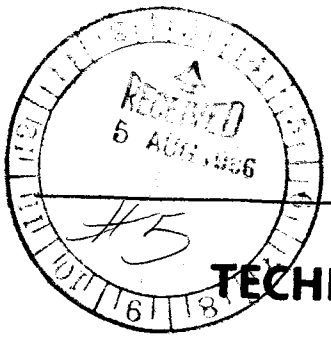


T.O. 1A-7D-2-4TP-1

TECHNICAL ORDER PAGE SUPPLEMENT

TECHNICAL MANUAL

ORGANIZATIONAL

PNEUDRAULIC SYSTEMS
A-7D

THIS PUBLICATION SUPPLEMENTS T.O. 1A-7D-2-4, DATED 1 JULY 1985, CHANGED 15 MAY 1986. THIS IS A NONCUMULATIVE TOPS.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE

30 JUNE 1986

LIST OF EFFECTIVE PAGES

NOTE: This TOPS contains supplementary information. Text pages do not supersede pages of basic TO but will be inserted facing the amended page. Total number of effective pages is 1.

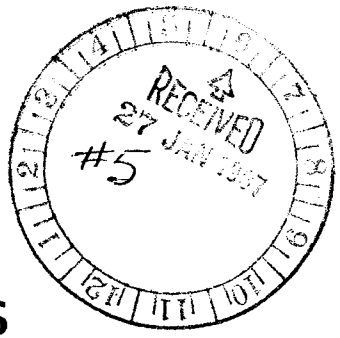
PAGE NO.	TOPS NO.
A-2H	TP-1

T.O. 1A-7D-2-4

TECHNICAL MANUAL

MAINTENANCE INSTRUCTIONS

ORGANIZATIONAL



PNEUDRAULIC SYSTEMS

A-7D

VOUGHT CORPORATION
N00019-67-C-0143
F34601-84-C-2924

Published under authority of the Secretary of the Air Force.

1 JULY 1975
Change 23 — 15 October 1986

LIST OF EFFECTIVE PAGES

INSERT LATEST CHANGED PAGES. DESTROY SUPERSEDED PAGES.

NOTE: The portion of the text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Extensively changed illustrations are indicated by a miniature pointing hand symbol pointing to the words MAJOR CHANGE.

Dates of issue for original and changed pages are:

Original 0	1 Jul 1975	Change 8	1 Oct 1979	Change 16	1 Aug 1983
Change 1	15 Jan 1976	Change 9	15 Aug 1980	Change 17	1 Nov 1983
Change 2	15 Nov 1976	Change 10	1 Mar 1981	Change 18	15 Sep 1985
Change 3	15 Apr 1977	Change 11	1 May 1981	Change 19	15 Dec 1985
Change 4	1 Jul 1977	Change 12	15 Mar 1982	Change 20	15 Mar 1986
Change 5	15 Nov 1977	Change 13	15 Jun 1982	Change 21	15 May 1986
Change 6	1 Nov 1978	Change 14	1 Feb 1983	Change 22	1 Oct 1986
Change 7	1 Apr 1979	Change 15	15 Jun 1983	Change 23	15 Oct 1986

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 246 CONSISTING OF THE FOLLOWING:

Page No.	*Change No.	Page No.	*Change No.	Page No.	*Change No.	Page No.	*Change No.
Title	.23	1-11	6	1-40	0	2-15	.15
A	.23	1-12 Blank	6	1-41	.16	2-16	.16
B	.23	1-13	6	1-42	0	2-17	4
C Blank	.20	1-14	.17	1-43	2	2-18	.16
i	.16	1-15	2	1-44 thru 1-51	0	2-19	0
ii	6	1-16 Blank	2	1-52	7	2-20	.16
iii	5	1-17 thru 1-20 Deleted	2	1-53	0	2-21	.16
iv	6	1-21	2	1-54	7	2-22 thru 2-27	0
v	5	1-22	0	1-55	.12	2-28 Blank	0
vi	.19	1-23	.15	1-56	2	3-1	2
vii	2	1-24	0	2-1	5	3-2 Blank	
viii	.16	1-25	.15	2-2	0	3-3	4
viii-A	2	1-26	0	2-3	0	3-4	1
viii-B Blank	2	1-26A	.16	2-4	.15	3-5	0
ix	0	1-26B	.16	2-5	.10	3-6	0
x thru xiii	.23	1-27	1	2-6	5	3-7	1
1-0	0	1-28	0	2-7	.15	3-8	1
1-1	.12	1-29	.12	2-8	1	3-8A	5
1-2	2	1-30	.16	2-8A	2	3-8B	5
1-3 thru 1-6	0	1-31	0	2-8B	5	3-9	0
1-7	1	1-32	.16	2-9	5	3-10	5
1-8	1	1-33 thru 1-35	0	2-10	5	3-11	.14
1-8A	5	1-36	.16	2-11	.13	3-12	.14
1-8B	5	1-37	2	2-12	0	3-13	.16
1-9	0	1-38	0	2-13	.22	3-14	0
1-10	5	1-39	.12	2-14	.15	3-15	.12

*Zero in this column indicates an original page.

USAF

LIST OF EFFECTIVE PAGES

Page No.	*Change No.
3-16 - 3-20	0
3-21	16
3-22	14
3-23	16
3-24	14
3-25 - 3-26	0
3-26A	15
3-26B Blank	15
3-27	12
3-28	16
3-28A	16
3-28B Blank	16
3-29	4
3-30	0
3-31	15
3-32	2
4-1 - 4-3	0
4-4	2
4-4A	5
4-4B Blank	5
4-5	2
4-6 - 4-8	0
4-9	16
4-10	0
4-11	18
4-12	0
5-1 - 5-10	0
5-11	11
5-12 - 5-14	16
5-15	0
5-16	16
5-17 - 5-18	0
6-1 - 6-2	0
6-3	15
6-4 - 6-8	0
6-9	15
6-10	5
6-10A	5
6-10B Blank	5
6-11 - 6-12	0
6-13 - 6-14	2
6-15 - 6-16	19
A-1	0
A-2	14
A-2A	5
A-2B - A-2G	12
A-2H	21
A-3	4
A-4	3
A-5 - A-8	2
A-9 - A-10	15
A-11	16
A-12	15
A-13	2
A-14 - A-19	0
A-20	1
A-21	4
A-22 - A-24	5
A-25	19
A-26	5
A-27	19
A-28	5
A-29 - A-35	19
A-36 Blank	19
Index-1	4
Index-2	0
Index-3	5
Index-4 - Index-5	0
Index-6	1
Index-7	0
Index-8 Blank	0

*Zero in this column indicates an original page.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

INTRODUCTION

THIS MANUAL.

This manual contains descriptive material and organizational maintenance instructions for personnel to maintain the pneudraulic systems of the A-7D Corsair II airplane. This manual includes maintenance instructions on the following:

Power Control (PC) No. 1 Hydraulic Supply System	Section I
Power Control (PC) No. 2 Hydraulic Supply System	Section II
Power Control (PC) No. 3 Hydraulic Supply System (Airplanes AF69-6197 and Subsequent)	Section III
Emergency Power Control Hydraulic Supply System	Section IV
Hydraulic Indicating System	Section V
Accumulator Precharge System	Section VI
General Maintenance Information	Appendix A

Each organizational maintenance manual, with the exceptions of T.O. 1A-7D-2-1, 1A-7D-2-16, 1A-7D-2-17, and 1A-7D-2-18 series, is arranged to present organizational system and component maintenance coverage in a standard manner. A table of contents, listing all A-7D organizational maintenance manuals, is provided herein. Refer to T.O. 1A-7D-2-1 for the introduction to the complete series of A-7D manuals.

ARRANGEMENT AND USE OF THIS MANUAL.

The material and organizational maintenance information presented in this manual are divided into sections, one section for each major system covered.

In the description paragraphs, all major components are described and a brief explanation of their primary functions is provided. All system indicators and controls necessary to operate a system are depicted and their functions described in a controls and indicators illustration. System major components not covered by this controls and indicators illustration are shown in a system arrangement illustration. Controls and indicators are not normally repeated in the system arrangement illustration.

In the operation paragraphs, a complete description of the system's operation is provided. Schematics and diagrams aid in the understanding of system theory. Where a system is complex, a block diagram provides a simplified overview of the system to assist understanding of the detailed descriptions and schematics. Each major component of the system is listed in a components table which summarizes its function and location.

In the operational checkout paragraphs, an operational checkout is provided to determine the operational status of the system. Where reference is made in the checkout to controls and indicators, capital (upper case) letters of decal nomenclature are used for all test equipment and all airplane placard (decal) switch or control positions. All airplane system controls and indicators are referred to by their descriptive title in lowercase letters. Operational checkout procedural steps, which indicate a mandatory condition or result, are followed by a number or numbers in braces. These numbers are keyed to a system troubleshooting (malfunction) table which suggests corrective actions if a mandatory condition or result is not present. The corrective actions are in order of probable cause. When corrective actions call for the replacement of more than one component, replacement should be made in order of the listing. The operational checkout is usually repeated after each replacement until acceptable performance is obtained.

Removal and installation procedures are provided for each system component. These procedures reference access requirements with step by step instructions on how to accomplish the task. Also provided, as applicable, are repair and parts replacement, adjustment, cleaning, draining, or lubrication, extreme environmental condition procedures, and nonroutine servicing. Routine servicing instructions are in T.O. 1A-7D-2-1.

TOOLS AND TEST EQUIPMENT REQUIRED.

Tools and equipment required for a particular maintenance procedure are listed under Tools Required or Test Equipment Required in the procedure. The list does not include tools and equipment needed for access and common hand tools. It does include standard support equipment such as voltmeters, multimeters, etc.

REFERENCE PUBLICATIONS.

Publications generally related to subject matter contained in this manual or specifically referenced in this manual are listed in the table of reference publications.

TIME COMPLIANCE TECHNICAL ORDERS.

Time compliance technical orders for the systems covered in this manual are listed in a table. The listing, in technical order numerical sequence, includes the basic date, title, ECP number, and date of the change or revision.

THIS REVISION.

This manual has been revised to incorporate formalization changes.

PRECAUTIONS.

STANDARD PRECAUTIONS. The following standard precautions should be observed during servicing and repair:

a. Wear safety goggles during hydraulic and pneumatic pressurization, depressurization, and line work.

b. Always depressurize the pneumatic system before disconnecting a line or replacing a component in the system.

WARNING

Hydraulic fluid is toxic to eyes, skin, and respiratory tract. Eye and skin protection required. Good general ventilation is normally adequate.

c. Drain hydraulic system replacement components of any preservative and refill with MIL-H-83282 hydraulic fluid before installation.

d. If flight control surfaces are cycled without all PC systems pressurized, the hydraulic system air check should be performed (T.O. 1A-7D-2-1).

e. When servicing the hydraulic system, bleed air from servicing hose and ensure that fluid quantity is sufficient to prevent pumping air into the system.

f. Do not attempt to straighten hoses during pump removal and installation.

CLEANNESS. The importance of maintaining high standards of cleanness while working on hydraulic and pneumatic systems cannot be overemphasized. Close tolerances and high system pressures require contamination-free operation. Proper cleanness standards can be maintained by observation of the following:

a. Clean fittings, including disconnects, and adjacent areas before disconnecting or removing.

b. Use only filtered, moisture-free, compressed air when drying lines and components.

c. Use only clean solvent and clean container when flushing lines or cleaning components.

NOTE

An adequate supply of clean solvent and clean, lint-free rags should be available.

d. Maintain clean, dry tools.

e. When disconnecting lines or components, loosen connections two turns and run system enough to discharge a small amount of hydraulic fluid from each connection, if practical.

f. Before installing unit, clean area around shipping plugs and install proper capped fittings. Fill unit on bench if practical.

g. When installing or connecting components, have proper size plugs and caps ready for immediate installation.

h. If practical, before connecting lines to units, loosen plugs in tube fittings one at a time and operate system to allow a small amount of hydraulic fluid to flow from the tube to flush thread burrs or chips. Immediately connect tube to fitting while decreasing fluid flow.

NOTE

High flow rate flushing of lines and selector valves is an effective method of cleaning the hydraulic system, provided that the contaminant and air are removed from the airplane hydraulic system.

i. Tube or hose ends of test equipment should not touch the floor. Keep ends plugged and covered with plastic bag when not in use.

j. Mask or cover all valve sliding rods, cylinder sliding rods, and line fittings when painting in adjacent area. Paint sticking to rods will damage packings and cause leaks. Paint on line fittings may also cause leaks.

k. Extreme care should be used to prevent dirt, metal chips, or other contamination from entering pneumatic system. Cap or plug any disconnected line or port.

HYDRAULIC SYSTEM LEAKAGE AND LINE CHECKS. Hydraulic system leakage and line checks should be performed in the following manner:

a. Visually check all lines and fittings for the following:

1. Leaks.

2. Proper assembly and installation of tubing and fittings.

3. Crossed lines (pressure connected to return and vice versa or PC No. 1, PC No. 2, and PC No. 3 lines interconnected).

4. Cross-threaded or stripped fittings.

5. Unattached lines.

6. Faulty or incorrect fittings.

7. Proper engagement of disconnects.

8. Improperly installed check valves, relief valves, and restrictors.

9. Pinched lines.

b. If a joint leaks, loosen fitting and check that tubing is properly aligned and seated. Retighten fitting to maximum torque or flats value and apply hydraulic pressure. Do not overtorque. If joint still leaks, shut down pressure and repair or replace components as necessary.

c. If leakage is noted in a particular compartment, wipe all applicable connections clean and apply hydraulic pressure. Determine which joint is leaking and perform step b. Do not tighten joints which are not leaking. Overtorquing is a major cause of joint and nut failure.

d. Any hydraulic system accumulator requiring repeated pneumatic servicing should be investigated and the problem corrected.

FLUSHING AND BLEEDING. General flushing and bleeding procedures are as follows:

a. Contamination of the hydraulic system with excessive air can result in various system malfunctions including complete loss of system pressure. In many cases, system malfunctions resulting from excessive air are erroneously attributed to faulty components. Excessive air in a system can result in one of the following malfunctions:

1. Hydraulic pump cavitation. Each PC system hydraulic pump requires a positive pump inlet pressure (35 psi) to maintain proper pump output. Excessive air ingested into the pump case will interrupt the flow of fluid through the pump. Loss of fluid flow from the pump will result in loss of reservoir pressurization supplying fluid to the pump inlet. This condition is not self-correcting and can result in overheating and subsequent failure of the pump.

2. Erratic control system response. Excessive air in a hydraulic system will affect response of that system. Since the servo valves utilized in the AFCS, trailing edge flaps, and nose wheel steering systems are dependent on precise flow and pressure balance, erratic operation of these systems could be indicative of excessive air within the hydraulic power control system.

b. When air is introduced into a pressurized hydraulic system, a small percentage of the air will enter into solution with the oil (the air will occupy space between the oil molecules). The air which is absorbed into solution in the hydraulic fluid is not detrimental to the system performance and does not cause any measurable effect on the compressibility or viscosity of the fluid. The larger percentage of the air becomes entrained in the oil as a finely divided mixture of air and fluid. As the oil and air mixture is circulated through various components such as pumps, servo valves, restrictors, and selector valves, the entire hydraulic system becomes a homogeneous mixture of fluid and air. Since the volume of air in mixture with fluid is proportional to the pressure within the system, removal of this air is most effectively accomplished by lowering the applied pressure. Removal of the air entrained as bubbles will be accelerated by decreasing the velocity of the fluid, allowing the air bubbles to float out of the mixture. Consideration of these properties has been incorporated into the hydraulic bleeding procedures, summarized as follows:

1. Bleeding following individual component replacement. This procedure assumes that the air introduced during component replacement is contained within the component and in the tubes leading to the component. Bleeding is accomplished at a low pressure, with a minimum amount of cycling. Cycling of other components should be avoided until the replacement component has been bled.

2. Complete system bleeding. Effective system bleeding is accomplished by cycling the fluid through a large unpressurized reservoir. The sudden drop in pressure and reduced velocity will allow the entrained bubbles to float out of the mixture. This procedure is accomplished by cycling the system oil through the unpressurized reservoir on an external hydraulic test stand.

c. Thoroughly flush all tubing before installation with P-D-680 drycleaning solvent until all foreign matter has been removed. Air pressure can be applied to aid in removing the solvent. Cap tube if not to be immediately installed.

d. Slow actuation is important in bleeding of the systems. Fast operation causes foaming of hydraulic fluid.

e. Ensure that all control links and levers are properly connected whenever power is on, unless systems are being bled separately.

f. Hydraulic system servo valves are spring loaded. xercise caution during bleeding procedure to ensure iat the valve control rod does not slip, allowing ervo valve to bottom hard.

g. Ensure that bleeding procedures are ccomplished following any hydraulic system iaintenance.

ISCONNECTS.

he following information describes and gives general ractices for the use of disconnects:

a. Disconnects are self-sealing couplings that acilitate hydraulic servicing and maintenance by roviding rapid separation or reconnection of lines vithout introduction of air into the system or loss of ydraulic fluid.

b. Couplings are hand-operated fittings that are ocked together with ratchet locks. When disconnecting, turn of the union nut to the left unlocks the fitting by neans of reverse threads within the coupling housing.

c. Connect couplings by aligning the halves and urning the union nut to the right.

d. During the tightening process, a series of clicks ndicates that the ratchet teeth of the union nut are nating with teeth on the lockspring assembly. Ensure hat coupling halves are mated firmly and securely.

e. When attaching protective cover to coupling half, nsure that cover is screwed on snugly to prevent acking off.

f. Check proper connection by visual observation.

g. Be careful to prevent fluid leakage while connecting or disconnecting external test stand hoses at the quick disconnects. Any fluid lost will be replaced by air.

O-RING PACKINGS.

Proper installation of packings is critical. Observe the llowing general rules concerning packing removal, nstallation, and inspection:

a. To prevent damage to packing groove or component, do not use sharp-edged tools to remove old packing. Use fabricated packing removal tool.

b. Destroy removed packings immediately to prevent reuse.

c. Fabricate packing removal tool from flattened 1/4-inch brass stock. Remove burrs, nicks, and sharp edges which could damage components.

d. Clean packing compartment groove with hydraulic fluid. Examine groove for scratches, foreign material, and burrs.

e. Do not remove packing from package envelope until component is ready for packing installation.

f. Inspect packings for defects.

g. For hydraulic components, moisten packing receiving groove and portion of component over which packing will pass during installation with hydraulic fluid.

h. Do not overstretch or roll packing onto the component. Keep packing mold line in one place to prevent rolling and twisting. Twisting will cause packing failure.

i. After packing installation, visually inspect seating of packing before further assembly of component.

j. For pneumatic system connections, install retainer and packing. Pack groove with MIL-G-4343 grease. Coat threads with light coat of MIL-G-4343 grease. Avoid excessive use of grease.

LIST OF SYSTEMS MAINTENANCE MANUALS

T.O. 1A-7D-2-1	General Information and Airframe Group
T.O. 1A-7D-2-1CL-1	General Information and Airframe Group — Ground Handling Checklist
T.O. 1A-7D-2-1CL-2	General Information and Airframe Group — Servicing Checklist
T.O. 1A-7D-2-2CL-1	Egress and Survival Systems Seat Removal and Installation Checklist
T.O. 1A-7D-2-2CL-1	Egress and Survival Systems Checklist
T.O. 1A-7D-2-3	Mechanical Accessories Systems
T.O. 1A-7D-2-4	Pneudraulic Systems
T.O. 1A-7D-2-5	Powerplant Systems

LIST OF SYSTEMS MAINTENANCE MANUALS (continued)

T.O. 1A-7D-2-5CL-1	Powerplant Systems — Engine Removal and Installation Checklist
T.O. 1A-7D-2-5CL-2	Power Loss/Flameout Occurrences Checklist
T.O. 1A-7D-2-5CL-3	Engine Setup Procedures Checklist — TF41-A-1, -1A, or -1B Engine
T.O. 1A-7D-2-6	Fuel System
T.O. 1A-7D-2-7	Landing Gear Systems
T.O. 1A-7D-2-7CL-1	Landing Gear Systems — Rigging Checklist
T.O. 1A-7D-2-7CL-2	Main/Nose Wheel and Tire Assembly Removal and Installation Checklist
T.O. 1A-7D-2-8	Flight Control Systems
T.O. 1A-7D-2-8CL-1	Flight Control Systems — Rigging Procedures Checklist
T.O. 1A-7D-2-9	Automatic Flight Control System
T.O. 1A-7D-2-9CL-1	Automatic Flight Control System Checklist
T.O. 1A-7D-2-10	Instrument Systems
T.O. 1A-7D-2-10CL-1	Instrument Systems Statistical Accelerometer Data Collection and Reporting Checklist
T.O. 1A-7D-2-11	Electrical Power and Lighting Systems
T.O. 1A-7D-2-12	Radio Communication and Navigation Systems
T.O. 1A-7D-2-13	Armament Systems
T.O. 1A-7D-2-13CL-1	Armament Systems Checklist
T.O. 1A-7D-2-13CL-2	Accessory Installation: MER-10N, TER-9A, SUU-20 Series Dispenser, LAU-88/A and LAU-117/A Missile Launcher, and AERO-3B Missile Launcher Checklist
T.O. 1A-7D-2-14	Weapon Control Systems
T.O. 1A-7D-2-14CL-1	Weapon Control Systems Checklist
T.O. 1A-7D-2-14-1	AN/APQ-126(V)8 and AN/APQ-126(V)11 Radar Sets, Theory of Operation
T.O. 1A-7D-2-14-3	AN/APQ-126(V)8 and AN/APQ-126(V)11 Radar Sets, Maintenance Procedures

LIST OF SYSTEMS MAINTENANCE MANUALS (continued)

T.O. 1A-7D-2-14-4	AN/APQ-126(V)8 and AN/APQ-126(V)11 Radar Sets, Diagrams
T.O. 1A-7D-2-14-5	AN/AAR-48 Forward Looking Infrared (FLIR) System
T.O. 1A-7D-2-14-6	AN/AAR-48 Forward Looking Infrared (FLIR) System — Diagrams
T.O. 1A-7D-2-15	Electronic Countermeasure Systems (U) (Confidential)
T.O. 1A-7D-2-16	General Wiring Data
T.O. 1A-7D-2-17	Wiring Diagrams
T.O. 1A-7D-2-18-1	Integrated Avionic Systems (Airplanes Before T.O. 1A-7-530), Theory of Operation
T.O. 1A-7D-2-18-1-1	Integrated Avionic System (Airplanes After T.O. 1A-7-530), Theory of Operation
T.O. 1A-7D-2-18-2	Integrated Avionic Systems, Troubleshooting Schematics
T.O. 1A-7D-2-18-3	Integrated Avionic Systems, Debriefing
T.O. 1A-7D-2-18-4	Integrated Avionic Systems Troubleshooting, Tactical Computer/HUD/FLR/TISL/FLIR/VMS
T.O. 1A-7D-2-18-5	Integrated Avionic Systems Troubleshooting, IMS/Doppler/ Radar Altimeter/PMDS
T.O. 1A-7D-2-18-6	Integrated Avionic Systems, Weapon Delivery and Release Troubleshooting
T.O. 1A-7D-2-18-7	Integrated Avionic Systems Troubleshooting, HMS/ADC/AOA
T.O. 1A-7D-2-18-8	Integrated Avionic Systems, Operational Test Program Troubleshooting
T.O. 1A-7D-2-18-9	Integrated Avionic Systems, Grooming
T.O. 1A-7D-2-19	Cross Servicing Guide for A-7D Aircraft
T.O. 1A-7D-2-20	Testing and Troubleshooting Transmission Lines, Coaxial Cables, and Antennas

REFERENCE PUBLICATIONS	
T.O. 00-110N-11	Handling, Storage, and Disposal of Radioactive Sources
T.O. 00-25-172	Ground Servicing of Aircraft and Positioning of Equipment Static Grounding/Bonding
T.O. 00-25-186	Local Manufactures of Nonsource Coded Items
T.O. 1-1-1	Cleaning of Aerospace Equipment
T.O. 1-1-2	Corrosion Prevention and Control for Aerospace Equipment
T.O. 1-1-17	Storage of Aircraft and Missiles
T.O. 1-1-19	Inspection, Test, and Replacement of Vibration and Isolators on Equipment in Aircraft
T.O. 1-1-300	Acceptance/Functional Check Flights and Maintenance Operational Checks
T.O. 1-1A-1	Engineering Handbook Series for Aircraft Repair — General Manual for Structural Repair
T.O. 1-1A-8	Engineering Manual Series, Aircraft and Missile Repair, Structural Hardware
T.O. 1A-7D-06	Work Unit Code Manual
T.O. 1A-7D-2-1CL-2	General Information and Airframe Group — Servicing Checklist
T.O. 1A-7D-3	Structural Repair Instructions
T.O. 1A-7D-4-1	Illustrated Parts Breakdown Introduction

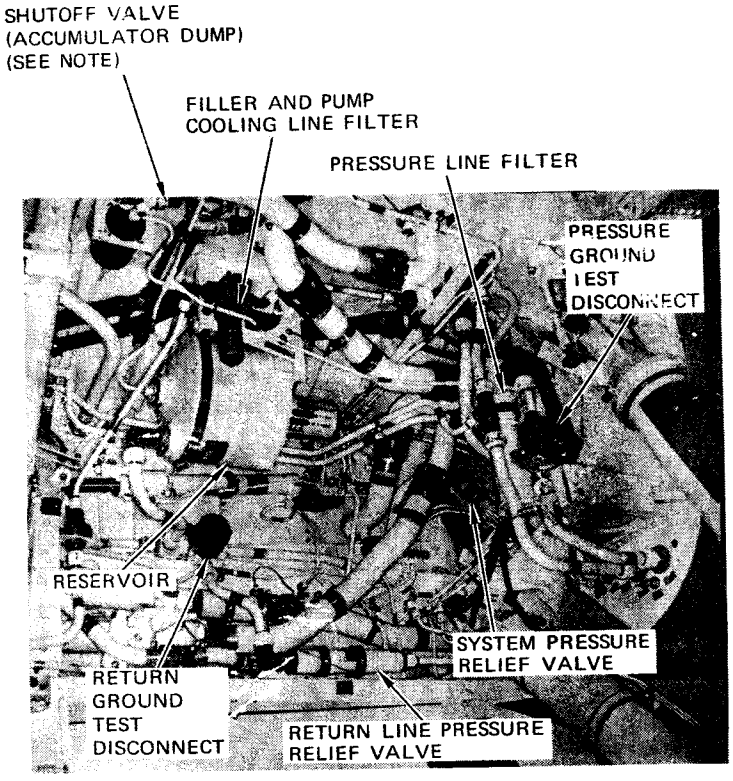
REFERENCE PUBLICATIONS (continued)	
T.O. 1A-7D-6	Inspection Instructions, Aircraft Scheduled Inspection and Maintenance Requirements
T.O. 1A-7D-6WC-1	Preflight/Thruflight — Handling — Postflight Inspection Workcards
T.O. 1A-7D-6WC-2	Phased Inspection Workcards
T.O. 11A-1-33	Handling and Maintenance of Explosives Loaded Aircraft
32B14-3-1-101	Operation and Service Instructions, Torque Indicating Tools
33A1-12-2-1	Operation Instructions — Multimeter AN/PSM-6
33A2-2-24-21	Operation and Maintenance Instructions — Gasoline Engine Driven Hydraulic System Portable Test Stand, Type MJ-2A
33D2-5-36-1	Operation and Maintenance Instructions — Gasoline Engine Driven Hydraulic System Portable Test Stand, Type TTU-228/E
33D2-5-39-1	Operation and Maintenance Instructions — Electric Motor Driven Hydraulic System Portable Test Stand, Type A/M 27T2-2
33D2-6-105-1	Operation and Service Instructions, Synchro Instrument Field Test Set
35C2-3-372-1	Operation and Service Instructions — Generator Set, Gas Turbine, Wheel Mounted, A/M32A-60
T.O. 42E1-1-1	Aerospace Hose Assemblies

RECORD OF TIME COMPLIANCE TECHNICAL ORDERS

T.O. Number	Date	Title	Change/Revision Date
1A-7-530		Installation of Forward Looking Infrared System on A-7 Aircraft (ECP 622)	15 October 1986
1A-7D-685	20 March 1975	Modification to Provide Controlled Isolation of Utility Brake Accumulator, A-7D Aircraft	1 July 1975
1A-7D-756	16 June 1975	Replacement of Aileron Extension Units with Hoses — A-7D ACFT and MTS (ECP 495)	1 January 1975
1A-7D-757	1 August 1975	Addition of Inline Hydraulic Filters — A-7D ACFT (ECP 490)	15 August 1974

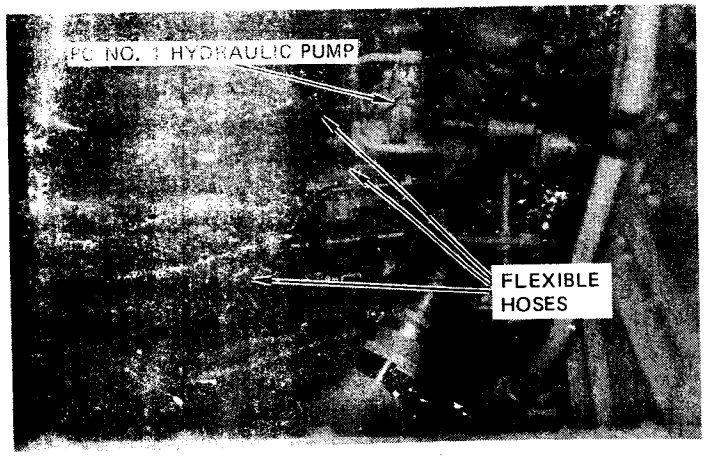
DETAIL A

(LEFT WHEEL WELL)



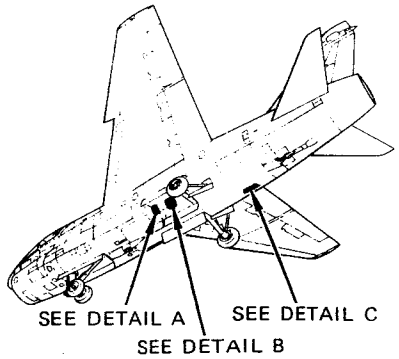
DETAIL B

(LEFT WHEEL WELL)



DETAIL C

(ACCESS 5222-1)



NOTE

Airplanes through AF69-6196.

04D048-05-75

Figure 1-1. Power Control No. 1 Hydraulic Supply System Arrangement

SECTION I

POWER CONTROL (PC) NO. 1 HYRAULIC SUPPLY SYSTEM

1-1. DESCRIPTION.

1-2. On airplanes through AF69-6196, the power control (PC) No. 1 hydraulic supply system powers the automatic flight control system yaw actuator and in conjunction with the PC NO. 2 system supplies operating power for tandem cylinders of the aileron, spoiler, unit horizontal tail, rudder, and roll feel isolation actuators.

1-3. On airplanes AF69-6197 and subsequent, the power control (PC) No. 1 hydraulic supply system powers the automatic flight control system roll actuator and in conjunction with either the PC No. 2 or PC No. 3 system supplies operating power for the tandem cylinders of the aileron, spoiler, unit horizontal tail, and roll feel isolation actuators.

1-4. The system is normally pressurized by an engine-driven, variable displacement, hydraulic pump. The PC No. 1 hydraulic supply system consists of the engine-driven pump, filters, fluid reservoir, relief valves, check valves, disconnects, shutoff valve (reservoir accumulator dump), and two accumulators (system surge damper and reservoir pressurization). Airplanes AF69-6197 and subsequent do not contain the shutoff valve and reservoir accumulator in the PC No. 1 system. See figure 1-1 for system arrangement and refer to table 1-1 for system leading particulars.

1-5. Refer to Section V for information on hydraulic system indicators. Refer to Appendix A for general torquing information.

Table 1-1. Power Control Systems Leading Particulars

NOTE

This table is applicable for PC No. 1 and PC No. 2 hydraulic systems and on airplanes AF69-6197 and subsequent, PC No. 3 hydraulic system.

Fluid	MIL-H-83282
Operating pressure	3,050 (±100) psi
Operating temperature range	−65° to 275°F
Filtration	5 micron absolute
System pressure relief	Full flow at 3,850 psi; reseat at 3,390 psi
Rated flow	25.5 gpm (PC No. 1) 42.5 gpm (PC No. 2) 15.0 gpm (PC No. 3)
Power source	Engine-driven, rotary, variable displacement pumps
System return pressure	90 psi (PC No. 1 and PC No. 3) 97.5 psi (PC No. 2)

Table 1-1. Power Control Systems Leading Particulars (continued)

System return relief pressure	Full flow at 200 (±5) psi; reseat at 160 psi minimum (PC No. 1, PC No. 2, and PC No. 3)
Reservoirs (bootstrap):	
PC No. 1 and PC No. 3	144 cubic inches full volume (0 psi and 70°F), 265 cubic inches maximum volume
PC No. 2	917 cubic inches full volume (0 psi and 70°F), 1,280 cubic inches maximum volume

1-6. OPERATION. (See figure 1-2 and 1-3.)

1-7. The PC No. 1 hydraulic pump is located on the engine accessory drive case and is driven through reduction gears in the diffuser section of the engine. The hydraulic pump discharges fluid through a check valve and the pressure line filter before it reaches the power control circuits. The pump pressure line check valve prevents reverse flow through the pump when external hydraulic power is applied and on airplanes through AF69-6196 when the emergency power package is operating. The filter contains a 5-micron disposable element. A red indicator button on the filter head extends to indicate a clogged filter element when the pressure drop across the element reaches 60 to 80 psi. An automatic shutoff valve in the filter permits the filter bowl and element to be removed without loss of hydraulic fluid or the entry of air into the hydraulic lines.

1-8. Internal pump cooling and lubrication are provided by bypass fluid which circulates through the pump case and is then routed through the emergency power package and back to the system hydraulic supply line; except on airplanes AF69-6197 and subsequent, the fluid is routed from the pump case through the power control return circuits and then to the system hydraulic supply line. A filter in the pump cooling line prevents foreign particles on the interior of the pump from entering the system. Hydraulic fluid entering the system through the system filler valve also passes through the filler and pump cooling line filter. The filter contains a 5-micron disposable element. A red indicator button on the filter head extends to indicate a clogged element when the pressure drop across the element reaches 60 to 80 psi. If a clogged condition causes a pressure differential of 90 to 110 psi, fluid is bypassed around the filter element through an integral relief valve. An automatic shutoff valve allows the filter bowl and element to be removed without the loss of hydraulic fluid from system lines. A check valve in the cooling line protects the pump from pressure surges in the return system and prevents overpressurization of the pump case during servicing of the system.

1-9. When a hydraulically operated system or component is actuated, fluid flows from the hydraulic supply pressure line to the actuating cylinder and from the return port of the cylinder to the hydraulic supply return line. A pressure relief valve in the system pressure line protects power control systems from excessive pressure and pressure surges by opening and directing fluid directly into the system return line. Reseat pressure of the relief valve is 3,390 psi with full flow at 3,850 psi.

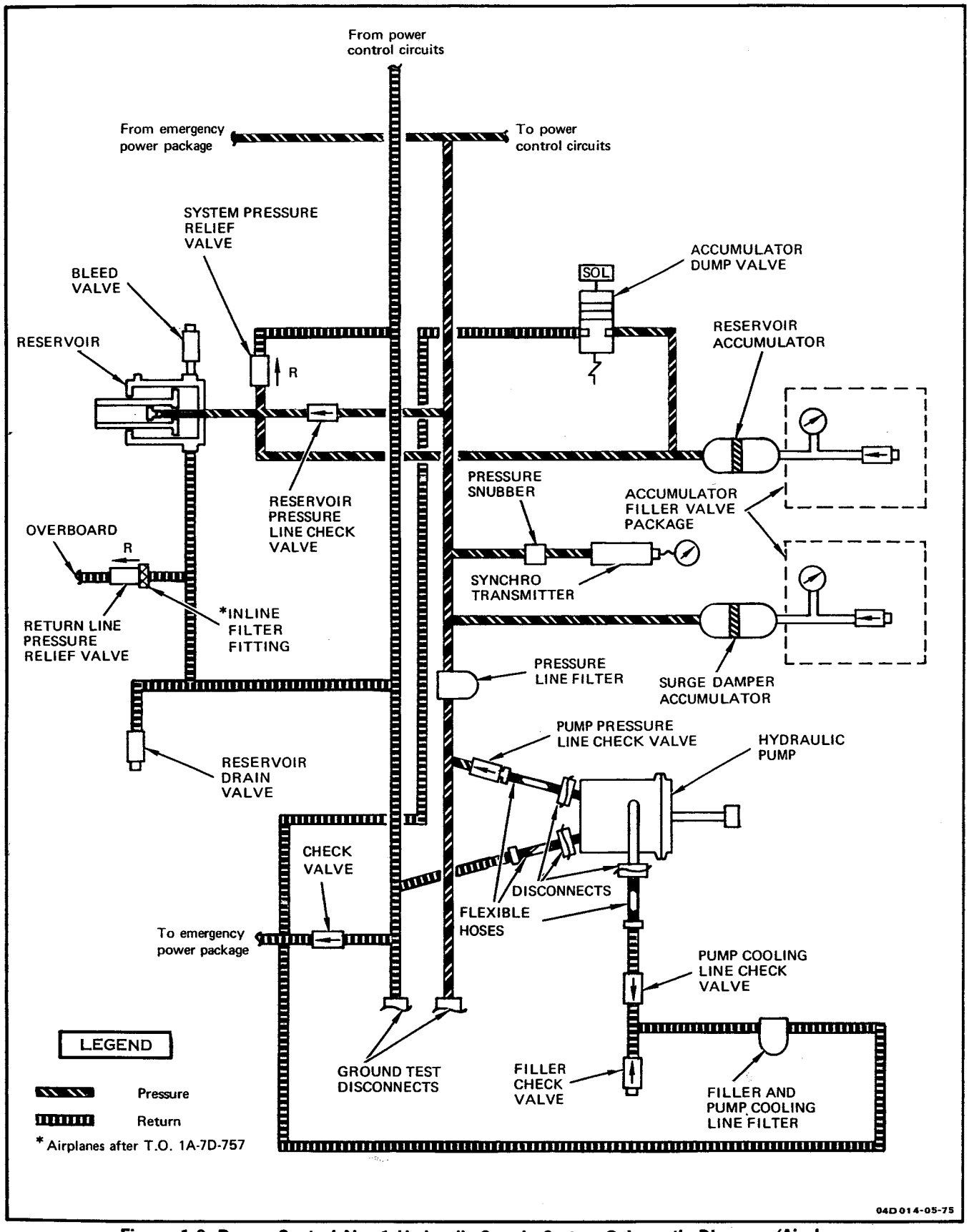


Figure 1-2. Power Control No. 1 Hydraulic Supply System Schematic Diagram (Airplanes Through AF69-6196)

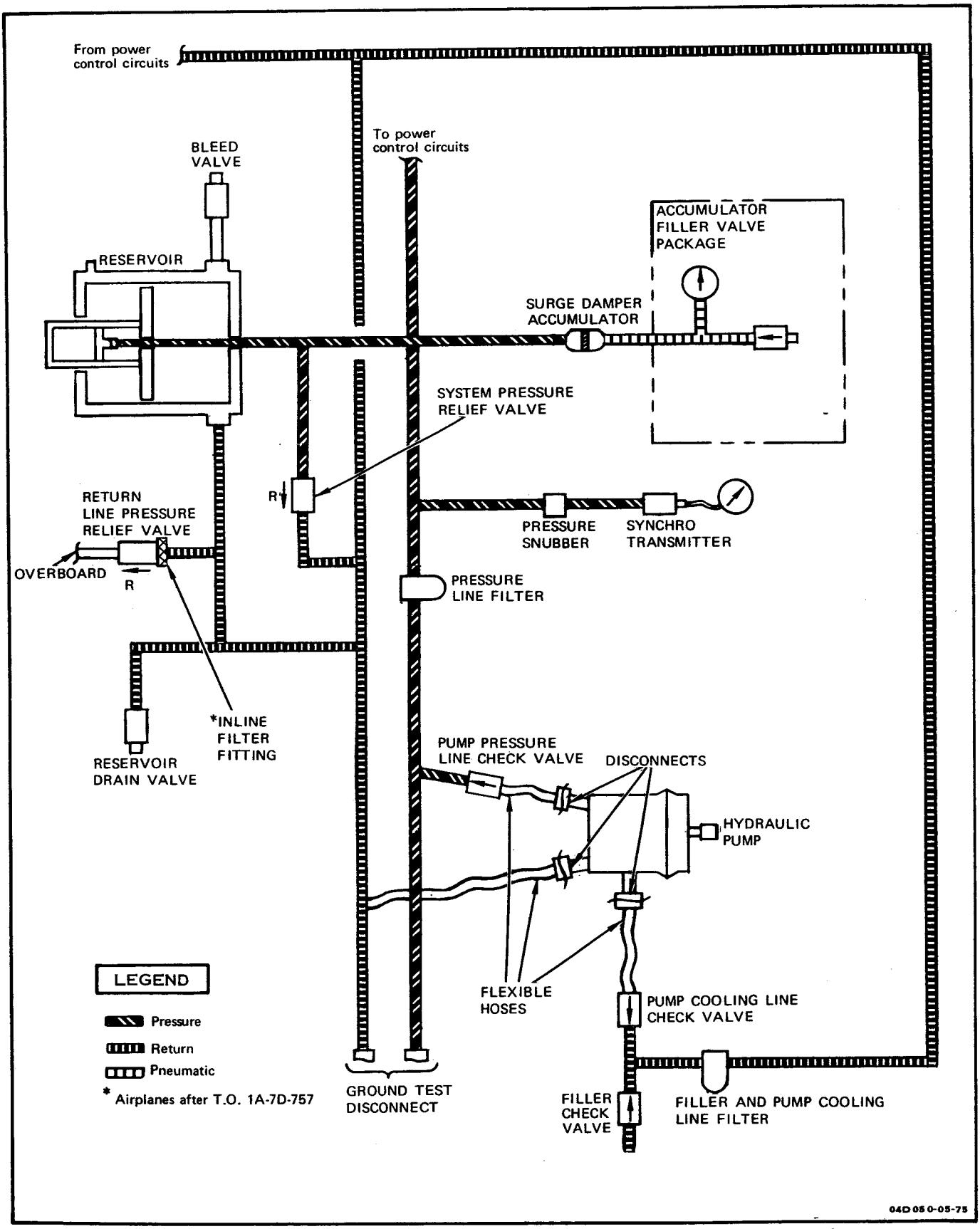


Figure 1-3. Power Control No. 1 Hydraulic Supply System Schematic Diagram (Airplanes AF69-6197 and Subsequent)

1-10. The fluid in the return line is directed back to the hydraulic pump and supply system reservoir. The reservoir stores fluid under 90 psi pressure to ensure an adequate flow of fluid to the hydraulic pump. The reservoir is equipped with a hydraulic bleed valve and a fluid level indicator. The window-type indicator shows reservoir fluid level under various temperature ranges for both the no pressure and system pressurized conditions. The distance between the NO PRESS and SYS PRESS window index marks for a given temperature range equals the normal amount of compression of the hydraulic fluid plus the volume required to fill the surge damper accumulator and reservoir accumulator (airplanes through AF69-6196). Any entrained air in the system will be reflected by excessive movement of the reservoir fluid level indicator.

1-11. When the system is in operation, hydraulic supply system pressure of approximately 3,100 psi is directed through the reservoir piston to an inner piston chamber. Here, the fluid pressure is applied against a small area on the back side of the piston. The ratio of this small area (on which the 3,100 psi is applied) to the larger area on the face of the piston creates a return system pressure of 90 psi. When additional fluid is required, the pressure exerted on the piston forces fluid from the reservoir into the supply system return line where it is directed to the hydraulic pump. With this design, there is no pressure on the return system until pressure is developed by the pump. The reservoir piston, therefore, can be moved only by developing an unbalanced hydraulic force as opposed to other hydraulic systems designed with air or spring pressure developing the return system pressure. A return line pressure relief valve in the supply system protects the reservoir from excessive pressurization by venting fluid overboard. On airplanes through AF69-6196, cracking pressure of the relief valve is 145 (±5) psi with full/flow at 180 psi. On airplanes AF69-6197 and subsequent, the relief valve is set for full flow at 200 (±5) psi and reseat at 160 psi minimum. On airplanes after T.O. 1A-7D-757, the elbow connected to the relief valve PRESS port contains an integral filter that protects the relief valve from contamination.

1-12. Since the reservoir provides a pressurized return system only with system pressure available, control surface operation with the PC No. 1 hydraulic system unpressurized and the other system/systems pressurized can result in air being induced into the system. Upon actuation of a tandem control cylinder with only one-half of the cylinder pressurized, the fluid forced from the unpressurized side of the cylinder must be replaced from the system reservoir. With no pressure applied to the piston to force the fluid from the reservoir, a partial vacuum is created within the cylinder. The partial vacuum may result in some air being drawn across the piston rod seal into the cylinder. Elimination of this source of air can be achieved by ensuring that all systems are pressurized during any control surface movement.

1-13. The supply system incorporates a 26.2 cubic-inch capacity surge damper accumulator precharged to 1,000 (±100) psi to absorb surges in the system pressure line. On airplanes through AF69-6196, an identical reservoir accumulator precharged to 1,500 (±50) psi is incorporated to maintain approximate system pressure on the reservoir. Both accumulators are system charged with hydraulic fluid through the supply system pressure line.

1-14. On airplanes through AF69-6196, if PC No. 1 system pressure is lost, a check valve retains approximately 3,000 psi in the reservoir accumulator. This pressure applied to the reservoir results in a system return pressure of 90 psi which ensures inlet pressure to the emergency power package hydraulic pump. This pressure is present in the return line as long as the accumulator is charged. The design of the servo valve packages utilized in the power control system can provide a path for fluid transfer between systems if PC No. 1 system remains pressurized for extended periods with no pressure on the remaining systems. This fluid transfer can be prevented by dumping the accumulator pressure when not needed for operations. An accumulator dump valve, actuated by the emergency accumulator test switch in the right wheel well, is used to dump system pressure from the reservoir accumulator. Placing the test switch in DUMP connects 28 volts from the secondary dc bus to the dump valve. The energized valve dumps the accumulator hydraulic fluid into the system return line.

1-15. COMPONENTS.

1-16. For a list of system components, their locations (accesses), and functions, refer to table 1-2.

Table 1-2. Power Control No. 1 Hydraulic Supply System Components

Component	Access	Function
Accumulator, reservoir[1]	Left wheel well	Maintains pressure on system reservoir to provide inlet pressure for emergency power package pump.
Accumulator, surge damper	Left wheel well	Absorbs pressure surges in main pressure line.
Disconnects, ground tests, pressure and return	Left wheel well	Permit rapid connection of external power to PC No. 1 supply system.
Filter, hydraulic filler and pump cooling line	Left wheel well	Removes contamination particles from fluid entering system through reservoir filler connection and from pump case.
Filter, pressure line	Left wheel well	Removes contamination particles from fluid being discharged from pump discharge port.
Fitting, inline filter[2]	Left wheel well	Connected to PRESS port of return line pressure relief valve. Protects relief valve from system contamination.
Hoses, flexible (3)	5223-1	Connect engine-mounted pump to system lines.
Pump, hydraulic	5223-1	Provides system pressure of approximately 3,100 psi.
Reservoir, hydraulic	Left wheel well	Stores system fluid under pressure to ensure adequate fluid supply to pump.
Valve, shutoff (accumulator dump)[1]	Left wheel well	Vents accumulator pressure by dumping fluid from accumulator into system return line. Energized by emergency accumulator test switch.
Valve, check, filler	Left wheel well	Serves as system filling point and prevents backflow of fluid at filler line connection.
Valve, check, pump cooling line	Left wheel well	Protects pump and cooling line filter from pressure surges in the return system and prevents overpressurization of the pump case during reservoir filling.
Valve, check, pump pressure line	5223-1	Prevents reverse flow through the pump when external hydraulic power is applied. On airplanes through AF69-6196, prevents reverse flow through the pump when emergency power package is operating.
Valve, check, reservoir pressure line[1]	Left wheel well	Maintains system return line pressure by preventing the loss of accumulator pressure from reservoir pressurizing circuit into supply system.
Valve, return line pressure relief	Left wheel well	Protects components and systems from excessive return line pressure by venting fluid overboard.

TECHNICAL ORDER PAGE SUPPLEMENT
TECHNICAL MANUAL

MAINTENANCE INSTRUCTIONS

ORGANIZATIONAL

PNEUDRAULIC SYSTEMS

A-7D

F34601-86-C-3689

THIS PUBLICATION SUPPLEMENTS T.O. 1A-7D-2-4, DATED 1 JULY 1975, CHANGED 1 OCTOBER 1986.

THIS IS A NONCUMULATIVE TOPS.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE

1 DECEMBER 1986

LIST OF EFFECTIVE PAGES

NOTE: This TOPS contains supplementary information. Text pages do not supersede pages of basic TO but will be inserted facing the amended page. Total number of effective TOPS pages is 1.

#5

Page No.	TOPS No.
2-8B ✓	TP-2

Table 1-2. Power Control No. 1 Hydraulic Supply System Components (continued)

Component	Access	Function
Valve, system pressure relief	Left wheel well	Protects systems and components from excessive pressure by venting fluid from the pressure line into the return line.

[1]Airplanes through AF69-6196

[2]Airplanes after T.O. 1A-7D-757

1-17. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine

NOTE

A number, or numbers, enclosed in parentheses at the end of a step in the following checkout is a reference to a corresponding number in troubleshooting table 1-3.

a. Service PC No. 1 reservoir (T.O. 1A-7D-2-1) to level shown in figure 1-3A.

a-1. Place a reference mark on indicator housing so that indicator movement can be measured after engine start.

b. Start engine (T.O. 1A-7D-2-1) and operate at idle. Check that low hydraulic pressure caution light is off. (1 and 2)

NOTE

Measure indicator movement within 5 minutes of engine start.

c. Measure distance reservoir indicator has moved. Movement of indicator should be 0.36 to 0.62 inch (figure 1-3A). (3)

d. Check that PC No. 1 hydraulic system pressure indicator indicates 3,100 (±150) psi and pressure fluctuation is less than 150 psi. (4 and 5)

e. Cycle control stick and check that control surfaces move smoothly and pressure does not drop excessively. Pressure should return to normal at end of travel. (6 and 7)

f. Shut down engine.

g. On airplanes through AF69-6196, check that PC No. 1 reservoir accumulator pressure (station 2) is greater than 2,950 psi. (8)

1-18. TROUBLESHOOTING.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external hydraulic power		Connect external hydraulic power
	Equipment required for engine operation		Operate engine
1-4	Pressure gage assembly	(Local fabrication)	Check hydraulic pressure at ground test disconnect

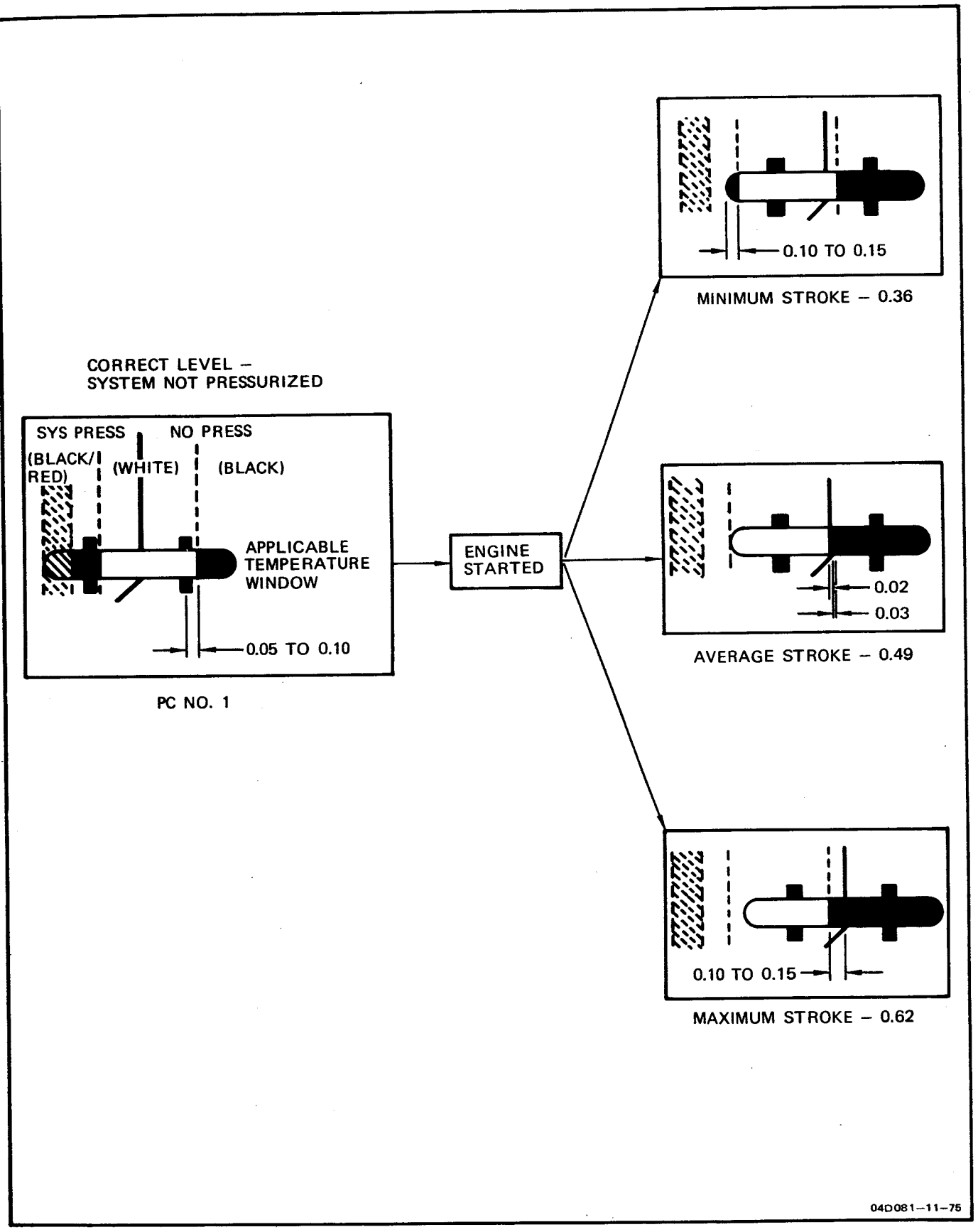


Figure 1-3A. PC No. 1 Reservoir Piston Stroke

1-19. Refer to table 1-3 for troubleshooting information. Malfunctions in the table are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout. Fabricate a pressure gage assembly as shown in figure 1-4.

Table 1-3. PC No. 1 Hydraulic Supply System Troubleshooting

Malfunction	Corrective Action
1. Hydraulic pressure indication is zero after engine start.	a. Shut down engine and perform the following: 1. Check for evidence of excessive fluid leakage (reservoir depleted). If pump was operated dry, check filter elements for metal chips. Replace filter elements (paragraphs 1-44 and 1-62), and if metal chips were found in either element, replace pump (paragraph 1-39). 2. Check for discoloration of PC No. 1 pump and disconnects. Discoloration may indicate overheat damage to pump. 3. If pump or pump housing failure is evident, replace filter elements (paragraphs 1-44 and 1-62), hoses, disconnects, and pump (paragraph 1-39). Failure may have been caused by incomplete connection of cooling line disconnect. Ensure all disconnects are completely connected. 4. If there is no evidence of overheat and/or pump failure, proceed to step b. b. Check pump pressure line check valve for proper installation. If required, install valve properly. If valve is installed properly, proceed to step c. c. Connect locally fabricated pressure gage assembly to PC No. 1 pressure ground test disconnect. Start engine and check that pressure is 3,025 to 3,175 psig. If pressure is within limits, troubleshoot indicating system (paragraph 5-27). If pressure is zero, shut down engine and proceed to step d. d. Perform hydraulic system bleeding (T.O. 1A-7D-2-1). If excessive air is not indicated, replace hydraulic pump.

Table 1-3. PC No. 1 Hydraulic Supply System Troubleshooting (continued)

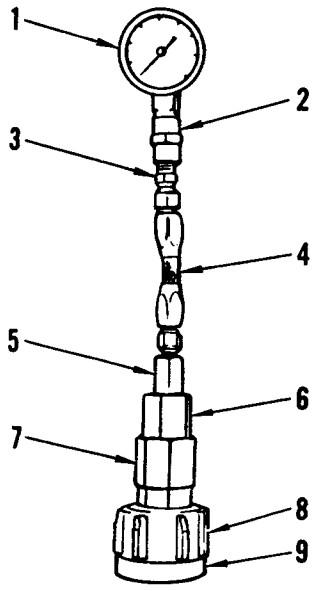
Malfunction	Corrective Action
2. Low hydraulic pressure caution light does not go off when pressure is above 1,840 psi.	a. Troubleshoot hydraulic indicating system (paragraph 5-27).
3. After 2,950 to 3,250 psig system pressure is obtained, the distance reservoir indicator has moved is not 0.36 to 0.62 inch.	a. For excessive movement, shut down engine and check accumulators for low precharge (T.O. 1A-7D-2-1). Service accumulators if required. If precharge is correct, perform the following: 1. Check for leakage and repair as required. 2. If no leaks are found, system contains excessive air. Perform hydraulic system bleeding (T.O. 1A-7D-2-1). b. For less than 0.36-inch movement, shut down engine and check for excessive precharge of accumulators (T.O. 1A-7D-2-1). Service accumulators if required. If precharge is correct, ensure that proper no pressure servicing of reservoir was performed.
4. Pressure indicated on cockpit indicator is not between 2,950 and 3,250 psi.	a. Check for evidence of excessive fluid leakage. Repair leaks as required. If no leaks are found, proceed to step b. b. Check pressure line filter differential pressure indicator for extension. If indicator is extended, reset indicator and cycle flight controls. If indicator extends again, replace filter element (paragraph 1-44). If indicator is not extended, proceed to step c. c. Check system pressure relief valve for overheating which indicates valve is bypassing fluid. If valve is cool, proceed to step d or e. As positive check for defective valve, perform the following: 1. Shut down engine. 2. On airplanes through AF69-6196, dump PC No. 1 reservoir accumulator (T.O. 1A-7D-2-1). 3. Disconnect and plug return line at valve outlet port. 4. Connect external hydraulic power (T.O. 1A-7D-2-1) and slowly apply 3,000 psig.

Table 1-3. PC No. 1 Hydraulic Supply System Troubleshooting (continued)

Malfunction	Corrective Action
	5. If leakage from outlet port is greater than 60 drops (3 cc) per minute, replace valve (paragraph 1-50). d.On airplanes through AF69-6196, check accumulator dump valve for overheating which indicates valve bypassing fluid. If valve is cool, proceed to step e. As positive check for defective valve, perform the following: 1. Shut down engine. 2. Dump PC No.1 reservoir accumulator (T.O. 1A-7D-2-1). 3. Disconnect and plug return line from valve. 4. Connect external hydraulic power (T.O. 1A-7D-2-1) and slowly apply 3,000 psig. 5. If leakage from valve return port is more than 100 drops (5cc) per minute, replace valve (paragraph 1-68). e. Check reservoir for overheating which indicates fluid bypassing from pressure to return system. If reservoir is cool, proceed to step f. As positive check for defective reservoir, perform the following: 1. Shut down engine. 2. On airplanes through AF69-6196, dump PC No. 1 reservoir accumulator. 3. Disconnect and plug pressure line from reservoir. 4. Connect hydraulic filler cart to reservoir pressure port. 5. Operate filler cart. If reservoir begins to fill, replace reservoir (paragraph 1-36). f. Check that pump cooling line check valve is properly installed. If valve is properly installed, proceed to step g. g. Check for incomplete connection of cooling line quick disconnect. If disconnect is properly connected, proceed to step h. h. Shut down engine and connect locally fabricated pressure gage assembly to PC No. 1 pressure ground test disconnect. Start engine and check that pressure is 3,025 to 3,175 psig. If pressure is within limits, troubleshoot hydraulic indicating system (paragraph 5-27). If pressure is not within limits, replace hydraulic pump (paragraph 1-39).
5. System pressure fluctuates more than ±150 psi.	a. Check system pressure relief valve for bypassing fluid as indicated in malfunction 4, step c. If valve checks good, proceed to step b. b. Shut down engine and connect locally fabricated pressure gage assembly to PC No. 1 pressure ground test disconnect. Start engine and check that pressure fluctuation on gage is less than ±75 psi. If fluctuation is within limits, troubleshoot indicating system (paragraph 5-27). If not within limits, replace hydraulic pump (paragraph 1-39).
6. Excessive pressure drop while operating flight controls	a. Ensure system is free of excessive air (malfunction 3). If excessive air is not indicated, proceed to step b.

Table 1-3. PC No. 1 Hydraulic Supply System Troubleshooting (continued)

Malfunction	Corrective Action
	b. Check pressure line filter differential pressure indicator for extension. If indicator is extended, reset indicator and cycle flight controls. If indicator extends again, replace filter element (paragraph 1-44).
	c. Replace hydraulic pump (paragraph 1-39).
7. Chattering occurs or flight control movement is irregular.	a. Ensure system is free of excessive air (malfunction 3). If excessive air is not indicated, proceed to step b.
	b. Check that PC No. 1 surge damper accumulator (station 3) indicates 3,000 psig minimum. If pressure is low, troubleshoot precharge system (paragraph 6-17). If pressure is correct, troubleshoot for defective flight control actuator or linkage (T.O. 1A-7D-2-8).
8. On airplanes through AF69-6196, reservoir accumulator pressure (station 2) is less than 2,950 psig after engine shutdown.	a. Perform the following: 1. Dump reservoir accumulator. 2. Disconnect and plug return line from accumulator dump valve. 3. Connect external hydraulic power (T.O. 1A-7D-2-1) and slowly apply 3,000 psig. 4. If leakage from valve return port is more than 100 drops (5 cc) per minute, replace valve. 5. If leakage is acceptable, proceed to step b.
	b. Troubleshoot precharge system (paragraph 6-17). If precharge system checks good, replace reservoir pressure line check valve.



1. 0 to 4,000-psi gage
2. 1/4-inch pipe thread coupling (AN911-2)
3. AN816-4D union
4. MS28741-4-0060 hose assembly
5. AN894D6-4 bushing
6. AN894D10-6 bushing
7. AN894D12-10 bushing
8. 3/4-inch disconnect coupling half (Aeroquip 155-S5-12D)
9. 155-S9-12D dust plug (Aeroquip)

04D015-11-75

Figure 1-4. Disconnect Pressure Gage Assembly

Paragraphs 1-20 through 1-27 deleted.

Page 1-12 deleted.

Figure 1-5 deleted.

1-28. SYSTEM FLUSHING.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect external hydraulic power
		Equipment required for connecting external electrical power	Connect external electrical power
		Equipment required for jacking airplane.	Jack airplane

Tools Required (continued)

Figure & Index No.	Part Number	Nomenclature	Use and Application
	215-01616-1	Quick-disconnect adapter set	Allow hydraulic power to be applied to disconnected pump lines for flushing

a. If required to flush hoses from hydraulic pump(s) during system flushing, perform following:

1. Open access 5222-1.

CAUTION

To prevent damage to teflon liner, do not bend hoses during connection.

2. Disconnect hoses from pump of contaminated system(s).

3. Fill quick-disconnect adapters (table 1-4) with hydraulic fluid and install adapters on pump lines (setup No. 1, figure 1-7).

b. Connect hydraulic test stand pressure hose to adapter on pump line (setup No. 1) or to ground-test disconnect (setup No. 2) as required.

c. Install check valve(s), with free flow overboard, in return line(s) to prevent having to bleed system (setup No. 1 or No. 2).

d. Direct return flow in empty 55-gallon drum.

e. If required to flush complete system, jack airplane (T.O. 1A-7D-2-1).

NOTE

PC system that does not require flushing can be operated closed system. This will prevent reservoirs from dumping and eliminate need for reservoir servicing of those systems.

f. Ensure each test stand reservoir selector valve is set for open system operation for systems requiring flushing.

CAUTION

Add fluid during flushing to maintain level of test stand reservoir at 1/2 full or greater to provide adequate fluid supply and prevent possibility of ingesting air into airplane system.

g. Ensure test stand reservoir is full.

h. Ensure flap handle, gear handle, wingfold handle, and arresting gear handle match position of surface or component.

NOTE

With test stand set for open system operation, airplane reservoir will empty when hydraulic pressure is applied.

i. Connect external hydraulic power (T.O. 1A-7D-2-1) to system(s) that does not require flushing with test stand set for closed system operation.

NOTE

If differential pressure indicator button extends during flushing procedure, install new filter element and continue flushing.

j. Apply 1,500 psig to all PC systems.

NOTE

Flushing PC-1 and/or PC-3 system(s) requires cycling of only the flight controls and the surge damper accumulators.

k. Cycle leading and trailing flaps up and down 5 times.

l. Place stabilization engage switch in STAB and place AFCS engage switch in CONT AUG.

NOTE

Do not allow cockpit indicators to drop below 500 psig during cycling.

m. Slowly cycle ailerons, rudder, and UHT full throw for 5 minutes. During cycle, do not allow cockpit pressure indicators to drop below 500 psig.

n. Place stabilization switch in OFF.

o. Cycle inflight refueling receptacle and brake systems 5 times.

p. Increase pressure to 3,000 psig. Cycle wingfold system 5 times.

q. Slowly vary pressure on each system from 3,000 psig to 1,000 psig and back to 3,000 psig. Repeat pressure cycle 5 times to flush surge damper accumulators.

Figure 1-6 deleted.

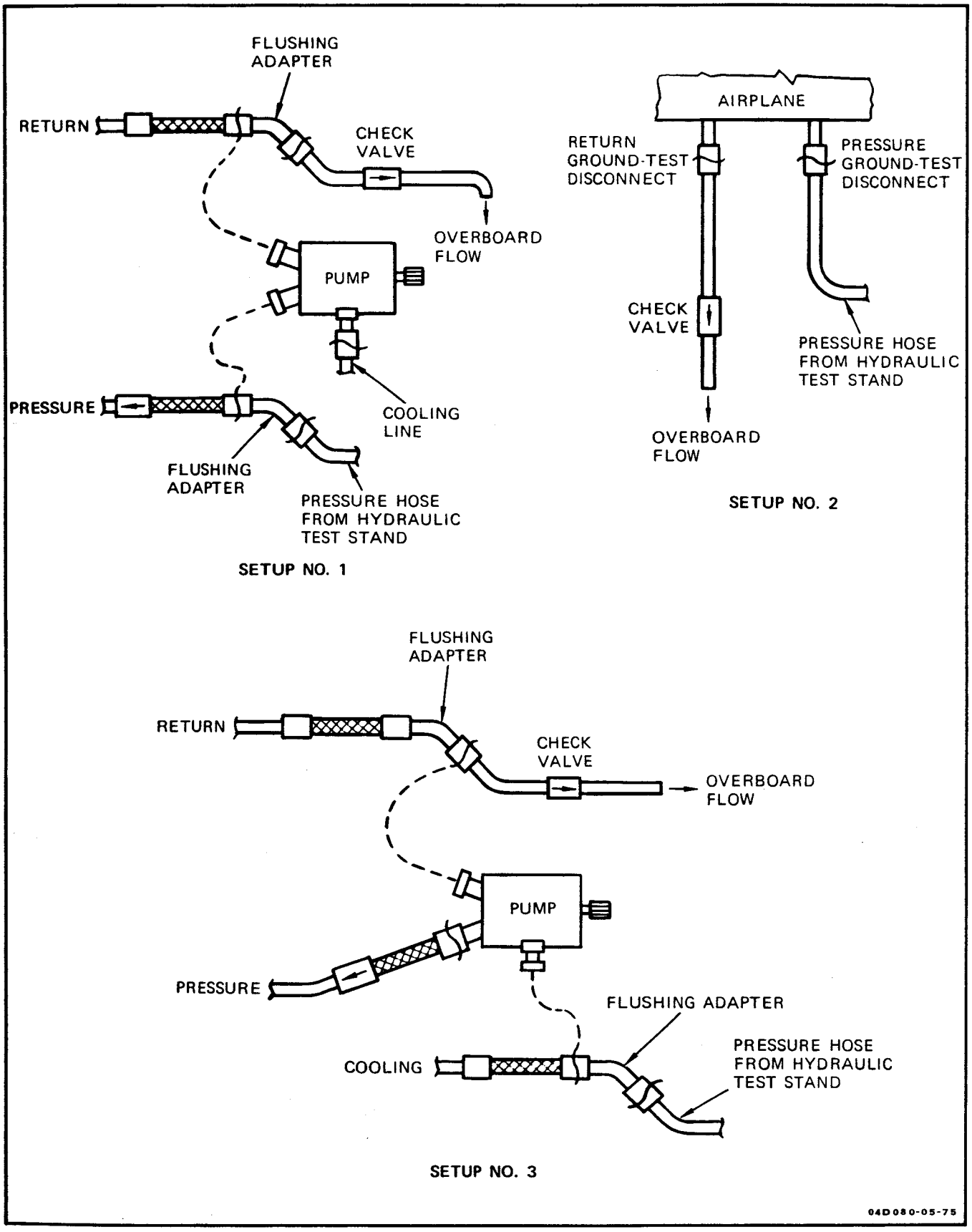


Figure 1-7. Flushing Setup

All data on pages 1–16 thru 1–20 deleted.

r. Disconnect gun and ammunition handling system drive shafts (T.O. 1A-7D-2-13).

s. Adjust test stand to supply 1,250 psig. Cycle gun drive hydraulic motor for 30 seconds by actuating the manual control on motor. Repeat cycling two additional times. Observe precautions in gun system operational checkout (T.O. 1A-7D-2-13).

t. Connect gun and ammunition handling system drive shafts (T.O. 1A-7D-2-13).

u. Cycle speed brake actuator five times as indicated in operational checkout (T.O. 1A-7D-2-8).

v. Cycle landing gear five times using normal hydraulic system. Observe precautions in landing gear operational checkout (T.O. 1A-7D-2-7).

w. Cycle nose gear steering five times observing precautions in nose gear steering operational checkout (T.O. 1A-7D-2-7).

x. Slowly reduce flow and pressure to zero on all systems, and shut down test stand in accordance with applicable test stand manual.

y. Flush pump cooling lines as follows:

1. Disconnect pump cooling line from pump.

2. Fill quick-disconnect adapter (table 1-4) with hydraulic fluid and install adapter on cooling line (setup No. 3, figure 1-5).

3. Connect test stand pressure hose to adapter.

4. Start test stand and apply 135 psig maximum pressure to cooling lines.

5. Allow fluid to flow for 3 to 5 minutes.

6. Shut down test stand.

z. Disconnect external hydraulic power (T.O. 1A-7D-2-1).

aa. If necessary, remove quick-disconnect adapter(s) and reconnect lines to pump.

ab. Disconnect electrical power.

ac. Install new filter element(s) in affected system filter(s).

ad. Lower airplane (T.O. 1A-7D-2-1).

Table 1-4. Quick-Disconnect Adapter Set (215-01616-1) Connections

System	Function	Part Number
PC 1	Pressure	215-01616-4
PC 1	Return	215-01616-3
PC 1	Return (Pump cooling)	215-01616-11
PC 2	Pressure	215-01616-7
PC 2	Return	215-01616-3
PC 2	Return (Pump cooling)	215-01616-11
PC 3	Pressure	215-01616-10
PC 3	Return	215-01616-9
PC 3	Return (Pump cooling)	215-01616-11

1-29. HYDRAULIC SYSTEM BLEEDING.

1-30. For system bleeding, refer to T.O. 1A-7D-2-1.

1-31. SERVICING.

1-32. For PC No. 1 system servicing, refer to T.O. 1A-7D-2-1.

1-33. RETURN LINE PRESSURE RELIEF VALVE REMOVAL AND INSTALLATION.

1-34. REMOVAL. (See figure 1-8.)

a. Drain reservoir fluid (T.O. 1A-7D-2-1). Leave test stand connected.

b. Disconnect hydraulic lines (1 and 2) from valve. Cap lines.

c. Remove screws (3) securing valve to airplane.

d. Remove return line pressure relief valve (4) from airplane and remove clamp (5).

NOTE

On airplanes after T.O. 1A-7D-757, elbow (6) is replaced by inline filter fitting. The filter fitting has the same general appearance as the elbow, but contains an integral filter.

e. Loosen jamnut and remove elbow or inline filter fitting (6), packing (7), retainer (8), and jamnut (9).

f. Remove union (10) and packing (11) from relief valve.

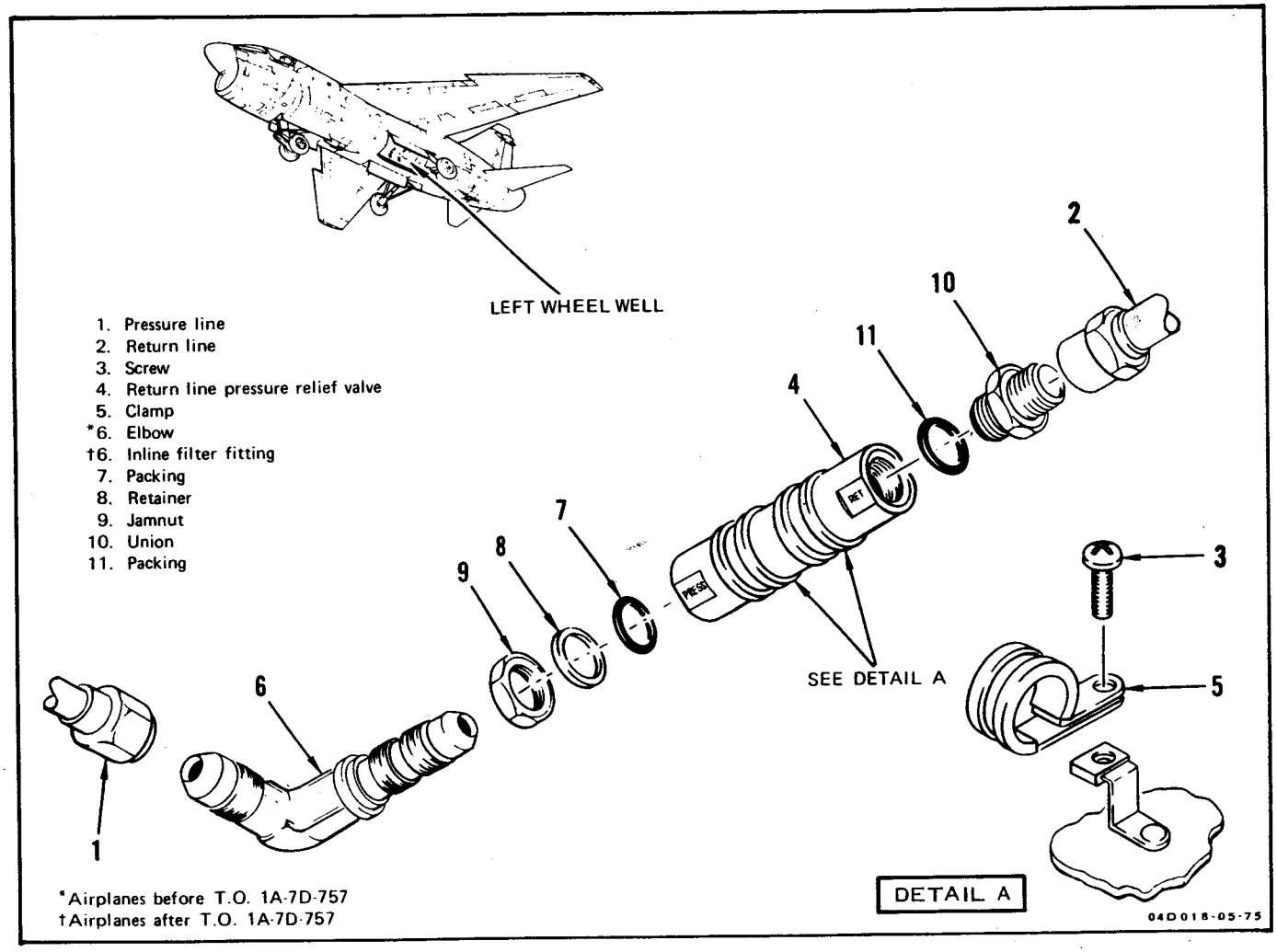


Figure 1-8. Return Line Pressure Relief Valve Removal and Installation

1-35. INSTALLATION. (See figure 1-8.)

a. Using new packing (11), install union (10) in relief valve.

b. Install jamnut (9), new retainer (8), and new packing (7) on elbow or inline filter fitting (6).

c. Install elbow or inline filter fitting (6) in relief valve. Do not tighten jamnut (9).

d. Install clamp (5) and position return line pressure relief valve (4) in wheel well. Secure relief valve with screws (3).

e. Uncap hydraulic lines (1 and 2) and connect to valve. Do not tighten pressure port line. Tighten jamnut (9).

f. Service reservoir (T.O. 1A-7D-2-1). During servicing, bleed at pressure port fitting of valve until fluid is free of air. Tighten line.

g. Perform PC hydraulic system air check (T.O. 1A-7D-2-1). Check for leaks at valve connections.

1-36. RESERVOIR REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect hydraulic power
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten bolts securing reservoir

1-37. REMOVAL. (See figure 1-9.)

a. Drain reservoir fluid (T.O. 1A-7D-2-1). Leave test stand connected.

b. Disconnect pressure line (1) from reservoir and cap.

c. Disconnect return line (2) from reservoir and cap.

d. Manually support reservoir. Remove bolts (3) and washers (4) at aft end of reservoir.

e. Loosen nut on T-bolt assembly (5) and disengage from other half of clamp.

f. Remove reservoir (6) from airplane.

g. Loosen jamnut and remove elbow (7), packing (8), retainer (9), and jamnut (10).

1-38. INSTALLATION. (See figure 1-9.)

a. Install jamnut (10), new retainer (9), and new packing (8) on elbow.

b. Drain preservative fluid from reservoir.

c. Install elbow (7) in reservoir. Do not tighten jamnut (10).

d. Manually support reservoir (6) and position in airplane.

e. Install washers (4) and bolts (3) at aft end of reservoir.

f. Tighten bolts to 22 (+3, –2) pound-inches torque and secure with MS20995C32 lockwire.

g. Engage T-bolt assembly (5) with other half of clamp and tighten nut.

h. Uncap return line (2) and connect to reservoir. Tighten jamnut (10).

i. Uncap pressure line (1) and connect to reservoir, but do not tighten.

j. Service reservoir (T.O. 1A-7D-2-1).

k. Connect external hydraulic power (T.O. 1A-7D-2-1). Apply 400 (± 100) psig pressure and bleed pressure line (1) until fluid is free of air. Tighten line (1).

l. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check connections for leaks.

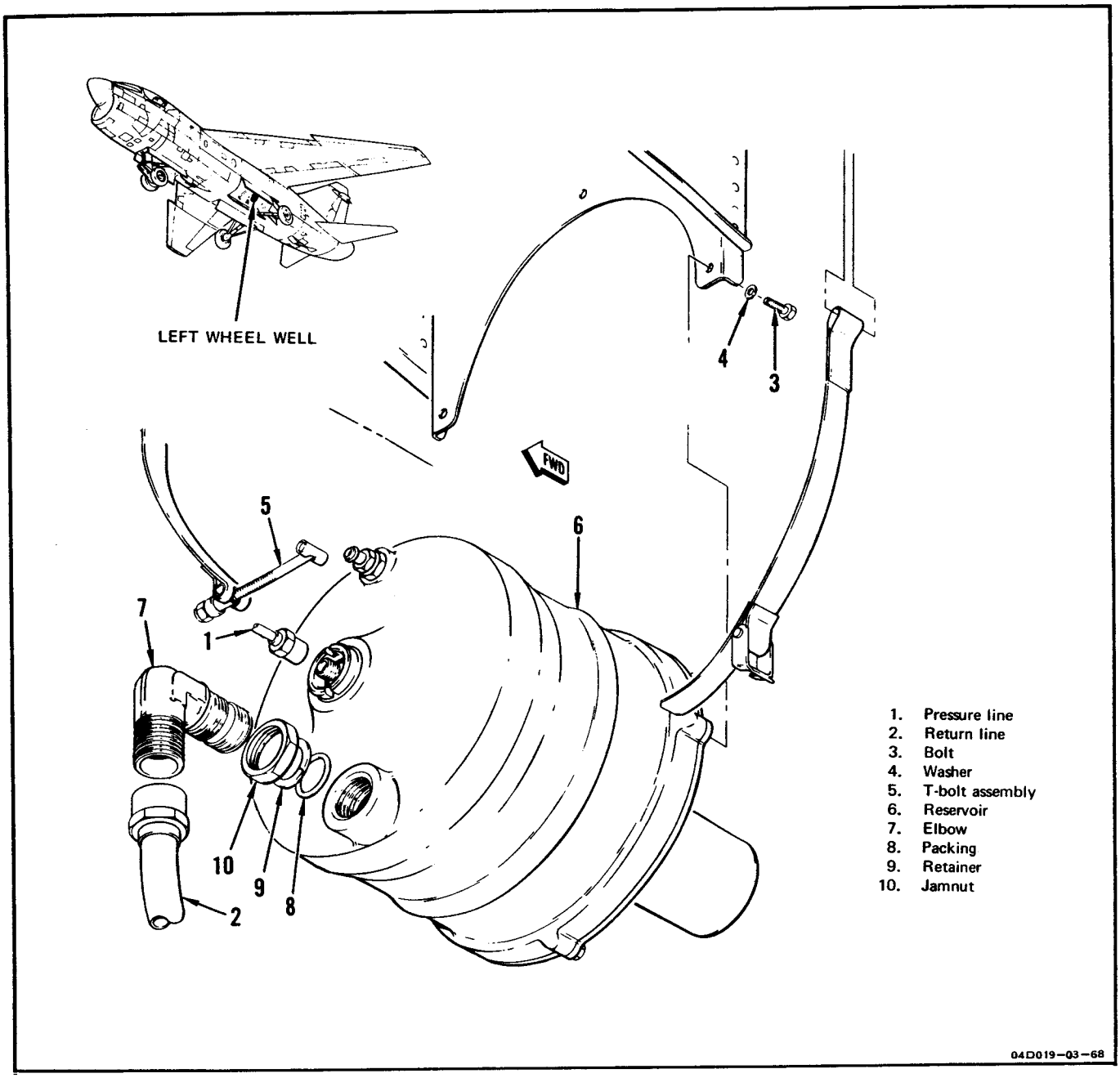


Figure 1-9. Reservoir Removal and Installation

1-39. HYDRAULIC PUMP REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	E10385 (Stewart Avionics, Inc., Brooklyn, New York)	Hydraulic filler cart	Fill hydraulic pump with hydraulic fluid
	GGG-W-686	Torque wrench, 0 to 250 pound-feet	Tighten coupling halves
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten clamp nut

1-40. REMOVAL. (See figure 1-10.)

a. Open access 5223-1.

CAUTION

Teflon-lined flexible hoses tend to conform to the shape of installed positions. Be careful when handling these hoses to prevent bending or straightening which could result in kinking and subsequent hose failure. Refer to T.O. 42E1-1-1 for additional hose information.

b. Disconnect flexible hoses (1) at disconnects. Cap each disconnect coupling half.

c. Cut lockwire and loosen nut (2) on clamp. Remove clamp (3) securing adapter to pump and remove pump (4) from engine. Remove packings (5 and 6). Cap opening on pump and adapter pad.

d. Remove cooling line (7). Loosen nut, and remove elbow (8), packing (9), and nut (10). Cap case drain opening and both ends of line.

e. Remove nut (11) and coupling half (12). Cap coupling half.

f. Remove coupling half (13), packing (14), coupling half (15), and packing (16). Cap coupling halves.

1-41. INSTALLATION. (See figure 1-10.)

CAUTION

If pump replacement was due to evidence of overheating and/or pump failure, the pump cooling line check valve shall be removed, visually inspected, checked for proper operation, and correctly installed. A reversed check valve may pass system checkout, but will cause overheating and possible pump failure.

If pump is discolored due to overheating, the pump, hoses, disconnects, and filter elements shall be replaced.

If pump failed, check pressure line and filler and pump cooling line filters for indicator button extension and check filter elements for metal chips

NOTE

To prevent hydraulic system contamination, do not remove protective caps from lines or ports until just before connecting.

a. Remove elements from pressure line and filler and pump cooling line filters (paragraphs 1-44 and 1-62), and perform the following:

1. Check differential pressure indicator buttons for extension.

2. If neither indicator button is extended or only the pressure line indicator button is extended, install new filter elements. System flushing is not required.

3. If the cooling line filter indicator button is extended, install new filter elements and flush system according to paragraph 1-28.

a-1. Uncap end of coupling half (13) that screws into pump and uncap inlet port on pump. Lubricate threads of coupling half with MIL-H-83282 or MIL-H-46170 fluid. Using new packing (14), install coupling half to 115 (+10, −15) pound-feet torque.

b. Uncap end of coupling half (15) that screws into pump and uncap pressure port on pump. Lubricate threads of coupling half with MIL-H-83282 or

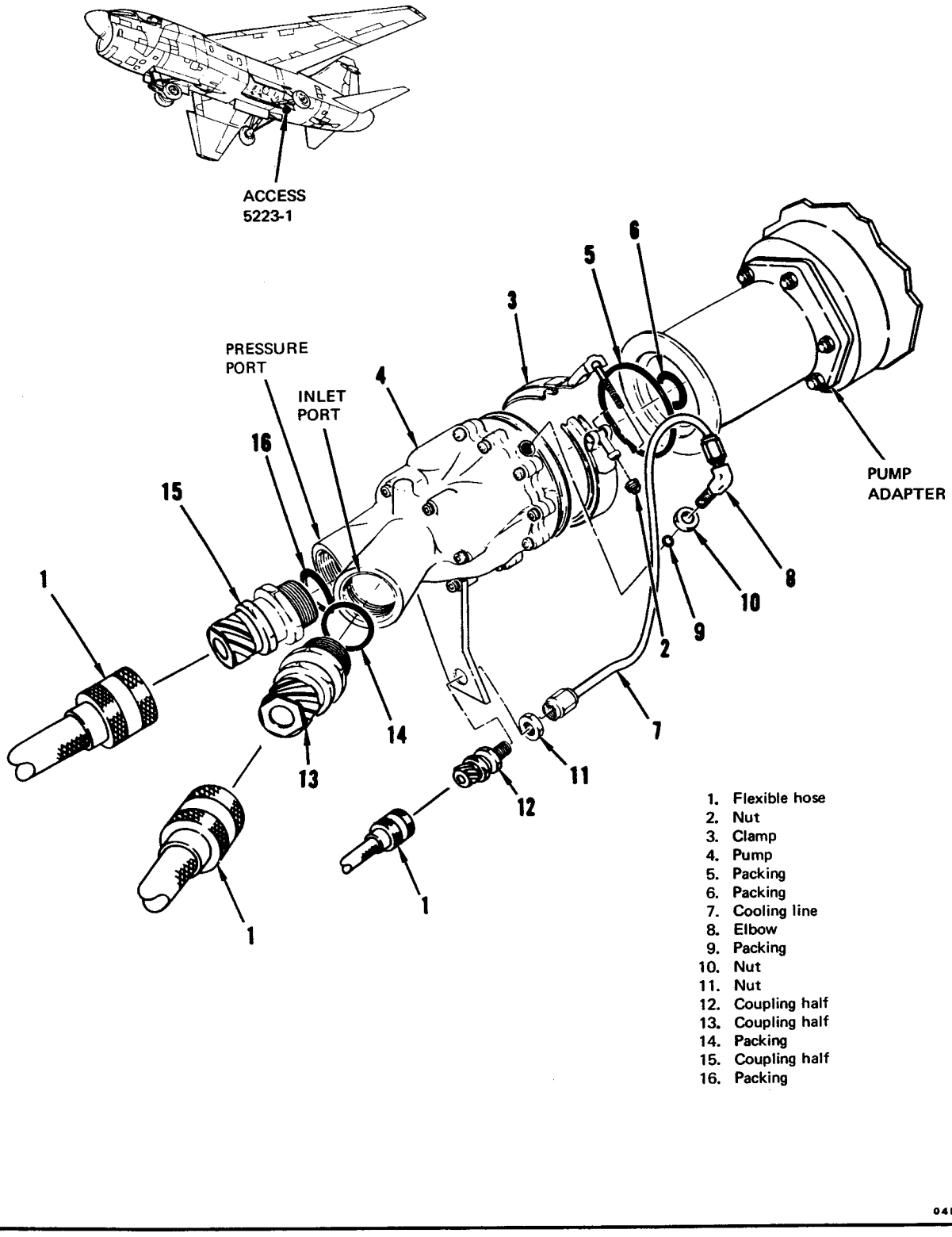


Figure 1-10. Hydraulic Pump Removal and Installation

MIL-H-46170 fluid. Using new packing (16), install coupling half in pressure port. Tighten coupling half to 75 (±7) pound-feet torque.

c. Uncap end of elbow (8) that screws into case drain port and uncap case drain port on pump. Using new packing (9) and nut (10), install elbow (8) into case drain port. Do not tighten nut.

d. Uncap cooling line (7) and threaded end of coupling half (12). Install coupling half (12) with nut (11) in bracket. Connect cooling line to coupling half. Connect other end of line to elbow (8) and tighten nut (10).

e. Uncap and connect hydraulic filler cart to pump inlet coupling half.

f. Open pressure coupling half and manually rotate pump spline. Operate hydraulic filler cart until fluid is free of air. Close pressure coupling half.

g. Open cooling line coupling half and manually rotate pump spline. Operate hydraulic filler cart until fluid is free of air. Close cooling line coupling half. Disconnect hydraulic filler cart.

WARNING

P-D-680, Type II, is combustible and moderately toxic to eyes, skin and respiratory tract. Eye and skin protection required. Good general ventilation is normally adequate.

CAUTION

To prevent excessive gearbox spline wear and subsequent equipment failure, gearbox and pump mating splines must be thoroughly cleaned and properly lubricated.

h. Clean splines of gearbox drive and pump with P-D-680, Type II, drycleaning solvent.

CAUTION

To prevent failure or loosening of the hydraulic pump drive shaft retaining screw which could cause damage to the gearbox, visually inspect the hydraulic pump drive shaft for proper installation of the hydraulic pump drive shaft retaining screw.

i. Uncap pump housing and install new packings (5 and 6). Apply thin coat of MIL-G-81322 grease to splines of pump and pump drive.

CAUTION

To prevent pump failure, check that index pin on pump mounting adapter aligns and mates with index hole in pump mounting flange.

j. Position pump (4) to adapter and secure with clamp (3). Tighten nut (2) on clamp (3) to 60 (+6, −5) pound-inches torque.

k. Using a soft punch and soft hammer or mallet, tap clamp (3) opposite nut and then around periphery of clamp. Tighten nut to 60 (+6, −5) pound-inches torque. Continue tapping and tightening operation until nut torque value stabilizes. Secure clamp with MS20995C41 lockwire (figure 1-10A).

l. Uncap and connect flexible hoses (1) to pump at disconnects.

m. Perform operational checkout (paragraph 1-17).

n. Check pump installation for evidence of leakage.

o. Close access 5223-1.

1-42. HYDRAULIC PUMP HOSE REMOVAL AND INSTALLATION.

NOTE

The following procedure is applicable to PC No. 1, PC No. 2, and PC No. 3 pump hoses.

1-43. Remove and install pump hoses through accesses 5222-1, 5223-1, and 6222-1, observing the following:

a. Cap each disconnect coupling half after disconnecting hoses.

b. Fill hose completely with hydraulic fluid before installing in airplane.

1-44. PRESSURE LINE FILTER ELEMENT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	413-900-020	Torque wrench, 10 to 750 pound-inches	Tighten filter bowl

NOTE

This procedure is applicable to PC No. 1 and PC No. 2 filter elements.

1-45. REMOVAL. (See figure 1-11.)

a. If PC No. 1 element is being removed on airplanes through AF69-6196, dump hydraulic reservoir accumulator (T.O. 1A-7D-2-1).

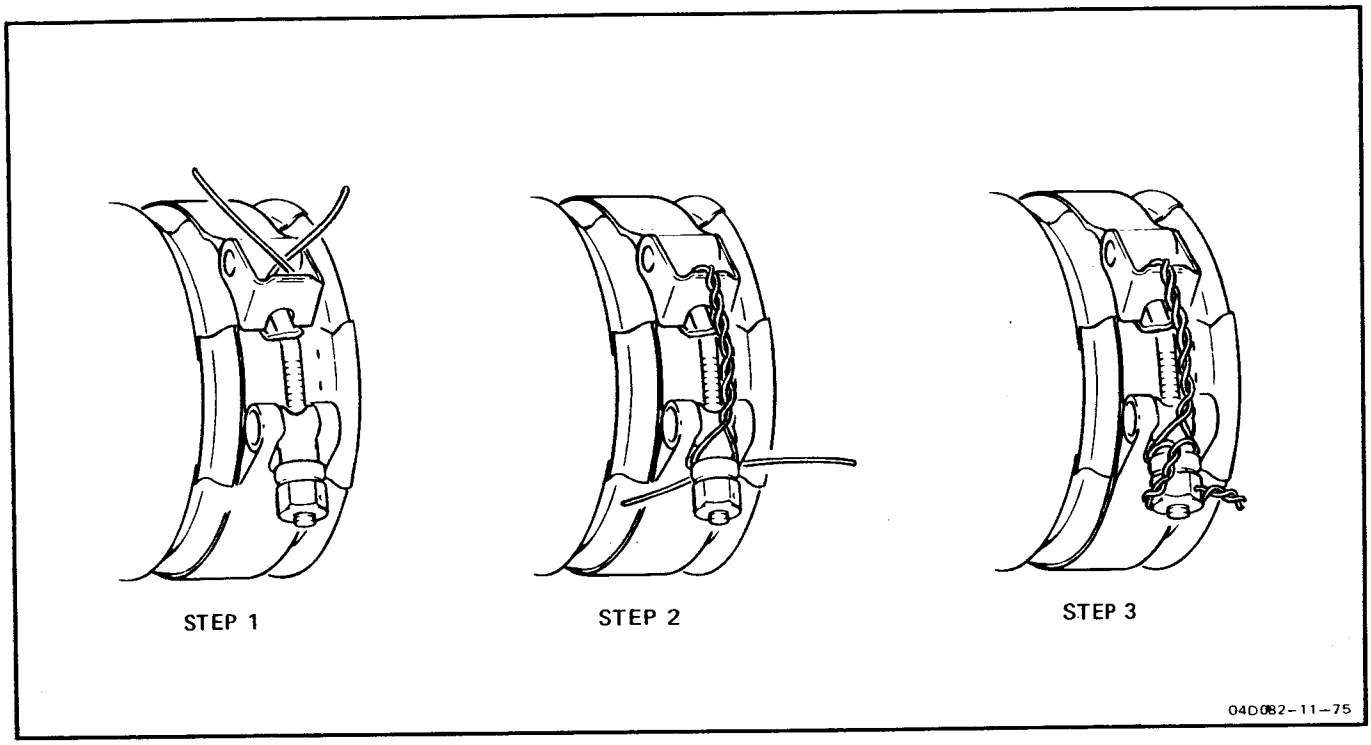
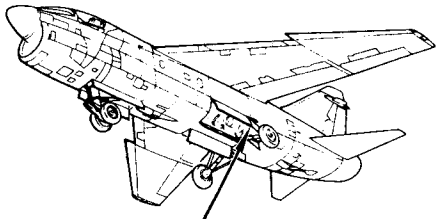
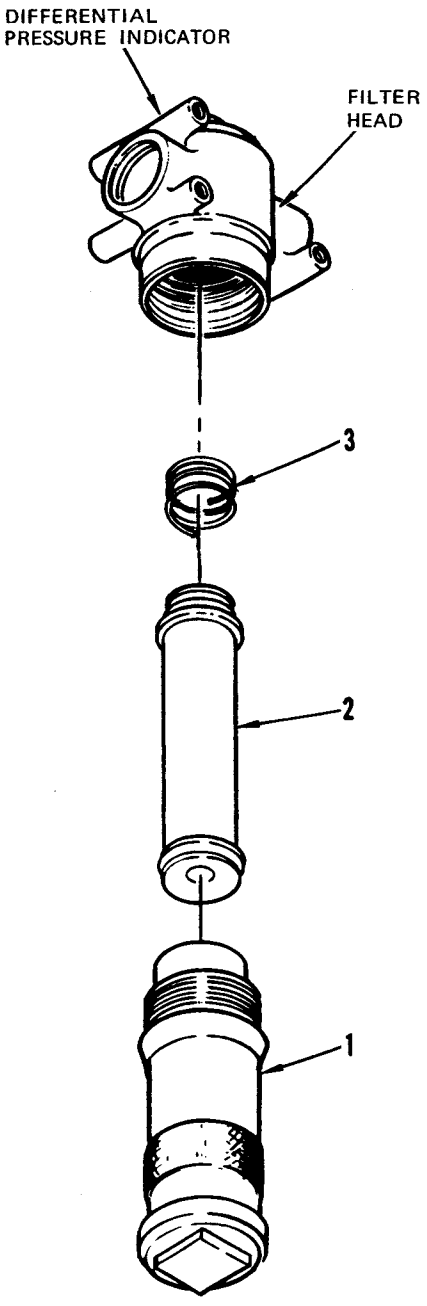


Figure 1-10A. Hydraulic Pump Clamp Lockwire Method



LEFT WHEEL WELL

SEE DETAIL A



1. Filter bowl
2. Filter element
3. Element removal coil spring

NOTE

PC No. 1 installation shown; typical for PC No. 2 installation in right wheel well.

DETAIL A

04D042-03-73

Figure 1-11. Pressure Line Filter Element Removal and Installation

b. Cut lockwire and unscrew filter bowl (1).

WARNING

Fluid in filter will be hot if system has been in operation.

NOTE

Diaphragm in filter head prevents fluid leakage from system after filter bowl is removed.

c. Remove filter element (2) from bowl and remove element removal spring (3) from filter head.

CAUTION

Some AD-3255-16HV filter assemblies incorporate a leaf type element removal spring which is susceptible to damage during element replacement. The leaf type spring should be discarded and replaced with coil spring or filter reassembled with no element removal spring installed. (Refer to T.O. 1A-7D-702.)

d. Before discarding leaf type spring, check that element removal spring is intact. If spring is broken, inspect element or downstream components for spring fragments.

e. Clean filter bowl.

1-46. INSTALLATION. (See figure 1-11.)

NOTE

For list of approved filter elements, refer to appendix A.

a. Carefully check filter bowl for evidence of internal scoring, especially at bottom of bowl where scoring is most likely to occur. Repair any scored area by blending with crocus cloth.

NOTE

Some filter elements provide a Belleville washer on bottom of element which preloads the element when element and bowl are installed.

b. On elements containing a Belleville washer, check that radius on outside diameter of washer exceeds 0.01 inch. If radius is less than 0.01 inch or sharp edges are apparent, replace element.

c. Insert element in bowl and check that element completely bottoms out without any evidence of binding. If binding is encountered when inserting element, replace element.

NOTE

Some AD-3255-16HV filter assemblies incorporate a coil type element removal spring. One end of spring is slightly opened so that spring can be retained by a groove in the filter diaphragm. Ensure spring is installed with open end engaging filter diaphragm so that spring can be retained in the groove.

d. Install element removal coil spring (3) in filter head. Ensure spring fully engages groove in filter diaphragm.

e. If element contains a Belleville washer, ensure washer rotates freely on element.

f. Immerse element in clean MIL-H-83282 hydraulic fluid for several minutes, and install filter element (2) in filter bowl.

NOTE

Ensure filter bowl is filled to capacity to minimize air inclusion into the system.

g. Fill bowl and element completely with clean MIL-H-83282 hydraulic fluid.

h. Insert bowl in filter head and tighten bowl to 360 (±60) pound-inches torque.

i. If required, press filter head indicator button to reset.

j. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check filter for leaks and indicator button for extension.

k. Secure filter bowl to filter head with MS20995C32 lockwire.

1-47. PRESSURE LINE FILTER REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect external hydraulic power

1-48. REMOVAL. (See figure 1-12.)

a. On airplanes through AF69-6196, dump PC No. 1 reservoir accumulator (T.O. 1A-7D-2-1).

b. Loosen clamp on line (2).

c. Disconnect hydraulic lines (1, 2, and 3) from filter. Cap lines.

d. Remove bolts (4), washers (5), and spacers (6) securing filter to airplane.

e. Remove pressure line filter (7) from airplane.

f. Loosen jamnuts and remove tee (8), elbow (9), packings (10), retainers (11), and jamnuts (12) from filter.

1-49. INSTALLATION. (See figure 1-12.)

a. Install jamnuts (12) on elbow and tee.

b. Install new retainers (11) and packings (10) on elbow and tee.

c. Drain preservative fluid from filter and fill with hydraulic fluid.

d. Install elbow (9) and tee (8) in filter. Do not tighten jamnuts (12).

e. Position pressure line filter (7) in wheel well and secure with spacers (6), washers (5), and bolts (4).

f. Connect hydraulic lines (1, 2, and 3) to filter. Secure line (2) with clamp. Tighten jamnuts (12).

WARNING

Serious injury can occur while high pressure testing. While testing, personnel will be protected by a shield or be a safe distance from the unit to prevent injury.

g. Connect external hydraulic power and apply 400 (± 100) psi (T.O. 1A-7D-2-1).

h. Loosen hydraulic line (2) at tee. Allow fluid to flow until free of air. Tighten line.

i. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check connections for leaks.

1-50. SYSTEM PRESSURE RELIEF VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect external hydraulic power

1-51. REMOVAL. (See figure 1-13.)

a. On airplanes through AF69-6196 before removal of system pressure relief valve, dump PC No. 1 reservoir accumulator (T.O. 1A-7D-2-1).

CAUTION

To prevent damage to brazed fitting, jamnut on fitting shall be loosened before removal of fitting is attempted.

b. Loosen jamnut (1) on brazed fitting. Disconnect and cap hydraulic line (2) and remove packing (3).

c. Disconnect and cap hydraulic lines (4).

d. Remove nuts (5), washers (6), and screws (7) securing valve to airplane.

e. Remove system pressure relief valve (8) from airplane and remove clamps (9).

f. Loosen jamnut and remove tee and elbow assembly (10) from valve.

g. Remove packing (11), retainer (12), and jamnut (13) from tee and elbow assembly.

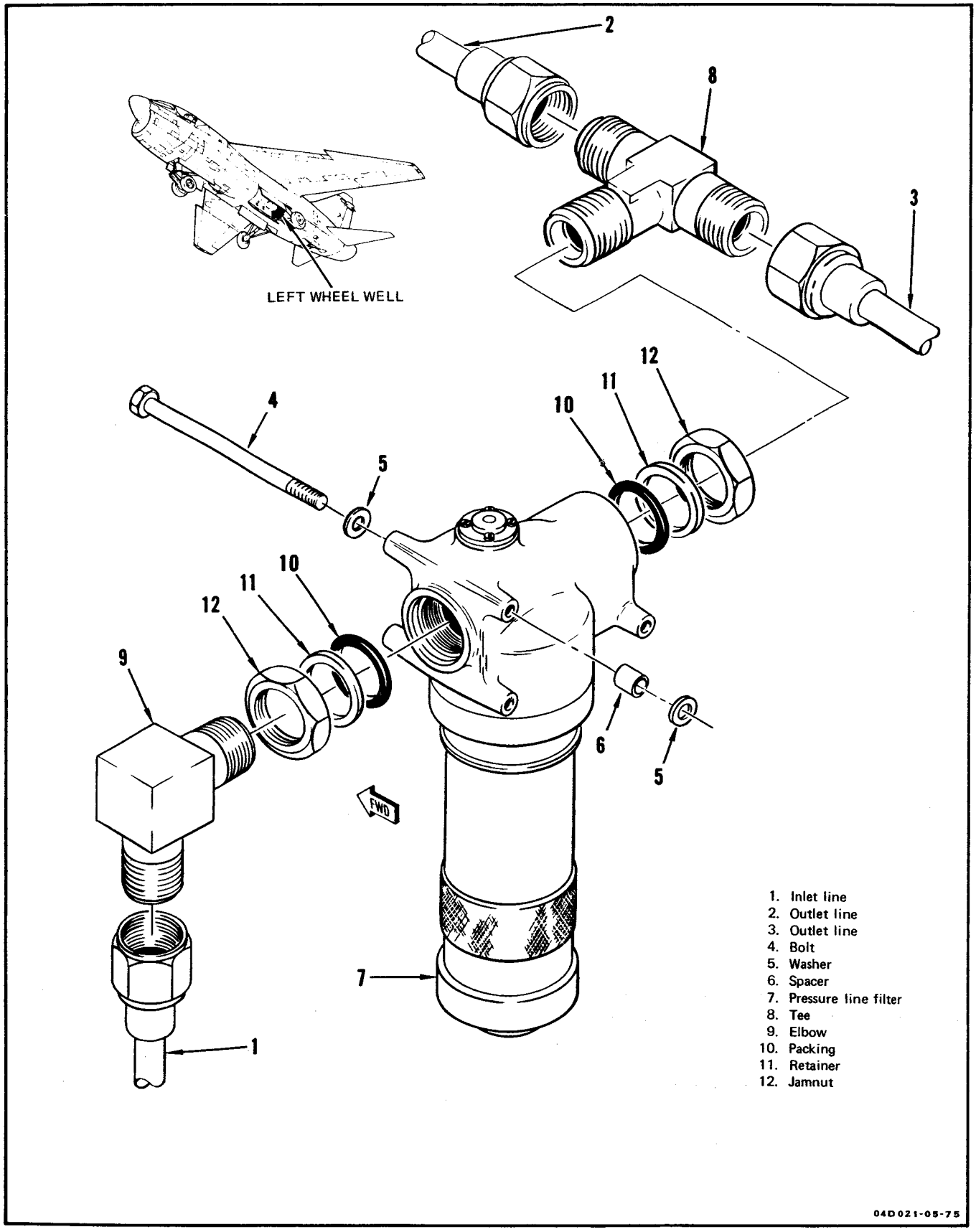


Figure 1-12. Pressure Line Filter Removal and Installation

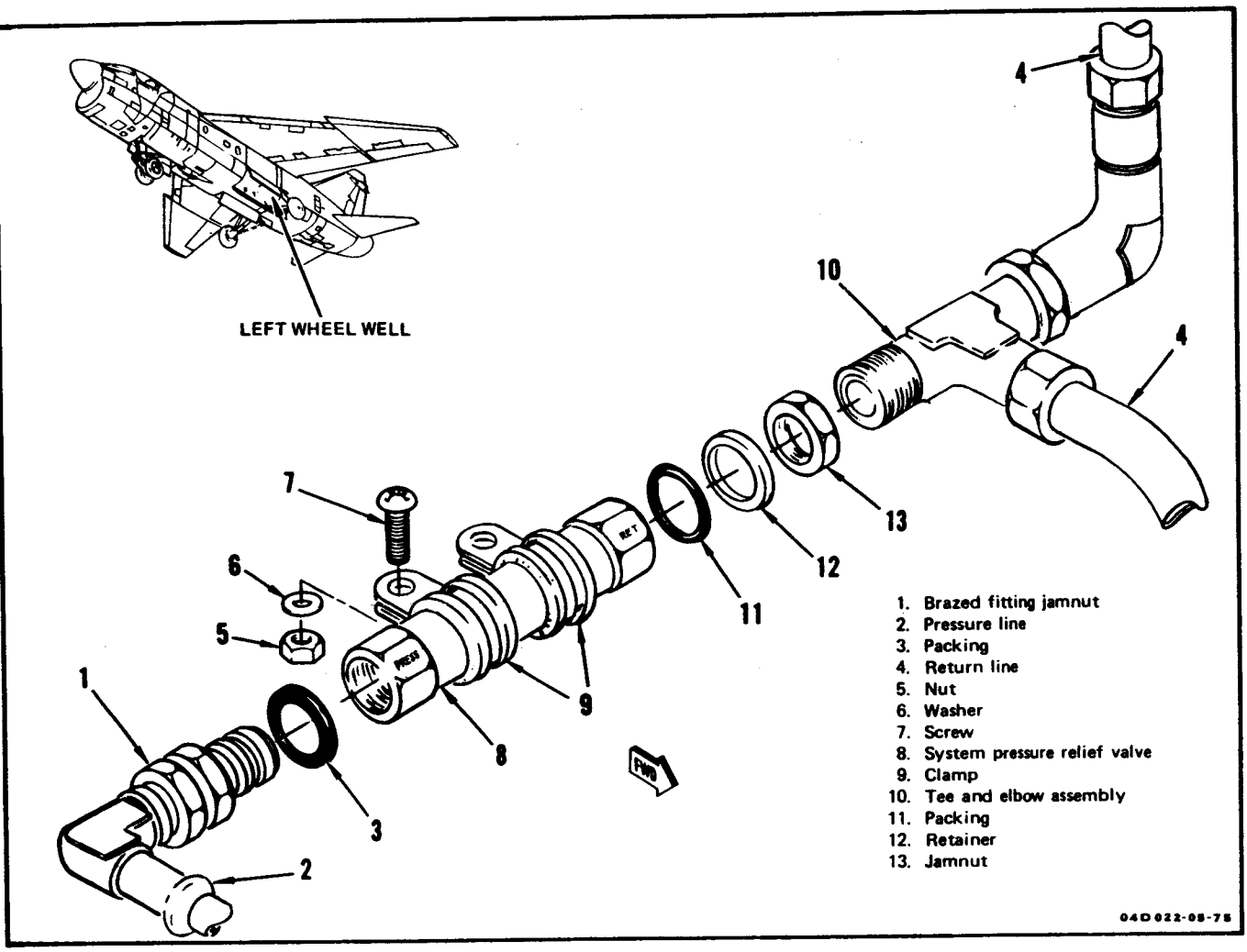


Figure 1-13. System Pressure Relief Valve Removal and Installation

1-52. INSTALLATION. (See figure 1-13.)

a. Install jamnut (13), new retainer (12), and new packing (11) on tee and elbow assembly.

b. Install tee and elbow assembly (10) on pressure relief valve (8). Do not tighten jamnut (13).

c. Install clamps (9), position valve (8) in airplane, and secure with screws (7), washers (6), and nuts (5).

d. Uncap hydraulic lines (2 and 4), install new packing (2), and connect lines to relief valve. Tighten jamnut (13).

WARNING

Serious injury can occur while high pressure testing. While testing, personnel will be protected by a shield or be a safe distance from the unit to prevent injury.

e. Connect external hydraulic power to PC No. 1 system and apply 400 (±100) psi (T.O. 1A-7D-2-1).

f. Loosen hydraulic line (2) at relief valve pressure port and allow fluid to flow until free of air. Tighten jamnut (1).

g. Loosen hydraulic line (4) at return port of relief valve and allow fluid to flow until free of air. Tighten line.

h. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check valve and connections for leaks.

1-53. ACCUMULATOR REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect external hydraulic power

1-54. REMOVAL. (See figure 1-14.)

NOTE

Airplanes through AF69-6196 PC No. 1 are equipped with two accumulators. This procedure is applicable for both accumulators.

a. Dump PC No. 1 reservoir accumulator (T.O. 1A-7D-2-1).

b. Reduce applicable PC No. 1 accumulator pneumatic pressure to zero (T.O. 1A-7D-2-1).

c. Disconnect hydraulic line (1) from accumulator. Cap line.

d. Disconnect pneumatic line (2) from accumulator. Cap line.

e. Remove nuts (3) securing accumulator to bracket and remove accumulator (4).

f. Remove reducers (5) and packings (6) from accumulator.

1-55. INSTALLATION. (See figure 1-14.)

a. Drain preservative fluid and fill hydraulic side of accumulator with hydraulic fluid.

b. Using new packings (6), install reducers (5) in accumulator.

c. Position accumulator (4) to bracket and secure with nuts (3).

d. Uncap and connect, but do not tighten, hydraulic line (1). Connect and tighten pneumatic line (2).

e. Charge accumulator pneumatically (T.O. 1A-7D-2-1).

f. Connect external hydraulic power to PC No. 1 hydraulic system and apply 400 (±100) (T.O. 1A-7D-2-1).

g. Allow fluid to flow from hydraulic line (1) until free of air. Tighten hydraulic line.

h. Increase hydraulic pressure to 3,000 psi and check connections for evidence of leakage.

i. Perform hydraulic system air check (T.O. 1A-7D-2-1).

1-56. PRESSURE GROUND TEST DISCONNECT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	413-900-020	Torque wrench, 10 to 750 pound-inches	Tighten coupling half

NOTE

The following procedures are applicable to both PC No. 1 and PC No. 2 pressure line disconnects.

1-57. REMOVAL. (See figure 1-15.)

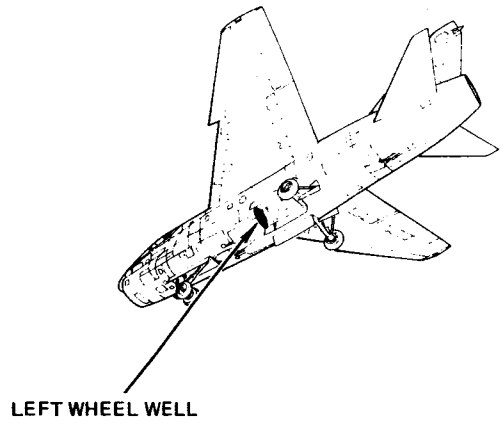
WARNING

Before removing disconnects, check that system hydraulic pressure is zero. High pressure can cause serious injury.

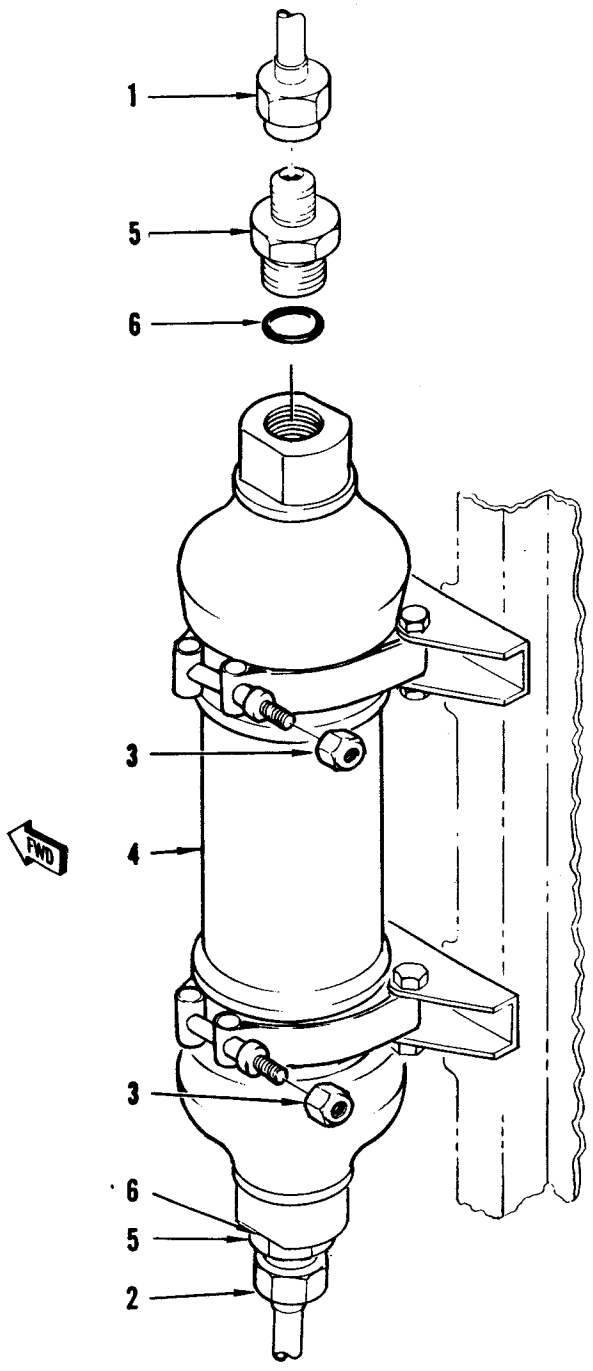
a. Drain PC No. 1 or PC No. 2 reservoir, as required (T.O. 1A-7D-2-1).

b. Open access 6222-1 for PC No. 2 disconnect. PC No. 1 disconnect is located in left wheel well.

c. Remove dust cover (1) from disconnect coupling half.

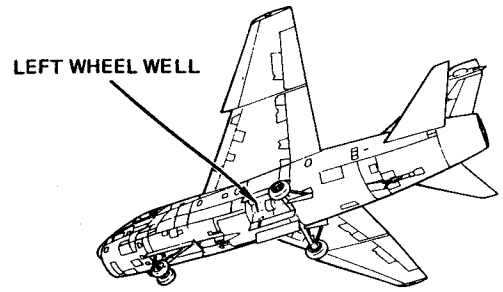


1. Hydraulic line
2. Pneumatic line
3. Nut
4. Accumulator
5. Reducer
6. Packing



04D023-05-69

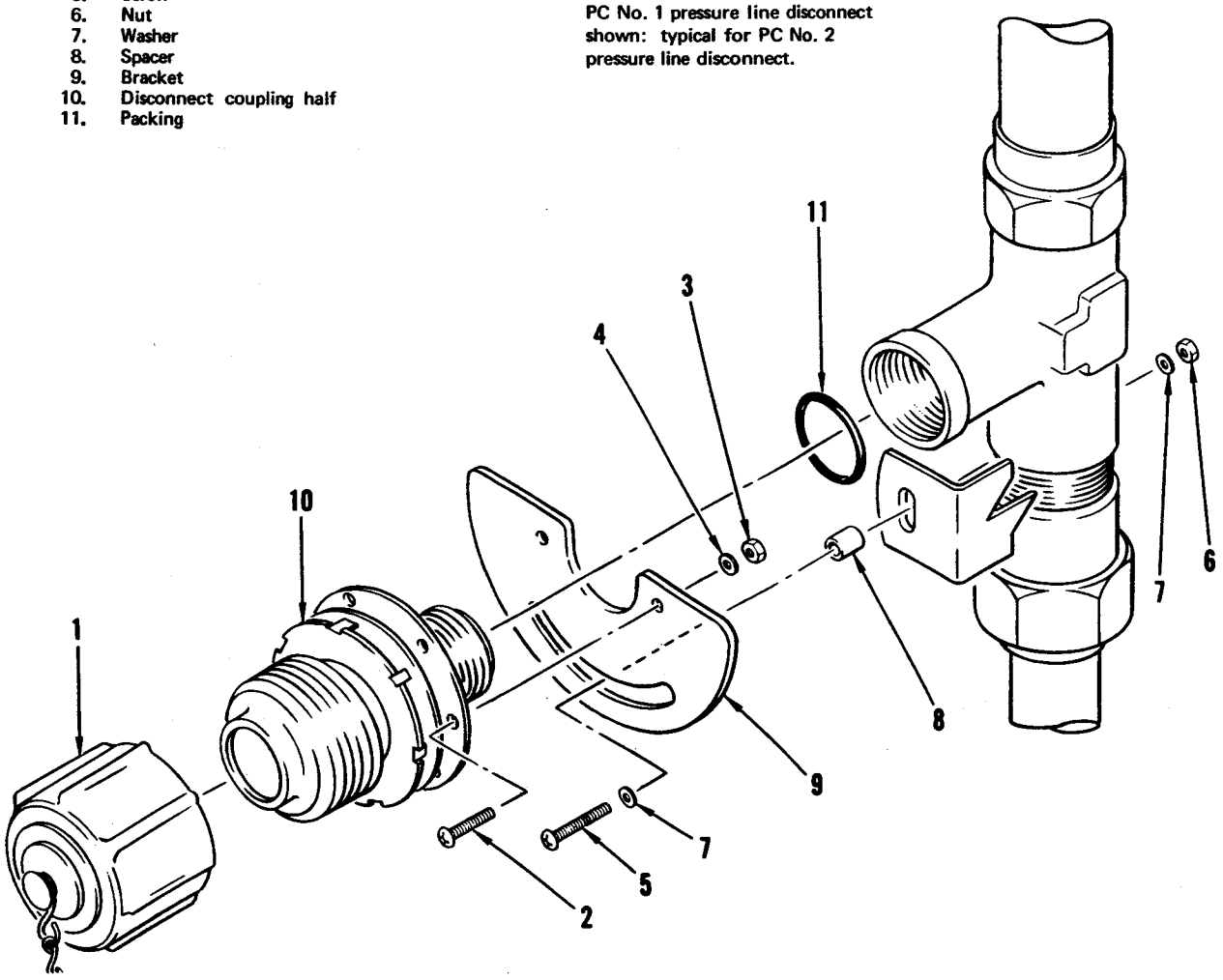
Figure 1-14. Accumulator Removal and Installation



1. Dust cover
2. Screw
3. Nut
4. Washer
5. Screw
6. Nut
7. Washer
8. Spacer
9. Bracket
10. Disconnect coupling half
11. Packing

NOTE

PC No. 1 pressure line disconnect shown: typical for PC No. 2 pressure line disconnect.



04D024-05-75

Figure 1-15. Pressure Line Ground Test Disconnect Removal and Installation

d. Remove screws (2), nuts (3), and washers (4) securing coupling half to bracket.

e. Disconnect coupling half and remove screw (5), nut (6), washers (7), and spacer (8) securing bracket to airframe. Remove bracket (9).

f. Remove disconnect coupling half (10) and packing (11) from tee. Install protective cap on tee.

1-58. INSTALLATION. (See figure 1-15.)

a. Remove protective cap from tee and install disconnect coupling half (10) using new packing (11).

b. Tighten coupling half to 400 (±100) pound-inches torque.

c. Install bracket (9) and secure with washers (4), nuts (3), and screws (2).

d. Secure bracket (9) to airframe with spacer (8), washers (7), nut (6), and screw (5).

e. Install dust cover (1) on coupling half.

f. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check for leaks around disconnect couplings.

g. Close access 6222-1.

1-59. RETURN GROUND TEST DISCONNECT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	413-900-020	Torque wrench, 10 to 750 pound-inches	Tighten coupling half

NOTE

The following procedures are applicable to both PC No. 1 and PC No. 2 return line disconnects.

1-60. REMOVAL. (See figure 1-16.)

a. Drain reservoir (T.O. 1A-7D-2-1). Leave test stand connected.

b. Open access 6222-1 for PC No. 2 disconnect. PC No. 1 disconnect is located in left wheel well.

c. Remove dust cover (1) from disconnect coupling half.

d. Remove screws (3), nuts (4), and washers (5) securing disconnect flanges and remove disconnect coupling half (6). Install protective cap on hydraulic line.

1-61. INSTALLATION. (See figure 1-16.)

a. Remove protective cap from hydraulic line. Position coupling half (5) and secure with screws (3), nuts (4), and washers (5).

b. Connect hydraulic line (2) to coupling half and tighten coupling half to 600 (±120) pound-inches torque.

c. Install dust cover (1) on coupling half.

WARNING

Serious injury can occur while high pressure testing. While testing, personnel will be protected by a shield or be a safe distance from the unit to prevent injury.

d. Apply 400 (±100) psi to system with test stand set for open system operation. Allow fluid to flow for 5 to 7 minutes.

e. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check for leaks around disconnect.

f. Close access 6222-1

1-62. FILLER AND PUMP COOLING LINE FILTER ELEMENT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	413-900-020	Torque wrench, 10 to 750 pound-inches	Tighten filter bowl

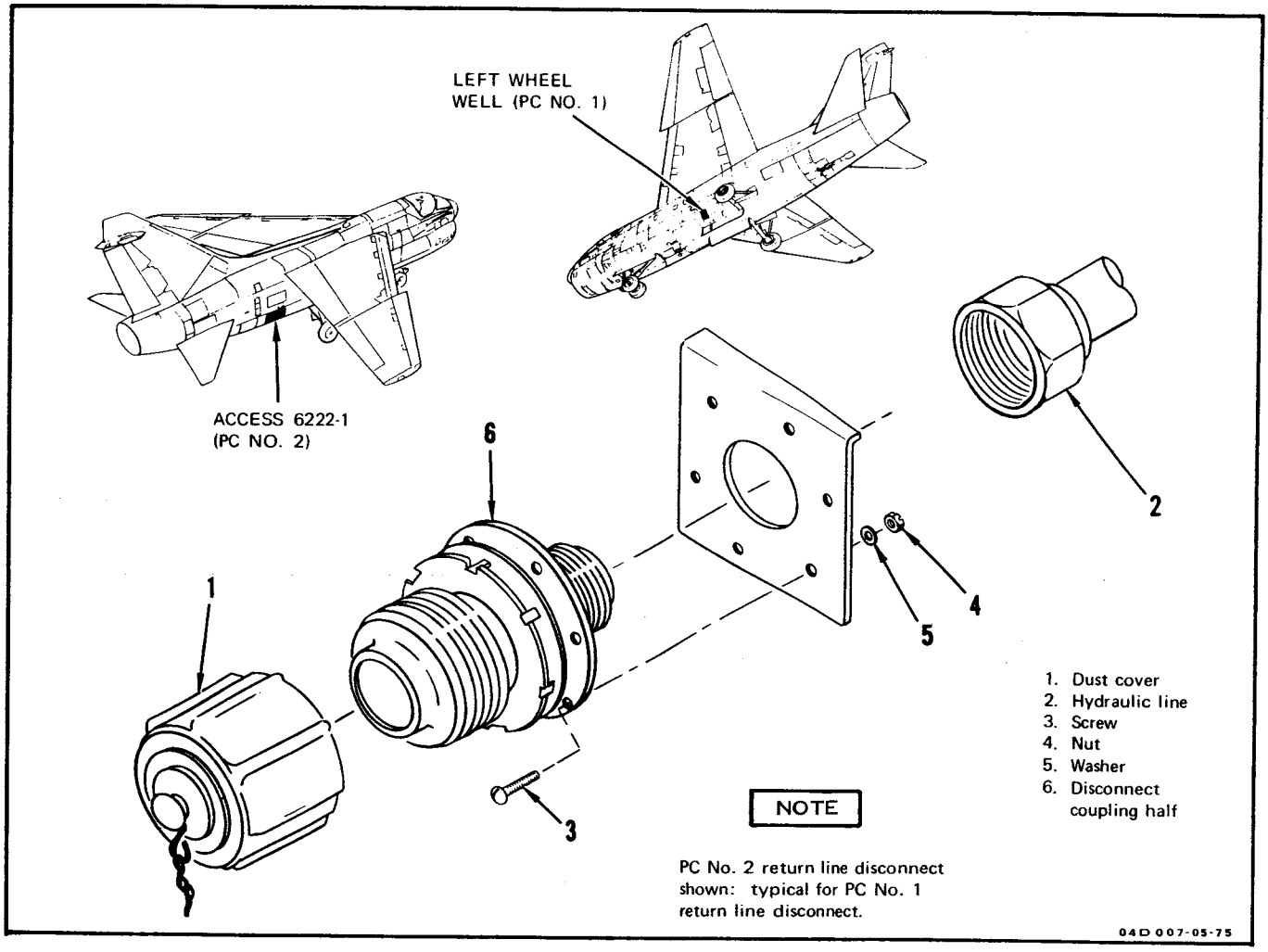


Figure 1-16. Return Line Ground Test Disconnect Removal and Installation

1-63. REMOVAL. (See figure 1-17.)

WARNING

Fluid in filter will be hot if system has been in operation.

NOTE

This procedure is applicable to PC No. 1, PC No. 2, and PC No. 3 cooling line filter elements.

a. If the PC No. 3 filter element or on airplanes through AF69-6196, the PC No. 1 filter element is being removed, dump hydraulic reservoir accumulator (T.O. 1A-7D-2-1).

b. Cut lockwire and unscrew filter bowl (1) from filter head.

c. Remove filter element (2) and spring (3).

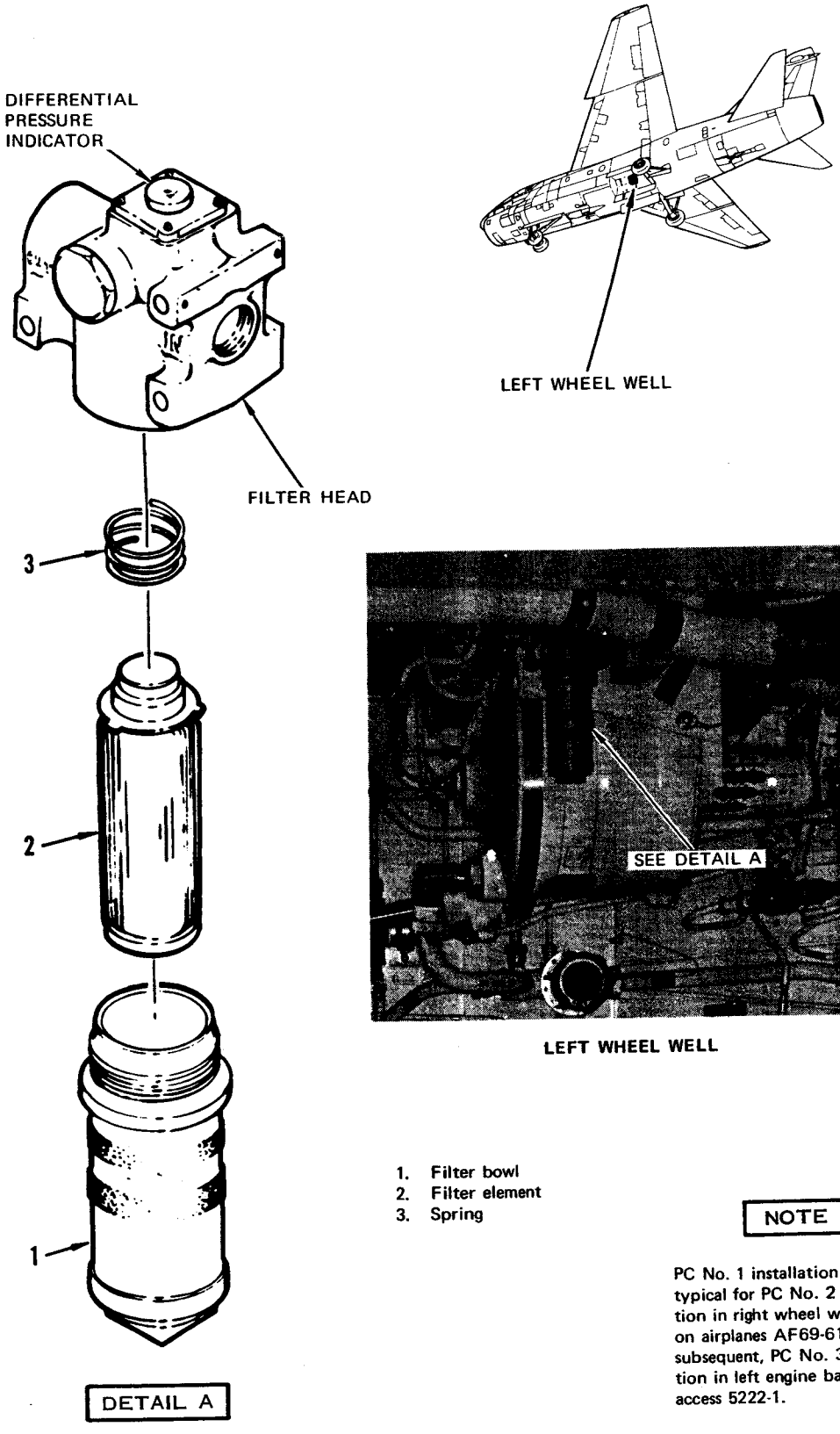
d. Clean filter bowl.

1-64. INSTALLATION. (See figure 1-17.)

NOTE

For list of approved filter elements, refer to appendix A.

a. Carefully check filter bowl for evidence of internal scoring, especially at bottom of bowl where scoring is most likely to occur. Repair any scored area by blending with crocus cloth.



LEFT WHEEL WELL

1. Filter bowl
2. Filter element
3. Spring

NOTE

PC No. 1 installation shown; typical for PC No. 2 installation in right wheel well, and on airplanes AF69-6197 and subsequent, PC No. 3 installation in left engine bay above access 5222-1.

04D043-05-75

Figure 1-17. Filler and Pump Cooling Line Filter Element Removal and Installation

NOTE

Some filter elements provide a Belleville washer on bottom of element which preloads the element when element and bowl are installed.

b. On elements containing a Belleville washer, check that radius on outside diameter of washer exceeds 0.01 inch. If radius is less than 0.01 inch or sharp edges are apparent, replace element.

c. Insert element in bowl and check that element completely bottoms out without any evidence of binding. If binding is encountered when inserting element, replace element.

d. Install element removal spring (3) in filter head. Ensure spring fully engages groove in filter diaphragm.

e. If element contains a Belleville washer, ensure washer rotates freely on element.

f. Immerse element in clean MIL-H-83282 hydraulic fluid for several minutes, and install filter element (2) in filter bowl.

NOTE

Ensure filter bowl is filled to capacity to minimize air inclusion into the system.

g. Fill bowl and element completely with clean MIL-H-83282 hydraulic fluid.

h. Insert bowl in filter head and tighten bowl to 150 (±30) pound-inches torque.

CAUTION

If element replacement is due to indicator button extension, examine filter element for metal chips. If metal chips are found, the system must be flushed.

i. If required, press filter head indicator button to reset and flush system (paragraph 1-28).

j. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check filter for leaks and indicator button for extension.

k. Secure bowl with MS20995C32 lockwire.

1-65. FILLER AND PUMP COOLING LINE FILTER REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	E10385 (Stewart Avionics, Inc., Brooklyn, New York)	Hydraulic filler cart	Bleed filter

1-66. REMOVAL. (See figure 1-18.)

a. On airplanes through AF69-6196, dump PC No. 1 reservoir accumulator (T.O. 1A-7D-2-1).

b. Disconnect hydraulic lines (1 and 2). Cap lines.

c. Remove nuts (3), washers (4), spacers (5), and bolts (6) securing filter to airplane.

d. Remove filler and pump cooling line filter (7).

e. On airplanes through AF69-6196, loosen jamnut and remove tee (8), packing (10), retainer (11), and jamnut (12).

f. On airplanes AF69-6197 and subsequent, loosen jamnut and remove elbow (9), packing (10), retainer (11), and jamnut (12).

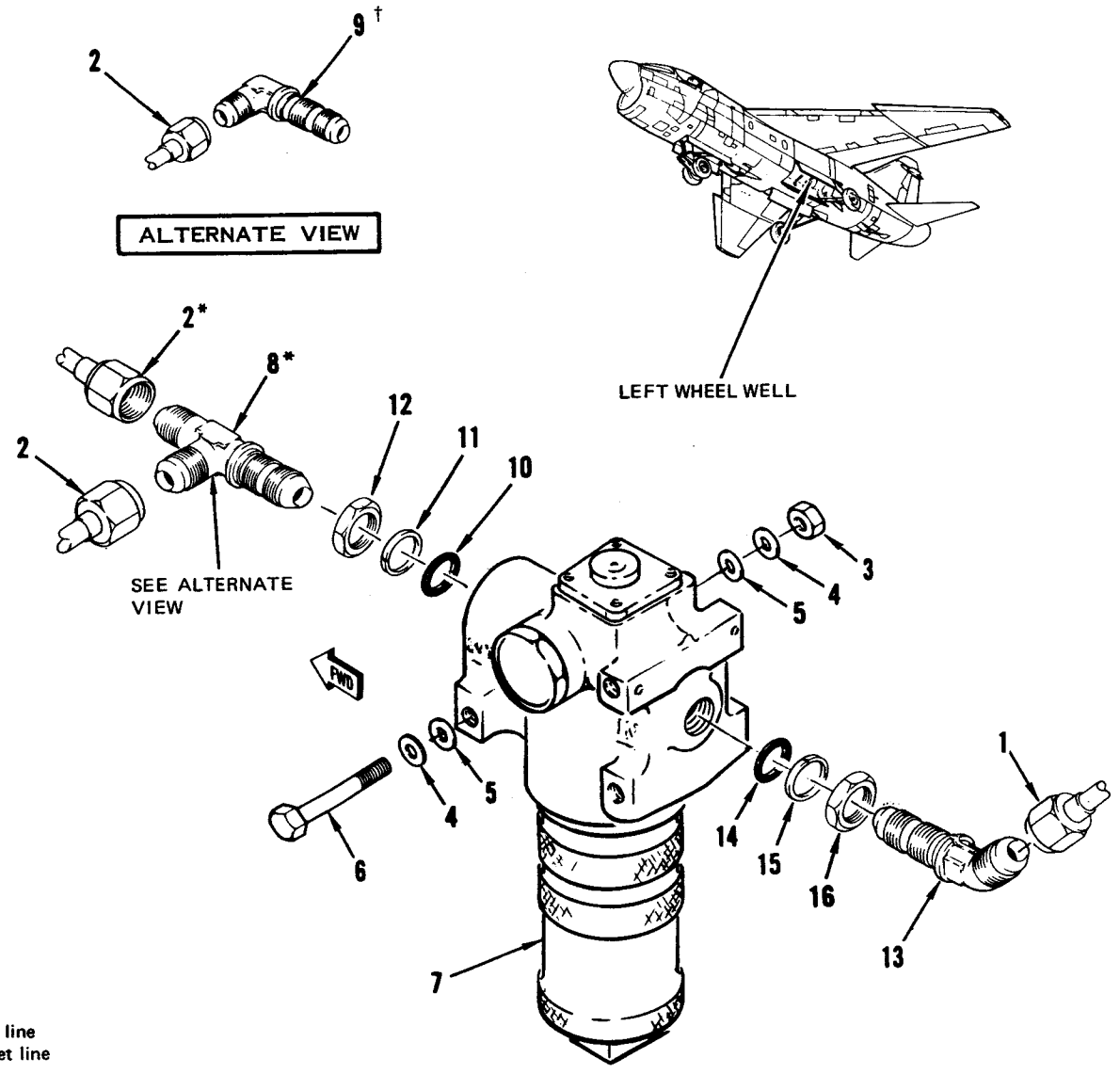
g. Loosen jamnut and remove elbow (13), packing (14), retainer (15), and jamnut (16).

1-67. INSTALLATION. (See figure 1-18.)

a. Install jamnut (16), new retainer (15), and new packing (14) on elbow.

b. Drain preservative fluid from filter and fill with hydraulic fluid.

c. Install elbow (13) in filter. Do not tighten jamnut (16).



1. Inlet line
2. Outlet line
3. Nut
4. Washer
5. Spacer
6. Bolt
7. Filler and pump cooling line filter
*8. Tee
†9. Elbow
10. Packing
11. Retainer
12. Jamnut
13. Elbow
14. Packing
15. Retainer
16. Jamnut

*Airplanes through AF69-6196
† Airplanes AF69-6197 and subsequent

04D035-05-75

Figure 1-18. Filler and Pump Cooling Line Filter Removal and Installation

d. On airplanes through AF69-6196 install jamnut (12), new retainer (11), and new packing (10) on tee. Install tee (8) in filter. Do not tighten jamnut (12).

e. On airplanes AF69-6197 and subsequent, install jamnut (12), new retainer (11), and new packing (10) on elbow (9). Install elbow (9) in filter. Do not tighten jamnut (12).

f. Secure filler and pump cooling line filter (7) to airplane with bolts (6), spacers (5), washers (4), and nuts (3).

g. Uncap and connect hydraulic lines (1 and 2). Tighten jamnuts (16 and 12).

h. Loosen hydraulic line (2) at outlet side.

i. Connect hydraulic filler cart to filler valve. Operate cart and allow fluid to flow until free of air. Tighten hydraulic line.

j. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check for leaks at line connections.

1-68. ACCUMULATOR DUMP VALVE REMOVAL AND INSTALLATION. (Airplanes Through AF69-6196.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Connect electrical power
		Equipment required for connecting external hydraulic power	Connect hydraulic power

1-69. REMOVAL. (See figure 1-19.)

WARNING

Failure to depressurize accumulator can cause serious injury to personnel.

a. Dump PC No. 1 reservoir accumulator (T.O. 1A-7D-2-1).

b. Disconnect electrical connector (1) from valve.

CAUTION

To prevent damage to brazed fitting, jamnut on fitting shall be loosened before removal of fitting is attempted.

c. Disconnect and cap hydraulic line (2).

d. Remove bolts (3) and washers (4).

e. Loosen jamnut (5) on brazed fitting. Unscrew fitting from accumulator dump valve. Cap brazed fitting.

f. Remove dump valve (6) and packing (6A) from airplane.

g. Loosen jamnut and remove elbow (7), packing (8), retainer (9), and jamnut (10).

1-70. INSTALLATION. (See figure 1-19.)

a. Install jamnut (10), new retainer (9), and new packing (8) on elbow.

b. Install elbow (7) in valve. Do not tighten jamnut (10).

c. Install new packing (6A) and position accumulator dump valve (6) on bracket. Install brazed fitting (5) in dump valve. Do not tighten jamnut.

d. Secure dump valve to airplane with washers (4) and bolts (3).

e. Uncap and connect hydraulic lines (2) to valve. Tighten jamnut (10) and jamnut on brazed fitting.

f. Connect electrical connector (1) to valve.

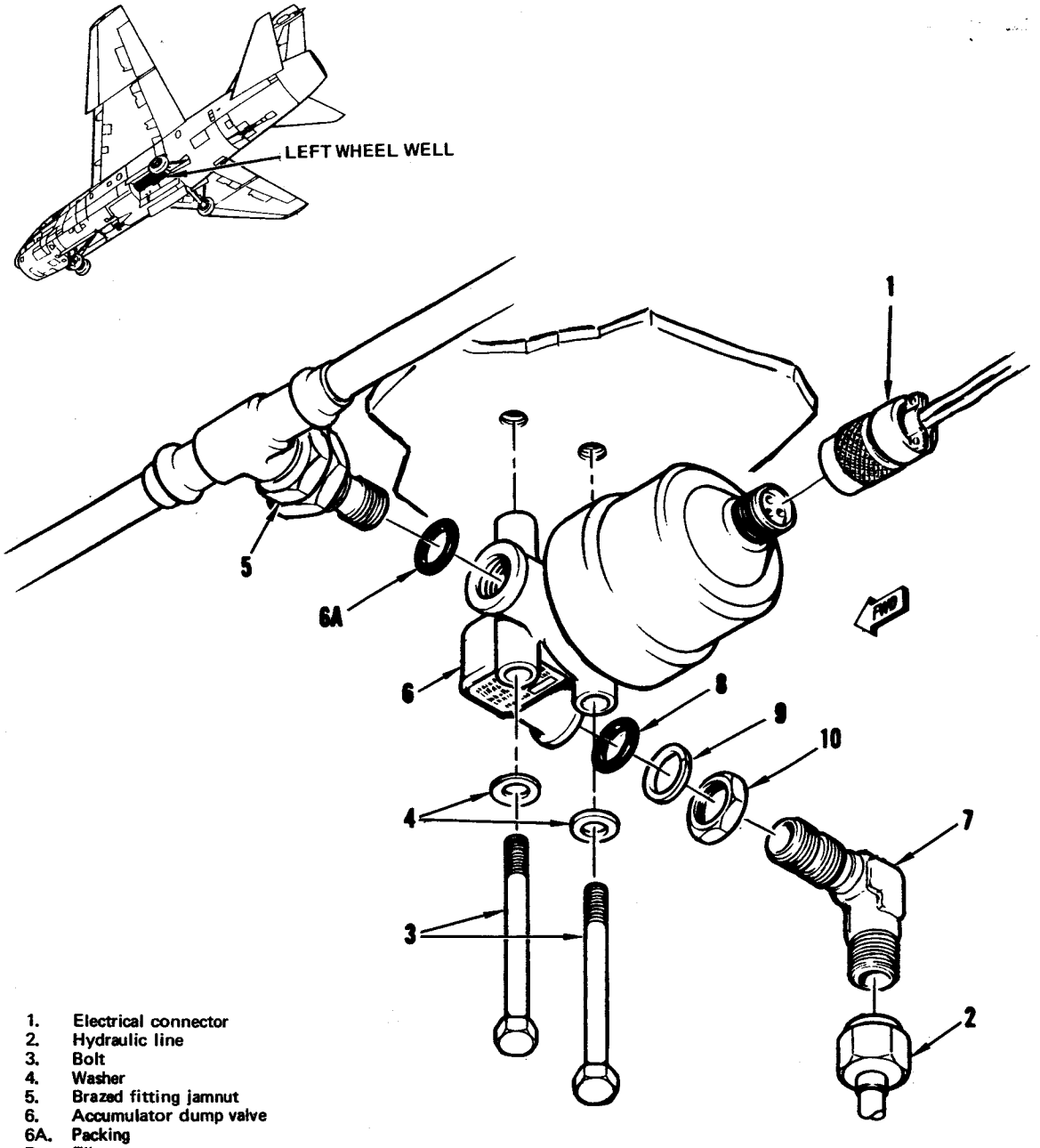
WARNING

Voltage used can cause arcing which may result in severe burns. Remove watches, rings and other jewelry that can cause a shock/burn hazard.

g. Connect external electrical power (T.O. 1A-7D-2-1).

h. Pneumatically service reservoir accumulator (T.O. 1A-7D-2-1).

i. Connect external hydraulic power to PC No. 1 (T.O. 1A-7D-2-1). Apply system operating pressure to charge reservoir accumulator and reduce hydraulic pressure to zero.



1. Electrical connector
2. Hydraulic line
3. Bolt
4. Washer
5. Brazed fitting jamnut
6. Accumulator dump valve
6A. Packing
7. Elbow
8. Packing
9. Retainer
10. Jamnut

04D026-05-75

Figure 1-19. Accumulator Dump Valve Removal and Installation (Airplanes Through AF69-6196)

j. With no external pressure on system, check PC No. 1 reservoir accumulator pressure (T.O. 1A-7D-2-1).

k. Place emergency accumulator test switch in DUMP. Reservoir accumulator pressure shall decrease rapidly.

l. Release test switch. Repeat charge and dump operation five times to purge air from the dump valve. Check valve connections for leaks.

m. Disconnect external electrical and hydraulic power (T.O. 1A-7D-2-1).

n. Perform hydraulic system air check (T.O. 1A-7D-2-1).

1-71. AILERON PC CYLINDER FLEXIBLE HOSE REMOVAL AND INSTALLATION.

(Airplanes AF69-6197 and Subsequent After T.O. 1A-7D-756.)

1-72. REMOVAL. (See figure 1-20.)

a. Open access 3232-1 or 4231-2.

b. Dump reservoir accumulator (T.O. 1A-7D-2-1).

c. Remove the two short hoses as follows:

1. Remove screw (1), washer (2), screw (3), washer (4), channel (5), spacer (6) (left wing only), and spacer (7).

2. Remove screw (8), washer (9), and two halves of block clamp (10).

3. Disconnect and remove hoses (11 and 12).

4. Install protective caps on bulkhead and servo valve fittings. Plug hoses.

d. Remove the two long hoses as follows:

1. Remove aileron PC cylinder (T.O. 1A-7D-2-8).

2. If not previously removed, remove screw (1), washer (2), screw (3), washer (4), channel (5), spacer (6) (left wing only), and spacer (7).

3. Remove screw (13), spacer (14), and screw (15).

4. Disconnect hoses (16 and 17) and remove from airplane. Remove clamps (18 and 19).

5. Install protective caps on bulkhead and servo valve fittings. Plug hoses.

1-73. INSTALLATION. (See figure 1-20.)

a. Install short hoses as follows:

1. Remove protective caps from bulkhead and servo valve fittings. Remove plugs from hoses.

CAUTION

Ensure that end of hoses with rigid angled sections are connected to bulkhead fittings. The pressure hose has a flareless type fitting at each end. The return hose has a flared fitting at each end.

2. Connect hoses (11 and 12) between bulkhead fittings and servo valve fittings while ensuring that rigid angle section at end of each hose is parallel to upper skin surface.

3. With aileron in approximately neutral position, install upper and lower halves of block clamp (10) around hoses and secure loosely to structure with washer (9) and screw (8) through hole on protruding side of clamp halves.

NOTE

Install channel with flanges positioned down.

If long hoses are to be installed, omit substeps 4, 5, and 6 and proceed to step b.

4. Install channel (5) with spacer (6) (left wing only), washer (4), screw (3), spacer (7), washer (2), and screw (1). Ensure that screw (3) engages threads in structure beneath clamp halves. Tighten screws.

5. Bleed aileron PC cylinder (T.O. 1A-7D-2-8).

6. Perform aileron operational checkout (T.O. 1A-7D-2-8).

b. Install long hoses as follows:

1. Remove protective caps from bulkhead fittings. Ensure that elbow is parallel to upper skin surface.

2. Remove protective plugs and connect hoses (16 and 17) to bulkhead fittings.

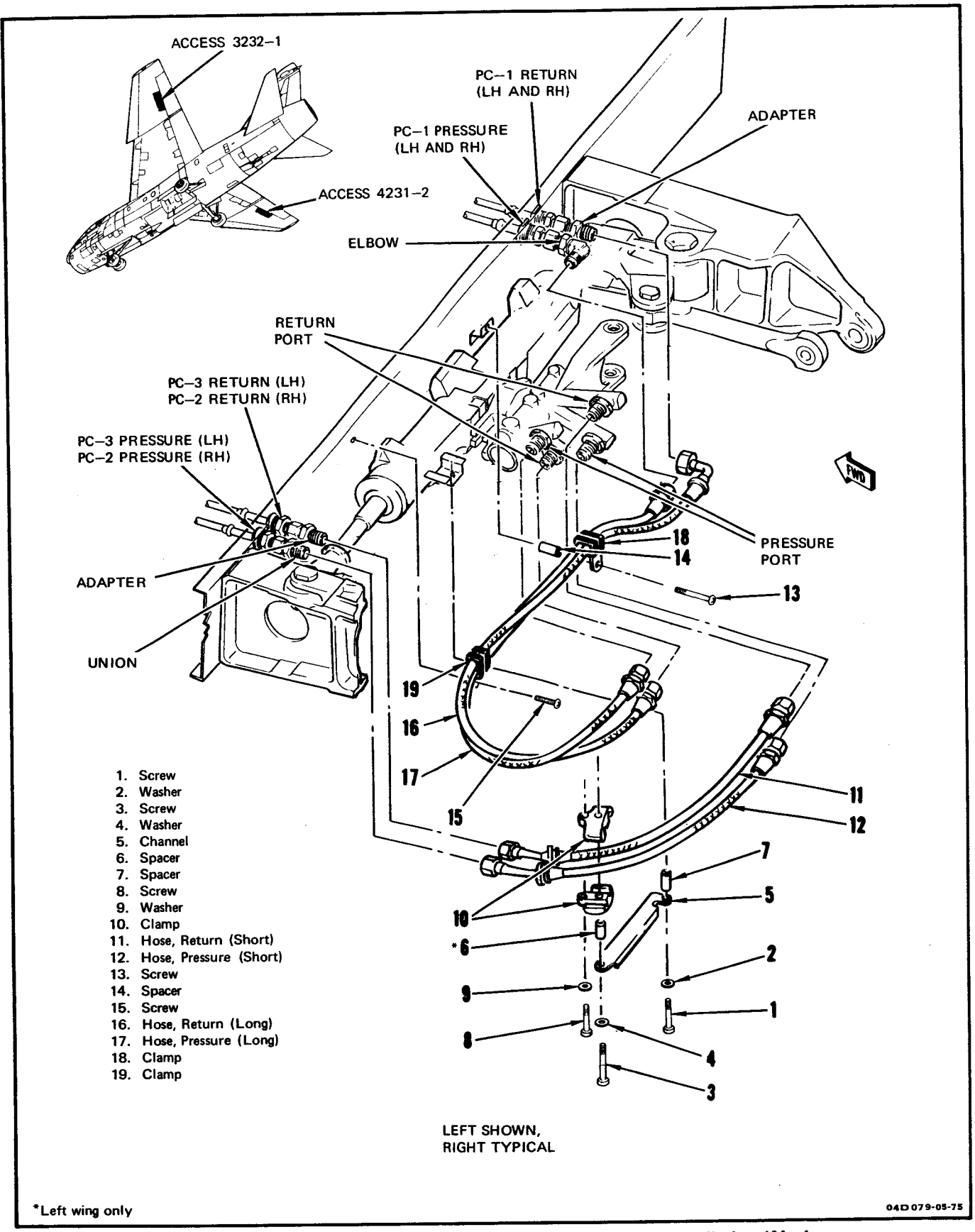


Figure 1-20. Aileron PC Cylinder Flexible Hose Removal and Installation (Airplanes AF69-6197 and Subsequent After T.O. 1A-7D-756)

3. Secure hoses to bulkhead with clamp (18), spacer (14), and screw (13).

4. Secure hoses to bulkhead with clamp (19) and screw (15).

NOTE

Install channel with flanges positioned down.

5. Install channel (5) with spacer (6) (left wing only), washer (4), screw (3), spacer (7), washer (2), and screw (1). Ensure screw (3) engages threads in structure beneath clamp halves. Tighten screws.

6. Install aileron PC cylinder (T.O. 1A-7D-2-8).

c. Close access 3232-1 or 4231-2 and check for security.

1-74. AILERON EXTENSION UNITS REMOVAL AND INSTALLATION. (Airplanes Through AF69-6196 and Airplanes Before T.O. 1A-7D-756.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 0 to 300 pound-inches	Tighten extension units
	314150	Grease nozzle (N2)	Facilitate lubrication
	MIL-G-3859	Grease gun	Apply lubricant

CAUTION

Several extension units in this airplane have nearly identical physical appearances but are different and are not interchangeable. To prevent damage to actuator or airframe, ensure proper extension unit is installed. Extension units shall be removed and installed as an assembly, complete with end fittings.

1-75. REMOVAL. (See figure 1-21.)

a. On airplanes through AF69-6196, if removing extension units in PC No. 1 system, dump PC No. 1 reservoir accumulator (T.O. 1A-7D-2-1).

b. On airplanes AF69-6197 and subsequent, if removing extension units on PC No. 3 system, dump PC No. 3 reservoir accumulator (T.O. 1A-7D-2-1).

CAUTION

To prevent contamination and damage, cap or plug all connections when disconnected.

c. Open access 3232-1 or 4231-2.

d. Disconnect hydraulic line(s) (1).

e. Remove two nuts (2), washers (3), and screws (4) securing extension units to bracket.

NOTE

If removal of a rear extension unit is required, the unit can be removed by moving the forward units away from the bracket at this time. Disconnecting the forward units from servo valve may not be necessary.

f. Disconnect extension unit (5 and/or 6) from servo valve and discard packing (7).

g. Loosen jamnut (8) and remove elbow (9). Discard packing (10) and retainer (11).

h. Disconnect hydraulic line (12 and/or 13).

i. Disconnect extension unit(s) (17) from servo valve and discard packing(s) (7).

j. Remove nuts (14), washers (15), and screws (16) securing extension unit (17) to bracket.

k. Retain plates (18 and 19) and spacers (20).

l. After removal of extension units from airplane, remove union (21) and packing (22). Retain union and discard packing.

1-76. INSTALLATION. (See figure 1-21.)

a. Measure retracted and extended length of extension unit and ensure unit matches with figure 1-22.

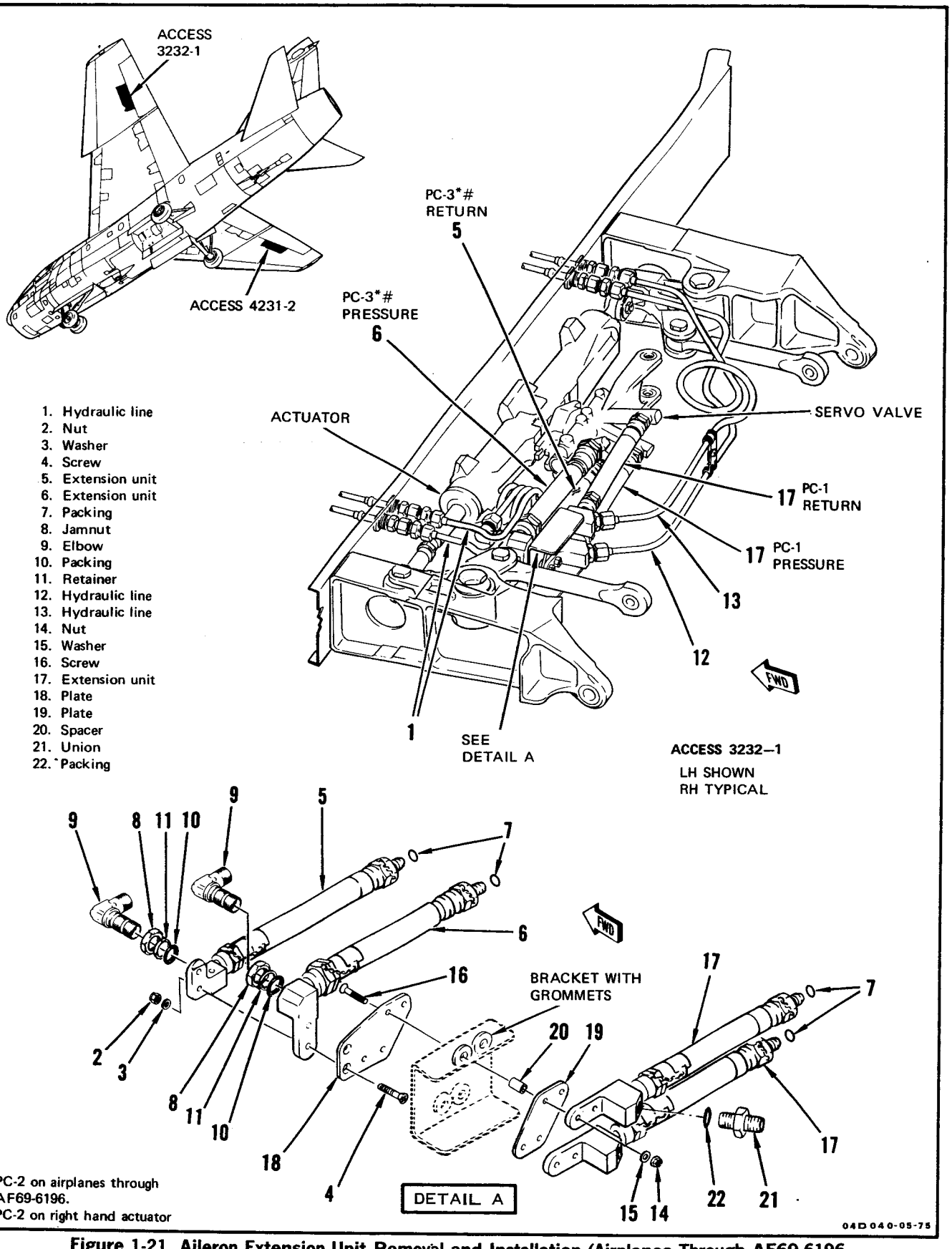
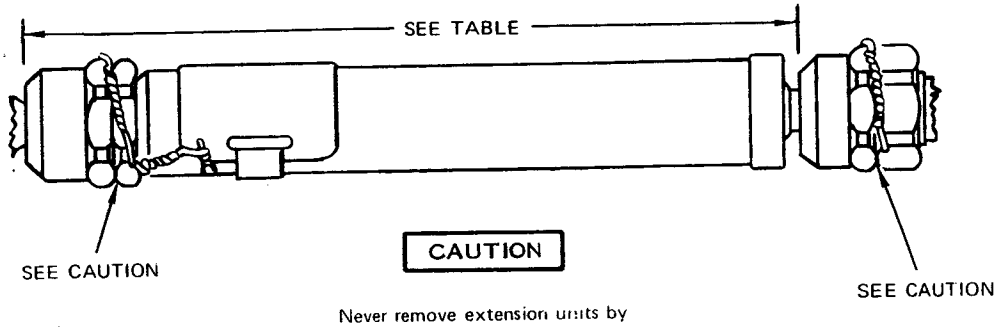


Figure 1-21. Aileron Extension Unit Removal and Installation (Airplanes Through AF69-6196 and Airplanes Before T.O. 1A-7D-756)

PART NUMBER	RETRACTED (±0.08)	EXTENDED (±0.09)	APPLICATION
200710	5.88	9.06	Spoiler/Deflector – PC-1 Pressure - Return
200715-3	5.88	9.06	Spoiler/Deflector – LH PC-3 Pressure
200715-4	5.88	9.06	Spoiler/Deflector – RH PC-2 Pressure
200715-5	5.88	9.06	Spoiler/Deflector – LH PC-3 Return
200715-6	5.88	9.06	Spoiler/Deflector – RH PC-2 Return
200755-2	5.88	9.06	Aileron – PC-1 Pressure and Return
200755-3	5.88	9.06	Aileron – LH PC-3 Return, RH PC-2 Return
200760-3	5.88	9.06	Aileron – LH PC-3 Pressure, RH PC-2 Pressure
200765	7.23	10.41	Roll Feel Isolation – PC-3 Pressure
200770	5.88	9.06	Roll Feel Isolation – PC-3 Return
200775-1	5.88	9.06	Roll Feel Isolation – PC-2 Return
200775-2	6.99	10.17	Roll Feel Isolation – PC-2 Pressure
200905	7.30	12.07	Nose Gear Steering – PC-2 Pressure and Return



CAUTION

Never remove extension units by disconnecting and leaving end fittings installed in airplane.

04D078-04-74

Figure 1-22. Extension Unit Dimensions

b. Drain preservative fluid.

c. Lubricate extension unit swivel end races with MIL-G-81322 grease before installing.

CAUTION

Ensure that one weep hole on each extension unit is located at lowest possible point to ensure proper drainage of hydraulic fluid. Trapped fluid will prevent proper operation of extension unit.

d. Install union (21) and new packing (22) on extension unit (17).

e. Connect extension unit (17) to servo valve with new packing (7) installed. Tighten to 150 (±50) pound-inches torque.

f. Position plate (18), spacers (20), plate (19), and extension unit (17) onto bracket with screws (16).

g. Secure extension unit with washers (15) and nuts (14).

h. Connect hydraulic lines (12 and/or 13).

i. Install new retainer (11) and packing (10) on elbow (9).

j. Install elbow (9) in extension unit (5 and/or 6). Do not tighten jamnut (8).

k. Connect extension unit (5 and/or 6) to servo valve using new packing (7). Tighten to 150 (±50) pound-inches torque.

l. Secure extension units (5 and 6) to plate (18) with screws (4), washers (3), and nuts (2).

m. Connect hydraulic line (1) and tighten jamnut (8).

n. Bleed aileron actuator (T.O. 1A-7D-2-8).

o. Perform aileron operational checkout (T.O. 1A-7D-2-8).

p. Close access 3232-1 or 4231-2.

1-77. NOSE GEAR STEERING EXTENSION UNIT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 0 to 300 pound-inches	Tighten extension units
	314150	Grease nozzle (N2)	Facilitate lubrication
	MIL-G-3859	Grease gun	Apply lubricant

1-78. Remove and install nose gear extensions units in order of index numbers in figure 1-23, observing the following.

CAUTION

Ensure that one weep hole on each extension unit is located at lowest possible point to ensure proper drainage of hydraulic fluid. Trapped fluid will prevent proper operation of extension unit.

Several extension units in this airplane have nearly identical physical appearance but are different and are not interchangeable. To prevent damage to actuator or airframe, ensure proper extension unit is installed. Extension units shall be removed and installed as an assembly, complete with end fittings.

a. Measure retracted and extended length of extension unit and ensure unit matches with figure 1-22.

b. Open access 2213-1.

c. Cap or plug all disconnected hydraulic lines, fittings, and extension unit ports.

d. Drain preservative fluid.

e. Lubricate extension unit swivel end races with MIL-G-81322 grease before installing.

f. Replace packings with new packings.

g. Tighten actuator end of extension unit to 150 (±50) pound-inches torque.

h. Bleed nose wheel steering (T.O. 1A-7D-2-7).

i. Perform nose wheel steering operational checkout (T.O. 1A-7D-2-7).

j. Close access 2213-1.

1-79. ROLL FEEL ISOLATION EXTENSION UNIT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 0 to 300 pound-inches	Tighten extension units
	314150	Grease nozzle (N2)	Facilitate lubrication
	MIL-G-3859	Grease gun	Apply lubricant

CAUTION

Several extension units in this airplane have nearly identical physical appearance but are different and are not interchangeable. To prevent damage to actuator or airframe, ensure proper extension unit is installed. Extension units shall be removed and installed as an assembly complete with end fitting.

1-80. REMOVAL. (See figure 1-24.)

a. On airplanes through AF69-6196, if removing extension units in PC No. 1 system, dump PC No. 1 reservoir accumulator (T.O. 1A-7D-2-1).

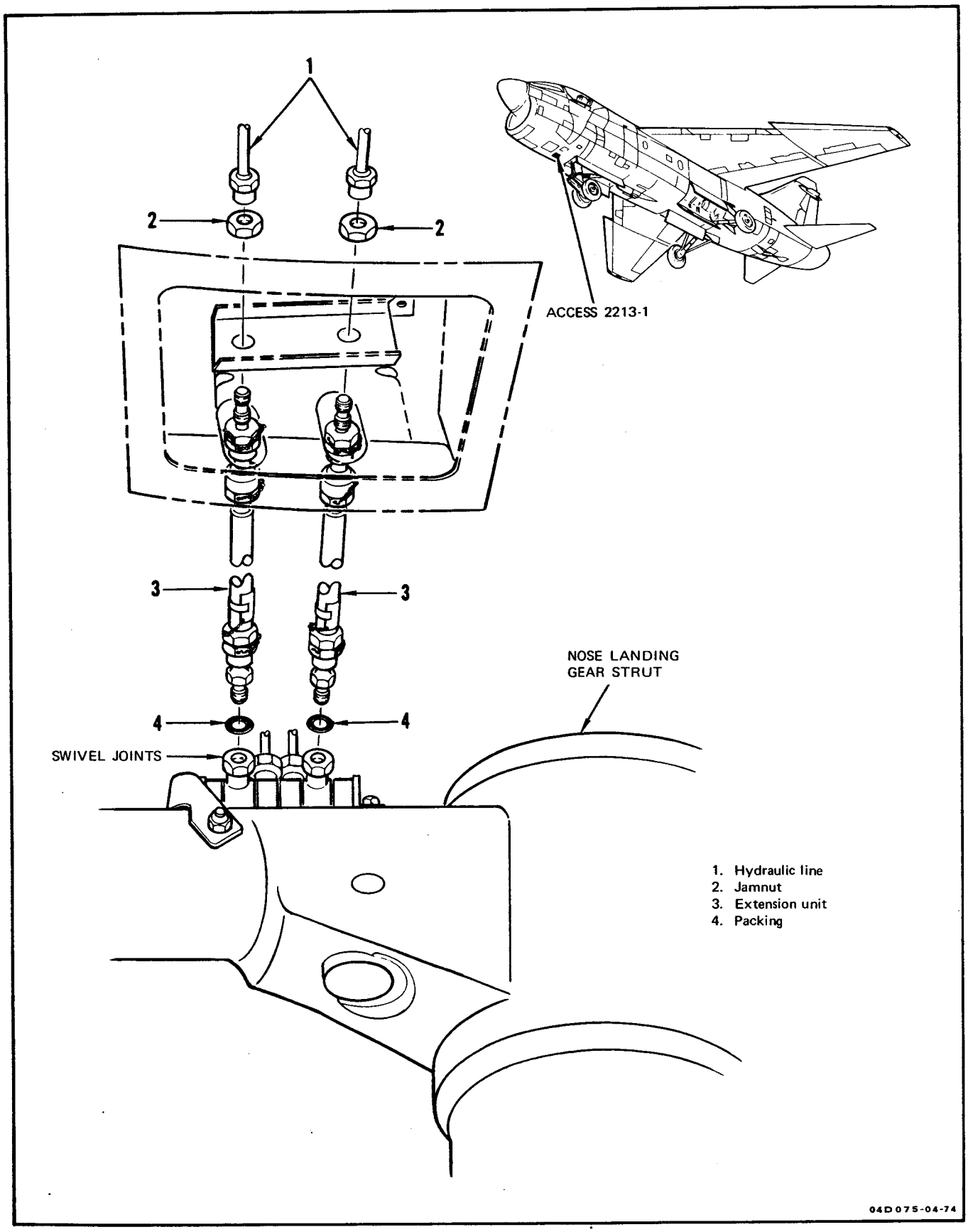
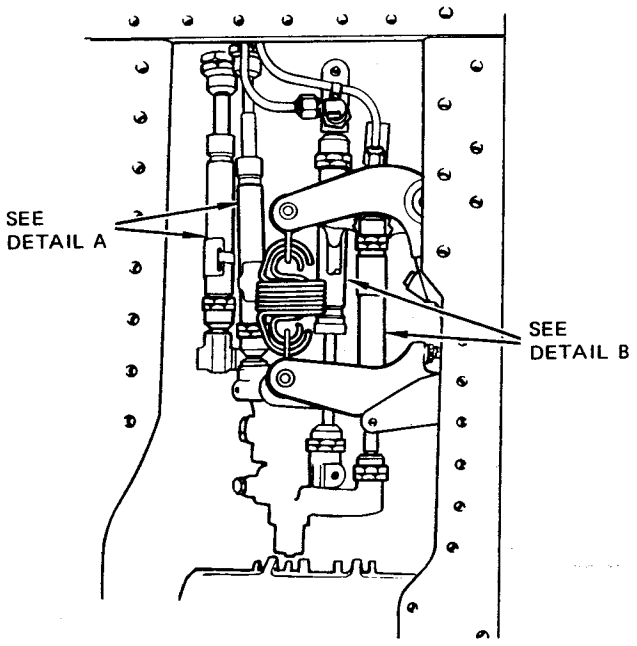
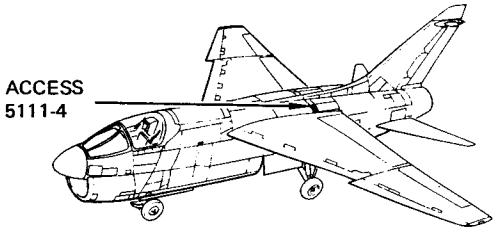
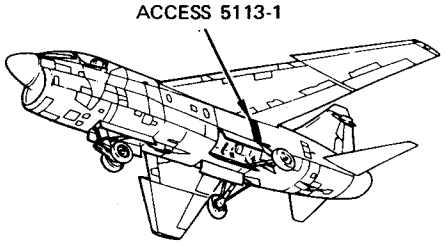


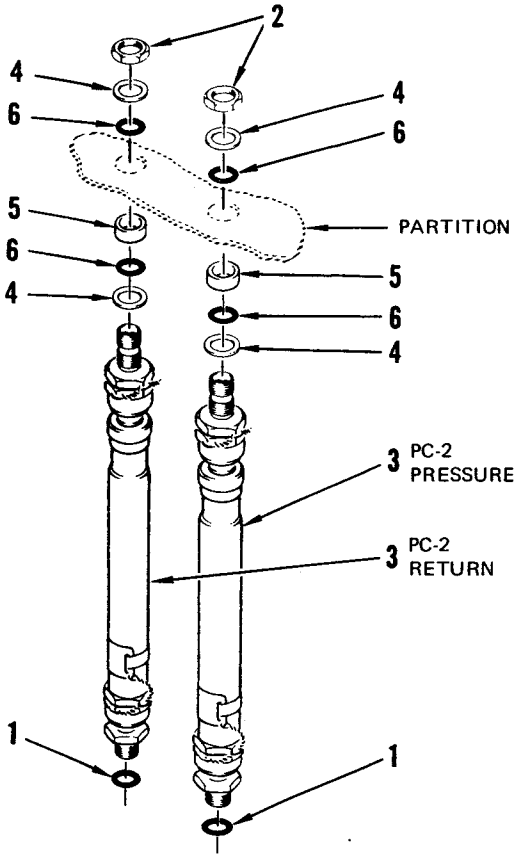
Figure 1-23. Nose Gear Steering Extension Unit Removal and Installation



ACCESS 5113-1

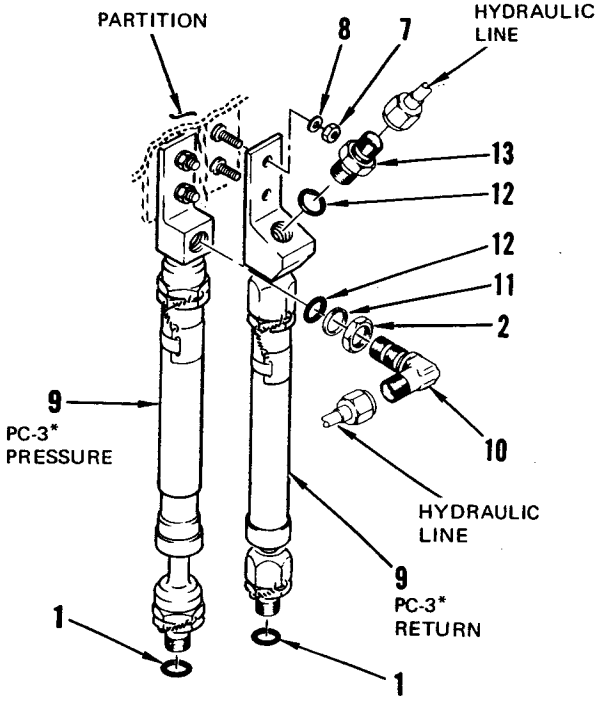






DETAIL A

FORWARD UNITS



DETAIL B

REAR UNITS

1. Packing
2. Jamnut
3. Extension unit
4. Washer
5. Spacer
6. Packing
7. Nut
8. Washer
9. Extension unit
10. Elbow
11. Retainer
12. Packing
13. Union

*PC-1 on airplanes through AF69-6196.

04D076-05-75

Figure 1-24. Roll Feel Isolation Extension Unit Removal and Installation

b. On airplanes AF69-6197 and subsequent, if removing extension units in PC No. 3 system, dump PC No. 3 reservoir accumulator (T.O. 1A-7D-2-1).

c. Cap or plug all disconnected hydraulic lines, fittings, and extension unit ports.

d. Remove access 5113-1. Remove access 5111-4 for removal and installation of the two forward extension units.

e. Lower ends of all four extension units are disconnected by unscrewing from actuator. Discard packing (1) on lower ends.

f. Disconnect upper ends of two forward extension units as follows:

1. Disconnect and plug hydraulic lines.

2. Cut lockwire and remove jamnut (2).

3. Cut lockwire and remove extension unit (3) and return washers (4) and spacer (5). Discard packings (6).

g. Disconnect upper ends of two rear extension units as follows:

1. Disconnect and plug hydraulic lines.

2. Remove nuts (7) and washers (8).

3. Remove extension unit (9).

4. Remove elbow (10) and/or union (13) and discard packing (12) and retainer (11).

1-81. INSTALLATION. (See figure 1-24.)

a. Drain preservative fluid.

b. Measure retracted and extended length of extension unit and ensure unit matches with figure 1-22.

c. Lubricate extension unit swivel end races with MIL-G-81322 grease before installing.

d. Install rear extension units as follows:

1. Install elbow (10) and/or union (13) and new packing (12) and retainer (11) on extension unit (9). Do not tighten jamnut on elbow (10).

2. Secure unit to partition with nuts (7) and washers (8).

3. Install new packing (1) and connect lower end of unit to actuator. Tighten to 150 (±50) pound-inches torque.

4. Unplug and connect lines.

5. Tighten jamnut on elbow (10).

e. Install forward extension units (3) as follows:

1. Place washer (4), spacer (5), and new packing (6) on extension unit (3) and install unit through partition.

2. Install new packing (6) and washer (4) on unit and secure with jamnut (2).

3. Unplug and connect lines.

4. Secure jamnuts (2) together with MS20995C32 lockwire.

5. Secure extension units together with MS20995C32 lockwire.

6. Install new packing (1) and connect lower end to actuator. Tighten to 150 (±50) pound-inches torque.

f. Bleed roll feel isolation actuator (T.O. 1A-7D-2-8).

g. Perform operational checkout of roll feel isolation actuator (T.O. 1A-7D-2-8).

h. Close access 5113-1 and, if applicable, access 5111-4.

1-82. SPOILER/DEFLECTOR EXTENSION UNIT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 0 to 300 pound-inches	Tighten extension units
	314150	Grease nozzle (N2)	Facilitate lubrication
	MIL-G-3859	Grease gun	Apply lubricant

CAUTION

Several extension units in this airplane have nearly identical physical appearances but are different and are not interchangeable. To prevent damage to actuator or airframe, ensure proper extension unit is installed. Extension units shall be removed and installed as an assembly, complete with end fittings.

NOTE

Removal and installation procedure is typical for left and right spoiler/deflector extension units.

1-83. REMOVAL. (See figure 1-25.)

a. On airplanes through AF69-6196 if removing extension units in PC No. 1 system, dump PC No. 1 reservoir accumulator (T.O. 1A-7D-2-1).

b. On airplanes AF69-6197 and subsequent, if removing extension units in PC No. 3 system, dump PC No. 3 reservoir accumulator (T.O. 1A-7D-2-1).

c. Cap or plug all disconnected hydraulic lines, fittings, and extension unit ports.

d. Manually lift spoiler to maximum open position. Secure spoiler in maximum open position.

e. Remove inboard extension units as follows.

CAUTION

Identify hydraulic lines connected from wing structure to extension units before removing lines. Failure to do so could result in damaged lines or incorrect installation of lines.

1. Disconnect and remove hydraulic line (1).

2. Remove jamnut (2).

3. Disconnect extension unit (3) from servo valve.

4. Remove and discard packing (4).

f. Remove outboard extension units as follows.

CAUTION

Identify hydraulic lines connected from wing structure to extension units before removing lines. Failure to do so could result in damaged lines or incorrect installation of lines.

1. Disconnect and remove hydraulic line (5).

2. Disconnect extension unit from servo valve.

3. Remove and discard packing (6).

4. Remove nut (7), washer (8), and bolt (9).

5. Remove extension unit (10).

6. Remove and retain union (11). Discard packing (12).

1-84. INSTALLATION. (See figure 1-25.)

a. Drain preservative fluid.

b. Measure extended and retracted length of extension unit and ensure unit matches with figure 1-22.

c. Lubricate extension unit swivel end races with MIL-G-81322 grease before installing.

CAUTION

Ensure that one weep hole on each extension unit is located at lowest possible point to ensure proper drainage of hydraulic fluid. Trapped fluid will prevent proper operation of extension unit.

d. Install outboard extension units as follows:

1. Install union (11) with new packing (12) on extension unit.

2. Connect extension unit (10) with new packing (6) to servo valve. Tighten to 150 (±50) pounds-inches torque.

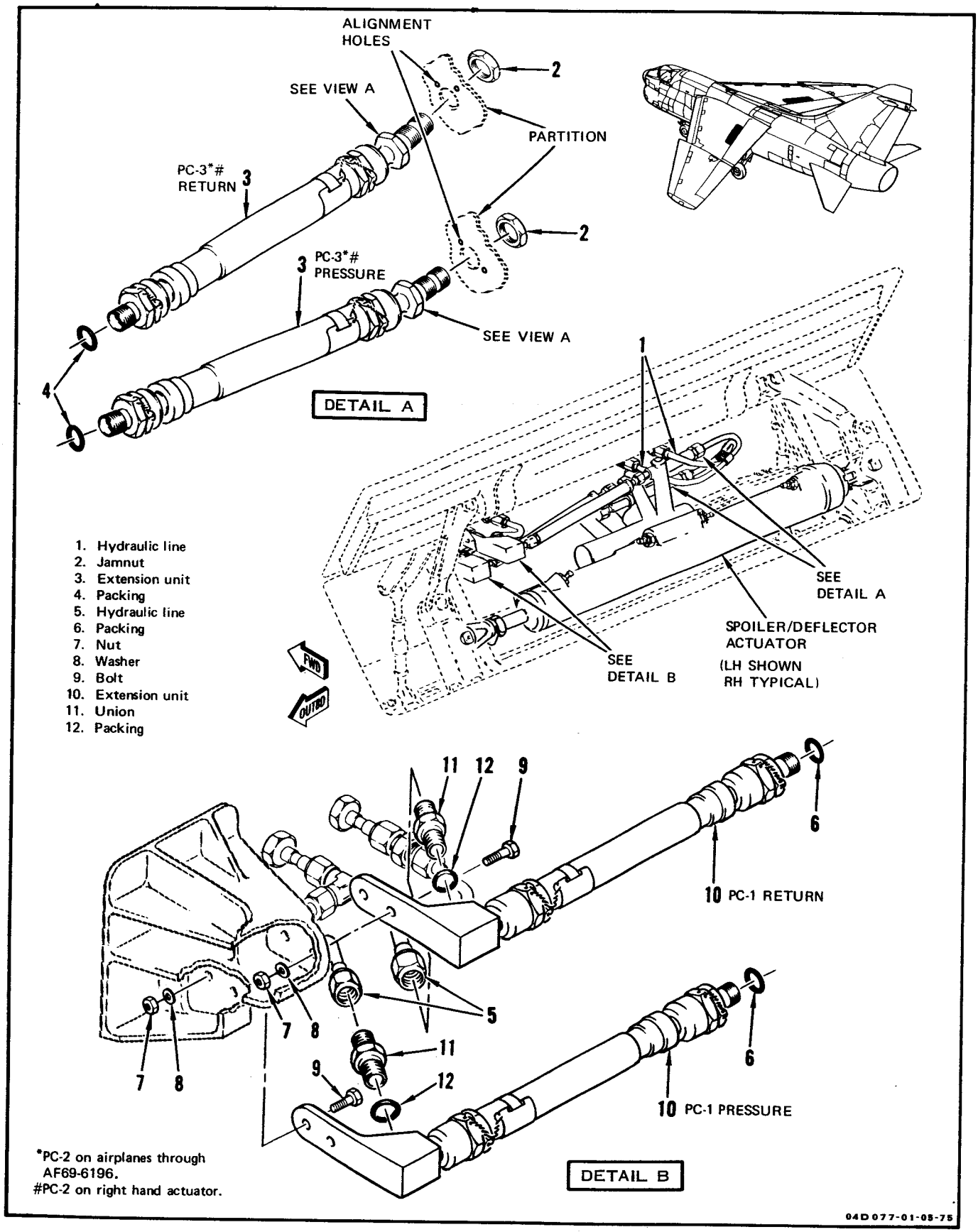


Figure 1-25. Spoiler/Deflector Extension Unit Removal and Installation (Sheet 1)

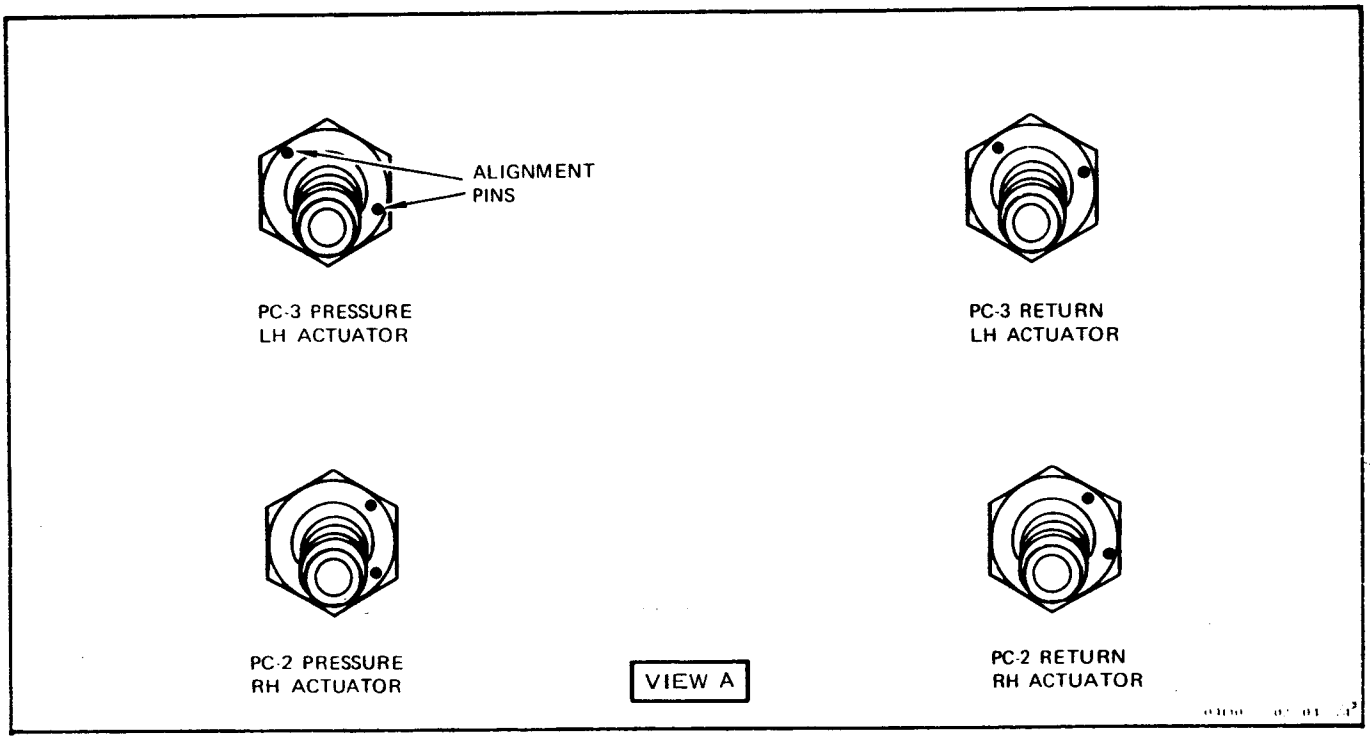


Figure 1-25. Spoiler/Deflector Extension Unit Removal and Installation (Sheet 2)

3. Secure extension unit to partition with bolt (9), washer (8), and nut (7).

4. Install hydraulic line (5).

e. Install inboard extension units as follows:

1. Connect extension unit (3) with new packing (4) to servo valve. Tighten to 150 (±50) pounds-inches torque.

2. Align alignment pins with holes in the partition and secure extension unit through partition with jamnut (2).

3. Install hydraulic line (1).

f. Bleed spoiler/deflector actuator (T.O. 1A-7D-2-8).

g. Perform spoiler/deflector operational checkout (T.O. 1A-7D-2-8).

1-85. SWIVEL JOINTS REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect external hydraulic power
	215-00215-12	Wingfold struts	Support wing outer panel when folded
	215-00268-1	Emergency power package safety lock	Prevent inadvertent retraction of emergency power package

WARNING

To prevent injury to personnel, ensure that emergency power package safety lock is installed if removing swivel joints in emergency power package access.

NOTE

If aileron control or wingfold swivel joints in wingfold area are to be removed, fold wing and install wingfold support strut (T.O. 1A-7D-2-1).

Minor differences will be encountered during removal and installation of swivel joints due to difference in attaching hardware. To gain access to wing center section leading edge flap swivel joints, the flap actuator must be removed (T.O. 1A-7D-2-8).

1-86. REMOVAL. (See figure 1-26.)

a. Dump PC No. 1 or PC No. 3 reservoir accumulator, as applicable (T.O. 1A-7D-2-1).

b. Open accesses 1121-5, 1121-6, 1121-7, 1121-8, and 3113-10.

CAUTION

Swivel must be held stationary while removing fitting nuts to prevent damage to hydraulic lines.

c. Disconnect hydraulic fittings from swivel. Cap lines and ports.

d. Remove attachment securing swivel assembly to airplane mount bracket and remove swivel joint assembly.

1-87. INSTALLATION. (See figure 1-26.)

a. Flush replacement swivel joint assembly with MIL-H-83282 hydraulic fluid.

b. Install swivel joint assembly to airplane with attaching hardware.

CAUTION

When installing aileron and flap control line swivel joints, hydraulic line fitting nuts shall be tightened in series and in increments not to exceed one-half turn to prevent damage to brazed assemblies.

c. Uncap and connect hydraulic fittings to swivel joint. Tighten line at outlet port finger-tight.

d. Connect external hydraulic power (T.O. 1A-7D-2-1).

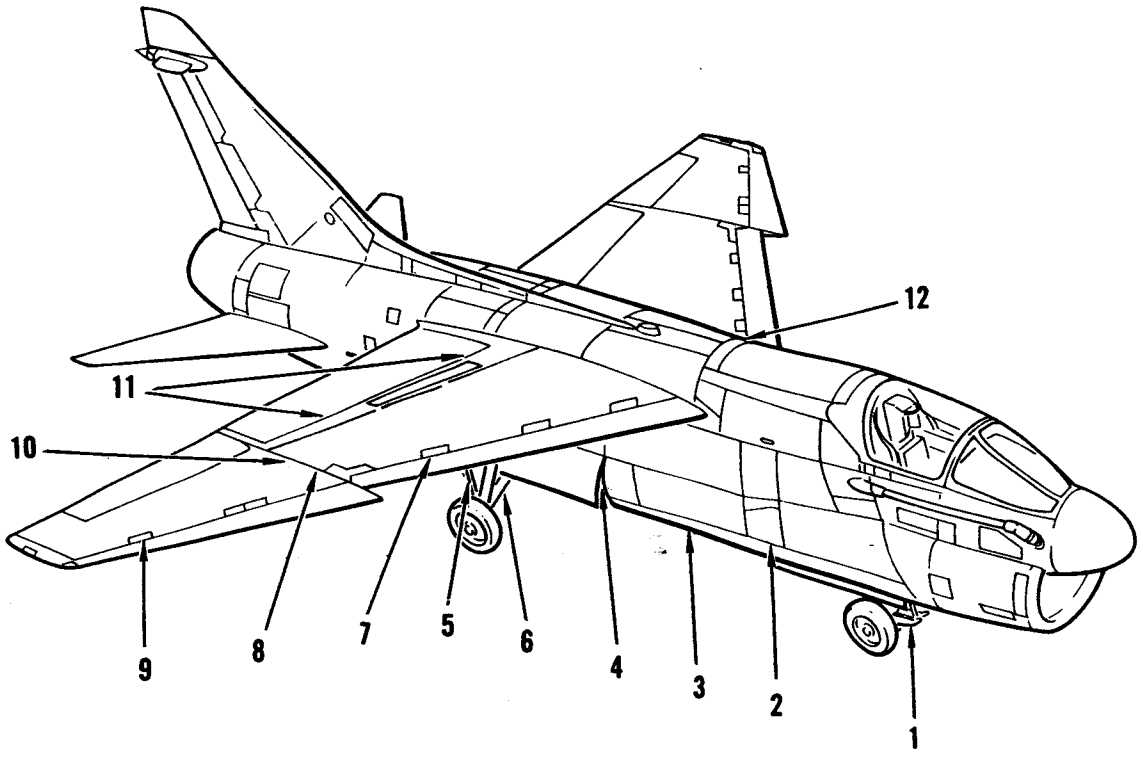
e. Apply low hydraulic pressure and bleed system until air-free fluid flows from outlet port line.

f. Tighten outlet port line.

g. Perform air check of affected system (T.O. 1A-7D-2-1).

h. Perform operational checkout of affected system.

i. Close accesses 1121-5, 1121-6, 1121-7, 1121-8, and 3113-10.



AREA	NUMBER REQUIRED	ACCESS
1. Nose gear steering cylinder	3 Swivel joints	Nosewheel well
2. Emergency power package	4 Swivel joints	2222-5
3. Speed brake actuating cylinder	2 Swivel joints	Speed brake well
4. Main landing gear door actuating cylinders	2 Swivel joints (each gear)	Main wheel wells
5. Main landing gear actuating cylinders	3 Swivel joints (each gear)	Main wheel wells
6. Wheel brakes	2 Swivel joints (each gear)	Main wheel wells
7. Leading edge flap actuating cylinders (center section)	4 Swivel joints (each wing)	2 on each actuating cylinder
8. Wingfold actuating cylinder	2 Swivel joints (each wing)	At wingfold joint
9. Leading edge flap actuating cylinders (outer panel)	8 Swivel joints (each wing)	4 on each actuating cylinder
10. Aileron and flap control lines	1 Swivel joint (each wing)	At wingfold joint
11. Trailing edge flap actuating cylinders	4 Swivel joints (each wing)	2 on each actuating cylinder
12. Connecting wing center section aileron and flap control lines to fuselage	10 Swivel joints	1121-5

04D041-09-76

Figure 1-26. Location of Swivel Joints

SECTION II

POWER CONTROL (PC) NO. 2 HYDRAULIC SUPPLY SYSTEM

2-1. DESCRIPTION.

2-2. On airplanes through AF69-6196, the PC No. 2 hydraulic supply system powers the automatic flight control system roll and pitch actuators, speed brake, air refueling, gun gas purge door, and gun drive and in conjunction with the PC No. 1 system, supplies operating power for tandem cylinders of the aileron, spoiler, unit horizontal tail, rudder, and roll feel isolation actuators.

2-3. On airplanes AF69-6197 and subsequent, the PC No. 2 hydraulic supply system powers the automatic flight control system pitch actuator, speed brake, gun gas purge door, gun drive, and air refueling. In conjunction with PC No. 1 system, the PC No. 2 system supplies operating power for the tandem cylinders of the right wing aileron and spoiler, and the right unit horizontal tail actuators. In conjunction with PC No. 3 system, PC No. 2 system supplies operating power to the tandem cylinders of the rudder and roll feel isolation actuators.

2-4. The PC No. 2 system also powers the following utility circuits through an isolation value: flaps, wingfold, wheel brakes, landing gear, arresting gear, emergency power package, and nose gear steering. The supply system is pressurized by the engine-driven, variable-displacement PC No. 2 hydraulic pump. The PC No. 2 hydraulic supply system consists of the hydraulic pump, filters, reservoir, accumulator, relief valves, check valves, disconnects, and shutoff valves. See figure 2-1 for system arrangement and table 1-1 for system leading particulars.

2-4A. On airplanes after T.O. 1A-7D-821, PC No. 2 hydraulic supply system powers the automatic maneuvering flap system through a valve arrangement that bypasses the isolation valve.

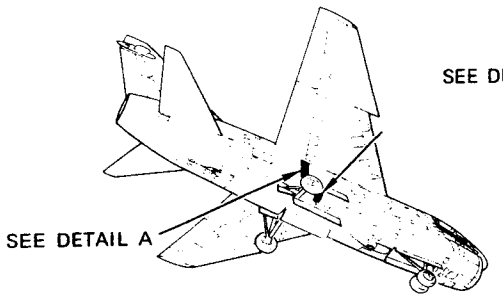
2-5. Refer to Section V for information on hydraulic system indicators. Refer to Appendix A for general torquing information.

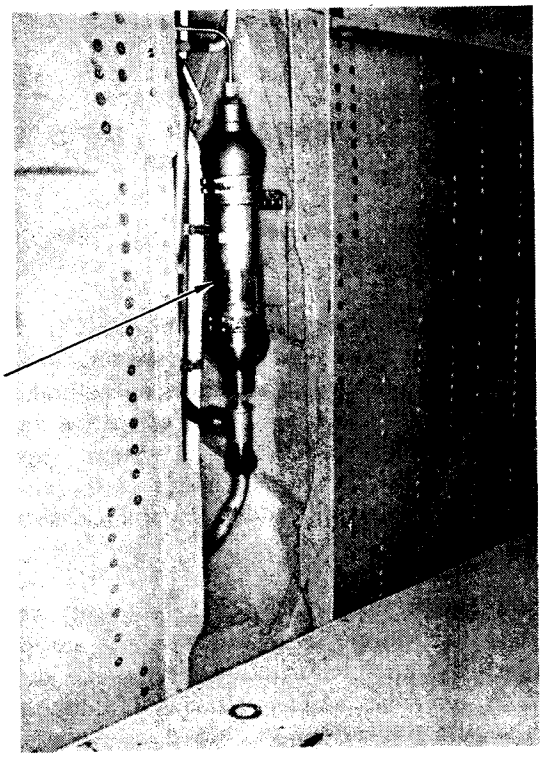
2-6. OPERATION. (See figure 2-2.)

2-7. The PC No. 2 hydraulic pump is located on the engine accessory drive case and driven through reduction gears in the engine diffuser. The fluid discharged into the system pressure line passes through a check valve and a pressure line filter before it reaches the power control and utility circuits. The pump pressure line check valve prevents reverse flow through the pump when external power is applied. The filter contains a 5-micron disposable element. A red indicator button on the filter head extends to indicate a clogged filter element when the pressure drop across the element reaches 60 to 80 psi. An automatic shutoff valve in the filter permits the filter bowl and element to be removed without the loss of hydraulic fluid or the entry of air into the hydraulic lines.

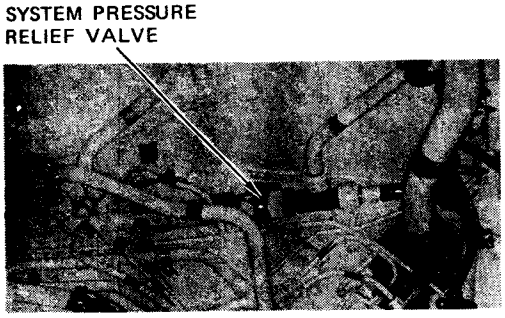
2-8. On airplanes through AF69-6196, internal pump cooling and lubrication is provided by bypass fluid which circulates through the pump case and is then routed back to the system return line through a pump cooling line.

2-9. On airplanes AF69-6197 and subsequent, internal pump cooling and lubrication is provided by bypass fluid routed through the pump case and pump cooling line and then circulated through a fluid cooling loop, located in access 2132-1, before reaching the system return line. An air inlet duct in access 2132-1 directs ambient air flow over the cooling loop to provide additional fluid cooling during flight.

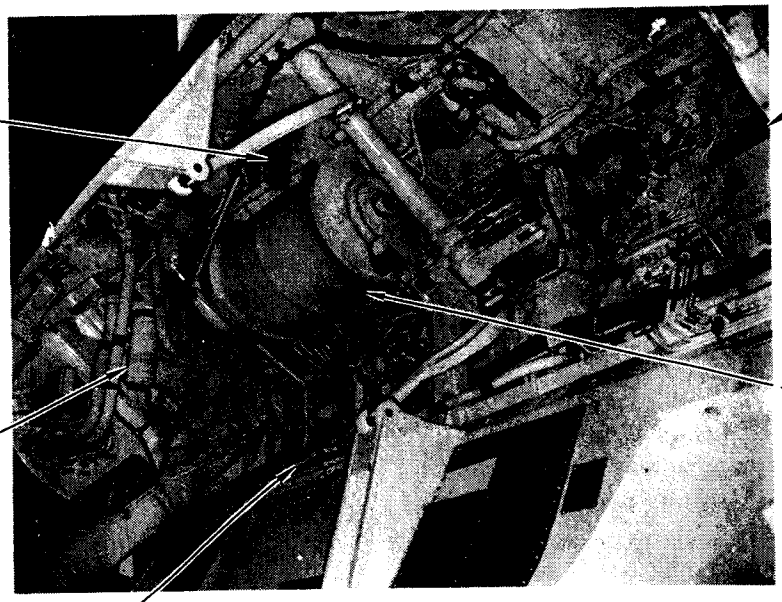




DETAIL A
(ACCESS 6113-1)



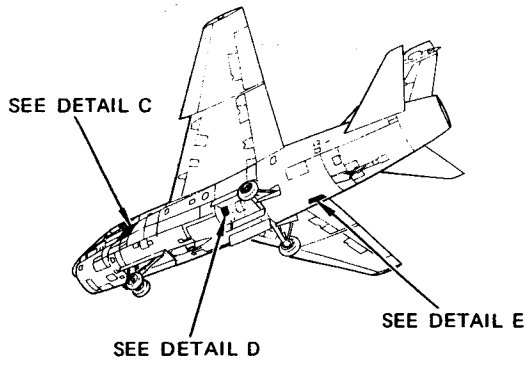
VIEW A
(RIGHT WHEEL WELL)

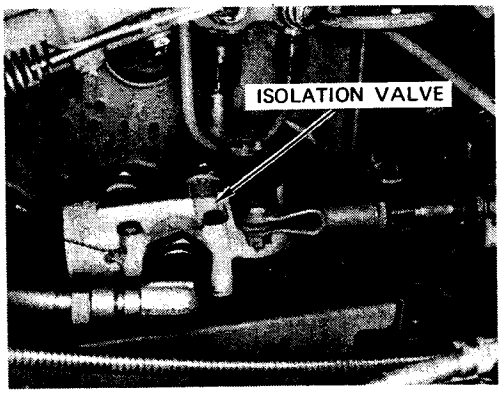


DETAIL B
(RIGHT WHEEL WELL)

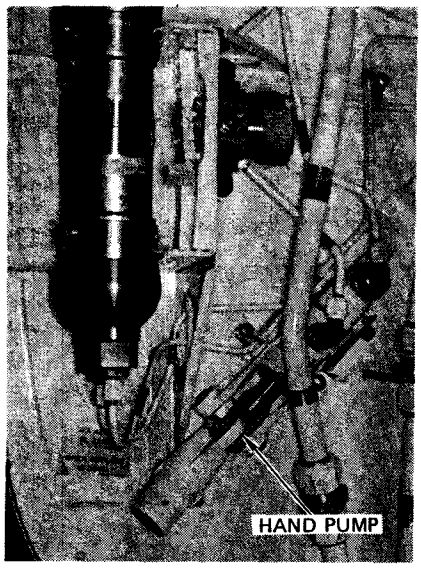
04D049-01-05-69

Figure 2-1. Power Control No. 2 Hydraulic Supply System Arrangement (Sheet 1)

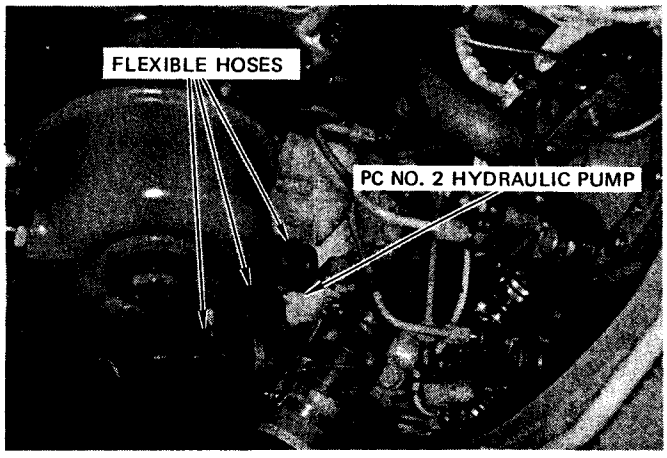




DETAIL C
(ACCESS 1123-1)



DETAIL D
(LEFT WHEEL WELL)



DETAIL E
(VIEWED THROUGH ACCESS 5222-1)

04D049-02-06-73

Figure 2-1. Power Control No. 2 Hydraulic Supply System Arrangement (Sheet 2)

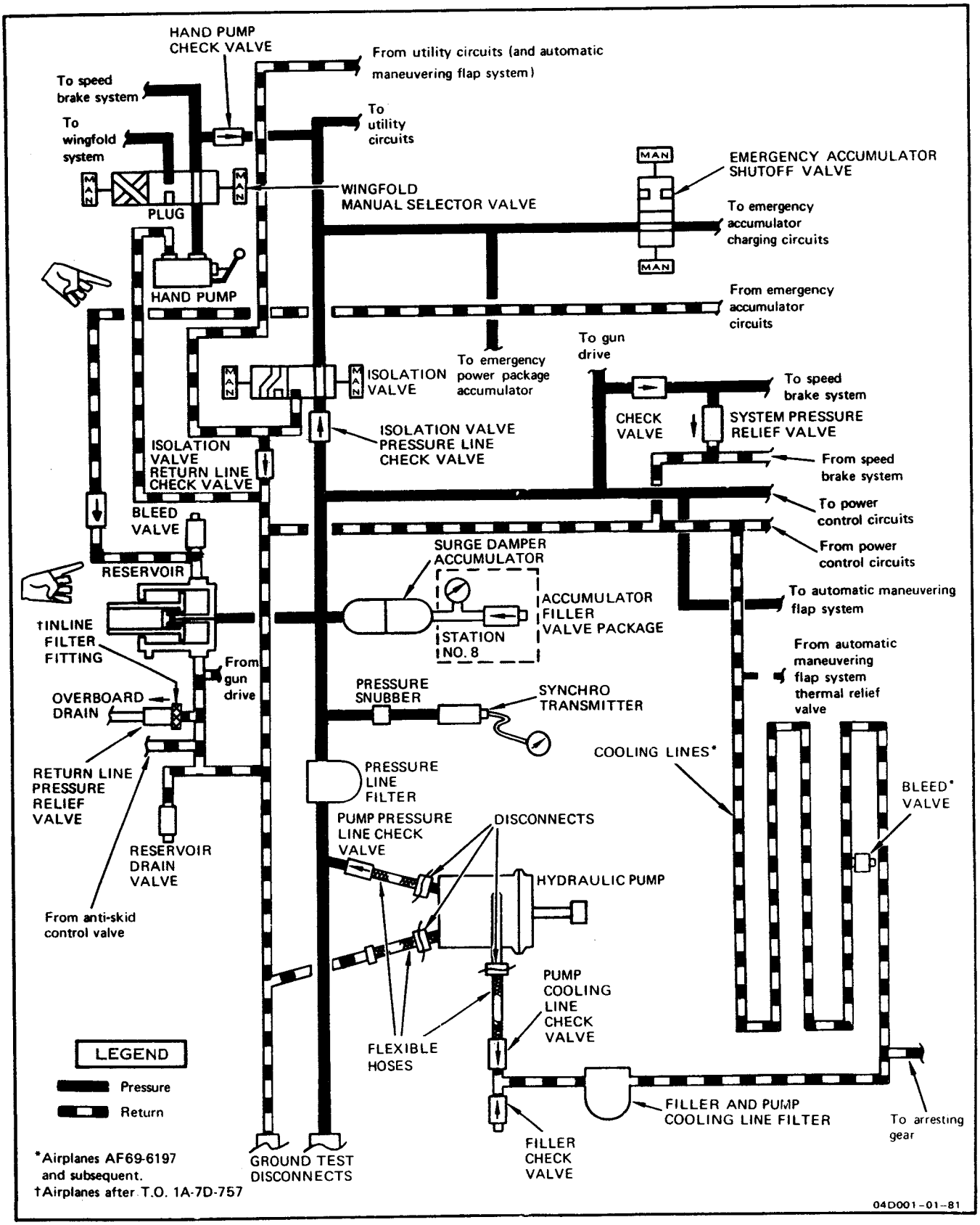


Figure 2-2. Power Control No. 2 Hydraulic Supply System Schematic Diagram

2-10. A filter in the pump cooling line prevents foreign particles from the interior of the pump from entering the system. Hydraulic fluid entering the system through the system filler valve also passes through the filler and pump cooling line filter. The filter contains a 5-micron disposable element. A red indicator button on the filter head extends to indicate a clogged element when the pressure drop across the element reaches 34 to 46 psi. If a clogged condition causes a pressure differential of 90 to 110 psi, fluid is bypassed around the filter element through an integral relief valve. An automatic shutoff valve allows the filter bowl and element to be removed without the loss of hydraulic fluid from system lines. A check valve in the cooling line protects the pump from pressure surges in the return system and prevents overpressurization of the pump case during servicing of the system.

2-11. When a hydraulically operated system or component is actuated, fluid flows from the hydraulic supply pressure line to the actuating cylinder and from the return port of the cylinder to the hydraulic supply return line. A pressure relief valve in the system pressure line protects power control systems from excessive pressure and pressure surges by opening and porting fluid directly into the system return line. Reseat pressure of the relief valve is 3,390 psi with full flow at 3,850 psi.

2-12. The fluid in the return line is directed back to the hydraulic pump and supply system reservoir. The reservoir stores fluid under 97.5 psi pressure to ensure an adequate flow of fluid to the hydraulic pump. The reservoir is equipped with a hydraulic bleed valve and a fluid level indicator. The window-type indicator shows reservoir fluid level under various temperature ranges for both the no pressure and system pressurized conditions. The distance between the NO PRESS and SYS PRESS window index marks for a given temperature range equals the normal amount of compression of the hydraulic fluid plus the volume required to fill the surge damper and emergency accumulators. Any entrained air in the system will be reflected by excessive movement of the reservoir fluid level indicator.

2-13. When the system is in operation, hydraulic supply system pressure of approximately 3,100 psi is directed through the reservoir piston to an inner piston chamber. Here the fluid applies pressure against a small area on the back side of the piston. The ratio of this small area (on which the 3,100 psi is applied) to the larger area on the face of the piston creates a return system pressure of 97.5 psi. When additional fluid is required, the pressure exerted on the piston forces fluid from the reservoir into the supply system return line where it is directed to the hydraulic pump. With this design, there is no pressure on the return system until pressure is developed by the pump. The reservoir piston, therefore, can be moved only by developing an unbalanced hydraulic force as opposed to other hydraulic systems designed with air or spring pressure developing the return system pressure. A return line pressure relief valve in the supply system protects the reservoir from excessive pressurization by venting fluid overboard. The full flow setting of the relief valve is 200 (±5) psi with reseat pressure of 160 psi minimum. On airplanes after T.O. 1A-7D-757, the union connected to the relief valve PRESS port contains an integral filter that protects the relief valve from contamination.

2-14. Since the reservoir provides a pressurized return system only with system pressure available, control surface operation with the PC No. 2 hydraulic system unpressurized and the other system/systems pressurized can result in air being induced into the system. Upon actuation of a tandem control cylinder with only one-half of the cylinder pressurized, the fluid forced from the unpressurized side of the cylinder must be replaced from the system reservoir. With no pressure applied to the piston to force the fluid from the reservoir, a partial vacuum is created within the cylinder. The partial vacuum may result in some air being drawn across the piston rod seal into the cylinder. Elimination of this source of air can be achieved by ensuring that all systems are pressurized during any control surface movement.

2-15. The supply system incorporates a 26.2 cubic-inch capacity accumulator to absorb pressure surges in the supply system pressure line. The surge damper accumulator is precharged to 1,000 (± 100) psi by means of the accumulator precharge system and is system charged with hydraulic fluid through the supply system pressure line.

2-16. Since utility circuits are normally used only during takeoff and landing, an isolation valve is installed in the hydraulic pressure line to the utility circuits. The valve is open when the flap handle is in UP or DOWN and closes when the flap handle is moved to ISO UTILITY following takeoff. The closed valve prevents a loss of pressure in the isolated utility circuits from depleting system pressure in the power control circuits. However, the automatic maneuvering flap system bypasses the isolation valve and could allow loss of PC No. 2 system fluid if a leak occurs in the flap system.

2-17. Emergency operation of the landing gear, wheel brakes, and leading and trailing edge flaps utility circuits is provided by emergency accumulators if the PC No. 2 supply system fails. The emergency accumulators are precharged with nitrogen through the accumulator filler valve package in the right wheel well. After precharging, the accumulators are charged with hydraulic fluid to 3,000 psi. A check valve in the hydraulic pressure line to each accumulator prevents the fluid from flowing back into the supply system when supply system pressure drops.

2-18. The emergency accumulators are connected to their respective systems through emergency hydraulic lines and normally closed, emergency operation selector valves. The emergency system lines are isolated from the normal system lines by shuttle valves. When emergency operation of a system is selected, the emergency selector valve is opened, allowing the accumulator to discharge into the emergency lines. The shuttle valves are positioned to isolate the system actuators from the normal system, and the actuators are extended or retracted as applicable to cycle the system. Displaced return fluid is returned through the normal system return lines except for landing gear fluid which is dumped overboard.

2-19. For ground operation, a hand pump, mounted in the left wheel well, is connected to the main pressure and return lines downstream of the isolation valve. When the isolation valve is closed, the valve connects the utility circuits pressure line to the PC No. 2 system return line. If the hand pump is operated with the isolation valve closed, fluid from the pump is dumped directly into the return line and no pressure is developed. When the isolation valve is open, an isolation valve pressure line check valve prevents pressure developed by the hand pump from entering the PC system. To prevent damage to hydraulic actuating cylinders with internal locking mechanisms, hand pump operation must be limited to the following:

a. Speed brake cycling

b. Folding/spreading of the wings

c. Charging of the brake and emergency accumulators

d. Static pressurization of the system for leak detection

2-20. Inadvertent pressurization of the speed brake by the application of external power to the utility circuits is prevented by a check valve. The check valve is installed in the pressure line from the hand pump.

2-21. An isolation valve return line check valve, installed in the PC No. 2 system return line downstream from the isolation valve, prevents backflow into the utility circuits. In the event of a utility circuit pressure loss, the check valve prevents the loss of PC No. 2 supply system fluid.

2-22. COMPONENTS.

2-23. For a list of system components, their locations (accesses), and functions, refer to table 2-1.

Table 2-1. Power Control No. 2 Hydraulic Supply System Components

Component	Access	Function
Accumulator, surge damper	6113-1	Absorbs pressure surges in main pressure line.
Disconnects, ground test, pressure and return	6222-1	Permit rapid connection of external power for operation of PC No. 2 and utility hydraulic circuits.

☆U.S. GOVERNMENT PRINTING OFFICE: 1981-771-002/1573

Table 2-1. Power Control No. 2 Hydraulic Supply System Components (continued)

Component	Access	Function
Filter, hydraulic filler and pump cooling line	Right wheel well	Removes contamination particles from fluid entering system through the reservoir filler connection and from pump case.
Filter, pressure line	Right wheel well	Removes contamination particles from fluid being discharged from pump pressure port.
Fitting, inline filter[1]	Right wheel well	Connected to PRESS port of return line pressure relief valve. Protects relief valve from system contamination.
Hoses, flexible (3)	5223-1	Connect engine-mounted pump to system lines.
Pump, hand	Left wheel well	Provides system pressure for ground operation of utility circuits.
Pump, hydraulic	5223-1	Provides system pressure of approximately 3,100 psi.
Reservoir, hydraulic	Right wheel well	Stores system fluid under pressure to ensure adequate fluid supply to pump.
Valve, check, filler	Right wheel well	Serves as system filling point and prevents backflow of fluid at filler line connection.
Valve, check, hand pump	Left wheel well	Prevents inadvertent pressurization of speed brake by pressure in utility circuits.
Valve, check, isolation valve pressure line	1123-4	Prevents pressurization of PC circuits by hand pump.
Valve, check, isolation valve return line	1123-4	Prevents backflow and loss of PC system fluid through utility circuits.
Valve, check, pump cooling line	Right wheel well	Protects pump and cooling line filter from pressure surges in the return system and prevents overpressurization of the pump case.
Valve, check, pump pressure line	5223-1	Prevents motoring of the pump when external ground test pressure is applied to system.
Valve, isolation	1123-1	Isolates utility circuits from PC portion of the system. Valve is opened and closed by flap handle on left console.
Valve, return line pressure relief	Right wheel well	Protects components and systems from excessive return line pressure by venting fluid overboard.
Valve, system pressure relief	Right wheel well	Protects systems and components from excessive pressure by venting fluid from the pressure line into the return line.
Valve, check, emergency accumulator dump line	Right wheel well	Prevents backflow and loss of PC system fluid through emergency accumulator dump lines.

[1] Airplanes after T.O. 1A-7D-757

2-24. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine

NOTE

A number, or numbers, enclosed in parentheses at the end of a step in the following checkout is a reference to a corresponding number in troubleshooting table 2-2.

a. Service PC No. 2 reservoir (T.O. 1A-7D-2-1) to level shown in figure 2-2A.

a-1. Place a reference mark on indicator housing so that indicator movement can be measured after engine start.

a-2. Start engine (T.O. 1A-7D-2-1) and operate at 60%. Check that low hydraulic pressure caution light is off. (1 and 2)

b. Ensure emergency accumulator shutoff valve is OPEN.

NOTE

Measure indicator movement within 5 minutes of engine start.

c. Measure distance reservoir indicator has moved. Movement of indicator should be 3.05 to 3.65 inches (figure 2-2A). (3)

d. Check that PC No. 2 hydraulic system pressure indicator indicates 3,100 (±150) psi and pressure fluctuation is less than 150 psi. (4 and 5)

e. Cycle control stick and check that control surfaces move smoothly and pressure does not drop excessively. Pressure should return to normal at end of control surface travel. (6 and 7)

f. Shutdown engine.

2-25. TROUBLESHOOTING.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external hydraulic power		Connect external hydraulic power
	Equipment required for engine operation		Operate engine
1-4	Pressure gage assembly	(Local fabrication)	Check hydraulic pressure at ground test disconnect

2-26. Refer to table 2-2 for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout. Fabricate a pressure gage assembly as shown in figure 1-4.

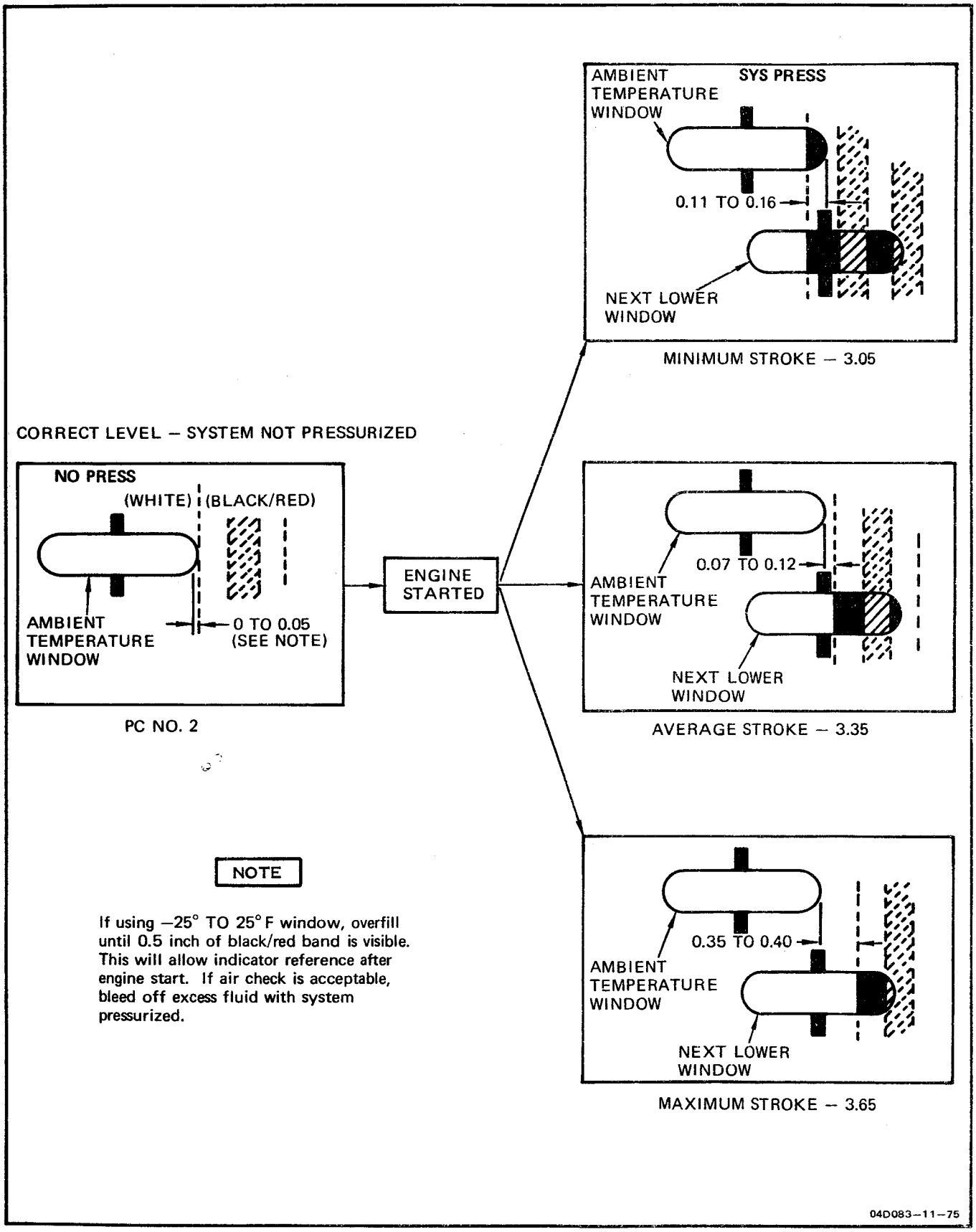


Figure 2-2A. PC No. 2 Reservoir Piston Stroke

Table 2-2. PC No. 2 Hydraulic Supply System Troubleshooting

Malfunction	Corrective Action
1. Hydraulic pressure indication is zero after engine start.	a. Shut down engine and perform the following: 1. Check for evidence of excessive fluid leakage (reservoir depleted). 2. If Vickers pump was operated dry, service reservoir, replace hoses and disconnects, and check filter elements for metal chips. Replace filter elements (paragraphs 2-41 and 2-56), and if metal chips were found in either element, replace pump (paragraph 2-38). 3. If Abex pump was operated dry for less than 30 minutes, service reservoir and recheck pump for proper pressure output. If pump fails check, replace hoses, disconnects, filter elements (paragraphs 2-41 and 2-56), and pump (paragraph 2-38). If Abex pump was operated dry for more than 30 minutes, service reservoir, replace hoses, and check filter elements for metal chips. Replace filter elements (paragraphs 2-41 and 2-56), and if metal chips were found in either element, replace pump (paragraph 2-38). 4. Check for discoloration of PC No. 2 pump and disconnects. Discoloration may indicate overheat damage to pump. 5. If pump or pump housing failure is evident, replace filter elements (paragraphs 2-41 and 2-56), hoses, disconnects, and pump (paragraph 2-38). Failure may have been caused by incomplete connection of cooling line disconnect. Ensure all disconnects are completely connected. 6. If there is no evidence of overheat and/or pump failure, proceed to step b. b. Check pump pressure line check valve for proper installation. If required, install valve properly. If valve is installed properly, proceed to step c. c. Connect locally fabricated pressure gage assembly to PC No. 2 pressure ground test disconnect. Start engine and operate at 60% rpm. Check that pressure is 3,025 to 3,175 psig. If pressure is within limits, troubleshoot indicating system (paragraph 5-27). If pressure is zero, shut down engine and proceed to step d. d. Perform hydraulic system bleeding (T.O. 1A-7D-2-1). If excessive vair is not indicated, replace hydraulic pump (paragraph 2-38).
2. Low hydraulic pressure caution light does not go off when pressure is above 1,840 psi.	a. Troubleshoot hydraulic indicating system (paragraph 5-27).

Section II, Table 2-2., is amended to CHANGE step 1.a., in its entirety as shown below:

Table 2-2. PC No. 2 Hydraulic Supply System Troubleshooting

Malfunction	Corrective Action
1. Hydraulic pressure indication is zero after engine start.	a. Shut down engine and perform the following: 1. Check for evidence of excessive fluid leakage (reservoir depleted). 2. If hydraulic pump was operated dry, service reservoir and check filter elements for metal chips. If no chips are found, replace filter elements (paragraphs 2-41 and 2-56) and check pump for proper pressure output. If metal chips were found in either element, replace pump (paragraph 2-38), filter elements (paragraph 2-41 and 2-56), hoses and disconnects. 3. Check for discoloration of PC No. 2 pump and disconnects. Discoloration may indicate overheat damage to pump. 4. If pump or pump housing failure is evident, replace filter elements (paragraphs 2-41 and 2-56), hoses, disconnects, and pump (paragraph 2-38). Failure may have been caused by incomplete connection of cooling line disconnect. Ensure all disconnects are completely connected. 5. If there is no evidence of overheat and/or pump failure, proceed to step b.

Table 2-2. PC No. 2 Hydraulic Supply System Troubleshooting (continued)

Malfunction	Corrective Action
3. After 2,950 to 3,250 psig system pressure is obtained, the distance reservoir indicator has moved is not 3.05 to 3.65 inches.	a. For excessive movement, shut down engine and check accumulators for low precharge (T.O. 1A-7D-2-1). Service accumulators, if required. If precharge is correct, perform the following: 1. Check for leakage and repair as required. 2. If no leaks are found, system contains excessive air. Perform hydraulic system bleeding (T.O. 1A-7D-2-1). b. For less than 3.05-inch movement, shut down engine and check for excessive precharge of accumulators (T.O. 1A-7D-2-1). Service accumulators, if required. If precharge is correct, ensure that proper no pressure servicing of reservoir was performed.
4. Pressure indicated on cockpit indicator is not between 2,950 and 3,250 psi.	a. Check for evidence of excessive fluid leakage. Repair leaks as required. If no leaks are found, proceed to step b. b. Check pressure line filter differential pressure indicator for extension. If indicator is extended, reset indicator and cycle flight controls. If indicator extends again, replace filter element (paragraph 2-41). If indicator is not extended, proceed to step c. c. Check system pressure relief valve for overheating which indicates valve is bypassing fluid. If valve is cool, proceed to step d. As positive check for defective valve, perform the following: 1. Shut down engine. 2. Disconnect and plug return line at valve outlet port. 3. Connect external hydraulic power (T.O. 1A-7D-2-1) and slowly apply 3,000 psig. 4. If leakage from outlet port is greater than 60 drops (3 cc) per minute, replace valve (paragraph 2-45). d. Check reservoir for overheating which indicates fluid bypassing from pressure to return system. If reservoir is cool, proceed to step e. As positive check for defective reservoir, perform the following: 1. Shut down engine. 2. Disconnect and plug pressure line from reservoir. 3. Connect hydraulic filler cart to reservoir pressure port. 4. Operate filler cart. If reservoir begins to fill, replace reservoir (paragraph 2-35). e. Check that pump cooling line check valve is properly installed. If valve is properly installed, proceed to step f. f. Check for incomplete connection of cooling line quick disconnect. If disconnect is properly connected, proceed to step g. g. Shut down engine and connect locally fabricated pressure gage assembly to PC No. 2 pressure ground test disconnect. Start engine and operate at 60% rpm. Check that pressure is 3,025 to 3,175 psig. If pressure is within limits, troubleshoot hydraulic indicating system (paragraph 5-27). If pressure is not within limits, replace hydraulic pump (paragraph 2-38).

Table 2-2. PC No. 2 Hydraulic Supply System Troubleshooting (continued)

Malfunction	Corrective Action
5. System pressure fluctuates more than ± 150 psi.	a. Check system pressure relief valve for bypassing fluid as indicated in malfunction 4, step c. If valve checks good, proceed to step b. b. Shut down engine and connect locally fabricated pressure gage assembly to PC No. 2 pressure ground test disconnect. Start engine and check that pressure fluctuation on gage is less than ± 75 psi. If fluctuation is within limits, troubleshoot indicating system (paragraph 5-27). If not within limits, replace hydraulic pump (paragraph 2-38).
6. Excessive pressure drop while operating flight controls	a. Ensure system is free of excessive air (malfunction 3). If excessive air is not indicated, proceed to step b. b. Check pressure line filter differential pressure indicator for extension. If indicator is extended, reset indicator and cycle flight controls. If indicator extends again, replace filter element (paragraph 2-41). c. Replace hydraulic pump (paragraph 2-38).
7. Chattering occurs or flight control movement is irregular.	a. Ensure system is free of excessive air (malfunction 3). If excessive air is not indicated, proceed to step b. b. Check that PC No. 2 surge damper accumulator (station 8) indicates 3,000 psig minimum. If pressure is low, troubleshoot precharge system (paragraph 6-17). If pressure is correct, troubleshoot for defective flight control actuator or linkage (T.O. 1A-7D-2-8).

2-27. Deleted.

2-28. HYDRAULIC SYSTEM BLEEDING.

2-29. For system bleeding, refer to T.O. 1A-7D-2-1.

2-30. SERVICING.

2-31. For PC No. 2 system servicing, refer to T.O. 1A-7D-2-1.

2-32. RETURN LINE PRESSURE RELIEF VALVE REMOVAL AND INSTALLATION.

2-33. REMOVAL. (See figure 2-3.)

a. Drain reservoir fluid (T.O. 1A-7D-2-1). Leave test stand connected.

b. Disconnect hydraulic line (1) from valve. Cap line.

c. Remove screw (2) and spacer (3) securing valve to airplane.

d. Remove return line pressure relief valve (4) from airplane and remove clamp (5). Plug hydraulic manifold port.

e. Remove reducer (6) and packing (7).

NOTE

On airplanes after T.O. 1A-7D-757, union (8) is replaced by inline filter fitting. The filter fitting has the same general appearance as the union, but contains an integral filter, and directional flow arrows to indicate correct installation.

f. Remove union or inline filter fitting (8) and packings (9).

2-34. INSTALLATION. (See figure 2-3.)

NOTE

On airplanes after T.O. 1A-7D-757, install inline filter fitting (8) with directional flow arrows toward relief valve.

a. Using new packings (9), install union or inline filter fitting (8).

b. Using new packing (7), install reducer (6).

c. Install clamp (5), unplug manifold, and connect return line pressure relief valve (4) to hydraulic manifold.

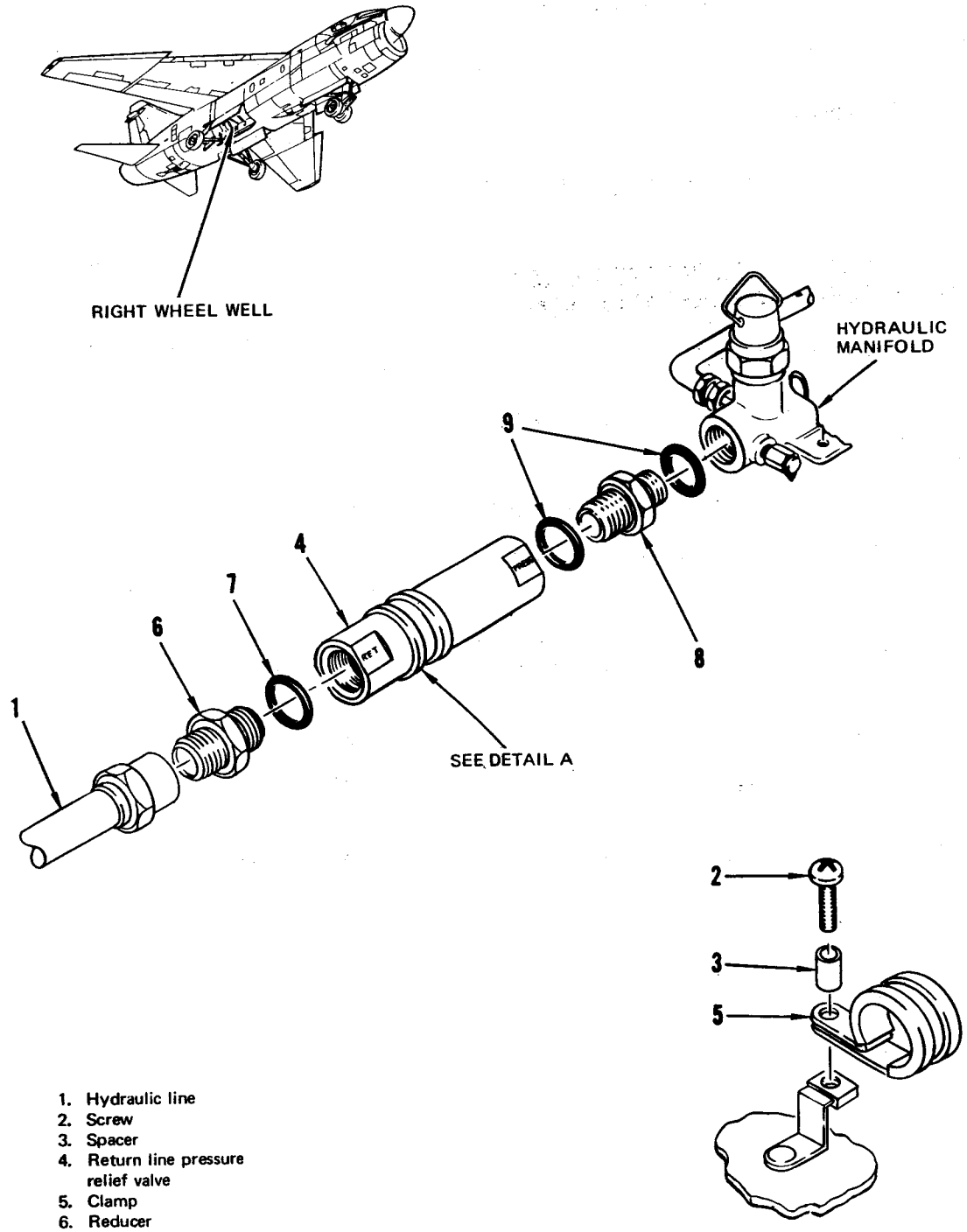
d. Secure relief valve with spacer (3) and screw (2).

e. Uncap hydraulic line (1) and connect to valve.

f. Reconnect test stand.

g. Service reservoir (T.O. 1A-7D-2-1). During servicing, bleed at drain valve on manifold until fluid is free of air.

h. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check for leaks at valve connections.



1. Hydraulic line
2. Screw
3. Spacer
4. Return line pressure relief valve
5. Clamp
6. Reducer
7. Packing
*8. Union
†8. Inline filter fitting
9. Packing (2)

*Airplanes before T.O. 1A-7D-757
†Airplanes after T.O. 1A-7D-757

04D002-07-74

Figure 2-3. Return Line Pressure Relief Valve Removal and Installation

☆U.S. GOVERNMENT PRINTING OFFICE:1982—569-001 / 2543

2-35. RESERVOIR REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect hydraulic power
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten bolts securing reservoir

2-36. REMOVAL. (See figure 2-4.)

a. Drain reservoir (T.O. 1A-7D-2-1).

b. Disconnect pressure line (1) from reservoir.

c. Disconnect return line (2) from tees and remove from airplane.

d. Disconnect return line (3) from tee.

e. Disconnect return line (3A) in left wheel well.

f. Remove jamnut (3B), washer (3C), and return line (3).

g. Disconnect dump line (20) from tee (15).

h. Manually support reservoir, and remove bolts (4) and washers (5) at aft end of reservoir.

i. Loosen nut on T-bolt assembly (6) and disengage from other half of clamp.

j. Remove reservoir (7) from airplane.

k. Loosen jamnut and remove tee (8), packing (9), retainer (10), and jamnut (11).

l. Loosen jamnut and remove tee (15), packing (12), retainer (13), jamnut (14), reducer (19) and packing (18).

2-37. INSTALLATION. (See figure 2-4.)

a. Remove plugs from pressure and return ports and bleed valve from dump line port. Drain preservation fluid from reservoir.

b. Install jamnut (11), new retainer (10) and new packing (9) on tee (8) and install in reservoir. Do not tighten jamnut (11) at this time.

c. Install jamnut (14) new retainer (13), new packing (9), new packing (16), bleed valve (17), new packing (18) and reducer (19) on tee (15). Install tee (15) in reservoir and position to allow access to bleed valve. Tighten jamnut (14).

d. Position reservoir (7) and engage T-bolt assembly (6) with other half of clamp. Tighten nut.

e. Secure aft end of reservoir with washers (5), and bolts (4). Tighten bolts to 22 (+ 3, -2) pound-inches torque.

f. Connect return line (3) to tee and secure brazed fitting end of line to main landing gear keel with washer (3C) and jamnut (3B).

g. Connect return line (3A).

h. Position return line (2) in airplane and connect to tees. Tighten jamnut.

i. Connect pressure line (1) to reservoir.

j. Connect dump line (20) to reducer (19).

k. Service reservoir (T.O. 1A-7D-2-1).

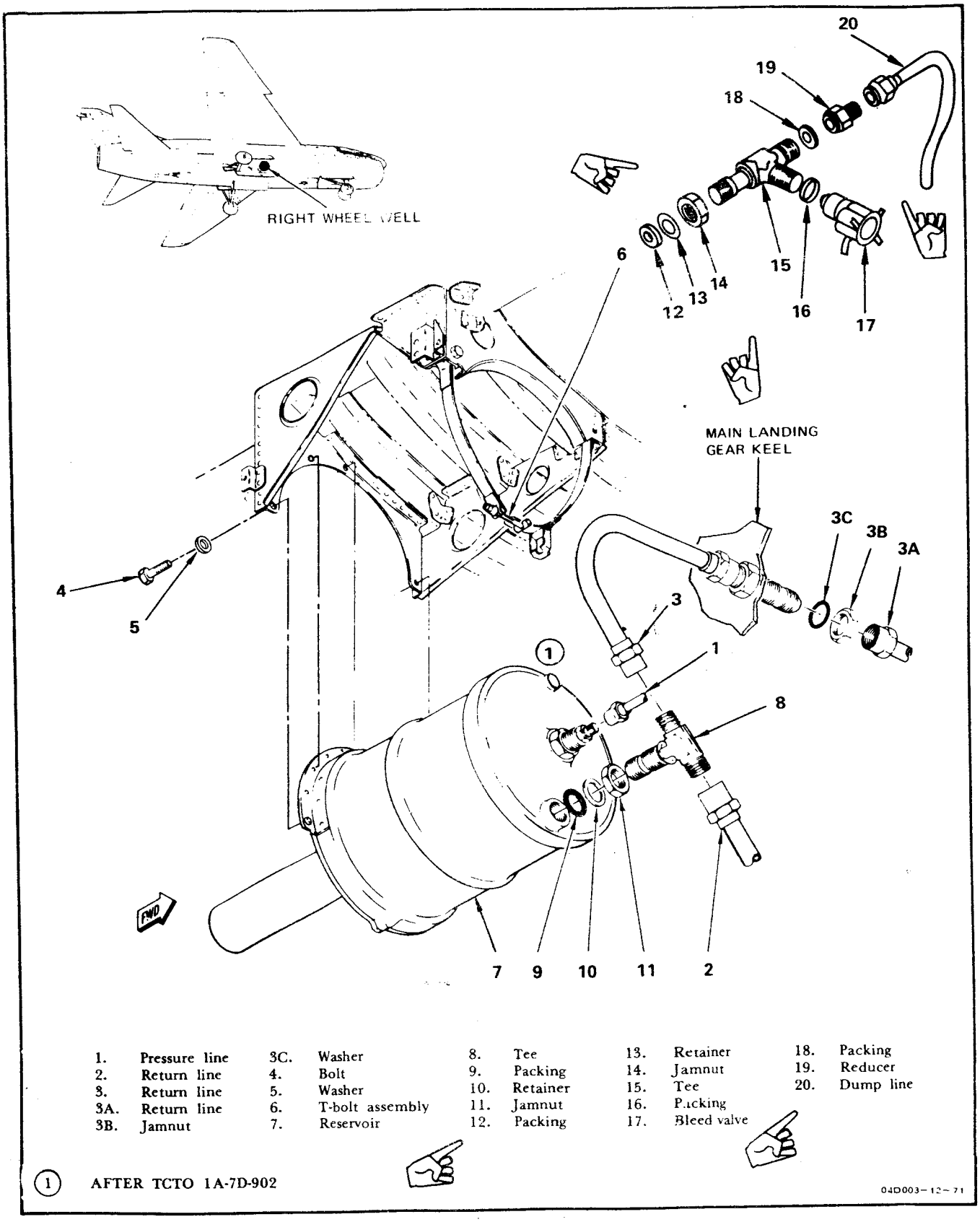
WARNING

Serious injury can occur while high pressure testing. While testing, personnel will be protected by a shield or be a safe distance from the unit to prevent injury.

l. Connect external hydraulic power (T.O. 1A-7D-2-1) and apply 400 (±100) psig pressure.

m. Bleed pressure line (1) until fluid is free of air. Tighten line.

n. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check connections for leaks.



1.	Pressure line	3C.	Washer	8.	Tee	13.	Retainer	18.	Packing
2.	Return line	4.	Bolt	9.	Packing	14.	Jamnut	19.	Reducer
3.	Return line	5.	Washer	10.	Retainer	15.	Tee	20.	Dump line
3A.	Return line	6.	T-bolt assembly	11.	Jamnut	16.	Packing		
3B.	Jamnut	7.	Reservoir	12.	Packing	17.	Bleed valve		

Figure 2-4. Reservoir Removal and Installation

U.S. Government Printing Office : 86 666-000 P.O

2-38. HYDRAULIC PUMP REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	E10385 (Stewart Avionics, Inc., Brooklyn, New York)	Hydraulic filler cart	Fill hydraulic pump with hydraulic fluid
	GGG-W-686	Torque wrench, 0 to 250 pound-feet	Tighten coupling halves
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten clamp nut

2-39. REMOVAL. (See figure 2-5.)

a. Open access 5223-1.

CAUTION

Teflon-lined flexible hoses tend to conform to the shape of installed positions. Be careful when handling these hoses to prevent bending or straightening which could result in kinking and subsequent hose failure. Refer to T.O. 42E1-1-1 for additional hose information.

b. Disconnect flexible hoses (1) at disconnects. Cap each disconnect coupling half.

c. Cut lockwire and loosen nut (2) on clamp. Remove clamp (3) securing adapter to pump and remove pump (4) from engine.

d. On vickers pump, remove packings (5 and 6).

e. On Abex pump, remove gasket (5A) and packing (6).

f. Plug openings on pump and adapter pad.

g. On Vickers pump, remove cooling line (7). Loosen jamnut and remove elbow (8), packing (9), backup ring (10), and jamnut (11). Plug pump opening and cap both ends of line.

h. On Abex pump, disconnect cooling line (7) at coupling half (14). Cap cooling line.

i. Remove nut (12), washer (13), and coupling half (14). Cap coupling half.

j. Remove coupling half (15), packing (16), coupling half (17), and packing (18). Cap coupling halves and plug openings on pump.

2-40. INSTALLATION. (See figure 2-5.)

CAUTION

If pump replacement was due to evidence of overheating and/or pump failure, the pump cooling line check valve shall be removed, visually inspected, checked for proper operation, and correctly installed. A reversed check valve may pass system checkout, but will cause overheating and possible pump failure.

If pump is discolored due to overheating, the pump, hoses, disconnects, and filter elements shall be replaced.

If the pump failed, check pressure line and filler and pump cooling line filters for indicator button extension and check filter elements for metal chips.

NOTE

To prevent hydraulic system contamination, do not remove protective caps from lines or ports until just prior to connecting.

a. Remove elements from pressure line and filler and pump cooling line filters (paragraphs 2-41 and 2-56), and perform the following:

1. Check differential pressure indicator buttons for extension.

2. If neither indicator button is extended or only the pressure line indicator button is extended, install new filter elements. System flushing is not required.

3. If the cooling line filter indicator button is extended, install new filter elements and flush system according to paragraph 1-28.

a-1. Uncap end of coupling half that screws into pump and uncap inlet port on pump. Lubricate threads of coupling half with MIL-H-83282 or MIL-H-46170 fluid. Using new packing (18), install coupling half (17) in inlet port. Tighten coupling half to 115 (+10, −15) pound-feet torque.

b. Uncap end of coupling half that screws into pump and uncap pressure port on pump. Lubricate threads of coupling half with MIL-H-83282 or MIL-H-46170 fluid. Using new packing (16), install coupling half (15) in pressure port. Tighten coupling half to 115 (+10, −15) pound-feet torque.

c. Install coupling half (14) and secure with washer (13) and nut (12).

NOTE

On Abex pumps, cooling line (7) is supported by union/jamnut for shipping.

d. On Vickers pump, uncap elbow (8) and cooling line port. Assemble jamnut (11), new backup ring (10), and new packing (9) on elbow. Install elbow (8). Uncap and install cooling line (7).

e. On Abex pump, uncap cooling line (7) and connect to coupling half (14).

f. Uncap and connect hydraulic filler cart to pump inlet coupling half.

g. Open pressure coupling half and manually rotate pump spline. Operate hydraulic filler cart until fluid is free of air. Close pressure coupling half.

h. Open cooling line coupling half and manually rotate pump spline. Operate hydraulic filler cart until fluid is free of air. Close cooling line coupling half. Disconnect hydraulic filler cart.

WARNING

P-D-680, Type II, is combustible and moderately toxic to eyes, skin and respiratory tract. Eye and skin protection required. Good general ventilation is normally adequate.

CAUTION

To prevent excessive gearbox spline wear and subsequent equipment failure, gearbox and pump mating splines must be thoroughly cleaned and properly lubricated.

i. Clean splines of gearbox drive and pump with P-D-680, Type II, drycleaning solvent.

CAUTION

To prevent failure or loosening of the hydraulic pump shaft retaining screw which could cause damage to the gearbox, visually inspect the hydraulic pump drive shaft for proper installation of the hydraulic pump drive shaft retaining screw.

j. On Abex pump, uncap pump and install packing (6) and gasket (5A).

k. On Vickers pump, uncap pump and install packings (6 and 5).

l. Apply thin coat of MIL-G-81322 grease to splines of pump and pump drive.

CAUTION

To prevent pump failure, check that index pin on pump mounting adapter aligns and mates with index hole in pump mounting flange.

m. Uncap adapter and position pump (4) to adapter. Secure with clamp (3). Tighten nut (2) on clamp (3) to 60 (+6, −5) pound-inches torque.

n. Using a soft punch and soft hammer or mallet, tap clamp (3) opposite nut (2) and then around periphery of clamp. Tighten nut to 60 (+6, −5) pound-inches torque. Continue tapping and tightening operation until nut torque value stabilizes. Secure clamp with MS20995C41 lockwire (figure 1-10A).

o. Uncap and connect flexible hoses (1) to pump at disconnects.

p. Perform operational checkout (paragraph 2-24).

q. Check pump installation for evidence of leakage.

r. Close access 5223-1.

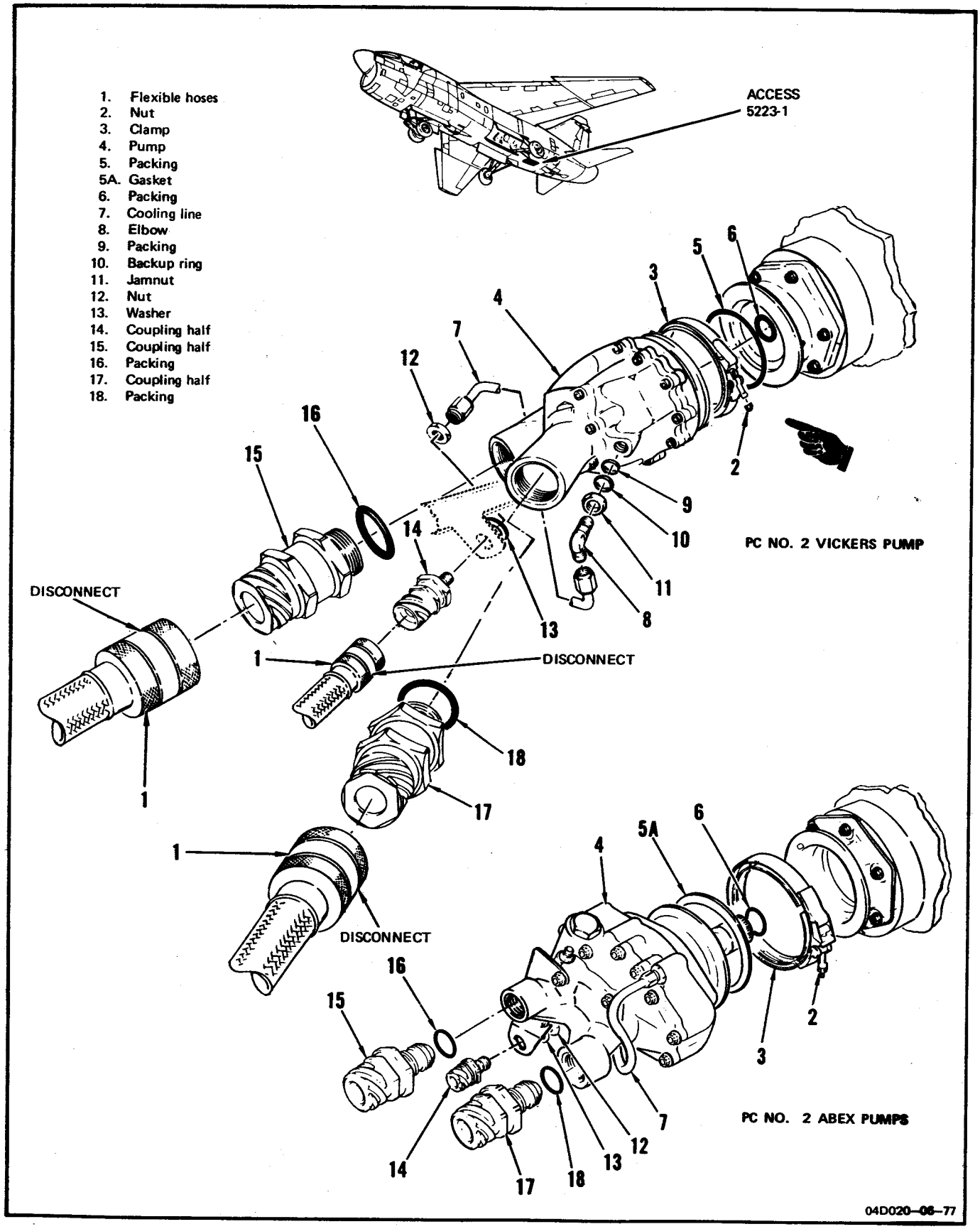


Figure 2-5. Hydraulic Pump Removal and Installation

2-41. PRESSURE LINE FILTER ELEMENT REMOVAL AND INSTALLATION.

(Refer to paragraph 1-44.)

2-42. PRESSURE LINE FILTER REMOVAL AND INSTALLATION.

2-43. REMOVAL. (See figure 2-6.)

a. Remove clamp (1) securing line (2) to PC-2 return line.

b. Disconnect line (2) at bulkhead fitting and elbow (11). Remove line from airplane.

c. Cap bulkhead fitting and plug openings on hydraulic line (2).

d. Disconnect line (3) at bulkhead tee.

e. Remove bolts (4), washers (5), and spacer (6) securing pressure line filter (7) to airplane. Remove filter (7) and line (3) from airplane.

f. Cap bulkhead tee.

CAUTION

To prevent damage to brazed fitting, ensure that fitting jamnut is loosened before removal of fitting is attempted.

g. Loosen brazed fitting jamnut (8) and remove line (3) and packing (9) from filter. Cap and plug openings on line.

h. Loosen jamnut (10) and remove elbow (11), packing (12), retainer (13), and jamnut from filter.

2-44. INSTALLATION. (See figure 2-6.)

a. Drain preservative fluid from filter assembly.

b. Install jamnut (10), new retainer (13), and new packing (12) on elbow (11).

c. Install elbow (11) in filter. Do not tighten jamnut (10).

d. Using new packing (9), connect hydraulic line (3) to filter. Do not tighten jamnut (8).

e. Uncap bulkhead tee.

f. Fill filter with hydraulic fluid. Fill at both ports.

g. Position pressure line filter (7) and line (3) assembly in airplane and secure with spacers (6), washers (5), and bolts (4).

h. Connect line (3) to bulkhead tee but do not tighten.

i. Connect line (2) to elbow (11) and bulkhead fitting and secure line with clamp (1).

j. Tighten jamnuts (10 and 8).

k. Service hydraulic reservoir (T.O. 1A-7D-2-1).

WARNING

Serious injury can occur while high pressure testing. While testing, personnel will be protected by a shield or be a safe distance from the unit to prevent injury.

l. Connect external hydraulic power (T.O. 1A-7D-2-1) and apply 400 (±100) psig. Bleed filter outlet line (3) at bulkhead tee fitting. Allow fluid to flow until free of air. Tighten line fitting.

m. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check lines and fittings for leaks.

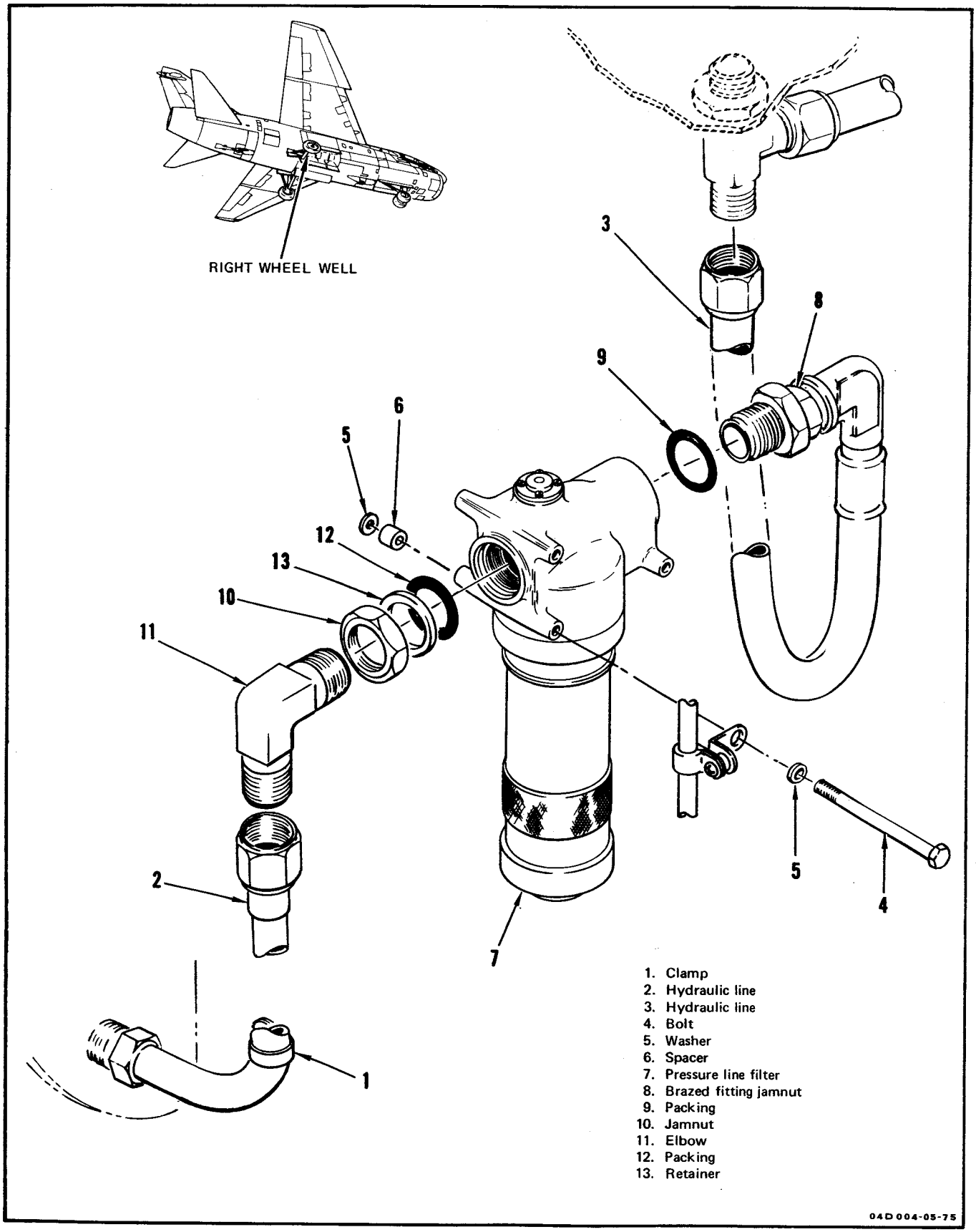


Figure 2-6. Pressure Line Filter Removal and Installation

2-45. SYSTEM PRESSURE RELIEF VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect external hydraulic power

2-46. REMOVAL. (See figure 2-7.)

a. Disconnect hydraulic lines (1) from tee and manifold. Cap lines.

b. Remove bolts (2) and washers (3) securing manifold to bulkhead.

c. Remove nuts (4), washers (5), and screws (6) securing valve to airplane.

d. Remove system pressure relief valve (7) from airplane.

e. Loosen jamnut and remove tee (8) and manifold (9) from valve.

f. Remove packing (10) from manifold.

g. Remove clamp (13) from relief valve.

2-47. INSTALLATION. (See figure 2-7.)

a. Install clamp (13) on relief valve.

b. Install jamnut (12) and new retainer (11), on tee (8).

c. Install new packings (10) on tee (8) and manifold (9).

d. Install manifold (9) and tee (8) in relief valve. Do not tighten jamnut.

e. Position system pressure relief valve (7) and secure to airplane with screws (6), washers (5), and nuts (4).

f. Secure manifold to bulkhead with washers (3) and bolts (2).

g. Uncap hydraulic lines (1) and connect to tee and manifold. Tighten jamnut.

WARNING

Serious injury can occur while high pressure testing. While testing, personnel will be protected by a shield or be a safe distance from the unit to prevent injury.

h. Connect external hydraulic power to PC No. 2 system and apply 400 (± 100) psi (T.O. 1A-7D-2-1).

i. Loosen hydraulic fitting at relief valve pressure port and allow fluid to flow until free of air. Tighten fitting.

j. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check valve and connections for leaks.

2-48. SURGE DAMPER ACCUMULATOR REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect external hydraulic power

2-49. REMOVAL. (See figure 2-8.)

a. Reduce surge damper accumulator pneumatic pressure to zero (T.O. 1A-7D-2-1).

b. Open access 6113-1.

c. Disconnect pneumatic line (1) from accumulator. Cap line.

d. Disconnect hydraulic lines (2) from accumulator. Cap lines.

e. Remove nuts (3) securing accumulator to bracket and remove accumulator (4).

f. Remove reducer (5) and packing (6) from accumulator.

g. Loosen jamnut and remove tee (7), packing (8), retainer (9), and jamnut (10) from accumulator.

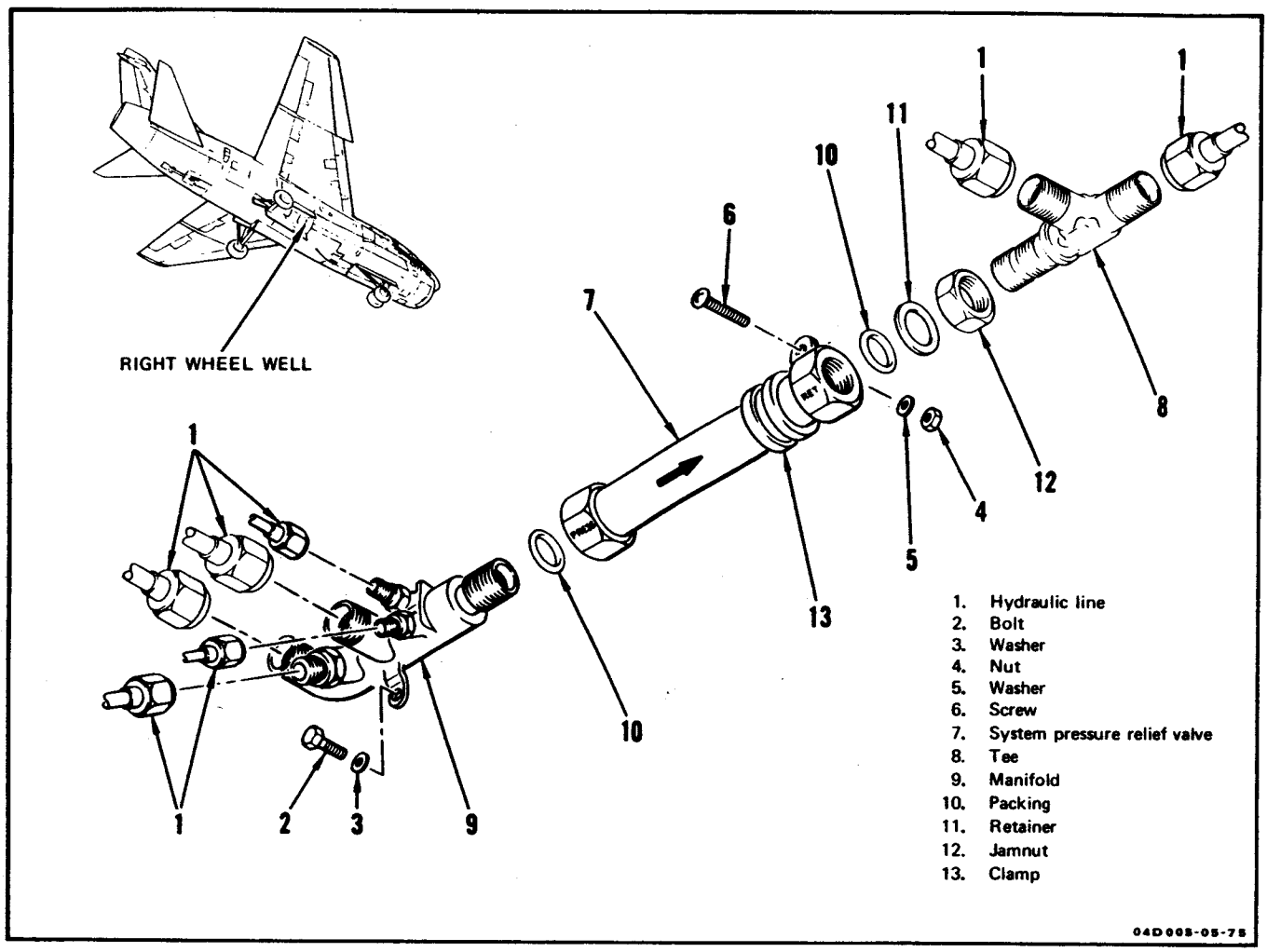


Figure 2-7. System Pressure Relief Valve Removal and Installation

2-50. INSTALLATION. (See figure 2-8.)

a. Drain preservative fluid from accumulator.

b. Install jamnut (10), new retainer (9), and new packing (8) on tee.

c. Install tee (7) in accumulator. Do not tighten jamnut.

d. Using new packing (6), install reducer (5) in accumulator.

e. Position surge damper accumulator (4) to bracket and secure with nuts (3).

f. Uncap and connect, but do not tighten, hydraulic lines (2). Connect and tighten pneumatic line (1). Tighten jamnut (10).

g. Service accumulator pneumatically (T.O. 1A-7D-2-1).

WARNING

Serious injury can occur while high pressure testing. While testing, personnel will be protected by a shield or be a safe distance from the unit to prevent injury.

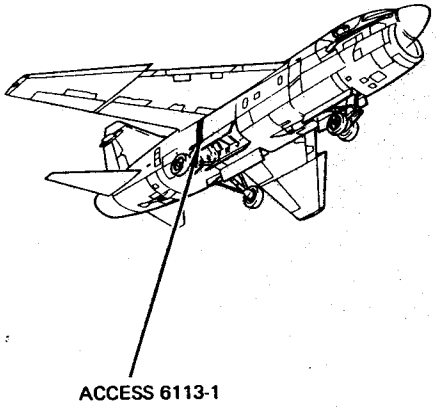
h. Connect external hydraulic power (T.O. 1A-7D-2-1) to PC No. 2 hydraulic system and apply 400 (± 100) psi.

i. Allow fluid to flow from hydraulic lines (2) until free of air. Tighten hydraulic lines.

j. Increase pressure to 3,000 psi and check that no leakage exists at hydraulic or pneumatic lines.

k. Perform hydraulic system air check (T.O. 1A-7D-2-1).

l. Close access 6113-1.



ACCESS 6113-1

1. Pneumatic line
2. Hydraulic line
3. Nut
4. Accumulator
5. Reducer
6. Packing
7. Tee
8. Packing
9. Retainer
10. Jamnut

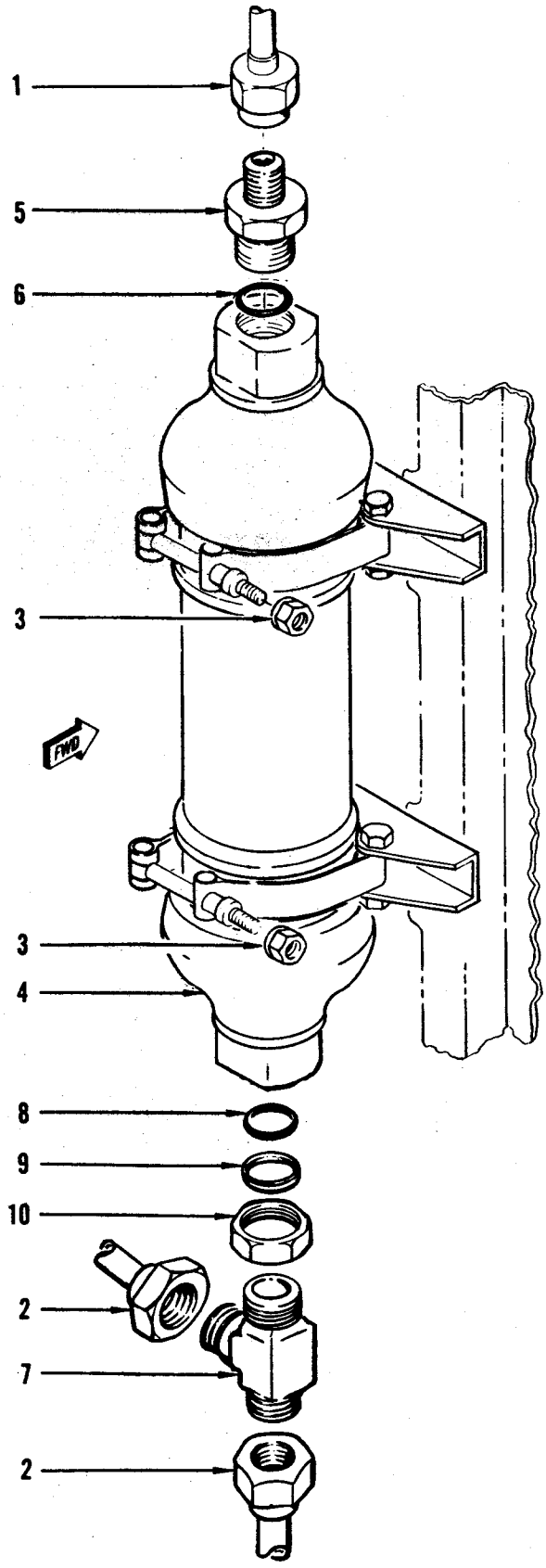


Figure 2-8. Surge Damper Accumulator Removal and Installation

2-51. PRESSURE GROUND TEST DISCONNECT REMOVAL AND INSTALLATION. (Refer to paragraph 1-56.)

2-52. RETURN GROUND TEST DISCONNECT REMOVAL AND INSTALLATION. (Refer to paragraph 1-59.)

2-53. ISOLATION VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	MIL-M-7404	Maintenance stand	Stand on while removing and installing isolation valve

2-54. REMOVAL. (See figure 2-9.)

CAUTION

To prevent contamination and damage, cap or plug all connections when disconnected.

a. Open access 1123-1.

b. Remove cotter pin (1), nut (2), and bolt (3) securing linkage (4) to isolation valve handle.

c. Disconnect hydraulic lines (5, 6, and 7).

d. Remove bolts (8) and washers (9) securing valve to bracket and remove isolation valve (10).

e. Remove cotter pin (11), nut (12), and washer (13) securing handle to isolation valve and remove handle (14).

f. Loosen jamnut and remove elbow (15), packing (16), retainer (17), and jamnut (18).

g. Remove reducers (19) and packings (20) from valve.

h. Place elbow, jamnut, and reducers in a clean plastic bag.

2-55. INSTALLATION. (See figure 2-9.)

CAUTION

To prevent contamination and damage, do not uncap or unplug lines until just prior to connecting.

a. Using new packings (20), install reducers (19) in valve ports.

b. Install jamnut (18), new retainer (17), and new packing (16) on elbow.

c. Install elbow (15) in valve. Do not tighten jamnut.

d. Connect hydraulic lines (5, 6, and 7). Do not tighten the fittings.

e. Position isolation valve (10) on bracket and secure with washers (9) and bolts (8). Tighten jamnut (18) and lines (5, 6, and 7).

f. Place flap handle in ISO UTILITY.

g. Position handle (14) on spline of isolation valve. Rotate ioslation valve fully clockwise against aft stop.

h. If necessary, reposition handle (14) on splines of isolation valve to permit connection to linkage.

i. Readjust linkage (4), if required, to permit final connection to isolation valve handle.

j. Secure handle (14) to isolation valve with washer (13), nut (12), and new cotter pin (11).

k. Secure linkage (4) to handle (14) with bolt (3), nut (2), and new cotter pin (1).

CAUTION

Ensure that the flap control handle is positioned to agree with the position of the leading edge flaps.

l. Bleed flap system (T.O. 1A-7D-2-8). Leave electrical and hydraulic power connected.

m. Place flap handle in ISO UTILITY. Note utility brake accumulator pressure (station 5).

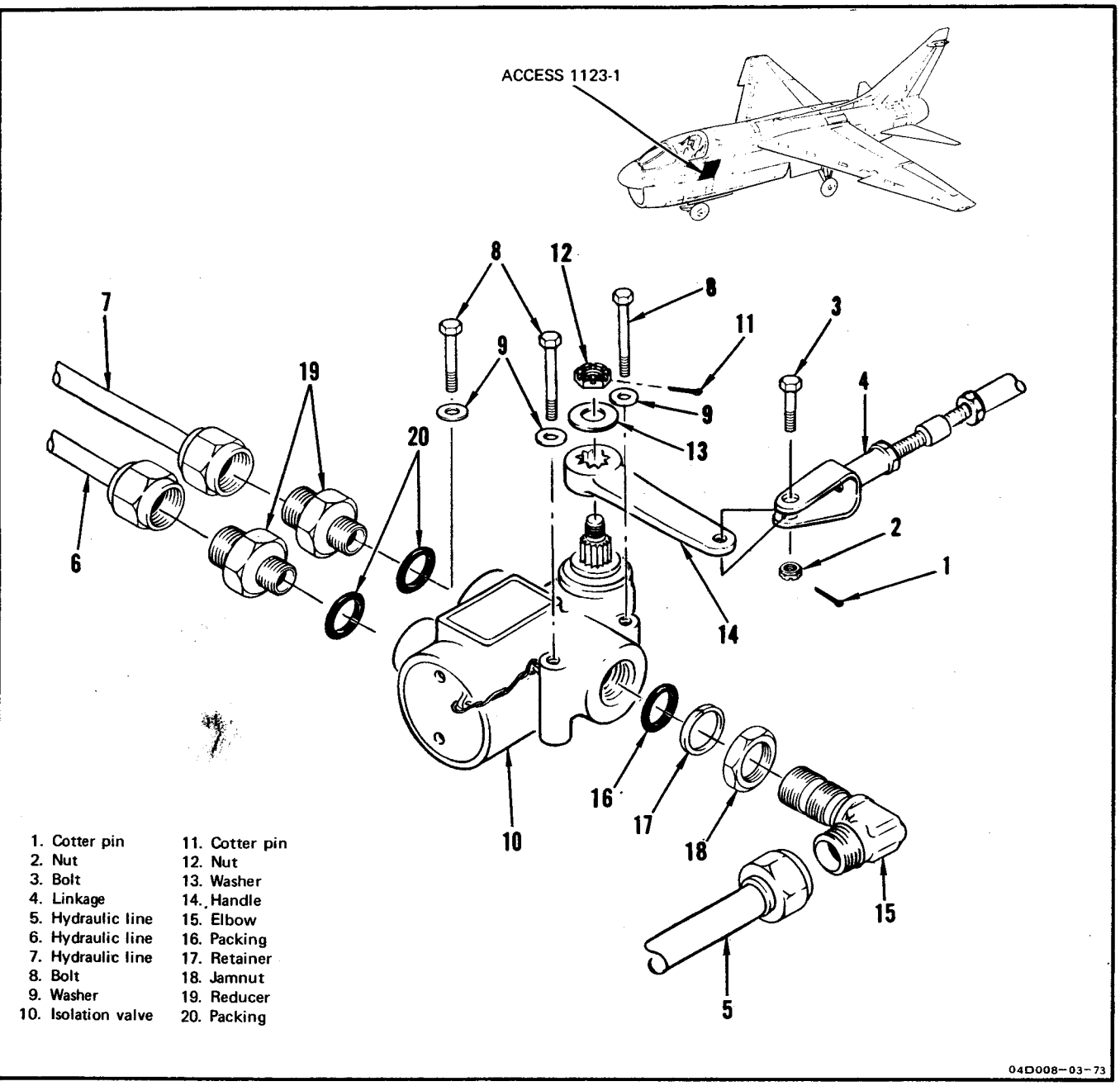


Figure 2-9. Isolation Valve Removal and Installation

n. On airplanes after T.O. 1A-7D-596 or 1A-7D-685, place antiskid switch in BRAKE ACCUM.

o. Actuate brakes five times and check that pressure has decreased to approximately precharge pressure.

p. Check valve for external leakage.

q. Perform hydraulic system air check (T.O. 1A-7D-2-1).

r. Close access 1123-1.

2-56. FILLER AND PUMP COOLING LINE FILTER ELEMENT REMOVAL AND INSTALLATION. (Refer to paragraph 1-62.)

2-57. FILLER AND PUMP COOLING LINE FILTER REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	E10385 (Stewart Avionics Inc., Brooklyn, New York)	Hydraulic filler cart	Provide fluid flow to bleed filter

2-58. REMOVAL. (See figure 2-10.)

CAUTION

To prevent damage to brazed fitting, ensure that fitting jamnut is loosened before removal of fitting is attempted.

a. Disconnect and cap hydraulic line (1).

b. Loosen jamnut (2) and disconnect and cap hydraulic line (3). Remove packing (4).

c. Remove nuts (5), washers (6), spacers (7), and bolts (8) securing filter and remove filler and pump cooling line filter (9).

d. Loosen jamnut and remove tee (10), packing (11), retainer (12), and jamnut (13).

2-59. INSTALLATION. (See figure 2-10.)

a. Install jamnut (13), new retainer (12), and new packing (11) on tee.

b. Install tee (10) in filter. Do not tighten jamnut (13).

c. Position filler and pump cooling line filter (9) on bracket and secure with bolts (8), spacers (7), washers (6), and nuts (5).

d. Using new packing (4), uncap and connect hydraulic line (3) to filter. Tighten jamnut (2).

e. Uncap and connect hydraulic line (1) to filter. Tighten jamnut (13).

CAUTION

To prevent damage to brazed fitting, do not loosen fitting for bleeding.

f. Loosen hydraulic line (3) downstream of outlet port.

g. Connect hydraulic filler cart to filler valve. Operate hydraulic filler cart and allow fluid to flow until free of air. Tighten outlet line.

h. Perform hydraulic system air check (T.O. 1A-7D-2-1).

i. Check for leaks at line connections.

2-60. HAND PUMP REMOVAL AND INSTALLATION.

2-61. REMOVAL. (See figure 2-11.)

a. In the left wheel well, disconnect hydraulic lines (1) from pump. Cap lines.

b. Remove locknuts (2), washers (3), and bolts (4) securing pump to airplane. Remove hand pump (5).

c. Note position of elbows, loosen jamnuts, and remove elbows (6), packings (7), retainers (8), jamnuts (9), reducer (10), and packing (11).

2-62. INSTALLATION. (See figure 2-11.)

a. Using new packing (11), install reducer (10) in hand pump.

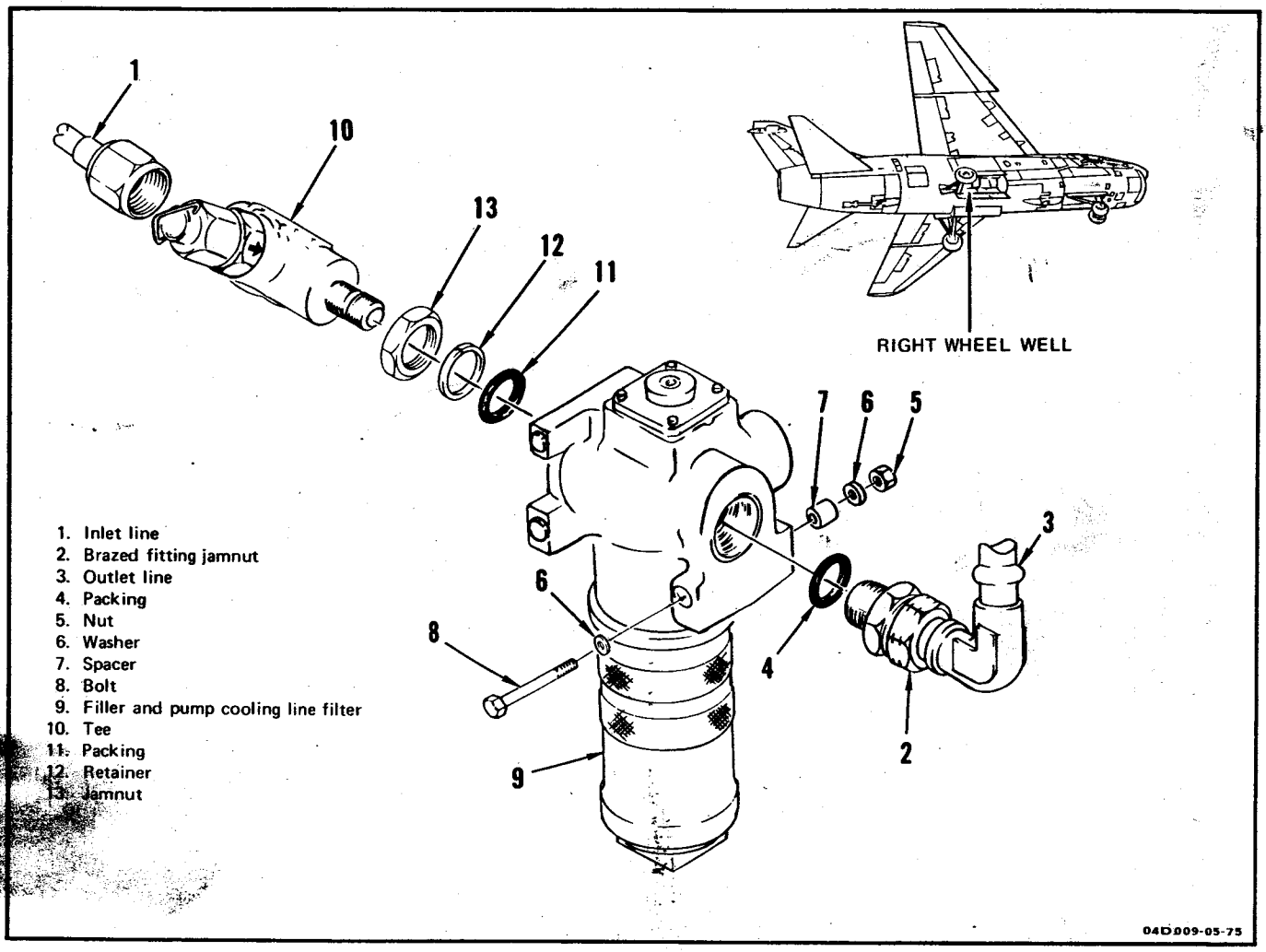


Figure 2-10. Filler and Pump Cooling Line Filter Removal and Installation

b. Install jamnuts (9), retainers (8), and new packings (7) on elbows.

c. Install elbows (6) in positions noted in removal. Do not tighten jamnuts.

d. Position hand pump (5) in airplane and secure with bolts (4), washers (3), and locknuts (2).

e. Uncap hydraulic lines (1) and connect to pump. Tighten elbow jamnuts.

f. Install handle (T.O. 1A-7D-2-1) in pump handle socket.

NOTE

Check valve is located in bulkhead tee above accumulator filler valve package.

g. Loosen line at check valve inlet in pressure line located in right wheel well, and bleed hand pump by operating until fluid is free of air. Tighten inlet fitting.

h. Check installation for evidence of leakage.

i. Perform hydraulic system air check (T.O. 1A-7D-2-1).

j. Dump utility brake accumulator (T.O. 1A-7D-2-1).

k. Pump utility brake accumulator up with hand pump to check hand pump operation.

l. Remove and stow hand pump handle.

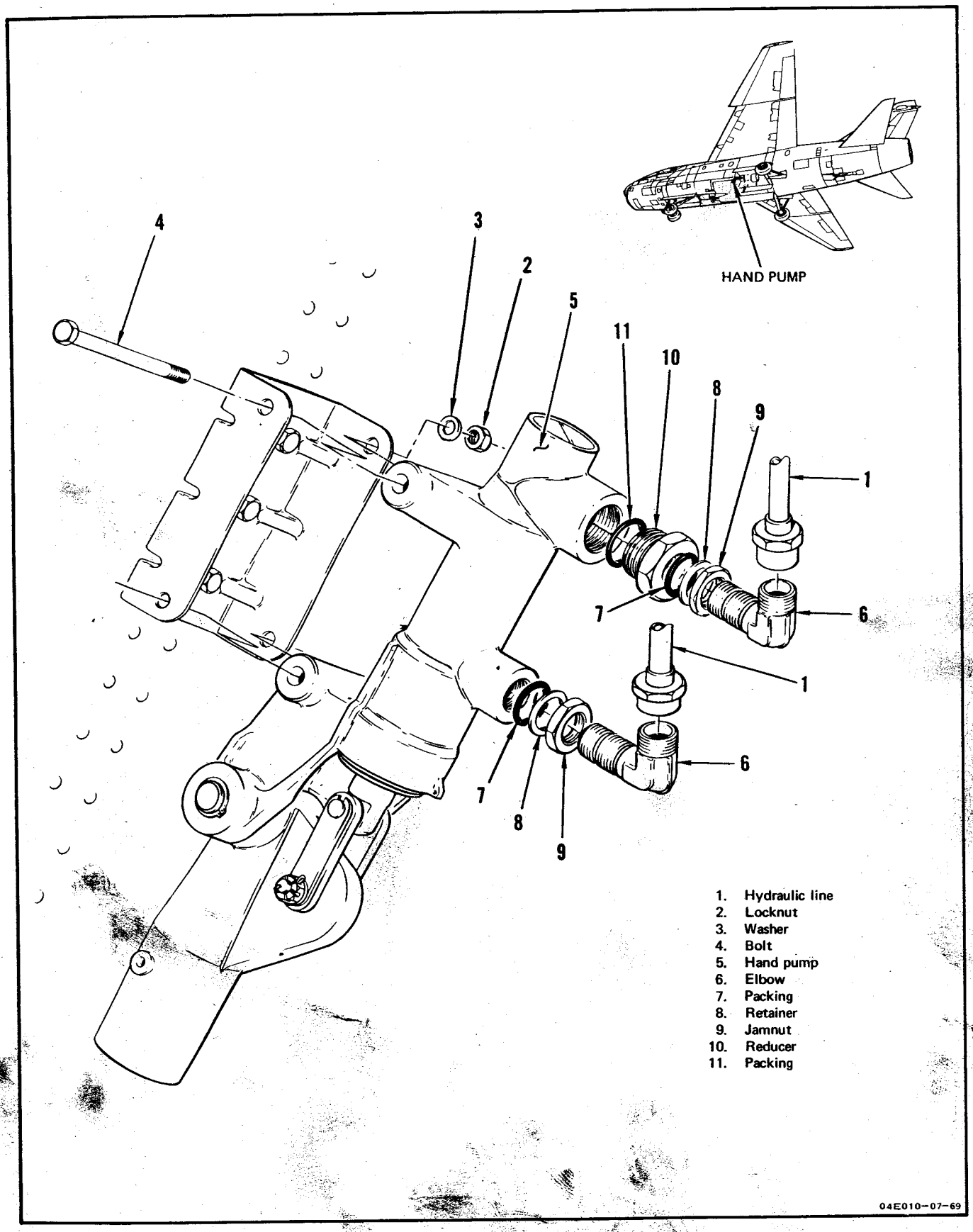


Figure 2-11. Hand Pump Removal and Installation

SECTION III

POWER CONTROL (PC) NO. 3 HYDRAULIC SUPPLY SYSTEM
Airplanes AF69-6197 and Subsequent)

3-1. DESCRIPTION.

3-2. The power control (PC) No. 3 hydraulic supply system ensures limited operation of primary flight control systems in the event of failure of both PC No. 1 and PC No. 2 hydraulic supply systems. The PC No. 3 system powers the automatic flight control system yaw actuator and fuel boost pump drive motor and in conjunction with either the PC No. 1 or PC No. 2 system, supplies operating power for the tandem cylinders of the rudder, roll feel isolation, left wing aileron and spoiler, and left unit horizontal tail actuators. The system is normally pressurized by the engine-driven, variable displacement PC No. 3 hydraulic pump. In the event of PC No. 3 pump failure, the system may be pressurized with the emergency power package (EPP) hydraulic pump. The PC No. 3 hydraulic system consists of the engine-driven hydraulic pump, filters, fluid reservoir, two accumulators (system surge damper and reservoir pressurization), shutoff valve (reservoir accumulator dump), relief valves, check valves, and disconnects. See figure 3-1 for system arrangement and table 1-1 for system leading particulars.

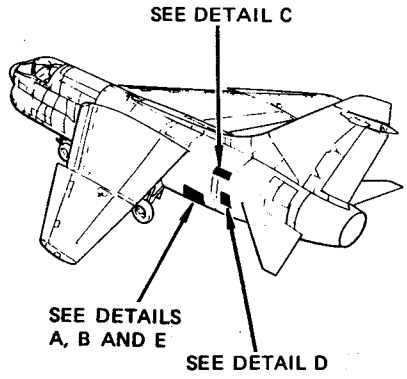
3-3. Refer to Section V for information on hydraulic system indicators. Refer to Appendix A for general torque value.

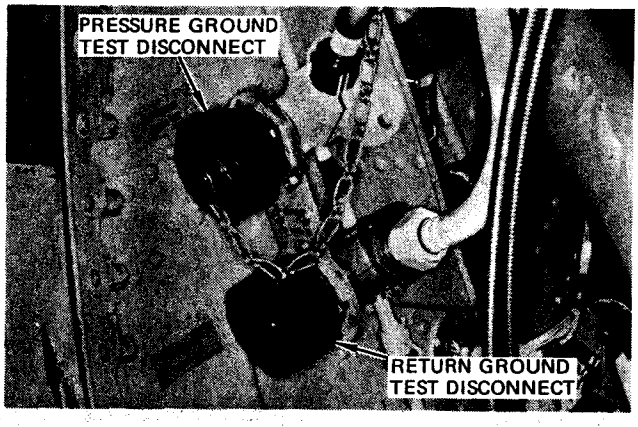
3-4. OPERATION. (See figure 3-2.)

3-5. The PC No. 3 hydraulic pump is located on the engine accessory drive case and is driven through reduction gears in the diffuser section of the engine. The hydraulic pump discharges fluid through a check valve and the pressure line filter before it reaches the power control circuits. The pump pressure line check valve prevents reverse flow through the pump when the emergency power package is operating or when external hydraulic power is applied. The filter contains a 5-micron disposable element. A red indicator button on the filter head extends to indicate a clogged filter element when the pressure drop across the element reaches 60 to 80 psi. An automatic shutoff valve in the filter permits the filter bowl and element to be removed without loss of hydraulic fluid or the entry of air into the hydraulic lines.

3-6. Internal pump cooling and lubrication are provided by bypass fluid which circulates through the pump case and is then routed through the emergency power package and back to the system return line. A filter in the pump cooling line prevents foreign particles on the interior of the pump from entering the system. Hydraulic fluid entering the system through the system filler valve also passes through the filler and pump cooling line filter. The filter contains a 5-micron disposable element. A red indicator button on the filter head extends to indicate a clogged element when the pressure drop across the element reaches 60 to 80 psi. If a clogged condition causes a pressure differential of 90 to 110 psi, fluid is bypassed around the filter element through an integral relief valve. An automatic shutoff valve allows the filter bowl and element to be removed without the loss of hydraulic fluid from system lines. A check valve in the cooling line protects the pump from pressure surges in the return system and prevents overpressurization of the pump case during servicing of the system.

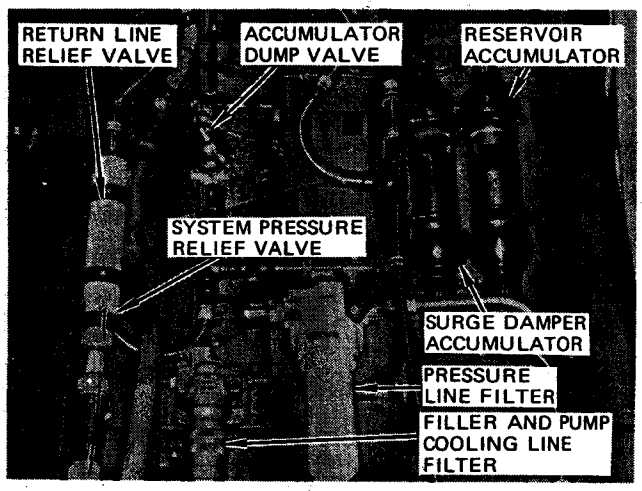
3-7. When a hydraulically operated system or component is actuated, fluid flows from the hydraulic supply pressure line to the actuating cylinder and from the return port of the cylinder to the hydraulic supply return line. A pressure relief valve in the system pressure line protects power control systems from excessive pressure and pressure surges by opening and directing fluid directly into the system return line. Reseat pressure of the relief valve is 3,390 psi with full flow at 3,850 psi.





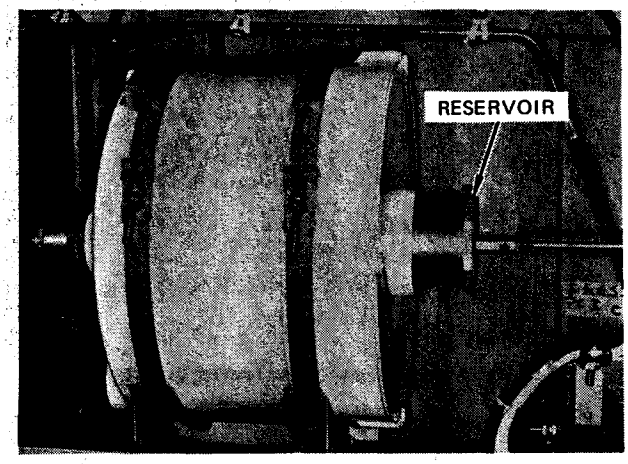
DETAIL A

(ACCESS 5222-1)



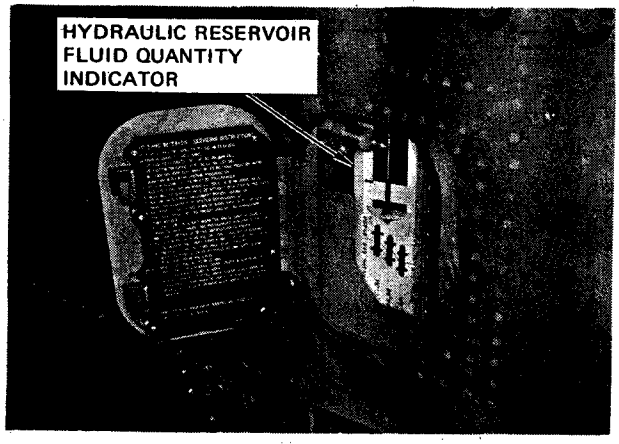
DETAIL B

(ACCESS 5222-1, UPPER ENGINE BAY)



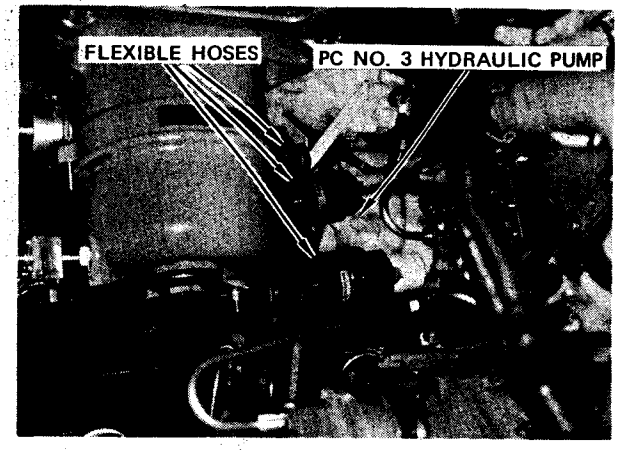
DETAIL C

(ACCESS 5122-6)



DETAIL D

(ACCESS 5222–4)



DETAIL E

(ACCESS 5222–1)

04D069–09–76

Figure 3-1. Power Control No. 3 Hydraulic Supply System Arrangement

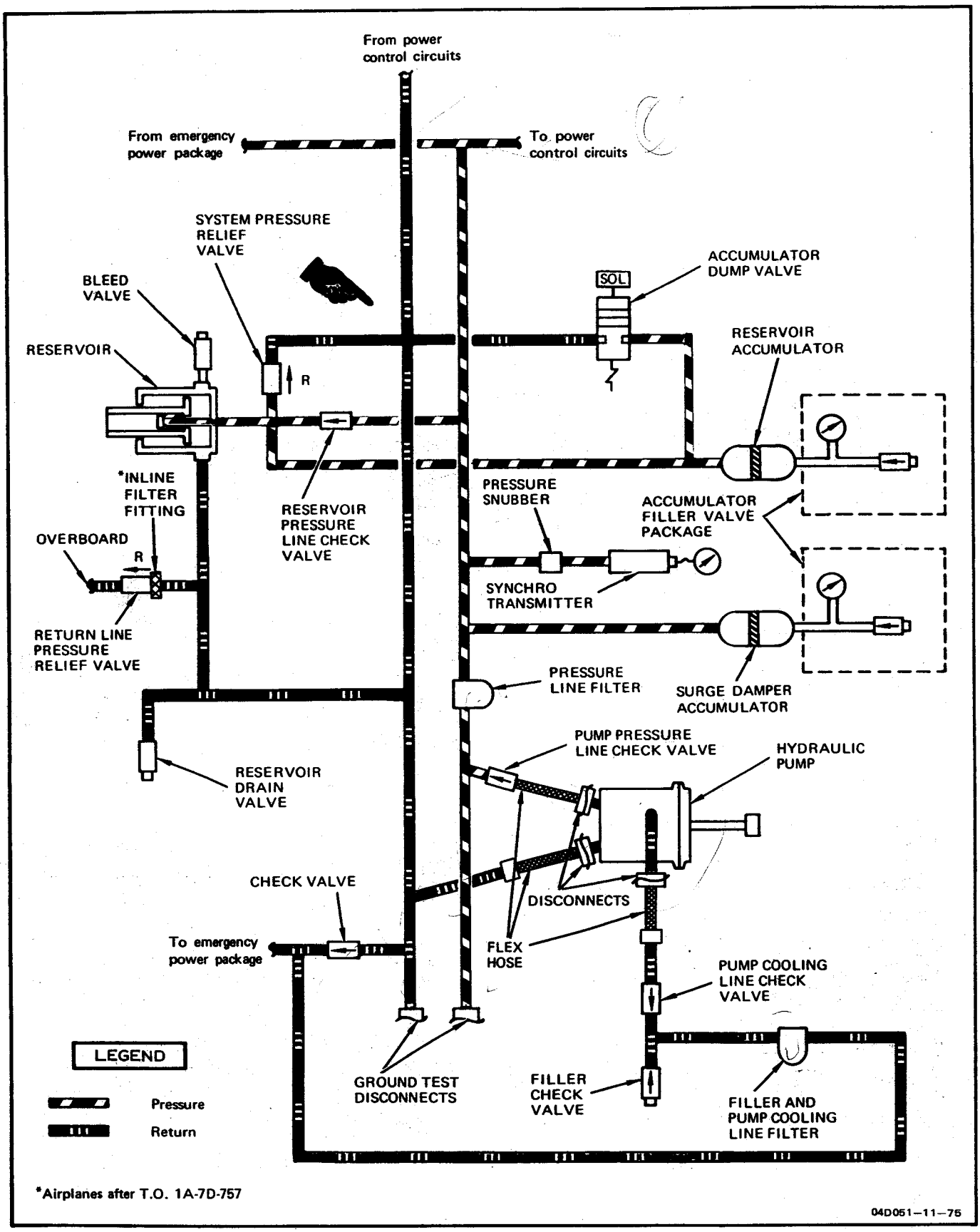


Figure 3-2. Power Control No. 3 Hydraulic System Schematic Diagram

3-8. The fluid in the return line is directed back to the hydraulic pump and supply system reservoir. The reservoir stores fluid under 90 psi pressure to ensure an adequate flow of fluid to the hydraulic pump. The reservoir is equipped with a hydraulic bleed valve and a fluid level indicator. The window-type indicator shows reservoir fluid level under various temperature ranges, for both the no pressure and system pressurized conditions. The distance between the NO PRESS and SYS PRESS window index marks for a given temperature range is the normal amount of compression of the hydraulic fluid plus the volume required to fill the surge damper and reservoir accumulators. Any entrained air in the system will be reflected by excessive movement of the reservoir fluid level indicator.

3-9. When the system is in operation, hydraulic supply system pressure of approximately 3,100 psi is directed through the reservoir piston to an inner piston chamber. Here the fluid applies pressure against a small area on the back side of the piston. The ratio of this small area (on which the 3,100 psi is applied) to the larger area on the face of the piston creates a return system pressure of 90 psi. When additional fluid is required, the pressure exerted on the piston forces fluid from the reservoir into the supply system return line where it is directed to the hydraulic pump. With this design, there is no pressure on the return system until pressure is developed by the pump. The reservoir piston, therefore, can be moved only by developing an unbalanced hydraulic force as opposed to other hydraulic systems designed with air or spring pressure developing the return system pressure. A return line pressure relief valve in the supply system protects the reservoir from excessive pressurization by venting fluid overboard. Full flow setting of the relief valve is 200 (±5) psi with valve reseat pressure of 160 psi minimum. On airplanes after T.O. 1A-7D-757, the union connected to the relief valve PRESS port contains an integral filter that protects the relief valve from contamination.

3-10. Since the reservoir provides a pressurized return system only with the system pressurized or pressure available from the accumulator, control surface operation with the PC No. 3 hydraulic return system unpressurized can result in air being induced into the system. Upon actuation of a tandem control cylinder with only one half of the cylinder pressurized, the fluid forced from the unpressurized side of the cylinder must be replaced from the system reservoir. With no pressure applied to the piston to force the fluid from the reservoir, a partial vacuum is created within the cylinder. The partial vacuum may result in some air being drawn across the piston rod seal into the cylinder. Elimination of this source of air can be achieved by ensuring that all systems are pressurized during any control surface movement.

3-11. The supply system incorporates a 26.2 cubic-inch capacity surge damper accumulator precharged to 1,000 (±100) psi to absorb surges in the system pressure line. An identical reservoir accumulator precharged to 1,500 (±50) psi is incorporated to maintain approximate system pressure on the reservoir. Both accumulators are system charged with hydraulic fluid through the supply system pressure line.

3-12. If PC No. 3 system pressure is lost, a check valve retains approximately 3,000 psi in the reservoir accumulator. This pressure applied to the reservoir results in a system return pressure of approximately 90 psi which ensures inlet pressure to the emergency power package hydraulic pump. This pressure is present in the return system as long as the accumulator is fully charged. The design of the servo valve packages utilized in the power control system can provide a path for fluid transfer between systems if PC No. 3 system remains pressurized for extended periods with no pressure on the remaining systems. This fluid transfer can be prevented by dumping the accumulator pressure when not needed for operations. An accumulator dump valve, actuated by the emergency accumulator test switch in the right wheel well, is used to dump hydraulic pressure from the accumulator. Placing the test switch in DUMP connects 28 volts from the secondary dc bus to the dump valve. The energized valve dumps the accumulator hydraulic fluid into the return system.

3-13. COMPONENTS.

3-14. For a list of system components, their locations (accesses), and functions, refer to table 3-1.

Table 3-1. Power Control No. 3 Hydraulic Supply System Components

Components	Access	Function
Accumulator, reservoir	5222-1	Maintains pressure on system reservoir to provide inlet pressure for emergency power package pump.
Accumulator, surge damper	5222-1	Absorbs pressure surges in main pressure line.
Disconnects, ground tests, pressure and return	5222-1	Permit rapid connection of external power to PC No. 3 supply system
Filter, hydraulic filler and pump cooling line	5222-1	Removes contamination particles from fluid entering system through reservoir filler connection and from pump case.
Filter, pressure line	5222-1	Removes contamination particles from fluid being discharged from pump discharge port.
Fitting, inline filter[1]	5222-1	Connected to PRESS port of return line pressure relief valve. Protects relief valve from contamination.
Indicator, reservoir quantity	5222-4	Indicates reservoir fluid level.
Pump, hydraulic	5223-1	Provides system pressure of approximately 3,100 psi.
Reservoir, hydraulic	5122-6	Stores system fluid under pressure to ensure adequate fluid supply to pump.
Valve, accumulator dump	5222-1	Vents accumulator pressure by dumping fluid from accumulator into system return line. Energized by emergency accumulator test switch.
Valve, check, filler	5222-4	Serves as system filling point and prevents backflow of fluid at filler line connection.
Valve, check, pump cooling line	5223-1	Protects pump and cooling line filter from pressure surges in the return system and prevents overpressurization of the pump case during reservoir filling.
Valve, check, pump pressure line	5222-1	Prevents reverse flow through pump when external hydraulic power is applied or when emergency power package is operating.
Valve, check, reservoir pressure line	5222-1	Maintains system return line pressure by preventing the loss of accumulator pressure from reservoir pressurizing circuit into supply system.
Valve, return line pressure relief	5222-1	Protects components and systems from excessive return line pressure by venting fluid overboard.

Table 3-1. Power Control No. 3 Hydraulic Supply System Components (continued)

Components	Access	Function
Valve, system pressure relief	5222-1	Protects systems and components from excessive pressure by venting fluid from the pressure line into the return line.

[1]Airplanes after T.O. 1A-7D-757

3-15. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine

NOTE

A number, or numbers, enclosed in parentheses at the end of a step in the following checkout is a reference to a corresponding number in troubleshooting table 3-2.

a. Service PC No. 3 reservoir (T.O. 1A-7D-2-1) to level shown in figure 3-2A.

a-1. Place a reference mark on indicator housing so that indicator movement can be measured after engine start.

b. Start engine (T.O. 1A-7D-2-1) and operate at idle. Check that low hydraulic pressure caution light is off. (1 and 2)

NOTE

Measure indicator movement within 5 minutes of engine start.

c. Measure distance reservoir indicator has moved. Movement of indicator should be 0.68 to 0.92 inch (figure 3-2A). (3)

d. Check that PC No. 3 hydraulic system pressure indicator indicates 3,100 (±150) psi and pressure fluctuation is less than 150 psi. (4 and 5)

NOTE

When flight controls are cycled, system pressure may drop sufficiently to cause the low hydraulic pressure caution light to come on momentarily.

e. Cycle control stick and check that control surfaces powered by PC No. 3 hydraulic system move smoothly and pressure does not drop excessively. Pressure should return to normal at end of travel. (6 and 7)

f. Shut down engine.

g. Check that PC No. 3 reservoir accumulator pressure (station 2) is greater than 2,950 psi. (8)

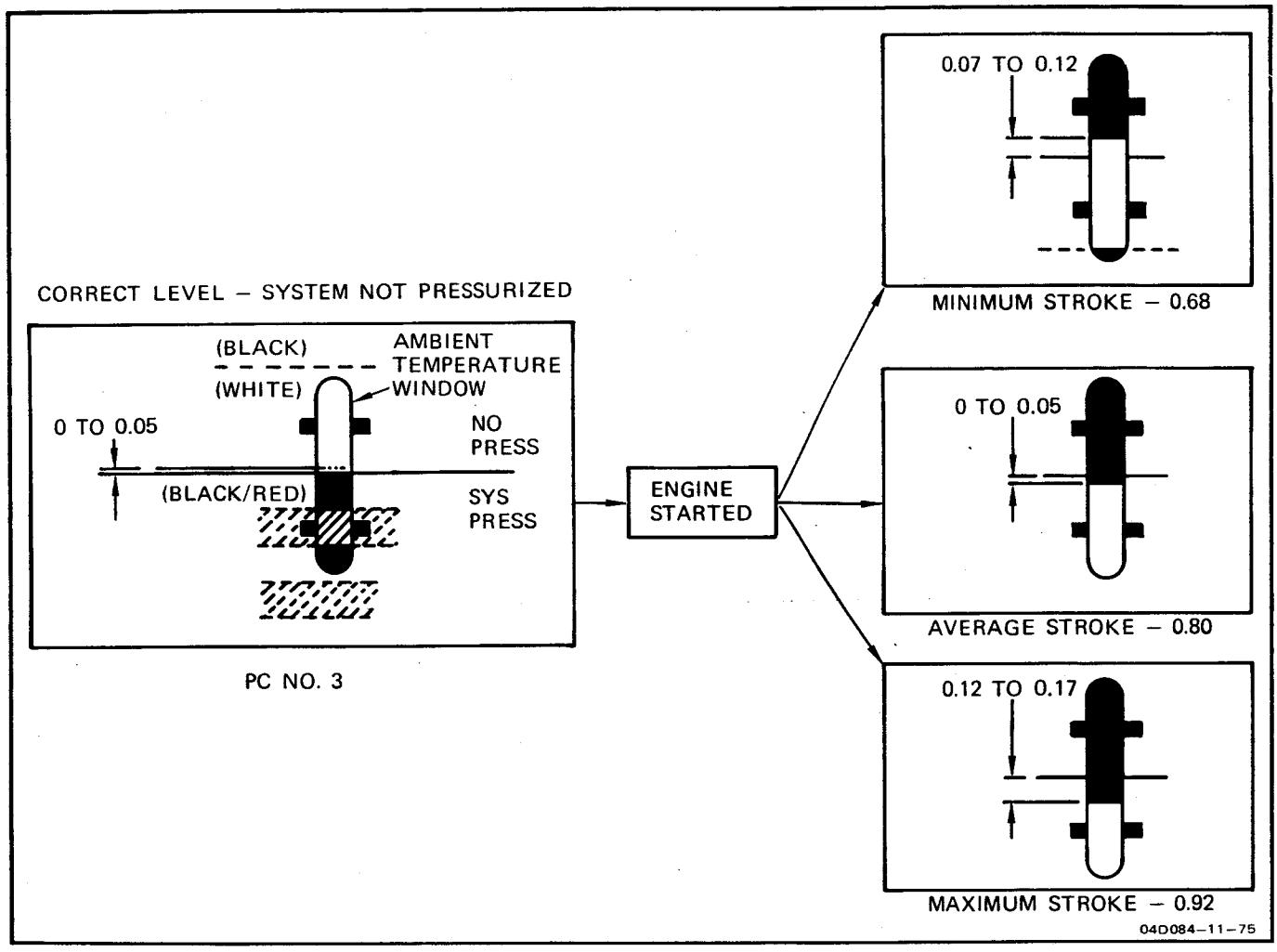


Figure 3-2A. PC No. 3 Reservoir Piston Stroke

3-16. TROUBLESHOOTING.

3-17. Refer to table 3-2 for troubleshooting information. Malfunctions are listed numerically in the table and are related to a corresponding number, or numbers, following a step in the operational checkout. Fabricate a pressure gage assembly as shown in figure 1-4.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external hydraulic power		Connect external hydraulic power to airplane
	Equipment required for engine operation		Operate engine
1-4	Pressure gage assembly	(Local fabrication)	Check hydraulic pressure at ground test disconnect

Table 3-2. PC No. 3 Hydraulic Supply System Troubleshooting

Malfunction	Corrective Action
1. Hydraulic pressure indication is zero after engine start.	a. Shut down engine and perform the following: 1. Check for evidence of excessive fluid leakage (reservoir depleted). 2. If pump was operated dry for more than 30 minutes, replace hoses and disconnects, and check filter elements for metal chips. Replace filter elements (paragraphs 3-31 and 3-37), and if metal chips were found in either element, replace pump (paragraph 3-53). 3. If pump has operated dry for less than 30 minutes, check pump for dry run damage (paragraph 3-18). 4. Check for discoloration of PC No. 3 pump and disconnects. Discoloration may indicate overheat damage to pump. 5. If pump or pump housing failure is evident, replace filter elements (paragraphs 3-31 and 3-37), hoses, disconnects, and pump (paragraph 3-53). Failure may have been caused by incomplete connection of cooling line disconnect. Ensure all disconnects are completely connected. 6. If there is no evidence of overheat and/or pump failure, proceed to step b. b. Check pump pressure line check valve for proper installation. If required, install valve properly. If valve is installed properly, proceed to step c. c. Connect locally fabricated pressure gage assembly to PC No. 3 pressure ground test disconnect. Start engine and check that pressure is 3,025 to 3,175 psig. If pressure is within limits, troubleshoot indicating system (paragraph 5-27). If pressure is zero, shut down engine and proceed to step d. d. Perform hydraulic system bleeding (T.O. 1A-7D-2-1). If excessive air is not indicated, replace hydraulic pump.
2. Low hydraulic pressure caution light does not go off when pressure is above 1,840 psi.	a. Troubleshoot hydraulic indicating system (paragraph 5-27).
3. After 2,950 to 3,250 psig system pressure is obtained, the distance reservoir indicator has moved is not 0.68 to 0.92 inch.	a. For excessive movement, shut down engine and check accumulators for low precharge (T.O. 1A-7D-2-1). Service accumulators, if required. If precharge is correct, perform the following: 1. Check for leakage and repair as required. 2. If no leaks are found, system contains excessive air. Perform hydraulic system bleeding (T.O. 1A-7D-2-1). b. For less than 0.68-inch movement, shut down engine and check for excessive precharge of accumulators (T.O. 1A-7D-2-1). Service accumulators if required. If precharge is correct, ensure that proper no pressure servicing of reservoir was performed.
4. Pressure indicated on cockpit indicator is not between 2,950 and 3,250 psi.	a. Check for evidence of excessive fluid leakage. Repair leaks as required. If no leaks are found, proceed to step b.

Table 3-2. PC No. 3 Hydraulic Supply System Troubleshooting (continued)

Malfunction	Corrective Action
	b. Check pressure line filter differential pressure indicator for extension. If indicator is extended, reset and cycle flight controls. If indicator extends again, replace filter element (paragraph 3-31). If indicator is not extended, proceed to step c. c. Check system pressure relief valve for overheating which indicates valve is bypassing fluid. If valve is cool, proceed to step d. As positive check for defective valve, perform the following: 1. Shut down engine. 2. Dump PC No. 3 reservoir accumulator (T.O. 1A-7D-2-1). 3. Disconnect and plug return line at valve outlet port. 4. Connect external hydraulic power (T.O. 1A-7D-2-1) and slowly apply 3,000 psig.

Table 3-2. PC No. 3 Hydraulic Supply System Troubleshooting (continued)

Malfunction	Corrective Action
	5. If leakage from outlet port is greater than 60 drops (3 cc) per minute, replace valve (paragraph 3-44).
	d. Check accumulator dump valve for overheating which indicates valve bypassing fluid. If valve is cool, proceed to step e. As positive check for defective valve, perform the following:
	1. Shut down engine.
	2. Dump PC No. 3 reservoir accumulator (T.O. 1A-7D-2-1).
	3. Disconnect and plug return line from valve.
	4. Connect external hydraulic power (T.O. 1A-7D-2-1) and slowly apply 3,000 psig.
	5. If leakage from valve return port is more than 100 drops (5 cc) per minute, replace valve (paragraph 3-47).
	e. Check reservoir for overheating which indicates fluid bypassing from pressure to return system. If reservoir is cool, proceed to step f. As positive check for defective reservoir, perform the following:
	1. Shut down engine.
	2. Dump PC No. 1 reservoir accumulator (T.O. 1A-7D-2-1).
	3. Disconnect and plug pressure line from reservoir.
	4. Connect hydraulic filler cart to reservoir pressure port.
	5. Operate filler cart. If reservoir begins to fill, replace reservoir (paragraph 3-28).
	f. Check that pump cooling line check valve is properly installed. If valve is properly installed, proceed to step g.
	g. Check for incomplete connection of cooling line quick disconnect. If disconnect is properly connected, proceed to step h.
	h. Shut down engine and connect locally fabricated pressure gage assembly to PC No. 3 pressure ground test disconnect. Start engine and check that pressure is 3,025 to 3,175 psig. If pressure is within limits, troubleshoot hydraulic indicating system (paragraph 5-27). If pressure is not within limits, replace hydraulic pump (paragraph 3-53).
5. System pressure fluctuates more than ±150 psi.	a. Check system pressure relief valve for bypassing fluid as indicated in malfunction 4, step c. If valve checks good, proceed to step b.
	b. Shut down engine and connect locally fabricated pressure gage assembly to PC No. 3 pressure ground test disconnect. Start engine and check that pressure fluctuation on gage is less than ±75 psi. If fluctuation is within limits, troubleshoot indicating system (paragraph 5-27). If not within limits, replace hydraulic pump (paragraph 3-53).
6. Excessive pressure drop while operating flight controls.	a. Ensure system is free of excessive air (malfunction 3). If excessive air is not indicated, proceed to step b.

Table 3-2. PC No. 3 Hydraulic Supply System Troubleshooting (continued)

Malfunction	Corrective Action
	b. Check pressure line filter differential pressure indicator for extension. If indicator is extended, reset indicator and cycle flight controls. If indicator extends again, replace filter element (paragraph 3-31). c. Replace hydraulic pump (paragraph 3-53).
7. Chattering occurs or flight control movement is irregular.	a. Ensure system is free of excessive air (malfunction 3). If excessive air is not indicated, proceed to step b. b. Check that PC No. 3 surge damper accumulator (station 10) and reservoir accumulator (station 2) indicate 3,000 psig minimum. If pressure is low, troubleshoot precharge system (paragraph 6-17). If pressure is correct, troubleshoot for defective flight control actuator or linkage (T.O. 1A-7D-2-8).
8. Reservoir accumulator pressure (station 2) is less than 2,950 psig after engine showdown.	a. Perform the following: 1. Dump reservoir accumulator (T.O. 1A-7D-2-1). 2. Disconnect and plug return line from accumulator dump valve. 3. Connect external hydraulic power (T.O. 1A-7D-2-1) and slowly apply 3,000 psig. 4. If leakage from valve return port is more than 100 drops (5 cc) per minute, replace valve. 5. If leakage is acceptable, proceed to step b. b. Troubleshoot precharge system (paragraph 6-17). If precharge system checks good, replace reservoir pressure line check valve.

3-18. TESTING PC NO. 3 PUMP FOR DRY RUN DAMAGE.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine for pump test

3-19. The following procedure provides instructions for testing pumps which have been operated dry less than 30 minutes:

CAUTION

Pumps operated dry longer than 30 minutes or which do not meet the requirements of steps c and e must be replaced.

a. Bleed PC No. 3 system (T.O. 1A-7D-2-1).

b. Start engine (T.O. 1A-7D-2-1).

c. Cycle control surfaces and check that pump output pressure is stable and within limits.

d. Shut down engine (T.O. 1A-7D-2-1).

e. Remove PC No. 3 system pressure line and filler and pump cooling line filter elements (paragraphs 3-31 and 3-37), and perform the following:

1. Check filter elements for metal chips and filter heads for extension of indicator button.

2. If chips are present in either element, replace pump (paragraph 3-53).

3. If either indicator button is extended and no

chips are present, replace filter elements (paragraphs 3-31 and 3-37), and repeat steps a through e.

4. If no chips are found and indicator buttons are not extended, pump is serviceable.

3-20. Deleted.

3-21. HYDRAULIC SYSTEM BLEEDING.

3-22. For system bleeding, refer to T.O. 1A-7D-2-1.

3-23. SERVICING.

3-24. For PC No. 3 system servicing, refer to T.O. 1A-7D-2-1.

3-25. RETURN LINE PRESSURE RELIEF VALVE REMOVAL AND INSTALLATION.

3-26. REMOVAL. (See figure 3-3.)

a. Open access 5222-1.

b. Drain PC No. 3 reservoir fluid (T.O. 1A-7D-2-1). Leave test stand connected.

c. Disconnect hydraulic lines (1) from relief valve (5).

d. Remove bolts (3), and spacers (4) securing relief valve (5) to airframe. Remove relief valve from airplane.

e. Remove clamps (6) from valve.

NOTE

On airplanes after T.O. 1A-7D-757, union (7) is replaced by inline filter fitting. The filter fitting has the same general appearance as the union, but contains an integral filter and directional flow arrows to indicate correct installation.

f. Remove union or inline filter fitting (7) from relief valve pressure port. Discard packing (8).

g. Remove union (9) from relief valve RET port. Discard packing (10).

h. Cap or plug open hydraulic lines and relief valve ports.

3-27. INSTALLATION. (See figure 3-3.)

a. Using new packing (10), install union (9) in relief valve RET port.

NOTE

On airplanes after T.O. 1A-7D-757, install inline filter fitting (7) with directional flow arrows toward relief valve.

b. Using new packing (8), install union or inline filter fitting (7) in relief valve PRESS port.

c. Install clamps (6) on valve.

d. Position valve for installation and install spacers (4), bolts (3) and uncap unions.

e. Unplug hydraulic lines (1) and connect to valve. Leave pressure port line loose.

f. Service reservoir (T.O. 1A-7D-2-1). During servicing, bleed at relief valve pressure port until fluid is free of air. Tighten line.

g. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check connections for leaks.

h. Close access 5222-1.

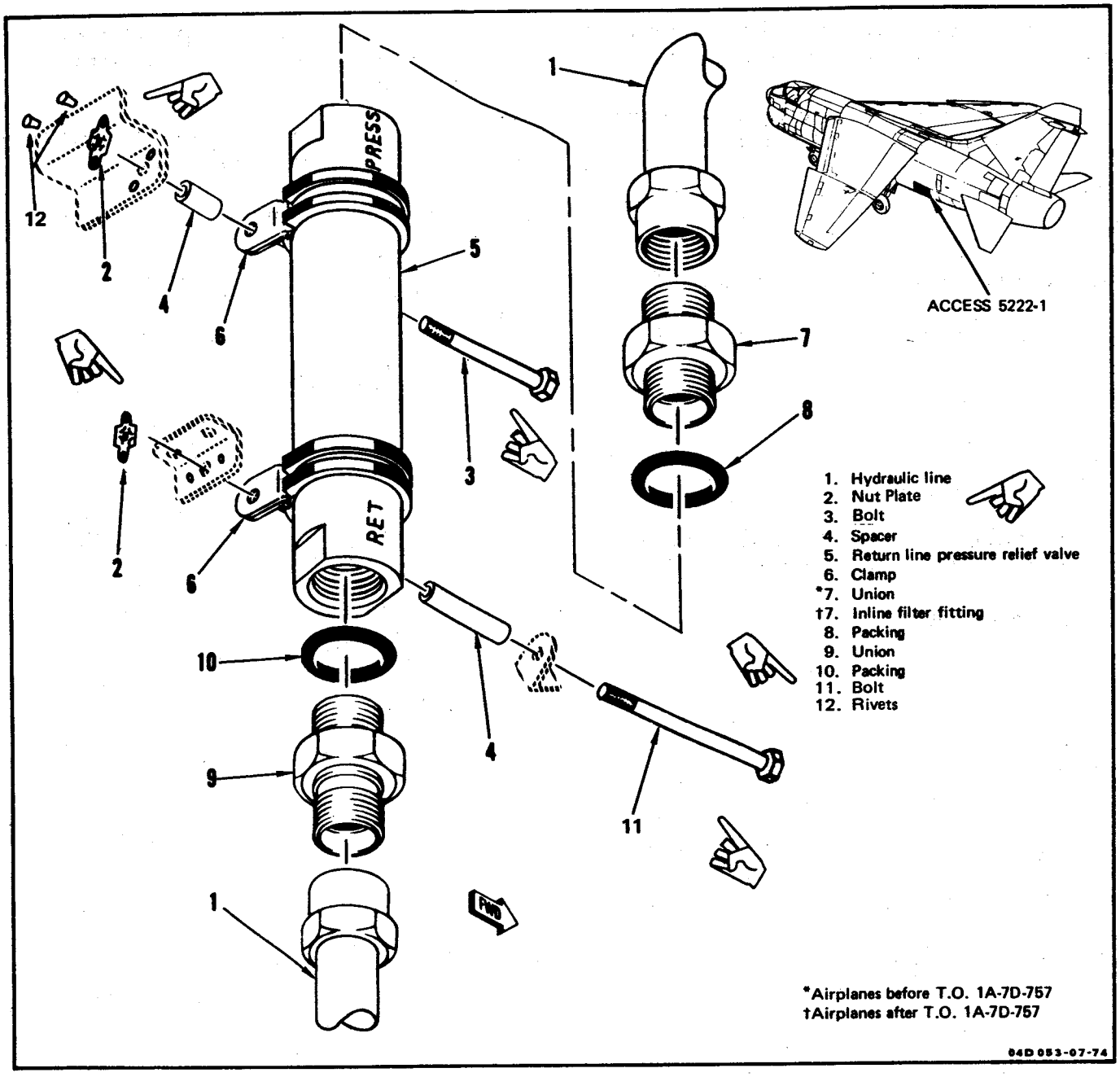


Figure 3-3. Return Line Pressure Relief Valve Removal and Installation

3-28. RESERVOIR REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect external hydraulic power to airplane
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten jamnut on indicator rod

3-29. REMOVAL. (See figure 3-4.)

a. Open access 5122-6.

b. Drain reservoir (T.O. 1A-7D-2-1). Leave test stand connected.

c. Remove lockwire, loosen jamnut (1), and disconnect indicator rod (2) from swivel bolt. Move rod aft and remove washer (3).

d. Disconnect hydraulic lines (4) from reservoir fittings. Cap or plug open lines and fittings as applicable.

e. Remove nuts (5) from clamps securing reservoir (6) to airframe and remove reservoir from airplane.

f. Loosen jamnut (7) and remove elbow (8) from reservoir.

g. Remove packing (9) and retainer (10) from elbow.

h. Remove unions (11) and packings (12) from reservoir.

i. Discard packings and retainer.

3-30. INSTALLATION. (See figure 3-4.)

a. Drain preservative fluid from reservoir.

b. Install new packings (12) on unions (11) and install unions on reservoir.

c. Install new retainer (10) and new packing (9) on elbow (8), and install elbow on reservoir. Do not tighten jamnut (7).

d. Position reservoir (6) in airframe, uncap and unplug fittings and lines, and connect hydraulic lines (4) to fittings. Leave pressure line losse.

e. Install nuts (5) on clamps to secure reservoir.

f. Tighten jamnut (7).

g. Install washer (3) and connect indicator rod (2) to swivel bolt. Tighten swivel bolt until rod end bottoms out.

h. Check reservoir indicator control assembly for proper installation as follows:

1. Measure and record distance (Dimension A) from end of reservoir to end of outer sleeve on the reservoir indicator control assembly.

2. Measure and record distance (Dimension B) from end of jamnut to end of threads on control assembly rod end.

3. Subtract Dimension B from Dimension A. If resulting value is 8.54 inches or greater, the installation is acceptable. If value is less than 8.54 inches, control assembly is improperly installed. Correct defective installation as required in accordance with installation procedure (paragraph 3-58).

i. Tighten jamnut (1) to 20 (±5) pound-inches torque and secure with MS20995C20 lockwire.

j. Rig hydraulic fluid quantity indicator (paragraph 3-59).

k. Service reservoir (T.O. 1A-7D-2-1).

WARNING

Serious injury can occur while high pressure testing. While testing, personnel will be protected by a shield or be a safe distance from the unit to prevent injury.

l. Connect external hydraulic power (T.O. 1A-7D-2-1) and apply 400 (±100) psig pressure.

m. Bleed pressure line until fluid is free of air. Tighten line.

n. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check connections for leaks.

o. Close access 5122-6.

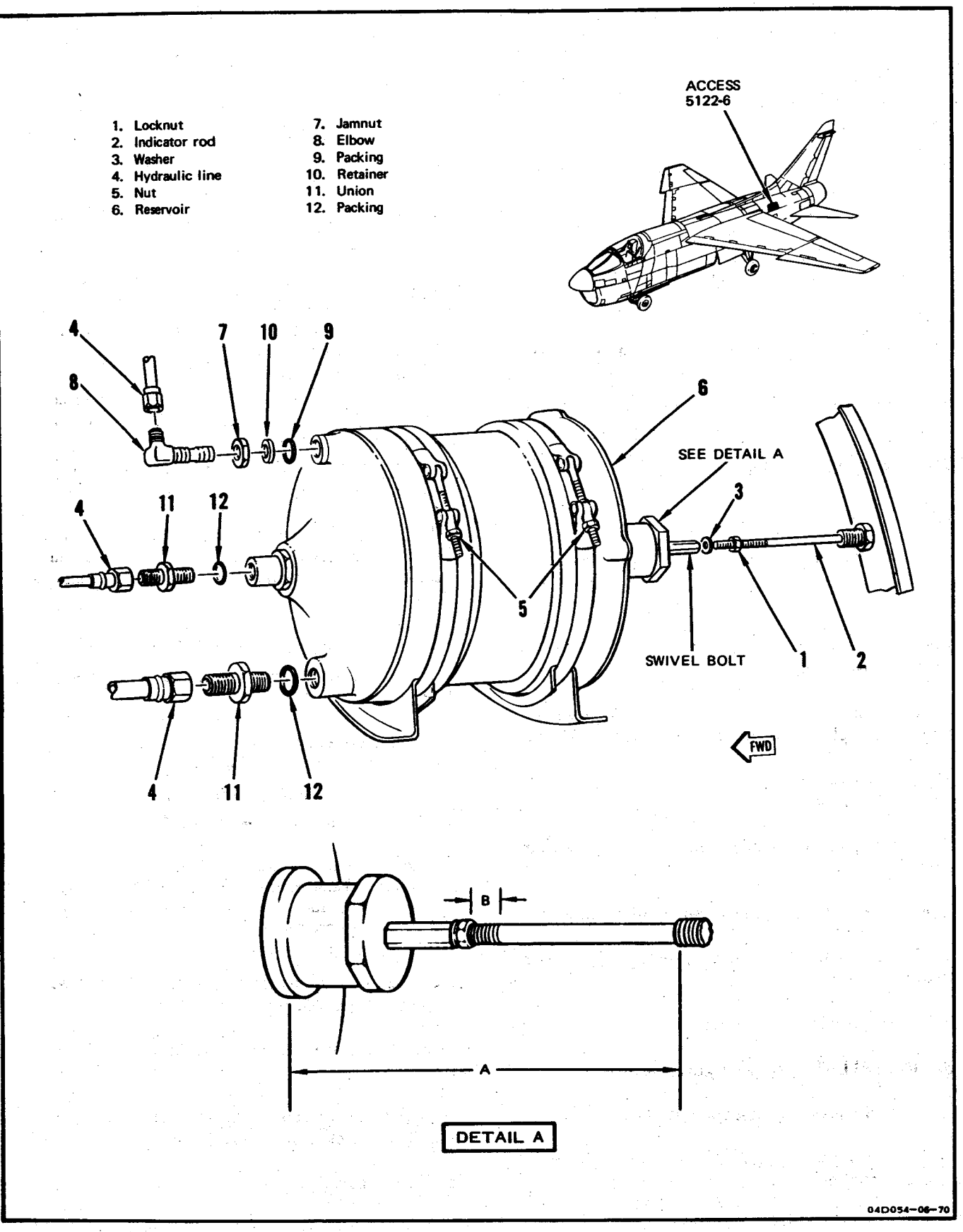


Figure 3-4. Reservoir Removal and Installation

3-31. PRESSURE LINE FILTER ELEMENT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	413-900-020	Torque wrench, 10 to 750 pound-inches	Tighten filter bowl

3-32. REMOVAL.

a. Open access 5222-1.

b. Dump hydraulic reservoir accumulator (T.O. 1A-7D-2-1).

c. Cut lockwire and unscrew filter bowl.

WARNING

Fluid in filter will be hot if system has been in operation.

NOTE

Diaphragm in filter head prevents fluid leakage from system after filter bowl is removed.

d. Remove filter element from filter bowl.

e. Clean filter bowl.

3-33. INSTALLATION.

NOTE

For list of approved filter elements, refer to appendix A.

a. Carefully check filter bowl for evidence of internal scoring, especially at bottom of bowl where scoring is most likely to occur. Repair any scored area by blending with crocus cloth.

NOTE

Some filter elements provide a Belleville washer on bottom of element which preloads the element when element and bowl are installed.

b. On elements containing a Belleville washer, check that radius on outside diameter of washer exceeds 0.01 inch. If radius is less than 0.01 inch or sharp edges are apparent, replace element.

c. Insert element in bowl and check that element completely bottoms out without any evidence of binding. If binding is encountered when inserting element, replace element.

d. If element contains a Belleville washer, ensure washer rotates freely on element.

e. Immerse element in clean MIL-H-83282 hydraulic fluid for several minutes, and install filter element in filter bowl.

NOTE

Ensure filter bowl is filled to capacity to minimize air inclusion into the system.

f. Fill bowl completely with clean MIL-H-83282 hydraulic fluid.

g. Insert bowl in filter head and tighten bowl to 162 (±18) pound-inches torque.

h. If required, press filter head indicator button to reset.

i. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check filter for leaks and indicator button for extension.

j. Secure filter bowl to filter head with MS20995C32 lockwire.

k. Close access 5222-1.

3-34. PRESSURE LINE FILTER REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect external hydraulic power

3-35. REMOVAL. (See figure 3-5.)

a. Dump PC No. 3 reservoir accumulator (T.O. 1A-7D-2-1).

b. Open access 5222-1.

c. Remove clamp (1) and disconnect line (2) from filter.

CAUTION

To prevent damage to brazed fitting, ensure that fitting jamnut is loosened before removal of fitting is attempted.

d. Loosen jamnut (3) and disconnect hydraulic line (4) from filter.

e. Remove bolts (6) and washers (7) securing pressure line filter (8) to airframe. Remove filter from airplane. Cap lines and filter openings.

f. Remove and discard packing (5).

g. Remove union (9) from filter, and remove and discard packing (10).

3-36. INSTALLATION. (See figure 3-5.)

a. Drain preservative fluid and fill filter with hydraulic fluid.

b. Install new packing (10) on union (9) and install union in filter inlet port.

c. Position pressure line filter (8) in airplane. Move bracket into position. Secure with washers (7) and bolts (6).

d. Unplug filter port, uncap line (4), install new packing (5) on fitting, and connect fitting to filter. Do not tighten jamnut (3).

e. Uncap union, unplug hydraulic line (2), and connect to filter. Install clamp (1).

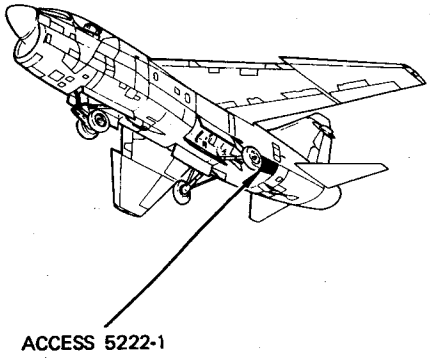
f. Connect external hydraulic power to PC No. 3 system (T.O. 1A-7D-2-1) and apply 400 (±100) psi pressure.

g. Loosen filter outlet fitting sufficiently to allow fluid to bleed from fitting. When bleed fluid becomes air-free, tighten fitting and jamnut (3).

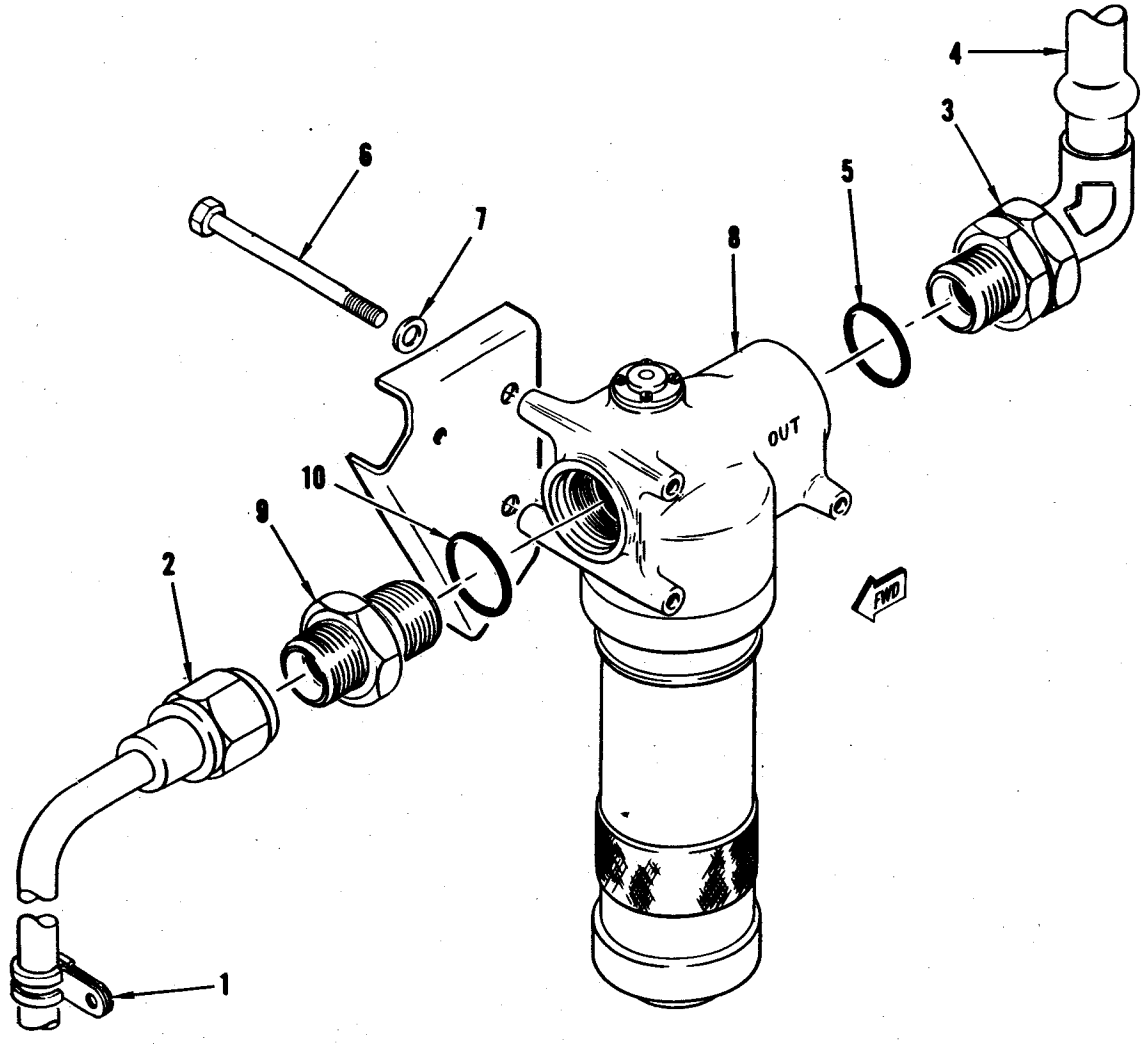
h. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check filter and connections for leaks.

i. Close access 5222-1.

1. Clamp
2. Inlet line
3. Brazed fitting jamnut
4. Outlet line
5. Packing
6. Bolt
7. Washer
8. Pressure line filter
9. Union
10. Packing



ACCESS 5222-1



04D056-05-75

Figure 3-5. Pressure Line Filter Removal and Installation

3-37. FILLER AND PUMP COOLING LINE FILTER ELEMENT REMOVAL AND INSTALLATION. (Refer to paragraph 1-62.)

3-38. FILLER AND PUMP COOLING LINE FILTER REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	E10385 (Stewart Avionics Inc., Brooklyn, New York)	Hydraulic filler cart	Bleed air from filter and lines

3-39. REMOVAL. (See figure 3-6.)

a. Dump PC No. 3 reservoir accumulator (T.O. 1A-7D-2-1).

b. Open access 5222-1.

c. Disconnect hydraulic line (1) from filter, cap elbow, and plug open line.

CAUTION

To prevent damage to brazed fitting, ensure that fitting jamnut is loosened before attempting removal of fitting.

d. Loosen jamnut (2) and disconnect hydraulic line (3) from filter. Cap fitting and plug open filter port.

e. Remove and discard packing (4).

f. Remove bolts (5) and washers (6) securing filter (7) to airframe. Remove filter from airplane.

g. Loosen jamnut (8) and remove elbow (9) from filter.

h. Remove packing (10) and retainer (11) from elbow, and discard packing and retainer.

3-40. INSTALLATION. (See figure 3-6.)

a. Drain preservative fluid and fill filter with hydraulic fluid.

b. Install jamnut (8), new retainer (11), and new packing (10) on elbow (9), and install elbow in filter inlet port. Do not tighten jamnut.

c. Position filter (7) in airplane, and secure with washers (6) and bolts (5).

d. Uncap line (3), install new packing (4) on fitting, unplug filter port, and connect fitting to filter. Do not tighten jamnut (2).

e. Uncap elbow, unplug hydraulic line (1), and connect to filter. Tighten jamnut (8).

f. Connect hydraulic filler cart to PC No. 3 system filler valve.

g. Loosen filter outlet fitting sufficiently to allow fluid to bleed from fitting. Operate hydraulic filler cart and allow fluid to flow until free of air. Tighten outlet fitting and jamnut (2).

h. Disconnect filler cart from airplane.

i. Perform hydraulic system air check (T.O. 1A-7D-2-1).

j. Close access 5222-1.

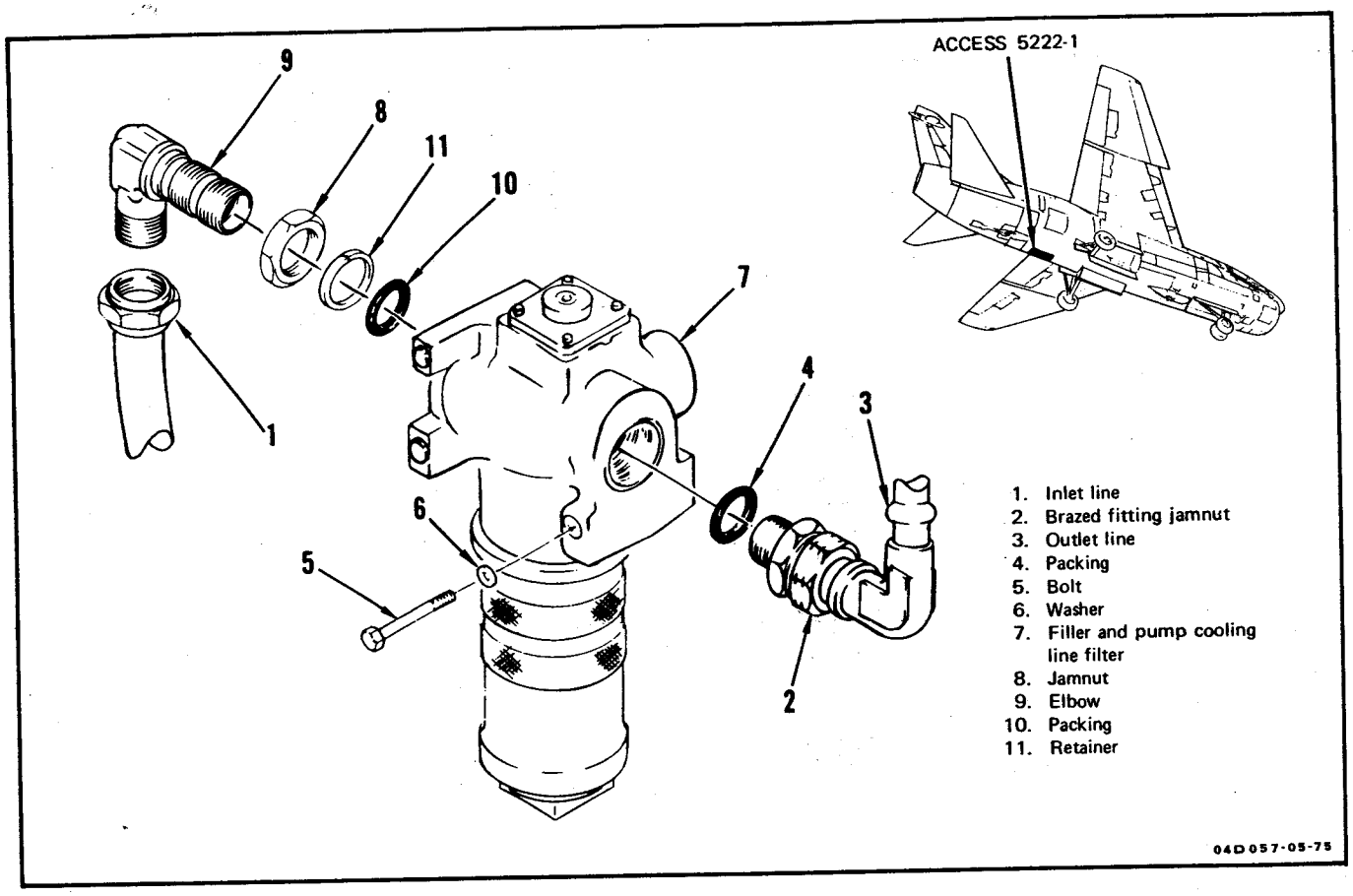


Figure 3-6. Filler and Pump Cooling Line Filter Removal and Installation

3-41. ACCUMULATOR REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect external hydraulic power

3-42. REMOVAL. (See figure 3-7.)

NOTE

These procedures are applicable to both PC No. 3 accumulators.

a. Dump PC No. 3 reservoir accumulator (T.O. 1A-7D-2-1).

b. Reduce accumulator pneumatic pressure to zero (T.O. 1A-7D-2-1).

c. Open access 5222-1.

d. Disconnect pneumatic line (1) from accumulator. Cap reducer and plug line.

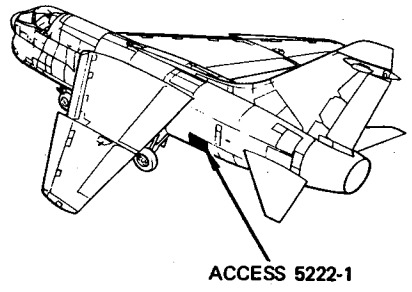
CAUTION

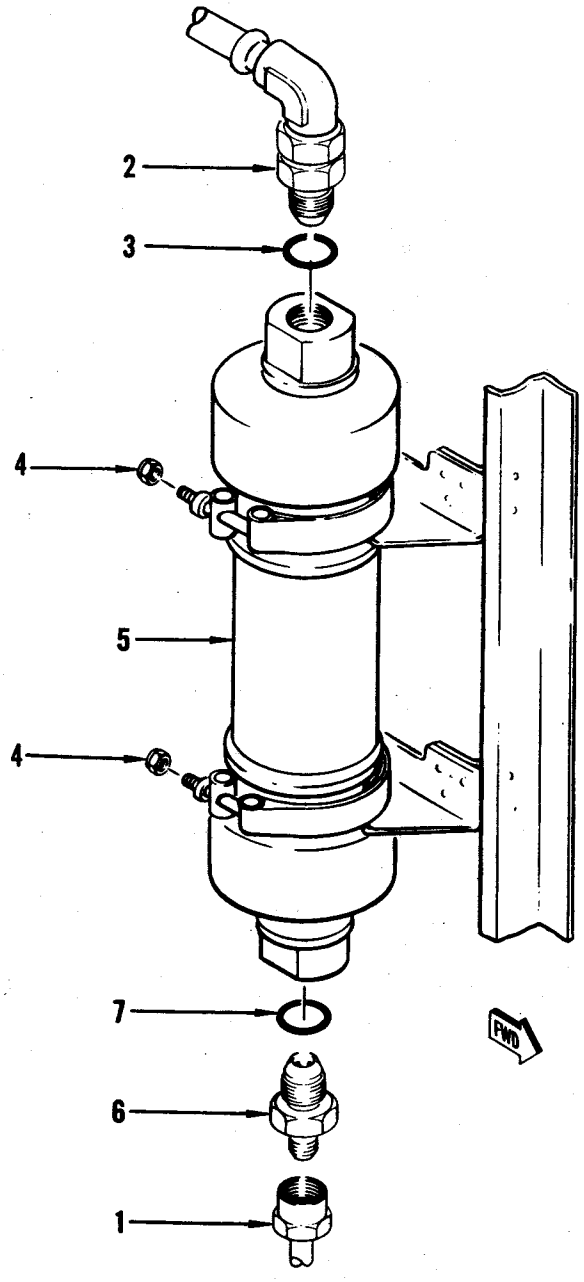
To prevent damage to brazed fitting, ensure that fitting jamnut is loosened before removal of fitting is attempted.

e. Disconnect brazed fitting (2) from accumulator, and remove and discard packing (3). Cap fitting and plug accumulator port.

f. Remove nuts (4) securing accumulator (5) to mounting bracket and remove accumulator from airplane.

g. Remove reducer (6) from accumulator, and remove and discard packing (7).





1. Pneumatic line
2. Brazed fitting
3. Packing
4. Nut
5. Accumulator
6. Reducer
7. Packing

04D058-02-70

Figure 3-7. Accumulator Removal and Installation

3-43. INSTALLATION. (See figure 3-7.)

a. Drain preservative fluid and fill hydraulic side of accumulator with hydraulic fluid.

b. Install new packing (7) on reducer (6) and install reducer in pneumatic port of accumulator (5).

c. Position accumulator (5) in mounting bracket and secure with nuts (4).

d. Uncap reducer, unplug pneumatic line (1), and connect to accumulator.

e. Uncap brazed fitting (2), install new packing (3) on fitting, unplug accumulator, and install fitting in accumulator. Do not tighten fitting.

f. Service accumulator pneumatically (T.O. 1A-7D-2-1).

WARNING

Serious injury can occur while high pressure testing. While testing, personnel will be protected by a shield or be a safe distance from the unit to prevent injury.

g. Connect external hydraulic power to PC No. 3 system and apply 400 (±100) psi pressure (T.O. 1A-7D-2-1).

h. Allow fluid to flow from brazed fitting (2) until free of air. Tighten brazed fitting and jamnut.

i. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check connections for leaks.

j. Close access 5222-1.

3-44. SYSTEM PRESSURE RELIEF VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect external hydraulic power

3-45. REMOVAL. (See figure 3-8.)

a. Dump PC No. 3 reservoir accumulator (T.O. 1A-7D-2-1).

b. Open access 5222-1.

c. Disconnect hydraulic lines (1). Plug lines and cap open fittings.

d. Remove bolt (2), spacer (3), washer (4) securing system pressure relief valve (6) to mounting bracket. Remove valve from airplane.

e. Remove reducer (7) from relief valve pressure port, and remove and discard packing (8).

f. Remove union (9) from relief valve return port, and remove and discard packing (10).

g. Remove clamp (11) from relief valve.

3-46. INSTALLATION. (See figure 3-8.)

a. Position clamp (11) on relief valve.

b. Install new packing (10) on union (9), and install union in return port of relief valve.

c. Install new packing (8) on reducer (7), and install reducer in pressure port of relief valve.

d. Position relief valve (6) in airplane and secure with bolt (2), spacer (3) and washer (4).

e. Uncap fittings, unplug hydraulic lines (1), and connect to relief valve.

f. Service system reservoir (T.O. 1A-7D-2-1).

WARNING

Serious injury can occur while high pressure testing. While testing, personnel will be protected by a shield or be a safe distance from the unit to prevent injury.

g. Connect external hydraulic power to PC No. 3 system and apply 400 (±100) psi pressure (T.O. 1A-7D-2-1).

h. Loosen hydraulic line at relief valve pressure port and allow fluid to flow until free of air. Tighten line fitting.

i. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check valve and connections for leaks.

j. Close access 5222-1.

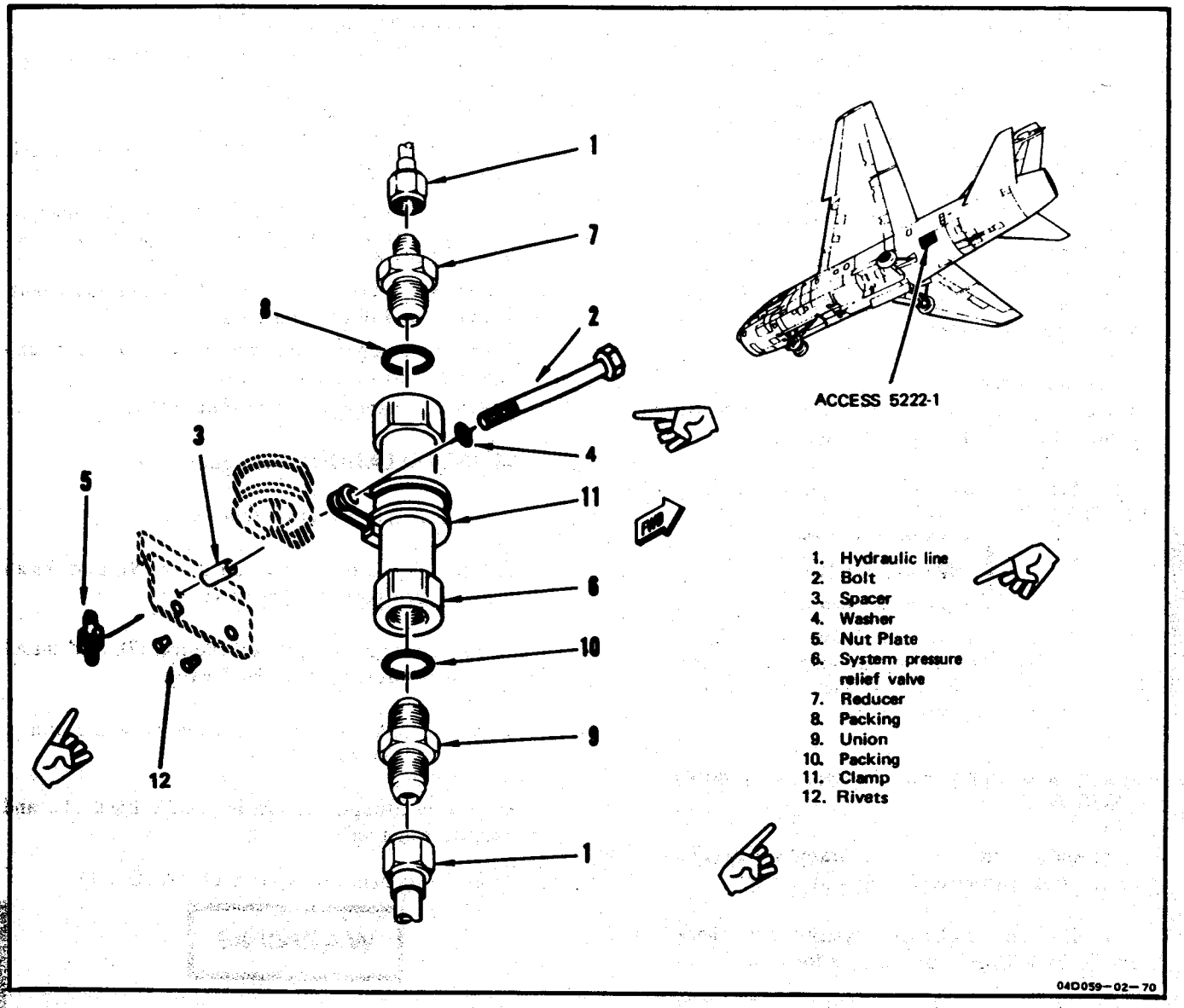


Figure 3-8. System Pressure Relief Valve Removal and Installation

3-47. ACCUMULATOR DUMP VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect external hydraulic power
		Equipment required for connecting external electrical power	Connect external electrical power

3-48. REMOVAL. (See figure 3-9.)

WARNING

Failure to depressurize accumulator before loosening hydraulic lines may cause serious injury to personnel.

a. Dump PC No. 3 reservoir accumulator (T.O. 1A-7D-2-1).

b. Open access 5222-1.

c. Disconnect electrical connector (1) from valve.

d. Disconnect hydraulic lines (2) from valve. Plug lines and cap open fittings.

e. Remove washers (4), clamps (5), and bolts (6) securing accumulator dump valve (7) to mounting brackets. Remove valve from airplane.

f. Remove union (8) from valve, remove packing (9) from union, and discard packing.

g. Remove reducer (10) from valve, remove packing (11) from reducer, and discard packing.

3-49. INSTALLATION. (See figure 3-9.)

a. Install new packing (11) on reducer (10) and install reducer in cylinder port of valve.

b. Install new packing (9) on union (8) and install union in pressure port of valve.

c. Position accumulator dump valve (7) in airplane mounting bracket and secure with bolts (6), clamps (5) and washers (4).

d. Uncap hydraulic fittings, unplug hydraulic lines (2), and connect to valve.

e. Connect electrical connector (1) to valve.

WARNING

Voltage used can cause arcing which may result in severe burns. Remove watches, rings and other jewelry that can cause a shock/burn hazard.

f. Connect external hydraulic and external electrical power to airplane (T.O. 1A-7D-2-1). Do not apply hydraulic pressure.

g. Check for proper precharge of reservoir accumulator (T.O. 1A-7D-2-1).

WARNING

Serious injury can occur while high pressure testing. While testing, personnel will be protected by a shield or be a safe distance from the unit to prevent injury.

h. With test stand set for open system operation, apply 3,000 psig. Allow accumulator pressure to stabilize, slowly reduce system pressure to zero, and check accumulator pressure gage for normal indication (T.O. 1A-7D-2-1).

i. Place emergency accumulator test switch in DUMP. Check reservoir accumulator pressure for rapid decrease.

j. Release switch. Hydraulically charge and dump reservoir accumulator five times to purge air from valve.

k. Disconnect external electrical and hydraulic power from airplane (T.O. 1A-7D-2-1).

l. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check valve installation for leaks.

m. Close access 5222-1.

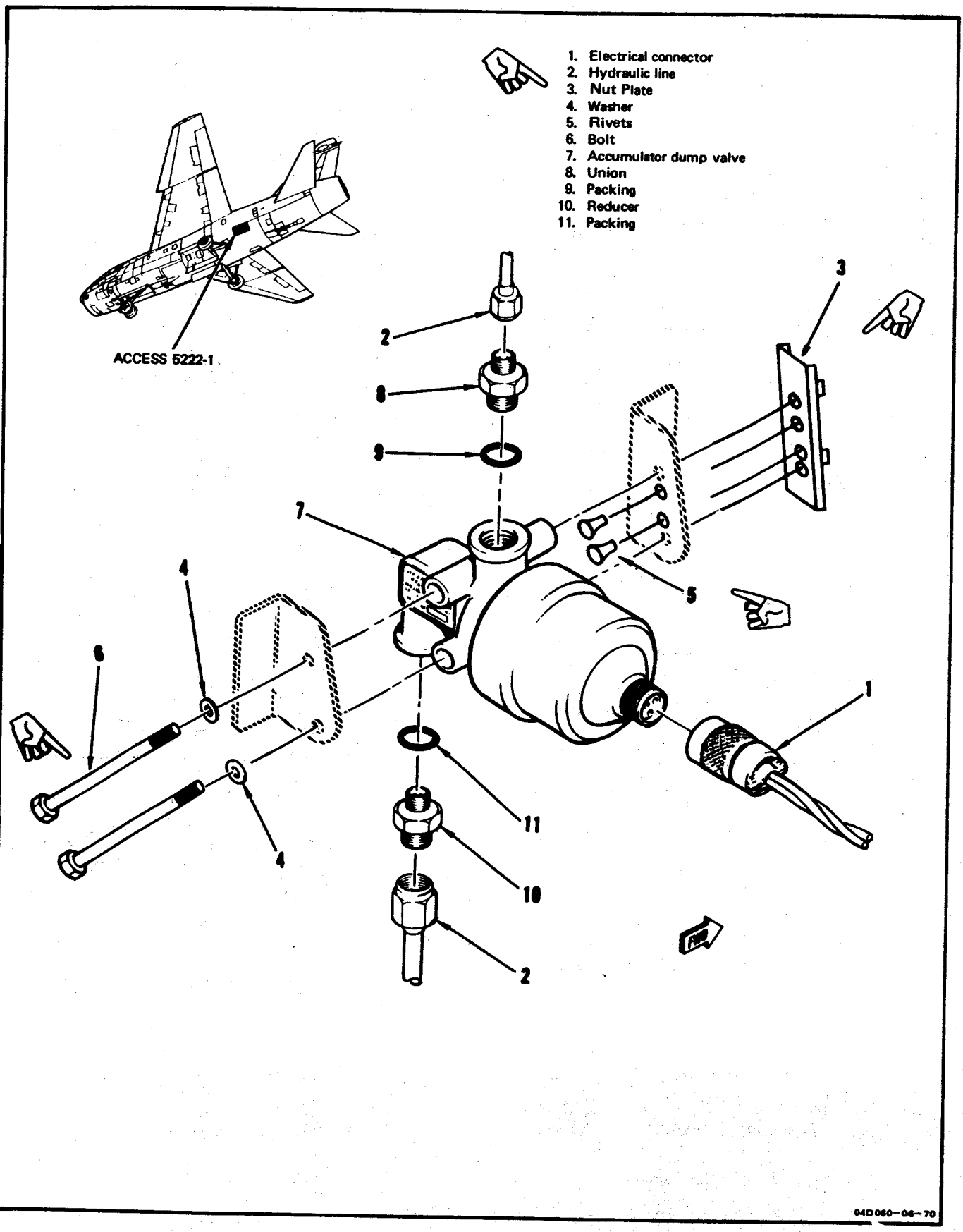


Figure 3-9. Accumulator Dump Valve Removal and Installation

3-50. PRESSURE AND RETURN GROUND TEST DISCONNECTS REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect external hydraulic power
	413-900-020	Torque wrench, 10 to 750 pound-inches	Tighten coupling halves

3-51. REMOVAL. (See figure 3-10.)

WARNING

To prevent serious injury to personnel, check that system hydraulic pressure is zero before removing disconnects.

NOTE

The following procedure is applicable to either pressure or return disconnect.

a. Open access 5222-1.

b. Dump PC No. 3 reservoir accumulator (T.O. 1A-7D-2-1).

c. Drain PC No. 3 hydraulic reservoir (T.O. 1A-7D-2-1).

d. Remove dust cover (1) from disconnect coupling half.

e. Remove screws (2) and washers (3) joining retainer assembly (4).

f. Remove screws (5), washers (6), and nuts (7) securing coupling halves to retainer assembly as required.

g. Remove applicable disconnect coupling half (8) from tee (9), remove packing (10) from coupling half, discard packing, and plug tee.

3-52. INSTALLATION. (See figure 3-10.)

a. Install new packing (10) on disconnect coupling half (8).

b. Remove plug from tee (9) and install coupling half (8) in tee. Tighten pressure line coupling half to 400 (±100) pound-inches torque. Tighten return line coupling half to 600 (±120) pound-inches torque.

c. Install nuts (7), washers (6), and screws (5) securing coupling halves to retainer assembly (4). Do not tighten.

d. Install washers (3) and screws (2) joining retainer halves. Tighten nuts securing coupling halves to retainer assembly.

e. Service reservoir (T.O. 1A-7D-2-1).

f. If pressure ground test disconnect was removed, perform the following:

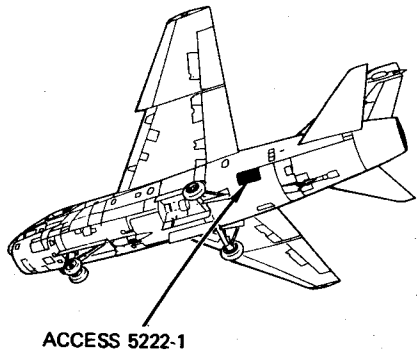
1. Connect hydraulic power to PC No. 3 system (T.O. 1A-7D-2-1) with test stand set for open system operation. Allow fluid to flow for 5 minutes. Do not cycle any components.

2. Reduce pressure to 400 (±100) psi. Loosen line connected to pressure port of reservoir. Allow fluid to flow until free of air. Tighten line.

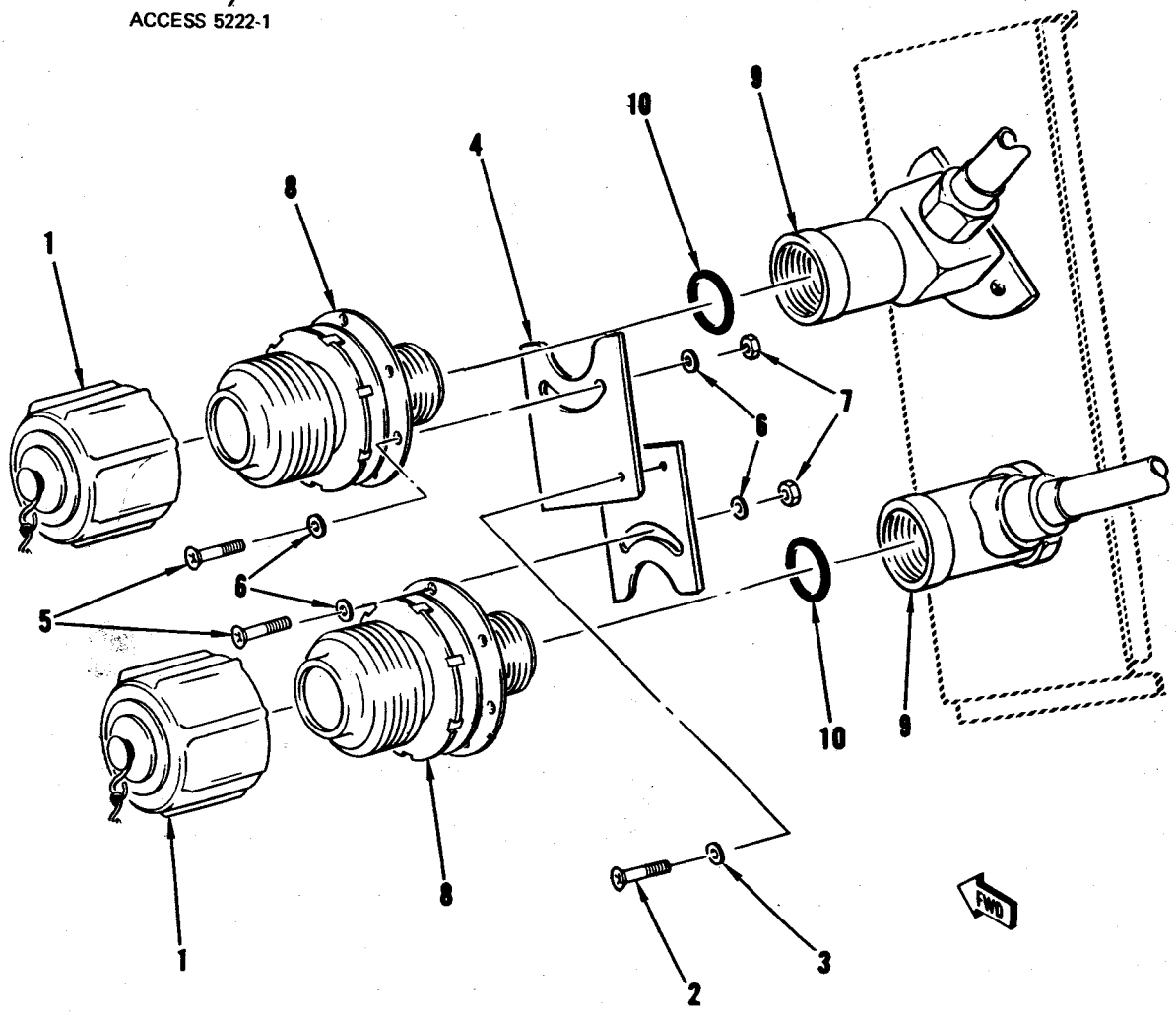
g. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check installation for leaks.

h. Install dust covers (1).

i. Close access 5222-1.



1. Dust cover
2. Screw (2)
3. Washer (2)
4. Retainer assembly
5. Screw
6. Washer
7. Nut
8. Disconnect coupling half
9. Tee
10. Packing



04D061-02-70

Figure 3-10. Pressure and Return Ground Test Disconnects Removal and Installation

3-53. HYDRAULIC PUMP REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	E10385 (Stewart Avionics Inc., Brooklyn, New York)	Hydraulic filler cart	Fill hydraulic pump with hydraulic fluid
	GGG-W-686	Torque wrench, 0 to 250 pound-feet	Tighten coupling halves
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten clamp nut

3-54. REMOVAL. (See figure 3-11.)

a. Open access 5223-1.

CAUTION

Teflon-lined flexible hoses tend to conform to the shape of installed positions. Be careful when handling these hoses to prevent bending or straightening which could result in kinking and subsequent hose failure. Refer to T.O. 42E1-1-1 for additional hose information.

b. Disconnect flexible hoses (1) at pump disconnects. Install dust caps and dust plugs on each coupling half as applicable.

c. Remove lockwire and loosen nut (2) on clamp (3) securing pump (4) to adapter. Support pump, remove clamp, and then remove pump from engine.

d. Remove packing (5) from pump housing, remove packing (6) from drive shaft, and discard packings.

e. Remove cooling line (7), loosen nut (8), and remove elbow (9), and packing (10). Discard packing, plug cooling line and port, and cap elbow.

f. Remove nut (11) and coupling half (12). Cap coupling half.

g. Remove coupling half (13), packing (14), coupling half (15), and packing (16). Discard packings and cap coupling halves.

3-55. INSTALLATION. (See figure 3-11.)

CAUTION

If pump replacement was due to evidence of overheating and/or pump failure, the pump cooling line check valve shall be removed, visually inspected, checked for proper operation, and correctly installed. A reversed check valve may pass system checkout, but will cause overheating and possible pump failure.

If the pump is discolored due to overheating or pump is operated dry for 30 minutes, the pump, hoses, disconnects, and filter elements shall be replaced.

If pump failed, check pressure line and filler and pump cooling line filters for indicator button extension and check filter elements for metal chips.

NOTE

To prevent hydraulic system contamination, do not remove protective caps from couplings and plugs from lines and ports until immediately before connecting.

a. Remove elements from pressure line and filler and pump cooling line filters (paragraphs 3-31 and 3-37), and perform the following:

1. Check differential pressure indicator buttons for extension.

2. If neither indicator button is extended or only the pressure line indicator buttons is extended, install new filter elements. System flushing is not required.

3. If the cooling line filter indicator button is extended, install new filter elements and flush system according to paragraph 1-28.

a-1. Uncap end of coupling half (15) that screws into pump pressure port. Lubricate threads of

coupling half with MIL-H-83282 or MIL-H-46170 fluid. Install new packing (16) on coupling half, and install coupling in pressure port. Tighten to 50 (±8) pound-feet torque.

b. Uncap end of coupling half (13) that screws into pump inlet port. Lubricate threads of coupling half with MIL-H-83282 or MIL-H-46170 fluid. Install new packing (14) on coupling half, and install coupling in inlet port. Tighten to 75 (±8) pound-feet torque.

c. Uncap end of coupling half (12) that connects to cooling line, insert coupling half into support bracket, and secure with nut (11). Do not tighten nut.

d. Uncap end of elbow (9) that screws into case drain port, install new packing (10) and nut (8) on elbow, and install elbow in case drain port. Do not tighten nut.

e. Unplug and connect cooling line (7) to elbow (9) and coupling half (12). Tighten nuts (8 and 11).

f. Uncap and connect hydraulic filler cart to pump inlet coupling half.

g. Open pressure coupling half and manually rotate pump splined shaft. Operate filler cart until fluid flowing from pressure coupling half is free of air. Close pressure coupling half.

h. Open cooling line coupling half and manually rotate pump splined shaft. Operate hydraulic filler cart until fluid flowing from coupling half is free of air. Close coupling half and disconnect filler cart.

WARNING

P-D-680, Type II, is combustible and moderately toxic to eyes, skin and respiratory tract. Eye and skin protection required. Good general ventilation is normally adequate.

CAUTION

To prevent excessive gearbox spline wear and subsequent equipment failure, gearbox and pump mating splines must be thoroughly cleaned and properly lubricated.

i. Clean splines of gearbox drive and pump with P-D-680, Type II, drycleaning solvent.

CAUTION

To prevent failure or loosening of the hydraulic pump drive shaft retaining screw which could cause damage to the gearbox, visually inspect the hydraulic pump drive shaft for proper installation or the hydraulic pump drive shaft retaining screw.

j. Install new packings (5 and 6). Apply thin coat of MIL-G-81322 grease to pump shaft splines and pump drive splines.

CAUTION

To prevent pump failure, check that index pin on pump mounting adapter aligns and mates with index hole in pump mounting flange.

k. Position pump (4) to pump mounting adapter and secure with clamp (3) and nut (2). Tighten nut to 60 (+6, −5) pound-inches torque.

l. Using a soft punch and soft hammer or mallet, tap clamp (3) opposite nut (2) and then around periphery of clamp. Tighten nut to 60 (+6, −5) pound-inches torque. Continue tapping and tightening operation until nut torque value stabilizes. Secure clamp with MS20995C41 lockwire (figure 1-10A).

m. Connect flexible hoses (1) to pump disconnects.

n. Perform operational checkout (paragraph 3-15).

o. Check pump installation for evidence of leakage.

p. Close access 5223-1.

3-56. RESERVOIR INDICATOR CONTROL ASSEMBLY REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten jamnut on indicator rod

3-57. REMOVAL. (See figure 3-12.)

a. Remove engine (T.O. 1A-7D-2-5).

b. Open accesses 5122-6 and 5222-4.

c. Drain PC No. 3 reservoir (T.O. 1A-7D-2-1).

d. Remove lockwire securing jamnut (1) to swivel bolt (2), loosen jamnut and unscrew swivel bolt from indicator control assembly, and remove jamnut and washer (3).

e. Remove lockwire from jamnut (4), and remove jamnut and washer (5).

f. Remove nut (6) from screw (7) and clamp (8) from indicator control assembly. Do not remove screw and spacer (9).

g. Remove lockwire from jamnut (10); remove jamnut and washer (11).

h. Push control assembly vertically through indicator, remove washer (12), remove lockwire from jamnut (13), and remove jamnut.

i. Remove lockwire from jamnut (14); remove jamnut and washer (15).

j. Remove lockwire from jamnut (16); remove jamnut and washer (17).

k. Remove lockwire from jamnut (18); remove jamnut and washer (19).

l. Remove indicator control assembly (20) from airplane.

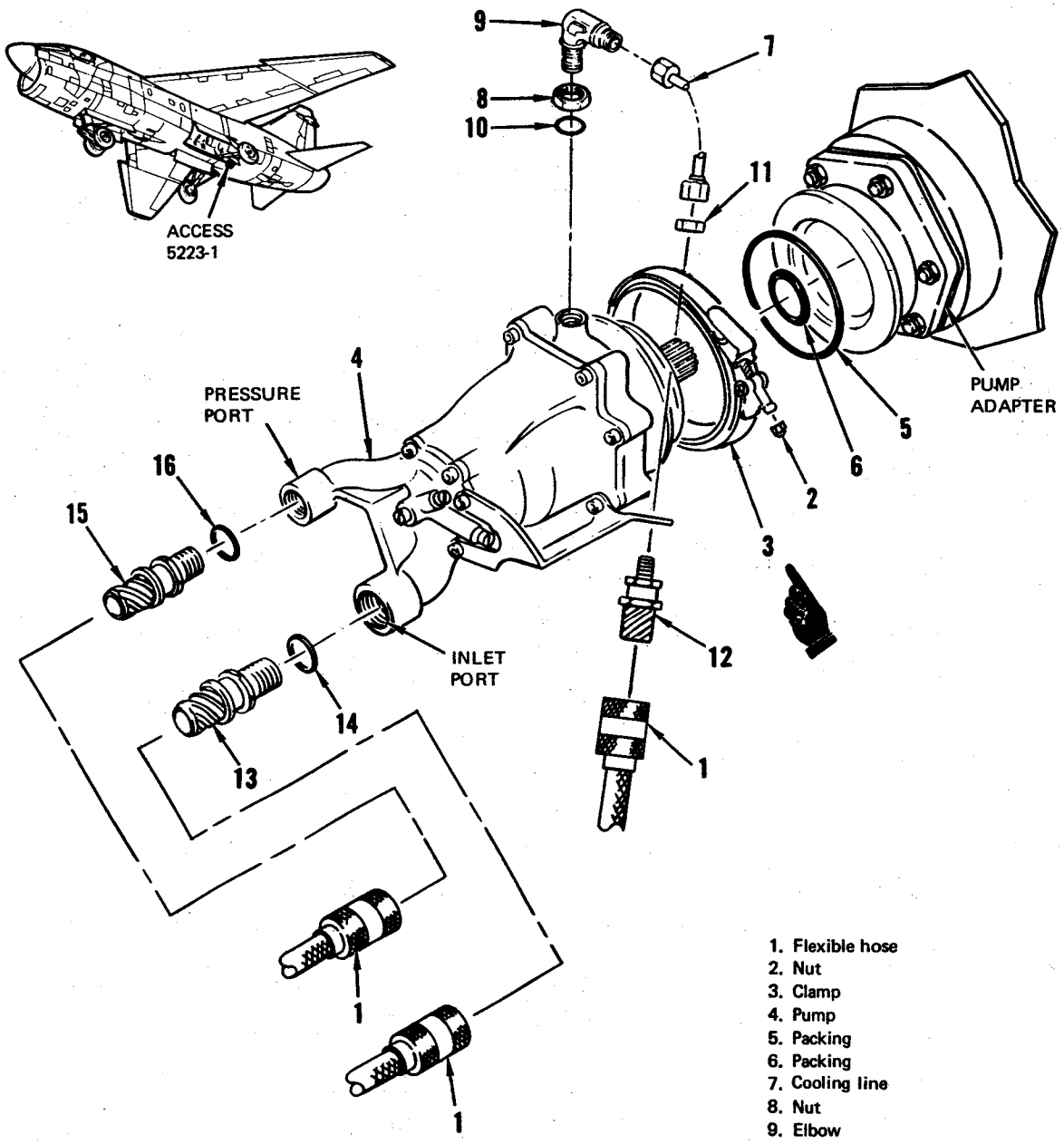


Figure 3-11. Hydraulic Pump Removal and Installation

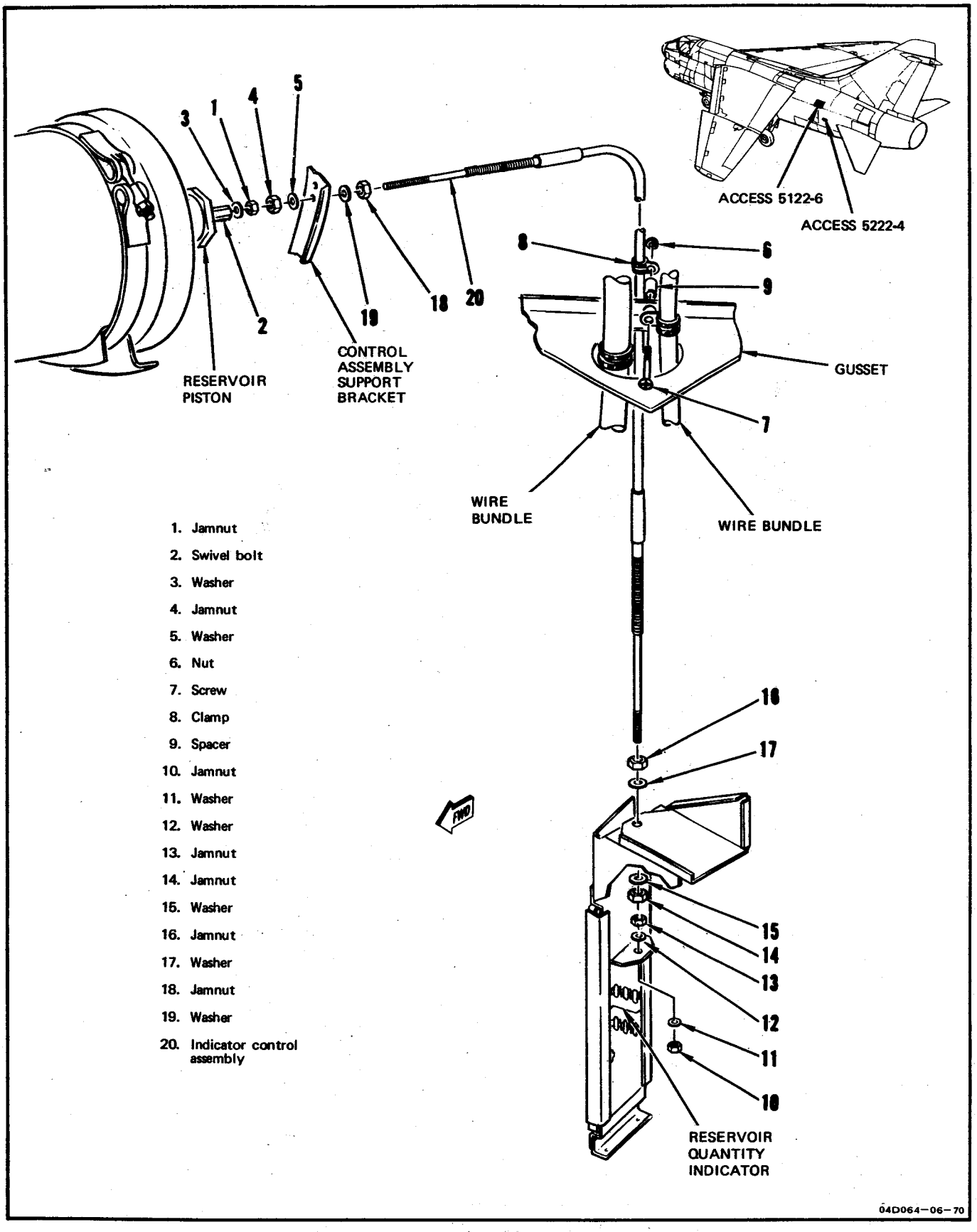


Figure 3-12. Reservoir Indicator Control Assembly Removal and Installation

3-58. INSTALLATION. (See figure 3-12.)

CAUTION

To prevent damage to indicator control assembly, minimum bend radius shall not be less than 3 inches.

a. Install jamnuts (16 and 18) and washers (17 and 19) on indicator control assembly (20), and position control assembly in airplane.

b. Install washer (15), jamnuts (14 and 13), and washer (12) on indicator control assembly. Do not tighten jamnuts.

c. Attach indicator slide to indicator control assembly using washer (11) and jamnut (10). Do not tighten jamnut.

d. Install washer (5), jamnuts (4 and 1), and washer (3). Do not tighten jamnuts.

e. Install end of indicator control rod into swivel bolt (2). Tighten swivel bolt until rod end bottoms out.

f. Tighten jamnut (1) to 23 (+2, −3) pound-inches torque and secure with MS20995C20 lockwire.

g. Slide outer sleeve of indicator control assembly away from reservoir until it bottoms out on its internal stops; then, advance sleeve off stops approximately 1/2 inch.

h. Tighten jamnuts (4 and 18) to 140 (±10) pound-inches torque and secure with MS20995C32 lockwire.

i. Ensure that screw (7) and spacer (9) are properly installed.

j. Ensure that minimum bend radius is not less than 3 inches, install clamp (8) on indicator control assembly, and secure with screw (7) and nut (6).

k. Adjust indicator control assembly by vertically screwing jamnuts (14 and 16) to obtain full travel of reservoir quantity indicator slide. Tighten jamnuts (10 and 13) to 23 (+2, −3) pound-inches torque and secure with MS20995C32 lockwire.

l. Tighten jamnuts (14 and 16) to 140 (±10) pound-inches torque and secure with MS20995C32 lockwire.

m. Rig reservoir indicator (paragraph 3-59).

n. Install engine (T.O. 1A-7D-2-5).

o. Close accesses 5122-6 and 5222-4.

3-59. RESERVOIR INDICATOR RIGGING. (See figure 3-13.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten jamnut on indicator rod

a. Open accesses 5122-6 and 5222-4.

b. Drain PC No. 3 reservoir (T.O. 1A-7D-2-1).

c. Fully retract reservoir piston. Full piston stroke is approximately 5.07 inches.

d. Remove lockwire from jamnuts on indicator push-pull control assembly.

CAUTION

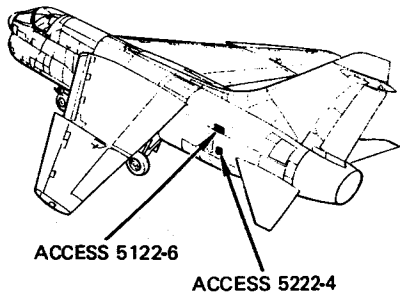
For proper adjustment of indicator, the piston must remain bottomed in the reservoir housing during rigging operation.

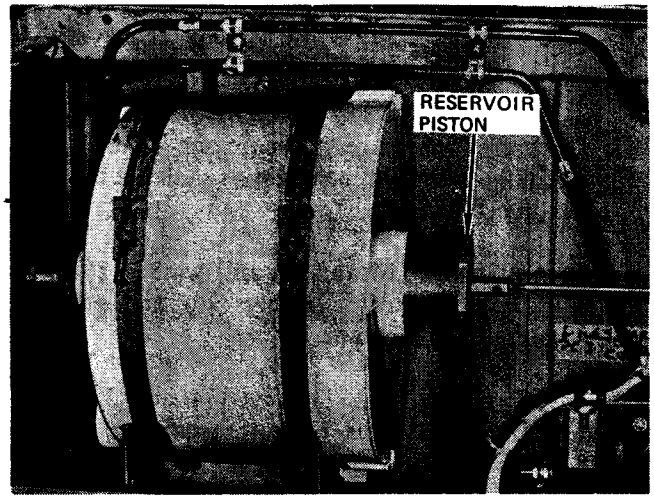
e. Adjust indicator slide by screwing jamnuts vertically on control assembly until black mark of rigging index window is aligned with black mark on indicator bracket.

f. Tighten jamnuts to 23 (+2, −3) pound-inches torque and secure with MS20995C20 lockwire.

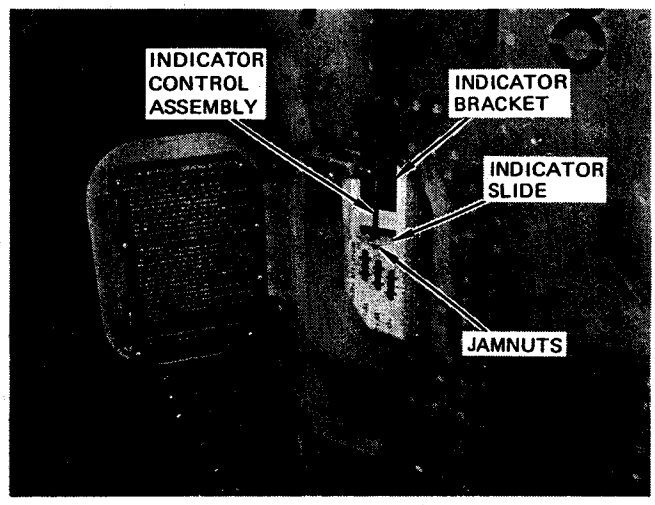
g. Service PC No. 3 hydraulic reservoir (T.O. 1A-7D-2-1).

h. Close accesses 5122-6 and 5222-4.





ACCESS 5122-6



ACCESS 5222-4

04D055-09-76

Figure 3-13. Reservoir Indicator Rigging

SECTION IV

EMERGENCY POWER CONTROL HYDRAULIC SUPPLY SYSTEM

4-1. DESCRIPTION.

4-2. On airplanes through AF69-6196, the emergency power control hydraulic supply system powers the automatic flight control system yaw actuator, aileron, spoiler, unit horizontal tail, rudder, and roll feel isolation actuators if PC No. 1 hydraulic pump fails in flight.

4-3. On airplanes AF69-6197 and subsequent, the emergency power control hydraulic supply system supplies power to the PC No. 3 system. If the PC No. 3 pump fails in flight, the emergency system may be used to power the automatic flight control yaw, roll feel isolation, rudder, left unit horizontal tail, left aileron, fuel boost pump, and left spoiler actuators. The emergency system basically consists of the emergency power package hydraulic pump, filter, and flow-sensitive regulator. See figure 4-1 for system arrangement.

4-4. Refer to T.O. 1A-7D-2-11 for information on the emergency power package system. Refer to Appendix A for general torquing information.

4-5. OPERATION. (See figure 4-2.)

4-6. The emergency hydraulic pump is a limited, variable displacement type piston pump which supplies hydraulic pressure to the applicable (PC No. 1 or PC No. 3) hydraulic supply system if the engine-driven pump fails in flight. The pump is basically a rotating cylinder barrel with nine pistons. The pistons are made to reciprocate by a limited, variable angle, inclined cam plate. Stroking of the pistons is accomplished as the piston shoes and cylinder barrel rotate around a nonrotating inclined surface.

4-7. The hydraulic pump can deliver a flow of 6.6 to 8.2 gpm through a pressure range of 300 to 3,000 psi. The flow is a function of turbine shaft speed and pressure at the pump outlet. At any given rpm, any increase in pressure at the pump outlet is sensed by the pump, which then decreases its piston stroke to decrease flow rate to the system.

4-8. Hydraulic pressure provided by the pump is primarily a function of airspeed. Maximum hydraulic pump output pressure is approximately 3,000 psi.

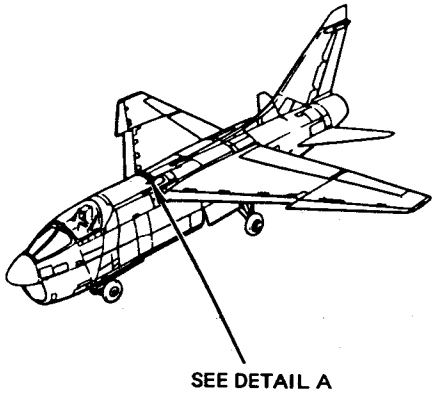
4-9. Emergency hydraulic fluid flows from the pump, through the filter to a flow-sensitive pressure regulator. The regulator establishes the pressure available as a function of flow (airspeed) and allows the flow required by the hydraulic system to pass through a check valve to the system pressure line. When the emergency power supply system is not in operation, the hydraulic lines are kept heated by return fluid from the applicable (PC No. 1 or PC No. 3) hydraulic supply system.

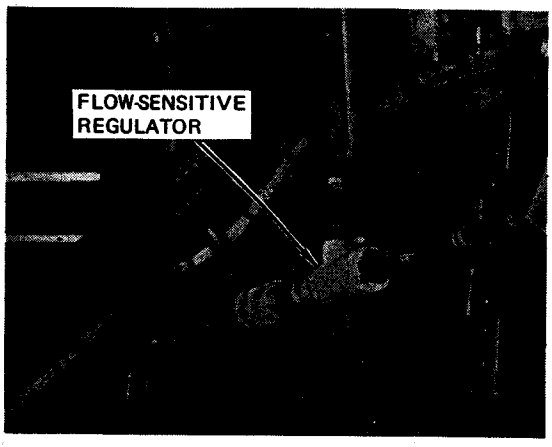
4-10. The flow-sensitive regulator performs the following functions in the system: It bypasses excess fluid flow to the return line, prevents the pump from stalling when no hydraulic flow is required, and reduces the hydraulic load on the turbine to a minimum during initial acceleration.

4-11. Hydraulic system pressure, with the emergency power package extended, is transmitted to the system hydraulic pressure indicator by the synchro transmitter. For additional information on the hydraulic indicating system, refer to Section V.

4-12. COMPONENTS.

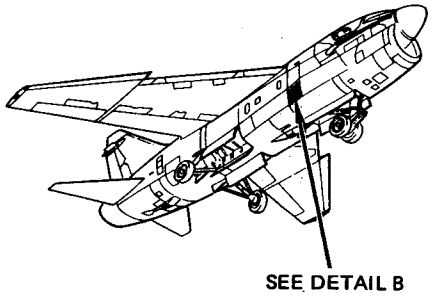
4-13. For a list of system components, their location (access), and function, refer to table 4-1.

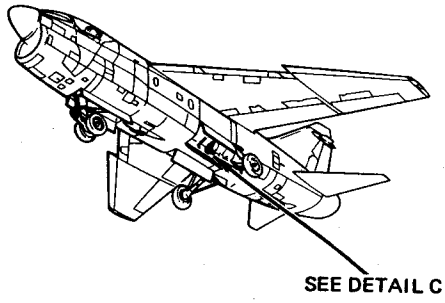


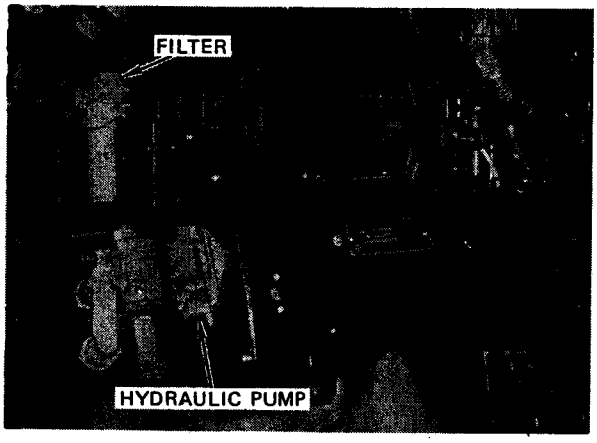


DETAIL A

(ACCESS 2121-9) Airplanes
AF69-6197 and subsequent

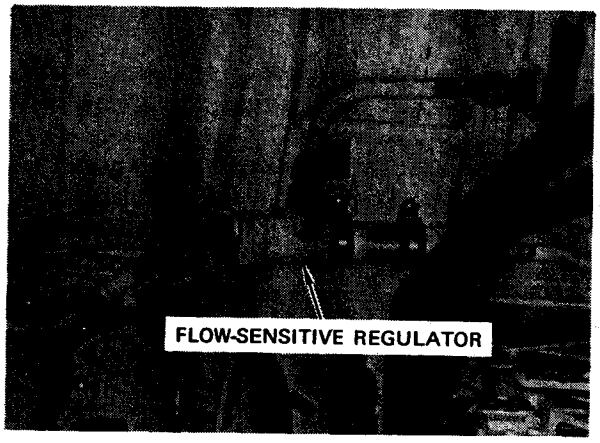






DETAIL B

(ACCESS 2222-5)



DETAIL C

(LEFT WHEEL WELL) Airplanes
through AF69-6196

04D047-12-71

Figure 4-1. Emergency Power Control Hydraulic Supply System Arrangement

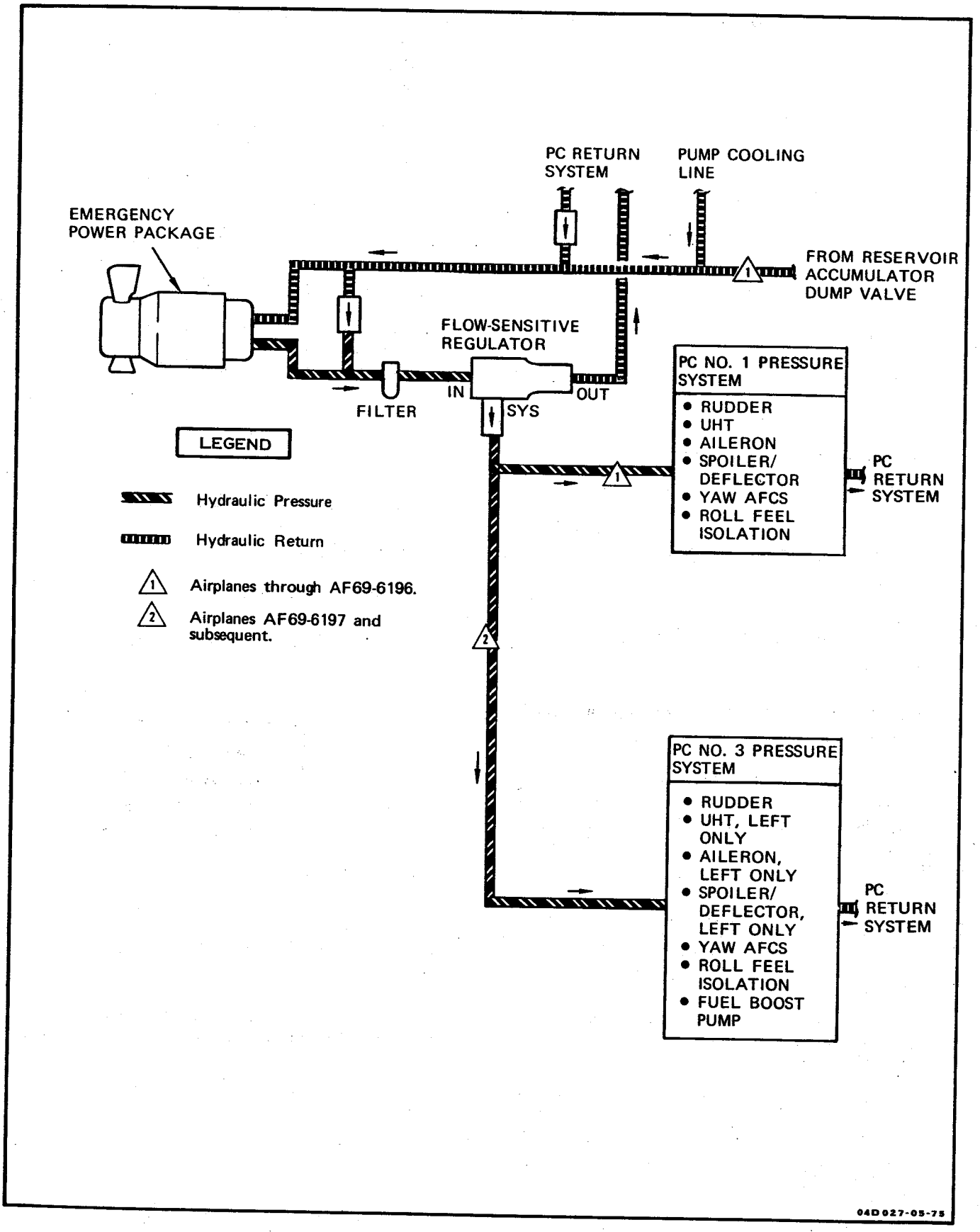


Figure 4-2. Emergency Power Control Hydraulic System Schematic Diagram

Table 4-1. Emergency Power Control Hydraulic Supply System Components

Component	Access	Function
Filter	2222-5	Prevents particles from flowing into the hydraulic power supply system.
Pump, hydraulic	2222-5	Supplies emergency hydraulic power to the hydraulic power supply system.
Regulator, flow-sensitive[1]	Left wheel well	Governs hydraulic fluid pressure from the hydraulic pump to PC No. 1 hydraulic supply system by regulating fluid flow.
Regulator, flow-sensitivity[2]	2121-9	Governs hydraulic fluid pressure from the hydraulic pump to PC No. 3 hydraulic supply system by regulating fluid flow.

[1]Airplanes through AF69-6196

[2]Airplanes AF69-6197 and subsequent

4-14. OPERATIONAL CHECKOUT. (Refer to T.O. 1A-7D-2-11.)

4-15. TROUBLESHOOTING. (Refer to T.O. 1A-7D-2-11.)

4-16. HYDRAULIC PUMP REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect hydraulic power
	E10385 (Stewart Avionics Inc., Brooklyn, N.Y.)	Hydraulic filler cart	Bleed pump
	215-00268-1	Safety lock	Lock emergency power package in extended position

4-17. REMOVAL.

a. Pull emergency power handle to extend EPP.

b. Dump hydraulic reservoir accumulator (T.O. 1A-7D-2-1).

WARNING

Ensure safety lock is installed while working in EPP access to prevent injury to personnel.

c. Install EPP safety lock.

d. Remove hydraulic lines between EPP hydraulic pump and swivel fittings. Install protective caps on swivel fittings.

e. Remove nuts and washers securing hydraulic pump to EPP generator assembly and remove pump.

f. Remove unions from hydraulic pump and remove gaskets from unions.

4-18. INSTALLATION.

CAUTION

If pump replacement is due to failure, check emergency power control hydraulic system filter element for metal chips and filter head for indicator button extension.

a. Install unions in hydraulic pump using new gaskets.

b. Secure hydraulic pump to EPP generator assembly with nuts and washers.

c. Remove protective caps from swivel fittings and install hydraulic lines. Do not tighten pressure line nut at swivel fitting.

d. Connect hydraulic filler cart to applicable reservoir filler valve. Operate cart and manually rotate emergency power package fan blades clockwise until air-free fluid flows from line. When fluid is free of air, tighten line nut.

e. If replacing failed pump, remove filter element from hydraulic system filter (paragraph 4-25). Check element for metal chips and filter indicator button for extension. If metal chips are present and indicator button is extended, flush system (paragraph 1-28). If metal chips are present and indicator button is not extended, install new filter element.

f. Perform emergency power package operational checkout (T.O. 1A-7D-2-11).

g. Perform hydraulic system air check (T.O. 1A-7D-2-1).

4-19. FLOW-SENSITIVE REGULATOR REMOVAL AND INSTALLATION (Airplanes Through AF69-6196).

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	E10385 (Stewart Avionics Inc., Brooklyn, New York)	Hydraulic filler cart	Provide fluid flow through EPP system

4-20. REMOVAL. (See figure 4-3.)

WARNING

To prevent injury to personnel, clear area around emergency power package access before extension. To prevent inadvertent retraction of emergency power package, install safety lock.

a. Extend emergency power package and install emergency power package safety lock.

b. Dump PC No. 1 reservoir accumulator hydraulic pressure (T.O. 1A-7D-2-1).

c. Disconnect and remove hydraulic line (1). Cap open ends of line and tee.

d. Disconnect and cap hydraulic lines (2).

e. Remove screw (4), spacer (5), and cushion clamps (6) from regulator and remove regulator (7).

f. Remove check valve (8) and packing (9) from SYS port.

g. Remove union (10) and packing (11) from RET port.

h. Loosen jamnut and remove elbow (12), packing (13), retainer (14), and jamnut (15) from regulator. Plug all open ports.

4-21. INSTALLATION. (See figure 4-3.)

a. Install jamnut (15), new retainer (14), and new packing (13) on elbow.

b. Remove plugs from hydraulic ports.

c. Install elbow (12) in INLET port. Do not tighten jamnut (15).

d. Using new packing (11), install union (10) in RET port.

e. Using new packing (9), install check valve (8) in SYS port.

f. Secure regulator (7) to airframe with cushion clamps (6), spacer (5), and screw (4).

g. Uncap and connect hydraulic lines (2) and tighten jamnut (15).

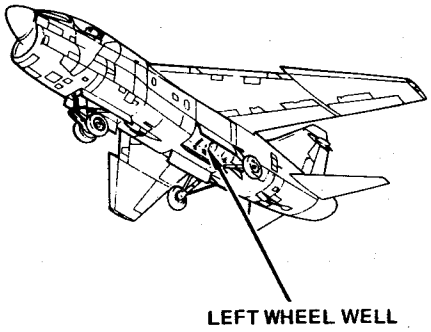
h. Install hydraulic line (1).

i. Connect hydraulic filler cart to PC No. 1 hydraulic filler valve (T.O. 1A-7D-2-1). Loosen tube nut at RET port.

j. Operate filler cart to bleed regulator. When only air-free fluid is flowing, tighten tube nut.

k. Perform hydraulic system air check (T.O. 1A-7D-2-1).

l. Perform emergency power package operational checkout (T.O. 1A-7D-2-11) and check for hydraulic leaks.



1. Hydraulic line
2. Hydraulic line
3. (Deleted)
4. Screw
5. Spacer
6. Clamp
7. Flow-sensitive regulator
8. Check valve
9. Packing
10. Union
11. Packing
12. Elbow
13. Packing
14. Retainer
15. Jamnut

Figure 4-3. Flow-Sensitive Regulator Removal and Installation (Airplanes Through AF69-6196)

4-22. FLOW-SENSITIVE REGULATOR REMOVAL AND INSTALLATION (Airplanes AF69-6197 and Subsequent).

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	E10385 (Stewart Avionics Inc., Brooklyn, New York)	Hydraulic filler cart	Provide fluid flow through EPP system

4-23. REMOVAL. (See figure 4-4.)

CAUTION

To prevent contamination and damage to system, cap or plug all connections when disconnected.

a. Open access 2121-9.

WARNING

To prevent injury to personnel, clear area around emergency power package access before extension. To prevent inadvertent retraction of emergency power package, install safety lock.

b. Extend emergency power package and install emergency power package safety lock.

c. Dump PC No. 3 reservoir accumulator hydraulic pressure (T.O. 1A-7D-2-1).

d. Disconnect and cap hydraulic lines (1).

e. Remove screws (2) securing regulator to airframe and remove flow-sensitive regulator (3) from airplane.

NOTE

Discard all packings upon removal.

f. Remove unions (4) and packings (5) from regulator.

g. Remove check valve (6) and packing (7) from regulator.

h. Remove clamps (8) from regulator.

4-24. INSTALLATION. (See figure 4-4.)

CAUTION

To prevent damage and contamination, do not uncap or unplug connections until immediately before connecting.

a. Install clamps (8) on flow-sensitive regulator (3).

b. Using new packing (7), install check valve (6) on regulator.

c. Using new packings (5), install unions (4) on regulator.

d. Position regulator (3) to airframe and secure with screws (2).

e. Uncap and connect hydraulic lines (1) to regulator. Leave tube nut at return port loose.

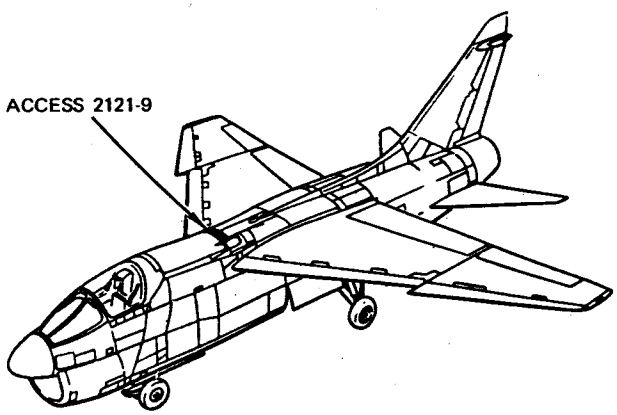
f. Connect servicing cart to PC No. 3 hydraulic filler valve (T.O. 1A-7D-2-1).

g. Operate cart to bleed regulator. When only air-free fluid is flowing, tighten tube nut.

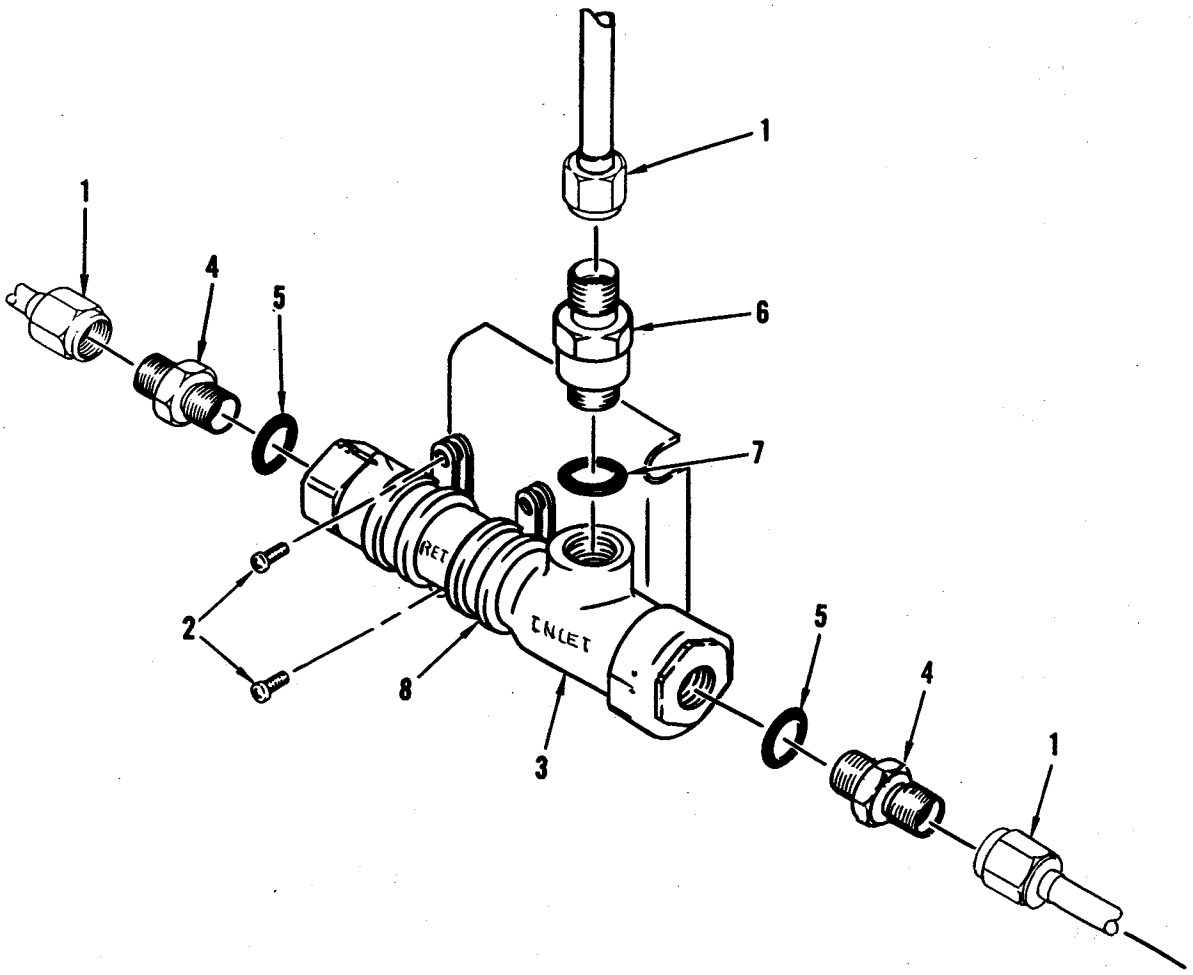
h. Perform hydraulic system air check (T.O. 1A-7D-2-1).

i. Perform emergency power package operational checkout (T.O. 1A-7D-2-11) and check for hydraulic leaks.

j. Close access 2121-9.



1. Hydraulic line
2. Screw
3. Flow-sensitive regulator
4. Union
5. Packing
6. Check valve
7. Packing
8. Clamp



04D052-04-71

Figure 4-4. Flow-Sensitive Regulator Removal and Installation (Airplanes AF69-6197 and Subsequent)

4-25. FILTER ELEMENT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	215-00268-1	Emergency power package safety lock	Prevent inadvertent retraction of emergency power package
	413-900-020	Torque wrench, 10 to 750 pound-inches	Tighten filter bowl

4-26. REMOVAL. (See figure 4-5.)

WARNING

To prevent injury to personnel, clear area around emergency power package access before extension. To prevent inadvertent retraction of emergency power package, install safety lock.

Fluid in filter will be hot if system has been in operation.

NOTE

Diaphragm in filter head will prevent leakage from system while bowl is being removed.

a. Extend emergency power package and install emergency power package safety lock.

b. Dump hydraulic reservoir accumulator (T.O. 1A-7D-2-1).

c. Cut lockwire and unscrew filter bowl (1) from filter head.

d. Remove filter element (2) and spring (3).

WARNING

P-D-680, Type II, is combustible and moderately toxic to eyes, skin and respiratory tract. Eye and skin protection required. Good general ventilation is normally adequate.

e. Clean filter bowl with P-D-680, Type II drycleaning solvent and dry with clean, lint-free cloth.

4-27. INSTALLATION. (See figure 4-5.)

NOTE

For list of approved filter elements, refer to appendix A.

a. Carefully check filter bowl for evidence of internal scoring, especially at bottom of bowl where scoring is most likely to occur. Repair any scored area by blending with crocus cloth.

NOTE

Some filter elements provide a Belleville washer on bottom of element which preloads the element when element and bowl are installed.

b. On elements containing a Belleville washer, check that radius on outside diameter of washer exceeds 0.01 inch. If radius is less than 0.01 inch or sharp edges are apparent, replace element.

c. Insert element in bowl and check that element completely bottoms out without any evidence of binding. If binding is encountered when inserting element, replace element.

d. Install spring (3) in filter head. Ensure spring fully engages groove in filter diaphragm.

e. If element contains a Belleville washer, ensure washer rotates freely on element.

f. Immerse element in clean MIL-H-83282 hydraulic fluid for several minutes, and install filter element (2) in filter bowl.

NOTE

Ensure filter bowl is filled to capacity to minimize air inclusion into the system.

g. Fill bowl completely with clean MIL-H-83282 hydraulic fluid.

h. Insert bowl in filter head and tighten bowl to 150 (±30) pound-inches torque.

i. If required, press filter head indicator button to reset.

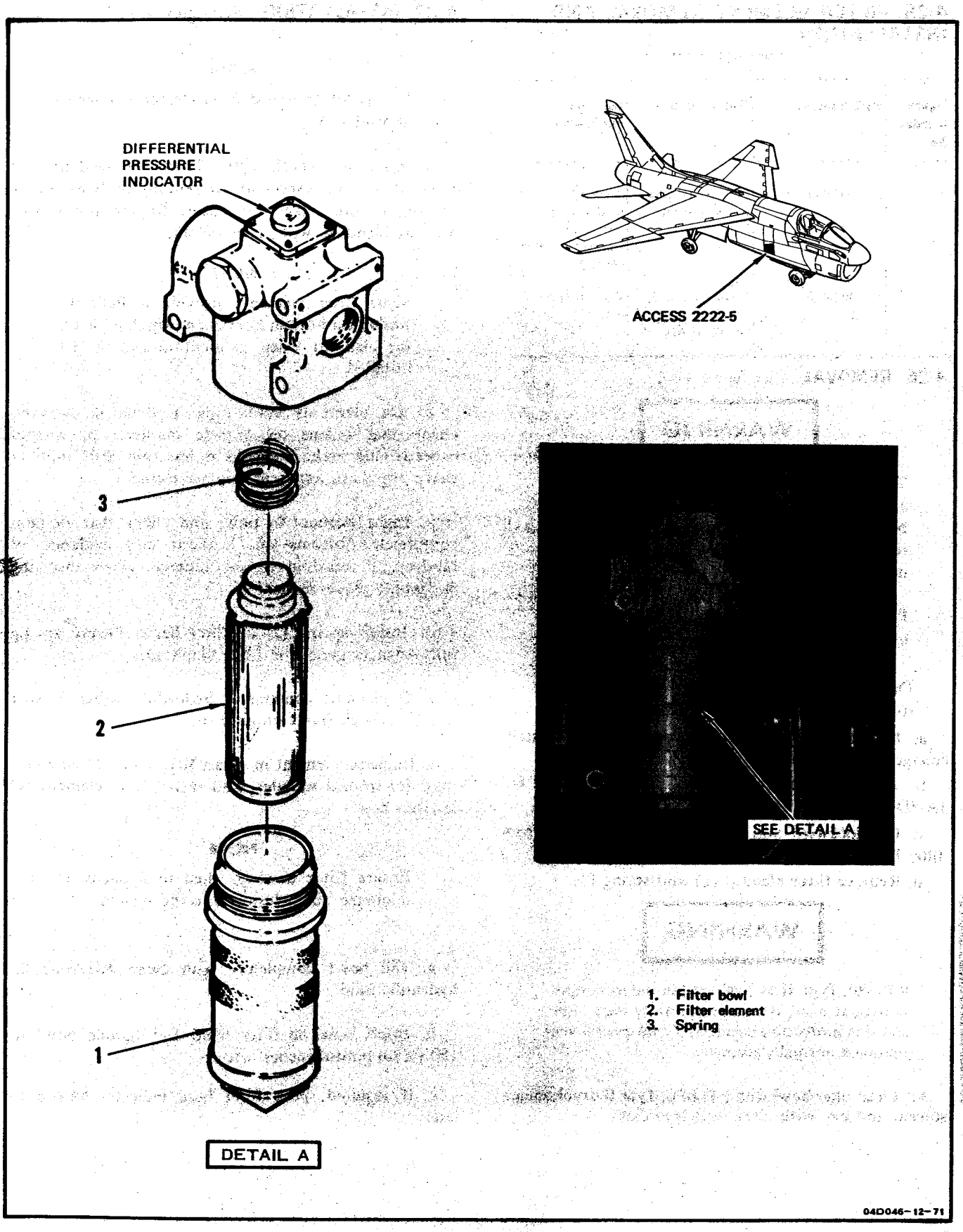


Figure 4-5. Filter Element Removal and Installation

j. Perform hydraulic system air check (T.O. 1A-7D-2-1). Perform limited emergency power package operational checkout (T.O. 1A-7D-2-11) and check for hydraulic leaks. Check differential pressure indicator button for extension.

k. Secure filter bowl to filter head with MS20995C32' lockwire.

l. Remove emergency power package safety lock and retract emergency power package.

4-28. FILTER REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	E10385 (Stewart Avionics Inc., Brooklyn, New York)	Hydraulic filler cart	Provide fluid flow through EPP system
	215-00268-1	Emergency power package safety lock	Prevent inadvertent retraction of emergency power package

4-29. REMOVAL. (See figure 4-6.)

a. Extend emergency power package and install emergency power package safety lock.

b. Dump PC No. 1 or PC No. 3 reservoir accumulator hydraulic pressure as applicable (T.O. 1A-7D-2-1).

WARNING

To prevent injury to personnel, clear area around emergency power package access before extension. To prevent inadvertent retraction of emergency power package, install safety.

c. Disconnect hydraulic lines (1) from filter and cap lines.

d. Remove bolts (2) and washers (3) securing filter to keel, and remove filter (4).

e. Loosen jamnuts and remove elbows (5), packings (6), retainers (7), and jamnuts (8) from filter.

4-30. INSTALLATION. (See figure 4-6.)

a. Drain preservative fluid and fill filter with hydraulic fluid.

b. Install jamnuts (8), new retainers (7), and new packings (6) on elbows.

c. Install elbows (5) in filter. Do not tighten jamnuts (8).

d. Position filter (4) to keel and secure with washers (3) and bolts (2).

e. Uncap and loosely connect hydraulic lines (1) to filter. Tighten jamnuts (8).

f. Tighten line connected to inlet port and leave hydraulic line loose at filter outlet port.

g. Connect hydraulic filler cart to PC No. 1 or PC No. 3 hydraulic filler valve as required.

h. Operate filler cart until air-free fluid flows from outlet port. Tighten hydraulic line at outlet port.

i. Service reservoir (T.O. 1A-7D-2-1) and disconnect hydraulic filler cart.

j. Perform hydraulic system air check (T.O. 1A-7D-2-1). Perform limited emergency power package operational checkout (T.O. 1A-7D-2-11) and check for hydraulic leaks. Check differential pressure indicator button for extension.

k. Remove emergency power package safety lock.

l. Retract emergency power package.

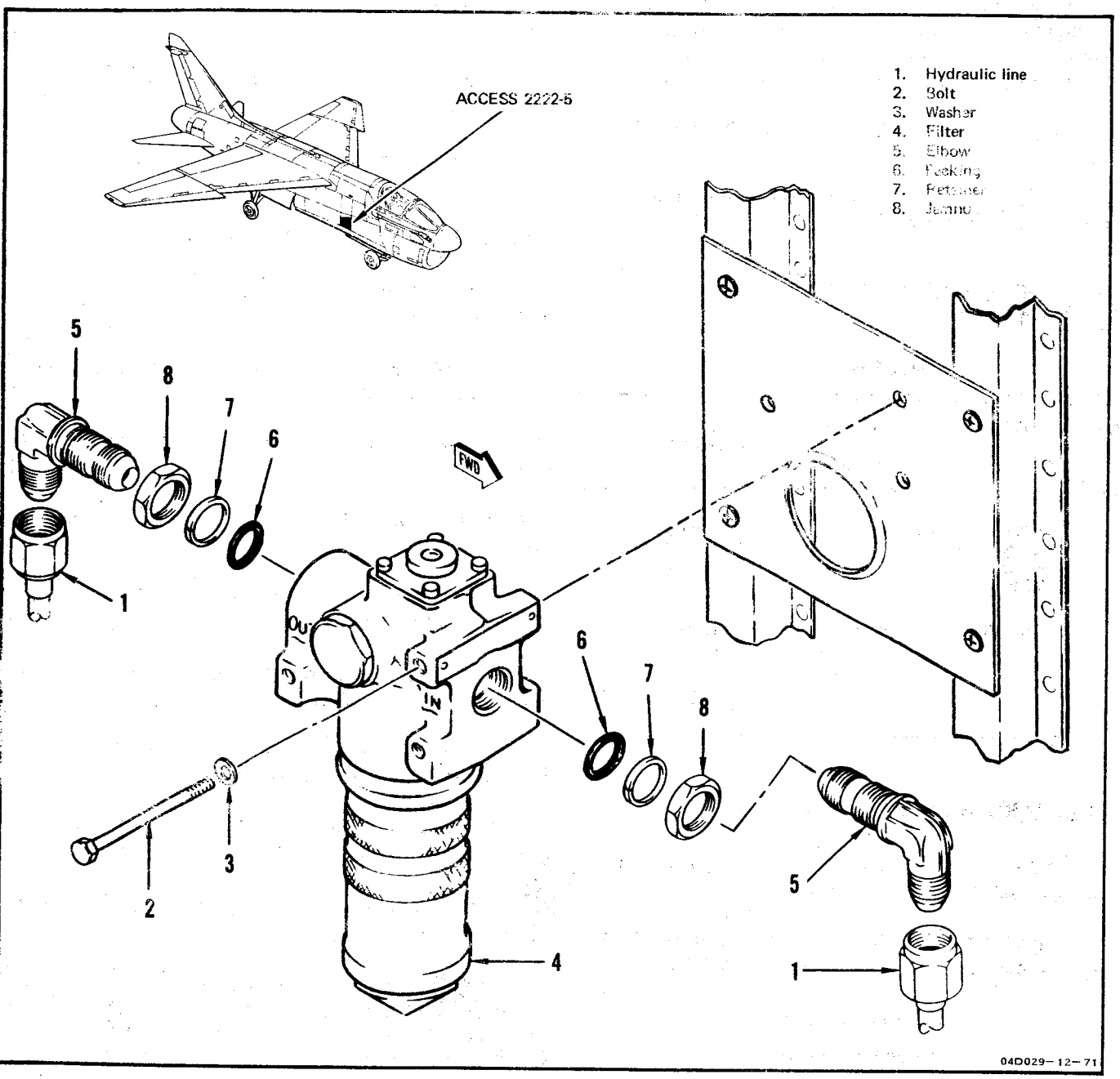


Figure 4-6. Filter Removal and Installation

U.S. Government Printing Office : 85 569-002 P.O. 24262

SECTION V

HYDRAULIC INDICATING SYSTEM

5-1. DESCRIPTION (Airplanes Through AF69-6196).

5-2. The hydraulic indicating system provides hydraulic supply system pressure information, low hydraulic pressure indication, and emergency accumulator isolation indication. The system displays PC No. 1 and PC No. 2 hydraulic supply system pressure on a dual-pointer indicator on the main instrument panel. The indicator pointers are designated 1 and 2 respectively. When the emergency power package is extended, emergency hydraulic pressure is indicated by the PC No. 1 pointer.

5-3. The low hydraulic pressure caution light (HYD PRESS) on the caution light panel comes on when there is low pressure in either the PC No. 1 or PC No. 2 hydraulic supply system. The light functions only for the PC No. 2 hydraulic supply system when the emergency power package is extended.

5-4. The emergency accumulator isolation (EMERG HYD ISO) caution light comes on when the emergency accumulator shutoff valve in the right wheel well is in OPEN.

5-5. See figure 5-1 for hydraulic indicating system indicators, and see figure 5-3 for system arrangement.

5-6. DESCRIPTION (Airplanes AF69-6197 and Subsequent).

5-7. The hydraulic indicating system provides hydraulic supply system pressure information, low hydraulic pressure indication, and emergency accumulator isolation information. The system displays PC No. 1, PC No. 2, and PC No. 3 hydraulic supply system pressures on separate indicators mounted on the right console slant panel. The indicators are designated PC 1, PC 2, and PC 3, respectively. When the emergency power package is extended, emergency hydraulic pressure is indicated by PC 3 indicator.

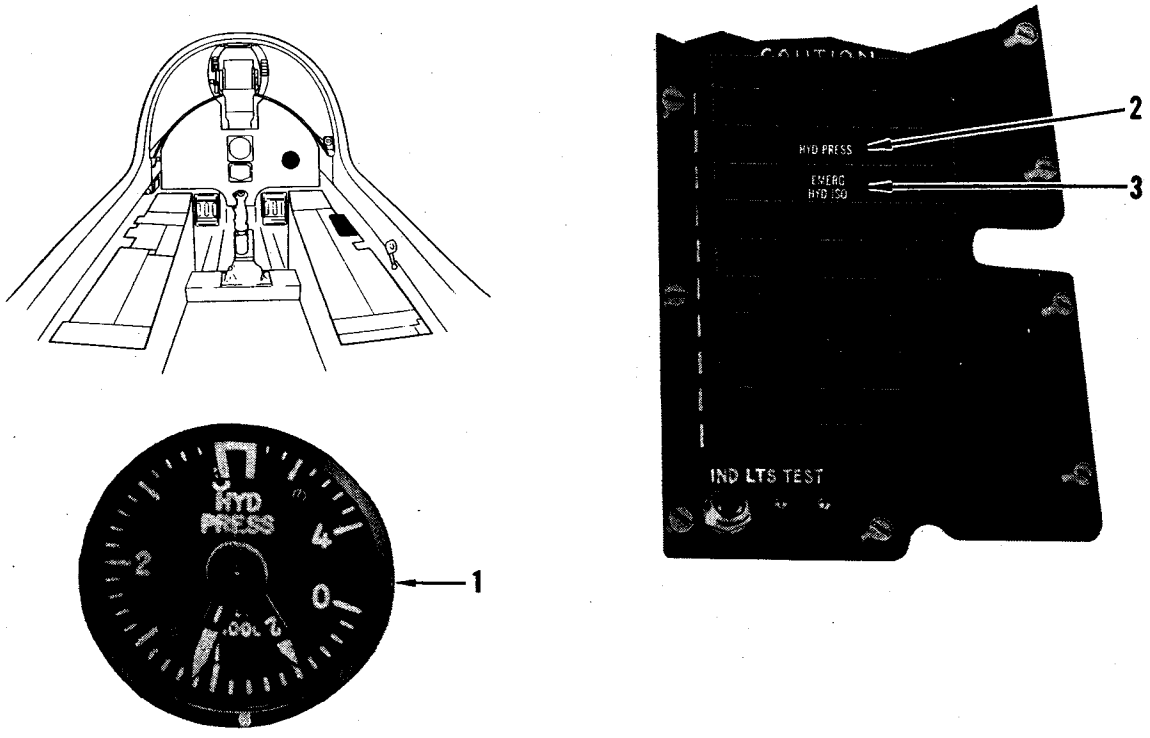
5-8. The low hydraulic pressure caution light (HYD PRESS) on the caution light panel comes on when there is low pressure in any of the three PC systems. The light functions only for PC No. 1 and PC No. 2 hydraulic supply when the emergency power package is extended.

5-9. The emergency accumulator isolation (EMER HYD ISO) caution light comes on when the emergency accumulator shutoff valve in the right wheel well is in OPEN.

5-10. See figure 5-2 for hydraulic indicating system indicators, and see figure 5-3 for system arrangement.

5-11. OPERATION (Airplanes Through AF69-6196). (See figure 5-4.)

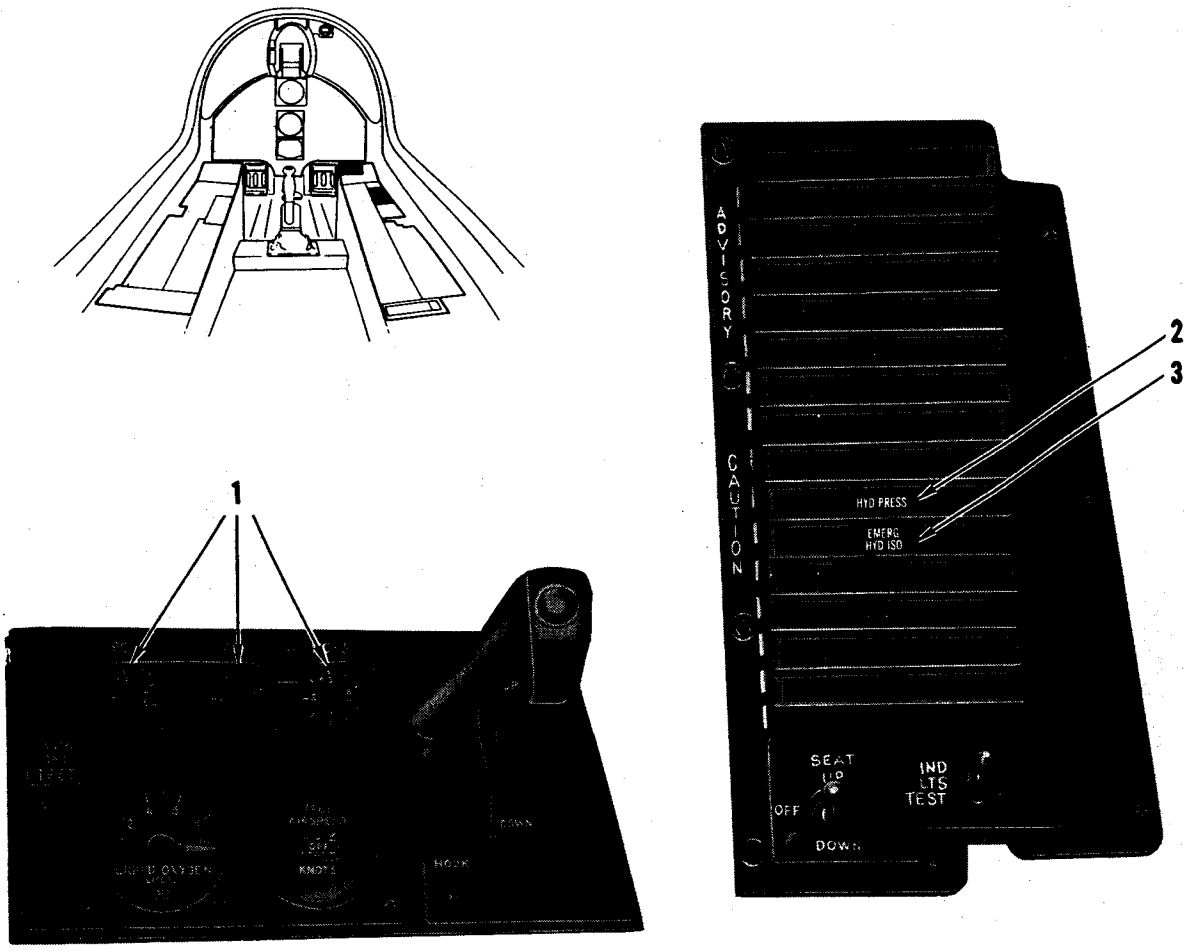
5-12. Hydraulic pressure from the PC supply systems pressure lines enters the pressure snubbers which damp transient pressure surges before the pressure enters the synchro transmitters. The synchro transmitters, which operate on 26-volt ac emergency instrument bus power, are autosyn type transmitters used to transmit electrical signals to the pressure indicator. Each transmitter contains a bourdon tube which is operated by system hydraulic pressure. The bourdon tube is mechanically linked to the transmitter rotor. Expansion of the bourdon tube, due to hydraulic pressure, moves the rotor in relation to the fixed transmitter stator coils. This results in a flux change in the stator coils and a resultant change in voltage. The signal applied to the pressure indicator in the cockpit is the resulting voltage difference.



INDEX NO.	INDICATOR	FUNCTION
1	Hydraulic Pressure Indicator	No. 1 pointer indicates hydraulic pressure in psi in PC No. 1 hydraulic supply system and emergency hydraulic pressure when emergency power package is extended. No. 2 pointer indicates hydraulic pressure in psi in PC No. 2 hydraulic supply system.
2	Low Hydraulic Pressure Caution Light (HYD PRESS)	ON – indicates that PC No. 1 or PC No. 2 (or both) system pressure is less than 1,500 psi. With EPP extended, indicates low pressure for PC No. 2 only.
3	Emergency Accumulator Isolation Caution Light (EMERG HYD ISO)	ON – indicates that emergency accumulator shutoff valve is open, admitting PC No. 2 pressure to emergency accumulator charge circuits.

04D030-05-75

Figure 5-1. Hydraulic Indicating System Indicators (Airplanes Through AF69-6196)



INDEX NO.	INDICATOR	FUNCTION
1	Hydraulic Pressure Indicator (PC NO. 1, PC NO. 2, and PC NO. 3)	PC No. 1 indicator indicates hydraulic pressure in psi in PC No. 1 hydraulic supply system PC No. 2 indicator indicates hydraulic pressure in psi in PC No. 2 hydraulic supply system. PC No. 3 indicator indicates hydraulic pressure in psi in PC No. 3 hydraulic supply system and emergency hydraulic pressure when emergency power package is extended.
2	Low Hydraulic Pressure Caution Light (HYD PRESS)	ON – indicates that PC No. 1 and/or PC No. 2 and/or PC No. 3 system pressure is less than 1,500 psi.
3	Emergency Accumulator Isolation Caution Light (EMERG HYD ISO)	ON – indicates that emergency accumulator shutoff valve is open, admitting PC No. 2 pressure to accumulator charge circuits.

04D065-03-70

Figure 5-2. Hydraulic Indicating System Indicators (Airplanes AF69-6197 and Subsequent)

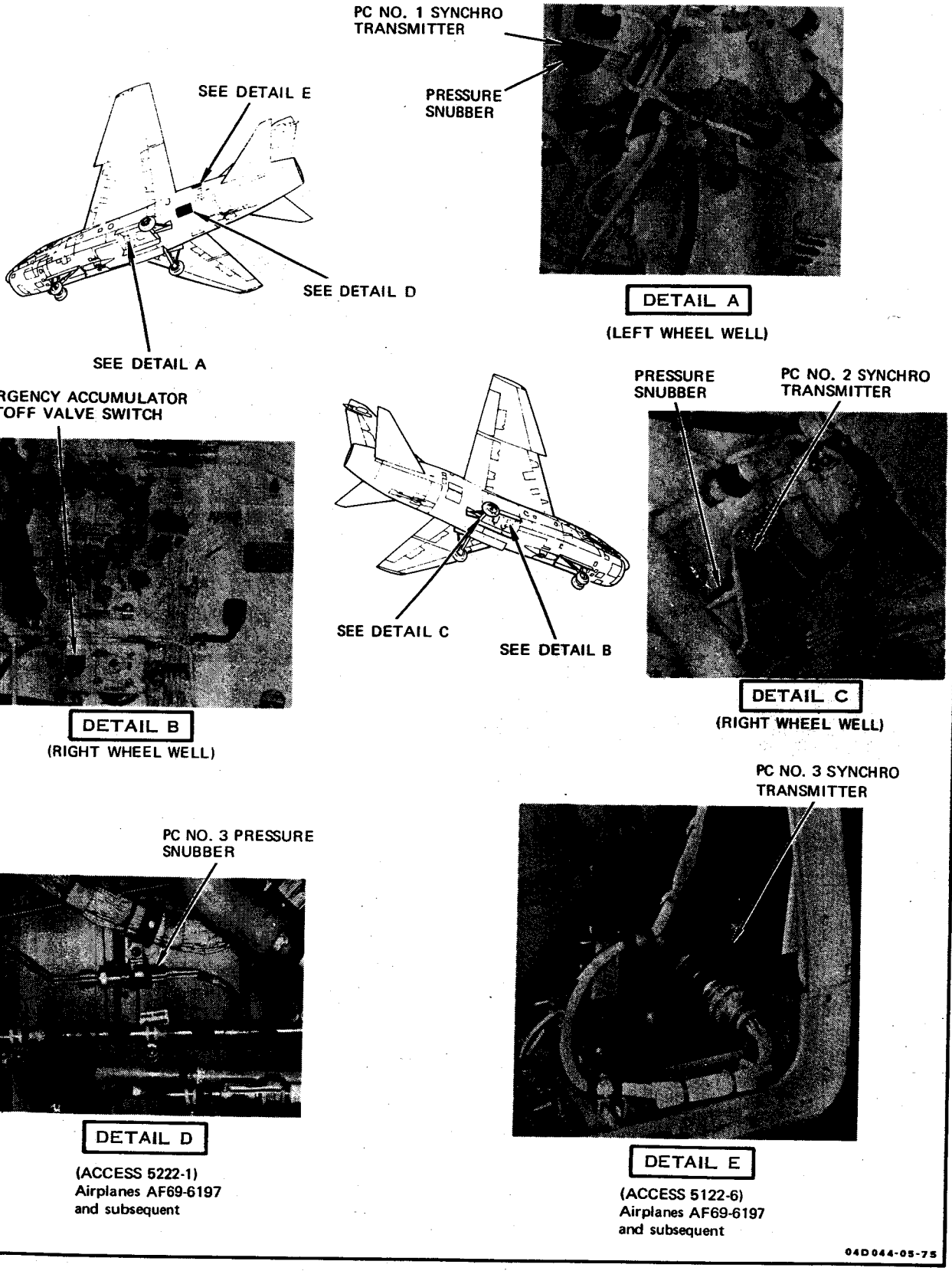


Figure 5-3. Hydraulic Indicating System Arrangement

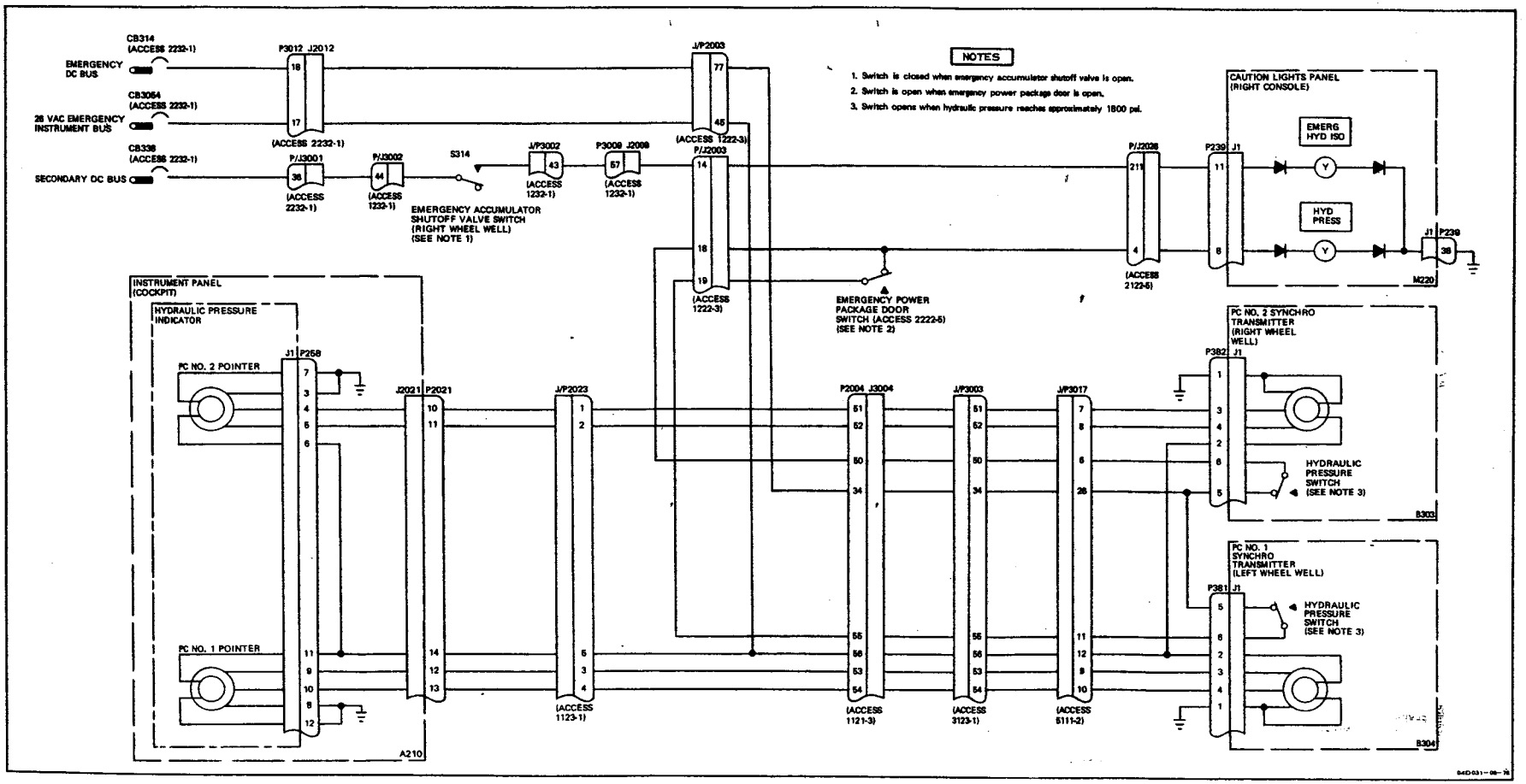


Figure 5-4. Hydraulic Indicating System Electrical Schematic Diagram (Airplanes Through AF69-6196)

5-13. Each transmitter contains a pressure switch. The normally closed switch opens when pressure increases to approximately 1,800 psi and closes if hydraulic pressure drops to approximately 1,500 psi. A closed switch in either transmitter completes a 28-volt dc circuit to the low hydraulic pressure caution light, causing it to come on. The light remains on as long as pressure in the affected system is 1,500 psi or below. The light goes off when pressure increases to approximately 1,800 psi.

5-14. If normal PC No. 1 hydraulic pressure is lost, the emergency power package can be extended to provide sufficient emergency hydraulic pressure for operation of the flight controls. With the emergency power package extended, emergency hydraulic pressure is indicated by the PC No. 1 pointer.

5-15. The PC No. 1 synchro transmitter provides PC No. 1 system pressure information to the hydraulic pressure indicator with the emergency power package either extended or retracted. When the emergency power package is extended, the open contacts of the emergency power package door switch prevents the low hydraulic pressure caution light from responding to low pressure in the PC No. 1 hydraulic supply system.

5-16. The emergency accumulator isolation caution light (figure 5-4) comes on indicating that the emergency accumulator shutoff valve is open. Manually placing the valve handle in OPEN opens the valve and closes the contacts of the switch mounted on the valve. The switch connects 28-volt dc power to the emergency accumulator isolation caution light, and the light comes on.

5-17. OPERATION (Airplanes AF69-6197 and Subsequent). (See figure 5-5.)

5-18. Hydraulic pressure from the PC supply system pressure lines enters the pressure snubbers which damp transient pressure surges before the pressure enters the synchro transmitters. The synchro transmitters, which operate on 26-volt ac emergency instrument bus power, are autosyn type transmitters used to transmit electrical signals to the pressure indicator. Each transmitter contains a bourdon tube which is operated by system hydraulic pressure. The bourdon tube is mechanically linked to the transmitter rotor. Expansion of the bourdon tube due to hydraulic pressure moves the rotor in relation to the fixed transmitter stator coils. This results in a flux change in the stator coils and a resultant change in voltage. The signal applied to the pressure indicator in the cockpit is the resulting voltage difference.

5-19. Each transmitter contains a pressure switch. The normally closed switch opens at approximately 1,800-psi rising pressure and closes if hydraulic pressure drops to approximately 1,500 psi. A closed switch in any of the three transmitters completes a 28-volt dc circuit to the low hydraulic pressure caution light, causing it to come on. The light remains on as long as pressure in the affected system is 1,500 psi or below. The light goes off with rising pressure at approximately 1,800 psi.

5-20. If normal PC No. 3 hydraulic pressure is lost, the emergency power package can be extended to provide sufficient emergency hydraulic pressure for operation of the flight control. With the emergency power package extended, emergency hydraulic pressure is indicated on the PC No. 3 indicator.

5-21. The PC No. 3 synchro transmitter provides PC No. 3 system pressure information to the hydraulic pressure indicator with the emergency power package either extended or retracted. When the emergency power package is extended, the open contacts of the emergency power package door switch prevent the low hydraulic pressure caution light from responding to low pressure in the PC No. 3 hydraulic supply system.

5-22. The emergency accumulator isolation caution light (figure 5-5) comes on indicating that the emergency accumulator shutoff valve is open. Manually placing the valve handle in OPEN opens the valve and closes the contacts of the switch mounted on the valve. The switch connects 28-volt dc power to the emergency accumulator isolation caution light, and the light comes on.

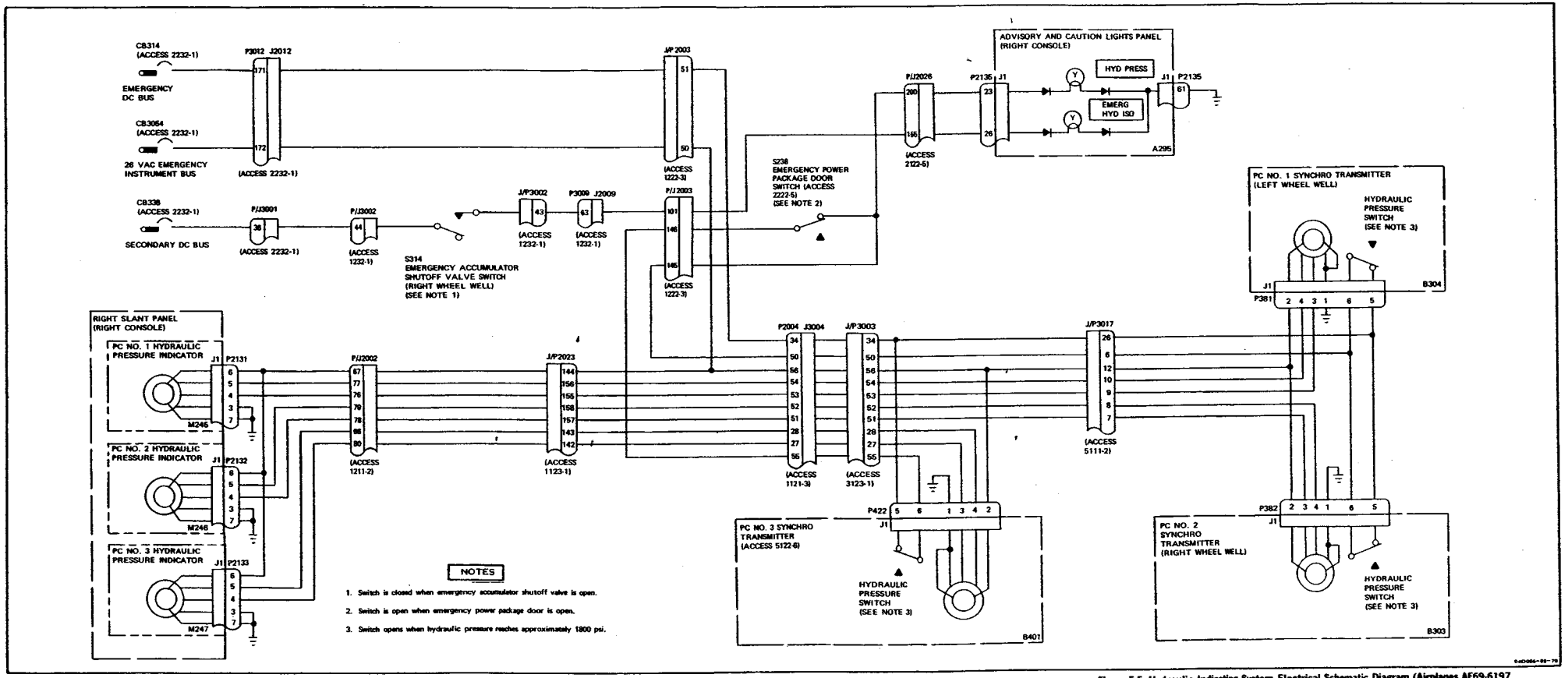


Figure 5-5. Hydraulic Indicating System Electrical Schematic Diagram (Airplanes AF69-6197 and Subsequent)

5-23. COMPONENTS.

5-24. For a list of system components, their location (access), and function, refer to table 5-1.

Table 5-1. Hydraulic Indicating System Components

Components	Access	Function
	Pressure Indicating Components	
Indicator, hydraulic pressure (1)[1]	Instrument panel	Dual pointers indicate, in increments of 100 psi, hydraulic pressure of PC No. 1 and PC No. 2 systems. With emergency power package extended, PC No. 1 pointer indicate pressure supplied by emergency power package.
Indicator, hydraulic pressure (3)[2]	Right console slant panel	Each indicator indicates, in increments of 500 psi, hydraulic pressure of the respective PC No. 1, PC No. 2, or PC No. 3 system. With emergency power package extended, PC No. 3 indicator indicates pressure supplied by emergency power package.
Light, low hydraulic pressure caution	Right console	On (HYD PRESS) indicates that PC No. 1 or PC No. 2, or PC No. 3[2] system pressure is less than 1,500 psi.
Snubber, pressure		Damps transient hydraulic pressure surges at pressure transmitter inlet.
PC No. 1	Left wheel well	
PC No. 2	Right wheel well	
PC No. 3[2]	5222-1	
Transmitter, synchro		Electrically transmits hydraulic pressure signals to pressure indicator. Provides switching function for low hydraulic pressure caution light.
PC No. 1	Left wheel well	
PC No. 2	Right wheel well	
PC No. 3[2]	5122-6	
	Emergency Accumulator Isolating Indication Components	
Light, emergency accumulator isolation caution	Right console	On (EMERG HYD ISO) indicates that emergency accumulator shutoff valve is open, admitting PC No. 2 pressure to accumulator charge circuits.
Switch, emergency accumulator shutoff valve	Right wheel well	Energizes emergency accumulator isolation caution light when actuated by placing the emergency accumulator shutoff valve handle in OPEN.

[1]On airplanes through AF69-6196

[2]On airplanes AF69-6197 and subsequent

5-25. OPERATIONAL CHECKOUT (Airplanes Through AF69-6196).

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required to connect external electrical power		Connect external electrical power
	Equipment required to connect external hydraulic power		Connect external hydraulic power

NOTE

A number, or numbers, enclosed in braces at the end of a step in the following checkout is a reference to a corresponding number in troubleshooting table 5-2.

a. Connect external electrical power (T.O. 1A-7D-2-1).

b. Connect external hydraulic power to PC No. 1 and PC No. 2 systems (T.O. 1A-7D-2-1). Operate at 3,100 psi. Check for indication of 2,950 to 3,250 psi on cockpit pressure indicators. (1)

c. Reduce PC No. 1 system pressure slowly and check that low hydraulic pressure caution light comes on before pressure has decreased below approximately 1,500 psi, as indicated on cockpit hydraulic pressure indicator. (2)

d. Increase PC No. 1 system pressure slowly and check that caution light goes off at a maximum 1,840 psi. (3)

WARNING

To prevent injury to personnel, clear area around emergency power package access before extending.

e. Extend emergency power package.

f. Slowly reduce PC No. 1 system pressure to zero. Check that caution light does not come on. (4)

g. Increase PC No. 1 system pressure to 3,100 psi.

h. Retract emergency power package.

i. Reduce PC No. 2 system pressure slowly and check that low hydraulic pressure caution light comes on before pressure has decreased below approximately 1,500 psi, as indicated on cockpit hydraulic pressure indicator. (2)

j. Increase PC No. 2 system pressure slowly and check that caution light goes off at a maximum of 1,840 psi. (3)

k. Place emergency accumulator shutoff valve in OPEN. Check that emergency accumulator isolation caution light comes on. Place valve in CLOSE. (5)

l. Disconnect external electrical power.

m. Disconnect external hydraulic power (T.O. 1A-7D-2-1).

5-26. OPERATIONAL CHECKOUT (Airplanes AF69-6197 and Subsequent).

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Connect external electrical power
	Equipment required for connecting external hydraulic power		Connect external hydraulic power

NOTE

A number, or numbers, enclosed in parentheses at the end of a step in the following checkout is a reference to a corresponding number in troubleshooting table 5-2.

a. Connect external electrical power (T.O. 1A-7D-2-1).

b. Connect external hydraulic power to PC No. 1, PC No. 2, and PC No. 3 systems (T.O. 1A-7D-2-1). Operate at 3,100 psi. Check for indication of 2,950 to 3,250 psi on cockpit pressure indicators. (1)

c. Reduce PC No. 1 system pressure slowly and check that low hydraulic pressure caution light comes on before pressure has decreased below approximately 1,500 psi, as indicated on cockpit hydraulic pressure indicator. (2)

d. Increase PC No. 1 system pressure slowly and check that caution light goes off at a maximum of 1,840 psi. (3)

e. Reduce PC No. 2 system pressure slowly and check that low hydraulic pressure caution light comes on before pressure has decreased below approximately 1,500 psi, as indicated on cockpit hydraulic pressure indicator. (2)

f. Increase PC No. 2 system pressure slowly and check that caution light goes off at a maximum of 1,840 psi. (3)

g. Reduce PC No. 3 system pressure slowly and check that low hydraulic pressure caution light comes on before pressure has decreased below approximately 1,500 psi, as indicated on cockpit hydraulic pressure indicator. (2)

h. Increase PC No. 3 system pressure slowly and check that caution light goes off at a maximum of 1,840 psi. (3)

WARNING

To prevent injury to personnel, clear area around emergency power package access before extending.

i. Extend emergency power package.

j. Slowly reduce PC No. 3 hydraulic pressure to zero. Check that caution light does not come on. (4)

k. Retract emergency power package.

l. Place emergency accumulator shutoff valve in OPEN. Check that emergency accumulator isolation caution light comes on. Place valve in CLOSE. (5)

m. Disconnect external electrical power.

n. Disconnect external hydraulic power (T.O. 1A-7D-2-1).

5-27. TROUBLESHOOTING. (See figure 5-4 or 5-5.)

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Multimeter	AN/PSM-6	Check for voltage and circuit continuity

5-28. Refer to table 5-2 for troubleshooting information. Malfunctions in the table are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

Table 5-2. Hydraulic Indicating System Troubleshooting

Malfunction	Corrective Action
1. Unsatisfactory pressure indication on cockpit indicator	a. Disconnect synchro transmitter connector. With external power applied, check for 26 volts ac across pins 1 and 2. If voltage is not present, proceed to step b. If voltage is present, perform transmitter check (paragraph 5-30). If transmitter checks good, proceed to step c. b. If voltage is not present across pins 1 and 2 of transmitter connector, perform the following: 1. Check for voltage at pin 2 using airframe as ground. If voltage is present, repair ground wire from pin 1. 2. If voltage is not present, check continuity from CB3054 to transmitter and repair as necessary. c. Perform indicator check (paragraph 5-29). Replace indicator if test values are not met. If test values are correct, troubleshoot hydraulic PC system.
2. Hydraulic low pressure caution light does not come on at approximately 1,500 psi (single system depressurized).	a. Press indicator lights test switch to check lamp. If lamp does not come on, replace lamp. If lamp comes on, proceed to step b. b. Disconnect transmitter electrical connector. Check for continuity between pins 5 and 6 of connector on transmitter. If continuity does not exist, replace transmitter (paragraph 5-31 or 5-34). If continuity is present, check for 28 volts dc across pins 5 and 1 of transmitter connector (plug). If voltage exists, proceed to step c. If voltage does not exist, check for continuity between CB314 and pin 5 of transmitter connector. Repair wiring as required. c. Check for continuity from pin 6 of transmitter connector to caution lights panel. If continuity is not present, repair defective wiring or, if applicable, replace emergency power package door switch (T.O. 1A-7D-2-11). If continuity is present, replace caution lights panel (T.O. 1A-7D-2-11).
3. Hydraulic low pressure caution light does not go off at 1,840 psi maximum.	a. With 3,000 psi applied to all systems, disconnect electrical connector from transmitter(s) and check that light goes off. If light goes off, replace defective transmitter. If light does not go off, check for defective wiring.
4. Hydraulic low pressure light comes on with emergency power package extended.	a. Replace defective emergency power package door switch (T.O. 1A-7D-2-11).
5. Emergency accumulator isolation caution light does not come on when emergency accumulator shutoff valve is OPEN.	a. Press indicator lights test switch. If light comes on, proceed to step b. If light does not come on, replace lamp. b. Check continuity from circuit breaker CB338 to caution indicator panel. If continuity is not present, adjust or replace emergency accumulator shutoff valve switch (paragraph 6-34) or repair defective wiring. If continuity is present, replace caution lights panel (T.O. 1A-7D-2-11).

5-29. HYDRAULIC PRESSURE INDICATOR CHECK.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Connect external electrical power
	Multimeter	AN/PSM-6	Check voltage at test set
	Synchro instrument field test set	13819-2A or TTU-23/E (airplanes AF69-6197 and subsequent)	Check indicator calibration
	Power cable	215-00366-5 (component of 215-01031-1 fuel gaging flight line test set)	Connect test set to airplane power receptacle
	Adapter cable	215-00380-7	Connect indicator to test set (airplanes through AF69-6196)
	Synchro instrument test cable assembly	216-01752-1	Connect indicator to test set (airplanes AF69-6197 and subsequent)

NOTE

Before starting checks, ensure that all test set switches are in OFF and controls are rotated fully counterclockwise.

Connect power cable connector to test set before connecting to J308 test receptacle.

a. Open access 1232-1 and connect 215-00366-5 power cable connector W4P1 to AN/ARW-77 test receptacle J308 and power cable connector W4P2 to POWER INPUT 10 on test set.

b. Remove indicator (paragraph 5-37).

c. On airplanes through AF69-6196, connect QB86030-1 cable assembly to test set. Connect opposite end of QB86030-1 cable assembly to 215-00380-7 adapter cable and connect adapter cable to indicator.

d. On airplanes AF69-6197 and subsequent, connect 216-01752-1 cable assembly connector W1P2 to indicator and connector W1P1 to TEST INPUT 9 on test set.

WARNING

Voltage used can cause arcing which may result in severe burns. Remove watches, rings and other jewelry that can cause a shock/burn hazard.

e. Connect external electrical power (T.O. 1A-7D-2-1).

NOTE

All numerical designations in the following steps are on the face of the test set.

f. Place test set POWER switch 17 in ON. Check that POWER lamp 16 comes on.

NOTE

If voltages in steps g and h are not within limits, test set is defective.

g. Check for 26 (±2.6) volts ac between test set binding posts 18 and 19.

h. Check for 10.8 (±1.08) volts ac between binding posts 19 and 20.

i. Place TEST SEL switch 2 to SYN IND and SYN IND switch 4 to E-Z. Indicator must indicate 2,000 psi.

j. Set SYN IND switch 4 to CAL. Rotate test set transmitter 1 to provide test point indications specified in table 5-3 and check for proper autosyn indications specified in table 5-3.

k. Place POWER switch in OFF.

l. Disconnect external electrical power.

m. Disconnect test setup and install indicator.

Table 5-3. Indicator Test Values

Test Points (psi)	Autosyn Indication	Tolerance (±)
0	20°	4°
500	60°	4°
1,000	100°	4°
1,500	140°	4°
2,000	180°	4°
2,500	220°	4°
3,000	260°	4°
3,500	300°	4°
4,000	340°	5°

5-30. SYNCHRO TRANSMITTER CHECK.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required to connect external electrical power		Connect external electrical power
	Equipment required to connect external hydraulic power		Connect external hydraulic power
	Synchro instrument field test set	13819-2A	Check transmitter calibration
	Power cable	215-00366-5	Connect power to test set
	Adapter cable	216-01751-1	Connect transmitter to test set
	Multimeter	AN/PSM-6	Check voltage at test set

NOTE

Before starting checks, ensure that test set switches are in OFF and controls are rotated fully counterclockwise.

Connect power cable connector to test set before connecting to J308 test receptacle.

a. Open access 1232-1 and connect 215-00366-5 power cable to AN/ARW-77 test receptacle J308 and to synchro instrument test set.

b. On airplanes AF69-6197 and subsequent, open access 5122-6 for access to PC No. 3 transmitter.

c. Disconnect electrical connector from transmitter.

d. Connect 216-01751-1 adapter cable assembly to test set and to transmitter.

e. Connect external electrical and hydraulic power (T.O. 1A-7D-2-1).

NOTE

All numerical designations in the following steps are on the face of the test set.

f. Place TEST SEL switch 2 to TRANS.

g. Place test set POWER switch 17 in ON. Check that POWER lamp 16 comes on.

NOTE

If voltages in steps h and i are not within limits, test set is defective.

h. Check for 26 (±2.6) volts ac between test set binding posts 18 and 19.

i. Check for 10.8 (±1.08) volts ac between binding posts 19 and 20.

j. Rotate AMPL GAIN control 8 fully clockwise and allow amplifier to warm up for a minimum of 1 minute before continuing.

k. If autosyn indication is not 20° (± 4°) in step one of table 5-4 with zero (0) psi applied, adjust as follows: Remove zero adjust cap on rear of transmitter. Loosen locknut and adjust transmitter to 20° (± 4°). Tighten locknut and replace cap. Vary hydraulic pressure as specified in table 5-4 and check for proper autosyn indications. If necessary, readjust zero and repeat Table 5-4.

l. Place test set POWER switch in OFF.

m. Disconnect external electrical and hydraulic power (T.O. 1A-7D-2-1).

n. Disconnect test setup and connect electrical connector to transmitter.

o. Close access 1232-1.

Table 5-4. Transmitter Test Values

Test Points (psi)	Autosyn Indication	Tolerance (±)
0	20°	4°
500	60°	4°
1,000	100°	4°
1,500	140°	4°
2,000	180°	4°
2,500	220°	4°
3,000	260°	6°

p. On airplanes AF69-6197 and subsequent, close access 5122-6.

5-31. PC NO. 1 AND PC NO. 2 SYNCHRO TRANSMITTER REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Connect external electrical power
		Equipment required for connecting external hydraulic power	Connect external hydraulic power

5-32. REMOVAL. (See figure 5-6.)

NOTE

The following procedure is applicable to PC No. 1 and PC No. 2 synchro transmitters. PC No. 1 transmitter is located in the left wheel well and PC No. 2 transmitter in the right wheel well.

a. Disconnect electrical connector (1) from transmitter.

b. On airplanes through AF69-6196, dump PC No. 1 reservoir accumulator (T.O. 1A-7D-2-1).

c. Disconnect hydraulic line (2) from snubber and cap line.

d. Cut lockwire and remove screws (3) and washers (4).

e. Remove synchro transmitter (5) from bracket.

f. Remove pressure snubber (6) and packing (7) from transmitter.

5-33. INSTALLATION. (See figure 5-6.)

a. Using new packing (7), install pressure snubber (6) on transmitter.

b. Position synchro transmitter (5) on bracket and secure with washers (4) and screws (3). Secure screws with MS20995C32 lockwire.

c. Remove caps and connect hydraulic line (2) to pressure snubber. Do not tighten line.

NOTE

Do not cap vent port on transmitter.

d. Connect electrical connector (1) to transmitter unit.

WARNING

Voltage used can cause arcing which may result in severe burns. Remove watches, rings and other jewelry that can cause a shock/burn hazard.

e. Connect external electrical power (T.O. 1A-7D-2-1).

CAUTION

Do not rotate adjustment eccentric more than 90 degrees clockwise or counterclockwise from initial setting.

NOTE

If necessary, adjust zero reading in accordance with paragraph 5-30.

f. Check for indication of 0 (± 50) psi on cockpit pressure indicator. If transmitter is out of tolerance, remove 5/8 inch adjustment cap adjacent to hydraulic pressure connector. Loosen hollow locking nut and adjust eccentric bushing with 1/8 inch Allen wrench by rotating clockwise to increase or counterclockwise to decrease the indication.

WARNING

Serious injury can occur while high pressure testing. While testing, personnel will be protected by a shield or be a safe distance from the unit to prevent injury.

g. Connect external hydraulic power to applicable PC system and apply 400 (±100) psig (T.O. 1A-7D-2-1).

h. Bleed fluid from line (2) until free of air. Tighten line.

i. Perform hydraulic system air check (T.O. 1A-7D-2-1).

j. Perform hydraulic indicating system operational checkout (paragraph 5-25 or 5-26).

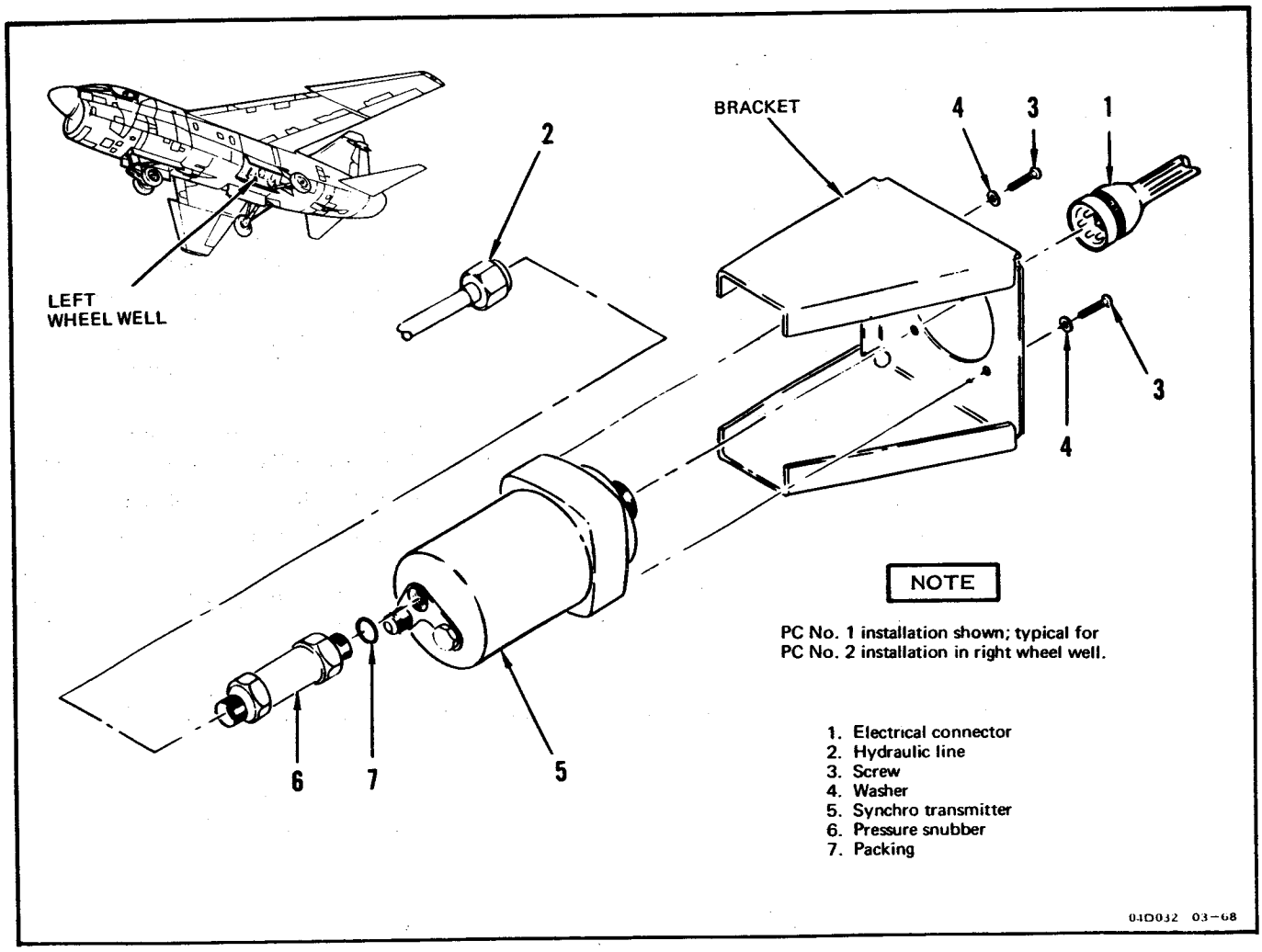


Figure 5-6. PC No. 1 and PC No. 2 Synchro Transmitter Removal and Installation

5-34. PC NO. 3 SYNCHRO TRANSMITTER REMOVAL AND INSTALLATION. (Airplanes AF69-6197 and Subsequent.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect external hydraulic power
		Equipment required for connecting external electrical power	Connect external electrical power

5-35. REMOVAL. (See figure 5-7.)

a. Dump PC No. 3 reservoir accumulator pressure (T.O. 1A-7D-2-1).

b. Open access 5122-6.

c. Disconnect electrical connector (1) from transmitter.

d. Disconnect hydraulic line (2) from elbow and plug line.

e. Remove lockwire, screws (3), and washers (4).

f. Remove synchro transmitter (5) from bracket.

g. Loosen jamnut (6) and remove elbow (7) from transmitter.

h. Remove packing (8) and retainer (9). Discard packing and retainer.

5-36. INSTALLATION. (See figure 5-7.)

a. Install new retainer (9) and packing (8) on elbow.

b. Install elbow (7) in transmitter. Do not tighten jamnut (6).

c. Position transmitter (5) in mounting bracket and install washers (4) and screws (3). Secure screws with MS20995C20 lockwire.

d. Unplug hydraulic line (2) and loosely connect to elbow. Tighten jamnut (6).

NOTE

Do not cap vent port on transmitter.

e. Connect electrical connector (1) to transmitter.

f. Connect external electrical power (T.O. 1A-7D-2-1).

CAUTION

Do not rotate adjustment eccentric more than 90 degrees clockwise or counterclockwise from initial setting.

NOTE

If necessary, adjust zero reading in accordance with paragraph 5-30.

g. Check for indication of 0 (± 50) psi on cock pit pressure indicator. If transmitter is out of tolerance, remove 5/8 inch adjustment cap adjacent to hydraulic pressure connector. Loosen hollow locking nut and adjust eccentric bushing with 1/8 inch Allen wrench by rotating clockwise to increase or counterclockwise to decrease the indication.

h. Connect external hydraulic power (T.O. 1A-7D-2-1) and apply 400 (± 100) psi pressure.

i. Bleed fluid from line until free of air. Tighten line.

j. Perform hydraulic system air check (T.O. 1A-7D-2-1).

k. Perform hydraulic indicating system operational checkout (paragraph 5-26).

l. Close access 5122-6.

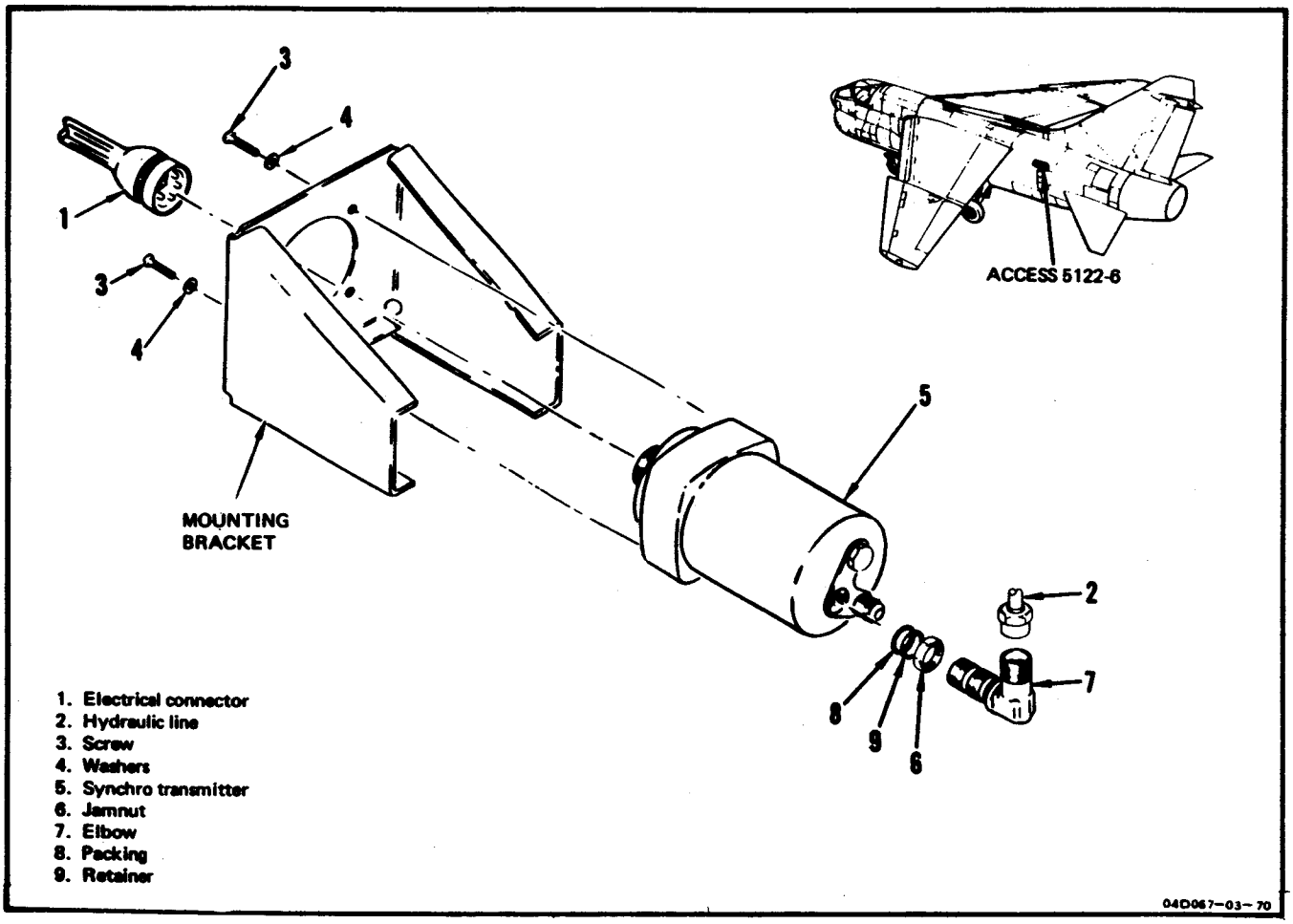


Figure 5-7. PC No. 3 Synchro Transmitter Removal and Installation (Airplanes AF69-6197 and Subsequent)

5-37. HYDRAULIC PRESSURE INDICATOR REMOVAL AND INSTALLATION.

5-38. REMOVAL. (See figure 5-1 or 5-2.)

a. Loosen roundhead screw adjacent to indicator until retainer-clamp tension is relieved.

b. Slide indicator out front of panel.

c. Disconnect electrical connector.

5-39. INSTALLATION. (See figure 5-1 or 5-2.)

a. Connect electrical connector.

b. Slide indicator into front of panel.

c. Tighten roundhead screw until indicator is secure in panel.

d. Perform hydraulic indicating system operational checkout (paragraph 5-25 or 5-26).

5-40. PC NO. 3 PRESSURE SNUBBER REMOVAL AND INSTALLATION. (Airplanes AF69-6197 and Subsequent.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Connect external hydraulic power

5-41. REMOVAL. (See figure 5-8.)

a. Dump PC No. 3 reservoir accumulator pressure (T.O. 1A-7D-2-1).

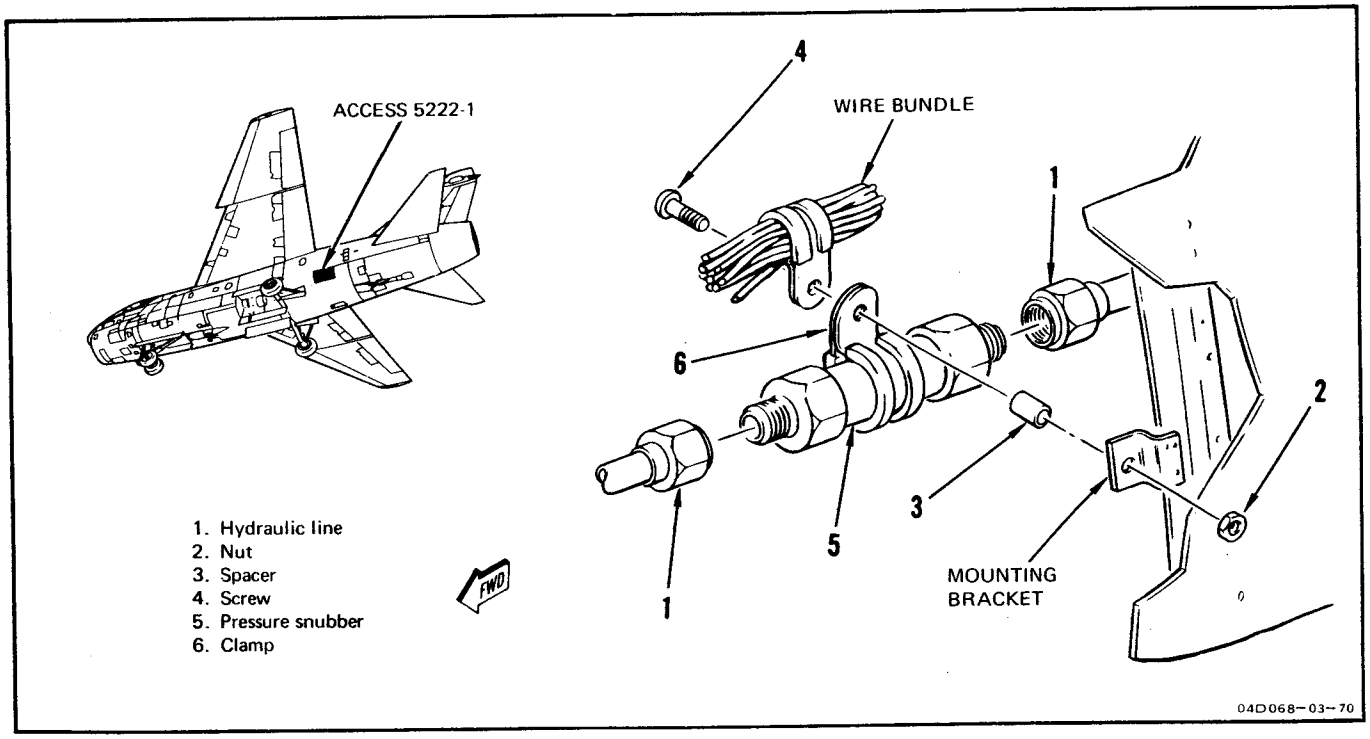


Figure 5-8. PC No. 3 Pressure Snubber Removal and Installation (Airplanes AF69-6197 and Subsequent)

b. Open access 5222-1.

c. Disconnect and plug hydraulic lines (1).

d. Remove nut (2), spacer (3), and screw (4) securing snubber to mounting bracket.

e. Remove snubber (5) from airplane and remove clamp (6) from snubber.

5-42. INSTALLATION. (See figure 5-8.)

a. Install clamp (6) on snubber (5).

b. Position snubber in airplane and secure to mounting bracket with screw (4), spacer (3), and nut (2).

c. Unplug hydraulic lines (1) and connect to snubber.

d. Connect external hydraulic power (T.O. 1A-7D-2-1) and apply 400 (±100) psi pressure.

e. Loosen line connected to elbow on transmitter (downstream of snubber) sufficiently to allow fluid flow. Tighten line when fluid becomes air-free.

f. Perform hydraulic system air check (T.O. 1A-7D-2-1). Check snubber installation for leaks.

g. Close access 5222-1.

5-43. CAUTION INDICATOR PANEL ASSEMBLY REMOVAL AND INSTALLATION.

(Refer to T.O. 1A-7D-2-10).

SECTION VI
ACCUMULATOR PRECHARGE SYSTEM

6-1. DESCRIPTION.

6-2. The accumulator precharge system provides a means of charging with nitrogen, depressurizing, or pressure checking the airplane accumulators from a single location in the right wheel well. Emergency accumulators served by the accumulator precharge system include the landing gear, emergency wheel brakes, leading and trailing edge flaps, and emergency power package. Other accumulators served by the system are the arresting gear, wheel brakes, and the accumulators for the power control hydraulic supply systems.

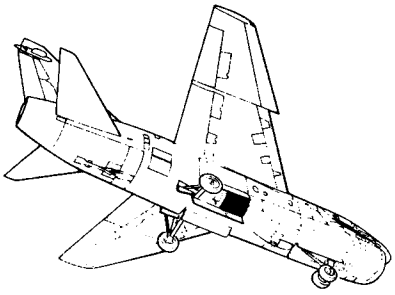
6-3. On airplanes through AF69-6196, the precharge system consists of the accumulators filler valve package and the emergency accumulator test switch. The filler valve package consists of nine high pressure pneumatic charge and bleed valves and gages mounted in a common housing. Each charge and bleed valve and gage is identified by a station number relating to the connect accumulator. The nine stations and connected accumulators are:

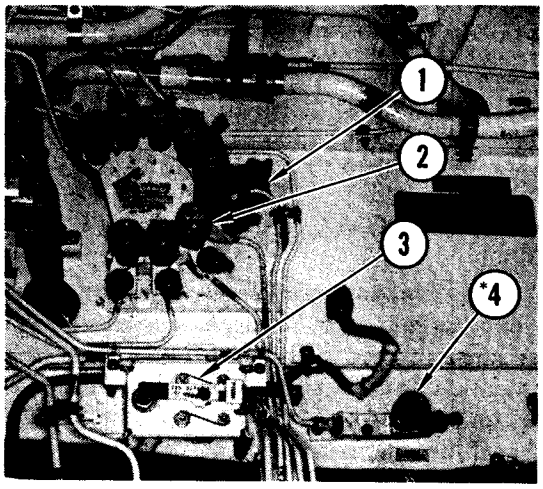
Station	Accumulator
1	Arresting gear
2	PC No. 1 reservoir
3	PC No. 1 surge damper
4	Emergency landing gear
5	Wheel brakes
6	Emergency power package
7	Emergency wheel brakes
8	PC No. 2 surge damper
9	Emergency flaps

6-4. On airplanes AF69-6197 and subsequent, the precharge system consists of the emergency accumulator test switch, a pneumatic single-point filler containing nine high pressure pneumatic charge valves and gages mounted in a common housing and a tenth charge valve and gage mounted in a single housing. Each charge valve and gage is identified by a station number. The 10 stations and connected accumulators are:

Station	Accumulator
1	Arresting gear
2	PC No. 3 reservoir
3	PC No. 1 surge damper
4	Emergency landing gear
5	Wheel brakes
6	Emergency power package
7	Emergency wheel brakes
8	PC No. 2 surge damper
9	Emergency flaps
10	PC No. 3 surge damper

6-5. See figure 6-1 for accumulator precharge system controls and indicators. Refer to Appendix A for general torquing information.





INDEX NO.	CONTROL/INDICATOR	FUNCTION
1	Emergency accumulator test switch	DUMP — energizes reservoir accumulator and emergency accumulator solenoid valves open to dump hydraulic fluid from accumulators. PRESS — energizes emergency accumulator solenoid valves to open nitrogen side of accumulators to pneumatic single point filler.
2	Accumulator filler valve package pressure gage (Stations No. 1 through No. 9)	Indicates accumulator pressure in increments of 200 psi.
3	Emergency accumulator shutoff valve control	OPEN — applies PC No. 2 system pressure to charge landing gear, brake, and flap emergency accumulators. CLOSED — isolates emergency accumulator charging circuits from PC system.
*4	PC No. 3 surge damper accumulator pressure gage (station No. 10)	Indicates accumulator pressure in increments of 200 psi.

*Airplanes AF69-6197 and subsequent.

04D045-05-75

Figure 6-1. Accumulator Precharge System Controls and Indicators

6-6. OPERATION. (See figure 6-2.)

6-7. EMERGENCY ACCUMULATORS. To charge, check accumulator precharge (nitrogen) pressure or depressurize any one of the four emergency accumulators (stations 4, 6, 7, and 9). It is necessary to control the accumulator package solenoid-operated valves with the emergency accumulator test switch (figure 6-3 or 6-4). Operation of the solenoid valves normally requires airplane battery power; however, the valves may be operated manually.

6-8. The emergency accumulators normally contain hydraulic fluid under pressure equal to approximate PC No. 2 supply system pressure. Before the emergency accumulator can be properly checked or precharged, the hydraulic fluid shall be dumped from the accumulators by placing the emergency accumulator test switch in DUMP for a minimum of 1 minute. This connects 28 volts dc to the solenoid-operated shutoff valve on the hydraulic side of each of the four emergency accumulator packages and dumps hydraulic fluid into the PC No. 2 reservoir.

6-9. With the hydraulic fluid dumped, checking, charging, or bleeding the nitrogen precharge pressure in the emergency accumulators is accomplished by placing the emergency accumulator test switch in PRESS. Placing the switch in PRESS opens the solenoid-operated shutoff valve on the nitrogen side of each of the four emergency accumulators packages. This connects the nitrogen side of the four accumulators directly to the charge and bleed valves of the accumulator filler valve package.

6-10. Fluid to the emergency accumulators (except the emergency power package accumulator) is controlled by an emergency accumulator shutoff valve in the right wheel well. When this valve is in OPEN and the utility isolation valve is open, PC No. 2 system pressure forces fluid into the emergency accumulators compressing the nitrogen precharge. The compressed nitrogen in the emergency accumulators maintains the hydraulic fluid under pressure for emergency use. After the accumulators are charged with fluid, the shutoff valve is closed to isolate PC No. 2 system and its supply circuits from the emergency circuits. This prevents depletion of PC No. 2 system pressure if a failure should occur in the emergency circuits. The charging line to the emergency power package accumulator bypasses the emergency accumulator shutoff valve so that the accumulator can be hydraulically charged in flight.

6-11. UTILITY ACCUMULATORS. Emergency accumulator test switch actuation is not required when charging, depressurizing, or pressure checking the utility accumulators (stations 1, 3, 5, 8, and on airplanes AF69-6197 and subsequent, station 10). Prior to checking accumulator precharge pressures, the applicable system(s) cockpit controls will be cycled to relieve any pressure in system lines. To charge these stations, it is necessary only to connect an external nitrogen source to the appropriate station charge and bleed valve of the accumulator filler valve package.

6-12. RESERVOIR ACCUMULATOR. On airplanes through AF69-6196, an accumulator is contained in the PC No. 1 hydraulic system to maintain 90 psi pressure in the reservoir to ensure proper emergency power package operation in the event of engine driven hydraulic pump failure in flight. On airplanes AF69-6197 and subsequent, the reservoir accumulator is removed from the PC No. 1 system and the accumulator is a part of the PC No. 3 hydraulic supply system. Operation and function of the accumulator remains the same for PC No. 3 system as for PC No. 1 system.

6-13. A check valve in the hydraulic line to the reservoir accumulator (station 2) retains 3,000 psi hydraulic fluid in the accumulator. Before the accumulator nitrogen precharge can be properly checked, the hydraulic fluid must be dumped. Placing the emergency accumulator test switch in DUMP for a minimum of 1 minute energizes the accumulator dump valve. The open dump valve dumps the hydraulic fluid into the system return line. With the hydraulic fluid dumped, checking, charging, or bleeding the nitrogen precharge in the reservoir accumulator is accomplished in the normal manner through the station 2 valve of the accumulator filler valve package.

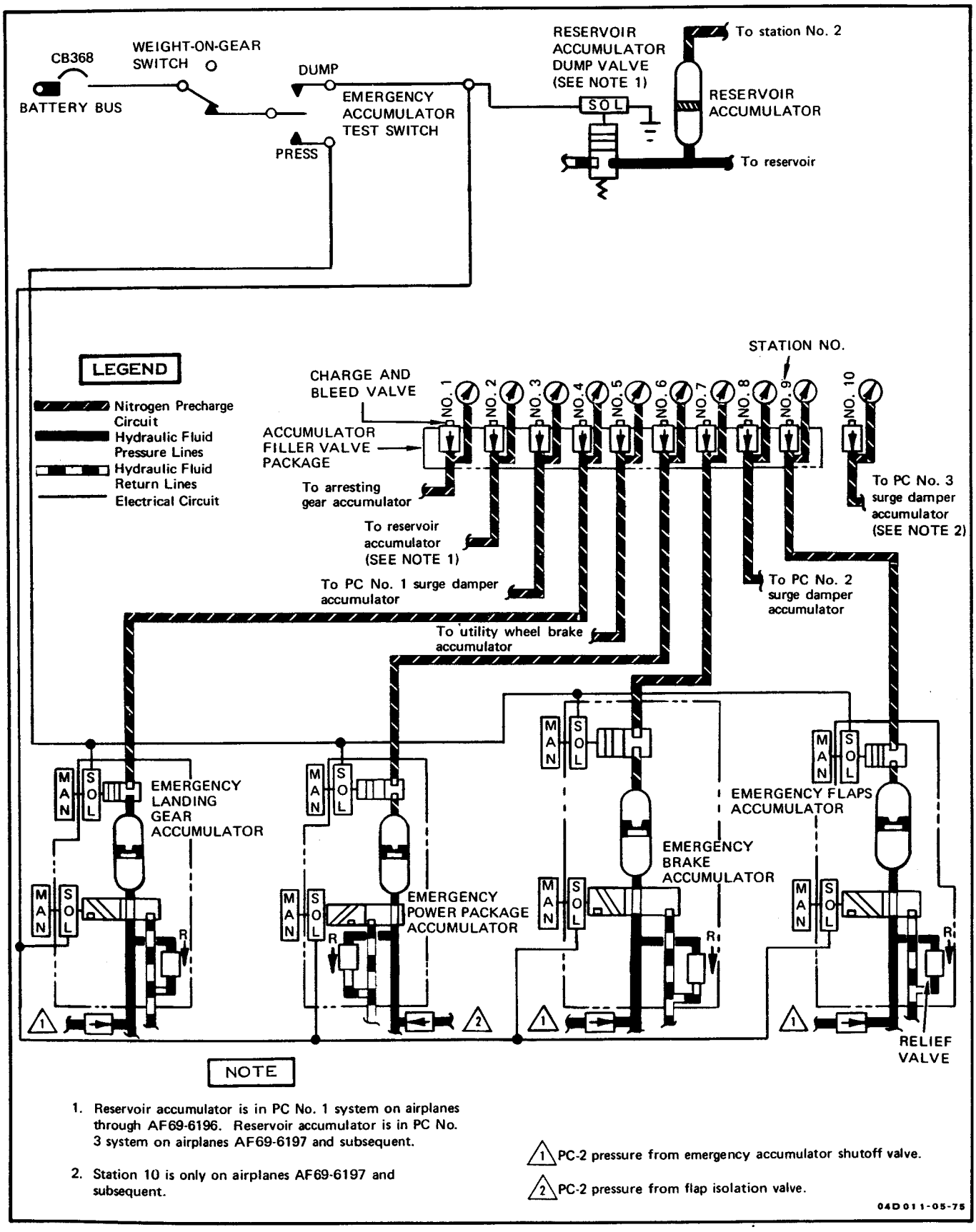


Figure 6-2. Accumulator Precharge System Schematic Diagram

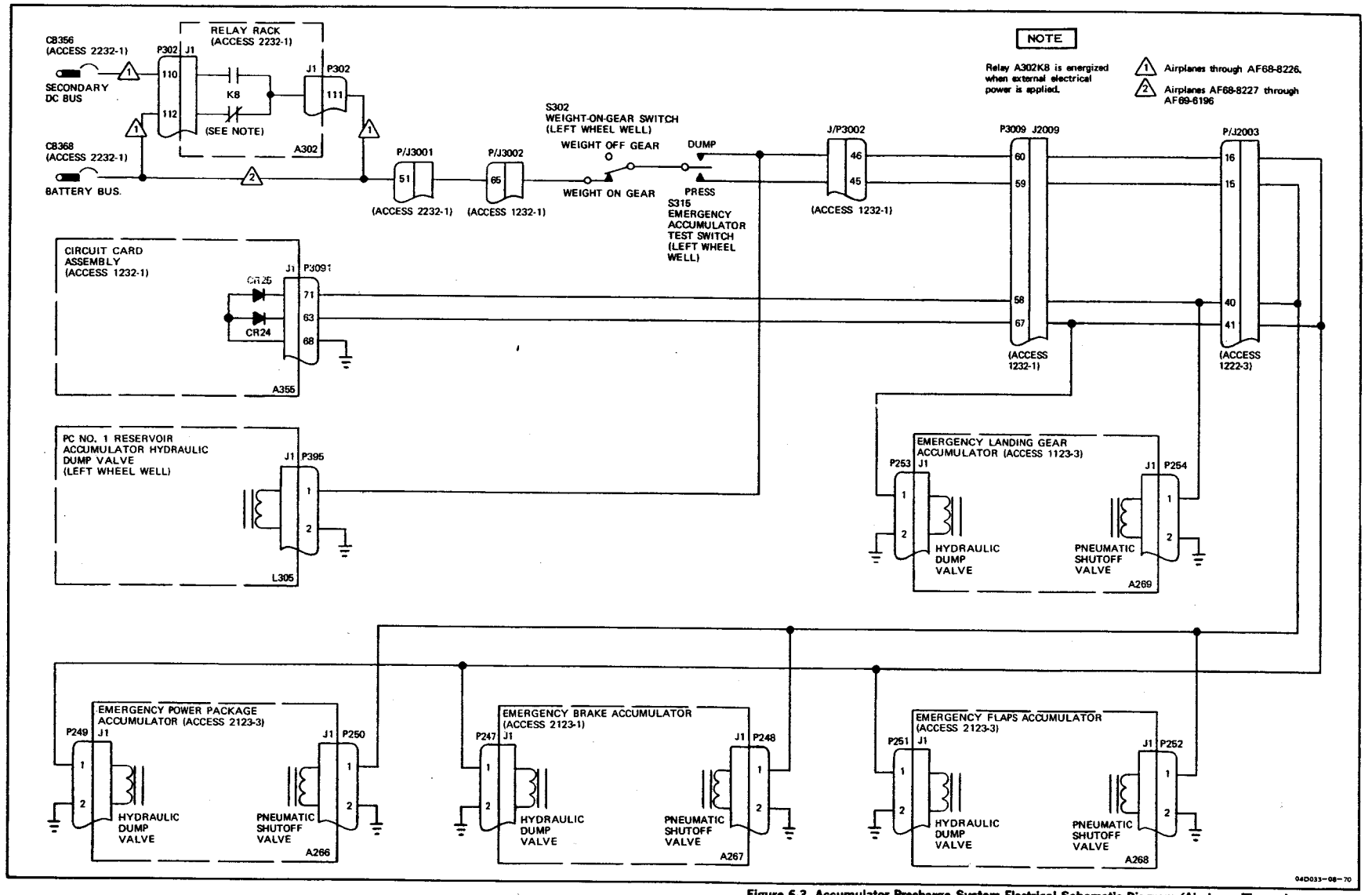


Figure 6-3. Accumulator Precharge System Electrical Schematic Diagram (Airplanes Through AF69-6196)

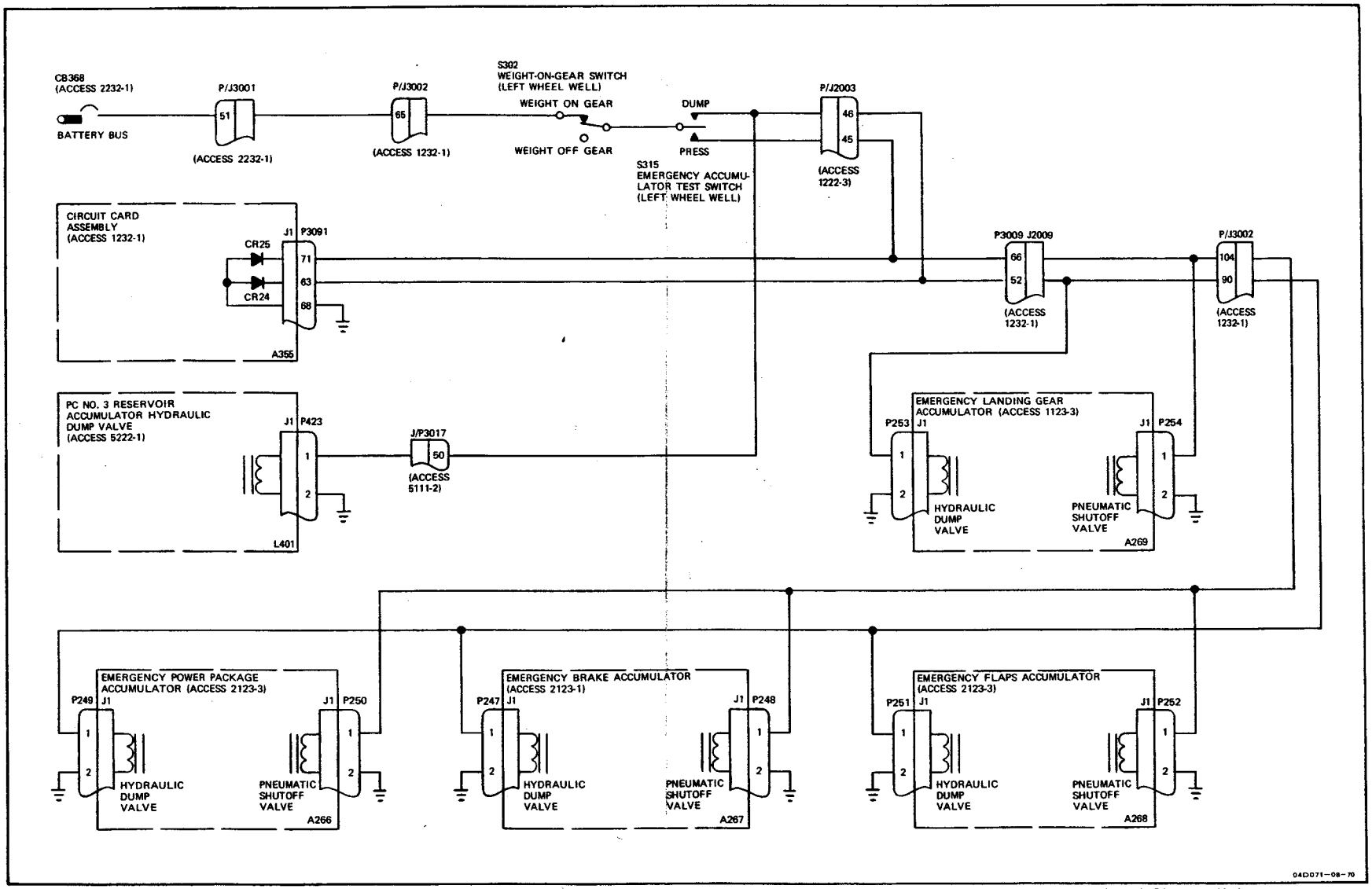


Figure 6-4. Accumulator Precharge System Electrical Schematic Diagram (Airplanes AF69-6197 and Subsequent)

6-14. COMPONENTS.

6-15. For a list of system components, their location (access), and function, refer to table 6-1.

Table 6-1. Accumulator Precharge System Components

Component	Access	Function
Filler valve and gage assembly[1]	Right wheel well	Provides a point for pressure checking, precharging, and depressurizing PC No. 3 surge damper accumulator (station No. 10)
Package, accumulator filler valves and gages	Right wheel well	Provides a single point for pressure checking, precharging, and depressurizing hydraulic accumulators (stations No. 1 through 9).
Switch, emergency accumulator test	Right wheel well	Controls solenoid-operated valves in emergency accumulators and the reservoir accumulator dump valve.
Valve, shutoff, emergency accumulator	Right wheel well	Manually opened to charge emergency flaps, brake, and landing gear accumulators with hydraulic fluid from PC No. 2 supply system. Closed to isolate emergency accumulator charging circuit from PC system.

[1]Airplanes AF69-6197 and subsequent

6-16. OPERATIONAL CHECKOUT.

NOTE

A number, or numbers, enclosed in parentheses at the end of a step in the following checkout is a reference to a corresponding number in troubleshooting table 6-2.

a. Precharge accumulators (T.O. 1A-7D-2-1). (1, 2, 3, and 4)

b. Hydraulically charge the emergency accumulators (stations 4, 6, 7, and 9), but leave the emergency accumulator shutoff valve open (T.O. 1A-7D-2-1).

c. Check and record pressures indicated on accumulator filler valve package for stations 4, 6, 7, and 9 (T.O. 1A-7D-2-1).

NOTE

A pressure drop of 200 psi or less may occur due to temperature stabilization after servicing.

d. After 5 minutes, check accumulator pressures again. Pressure drop must not exceed 200 psi on any accumulator. (5)

e. Place emergency accumulator shutoff valve handle in CLOSE.

6-17. TROUBLESHOOTING. (See figures 6-3 and 6-4.)

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Connect external electrical power
	Multimeter	AN/PSM-6	Check for voltage and circuit continuity

6-18. Refer to table 6-2 for troubleshooting information. Malfunctions in the table are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

Table 6-2. Accumulator Precharge System Troubleshooting

Malfunction	Corrective Action
1. Emergency accumulator (stations 4, 6, 7, or 9) cannot be pressurized.	a. If only one accumulator cannot be pressurized, proceed to step b. If all accumulators cannot be pressurized, perform the following: 1. Check that circuit breaker CB368 (CB356 on airplanes through AF68-8226) is closed. If required, close circuit breaker. If circuit breaker will not remain closed, check for defective circuit breaker, wiring, or diode CR25 and repair as required. 2. If circuit breaker is closed, check for defective weight-on-gear switch S302 or accumulator test switch S315. Replace defective switch as required. 3. If switches check good, check for defective wiring and repair as required. b. Using soap solution, check charge and bleed valve, pressure gage, and all line connections for leakage. Repair leaks as required. Proceed to step c if no leaks are found. c. Disconnect electrical connector from pneumatic shutoff valve of accumulator that cannot be pressurized. Place emergency accumulator test switch in PRESS and check for 28 volts dc across pins 1 and 2 of connector. If voltage is present, replace accumulator. If voltage is not present, check for continuity between pin 2 and ground and between pin 1 and splice. Repair defective wiring as required.
2. Utility accumulator (station 1, 2, 3, 5, 8, or 10*) cannot be pressurized.	a. Using soap solution, check charge and bleed valve, pressure gage, and all line connections for leakage. Repair leaks as required.
3. Emergency accumulator (station 4, 6, 7 or 9) cannot be dumped.	a. If only one accumulator cannot be dumped, proceed to step b. If all accumulators cannot be dumped, perform the following: 1. Check that circuit breaker CB368 (CB356 on airplanes through AF68-8226) is closed. If required, close circuit breaker. If circuit breaker will not remain closed, check for defective circuit breaker, wiring, or diode CR24 and repair as required.

Table 6-2. Accumulator Precharge System Troubleshooting (continued)

Malfunction	Corrective Action
	2. If circuit breaker is closed, check for defective weight-on-gear switch S302 or accumulator test switch S315. Replace defective switch as required.
WARNING Exercise extreme care when disconnecting hydraulic lines. A defective check valve could maintain high pressure fluid in the accumulator dump lines.	3. If switches check good, check for defective wiring and repair as required. 4. If wiring checks good, check for defective accumulator dump line check valve. b. Disconnect electrical connector from dump valve of accumulator that will not dump. Place emergency accumulator test switch in DUMP and check for 28 volts dc across pins 1 and 2 of connector. If voltage is present, replace accumulator. If voltage is not present, check continuity between pin 2 and ground and between pin 1 and splice. Repair defective wiring as required.
4. Reservoir accumulator (station 2) cannot be dumped.	a. Disconnect electrical connector from reservoir accumulator dump valve. Place test switch in DUMP and check for 28 volts dc across pins 1 and 2 of connector. If voltage is present, replace dump valve (paragraph 1-68 or 3-47). If voltage is not present, check for continuity between pin 2 and ground and between pin 1 and splice. Repair defective wiring as required.
5. Pressure drop on accumulator exceeds 200 psi.	a. Using soap solution, check charge and bleed valve, pressure gage, and all line connections for leaks. Repair leaks as required. If no leaks are found, proceed to step b. b. Perform internal leakage check (paragraph 6-20). Replace accumulator if leakage is excessive. If leakage is acceptable, proceed to step c. c. For excessive pressure drop on emergency accumulator (stations 4, 6, 7 or 9), perform the following: 1. Place accumulator test switch in DUMP for approximately 1 minute.
WARNING Ensure accumulator is dumped and exercise extreme care when disconnecting hydraulic lines. A defective relief valve could result in high pressure fluid release and subsequent injury to personnel.	2. Verify approximate precharge pressure on station gage. 3. Disconnect hydraulic line from return port of accumulator. Remove residual fluid from opened port. 4. With accumulator shutoff valve open, slowly apply 3,000 psi pressure to PC No. 2 system. 5. Leakage shall not exceed 2 drops in 30 minutes. If leakage is excessive, replace accumulator. If leakage is acceptable, shut down hydraulic power, reconnect line to return port, and proceed to substep 6.
NOTE If check valve cannot be bench checked, replace valve and repeat operational checkout.	6. Remove fill port check valve and bench check for leakage. If leakage through valve (with 3,000 psig applied) exceeds 3 drops in last 3 minutes of 5-minute test period, replace check valve.

*Station No. 10 on airplanes AF 69-6197 and subsequent

6-19. ACCUMULATOR INTERNAL LEAKAGE CHECK.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Beaker, 20 cc	Catch expelled hydraulic fluid
	(Local fabrication)	Bleed line	Connect charge and bleed valve to beaker

6-20. LEAKAGE CHECK.

a. Place battery switch in BATT (not required for stations 3, 8, and 10).

CAUTION

When accumulators are depressurized, wheel brakes will not be available unless engine is operating or external hydraulic power is applied.

b. Place emergency accumulator test switch in DUMP and hold for 1 minute (not required for stations 3, 8, and 10). Check that all stations indicate a minimum of 500 psi precharge.

c. Attach bleed hose to charge and bleed valve and place other end in beaker.

NOTE

If any fluid is drained from station 1 (arresting gear accumulator) or station 5 (wheel brake accumulator), replace that component.

d. Slowly open charge and bleed valve and bleed pneumatic pressure to zero. Catch all hydraulic fluid expelled through valve. If fluid collected is less than 10 cc, accumulator is satisfactory. If 10 cc to maximum of 16.4 cc of fluid is drained from air side of accumulator, recheck after 10 flight hours. If fluid accumulation after 10 flight hours is not in excess of 3.3 cc, the accumulator will be considered serviceable.

e. Remove bleed hose.

f. Service accumulators pneumatically (T.O. 1A-7D-2-1).

6-21. SERVICING.

6-22. For accumulator precharge system servicing, refer to T.O. 1A-7D-2-1.

6-23. ACCUMULATOR FILLER VALVE PACKAGE REMOVAL AND INSTALLATION.

6-24. REMOVAL. (See figure 6-5.)

WARNING

Ensure that pneumatic pressure in accumulators is zero before disconnecting lines or components. High pressure can cause serious injury.

CAUTION

When accumulators are depressurized, wheel brakes will not be available unless engine is operating or external hydraulic power is applied.

a. Reduce pneumatic pressure to zero in all accumulators pressurized through accumulator filler valve package (T.O. 1A-7D-2-1).

☆U.S. GOVERNMENT PRINTING OFFICE: 1983— 674-189

b. Remove nut, screw, and clamp securing wire bundle (aft and above primary and secondary precheck valves in left wheel well).

c. Disconnect pneumatic lines (1) from accumulator filler valve package.

NOTE

Bolts securing filler valve package are removed from left wheel well.

d. Cut lockwire and remove bolts (2), washers (3), and spacers (4) securing filler assembly to keel, and remove accumulator filler valve package (5).

6-25. INSTALLATION. (See figure 6-5.)

a. Position accumulator filler valve package (5) to keel and secure with spacers (4), washers (3), and bolts (2). Bolts are inserted from left wheel well. Secure bolts with MS20995C32 lockwire.

b. Secure wire bundle with clamp, screw, and nut.

c. Connect pneumatic lines (1) to filler assembly.

d. Service accumulators (T.O. 1A-7D-2-1).

e. Check for leakage by applying soap solution at valve line fittings and at gage, and charge and bleed valve ports. Wipe solution from fittings when check is completed.

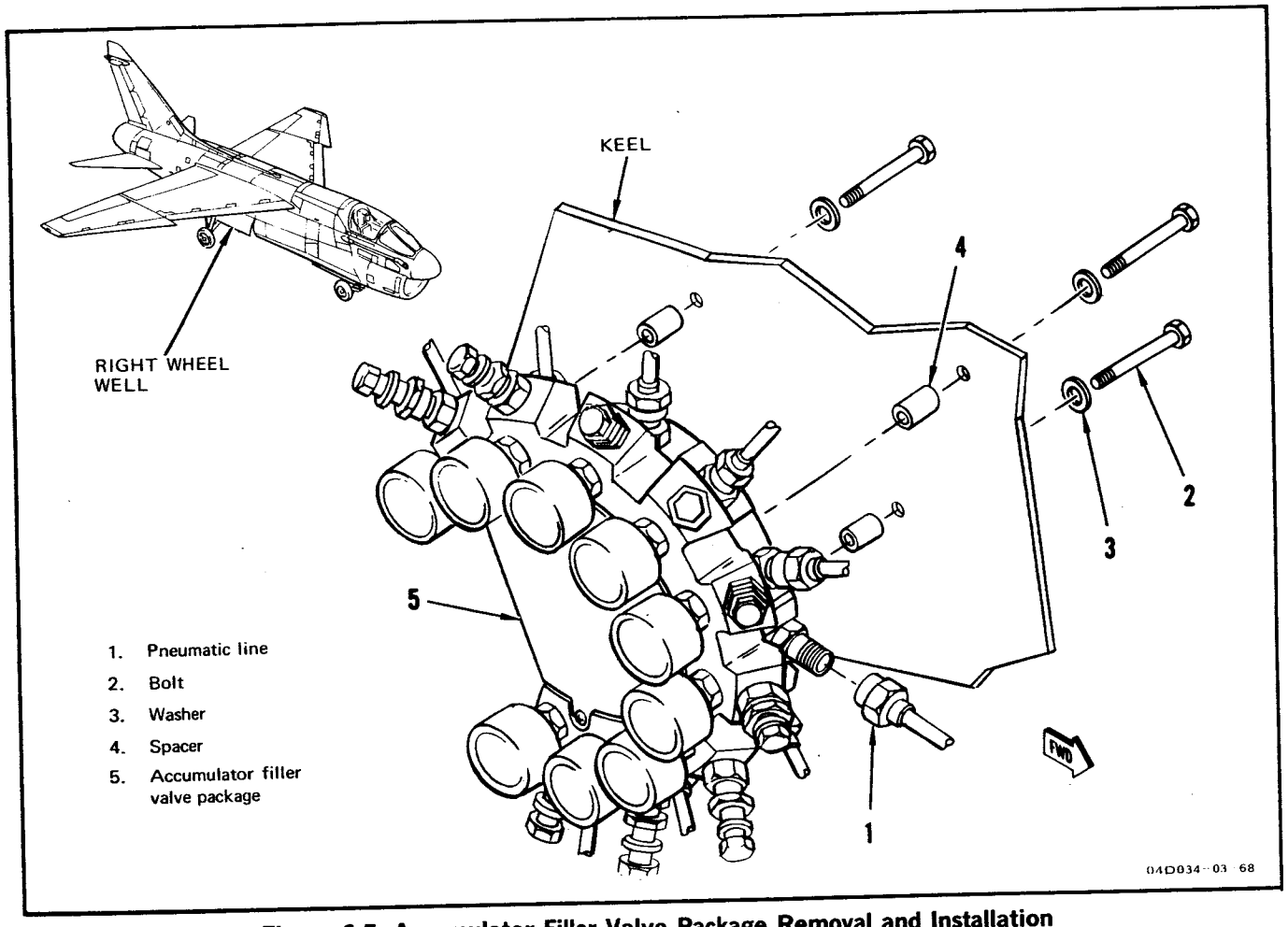


Figure 6-5. Accumulator Filler Valve Package Removal and Installation

6-26. CHARGE AND BLEED VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	MIL-H-4034	Torque wrench, 10 to 150 pound-inches	Tighten charge and bleed valve

6-27. REMOVAL. (See figure 6-6.)

WARNING

Ensure that pneumatic pressure in accumulators is zero before removing charge and bleed valve. High pressure can cause serious injury.

CAUTION

When accumulators are depressurized, wheel brakes will not be available unless engine is operating or external hydraulic power is applied.

a. Depressurize all accumulators (T.O. 1A-7D-2-1) pressurized through accumulator filler valve package.

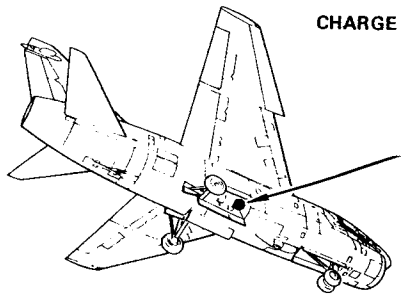
b. Cut and remove lockwire.

c. Loosen valve locknut and remove accumulator filler valve package charge and bleed valve (1) and packing (2) from housing.

6-28. INSTALLATION. (See figure 6-6.)

a. Clean mating surface on filler valve package housing and ensure surface is free of nicks and scratches.

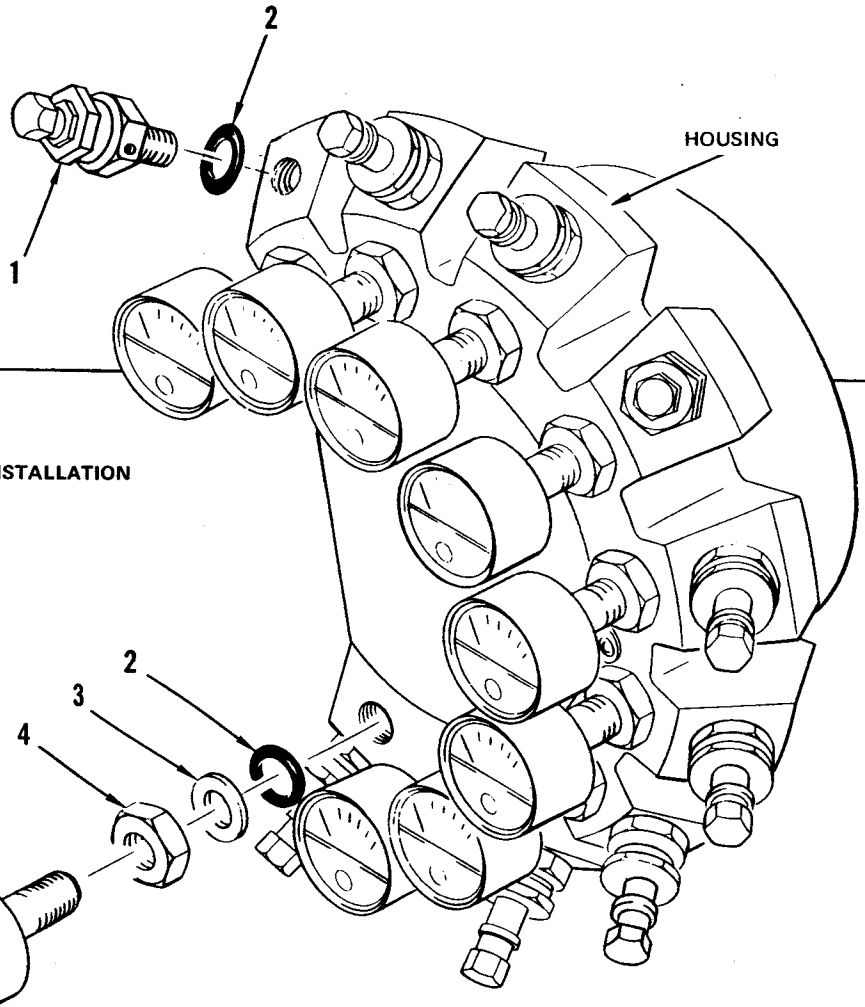
b. Lubricate new packing (2) with MIL-L-4343 grease and install packing on charge and bleed valve (1).



CHARGE AND BLEED VALVE REMOVAL AND INSTALLATION

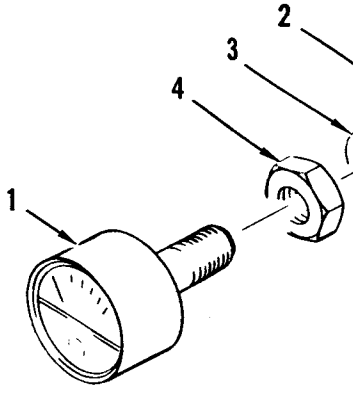
RIGHT WHEEL WELL

1. Charge and bleed valve
2. Packing



PRESSURE GAGE REMOVAL AND INSTALLATION

1. Pressure gage
2. Packing
3. Retainer
4. Locknut



NOTE

Stations 1 through 9 installation shown; typical for station 10.

04D012-03-70

Figure 6-6. Charge and Bleed Valve and Pressure Gage Removal and Installation

c. Install valve in housing and tighten valve body to 105 (±5) pound-inches torque.

d. Secure valve to housing with MS20995C32 lockwire.

e. Service accumulators pneumatically (T.O. 1A-7D-2-1) and check charge valve for leakage.

f. Tighten charge valve locknut to 60 (±10) pound-inches torque.

g. Tighten dust cap to extreme finger-tightness.

6-29. PRESSURE GAGE REMOVAL AND INSTALLATION.

6-30. REMOVAL. (See figure 6-6.)

WARNING

Ensure that pneumatic pressure in accumulators is zero before removing pressure gage. High pressure can cause serious injury.

CAUTION

When accumulators are depressurized, wheel brakes will not be available unless engine is operating or external hydraulic power is applied.

a. Depressurize all accumulators (T.O. 1A-7D-2-1).

b. Loosen locknut on gage.

c. Remove accumulator filler valve package pressure gage (1), packing (2), retainer (3), and locknut (4).

6-31. INSTALLATION. (See figure 6-6.)

a. Position locknut (4) on gage stem.

b. Using new retainer (3) and new packing (2), install accumulator filler valve package pressure gage (1) in housing.

c. Tighten locknut to secure gage to filler.

d. Service accumulators pneumatically (T.O. 1A-7D-2-1) and check pressure gage for leakage.

6-32. EMERGENCY ACCUMULATOR SHUTOFF VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Connect external electrical power
		Equipment required for connecting external hydraulic power	Connect external hydraulic power

6-33. REMOVAL. (See figure 6-7.)

NOTE

The emergency accumulator shutoff valve is located in the right wheel well.

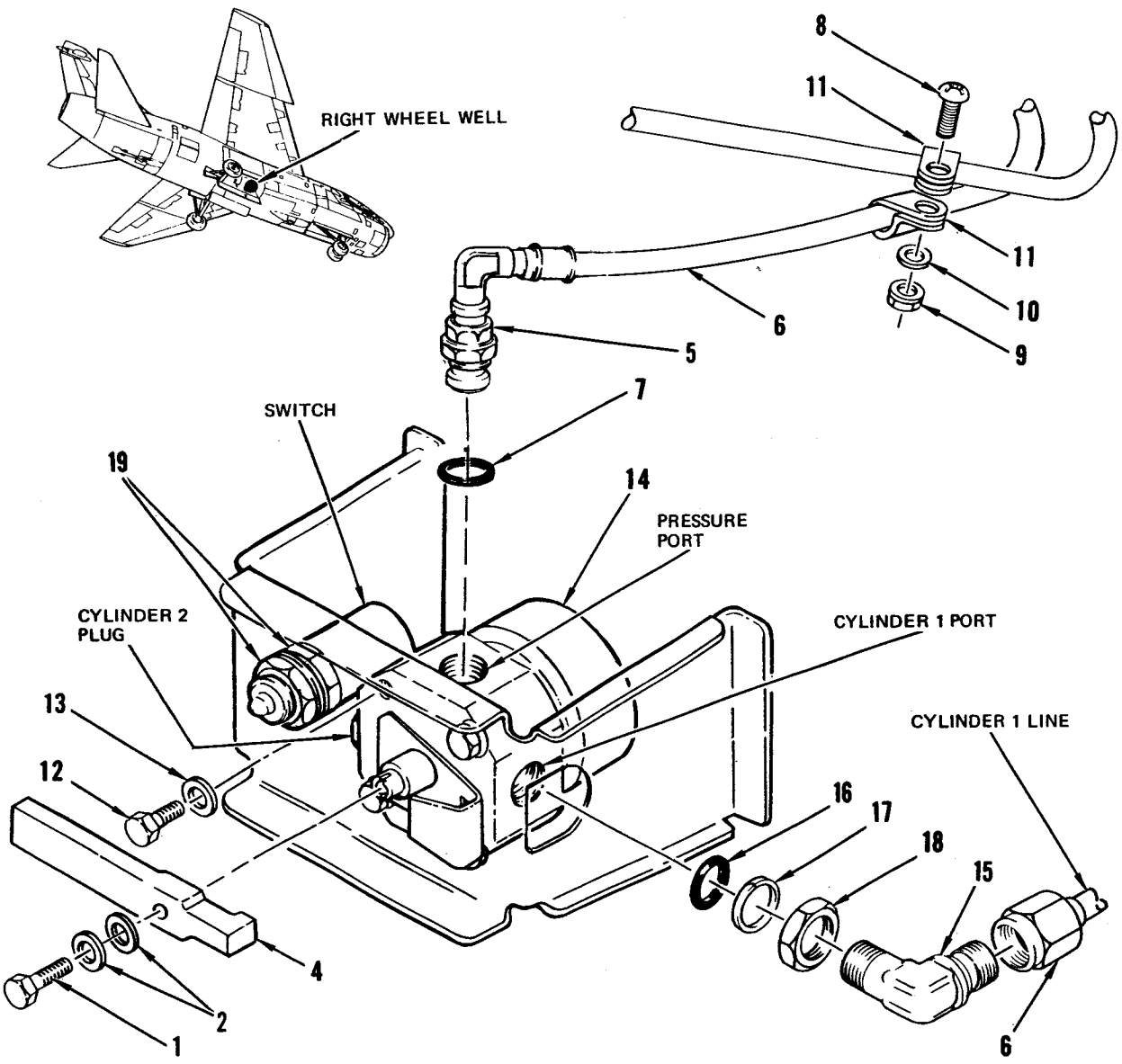
a. Dump hydraulic pressure in all emergency accumulators (T.O. 1A-7D-2-1).

b. Cut lockwire and remove bolt (1) and washers (2). Remove handle (4) from valve.

CAUTION

To prevent damage to brazed fitting, ensure that fitting jamnut is loosened before removal of fitting is attempted.

c. Loosen jamnut (5). Disconnect and cap hydraulic lines (6) and remove packing (7).



1. Bolt
2. Washer
3. Deleted
4. Handle
5. Brazed fitting jamnut
6. Hydraulic line
7. Packing
8. Screw
9. Nut
10. Washer
11. Clamp
12. Bolt
13. Washer
14. Emergency accumulator shutoff valve
15. Elbow
16. Packing
17. Retainer
18. Jamnut
19. Locknut

04D013-09-76

Figure 6-7. Emergency Accumulator Shutoff Valve Removal and Installation

d. Remove screw (8), nut (9), washer (10), and clamps (11).

e. Cut lockwire and remove bolts (12) and washers (13). Remove emergency accumulator shutoff valve (14) from airplane.

f. Loosen jamnut and remove elbow (15), packing (16), retainer (17), and jamnut (18).

6-34. INSTALLATION. (See figure 6-7.)

a. Install jamnut (18), new retainer (17), and new packing (16) on elbow.

b. Install elbow (15) in valve. Do not tighten jamnut (18).

c. Check that both plugs are installed in return and cylinder 2 ports and that both are secured with MS20995C32 lockwire.

d. Position emergency accumulator shutoff valve (14) to bracket and secure with washers (13) and bolts (12).

e. Secure bolts (12) with MS20995C32 lockwire.

f. Position clamps (11) and secure with washer (10), nut (9), and screw (8).

g. Using new packing (7), uncap and connect hydraulic lines (6) to valve. Tighten hydraulic line to cylinder 1 port finger-tight. Tighten jamnuts (18 and 5).

h. Bleed valve and line by operating hand pump until air-free fluid flows from cylinder 1 line. Tighten hydraulic line.

i. Install handle (4) with washers (2) and bolt (1). Secure bolt with MS20995C32 lockwire.

j. Check that switch overtravel is 0.060 (+0.020, −0.000) inch when handle (4) is in CLOSE.

k. If switch requires adjustment, cut lockwire and loosen locknuts (19). Adjust switch to values specified in step j. Tighten locknuts and secure with MS20995C32 lockwire.

WARNING

Voltage used can cause arcing which may result in severe burns. Remove watches, rings and other jewelry that can cause a shock/burn hazard.

l. Connect external electrical power (T.O. 1A-7D-2-1).

m. Check that handle (4) can be moved down 90° to OPEN and that emergency accumulator isolation caution light comes on.

n. Check that caution light goes off when handle is in CLOSE.

o. Connect external hydraulic power to PC No. 2 system (T.O. 1A-7D-2-1).

p. Position valve handle to OPEN. Check that filler gages indicate that emergency accumulators (stations 4, 7, and 9) are charged (T.O. 1A-7D-2-1).

q. Position valve handle to CLOSE and check for leaks.

r. Disconnect external electrical and hydraulic power (T.O. 1A-7D-2-1).

s. Perform hydraulic system air check (T.O. 1A-7D-2-1).

6-35. EMERGENCY ACCUMULATOR EXCESSIVE LEAKAGE CHECK.

FIGURE AND INDEX	PART NO.	NOMENCLATURE	USE AND APPLICATION
Tables A-10 thru A-14	MIL-G-8348 Class A, Size 4 (or equivalent)	Air pressure gage assembly	Monitor Air Charge
		Equipment required for connecting external/hydraulic power	Connect External Hydraulic Power
		Equipment required for connecting external electrical power	Connect External Electrical Power

6-36. LEAKAGE CHECK (Tables A-10 thru A-14).

a. Perform internal leak check (paragraph 6-19).

b. Install test gage assembly swivel nut on service fitting of appropriate accumulator.

c. After determining the ambient temperature, refer to the accumulator precharge pressure table on the right hand main landing gear to determine proper precharge.

d. Using nitrogen source, precharge the accumulator to the value specified (+ 50/-0 PSI), by placing the emergency accumulator test switch in PRESS position.

e. Hydraulically charge the accumulators by connecting an external hydraulic power supply unit to the PC-2 system. Adjust the hydraulic power supply unit to provide 3050 (+ 100/-0 PSI), open the manually-operated emergency accumulator isolation valve. After a one-minute charging period, close the valve. Verify that the accumulators are charged by placing the emergency accumulator test switch to PRESS position.

NOTE

It is assumed that hydraulic charging of the accumulators will be accomplished immediately after the precharging tasks. Should there be a delay between performance of these tasks, note the ambient temperature at the time of hydraulic charging for use later in this test procedure.

f. The three accumulators equipped with heater blankets must be electrically powered immediately after charged with hydraulic fluid and remain electrically powered throughout the duration of the test period.

g. Following the test period, the emergency landing gear, flap and EPP extension accumulators should be checked by placing the emergency accumulator test switch in PRESS position.

h. The readings observed on the test gage assembly should be compared to the minimum acceptable pressure shown on the applicable table.

i. The emergency and utility brake accumulators are not provided with a heater blanket, the ambient temperature existing at the conclusion of the test period must be noted. The pressure observed at the end of the test should be compared to the value shown on the chart defining the ambient temperature at the time the accumulator was hydraulically charged. Locate the column on the chart for the ambient temperature noted at the conclusion of the test period. The minimum acceptable pressure is shown on the line denoting the length of time that has elapsed from initial charging to final checking of the accumulator. If ambient temperature does not agree with a specific column in the leakage table, interpolation to the precise temperature can be determined.

j. If the observed pressure at the conclusion of the test is less than the minimum shown, excessive leakage has occurred in the system. Troubleshooting of the system components will be required to isolate the defective component.

k. Any component replacement will require a retest of the affected accumulator circuit to verify system integrity.

l. If accumulators pass the leakage checks, place the emergency accumulator test switch in DUMP.

m. Disconnect external hydraulic and electrical powers.

APPENDIX A
GENERAL MAINTENANCE INFORMATION

A-1. GENERAL.

A-2. This appendix provides general hydraulic and pneumatic systems maintenance information. Overall system schematics (figures A-1 through A-4) are included to show connections between the supply systems and supplied circuits.

A-3. TORQUING.

A-4. GENERAL INFORMATION.

a. Hydraulic and pneumatic fittings should be tightened to torque values specified in tables A-1 through A-8 and figure A-5. Do not overtighten. Overtightening causes distortion, binding of sliding parts, kinks, sharp bends, and dents. This may result in sufficient restriction and back pressure to cause faulty operation of, or damage to, hydraulic and pneumatic lines.

b. Torquing of a pattern of nuts and bolts should be accomplished in at least two stages. Recommended tightening sequences are shown in figure A-6. Odd-shaped flanges and covers should be tightened evenly by alternating bolts.

c. Torquing of two or more fittings, fitting jamnuts, locknuts, and brazed universal fittings installed in a component shall be done alternately and progressively. Continue alternate retorquing until no torque loss is indicated.

d. Wherever a range of torque values is given and torque is being applied to a nut, installation should be as close as possible to the center value of the range. However, when torque is applied to a bolt, the higher figure in the range should be used.

e. If a crow-foot adapter is used on a torque wrench, the torque wrench dial indication shall be recalculated.

f. Torque values for aluminum nuts on aluminum bolts are given in table A-1.

g. Torque values for steel nuts on steel bolts are given in table A-2.

h. Torque values for bolt and screw installations through Metalite are given in table A-3.

i. Torque values for nuts on tube and hose assemblies are given in table A-4.

j. Torque values for jamnuts and shoulder type fittings (union, plugs, locknuts, etc) are given in table A-5.

k. Torque values for steel and aluminum plugs installed in a cylinder boss are given in table A-6.

l. Torque values for steel and aluminum bleed fittings installed in a cylinder boss are given in table A-7.

m. Where torque values for both steel and aluminum fittings are listed in tables A-6 and A-7, either type may be used. Where only torque values for aluminum are provided, only aluminum fittings may be used.

CAUTION

When installing the CVC4202 bleed fitting assembly, torque values given in table A-7 shall be applied to the wrenching flats of the retainer part of the fitting assembly only.

NOTE

The CVC4202 bleed fitting assembly consists of the CVC4204-1 bleed plug and a CVC4203-2 retainer. The bleed plug may be found installed directly into a cylinder boss or into the CVC4203 retainer. In any event, the bleed plug shall be tightened to 10 (±5) pound-inches of torque and shall have a minimum gap of 0.010 inch between bleed plug and retainer or cylinder boss when installed in cylinder. If gap is less than 0.010 inch after application of proper torque, the bleed plug shall be replaced.

n. Torque values for CVC4202 bleed fitting assemblies are given in table A-7.

o. Torque values for brazed universal boss fittings are given in table A-8.

A-5. FLARELESS FITTINGS.

CAUTION

Do not tighten nut beyond 1/3 turn (two flats on hex nut). Tightening beyond this point will permanently damage sleeve and tube. Brazed tube assembly fitting and installation and removal requires extra care to prevent bending of the brazed tube assembly, particularly the heat softened zone adjacent to the brazed area at the end of the fittings.

a. Torque flareless fittings as follows:

1. Insert tube into fitting; ensure that sealing surfaces are not scratched during installation.

2. Align tube assembly so nut can be turned with finger pressure (figure A-7). Do not use nut to draw the sleeve to the fitting.

3. Using the proper size wrench, tighten nut until a sharp increase in torque is felt. Do not rotate tube in sleeve after this step is accomplished.

4. Hold fitting with a wrench to prevent misalignment and tighten tube nut 1/4 turn (one and one-half flats on hex nut) as shown in figure A-5.

5. Apply a torque stripe to connection in a straight line parallel to the centerline of tube. This identifies the tube as having been properly tightened to 1/4 turn.

6. If connection leaks during pressure check, perform the following:

(a) Shut down hydraulic pressure.

(b) Loosen tube nut one full turn. Do not remove the torque stripe.

(c) Tighten tube nut until torque stripe is aligned.

(d) Pressure check connection. If connection does not leak, do not alter torque stripe.

(e) If connection leaks, shut down hydraulic pressure and overtighten tube nut up to 1/12 turn (1/2 flat on hex nut).

(f) Pressure check connection. If connection does not leak, do not remove torque stripe. Install a second torque stripe adjacent to the first. A connection with a broken and an unbroken torque stripe indicates that connection has been torqued to the maximum.

7. If leakage persists, install CVC4228 (-3 through -16) seal in tube connection. Dash number after seal part number indicates size of tubing on which seal is to be used. Retorque tube nut and check for leakage.

8. If leakage still persists, perform the following:

(a) Remove torque stripes.

(b) Disassemble connection and inspect fitting for evidence of gouges, cracks, and deformation. Install new fitting if required.

(c) If leak occurred elsewhere on connection, a new tube assembly must be fabricated and installed.

A-6. FLARED FITTINGS, TUBING, AND HOSE.

a. Push nut back from flare and align tubing. With tubing aligned, tighten nut finger-tight.

CAUTION

Overtightening will cause the flare to be damaged and the joint to be weakened and may cause the fitting threads to strip.

b. Tighten to middle of minimum and maximum torque values in table A-4.

A-7. HYDRAULIC SYSTEMS LEAKAGE.

A-7A. Refer to paragraph A-5 for correcting leakage at flareless fittings.

A-8. To determine the maximum allowable leakage rate for hydraulic system components, see figure A-8. Each component shown is identified by descriptive nomenclature. If allowable leakage is not given, the leakage shall be zero.

A-9. Any component showing signs of leakage should be wiped dry and then operated in a closed system to determine the leakage rate.

NOTE

Any actuator that fails an external leakage test shall be recycled several times and

retested. Units which pass a second leakage test are acceptable. No actuator shall be replaced due to external leakage until it has been retested at least once.

a. Definitions:

1. Zero leakage — Leakage which is insufficient to form a drop.

2. One drop — 1/20 of a cubic centimeter.

3. Cycle — The movement of a component through its entire range of travel.

A-10. HYDRAULIC SYSTEM FILTER ELEMENTS.

A-11. For location and part number of hydraulic system filter elements, refer to table A-9.

A-11A. HYDRAULIC FILTER DIFFERENTIAL PRESSURE INDICATOR TESTING.

NOTE

PC No. 1, PC No. 2, and PC No. 3 pressure line filters, PC No. 1 and PC No. 3 filler and pump cooling line filters, and emergency power control (EPP) filters incorporate a thermal lockout mechanism that prevents indicator extension at less than 50°F. Testing cannot be accomplished on these filters if temperature is less than 50°F. The gun drive filter and the PC 2 filler and pump cooling line filter cannot be tested while installed on the airplane.

A-11B. Procedures in paragraphs A-11C through A-11M are to be performed when there is reason to suspect that indicators are not extending within normal pressure range.

A-11C. PC NO. 1 PRESSURE LINE FILTER.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
A-8A	(Local fabrication)	Filter indicator test gage assembly	Check hydraulic pressure required to extend filter indicator

Tools Required (continued)

Figure & Index No.	Part Number	Nomenclature	Use and Application
	HSU-1	Hydraulic servicing unit	Provide hydraulic pressure
	GGG-W-686	Torque wrench, 0 to 50 pound-feet	Tighten filter bowl

a. On airplanes through AF69-6196, dump reservoir accumulator hydraulic pressure (T.O. 1A-7D-2-1).

b. Remove one cap (5, figure A-8A) from cross (6) on indicator test gage assembly, and connect hose of hydraulic servicing unit to cross.

c. Bleed air from test gage assembly as follows:

1. Loosen remaining cap (5) on cross.

2. Loosen fitting on each leg of assembly.

3. Actuate servicing unit hand pump.

4. Tighten each fitting as fluid flow becomes air free.

d. Connect test gage assembly quick-disconnect coupling half (10) to PC No. 1 pressure ground test quick-disconnect (figure A-8B). Support gage in upright position.

WARNING

Fluid in filter will be hot if system has been in operation.

e. Cut lockwire and unscrew filter bowl.

f. Remove element and bowl. Leave element in bowl and install protective covers on bowl and on filter head.

CAUTION

To prevent damage to filter head diaphragm, do not exceed 100 psig. Fluid will be pumped into a dead end line and pressure buildup will be instantaneous.

g. Observing pressure gage on test gage assembly, actuate servicing unit hand pump very slowly.

h. Check that indicator extends at 60 to 80 psig and there is no leakage around diaphragm in filter head in 1 minute.

i. If there is leakage from filter head diaphragm or if indicator does not extend within specified pressure range, replace filter assembly.

j. If there is no leakage and indicator extension is normal loosen cap (5, figure A-8A) on cross (6) to relieve pressure trapped in filter. Leave cap loose.

k. Depress and then release indicator. If indicator does not lock in depressed position, replace filter assembly.

l. Fill bowl and element with clean MIL-H-83282 hydraulic fluid.

NOTE

Ensure that filter element retainer spring is installed in filter head.

m. With cap (5) still loose, install bowl in filter head. Tighten bowl to 25 to 35 pound-feet torque.

n. Disconnect test gage assembly from PC No. 1 pressure ground test quick-disconnect.

o. Secure bowl to filter head with MS20995C32 lockwire.

p. On airplanes through AF69-6196, hydraulically charge emergency accumulators (T.O. 1A-7D-2-1).

q. Perform hydraulic system air check (T.O. 1A-7D-2-1), and while pressure is applied, ensure there are no leaks at filter.

A-11D. PC NO. 2 PRESSURE LINE FILTER.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
A-8A	(Local fabrication)	Filter indicator test gage assembly	Check hydraulic pressure required to extend filter indicator
	HSU-1	Hydraulic servicing unit	Provide hydraulic pressure
	GGG-W-686	Torque wrench, 0 to 50 pound-feet	Tighten filter bowl

a. Remove one cap (5, figure A-8A) from cross (6) on indicator test gage assembly, and connect hose of hydraulic servicing unit to cross.

b. Bleed air from test gage assembly as follows:

1. Loosen remaining cap (5) on cross.

2. Loosen fitting on each leg of assembly.

3. Actuate servicing unit hand pump.

4. Tighten each fitting as fluid flow becomes air free.

c. Connect test gage assembly quick-disconnect coupling half (10) to PC No. 2 pressure ground test quick-disconnect (figure A-8C). Support gage in upright position.

WARNING

Fluid in filter will be hot if system has been in operation.

d. Cut lockwire and unscrew filter bowl.

e. Remove element and bowl. Leave Element in bowl and install protective covers on bowl and on filter head.

CAUTION

To prevent damage to filter head diaphragm, do not exceed 100 psig. Fluid will be pumped into a dead end line and pressure buildup will be instantaneous.

f. Observing pressure gage on test gage assembly, actuate servicing unit hand pump very slowly.

g. Check that indicator extends at 60 to 80 psig and there is no leakage from diaphragm in filter head in 1 minute.

h. If there is leakage from filter head diaphragm or if indicator does not extend within specified pressure range, replace filter assembly.

i. If there is no leakage and indicator extension is normal, loosen cap (5, figure A-8A) on cross (6) to relieve pressure trapped in filter. Leave cap loose.

j. Depress and then release indicator. If indicator does not lock in depressed position, replace filter assembly.

k. Fill bowl and element with clean MIL-H-83282 hydraulic fluid.

NOTE

Ensure that filter element retainer spring is installed in filter head.

l. With cap (5) still loose, install bowl in filter head. Tighten bowl to 25 to 35 pound-feet torque.

m. Disconnect test gage assembly from PC No. 2 pressure ground quick-disconnect.

n. Secure bowl to filter head with MS20995C32 lockwire.

o. Perform hydraulic system air check (T.O. 1A-7D-2-1), and while pressure is applied, ensure there is no leakage at filter.

A-11E. PC NO. 3 PRESSURE LINE FILTER.

a. Dump reservoir accumulator hydraulic pressure (T.O. 1A-7D-2-1).

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
A-8A	(Local fabrication)	Filter indicator test gage assembly	Check hydraulic pressure required to extend filter indicator
	HSU-1	Hydraulic servicing unit	Provide hydraulic pressure
	GGG-W-686	Torque wrench, 0 to 50 pound-feet	Tighten filter bowl

b. Open access 5222-1.

c. Remove one cap (5, figure A-8A) from cross (6) on indicator test gage assembly, and connect hose of hydraulic servicing unit to cross.

d. Bleed air from test gage assembly as follows:

1. Loosen remaining cap (5) on cross.

2. Loosen fitting on each leg of assembly.

3. Actuate servicing unit hand pump.

4. Tighten each fitting as fluid flow becomes air free.

e. Connect test gage assembly quick-disconnect coupling half (10) to PC No. 3 pressure ground test quick-disconnect (figure A-8D). Support gage in upright position.

NOTE

Fluid in filter will be hot if system has been in operation.

f. Cut lockwire and unscrew filter bowl.

g. Remove spring, element, and bowl. Leave element in bowl and install protective covers on bowl and on filter head.

CAUTION

To prevent damage to filter head diaphragm, do not exceed 100 psig. Fluid will be pumped into a dead end line and pressure buildup will be instantaneous.

h. Observing pressure gage on test gage assembly, actuate servicing unit hand pump very slowly.

i. Check that indicator extends at 60 to 80 psig and there is no leakage around diaphragm in filter head in 1 minute.

j. If there is leakage from filter head diaphragm or if indicator does not extend within specified pressure range, replace filter assembly.

k. If there is no leakage and indicator extension is normal, loosen cap (5, figure A-8A) on cross (6) to relieve pressure trapped in filter. Leave cap loose.

l. Depress and then release indicator. If indicator does not lock in depressed position, replace filter assembly.

m. Fill bowl and element with clean MIL-H-83282 hydraulic fluid.

n. With cap (5) still loose, install filter bowl and element in filter head. Tighten bowl to 12 to 15 pound-feet torque.

o. Disconnect test gage assembly from PC No. 3 pressure ground test quick-disconnect.

p. Secure filter bowl to filter head with MS20995C32 lockwire.

q. Hydraulically charge emergency accumulators (T.O. 1A-7D-2-1).

r. Perform hydraulic system air check (T.O. 1A-7D-2-1), and while pressure is applied, ensure there are no leaks at filter.

s. Check access 5222-1 for cleanness and freedom from foreign objects.

t. Close access 5222-1 and check for security.

A-11F. PC NO. 1 FILLER AND PUMP COOLING LINE FILTER.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
A-8A	(Local fabrication)	Filter indicator test gage assembly	Check hydraulic pressure required to extend filter indicator
	HSU-1	Hydraulic servicing unit	Provide hydraulic pressure
	GGG-W-686	Torque wrench, 0 to 50 pound-feet	Tighten filter bowl

a. On airplanes through AF69-6196, dump reservoir accumulator hydraulic pressure (T.O. 1A-7D-2-1).

b. Remove both caps (5, figure A-8A) from cross (6) on indicator test gage assembly, and connect hose of hydraulic servicing unit to one port of cross.

c. Connect MS28741-4 hose assembly (any length) to other port of cross and to PC No. 1 reservoir filler valve (figure A-8E).

d. Bleed air from test gage assembly as follows.

1. Loosen fitting on each leg of assembly.

2. Actuate servicing unit hand pump.

3. Tighten each fitting as fluid flow becomes air free.

e. Bleed air from MS28741-4 hose assembly by cracking connection at reservoir filler valve and actuating servicing unit hand pump until air-free fluid flows. Tighten connection.

WARNING

Fluid in filter will be hot if system has been in operation.

f. Cut lockwire and unscrew filter bowl.

g. Remove element and bowl. Leave element in

bowl and install protective covers on bowl and filter head.

CAUTION

To prevent actuation of the filter bypass, do not exceed 90 psig. Fluid will be pumped into a dead end line and pressure buildup will be instantaneous.

h. Observing pressure gage on test gage assembly, actuate servicing unit hand pump very slowly.

i. Check that indicator extends at 60 to 80 psig and there is no leakage around diaphragm in filter head in 1 minute.

j. If there is leakage from filter head diaphragm or if indicator does not extend within specified pressure range, replace filter assembly.

k. If there is no leakage and indicator extension is normal, depressurize filter by loosening filter inlet line. Leave line loose.

l. Depress and then release indicator. If indicator does not lock in depressed position, replace filter assembly.

m. Fill bowl and element with clean MIL-H-83282 hydraulic fluid.

NOTE

Ensure that filter element retainer spring is installed in filter head.

n. With filter inlet line still loose, install bowl in filter head. Tighten bowl to 10 to 15 pound-feet torque. Tighten filter inlet line and ensure indicator remains in depressed position.

o. Disconnect test gage assembly and MS28741-4 hose assembly from reservoir filler valve and replace cap on valve.

p. Secure bowl with MS20995C32 lockwire.

q. Perform hydraulic system air check (T.O. 1A-7D-2-1), and while pressure is applied, ensure there are no leaks at the filter.

r. Check wheel well for cleanness and freedom from foreign objects.

NOTE

If filter is on an airplane through AF69-6196, proceed to paragraph A-11K for emergency power control (EPP) filter-indicator testing.

A-11G. PC NO. 2 FILLER AND PUMP COOLING LINE FILTER.

A-11H. The PC No. 2 filler and pump cooling line filter cannot be tested on the airplane. Remove the filter and forward to IMA for testing. After reinstallation of filter, perform hydraulic system air check (T.O. 1A-7D-2-1), and while pressure is applied, ensure there are no leaks at filter.

A-11J. PC NO. 3 FILLER AND PUMP COOLING LINE FILTER.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
A-8A	(Local fabrication)	Filter indicator test gage assembly	Check hydraulic pressure required to extend filter indicator
	HSU-1	Hydraulic servicing unit	Provide hydraulic pressure
	GGG-W-686	Torque wrench, 0 to 50 pound-feet	Tighten filter bowl

a. Dump reservoir accumulator hydraulic pressure (T.O. 1A-7D-2-1).

b. Remove both caps (5, figure A-8A) from cross (6) on indicator test gage assembly, and connect hose of hydraulic servicing unit to one port of cross.

c. Connect one end of MS28741-4 hose assembly (any length) to other port of cross. Open access 5222-4 and connect other end of hose assembly to PC No. 3 reservoir filler valve (figure A-8F).

d. Bleed air from test gage assembly as follows:

1. Loosen fitting on each leg of assembly.

2. Actuate servicing unit hand pump.

3. Tighten each fitting as fluid flow becomes air free.

e. Bleed air from MS28741-4 hose assembly by cracking connection at reservoir filler valve and actuating servicing unit hand pump until air-free fluid flows. Tighten connection.

WARNING

Fluid in filter will be hot if system has been in operation.

f. Open access 5222-1, cut lockwire, and unscrew filter bowl.

g. Remove element and bowl. Leave element in bowl and install protective cover on bowl and filter head.

CAUTION

To prevent actuation of filter bypass, do not exceed 90 psig. Fluid will be pumped into a dead end line and pressure buildup will be instantaneous.

h. Observing pressure gage on test gage assembly, actuate servicing unit hand pump very slowly.

i. Check that indicator extends at 60 to 80 psig and there is no leakage at diaphragm in filter head in 1 minute.

j. If there is leakage from filter head diaphragm or if indicator does not extend within specified pressure range, replace filter assembly.

k. If there is no leakage and indicator extension is normal, depressurize filter by loosening filter inlet line. Leave line loose.

l. Depress and then release indicator. If indicator does not lock in depressed position, replace filter assembly.

m. Fill bowl and element with clean MIL-H-83282 hydraulic fluid.

NOTE

Ensure that filter element retainer spring is installed in filter head.

n. With filter inlet line still loose, install bowl in filter head. Tighten bowl to 10 to 15 pound-feet torque. Tighten filter inlet line.

o. Check wheel well for cleanness and freedom from foreign objects.

p. Perform procedure in paragraph A-11K to test emergency power control (EPP) filter indicator.

q. Disconnect hydraulic servicing unit and MS28741-4 hose from reservoir filler valve.

r. Perform hydraulic system air check (T.O. 1A-7D-2-1), and while pressure is applied, ensure there is no leakage at filter.

s. Secure bowl with MS20995C32 lockwire.

t. Check accesses 5222-4 and 5222-1 for cleanness and freedom from foreign objects.

u. Close accesses and check for security.

A-11K. PC NO. 1, PC NO. 3 EMERGENCY POWER CONTROL (EPP) FILTER.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	215-00268-1	Emergency power package safety lock	Prevent inadvertent retraction of emergency power package
	GGG-W-686	Torque wrench, 0 to 50 pound-feet	Tighten filter bowl

NOTE

This procedure is to be performed after PC No. 1 or PC No. 3 filler and pump cooling line filter indicator testing.

It is assumed that the filter indicator test gage assembly is still connected to PC No. 1 or PC No. 3, as applicable.

a. Using airplane hand pump, charge emergency power package accumulator.

b. Extend emergency power package.

WARNING

To prevent inadvertent retraction of emergency power package, ensure emergency power package safety lock is installed.

c. Install emergency power package safety lock.

d. Cut lockwire and unscrew EPP filter bowl from filter head.

e. Remove element and filter bowl. Leave element in bowl and install protective covers on bowl and on filter head.

CAUTION

To prevent actuation of the filter bypass, do not exceed 90 psig. Fluid will be pumped into a dead end line and pressure buildup will be instantaneous.

f. Observing pressure gage on test gage assembly, actuate servicing unit hand pump very slowly.

g. Check that indicator extends at 60 to 80 psig and there is no leakage at diaphragm in filter head in 1 minute.

h. If there is leakage from filter head diaphragm or if indicator does not extend within specified pressure range, replace filter assembly.

i. If there is no leakage and indicator extension is normal, depressurize filter by loosening filter inlet line. Leave line loose.

j. Depress and then release indicator. If indicator does not lock in depressed position, replace filter assembly.

k. Fill bowl and element with clean MIL-H-83282 hydraulic fluid.

NOTE

Ensure that filter element retainer spring is installed in filter head.

l. With filter inlet line still loose, install bowl in filter head. Tighten bowl to 10 to 15 pound-feet torque. Tighten filter inlet line.

m. Hydraulically charge emergency accumulators (T.O. 1A-7D-2-1).

n. Secure filter bowl to filter head with MS20995C32 lockwire.

o. Check access for cleanness and freedom from foreign objects.

p. Perform hydraulic system air check (T.O. 1A-7D-2-1), and while pressure is applied, ensure there are no leaks at filter.

q. Remove emergency power package safety lock and retract emergency power package.

A-11L. GUN DRIVE FILTER.

A-11M. The gun drive filter indicator cannot be tested on the airplane. Remove the filter and forward to IMA for testing. After reinstallation of filter, perform hydraulic system air check (T.O. 1A-7D-2-1), and while pressure is applied, ensure there are no leaks at filter.

A-12. BRAZED UNIVERSAL BOSS FITTING INSTALLATION.

A-13. Install brazed universal fittings as follows:

a. Lubricate packing and threads of bushing with MIL-H-83282 hydraulic fluid.

CAUTION

Exercise care while passing packing over threads of bushing to ensure packing is not damaged.

b. Install packing.

c. Back off jamnut to permit bushing to swivel.

d. Screw bushing into boss until bushing hex

bottoms on boss.

e. Tighten bushing to applicable torque value specified in table A-8.

f. Align fitting and tighten jamnut to applicable torque value specified in table A-8.

A-13A. BRAZED FITTING INSPECTION.

A-13B. Figure A-9 provides inspection criteria for brazed fittings.

A-14. HYDRAULIC SYSTEM TUBING REPAIR.

A-15. Use of Permaswage system (T.O. 1-1A-8) for permanent repair of hydraulic system tubing is permitted.

A-16. Inspect tubing for damage in accordance with T.O. 1-1A-8, Section XIII, except for chafing damage. Chafing up to 15% of the tubing wall thickness is permissible providing there are no rough edges. Rough edges may be burnished out provided the 15% limitation is not exceeded.

A-17. TUBE CLEARANCE. When clearance between tubes and adjacent components is more or less than drawing or specification requirements, due to tolerance buildups, clamp spacing provisions in the area of discrepancy may be altered provided alteration does not produce an unacceptable misalignment. Spacers, if used, may be:

a. Altered in length ± 1/4 inch maximum.

b. Added if none were used initially, up to 1/4 inch maximum in length.

c. Deleted in whole or in part if initial length was less than 1/4 inch.

APPENDIX A , GENERAL MAINTENANCE INFORMATION; ADD new step A-18 to read as follows:

A-18. Use of cryofit coupling system (TO 1-1A-8) for permanent repair of hydraulic system tubing is permitted.

Table A-1. Torque Values for Aluminum Nuts on Aluminum Bolts

Aluminum Bolt Size	Regular Size Aluminum Nuts (Pound-Inches)	Thin Aluminum Nuts (Pound-Inches)
	NOTE When torque is applied to bolthead instead of nut, use upper limit of torque value shown.	
10-32	10 to 12	6 to 7
1/4-28	25 to 35	15 to 20
5/16-24	50 to 70	30 to 40
3/8-24	80 to 95	45 to 55
7/16-20	220 to 250	130 to 150
1/2-20	240 to 340	140 to 200
9/16-18	400 to 500	240 to 300
5/8-18	550 to 650	330 to 390
3/4-16	1,150 to 1,250	690 to 750
7/8-14	1,250 to 1,500	750 to 900
1-14	1,850 to 2,750	1,100 to 1,650
1 1/8-12	2,500 to 3,500	1,500 to 2,100
1 1/4-12	4,500 to 5,500	2,700 to 3,300

Table A-2. Torque Values for Steel Nuts on Steel Bolts

Steel Bolt Size	Regular Size Steel Nuts (Pound-Inches)	Thin Steel Nuts (Pound-Inches)
	NOTE When torque is applied to bolt instead of nut, use upper limit of torque value shown.	
10-32	20 to 25	12 to 15
1/4-28	50 to 70	30 to 40
5/16-24	100 to 140	60 to 85
3/8-24	160 to 190	95 to 110
7/16-20	450 to 500	270 to 300
1/2-20	480 to 690	290 to 410
9/16-10	800 to 1,000	480 to 600
5/8-18	1,100 to 1,300	660 to 780
3/4-16	2,300 to 2,500	1,300 to 1,500
7/8-14	2,500 to 3,000	1,500 to 1,800
1-14	3,700 to 5,500	2,200 to 3,300
1 1/8-12	5,000 to 7,000	3,000 to 4,200
1 1/4-12	9,000 to 11,000	5,400 to 6,600

Table A-3. Torque Values for Bolts and Screws Through Metalite

Bolt Size	Torque (Pound-Inches)
3/16	15 to 25
1/4	30 to 45
5/16	40 to 55
3/8	60 to 75

Table A-4. Torque Values for Nuts on Tube and Hose Assembly

Tubing Size (Inches)	Dash No.	Aluminum[1] (Pound-Inches)	Steel[2] (Pound-Inches)
3/16	−3	25 to 35	90 to 105
1/4	−4	50 to 65	135 to 145
5/16	−5	70 to 90	170 to 190
3/8	−6	110 to 130	215 to 245
1/2	−8	230 to 260	430 to 470
5/8	−10	330 to 360	620 to 680
3/4	−12	460 to 500	855 to 945
1	−16	640 to 700	1,140 to 1,260
1 1/4	−20	800 to 900	1,520 to 1,680
1 1/2	−24	800 to 900	1,900 to 2,100

Table A-4. Torque Values for Nuts on Tube and Hose Assembly (continued)

Tubing Size (Inches)	Dash No.	Aluminum[1] (Pound-Inches)	Steel[2] (Pound-Inches)

[1]Assembly in which one component (nut, tube, or fitting) is aluminum

[2]Assembly in which all components are steel

Table A-5. Torque Values for Jamnuts and Shoulder-Type Fittings

Tubing Size	Dash No.	AN 924 AN 6289 (Pound-Inches)[1]	Aluminum AN 924[2] CVC 1150 (Pound-Inches)	Steel AN 924[2] CVC 1150 (Pound-Inches)
1/8	−2	30 to 50	35 to 50	
3/16	−3	40 to 65	65 to 80	70 to 90
1/4	−4	90 to 100	85 to 105	110 to 130
5/16	−5	120 to 150	105 to 125	135 to 165
3/8	−6	150 to 230	120 to 150	200 to 250
1/2	−8	300 to 500	240 to 280	400 to 500
5/8	−10	500 to 700	320 to 380	550 to 650
3/4	−12	600 to 1,050	500 to 600	800 to 900
1	−16	1,200 to 1,700	720 to 880	1,100 to 1,300
1 1/4	−20	2,200 to 2,800	960 to 1,200	
1 1/2	−24	3,000 to 3,800	1,200 to 1,440	
1 3/4	−28	4,700 to 5,600		
2	−32	6,000 to 7,000	1,400 to 1,500	

[1]Boss applications — shoulder type fittings

[2]Used on web applications. CVC 1150 nuts shall be torqued to 1/2 these values.

Table A-6. Torque Values for Steel and Aluminum Plugs

AN814 Plug Dash No.	Steel (Pound-Inches)	Aluminum (Pound-Inches)
−2	50 to 60	30 to 50
−3		40 to 65
−4	110 to 130	90 to 100
−5		120 to 150
−6		150 to 230
−8		300 to 500
−12		600 to 1,050

Table A-7. Torque Values for Bleed Fitting Assemblies

CVC4202 Fitting Assembly Dash No.[1]	Steel (Pound-Inches)	Aluminum (Pound-Inches)
−2	135 to 165	120 to 150
−3		150 to 230

[1]Torque value for bleed plug part of fitting assembly shall be 10 (±5) pound-inches.

Table A-8. Torque Values for Brazed Universal Boss Fittings

Fitting Size (Inches)	Dash No.	Bushing and Jamnut (Pound-Inches)
1/4	−4	70 to 120
3/8	−6	100 to 250
1/2	−8	210 to 420
5/8	−10	300 to 480
3/4	−12	500 to 850
1	−16	700 to 1,150

Table A-9. Filter Element Replacement

Filter Location	Filter Assembly P/N	Element P/N (5-Micron)
PC No. 1 and PC No. 2 system pressure line	AC3255-16HV	AC7031F-1697Y3
PC No. 3 system pressure line	11-10974	AC7031F-1297Y3
PC No. 1 and PC No. 3 filler and pump cooling line	AC3258-6H	AC7031F-697Y3
PC No. 2 filler and pump cooling line	AC9531-68HV	AC7031F-897Y3
Emergency power package pressure line	AC3258-8HV	AC7031F-897Y3
Gun drive motor case drain line	AC3258-6H	AC7031F-697Y3
Fuel boost pump motor return line	AC3258-6H	AC7031F-697Y3

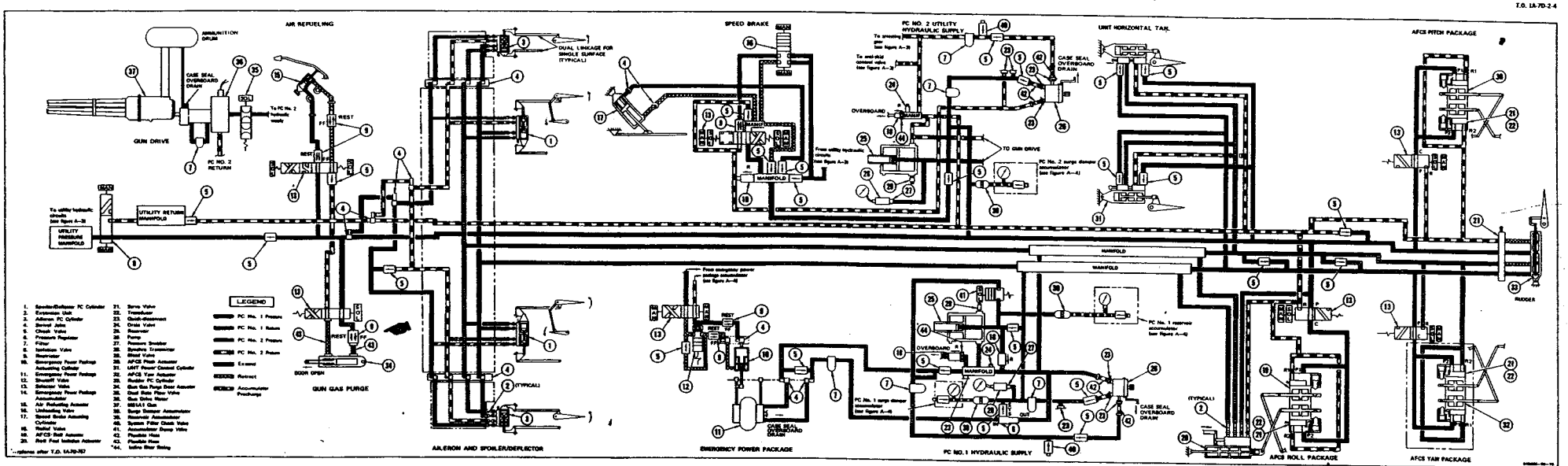


Figure A-1. Hydraulic Power Control System Schematic Diagram (Airplanes Through AF69-6196)

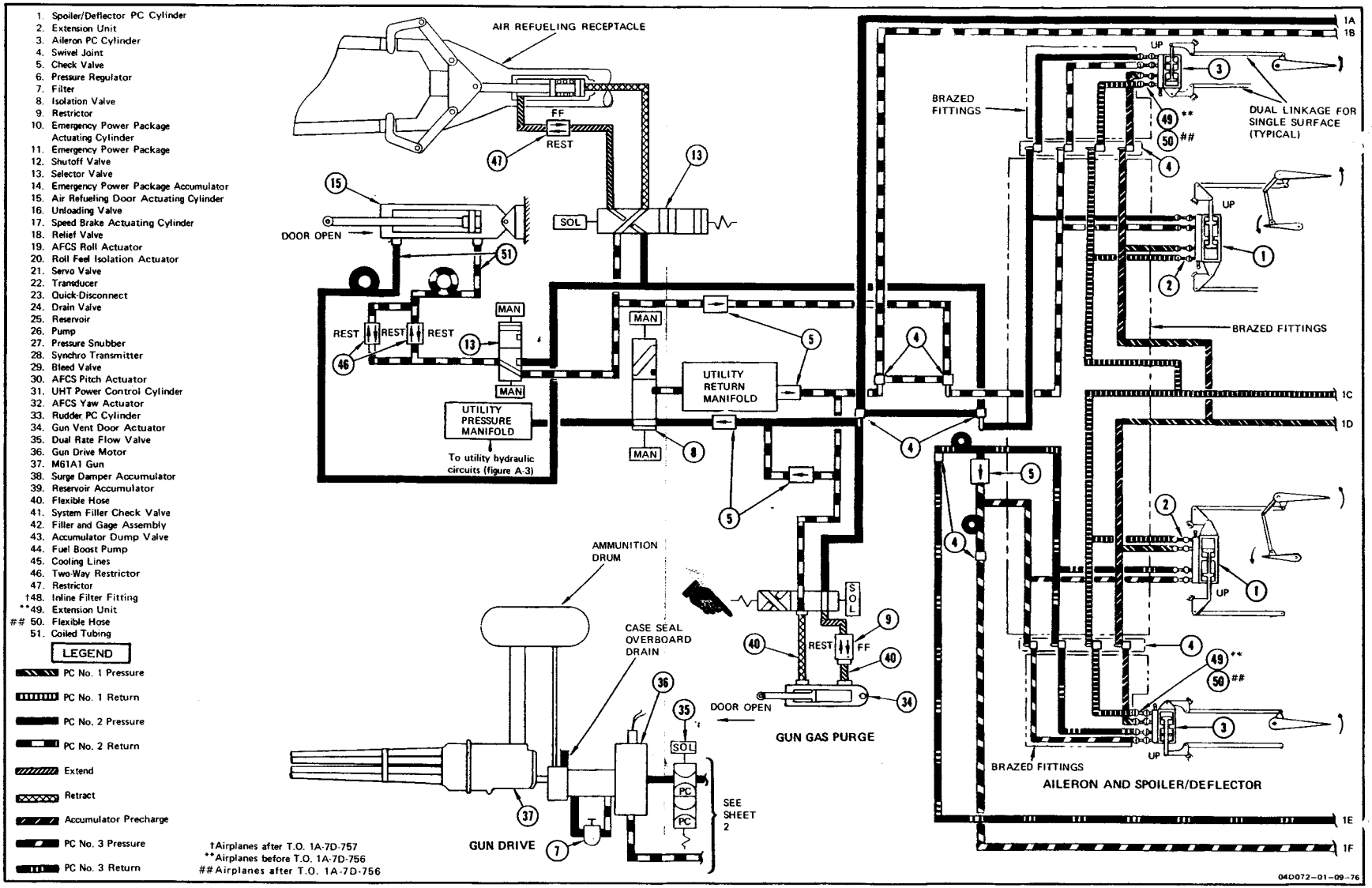


Figure A-2. Hydraulic Power Control System Schematic Diagram (Airplanes AF69-6197 and Subsequent) (Sheet 1)

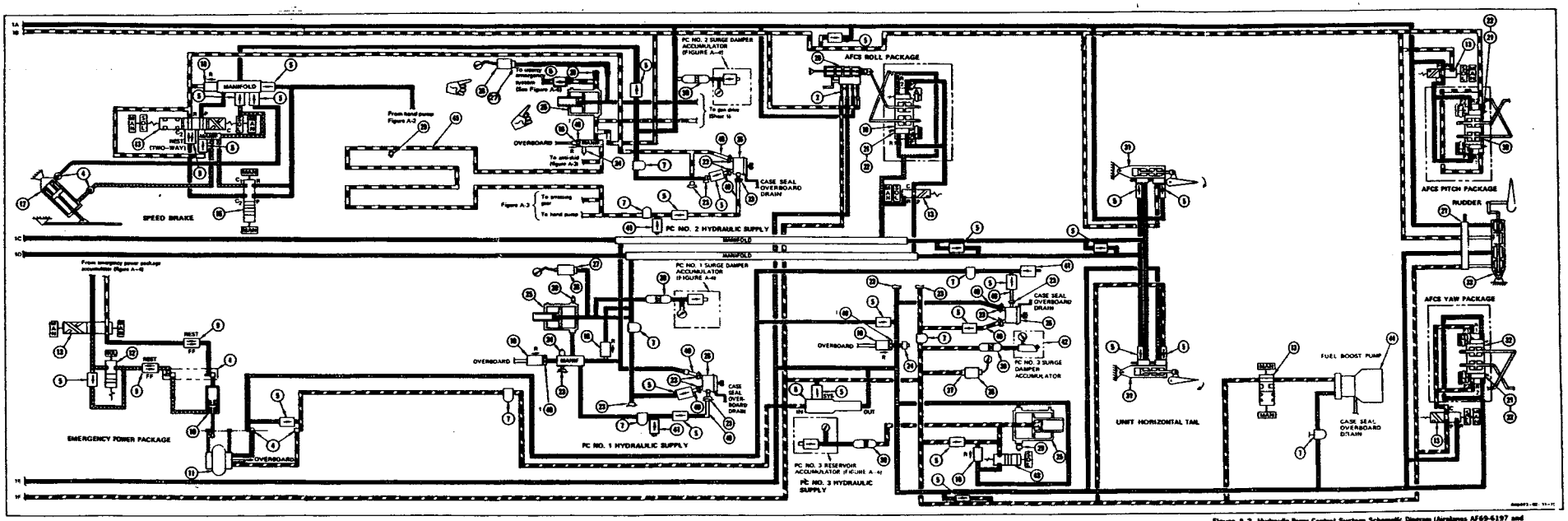


Figure A-2. Hydraulic Power Control System Schematic Diagram (Airplanes AF69-6197 and Subsequent) (Sheet 2)

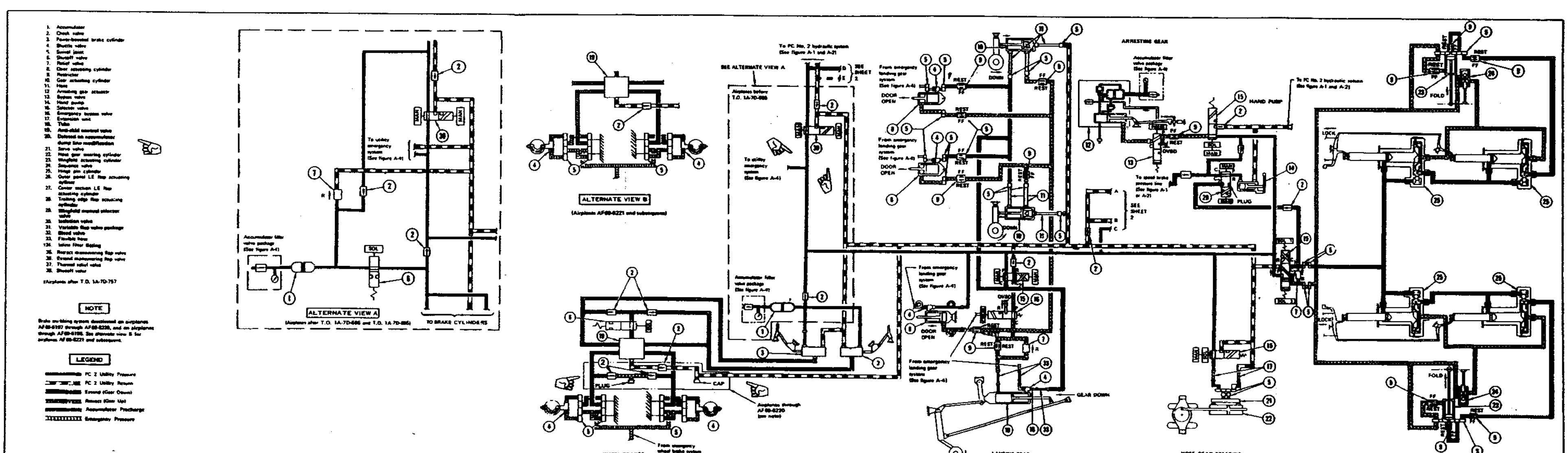


Figure A-3. Hydraulic Utility Circuits Schematic Diagram (Sheet 1)

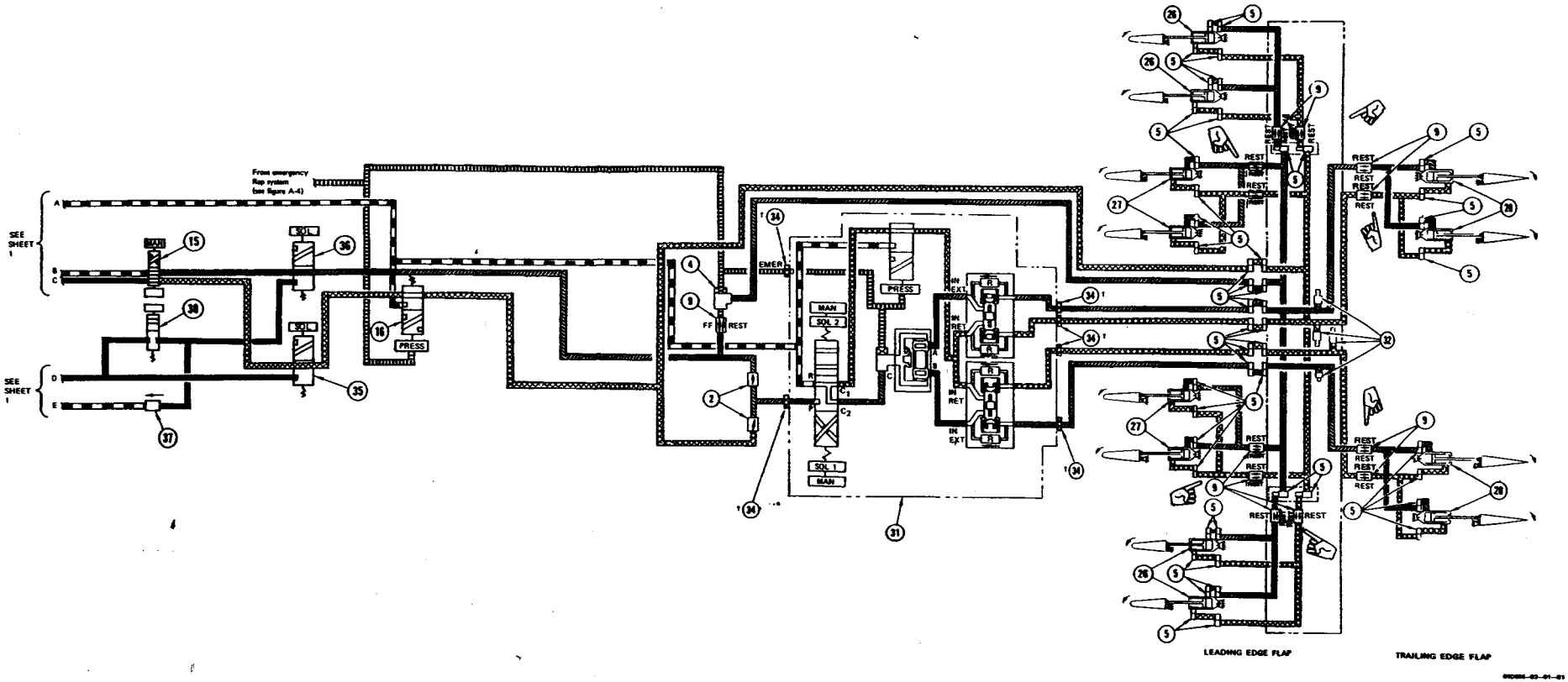


Figure A-3. Hydraulic Utility Circuits Schematic Diagram (Sheet 2)

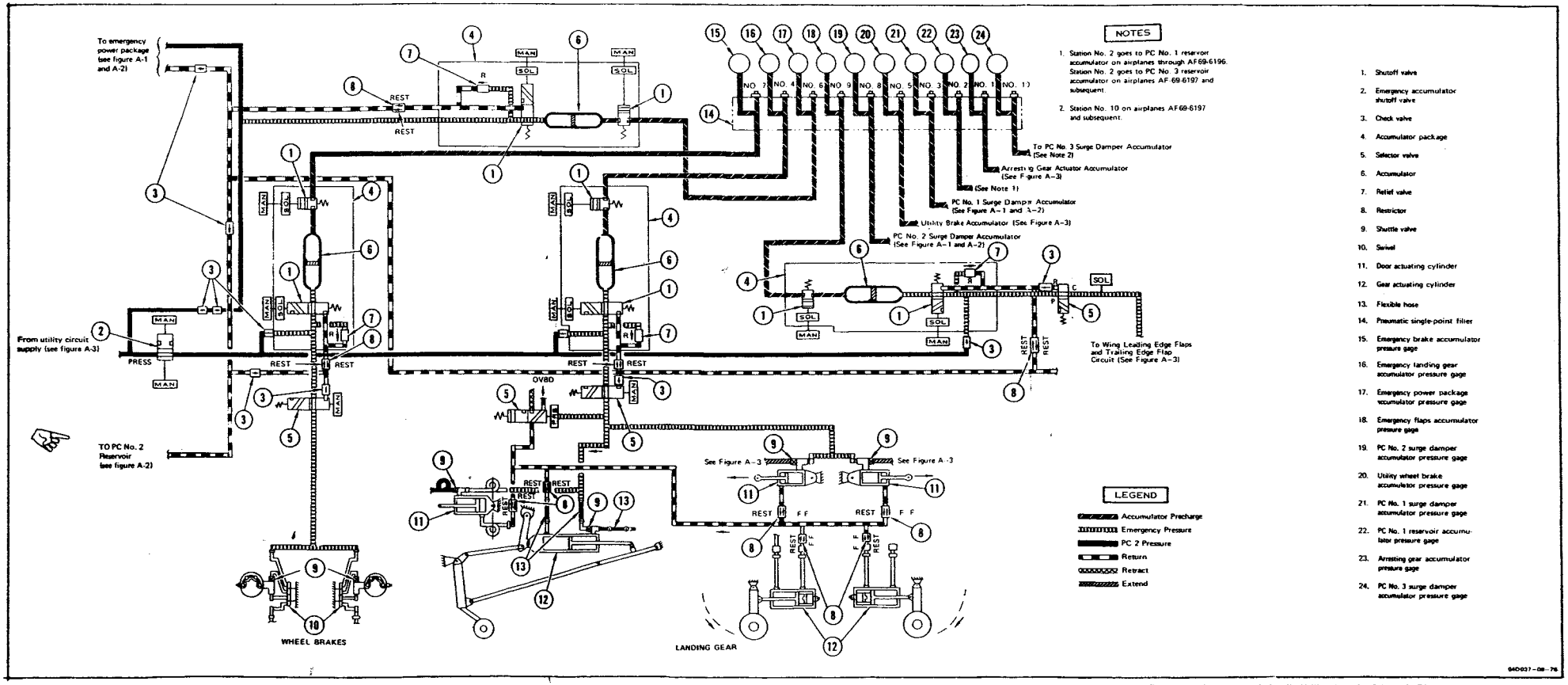
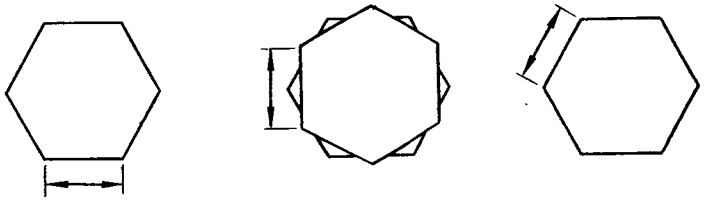


Figure A-4. Emergency/Hydraulic Utility Circuits Schematic Diagram

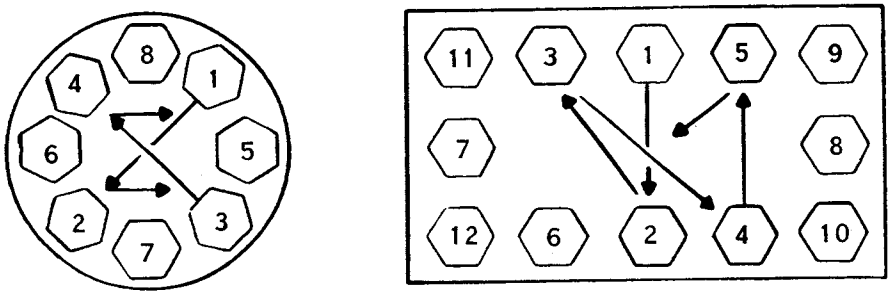
MAJOR CHANGE



TUBING	TUBE SIZE (INCHES)	DASH NO.	TIGHTENING – RULE OF THUMB (FLAT – TURNS AFTER PRETIGHTENING)	
			NORMAL TIGHT	EXTRA TIGHT
Aluminum or steel	3/16	–3	1 1/2	2 Maximum
	1/4	–4	1 1/2	2 Maximum
	3/8	–6	1 1/2	2 Maximum
	1/2	–8	1 1/2	2 Maximum
	5/8	–10	1 1/2	2 Maximum
	3/4	–12	1 1/2	2 Maximum
	1	–16	1 1/2	2 Maximum
Aluminum	1-1/4	–20	1 to 1 1/2	2 Maximum
	1-1/2	–24	5/6 to 1	1 1/2 Maximum

04D038–09–76

Figure A-5. Flat Turn Values for Nuts on Flareless Tubing

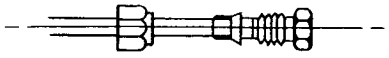


04D039–04 68

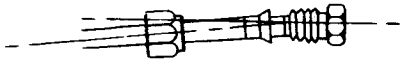
Figure A-6. Torque Sequence

DO NOT USE FORCE TO OBTAIN PROPER ALIGNMENT OF TUBE AND FITTING.

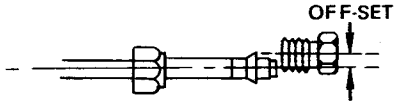
LENGTH OF LINE (SEE NOTE)	MAX. ANGULAR MISALIGNMENT	MAXIMUM OFF-SET MISALIGNMENT
UP TO 8 INCHES	3°	1/16 INCH
8 TO 20 INCHES	5°	1/8 INCH
OVER 20 INCHES	5°	1/4 INCH



PROPER ALIGNMENT



ANGULAR MISALIGNMENT



OFF-SET MISALIGNMENT

NOTE

Length of line is that length from end of tube to first support (clamp) or start of first bend.

04D074-07-72

Figure A-7. Alignment of Flareless Fittings

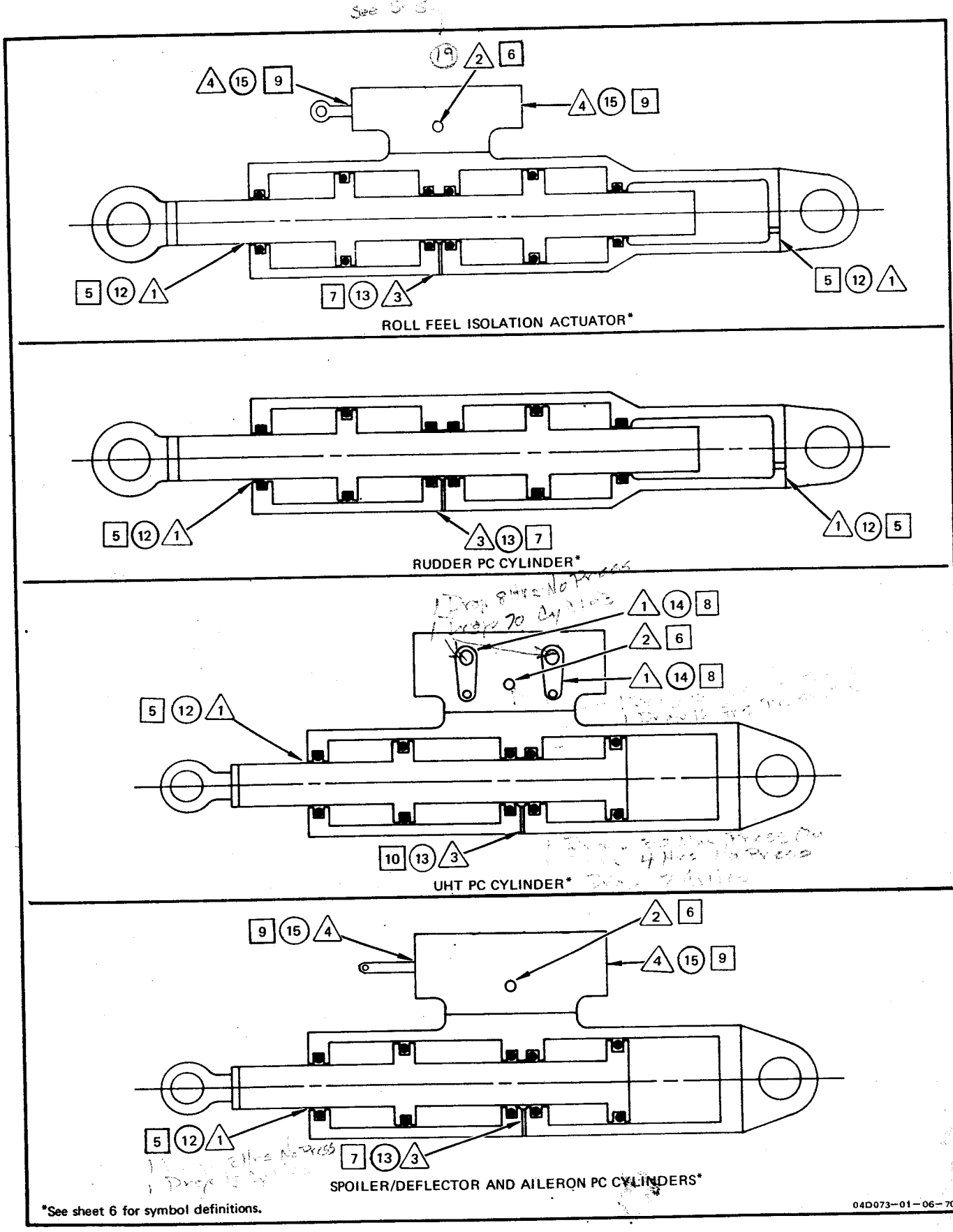
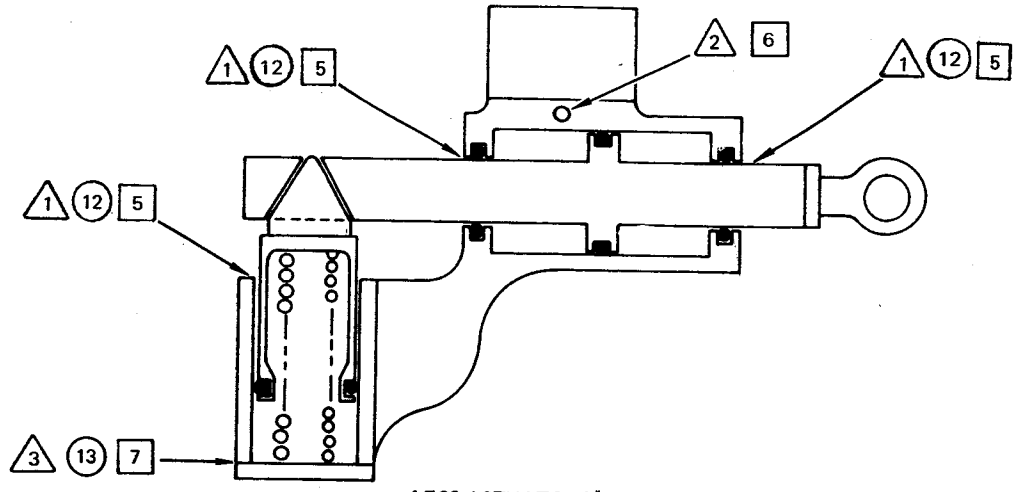
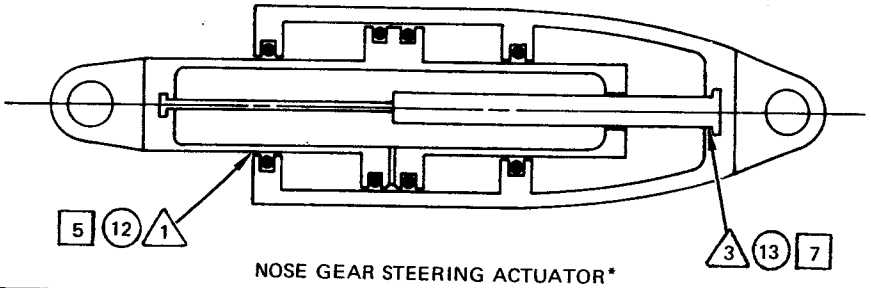


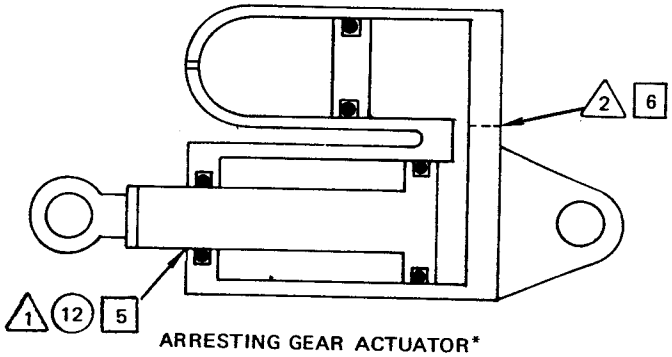
Figure A-8. Hydraulic Component Allowable Leakage (Sheet 1)



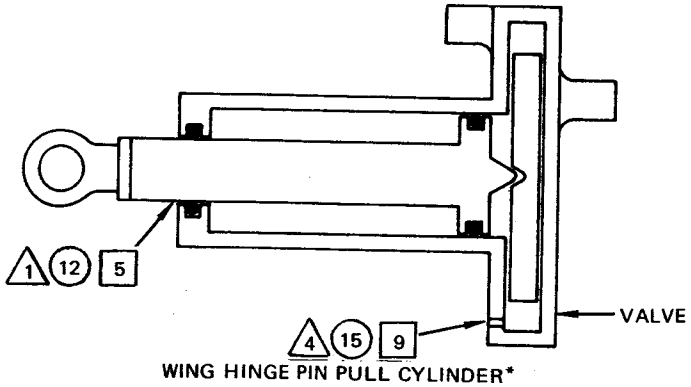
AFCS ACTUATORS*



NOSE GEAR STEERING ACTUATOR*



ARRESTING GEAR ACTUATOR*

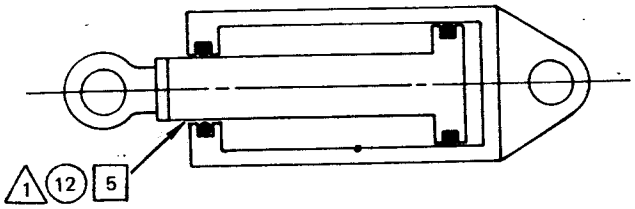


WING HINGE PIN PULL CYLINDER*

*See sheet 6 for symbol definitions.

04D073-02-05-75

Figure A-8. Hydraulic Component Allowable Leakage (Sheet 2)

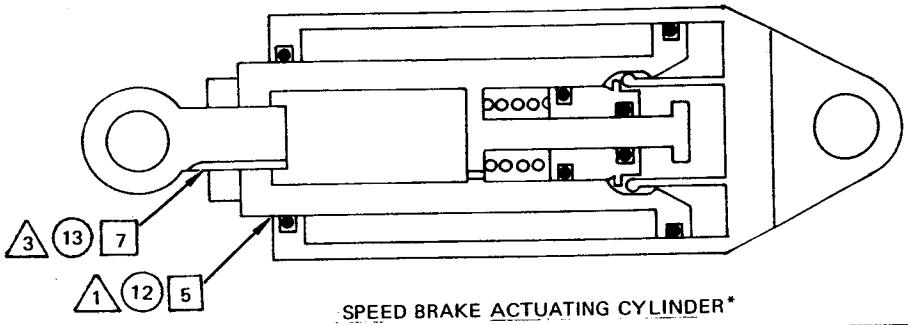


NOTE

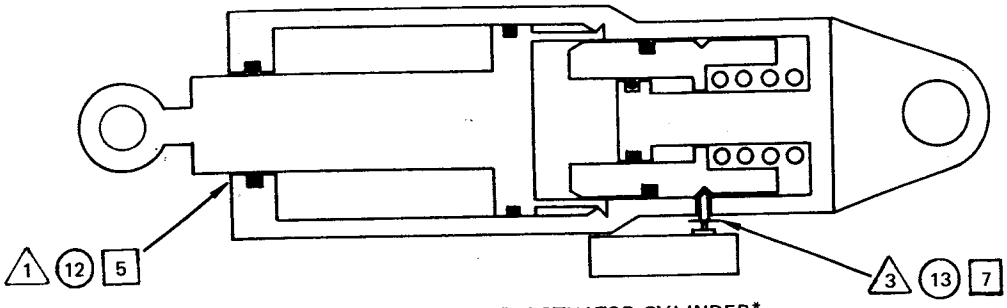
Typical for the following cylinders

Air refueling receptacle door #
Air refueling receptacle latch #
Gun gas purge door
Main gear door
Nose gear
Nose gear door
Wingfold
Hand pump

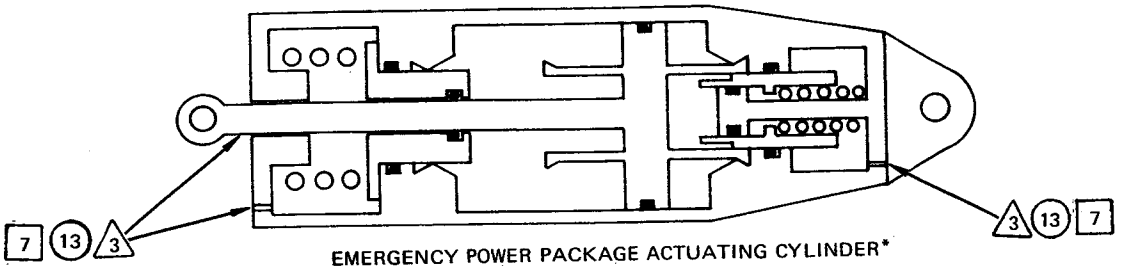
SINGLE PC CYLINDERS*



SPEED BRAKE ACTUATING CYLINDER*



MAIN LANDING GEAR ACTUATOR CYLINDER*



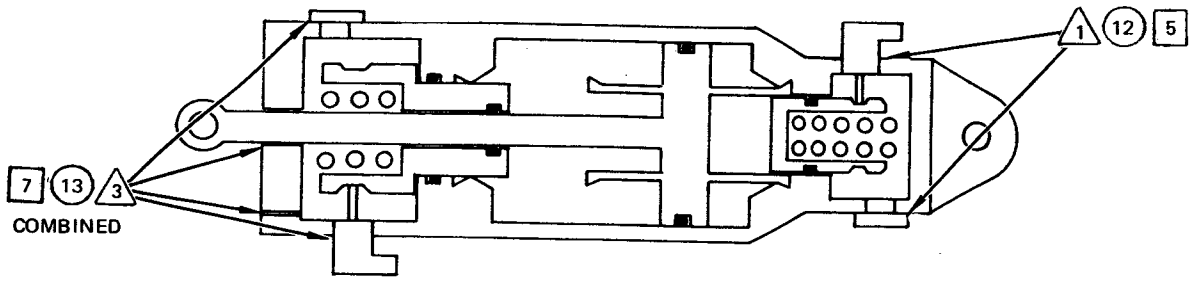
EMERGENCY POWER PACKAGE ACTUATING CYLINDER*

COMBINED

*See sheet 6 for symbol definitions
#Airplanes AF69-6197 and subsequent

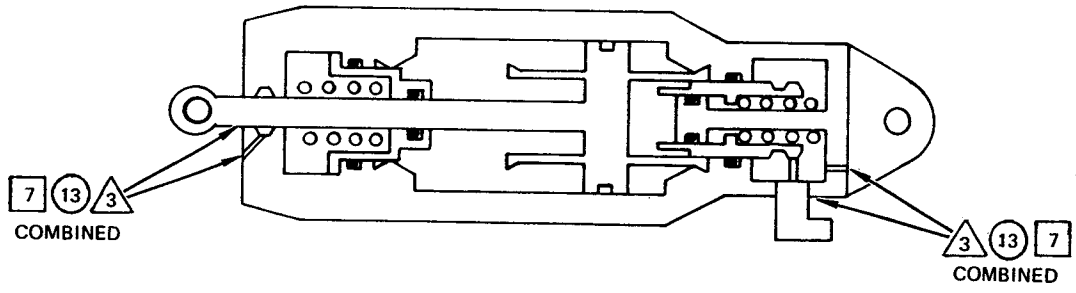
04D073-03-05-75

Figure A-8. Hydraulic Component Allowable Leakage (Sheet 3)

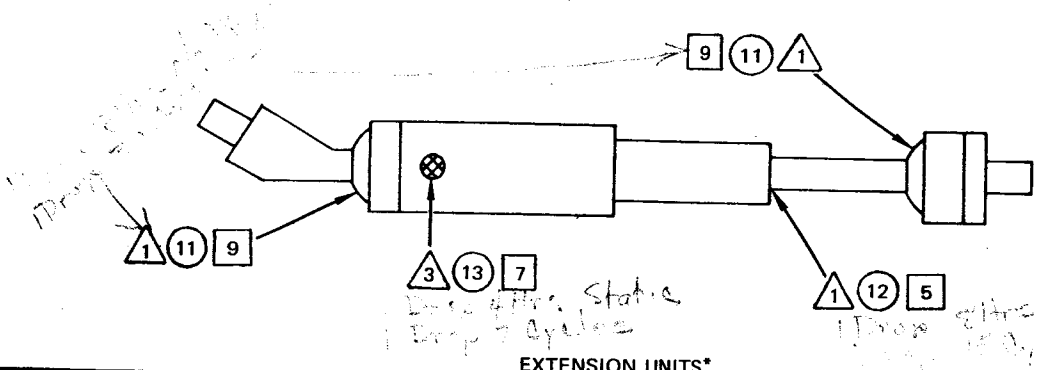


(Airplanes through AF69-6196)

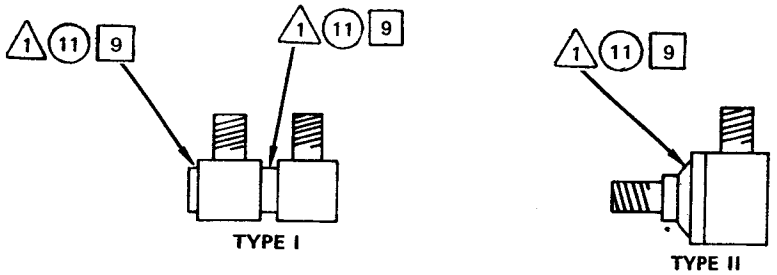
AIR REFUELING PROBE ACTUATING CYLINDER*



LE AND TE FLAP ACTUATING CYLINDER*



EXTENSION UNITS*

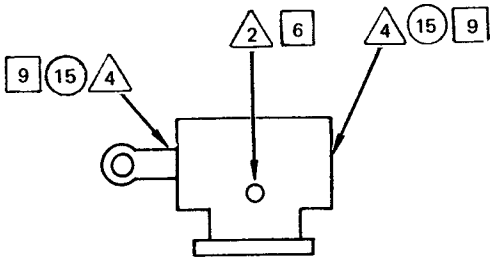


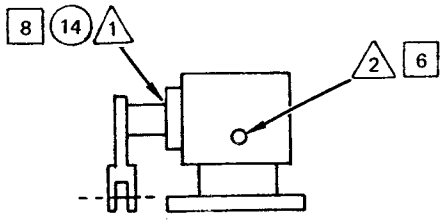
SWIVEL JOINTS*

*See sheet 6 for symbol definitions.

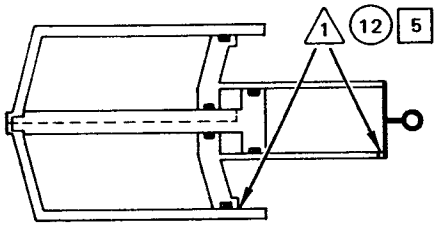
04D073-04-05-75

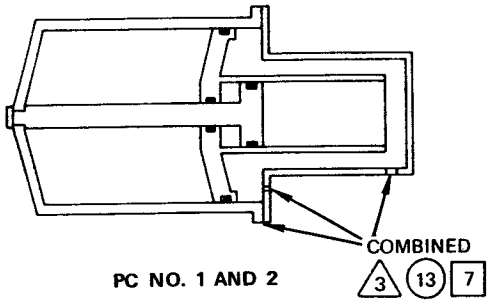
Figure A-8. Hydraulic Component Allowable Leakage (Sheet 4)



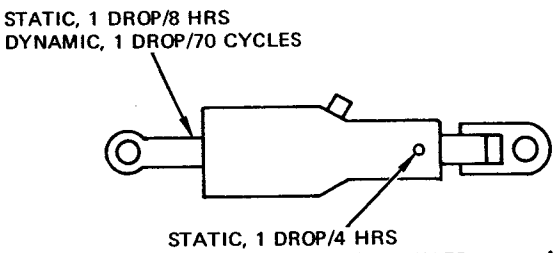


MANUAL VALVES*



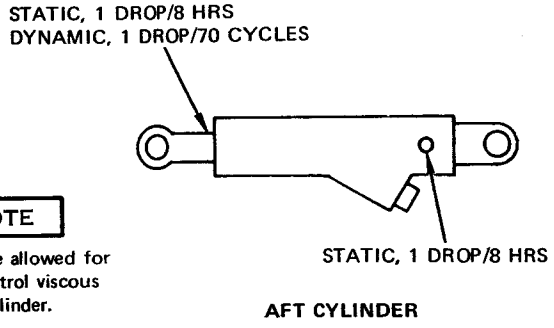


RESERVOIRS*

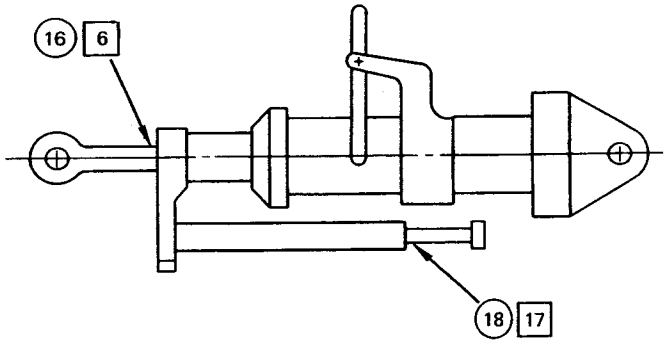


NOTE

No leakage allowed for lateral control viscous damper cylinder.



VISCOUS DAMPER CYLINDERS (PITCH CONTROL)

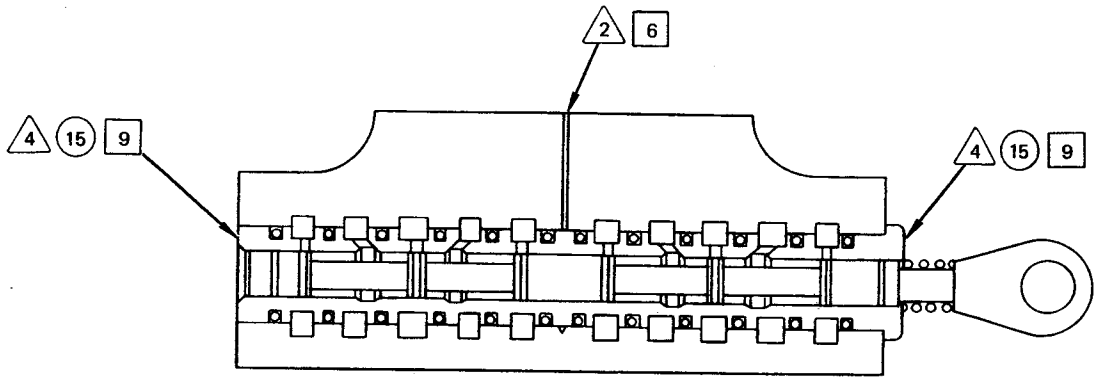


*See sheet 6 for symbol definitions.

CANOPY ACTUATOR*

04D073-05-12-71

Figure A-8. Hydraulic Component Allowable Leakage (Sheet 5)



RUDDER SERVO VALVE

MISCELLANEOUS COMPONENTS

COMPONENT	LOCATION	TYPE	ALLOWABLE LEAKAGE	
			UNPRESSURIZED	PRESSURIZED
Pumps	At shaft At shaft	Static Dynamic	1 drop/2 min	1 drop/2 min 100 drops/hr
Motors (gun drive and fuel boost pump)	At shaft At shaft	Static Dynamic	1 drop/2 min	1 drop/2 min 100 drops/hr
Quick disconnects: Coupled Uncoupled (with dust cover installed)		Static Static	1 drop/6 hrs 1 drop/12 hrs	1 drop/6 hrs 1 drop/12 hrs
Reservoir overboard relief valve: 215-32359-3 and -4	Overboard drain	Static	——	5 drops/1 min after 2 min wait
215-32359-5	Overboard drain	Static	——	5 drops/10 min after 10 min wait

No leakage allowed for:

Check Valves, Restrictors, Snubbers, Switches, Line Fittings, Boss Seals, Transducers, Regulators, Filters, Surge Dampers

Accumulators — except emergency accumulators; allowable leakage at manual override on-fluid end of emergency accumulators shall not exceed applicable leakage for solenoid valves with manual override (sheet 7).
Relief Valves — except reservoir overboard relief valve.
Solenoid Valves Without Manual Override
Shuttle Valves

SYMBOL DEFINITIONS

Static Leak — System Unpressurized

- △1 1 Drop/8 hrs
- △2 1 Drop/16 hrs
- △3 1 Drop/4 hrs
- △4 1 Drop/3 hrs

Static Leak — At System Pressure

- [5] 1 Drop/90 min
- [6] 1 Drop/16 hrs
- [7] 1 Drop/45 min
- [8] 1 Drop/6 hrs
- [9] 1 Drop/3 hrs
- [10] 1 Drop/30 min
- [17] 2 Drops/30 days

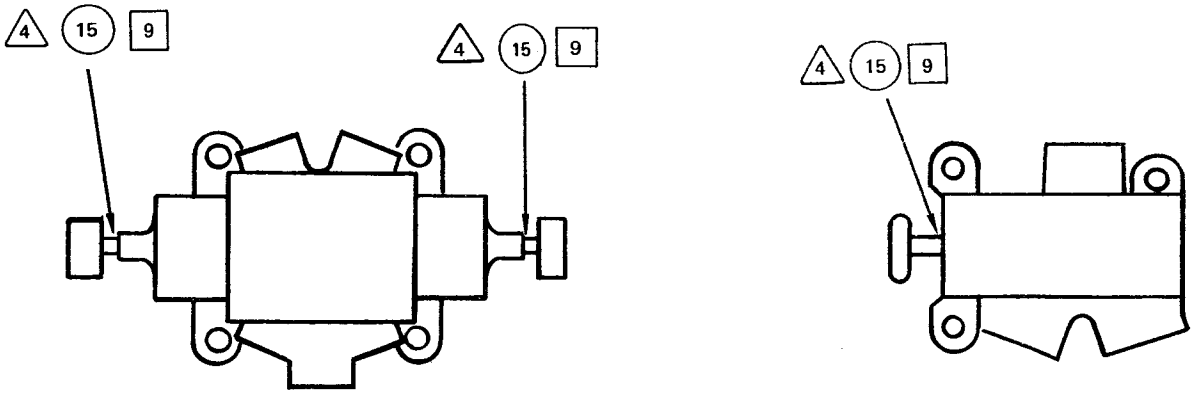
Dynamic Leakage — At System Pressure*

- (11) 1 Drop/30 cycles
- (12) 1 Drop/15 cycles
- (13) 1 Drop/7 cycles
- (14) 1 Drop/70 cycles
- (15) 1 Drop/10 cycles
- (16) 1 Drop/17 cycles
- (18) 1 Drop/140 cycles

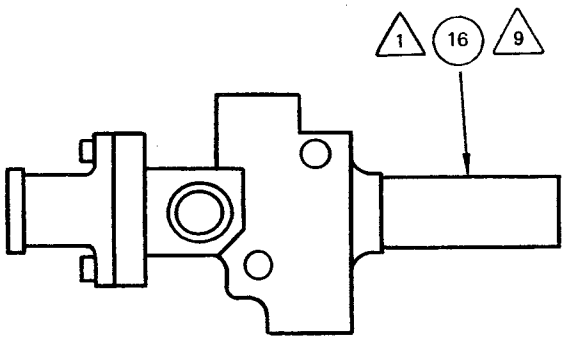
*Allowable dynamic leakage is given in rates. Leakage in excess of the rate shown is cause for replacement. (19) 2 drops/25 cycles

04D073-06-11-75

Figure A-8. Hydraulic Component Allowable Leakage (Sheet 6)



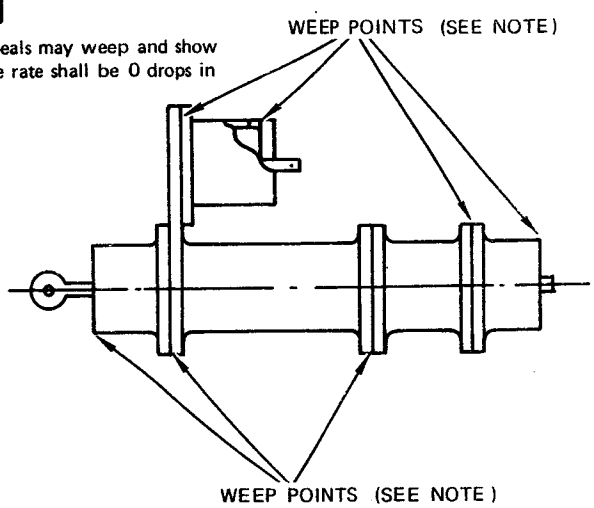
DUAL SOLENOID VALVES WITH MANUAL OVERRIDE* SINGLE



PRESSURE OPERATED BYPASS VALVE*

NOTE

The lateral damper belloframs and seals may weep and show wettness with time. The acceptance rate shall be 0 drops in 24 hours per seal.

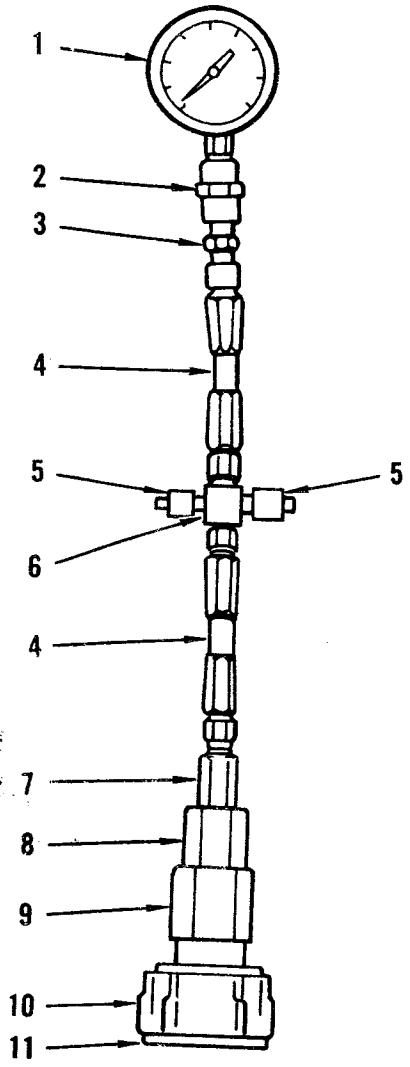


LATERAL VISCOUS DAMPER (215-22150)

* See sheet 6 for symbol definitions

04D073-07-05-75

Figure A-8. Hydraulic Component Allowable Leakage (Sheet 7)



NOTE

This assembly can be made from pressure gage assembly (figure 1-4) by replacing gage with 0-100 psi gage and adding one hose assembly (4), two caps (5), and one cross (6).

1. 0 to 100 psi gage
2. 1/4 inch pipe thread coupling (AN911-2)
3. AN816-4-4D union
4. MS28741-4-6 hose assembly (2)
5. AN929-4 cap (2)
6. AN927-4D cross
7. AN894D6-4 bushing
8. AN894D10-6 bushing
9. AN894D12-10 bushing
10. 3/4 inch quick-disconnect coupling half (Aeroquip T15D-S1-12D)
11. 155-S9-12D dust plug (Aeroquip)

04D086-11-77

Figure A-8A. Filter Indicator Test Gage Assembly

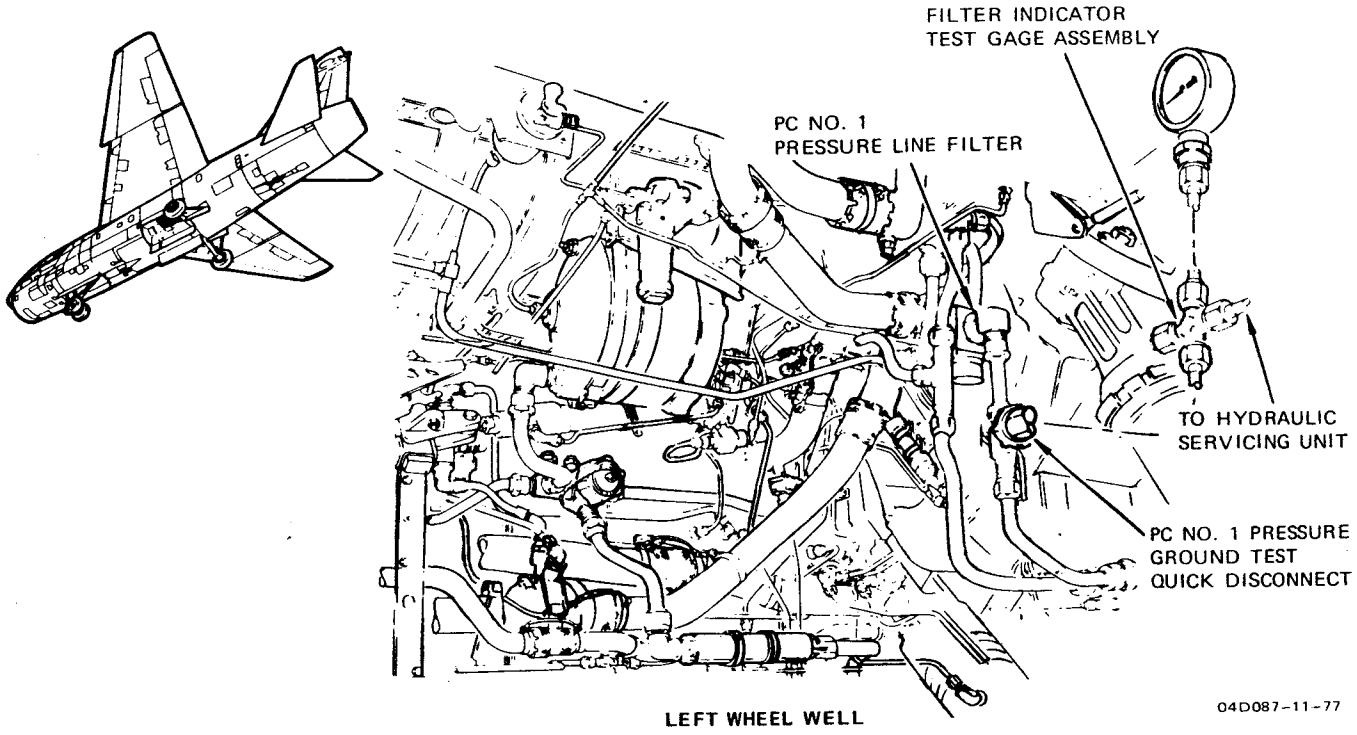


Figure A-8B. PC No. 1 Pressure Line Filter Differential Pressure Indicator Test Connections

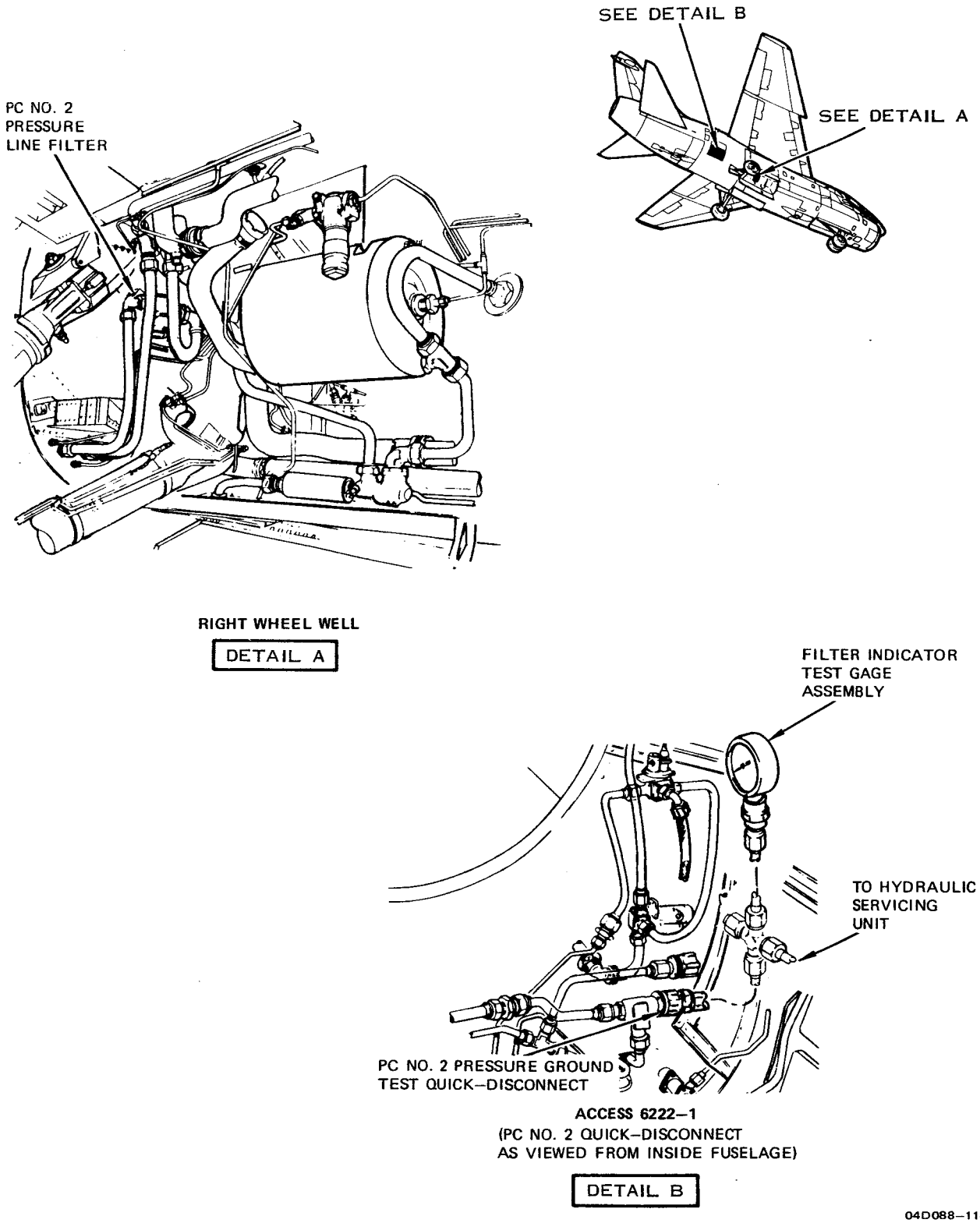


Figure A-8C. PC No. 2 Pressure Line Filter Differential Pressure Indicator Test Connections

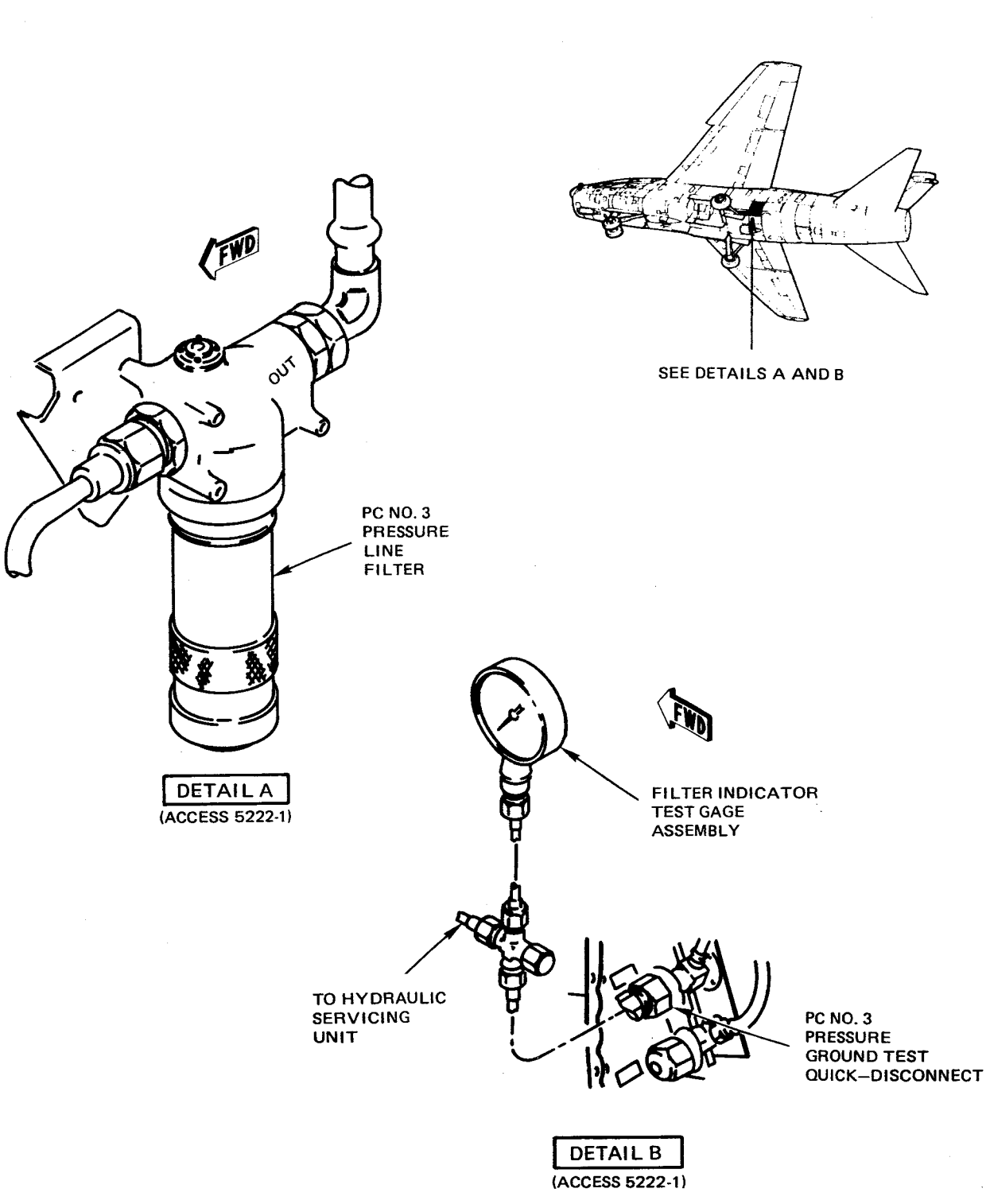


Figure A-8D. PC No. 3 Pressure Line Filter Differential Pressure Indicator Test Connections

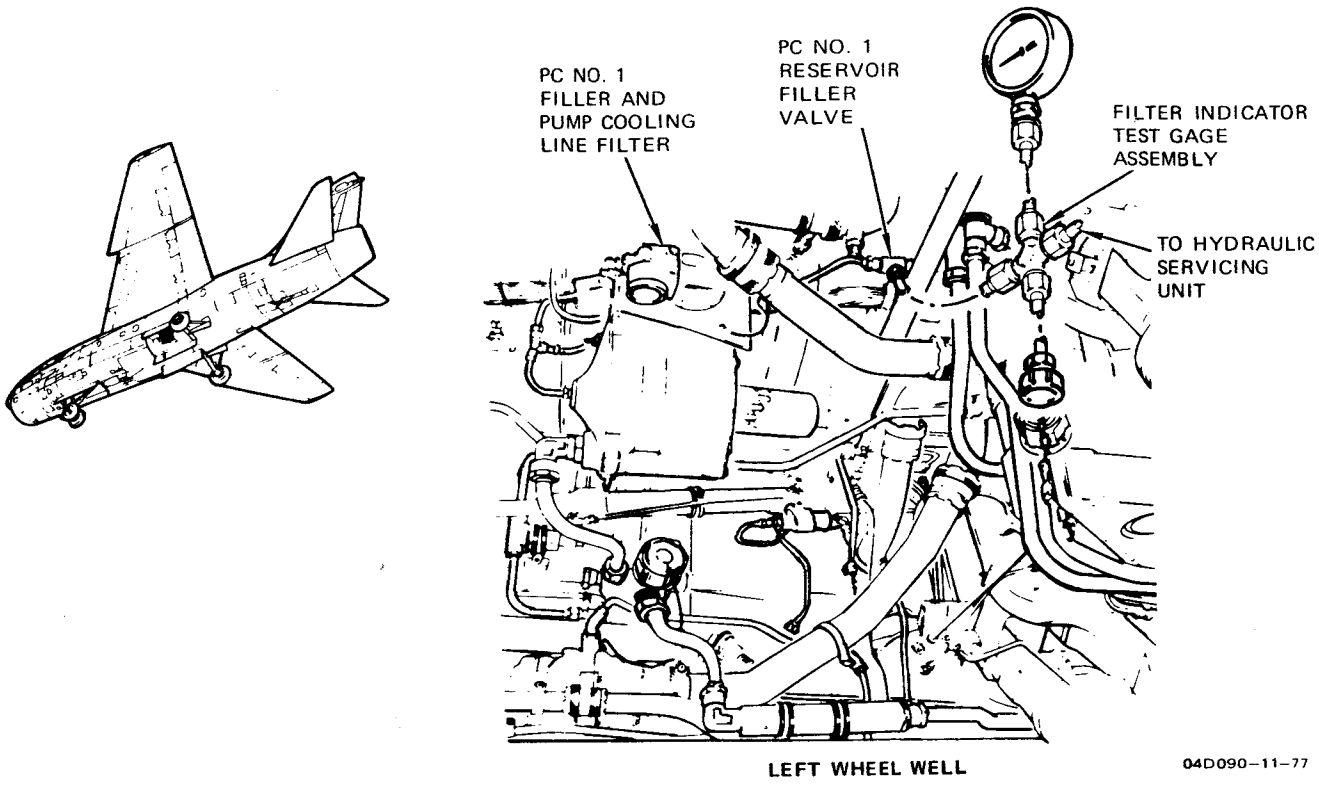


Figure A-8E. PC No. 1 Filler and Pump Cooling Line Filter Differential Pressure Indicator Test Connections

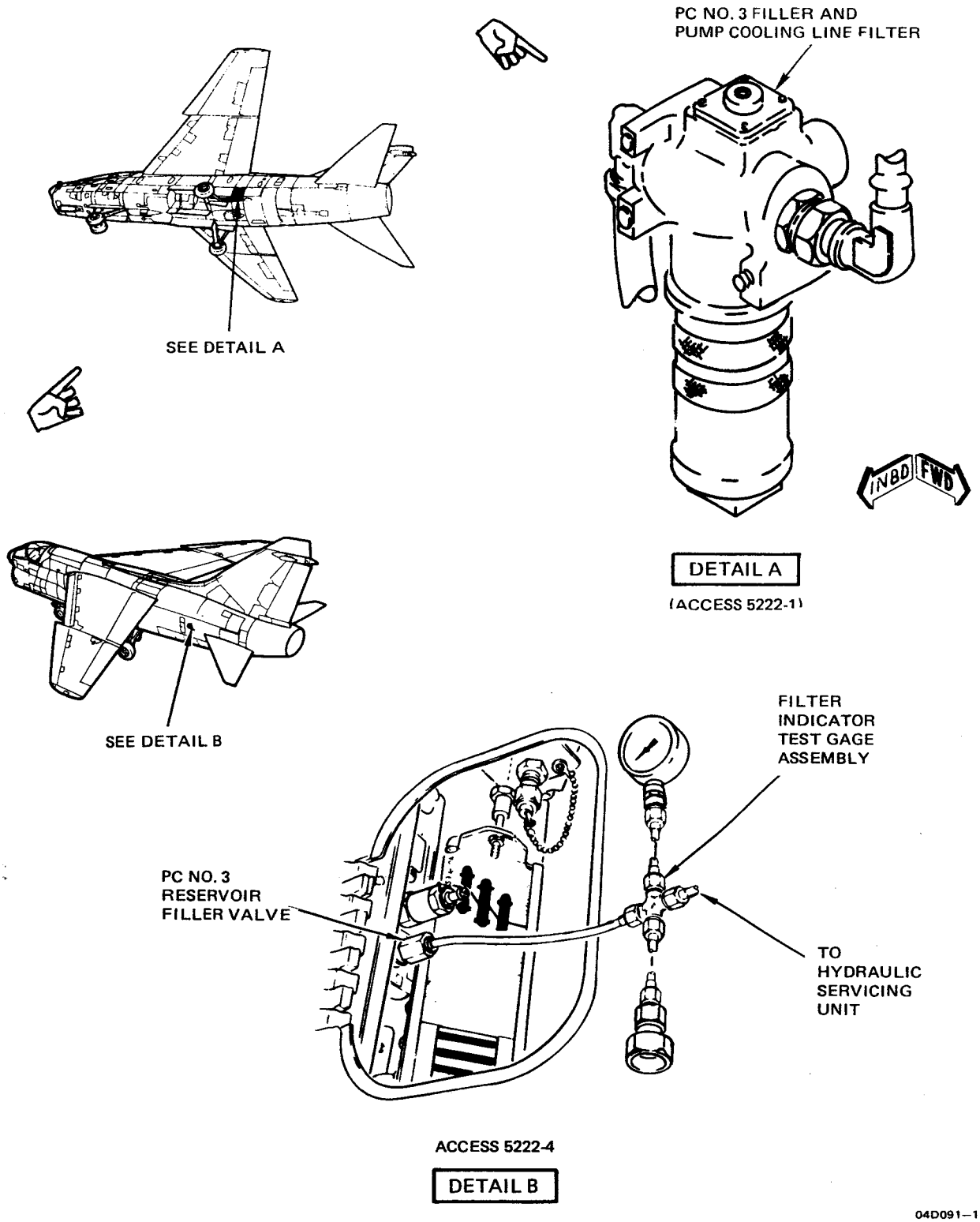
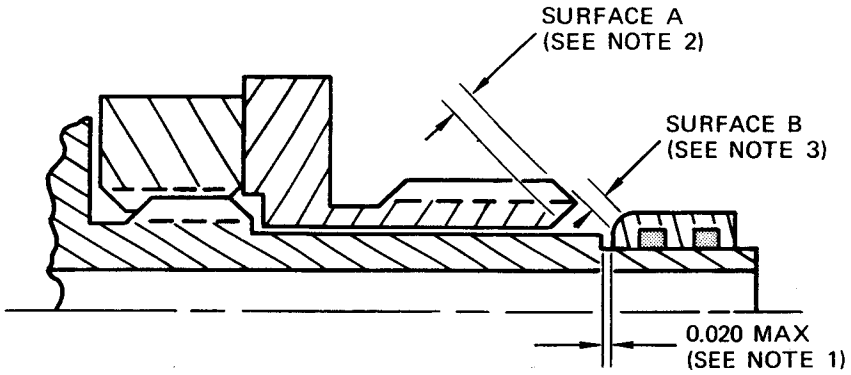


Figure A-8F. PC No. 3 Filler and Pump Cooling Line Filter Differential Pressure Indicator Test Connections



NOTES

1. MAXIMUM ALLOWABLE GAP BETWEEN SHOULDER AND COLLAR. GAP IN EXCESS OF 0.020 INDICATES COLLAR IS NOT HOLDING PROPERLY OR HAS BEEN OVER STRESSED.
2. SURFACE A IS MACHINED TO A 63 RMS FINISH BEFORE ASSEMBLY.
3. SURFACE B IS MACHINED TO A 32 RMS FINISH BEFORE ASSEMBLY.
4. AFTER ASSEMBLY, SURFACES A AND B ARE LAP FINISHED TO EACH OTHER TO A FLUID TIGHT SEAL. ANY INDICATION OF DISPLACED METAL OR GALLING ON THESE SURFACES SHOULD BE SUSPECTED OF POSSIBLE LEAKAGE.
5. A GALLED CONDITION ON SURFACES A AND B CAN ONLY BE CAUSED BY IMPROPER ASSEMBLY CONDITIONS.

04D085-06-77

Figure A-9. Brazed Fitting Inspection

Table A-10. Minimum Acceptable Pressures For Emergency Brake Accumulator

Time From Oil Charging To Final Check — HRS.	Minimum Acceptable Accumulator Pressure At Temperature Indicated — PSIG				
	0°F	30°F	60°F	90°F	120°F
Initial Charge at 0°F					
0.5	2333	2486	2639	2792	2945
1.0	2260	2409	2557	2705	2854
1.5	2192	2336	2480	2624	2768
2.0	2128	2267	2407	2547	2687
2.5	2067	2203	2339	2474	2610
3.0	2010	2142	2274	2406	2538
3.5	1956	2084	2213	2341	2470
4.0	1904	2029	2155	2280	2405
4.5	1856	1977	2099	2221	2343
5.0	1809	1928	2047	2166	2285
5.5	1765	1881	1997	2113	2229
6.0	1723	1836	1950	2063	2176
6.5	1683	1794	1904	2015	2126
7.0	1645	1753	1861	1969	2078
7.5	1608	1714	1820	1926	2032
8.0	1573	1677	1780	1884	1987
Initial Charge at 30°F					
0.5	2254	2438	2588	2739	2889
1.0	2185	2362	2508	2653	2799
1.5	2120	2291	2432	2574	2715
2.0	2059	2224	2361	2498	2635
2.5	2001	2161	2294	2427	2560
3.0	1946	2101	2230	2360	2489
3.5	1894	2044	2170	2296	2422
4.0	1845	1991	2113	2236	2359
4.5	1798	1940	2059	2179	2299
5.0	1754	1891	2008	2125	2241
5.5	1712	1845	1959	2073	2187
6.0	1671	1801	1912	2024	2135
6.5	1633	1759	1868	1977	2085
7.0	1596	1719	1825	1932	2038
7.5	1561	1681	1785	1889	1993
8.0	1527	1644	1746	1848	1949

Table A-10. Minimum Acceptable Pressures For Emergency Brake Accumulator (continued)

Time From Oil Charging To Final Check – HRS.	Minimum Acceptable Accumulator Pressure At Temperature Indicated – PSIG 0°F	30°F	60°F	90°F	120°F
Initial Charge At 60°F					
0.5	2272	2459	2648	2802	2956
1.0	2204	2382	2566	2715	2864
1.5	2139	2312	2489	2633	2777
2.0	2078	2245	2416	2556	2696
2.5	2020	2182	2347	2483	2620
3.0	1966	2122	2282	2415	2547
3.5	1914	2065	2221	2350	2479
4.0	1865	2012	2162	2288	2414
4.5	1818	1961	2107	2229	2352
5.0	1774	1913	2054	2174	2293
5.5	1732	1867	2004	2121	2237
6.0	1691	1823	1957	2070	2184
6.5	1653	1781	1911	2022	2133
7.0	1616	1741	1868	1976	2085
7.5	1581	1702	1826	1933	2039
8.0	1547	1666	1787	1891	1994
Initial Charge At 90°F					
0.5	2285	2471	2663	2859	3016
1.0	2217	2396	2581	2771	2922
1.5	2153	2326	2504	2687	2834
2.0	2092	2260	2432	2608	2751
2.5	2035	2197	2364	2534	2673
3.0	1981	2138	2299	2464	2599
3.5	1929	2082	2238	2398	2529
4.0	1880	2028	2180	2335	2463
4.5	1834	1978	2125	2275	2400
5.0	1790	1929	2072	2218	2340
5.5	1747	1883	2022	2164	2283
6.0	1707	1840	1975	2113	2229
6.5	1669	1798	1929	2064	2177
7.0	1632	1758	1886	2017	2128
7.5	1597	1719	1845	1972	2081
8.0	1563	1683	1805	1929	2035

Table A-10. Minimum Acceptable Pressures For Emergency Brake Accumulator (continued)

Initial Charge At 120°F					
Time From Oil Charging To Final Check – HRS.	Minimum Acceptable Accumulator Pressure At Temperature Indicated – PSIG				
	0°F	30°F	60°F	90°F	120°F
0.5	2214	2394	2579	2769	2965
1.0	2149	2322	2501	2684	2873
1.5	2088	2255	2527	2605	2786
2.0	2030	2192	2358	2529	2705
2.5	1975	2132	2293	2458	2628
3.0	1923	2075	2231	2391	2555
3.5	1874	2021	2172	2328	2486
4.0	1827	1970	2117	2267	2421
4.5	1782	1921	2064	2210	2359
5.0	1739	1875	2014	2155	2300
5.5	1699	1831	1966	2104	2244
6.0	1660	1789	1920	2054	2191
6.5	1623	1748	1876	2007	2140
7.0	1588	1710	1834	1962	2092
7.5	1554	1673	1794	1919	2045
8.0	1521	1638	1756	1877	2001

Table A-11. Minimum Acceptable Pressures For Emergency Power Package Accumulator

Time From Oil Charging To Final Check – HRS.	Minimum Acceptable Accumulator Pressure At Heater Blanket Temp. (PSIG)
0.5	2995
1.0	2985
1.5	2976
2.0	2967
2.5	2958
3.0	2949
3.5	2940
4.0	2931
4.5	2922
5.0	2913
5.5	2904
6.0	2895
6.5	2886
7.0	2878
7.5	2869
8.0	2861

Table A-12. Minimum Acceptable Pressures For Emergency Flap Accumulator

Minimum Acceptable Accumulator Pressure Tables	
Time From Oil Charging To Final Check – HRS.	Minimum Acceptable Accumulator Pressure At Heater Blanket Temp. (PSIG)
0.5	2642
1.0	2632
1.5	2623
2.0	2613
2.5	2604
3.0	2595
3.5	2585
4.0	2576
4.5	2567
5.0	2558
5.5	2549
6.0	2540
6.5	2531
7.0	2522
7.5	2513
8.0	2504

Table A-13. Minimum Acceptable Pressures For Emergency Landing Gear Accumulator

Time From Oil Charging To Post Flight Check-HRS.	Minimum Acceptable Accumulator Pressure At Heater Blanket Temp. (PSIG)
0.5	2863
1.0	2853
1.5	2842
2.0	2831
2.5	2821
3.0	2811
3.5	2800
4.0	2790
4.5	2780
5.0	2770
5.5	2760
6.0	2750
6.5	2740
7.0	2730
7.5	2720
8.0	2711

Table A-14. Minimum Acceptable Pressures For A-7D Utility Brake Accumulator

Time From Oil Charging To Final Check — HRS.	Minimum Acceptable Accumulator Pressure At Temperature Indicated — PSIG				
	0°F	30°F	60°F	90°F	120°F
Initial Charge At 0°F					
0.5	2869	3057	3245	3434	3622
1.0	2634	2807	2980	3153	3325
1.5	2435	2594	2754	2914	3074
2.0	2263	2412	2560	2709	2857
2.5	2114	2253	2392	2531	2669
3.0	1983	2113	2244	2374	2504
3.5	1867	1990	2113	2236	2359
4.0	1764	1881	1997	2113	2229
4.5	1672	1782	1892	2002	2112
5.0	1589	1694	1798	1903	2007
5.5	1514	1613	1713	1813	1912
6.0	1445	1540	1635	1731	1826
6.5	1382	1473	1564	1656	1747
7.0	1325	1412	1499	1587	1674
7.5	1272	1356	1439	1523	1607
8.0	1223	1303	1384	1465	1546
Initial Charge At 30°F					
0.5	2562	2869	3046	3222	3395
1.0	2362	2634	2797	2959	3121
1.5	2190	2435	2585	2735	2885
2.0	2042	2263	2403	2542	2682
2.5	1912	2114	2244	2375	2505
3.0	1797	1983	2106	2228	2350
3.5	1696	1867	1983	2098	2213
4.0	1605	1764	1873	1982	2091
4.5	1523	1672	1775	1879	1982
5.0	1450	1589	1687	1785	1884
5.5	1383	1514	1607	1701	1794
6.0	1321	1445	1534	1624	1713
6.5	1265	1382	1468	1553	1639
7.0	1214	1325	1407	1489	1571
7.5	1166	1272	1350	1429	1503
8.0	1122	1223	1298	1374	1450

Table A-14. Minimum Acceptable Pressures For A-7D Utility Brake Accumulator (continued)

Time From Oil Charging To Final Check – HRS.	Minimum Acceptable Accumulator Pressure At Temperature Indicated – PSIG 0°F	30°F	60°F	90°F	120°F
Initial Charge At 60°F					
0.5	2306	2572	2869	3036	3202
1.0	2133	2370	2634	2787	2940
1.5	1984	2198	2435	2576	2717
2.0	1854	2049	2263	2395	2526
2.5	1740	1919	2114	2237	2360
3.0	1639	1804	1983	2098	2214
3.5	1549	1702	1867	1976	2085
4.0	1469	1611	1764	1867	1970
4.5	1396	1529	1672	1770	1867
5.0	1330	1455	1589	1681	1774
5.5	1270	1388	1514	1602	1690
6.0	1215	1326	1445	1529	1613
6.5	1164	1270	1382	1463	1543
7.0	1118	1218	1325	1402	1479
7.5	1075	1170	1272	1346	1420
8.0	1035	1126	1223	1294	1365
Initial Charge At 90°F					
0.5	2083	2322	2581	2869	3027
1.0	1932	2147	2379	2634	2789
1.5	1802	1997	2206	2435	2568
2.0	1689	1867	2056	2263	2387
2.5	1588	1752	1925	2114	2230
3.0	1499	1650	1810	1983	2092
3.5	1419	1560	1708	1867	1970
4.0	1347	1479	1617	1764	1862
4.5	1282	1405	1534	1672	1764
5.0	1223	1339	1460	1589	1676
5.5	1169	1278	1392	1514	1597
6.0	1120	1223	1331	1445	1525
6.5	1074	1172	1274	1382	1458
7.0	1032	1126	1245	1325	1398
7.5	994	1082	1175	1272	1342
8.0	958	1042	1130	1223	1290

Table A-14. Minimum Acceptable Pressures For A-7D Utility Brake Accumulator (continued)

Initial Charge At 120°F

Time From Oil Charging To Final Check – HRS.	Minimum Acceptable Accumulator Pressure At Temperature Indicated – PSIG				
	0°F	30°F	60°F	90°F	120°F
0.5	1894	2104	2338	2588	2869
1.0	1762	1952	2162	2385	2634
1.5	1648	1821	2011	2212	2435
2.0	1547	1706	1879	2062	2263
2.5	1458	1604	1764	1931	2114
3.0	1378	1514	1661	1815	1983
3.5	1307	1434	1570	1713	1867
4.0	1242	1361	1488	1621	1764
4.5	1184	1295	1415	1539	1672
5.0	1131	1236	1348	1464	1589
5.5	1082	1181	1287	1396	1514
6.0	1037	1131	1231	1335	1445
6.5	996	1085	1180	1278	1382
7.0	958	1043	1133	1226	1325
7.5	922	1004	1090	1178	1272
8.0	890	967	1049	1134	1223

ALPHABETICAL INDEX

NOTE

*INDICATES FIGURE NUMBER
†INDICATES TABLE NUMBER
ALL OTHER NUMBERS INDICATE PARAGRAPH NUMBERS

ALPHABETICAL INDEX

NOTE

*INDICATES FIGURE NUMBER
†INDICATES TABLE NUMBER
ALL OTHER NUMBERS INDICATE PARAGRAPH NUMBERS

	General	Description	Operation	Components	Checkout	Troubleshooting	Rigging/Adjustment	Removal/Installation	Servicing	Testing		
Return Ground Test (PC No. 1)								1-59 *1-16				
Return Ground Test (PC No. 2)								2-52 *1-16				
Element, Filter:	†A-9											
Emergency Power Control System								†A-9 4-25 *4-5				
Filler and Pump Cooling Line, PC No. 1, PC No. 2, and PC No. 3								1-62 *1-17 †A-9				
Pressure Line, PC No. 1, PC No. 2 and PC No. 3								1-44 *1-11 †A-9				
Emergency Hydraulic Utility Circuits Schematic Diagram	*A-4											
Emergency Power Control Hydraulic Supply System		4-1	4-5 *4-2	4-12 †4-1	4-14	4-15						
Emergency Power Control Hydraulic Supply System Arrangement		*4-1										
Emergency Power Control Hydraulic Supply System Schematic Diagram		*4-2										
Extension Units								1-74 1-77 1-79 1-82 *1-21 *1-22 *1-23 *1-24				
Filter:												
Emergency Power Control System								4-28 *4-6				
Filler and Pump Cooling Line, PC No. 1								1-65 *1-18				
Filler and Pump Cooling Line, PC No. 2								2-56 *2-10				

ALPHABETICAL INDEX

NOTE
*INDICATES FIGURE NUMBER
†INDICATES TABLE NUMBER
ALL OTHER NUMBERS INDICATE PARAGRAPH NUMBERS

ALPHABETICAL INDEX

NOTE

*INDICATES FIGURE NUMBER
†INDICATES TABLE NUMBER
ALL OTHER NUMBERS INDICATE PARAGRAPH NUMBERS

☆ U. S. GOVERNMENT PRINTING OFFICE: 1978 — 771-073/634

ALPHABETICAL INDEX

NOTE

*INDICATES FIGURE NUMBER
†INDICATES TABLE NUMBER
ALL OTHER NUMBERS INDICATE PARAGRAPH NUMBERS

	General	Description	Operation	Components	Checkout	Troubleshooting	Rigging/Adjustment	Removal/Installation	Servicing	Testing		
Hand Pump								2-60 *2-11				
PC No. 1 Engine Driven								1-39 *1-10				
PC No. 2 Engine Driven								2-38 *2-5				
PC No. 3 Engine Driven								3-53 *3-11		3-18		
Regulator, Flow-Sensitive								4-19 *4-3 4-22 *4-4				
Reservoir:												
PC No. 1 System								1-36 *1-9				
PC No. 2 System								2-35 *2-4				
PC No. 3 System								3-28 *3-4				
Reservoir Indicator Control (PC No. 3)							3-59 *3-13	3-56 *3-12				
Snubber, Pressure (PC No. 3)							5-40 *5-8					
Swivel Joints								1-85 *1-26				
Torque Sequence	*A-5											
Torque Values for Aluminum Nuts on Aluminum Bolts	†A-1											
Torque Values for Bleed Fitting Assemblies	†A-7											
Torque Values for Bolts and Screws Through Metalite	†A-3											

ALPHABETICAL INDEX

NOTE

*INDICATES FIGURE NUMBER
†INDICATES TABLE NUMBER
ALL OTHER NUMBERS INDICATE PARAGRAPH NUMBERS

☆U.S. GOVERNMENT PRINTING OFFICE: 1976- 671-584/6191

ALPHABETICAL INDEX

NOTE

*INDICATES FIGURE NUMBER
†INDICATES TABLE NUMBER
ALL OTHER NUMBERS INDICATE PARAGRAPH NUMBERS

	General	Description	Operation	Components	Checkout	Troubleshooting	Rigging/Adjustment	Removal/Installation	Servicing	Testing		
Return Line Pressure Relief (PC No. 3)								3-25 *3-3				
System Pressure Relief (PC No. 1)								1-50 *1-13				
System Pressure Relief (PC No. 2)								2-45 *2-7				
System Pressure Relief (PC No. 3)								3-44 *3-8				

☆U.S. GOVERNMENT PRINTING OFFICE: 1975—671-584/6012

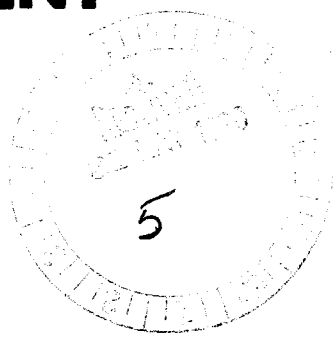
SAFETY SUPPLEMENT

TECHNICAL MANUAL

MAINTENANCE INSTRUCTIONS

ORGANIZATIONAL

FLIGHT CONTROL SYSTEMS



A-7D

THIS PUBLICATION SUPPLEMENTS TO 1A-7D-2-8 DATED 1 APRIL 1981. Reference to this supplement will be made on the title page of the basic manual by personnel responsible for maintaining the publication in current status.

COMMANDERS ARE RESPONSIBLE FOR BRINGING THIS SUPPLEMENT TO THE ATTENTION OF ALL AFFECTED AF PERSONNEL.

Published under authority of the Secretary of the Air Force

9 APRIL 1990

1. PURPOSE.

   To reflect changes to basic manual as indicated.

2. INSTRUCTIONS.

   On page 22-16, paragraph 2-32 the following CAUTION is added to read:

CAUTION

When rigging flight control linkages, check witness holes either visibly or with a piece of safety wire to ensure rode end threads cover the holes.

THE END