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ORGANIZATIONAL

MECHANICAL ACCESSORIES SYSTEMS

A-7D

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INTRODUCTION

THIS MANUAL.

This manual contains descriptive material and organizational maintenance instructions for personnel to maintain the air-conditioning and liquid oxygen systems of the A-7D Corsair II airplane.

This manual includes maintenance instructions on the following:

Air-Conditioning Supply System	Section I
Control Air System	Section II
Cockpit Air Temperature System	Section III
Pilot Suit Cooling System	Section IV
Ground Cooling System	Section V
Defog System	Section VI
Electronic Equipment and Camera Compartment Cooling System	Section VII
Radar Pressurization System	Section VIII
Antiblackout System	Section IX
Cockpit Pressure Regulator System	Section X
Low-Pressure Engine Bleed Air Supply System	Section XI
Rain Removal and Anti-Ice System	Section XII
Oxygen System	Section XIII
Gun Gas Purge System	Section XIV
Air Conditioning System Operational Check	Appendix A

Each organizational maintenance manual provides 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. Checklist T.O. 1A-7D-2-10CL-1 prescribes the procedure for collecting and reporting data from the A-7D equipped with statistical (counting) accelerometers.

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. Routing servicing instructions are in T.O. 1A-7D-2-1.

TOOLS AND TEST EQUIPMENT REQUIRED.

Tools and test 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 or 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.

REVISION.

This manual has been revised to incorporate changes resulting from formalization and airplane design changes.

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-2-2	Egress and Survival Systems
T.O. 1A-7D-2-2CL-1	Egress and Survival Systems Seat Removal and Installation 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
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

LIST OF SYSTEMS MAINTENANCE MANUALS (continued)

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
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

LIST OF SYSTEMS MAINTENANCE MANUALS (continued)

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. 1-1-1	Cleaning of Aerospace Equipment
T.O. 1-1-2	Corrosion Prevention and Control for Aerospace Equipment
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-3	Structural Repair Instructions
T.O. 1A-7D-4-1	Illustrated Parts Breakdown, Introduction
T.O. 1A-7D-6	Inspection Instructions, Aircraft Scheduled Inspection and Maintenance Requirements
T.O. 33A4-4-8-1	Operation and Service Instructions, Portable Gasoline Engine Driven Pressurized Cabin Leakage Tester, Type MB-1
T.O. 33D2-10-55-1	Operation and Maintenance Instructions, 31TA2655-2 Oxygen Regulator Field Tester

REFERENCE PUBLICATIONS (continued)

T.O. 33D2-39-14-2	Maintenance Instructions with Calibration Procedures and Illustrated Parts Breakdown, Environmental Control System Test Set, 216-01492-1 (AN/ASM-390)
T.O. 33D7-3-117-2	Intermediate and Depot Maintenance Instructions with Illustrated Parts Breakdown, SM-565/ASM Air Data Simulator, 215-01633-1
T.O. 35D3-6-12-1	Operation and Service Instructions Type MB-4 Gaseous Oxygen Trailer
T.O. 35E22-3-3-1	Operation, Service, and Repair Instructions 31TB2105A Lox System Purging Kit

RECORD OF TIME COMPLIANCE TECHNICAL ORDERS

T.O. Number	Date	Title	Change/Revision Date
1A-7-530	15 Mar 1988	Installation of Forward Looking Infrared System on A-7 Aircraft (ECP 622)	15 Oct 1986
1A-7-562		Installation of Ring Laser Gyro Inertial Navigation System on A-7D/K Aircraft	1 Mar 1990
1A-7D-708	20 May 1974	Modification of Pitot-Static System – A-7D Aircraft	15 Oct 1974

SECTION I
AIR-CONDITIONING SUPPLY SYSTEM

1-1. DESCRIPTION.

1-2. The air-conditioning supply system provides conditioned air for cooling, heating, ventilating and pressurization. The supply system regulates and delivers the conditioned air to the cockpit, camera compartment, sweep generator, specific equipment in the avionic compartments, pilot suit cooling system, and defog system.

1-3. The air-conditioning supply system consists of an engine high pressure bleed air manifold, various ducts and couplings, pressure limiting and shutoff valve, air-conditioning package, and emergency vent air scoop. Supply system components which are part of the air-conditioning package include the flow control valve, low limit transmitter, water separator, water separator anti-ice valve, ejector air valve and nozzle, air-to-air heat exchanger, ejector dump valve, compressor inlet thermostat, and turbine-compressor.

1-4. The cockpit environmental control panel provides pilot control of the air-conditioning supply system and the following subsystems: cockpit temperature, cockpit pressure, rain repellent, rain removal and anti-ice, and defog. Temperature is controlled by temperature control valves and temperature sensors located in the air-conditioning ducts and in the cockpit.

1-5. For system controls and indicators, see figure 1-1. For system arrangement, see figure 1-2.

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

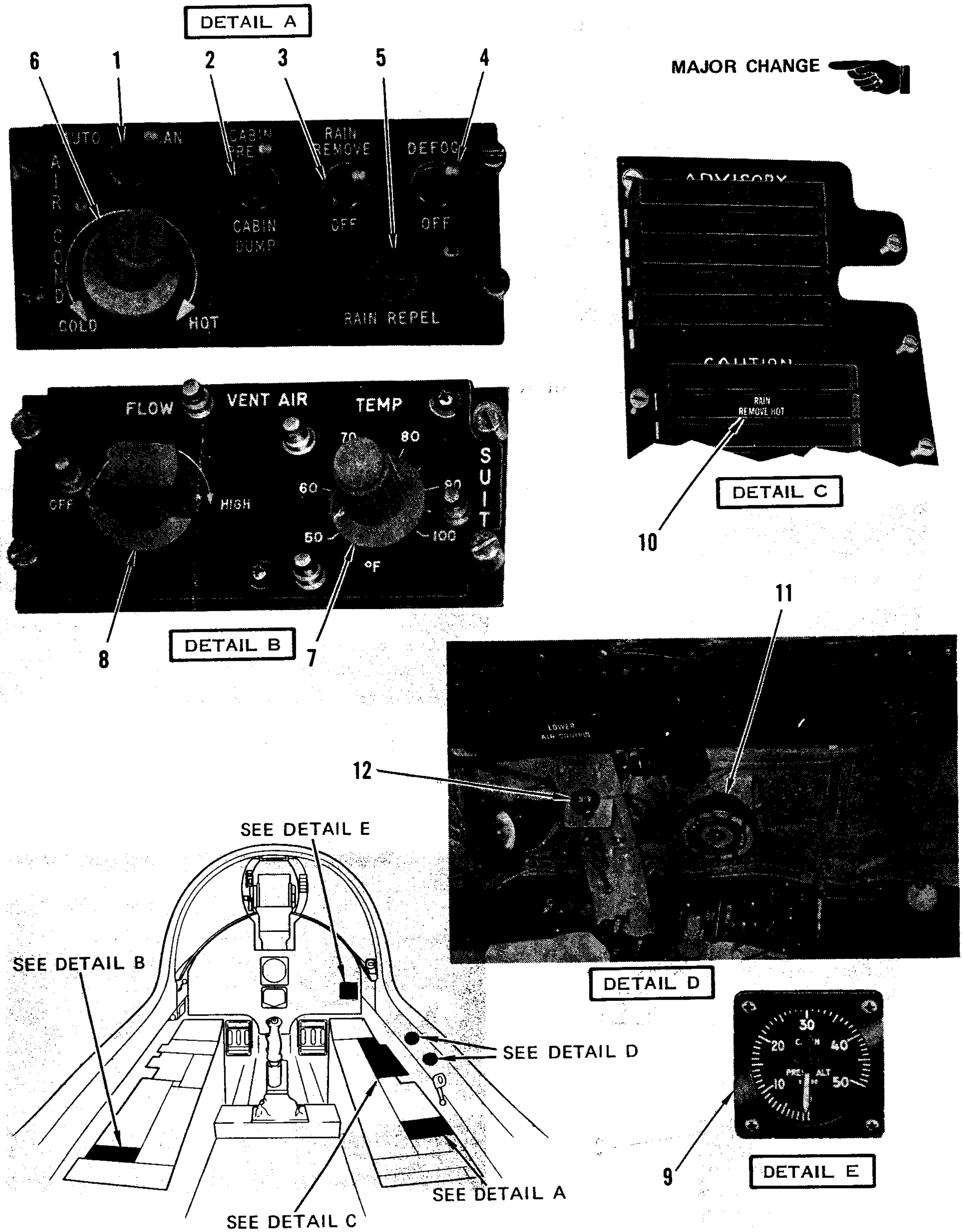
1-7. High temperature bleed air from the engine is ducted through thin-wall stainless steel tubing to the pressure limiting and shutoff valve. This valve is controlled by the cockpit pressure switch on the environmental control panel. When the switch, a pneumatic toggle valve, is in CABIN PRESS, control air pressure is applied to the valve. Control air pressure opens the valve admitting engine bleed air into the air-conditioning system. The pressure and flow of air that is admitted into the system is controlled by the pressure limiting and shutoff valve. The pressure is limited by balancing upstream pressure (engine bleed air) on one side of a diaphragm against the sum of a spring and downstream pressure. If upstream pressure is 110 psig or more, then the downstream pressure will be regulated to 110 psig or lower, as required by the flow control valve. Flow rate is controlled in response to pneumatic signals received from the flow control valve or compressor inlet thermostat. Signal from either component will cause the pressure limiting and shutoff valve to move toward the closed position.

1-8. The engine bleed air flows through the primary core of the heat exchanger to the compressor side of the turbine-compressor. The air is compressed to a temperature and pressure high enough to produce good heat transfer in the secondary core of the heat exchanger where the air is further cooled. After leaving the secondary core, the air is expanded in the turbine end of the turbine-compressor. The expansion in the cooling turbine develops the mechanical energy required to drive the turbine-compressor and also produces a temperature reduction in the bleed air.

1-9. To remove water from the turbine discharge air, a water separator is located between the turbine-compressor and the distribution system. Water droplets are formed as the air is forced through a dacron bag mounted on a conical support containing louvered openings. The support swirls the air so that the water droplets are thrown to the outside of the water separator shell where they accumulate and are drained off. Since turbine discharge air attains low temperatures, an anti-ice circuit is provided to prevent ice accumulation in the water separator. Warm air is introduced into the discharge duct to increase the temperature of the air entering the water separator. This is accomplished in response to a pressure drop sensed across the water separator. When the bag or the screen (located in the discharge duct of the water separator) ices, a pressure differential is established that causes the anti-ice valve to open, allowing warm air to enter the water separator and melt the ice. The anti-ice valve also limits the minimum turbine discharge temperature to -65°F in response to a pneumatic signal from the low limit transmitter. The transmitter senses the low temperature and opens to permit control air pressure to open the anti-ice valve and mix warm air with the turbine discharge air.

1-10. After leaving the water separator, the cold turbine discharge air enters the cold air manifold for distribution. The butterfly valve section of the flow control valve functions to maintain a 4.1-psi cold air manifold/cabin pressure differential. This 4.1-psi differential ensures an adequate flow of cold air to the pilot's antiexposure suit, camera, and air-conditioned avionics equipment at all times. The valve, at its fully closed position, still allows some airflow to the cockpit.

MAJOR CHANGE



Airplanes through AF69-6196

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Figure 1-1. Air Conditioning System Controls and Indicators (Sheet 1)

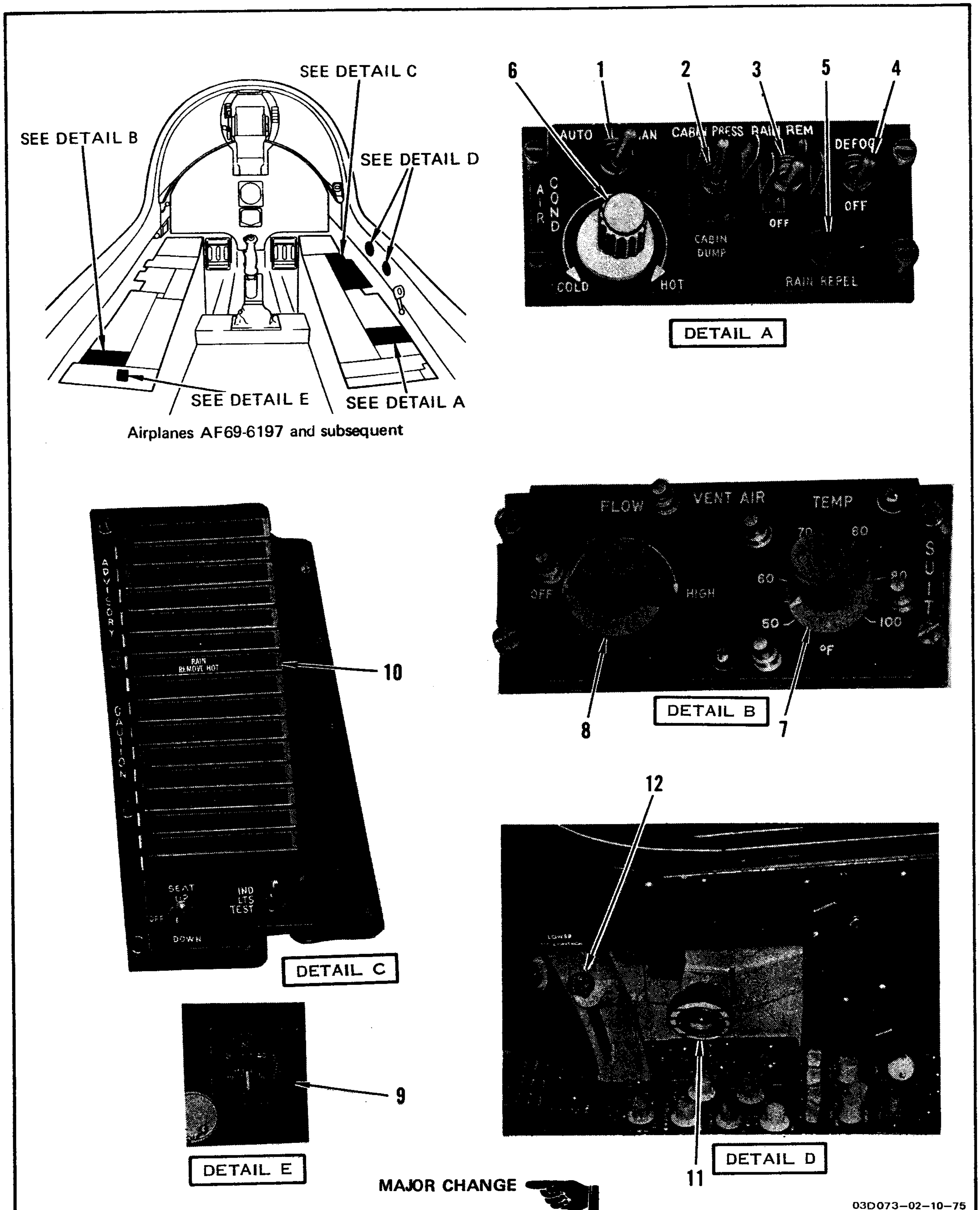

Figure 1-1. Air Conditioning System Controls and Indicators (Sheet 2)

INDEX NO.	CONTROL/INDICATOR	FUNCTION
1	Manual override switch	AUTO — allows cockpit temperature to be automatically maintained at the temperature selected by the temperature control knob. MAN — shuts off automatic cockpit temperature. Temperature is still controlled with temperature knob but must be manually adjusted to compensate for changing flight conditions.
2	Cockpit pressure switch	CABIN PRESS — opens bleed air pressure limiter and shutoff valve, placing air-conditioning and pressurization system in operation. Closes cockpit air safety valve, allowing cockpit to be pressurized. CABIN DUMP — closes bleed air pressure limiter and shutoff valve. Opens cockpit air safety valve allowing cockpit to depressurize.
3	Rain removal switch	RAIN REM — opens rain removal shutoff valve, permitting warm high-velocity air to flow from rain removal nozzles. OFF — closes rain removal shutoff valve which stops air flow from rain removal nozzles.
4	Defogger switch	DEFOG — opens defogger valve, allowing hot air to be added to cockpit air flowing through windshield defogger vents. OFF — closes defogger valve so that normal cockpit air flows through windshield defogger vents.
5	Rain repellent switch (RAIN REPEL)	When pressed, applies repellent fluid to the center and left windshield. Prevents rain from forming on windshields.
6	Cockpit temperature control knob	COLD TO HOT — electrically regulates temperature of air entering cockpit through canopy rail vents and windshield defogger vents.
7	Suit air temperature knob (TEMP)	50° to 100° F — controls temperature of air entering pilot's antiexposure suit.
8	Suit flow control knob (FLOW)	OFF to HIGH — regulates flow of air to pilot's anti-exposure suit.
9	Cockpit pressure altimeter	Indicates cockpit air pressure in terms of equivalent altitude
10	Rain removal caution light	On (rain remove hot) — indicates rain removal air temperature is in excess of 290° ($\pm 10^{\circ}$) F.
11	Emergency vent air knob	PULL — turn to open ram air scoop to release cockpit pressure and provide emergency cockpit ventilation.
12	Floor inlet shutoff valve control	OPEN — air flows from floor inlets. CLOSED — air flow stops.

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Figure 1-1. Air-Conditioning System Controls and Indicators (Sheet 3)

INDEX NO.	COMPONENT	ACCESS NO.
1	Center Rain Repellent Nozzle	Radar Compartment
2	Left Rain Repellent Nozzle	
3	Left Rain Removal Nozzle	
4	Rain Repellent Shutoff Valve	
5	Center Rain Removal Nozzle	
6	Thermal Switch	Radar Compartment
7	Desiccator	1211-2
8	Cockpit Air Pressure Regulator	1211-2
9	Radar Pressure Regulator	1211-2 and 2211-2
10	Cockpit Temperature Sensor	1211-2
11	Cockpit Air Safety Valve	2211-2
12	Floor Inlet Shutoff Valve	Below cockpit floor
13	Electrical Suit Temperature Control	2212-7
14	Emergency Vent Air Scoop	Above right console
15	Cockpit Environmental Control Panel	Right console
16	Water Separator Anti-Ice Valve	2212-6 and 2222-4
17	Cockpit Temperature Thermostatic Valve	2222-4
18	Turbine-Compressor	2212-6 and 2222-4
19	Compressor Inlet Thermostat	2212-10, 2212-6, and 2222-4
20	Defog Temperature Anticipator	2222-4
21	Heat Exchanger	2212-6 and 2222-4
22	Defog Temperature Transmitter	2222-4
23	Rain Removal Valve	2212-6 and 2222-4
24	Rain Removal Temperature Control Valve	2212-6 and 2222-4
25	Control Air Valve	2212-6 and 2222-4
26	Ejector Dump Valve	2212-6 and 2222-4
27	Defog Valve	2212-6 and 2222-4
28	Rain Removal Transmitter	2222-4
29	Cockpit Temperature Control Valve	2212-6 and 2222-4
30	Ejector Air Valve	2212-6 and 2222-4
31	Suit Temperature Control Valve	2212-6 and 2222-4
32	Cockpit Temperature Anticipator	2222-4
32A	Check Valve	2222-4
33	Water Separator	2212-6
33A	Cold Air Manifold	2212-6
34	Flow Control Valve	2212-6
35	Low Limit Transmitter	2212-6
36	Ground Cooling Air Socket	2233-1

INDEX NO.	COMPONENT	ACCESS NO.
36A	Ground Cooling Check Valve	2212-6
37	Differential Pressure Switch	2232-1
38	**Compartment Cooling Fan**	1232-1 or 2232-1
39	Gun Gas Purge Valve	2123-6
40	Rain Repellent Container	Left rear cockpit bulkhead
41	Canopy Rail Seal	Cockpit
42	Suit Temperature Sensor	1123-1
43	Pilot Services Disconnect Assembly	Left console
44	Anti-g Valve	1221-1
45	Suit Flow Control Valve	Left console
46	Suit Temperature Control	Left console
47	Gun Gas Purge Hydraulic Selector Valve	1222-6
48	Gun Gas Purge Door Actuating Cylinder	1222-6
49	Gun Gas Purge Door	1222-6
50	Camera Temperature Control Valve	6222-1
51	Linear Motion Compensator	6122-2 and 6222-3
52	High-Pressure Bleed Air Gimbal Duct	6122-2
53	Z-Section Duct	6111-2, 6111-4, and 6122-2
54	Pressure Limiting and Shutoff Valve	6122-2
55	Low Pressure Bleed Air Gimbal Duct	6122-2
56	Surge Tank	2121-3
57	△1 INU Cooling Air Check Valve	1232-1
58	△1 INU Cooling Fan	1232-1
59	△1 INU Cooling Pressure Switch	2222-4

△1 Airplanes after T.O. 1A-7-562

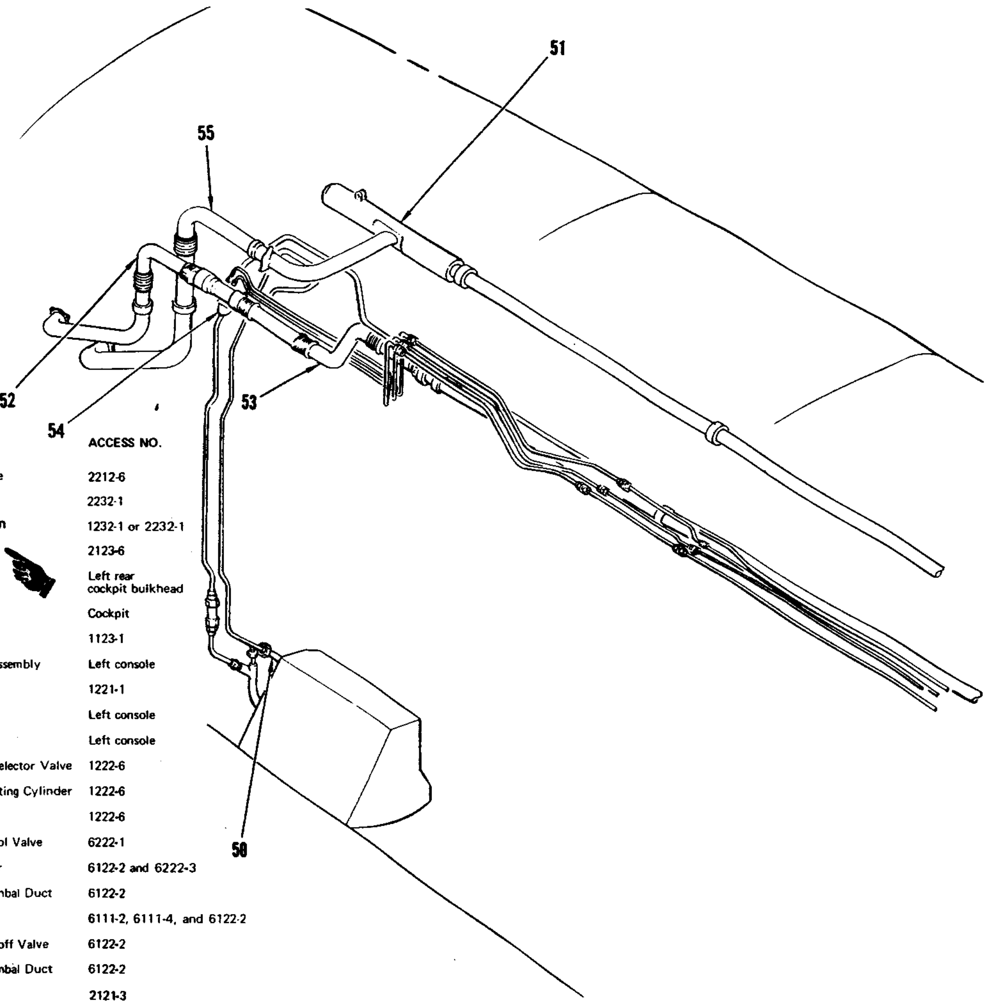


Figure 1-2. Air-Conditioning System Arrangement (Sheet 1)

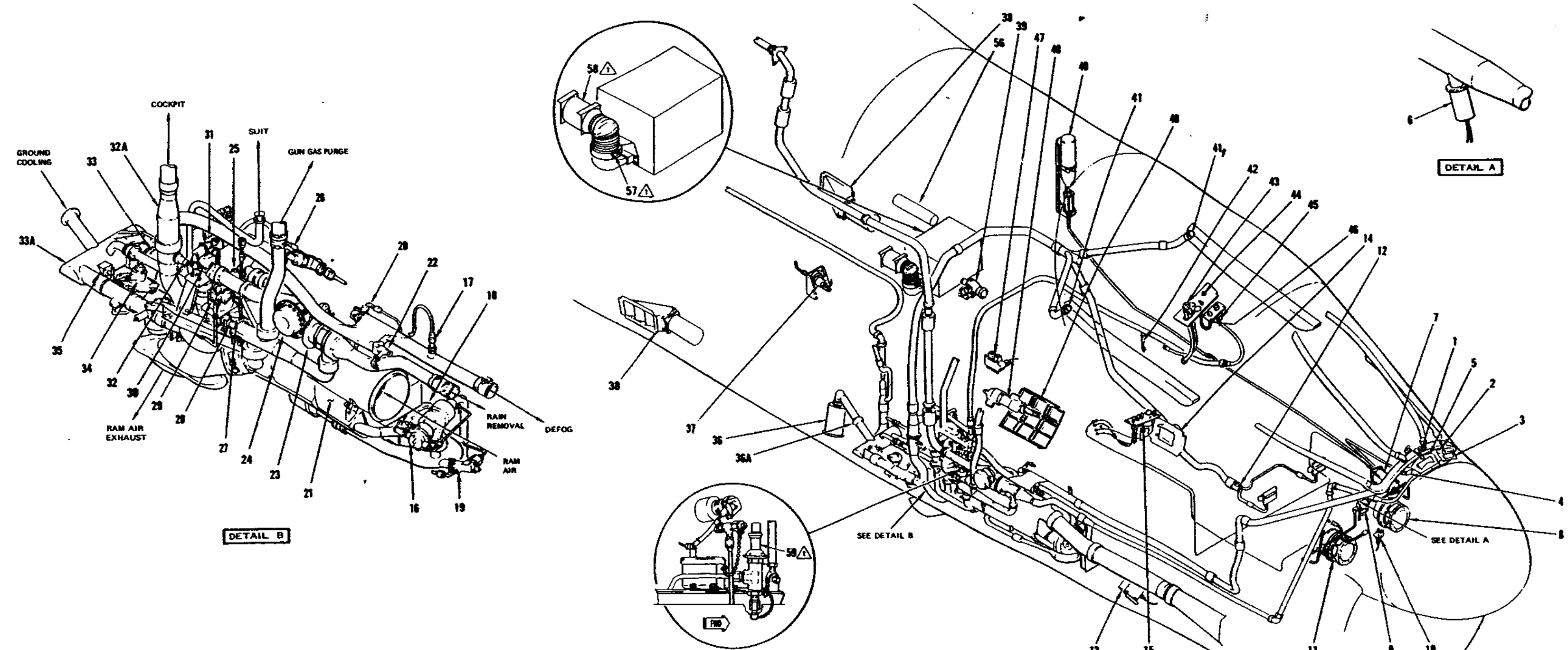


Figure 1-2. Air-Conditioning System Arrangement (Sheet 2)

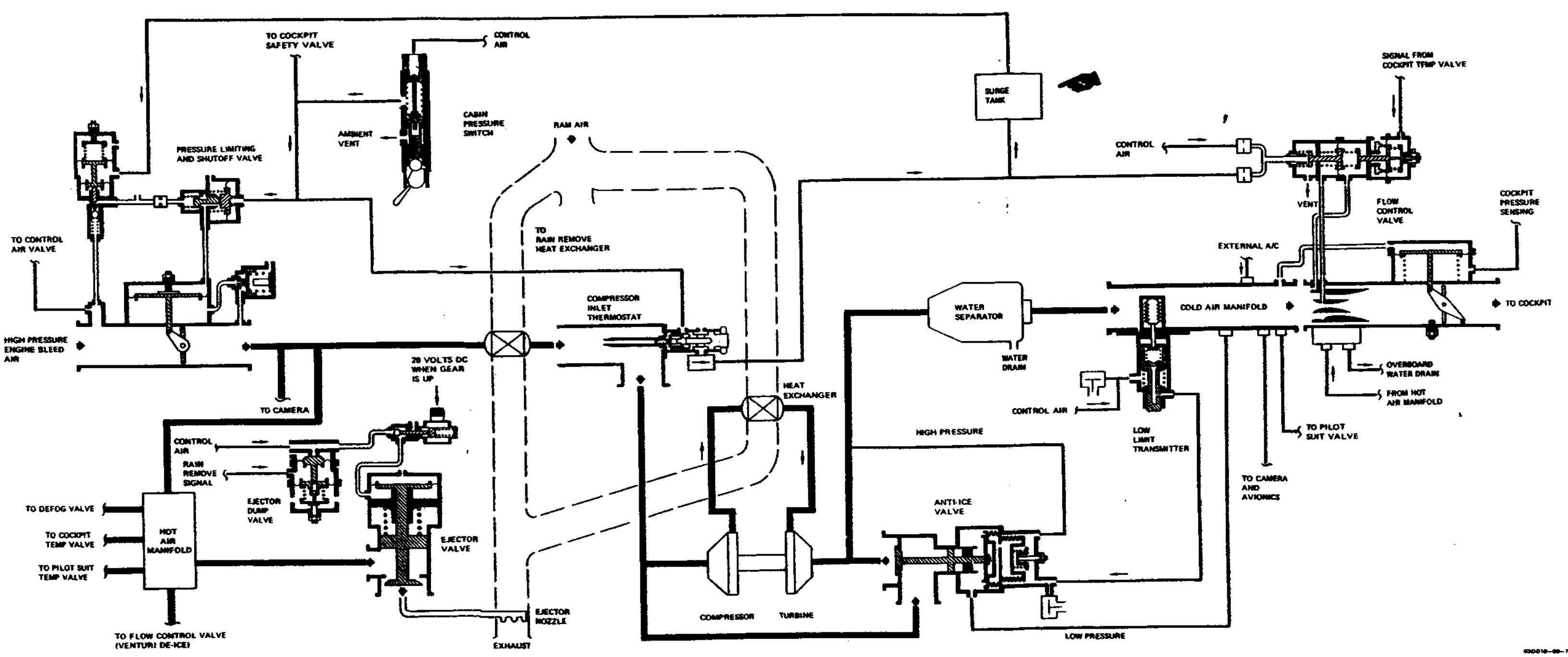


Figure 1-3. Air-Conditioning Supply System Schematic Diagram

1-11. The flow control section of the flow control valve provides a control air signal to the pressure limiting and shutoff valve in response to signals from other components. One signal is a differential between duct total pressure and the lower pressure created by a double venturi in the flow area of the valve. This pressure differential will modulate the flow control valve proportionally to the flow of air through the venturi. When airflow is below the desired value, control air is vented to ambient by the flow control valve. When airflow is too high, the valve is allowed to close partially and some of the control air pressure is applied to the pressure limiting and shutoff valve which partially closes and reduces the amount of bleed air entering the system. Another signal which affects operation of the flow control valve is provided from the cockpit temperature control valve. This signal is received when the cockpit is too cold and the temperature control knob is rotated to a warmer setting. Before hot air is admitted into the cockpit air by the temperature control valve, the cold airflow will be reduced as the first step to warm the cockpit. This is accomplished by using the initial control air pressure applied to the cockpit temperature control valve to recalibrate the flow control valve. When this happens, the flow control valve will partially close and demand less flow from the pressure limiting and shutoff valve.

1-12. If a condition occurs (such as low airspeed), that reduces the exchange of heat in the primary section of the heat exchanger, temperature of the air entering the turbine will increase. To prevent the temperature from reaching a point that may damage the turbine, the compressor inlet thermostat will open and allow control air to be sent to the pressure limiting and shutoff valve. This signal overrides the signal from the flow control valve. The pressure limiting and shutoff valve will allow minimum engine bleed airflow into the system until the heat exchanger recovers and the thermostat closes.

1-13. Engine bleed air flowing through the heat exchanger is cooled by ram air that is either forced through the heat exchanger by motion of the airplane through the air or is drawn through by air ejectors in the exhaust duct. During ground operation, these ejectors discharge high pressure streams of air out the exhaust duct. The motion of this air pulls air through the heat exchanger to provide the necessary cooling. When the landing gear is up and locked, the ejector air valve solenoid is energized allowing control air pressure to close the valve and stop ejector airflow. When the rain removal and anti-ice system is on, some of the ram air flow will flow through the rain removal heat exchanger core. To ensure adequate ram air flow during rain removal operation, control air pressure from the rain removal system is applied to the ejector dump valve. This valve opens and vents to ambient the control air holding the ejector air valve closed. The ejector valve will open, providing increased cooling airflow through the heat exchanger.

1-14. COMPONENTS.

1-15. For a list of components, their locations (accesses), and functions, refer to table 1-1 and see figure 1-2.

1-16. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine during operational checkout of air-conditioning supply system
1-5	Test gages		Indicate system pressures
	Thermometer, 0° to 250°F	71275 (United States Gage, Division of Ametex Inc., Sellersville, Pa.)	Check cockpit inlet air temperature

Table 1-1. Air-Conditioning Supply System Components

Component	Access	Function
Duct, high pressure bleed air gimbal and forward z-section	6122-2 and 6111-2	Directs high pressure engine bleed air.
Exchanger, heat	2212-6 and 2222-4	Reduces temperature of engine bleed air.
Scoop, emergency vent air	Above right forward console	Allows outside air to cockpit when air-conditioning system is not operating.
Separator, water	2212-6	Disposes of water particles in turbine discharge air.
Tank, surge	2121-3	Provides surge damping between flow control valve and pressure limiting and shutoff valve to prevent cabin pressure cycling.
Thermostat, compressor inlet	2212-10, 2212-6, and 2222-4	Provides control air pressure to position pressure limiting and shutoff valve for minimum bleed airflow when air temperature to turbine-compressor is excessive.
Transmitter, low limit	2212-6	Limits turbine discharge temperature to -65°F by providing control air pressure to anti-ice valve which opens to mix warm air with turbine outlet air.
Turbine-compressor	2212-6 and 2222-4	Refrigerates air from heat exchanger before it flows to the air-conditioning subsystems.
Valve, pressure limiting and air shutoff	6122-2	Controls engine bleed airflow to air-conditioning and pressurization system.
Valve, ejector air	2222-4	Directs engine bleed air to ejector nozzle when landing gear is lowered. Also controlled by ejector dump valve during operation of rain removal and anti-ice system.
Valve, flow control	2212-6	Regulates airflow to the cockpit. Maintains back pressure in cold air manifold to ensure air to avionic, camera, and antiexposure suit cooling functions.
Valve, ejector dump	2212-6 and 2222-4	Vents ejector air valve closing air pressure to ambient air, causing ejector air valve to open in flight when rain removal switch is placed in ON.
Valve, water separator anti-ice	2212-6 and 2222-4	Prevents ice accumulation in the water separator by supplying warm air when a pressure drop, caused by ice formation, is sensed across water separator.

WARNING

Personnel shall wear asbestos gloves to prevent severe burns when checking for bleed air leakage and heat exchanger exhaust.

NOTE

A number or numbers enclosed in braces at the end of a step in the following test is a reference to a corresponding number in troubleshooting figure 1-10A-1.

If excessive airflow rate into cockpit was reported during flight, check that cabin pressure sensing line from CABIN port of flow control valve is properly connected before performing checkout. This discrepancy will not be duplicated during the checkout.

a. If checkout is being performed to isolate malfunction, install test gages as indicated in the following test points:

1. No. 1 — 0 to 30 psi (figure 1-6)
2. No. 2 — 0 to 30 psi (figure 1-7)
3. No. 3 — 0 to 30 psi (figure 1-8)
4. No. 6 — 0 to 30 psi (figure 1-9)
5. No. 7 — 0 to 60 psi (figure 1-10)

b. Pull out floor inlet shutoff valve control in cockpit.

c. Position suit flow control to OFF.

d. Position cockpit environmental control panel switches and controls as follows:

Switch/Control	*Position*
Defog switch	OFF
Cockpit pressure switch	CABIN DUMP
Rain removal switch	OFF
Cockpit temperature control	Midscale
Manual override switch	MAN

e. Start engine (T.O. 1A-7D-2-1) and operate at idle rpm.

CAUTION

To prevent overheating of air-conditioning system, verify that ram airflow starts immediately from heat exchanger exhaust duct after placing both cockpit pressure switches in CABIN PRESS. If no flow occurs, place either switch in CABIN DUMP and troubleshoot air-conditioning supply system.

f. Close canopy.

g. Place cockpit pressure switch in CABIN PRESS and simultaneously check for airflow from canopy rail vents and for ram airflow from heat exchanger exhaust duct. (1 through 3)

h. Place thermometer in canopy rail vent. Ensure that thermometer does not touch metal.

i. If installed, check that test gage at test point No. 3 indicates minimum of 10 psig. Advance throttle to 70% rpm (or above) and check that pressure increases to 18 (+3, −2) psig. {4}

j. Advance throttle to 90% rpm.

k. Rotate cockpit temperature control to full COLD and check for the following:

NOTE

With the cockpit temperature control in full COLD, the test gage may momentarily exceed values shown in the following step during high power engine operation.

1. High rate of cold air from canopy rail vents. If installed, test gage at test point No. 7 indicates 12 to 22 psig during steady engine operation. (4 and 5)

2. If installed, test gage at test point No. 2 indicates 3-9 psig. (4 and 5)

3. After stabilization, temperature of air at canopy rail vents is 40. 40°F at donut seal when ambient temperature is below 80°F. Add 1/2° to 40°F requirement for each 1°F ambient above 80°F. (6)

4. If installed, check that gage at test point No. 7 does not indicate more than 22 psig during steady state engine operation. Check pressure difference between gages at test points No. 6 and 7. If pressure is less than 10 psig, check that anti-ice duct is cool (valve closed). If pressure is greater than 10 psig, check that anti-ice duct is warm (valve open). (6A, 6B)

l. Check that air flows from floor vents in cockpit. Push in floor inlet shutoff valve control and check that airflow ceases at floor vents.

NOTE

Pressure change will require approximately 30 to 60 seconds.

m. Rotate cockpit temperature control slowly from COLD through midscale position. Check that airflow first decreases and then increases as it becomes warmer. Continue to move cockpit temperature control to full HOT and check the following:

1. If installed, test gage at test point No. 2 indicates 14 (+3, −2) psig. (7 and 8)

n. Check that air or water is flowing from water separator drainline. (9)

o. Retard throttle to IDLE rpm.

p. Place cockpit pressure switch in CABIN DUMP and check that airflow ceases at canopy rail vents. (10)

q. Place cockpit pressure switch in CABIN PRESS and check that airflow is present at canopy rail vents.

CAUTION

Ensure cockpit is completely depressurized before opening canopy. A positive check may be accomplished by opening emergency vent air scoop.

r. Place aft cockpit pressure switch in CABIN DUMP and check that airflow ceases at canopy rail vents. (14)

s. Open canopy.

t. Shut down engine (T.O. 1A-7D-2-1).

u. Remove test gages if installed and reinstall test port caps.

Figure 1-3A. is deleted.

1-17. TROUBLESHOOTING. (See figures 1-5, 1-6, 1-7, 1-8, 1-9, 1-10, 1-10A-1.)

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Supply electrical power during troubleshooting of air-conditioning supply system
1-5	Test gages		Indicate system pressures
	Multimeter	AN/PSM-37 or equivalent	Check voltage
	Air/nitrogen trailer	MIL-T-26772	Supply nitrogen while troubleshooting

1-18. See figure 1-10A-1 for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout. Instructions for isolating system malfunctions to a specific component are provided in the troubleshooting figure.

1-19. EJECTOR DUMP VALVE CHECKOUT. (See figure 1-13.)

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Supply electrical power during checkout
	Air/nitrogen trailer	MIL-T-26772	Supply nitrogen while troubleshooting
	Multimeter	AN/PSM-37 or equivalent	Check voltage
	Torque wrench, 10 to 150 inch-pounds	GGG-W-686	Torque exhaust duct coupling

a. Disconnect right nose gear lower link (T.O. 1A-7D-2-7).

b. Open accesses 2222-4 and 2212-6.

c. Remove heat exchanger exhaust duct.

d. Remove ejector air valve outlet duct.

e. Place cockpit pressure switch to CABIN PRESS.

f. Position cockpit environmental control panel switches and controls as follows:

Switch/Control	*Position*
Rain removal switch	OFF
Defog switch	OFF
Cockpit pressure switch	CABIN PRESS

g. Remove cap from tee at test point No. 3.

h. Connect regulated air source to tee and apply 18 (+3 -2) psig pressure.

i. Disconnect P2089 from ejector air valve.

WARNING

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

j. Apply 28 volts dc between pins 3 and 6 of ejector air valve connector. Visually verify that valve poppet closes when voltage is applied.

k. Place cockpit rain removal switch in RAIN REMOVE and visually verify that ejector valve poppet opens.

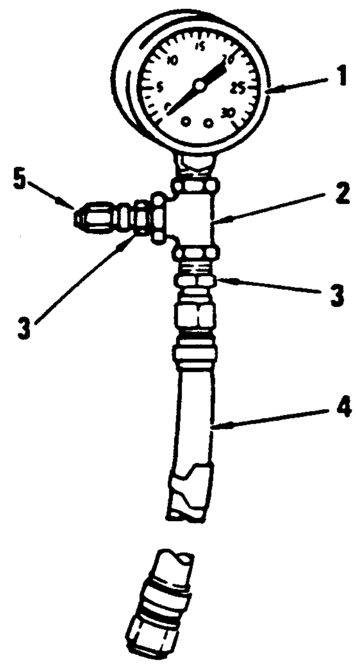
l. Place cockpit rain removal switch in OFF and check that ejector air valve poppet closes.

m. If ejector air valve fails to operate, replace ejector dump valve (paragraph 1-49).

n. Disconnect 28 volts. Note that ejector air valve poppet opens.

o. Connect electrical connector to ejector air valve.

p. Relieve air pressure and disconnect air source from test point No. 3 and cap tee.



1. IRM6685–833–6132–GX (pressure gage 0–30 psig)
2. AN917–2D tee
3. AN816–4–4D nipple
4. AN6270–4D–0160 hose assembly
5. AN929–4 cap

NOTE

Pressure gage P/N 1000, FSN IRM6685–663–4996, (0–160 PSI) or Pressure gage FSN IRM6685–922–2839 (0–60 PSI) must be used in place of 0–30 PSI pressure gage for some applications.

Test gage for test points 1, 2, 3, 4, 4A, 5, 6, and 7

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Figure 1-4. Air-Conditioning System Troubleshooting Test Gage Fabrication

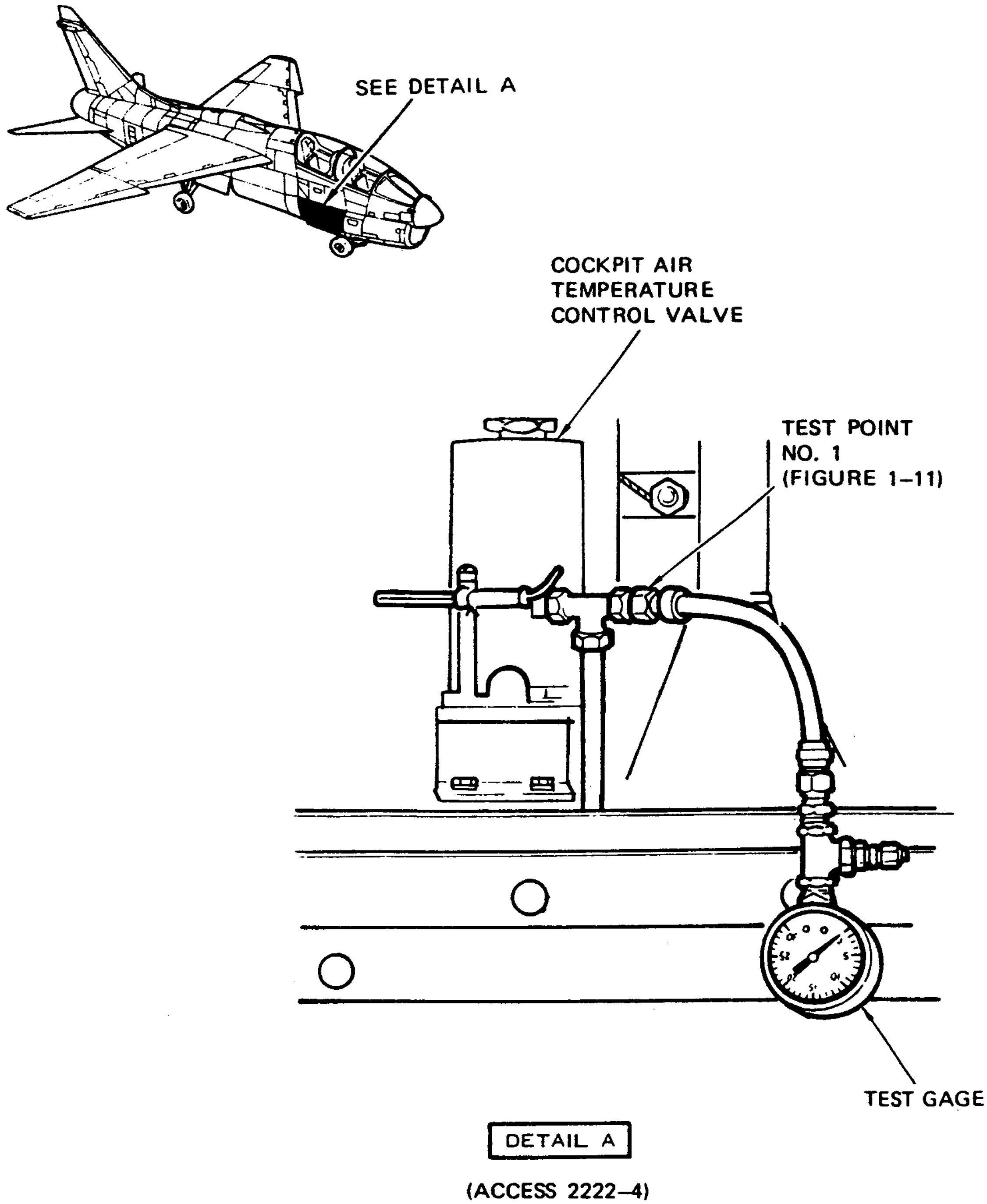

Figure 1-5. Test Gage Placement (Sheet 1 of 7)

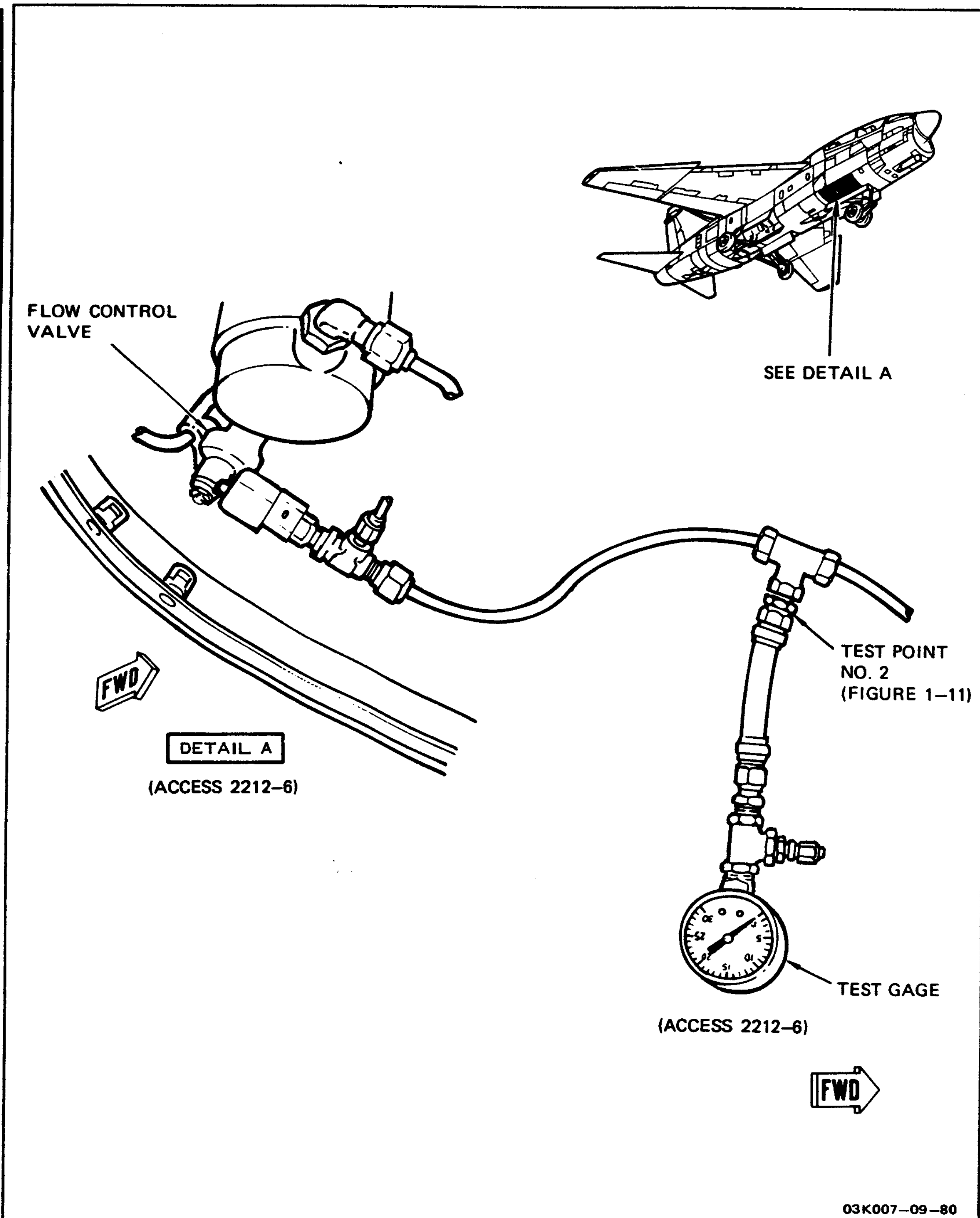

Figure 1-5. Test Gage Placement (Sheet 2 of 7)

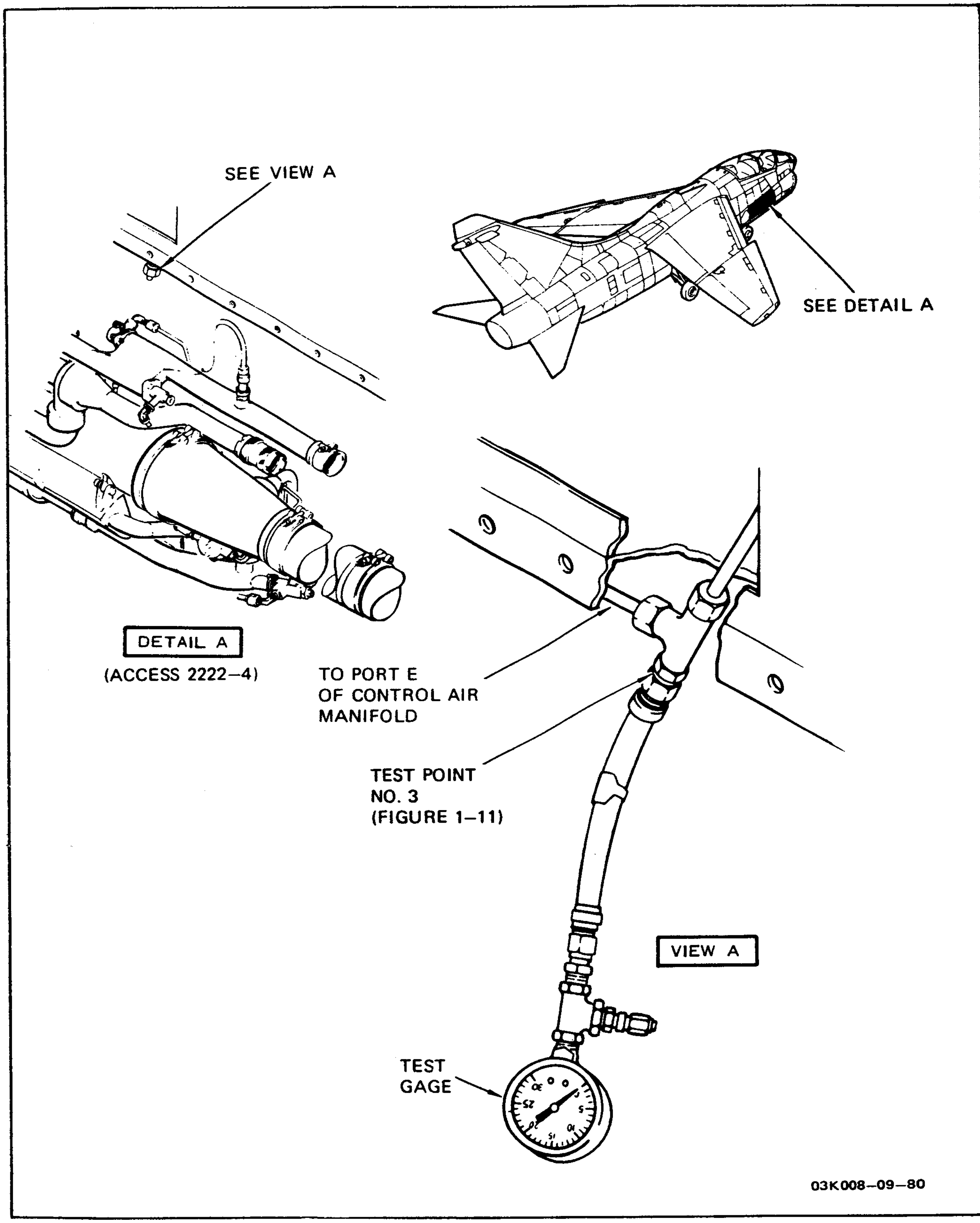

Figure 1-5. Test Gage Placement (Sheet 3 of 7)

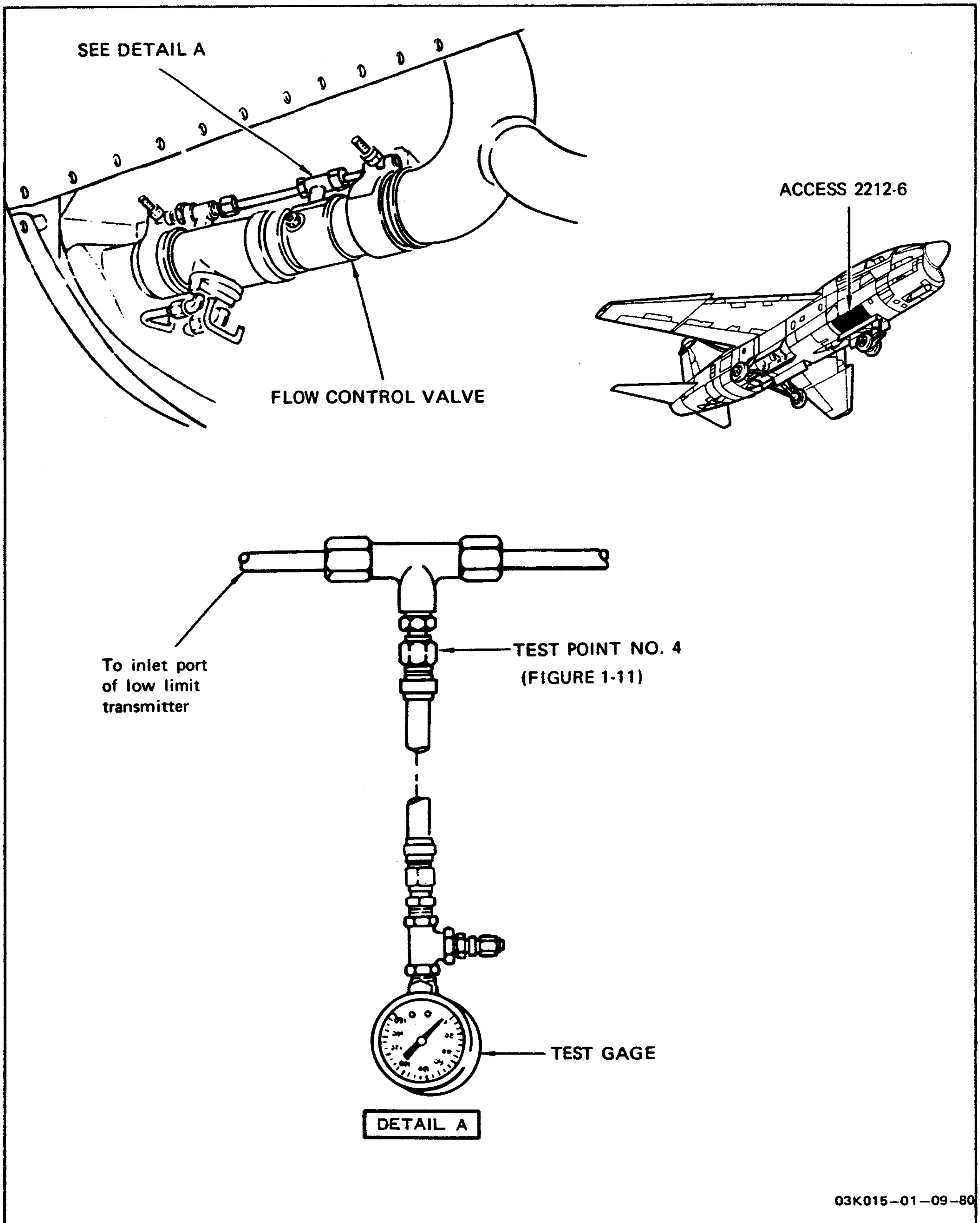

Figure 1-5. Test Gage Placement (Sheet 4 of 7)

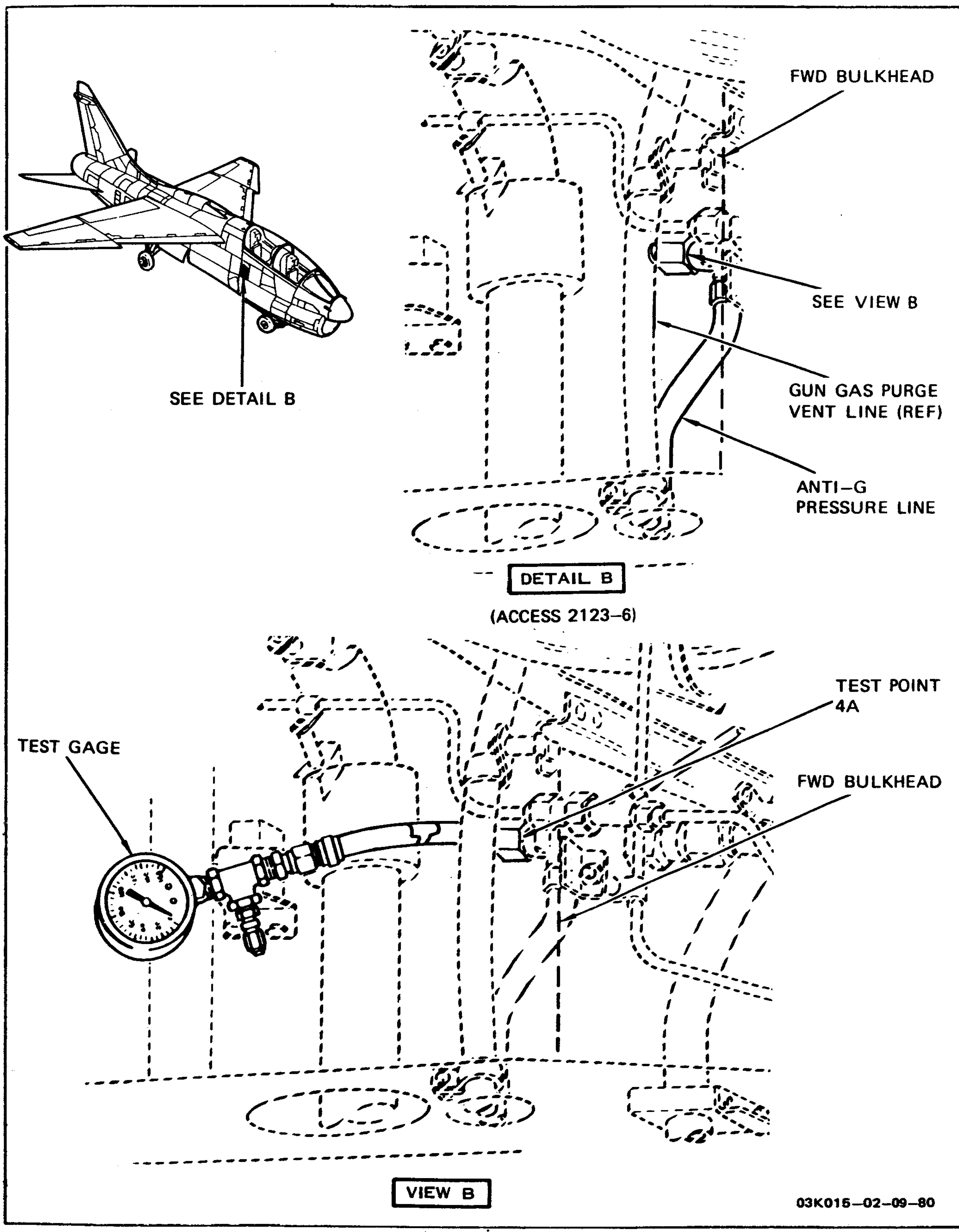

Figure 1-5. Test Gage Placement (Sheet 5 of 7)

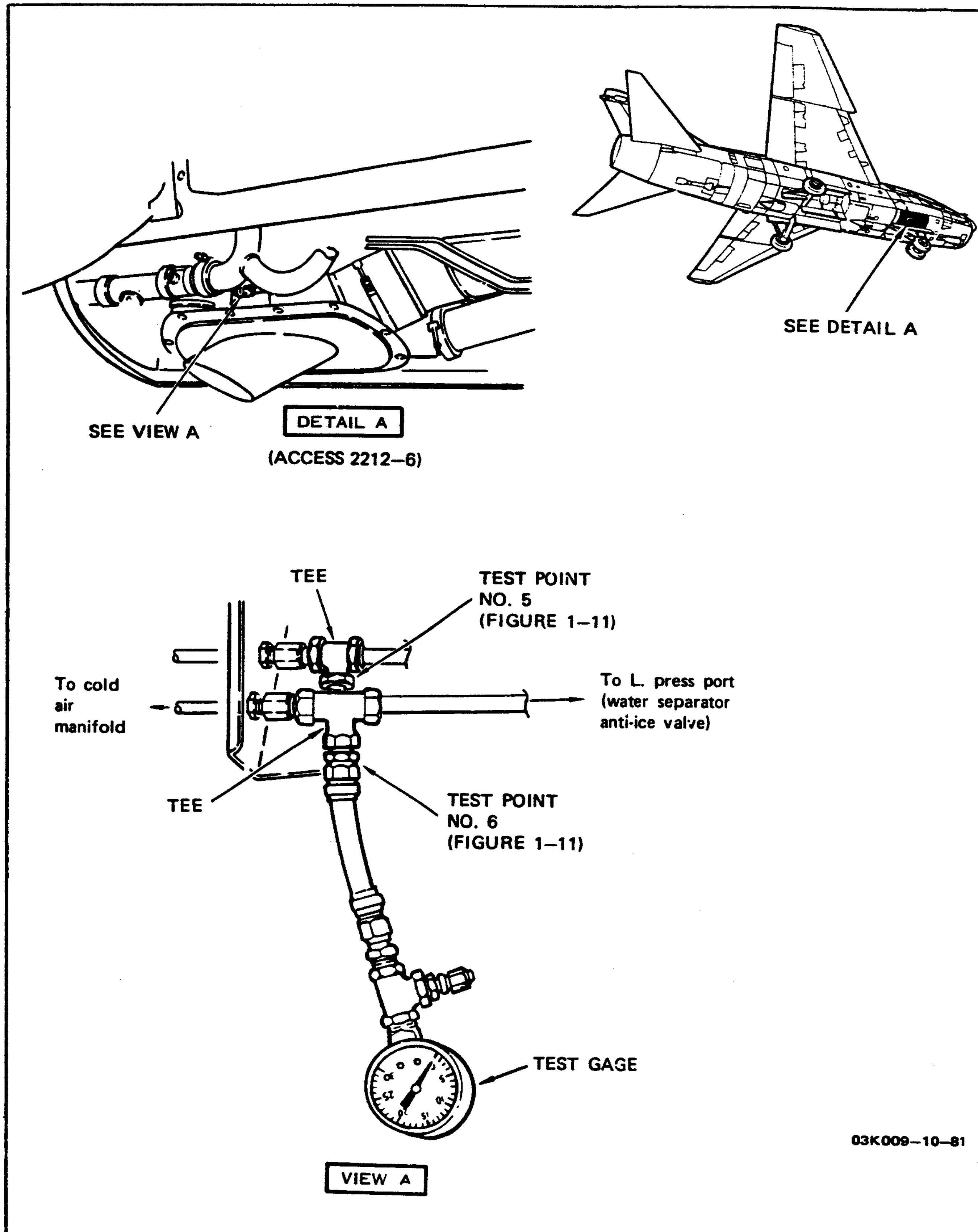

Figure 1-5. Test Gage Placement (Sheet 6 of 7)

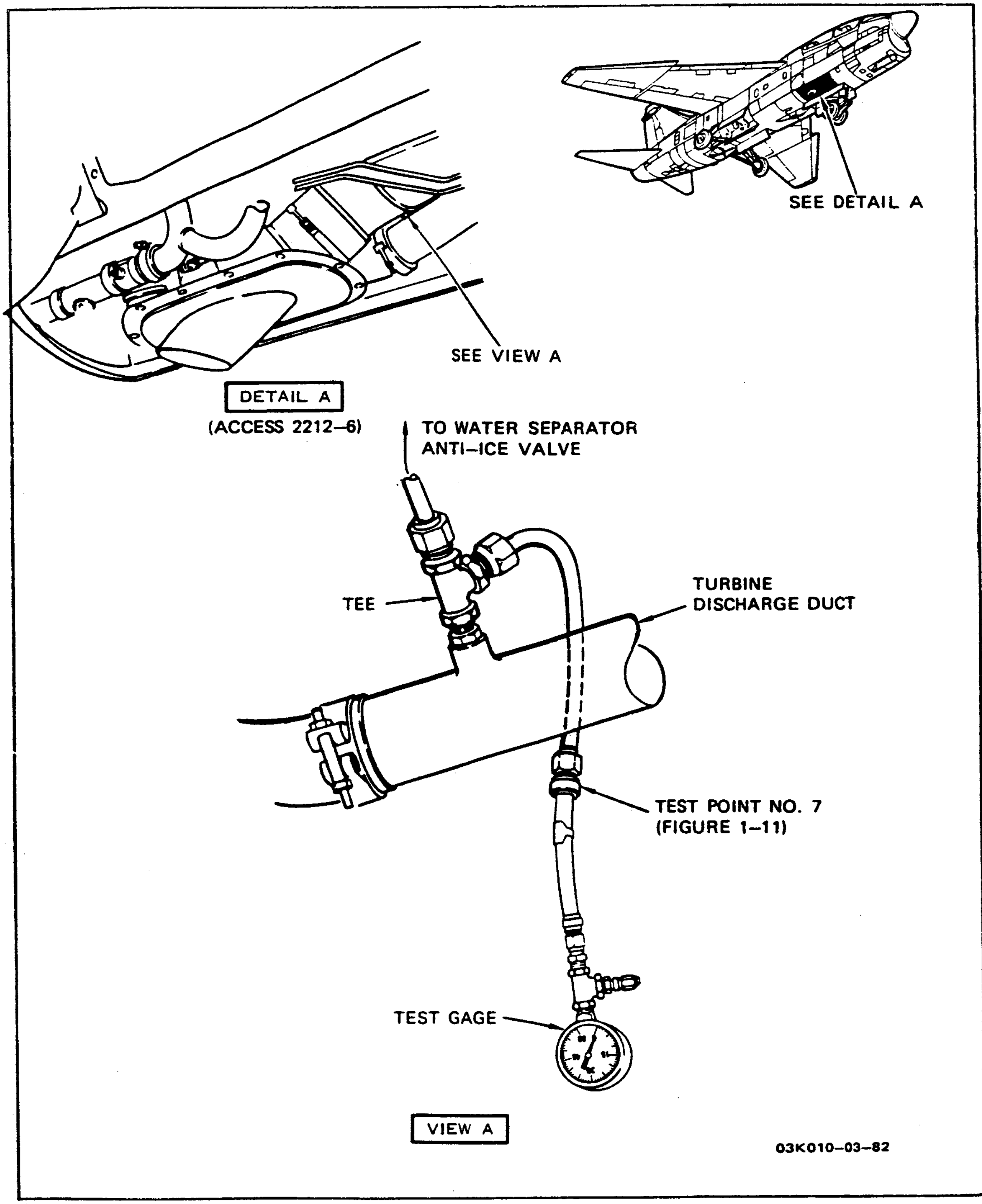

Figure 1-5. Test Gage Placement (Sheet 7 of 7)

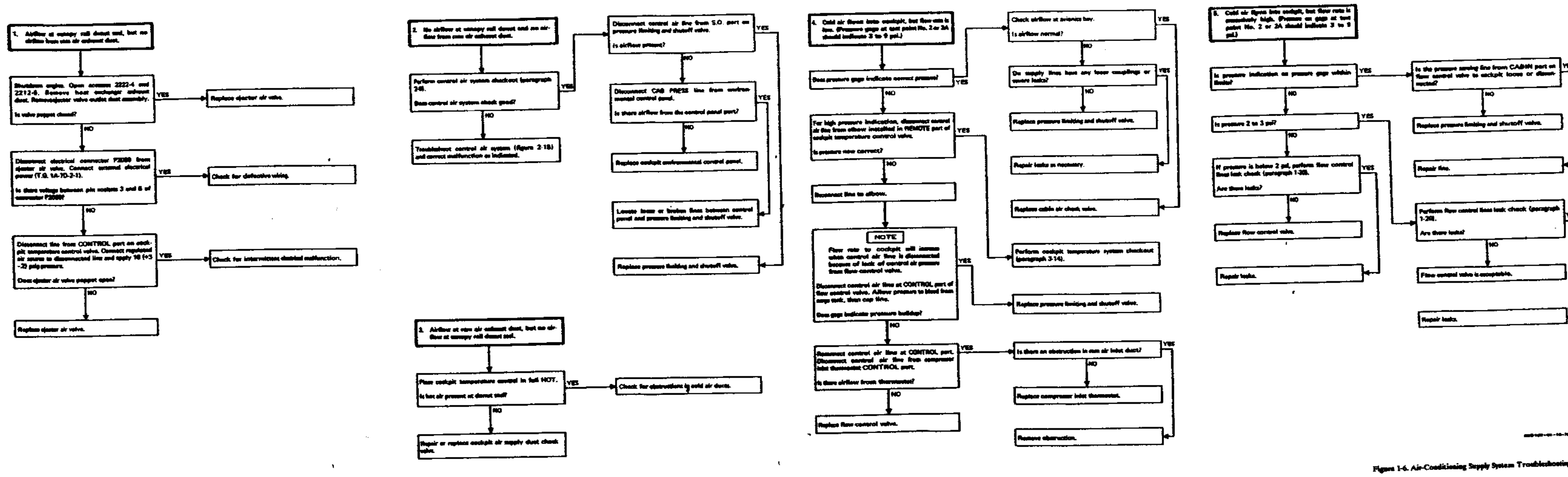

Figure 1-6. Air-Conditioning Supply System Troubleshooting (Sheet 1 of 3)

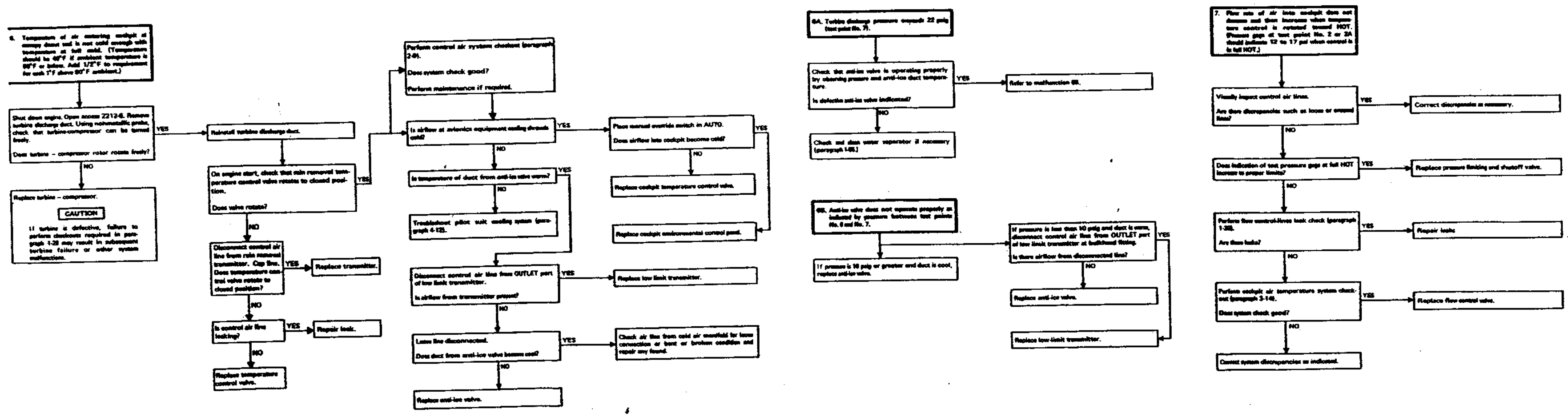

Figure 1-6. Air-Conditioning Supply System Troubleshooting (Sheet 2 of 3)

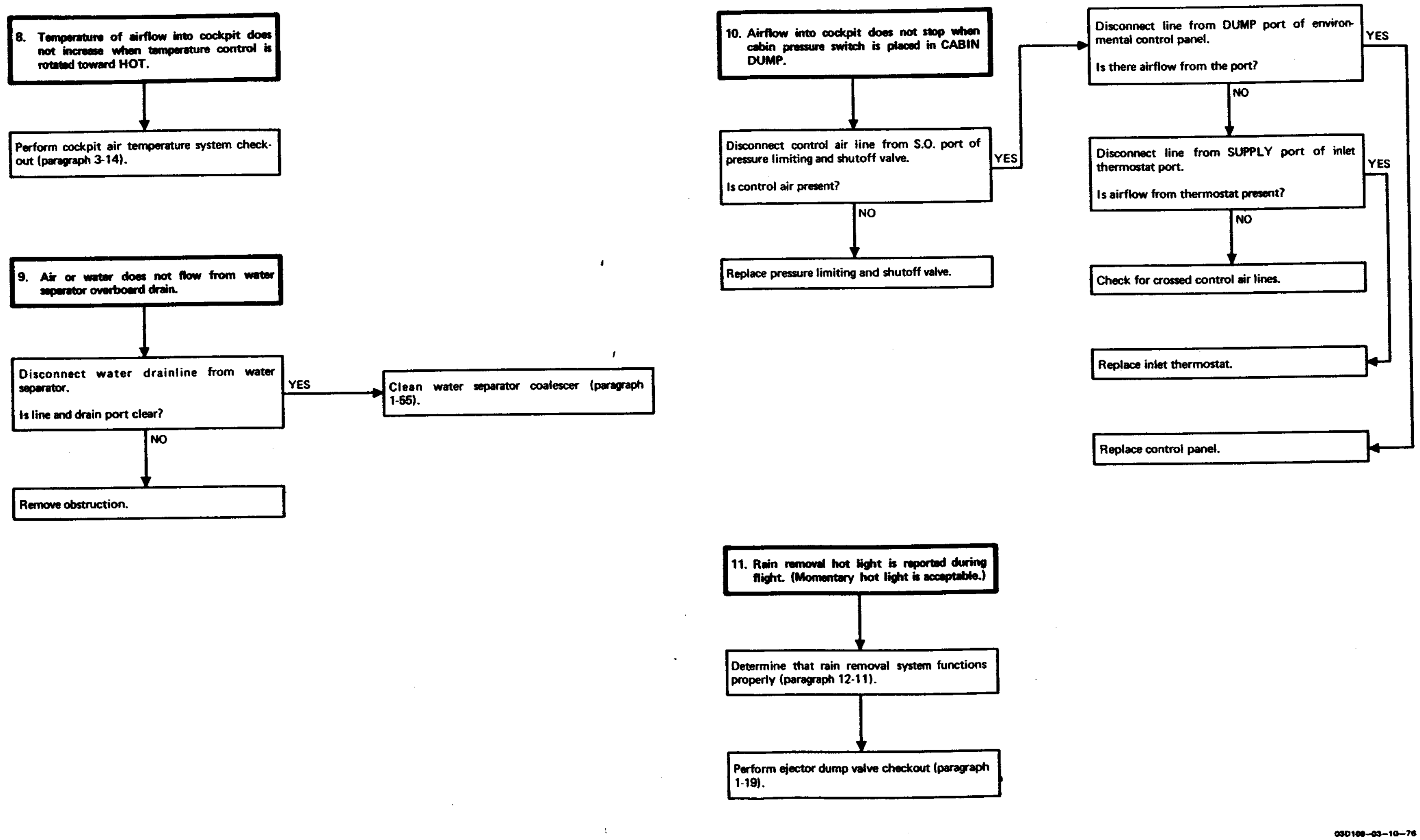

Figure 1-6. Air-Conditioning Supply System Troubleshooting (Sheet 3 of 3)

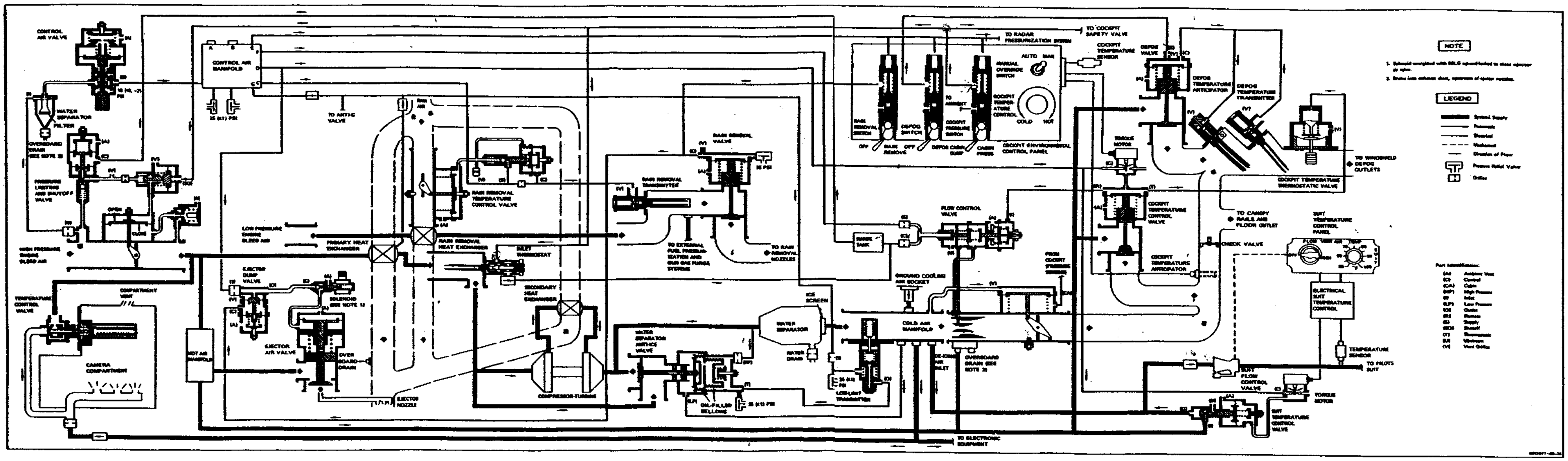

Figure 1-6A. Integrated System Troubleshooting Schematic Flow Diagram

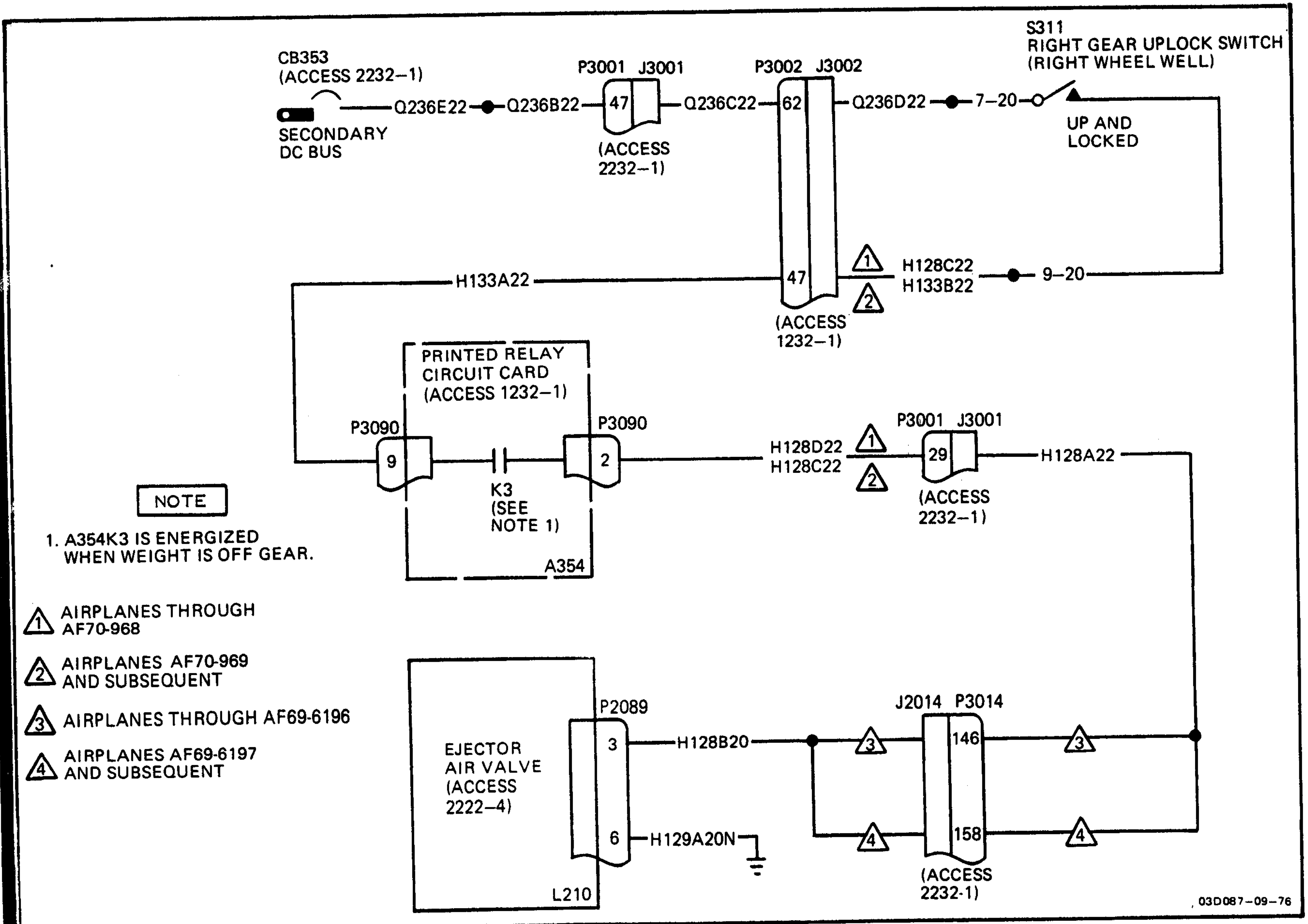

Figure 1-6B. Ejector Air Valve Electrical Troubleshooting Schematic Diagram

Figure 1-6B-1. is deleted.

b. Open access 2212-6.

c. Perform flow control lines leak check (paragraph 1-20).

d. Install 0 to 30 psig test gage at test point No. 2 (figure 1-7) and 0 to 160 psig test gage at test point No. 4 or 4A (figure 1-13).

e. Locate line from CONTROL port of flow control valve to tee at test point No. 2. Disconnect line from tee and cap tee.

f. Start engine (T.O. 1A-7D-2-1).

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from heat exchanger exhaust duct after placing cockpit pressure switches in CABIN PRESS. If no flow occurs, place switch in CABIN DUMP and troubleshoot air-conditioning supply system.

g. Position cockpit environmental control panel switches and controls as follows:

Switch/Control	*Position*
Cockpit pressure switch	CABIN PRESS
Cockpit temperature control	COLD
Manual override switch	MAN

h. Check that test gage at test point No. 2 indicates 0 psig. If pressure is indicated, replace pressure limiting and shutoff valve.

i. If 0 psig is indicated, remove cap installed on tee at test point No. 2 (step e) and reconnect line to tee.

j. Advance throttle to 90% rpm.

k. Check that test gage at test point No. 2 indicates 3 to 9 psig.

l. Check that test gage at test point No. 4 or 4A indicates pressure dictated by manual full cold setting (figure 1-16).

NOTE

If 16 psig cannot be obtained, place finger over vent hole on flow control valve to apply full control air pressure to pressure limiting and shutoff valve.

m. Rotate temperature control toward HOT until test gage at test point No. 2 indicates minimum of 16 psig.

n. Check that test gage at test point No. 4 or 4A indicates pressure dictated by minimum flow schedule (figure 1-16).

o. Place cockpit pressure switch in CABIN DUMP.

p. Shut down engine (T.O. 1A-7D-2-1).

q. If pressures were low in step l or n, accomplish steps s through v. If pressures were correct, proceed to step w.

r. Connect regulated air source to test gage at test point No. 4 or 4A and apply 100 psig.

s. Shut off air source and check that pressure does not decrease more than 25 psig in 1 minute.

t. If pressure decreases more than 25 psig, locate and repair leaks, then repeat steps s and t.

u. If pressure decreases 25 psig or less, replace pressure limiting and shutoff valve (paragraph 1-24).

v. Disconnect regulated air source and remove test gages.

w. Close access 2212-6.

x. Connect actuating link to right nosewheel door (T.O. 1A-7D-2-7).

1-19C. WATER SEPARATOR ANTI-ICE VALVE CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine
1-5	Test gage		Check pressure during checkout
	Air nitrogen trailer	MIL-T-26772	Provide pressure for checkout

TEST POINT NO.	GAGE (PSIG) (REF FIG. 1-3A)	LOCATION	FUNCTION	FIGURE REF
1	"B" (0-30)	Elbow at REMOTE port of cockpit temp valve.	Indicates pressure being applied to the flow control valve from the cockpit temp valve.	3-2A
2	"B" (0-30)	Tee at CONTROL port of flow control valve.	Indicates pressure being applied to pressure limiting and shutoff valve from flow control valve.	1-6A
2A	"A" (0-30)	Drain port of surge tank. This is an alternate location for test point No. 2.	Same as for test point No. 2.	1-6A
3	"C" (0-30)	Bulkhead fitting above control air manifold.	Indicates control air pressure.	2-1A
4	"D" (0-100)	Tee at INLET port of low limit transmitter.	Indicates outlet pressure of primary heat exchanger.	1-6C
5	"A" (0-30)	Bulkhead fitting between anti-ice valve and low limit transmitter.	Indicates pressure applied during anti-ice valve check-out.	1-6E
6	"B" (0-30)	Bulkhead fitting between anti-ice valve and cold air manifold.	Indicates pressure downstream of water separator. Used with gage at test point No. 7 to indicate pressure across anti-ice valve.	1-6B
7	"B" (0-30)	Elbow on turbine discharge duct.	Indicates turbine discharge pressure.	1-6B

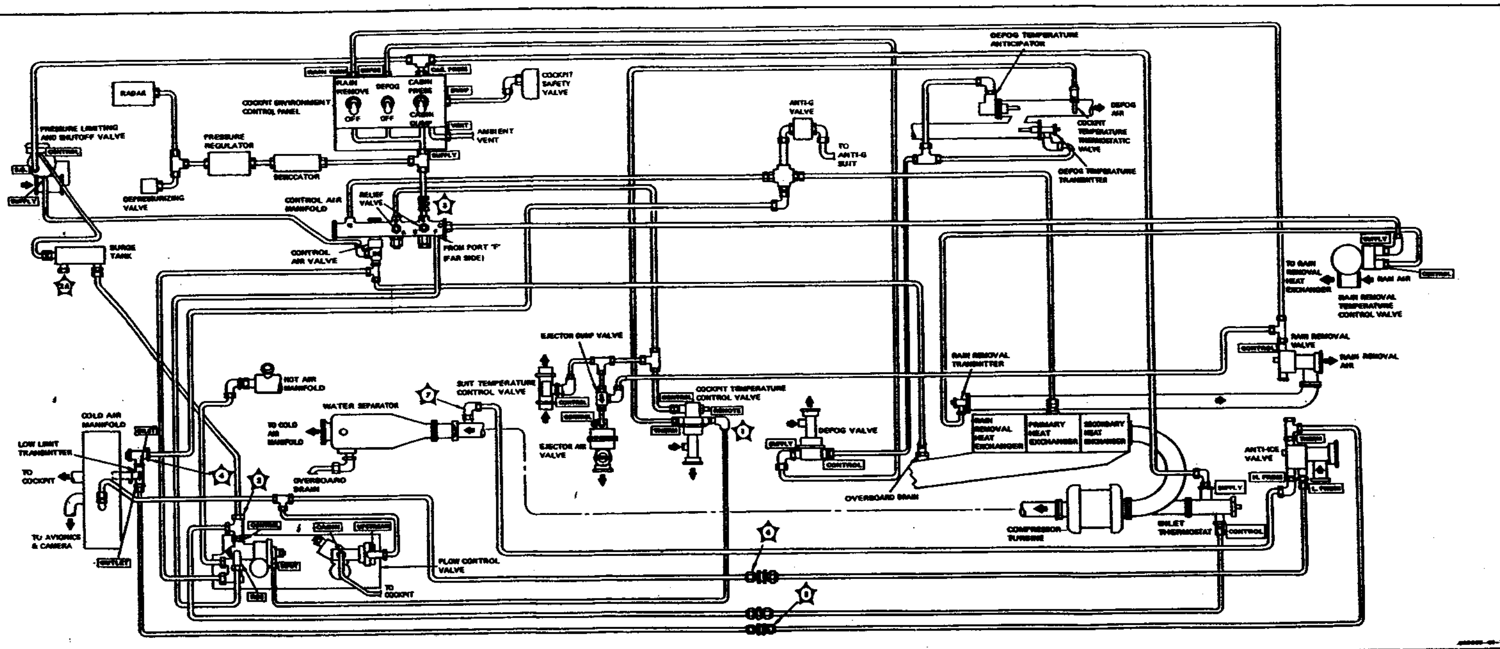

Figure 1-6C. Air-Conditioning System Plumbing Diagram and Test Point Gage Locations

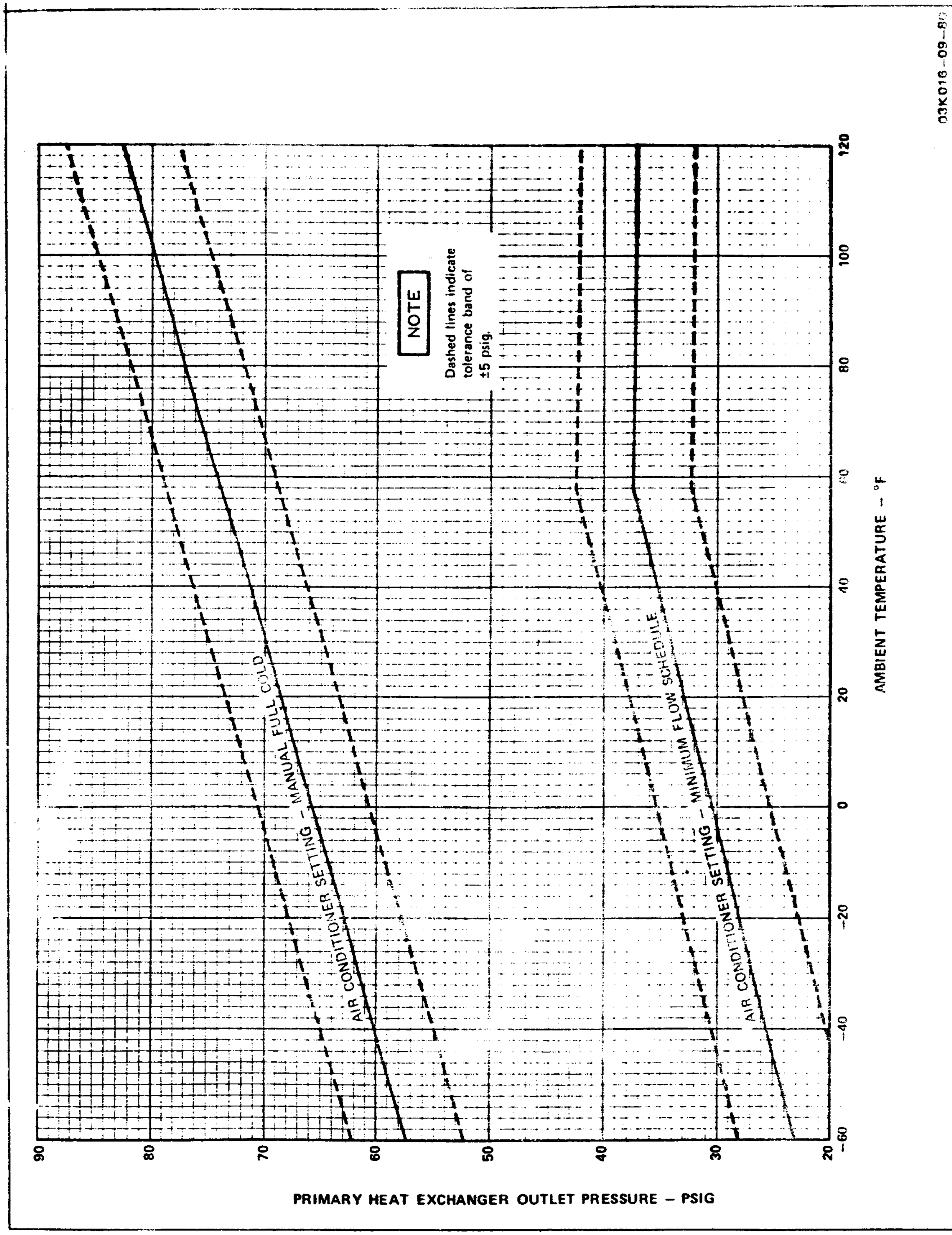

Figure 1-6D. Primary Heat Exchanger Outlet Pressure

NOTE

This checkout can be performed concurrently with low limit transmitter checkout (paragraph 1-19E).

a. Disconnect actuating link from right nosewheel door (T.O. 1A-7D-2-7).

b. Open accesses 2212-6 and 2222-4.

c. Disconnect line from L PRESS port of water separator anti-ice valve to bulkhead fitting at test point No. 6 (figure 1-17). Leave line to L PRESS port open. Install cap on bulkhead fitting on line to cold air manifold.

d. Disconnect line from THERM port of anti-ice valve to bulkhead fitting at test point No. 5 (figure 1-17). Connect 0 to 30 psig test gage to disconnected line. Install cap on bulkhead fitting on line to outlet port of low limit transmitter.

e. Disconnect line from H PRESS port of anti-ice valve to tee fitting on turbine discharge duct at test point No. 7 (figure 1-17). Install cap on tee. Connect regulated air source to disconnected line.

f. Start engine (T.O. 1A-7D-2-1).

g. Advance throttle to obtain 90% rpm.

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from heat exchanger exhaust duct after placing both cockpit pressure switches in CABIN PRESS. If no flow occurs, place either switch in CABIN DUMP and troubleshoot air-conditioning supply system.

h. Place cockpit pressure switch in CABIN PRESS.

i. Apply 18 psi air pressure to line disconnected from tee on turbine discharge duct. Check that water separator anti-ice valve opens by feeling that anti-ice duct becomes warm.

NOTE

For low temperature/high humidity operating environments, anti-ice valve differential pressure may be adjusted to assure adequate anti-ice protection of the system. Adjustment of valve to 3 to 5 pounds psi differential opening pressure can be accomplished on aircraft by capping the low limit transmitter port, applying 8-10 psig air pressure at the high pressure port and 5 psig at the low pressure port and turning the adjustment screw until the valve begins opening. When operating in warmer/lower humidity environments, valve should be readjusted to 12 psi differential opening pressure to preclude possibility of warm cockpit. Part No. 397862-2-1 can be used in place of current Part No. 397862-3-1.

j. Reduce pressure to 8 psi. Check that valve closes by feeling that duct cools.

k. Disconnect regulated air source.

WARNING

Lines and components become extremely hot during system operation. Be careful when connecting lines and performing leak check to avoid being burned.

l. Remove gage and caps. Reconnect lines and leak check connections.

m. Place cockpit pressure switch in CABIN DUMP.

n. Shut down engine (T.O. 1A-7D-2-1).

o. Replace water separator anti-ice valve if valve failed to operate (paragraph 1-39).

p. Close access 2212-6.

q. Connect right nose gear door lower link (T.O 1A-7D-2-7).

r. Close access 2222-4.

1-19D. COMPRESSOR INLET THERMOSTAT CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine
	Pyrometer, indicating	4000A	Indicate temperature during checkout

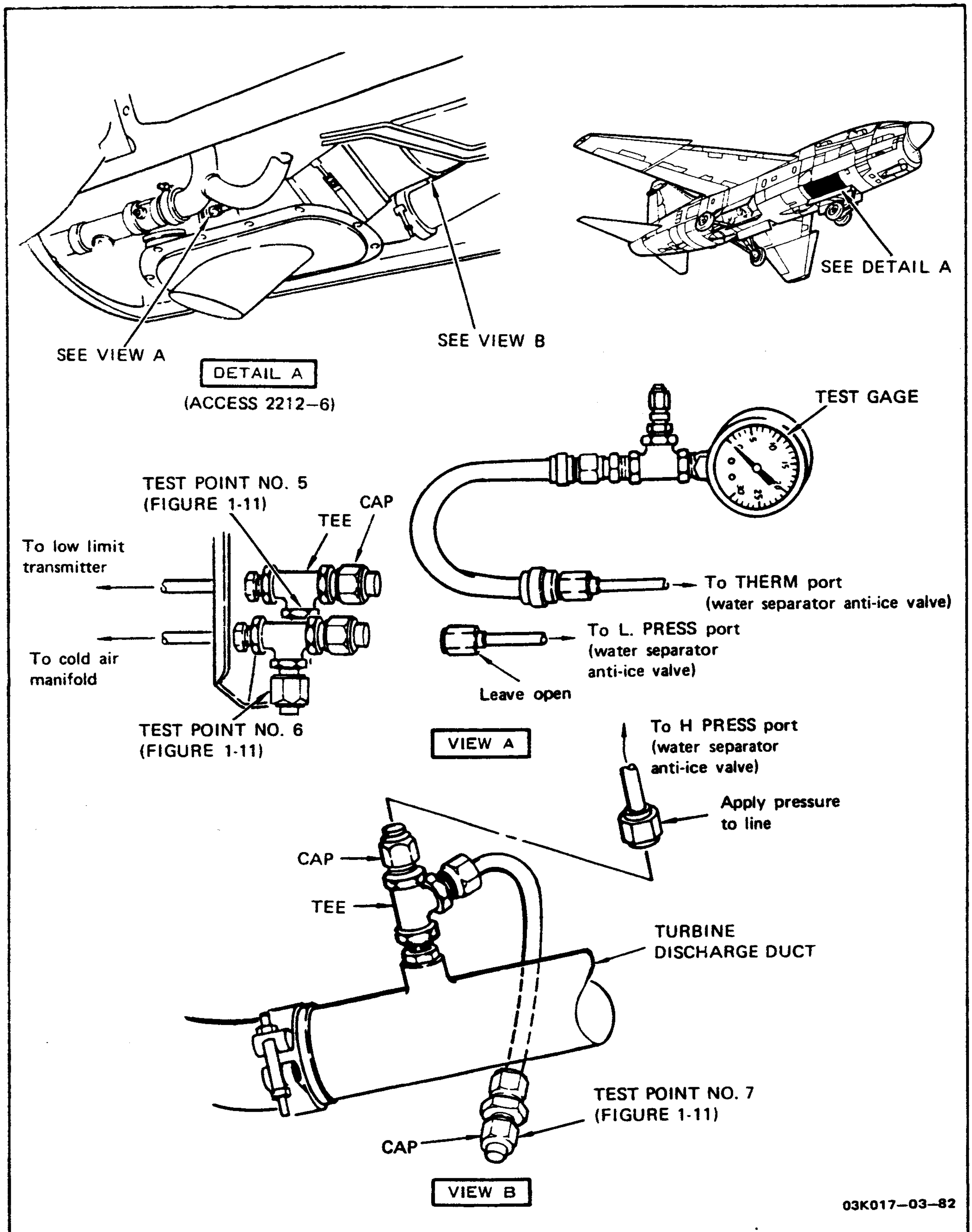

Figure 1-6E. Water Separator Anti-Ice Valve Test Gage Placement

a. Disconnect right nose gear door lower link (T.O. 1A-7D-2-1).

b. Open access 2212-6.

c. Perform flow control lines leak check (paragraph 1-20).

d. Disconnect compressor inlet thermostat control air line at CONTROL port of flow control valve.

e. Position thermocouple on compressor inlet duct between inlet thermostat and turbine. Secure thermocouple to duct with high temperature tape or other suitable method. Insulate around thermocouple and duct to retain heat and provide accurate reading.

f. Start engine (T.O. 1A-7D-2-1) and operate at 90% rpm.

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from heat exchanger exhaust duct after placing cockpit pressure switches in CABIN PRESS. If no flow occurs, place switch in CABIN DUMP and troubleshoot air-conditioning supply system.

g. Place cockpit pressure switch in CABIN PRESS.

NOTE

Temperature at which thermostat opens should not be reached on ground operation. If temperature exceeds 300°F, check for heat exchanger problem.

h. Check that compressor inlet temperature is less than 300°F and no airflow is present from disconnected thermostat line. If airflow is present, replace thermostat.

i. Place cockpit pressure switch in CABIN DUMP.

j. Shut down engine (T.O. 1A-7D-2-1).

k. Connect thermostat line.

l. Close access 2212-6.

m. Connect right nose gear door lower link (T.O. 1A-7D-2-7).

1-19E. LOW LIMIT TRANSMITTER CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine
	Thermometer, −30° to 180°F	TIC-2-6354	Indicate temperature during checkout

NOTE

The low limit transmitter functions at extremely low temperature and must be bench checked to ensure proper calibration and operation. This procedure provides a check to ensure the transmitter is not providing erroneous signal to the water separator anti-ice valve.

This checkout can be performed with water separator anti-ice valve checkout (paragraph 1-19C).

a. Disconnect right nose gear door lower link (T.O. 1A-7D-2-7).

b. Open accesses 2212-6 and 2222-4.

c. Disconnect line from OUTLET port of low limit transmitter to tee at test point No. 5 (figure 1-17). Cap tee fitting.

d. Place thermometer in canopy rail vent.

e. Start engine (T.O. 1A-7D-2-1).

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from heat exchanger exhaust duct after placing both cockpit pressure switches in CABIN PRESS. If no flow occurs, place either switch in CABIN DUMP and troubleshoot air-conditioning supply system.

f. Position cockpit environmental control panel switches and controls as follows:

Switch/Control	*Position*
Manual override switch	MAN
Suit flow control knob	OFF
Cockpit temperature control	COLD
Cockpit pressure switch	CABIN PRESS

g. Advance throttle to obtain 90% rpm.

NOTE

Do not adjust cockpit temperature control knob. Leave at COLD during check.

h. Check temperature at canopy rail vent. With temperature of −20°F and above, no airflow should be present from low limit transmitter. If airflow is present, replace transmitter (paragraph 1-42).

i. Shut down engine (T.O. 1A-7D-2-1).

j. Reconnect transmitter control air line.

k. Close accesses 2212-6 and 2222-4.

l. Connect right nose gear door lower link (T.O. 1A-7D-2-7).

1-20. FLOW CONTROL LINES LEAK CHECK.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
1-5	Test gage		Check pressure during checkout
	Air/nitrogen trailer	MIL-T-26772	Provide pressure for checkout

a. Disconnect right nose gear door lower link (T.O. 1A-7D-2-7).

b. Open accesses 2222-4 and 2212-6.

c. Disconnect two lines from tee installed in CONTROL port on flow control valve (figure 1-13).

d. Remove tee from flow control valve.

e. If not already installed, install 0- to 30-psi test gage at test point No. 2 (figure 1-7).

f. Reconnect lines to tee.

g. Connect regulated air source to tee and apply 18 (+3, −2) psig pressure. Note pressure on test gage at test point No. 2.

h. Shut off pressure source and check that pressure decay does not exceed 4 psig in 1 minute. If pressure decay is acceptable, proceed to step n. If pressure decay is more than 4 psig, proceed to step i.

i. Open access 6122-2 and perform the following:

1. Check for leakage at CONTROL port of pressure limiting and shutoff valve and at CONTROL port of compressor inlet thermostat.

2. Make a brief check for other leaks.

3. Repair leaks as required and repeat decay test.

4. If pressure decay is now acceptable, proceed to step n. If pressure decay is still excessive, proceed to step j.

j. Disconnect lines from CONTROL port on pressure limiting and shutoff valve and CONTROL port on compressor inlet thermostat (figure 1-13) and perform the following:

1. Cap lines and repeat decay check.

2. Pressure decay should be 0 psig in 3 minutes.

3. If decay is excessive, resolve line/connection leakage.

4. Proceed to step k.

k. Reconnect line to CONTROL port on shutoff valve and repeat decay test. If pressure decay is over 4 psig in 1 minute, replace pressure limiting and shutoff valve (paragraph 1-24). Proceed to step 1.

l. Disconnect line from CONTROL port on pressure limiting and shutoff valve and cap line. Reconnect line to inlet thermostat and repeat decay test. If decay is over 4 psig in 1 minute, replace compressor inlet thermostat (paragraph 1-59).

m. Reconnect line to CONTROL port on shutoff valve.

n. Disconnect pressure source.

o. Disconnect lines from tee and install tee in flow control valve using new packing.

p. Remove test gage and connect control air lines to tee.

q. Close accesses 2222-4 and 2212-6.

r. Connect right nose gear door lower link (T.O. 1A-7D-2-7).

1-21. HEAT EXCHANGER 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 couplings

1-22. REMOVAL. (See figure 1-7.)

NOTE

To facilitate removal, ducts may be removed with control air lines attached.

a. Disconnect right nose gear door lower link (T.O. 1A-7D-2-7).

b. Open accesses 2222-4, 2212-6, 2212-10, and 2123-6.

c. Remove coupling (1) and sleeve (2) from forward end of ram air inlet duct (3).

d. Remove coupling (4) and sleeve (5) from aft end of ram air inlet duct coupling (3).

e. Disconnect ram air exhaust duct coupling (6).

f. Remove nuts (7), washers (8), shims (9), and bolts (10) securing exhaust duct (11) to mounting bracket. Remove duct from airplane.

g. Remove water separator anti-ice valve (paragraph 1-39).

h. Remove water separator (paragraph 1-52).

i. Remove turbine-compressor (paragraph 1-27).

j. Disconnect control air lines (11A and 11B) from compressor inlet thermostat (11C).

k. Remove two couplings (12) and gaskets (13) from high pressure bleed air duct (14) and remove duct.

l. Remove two couplings (15) and gaskets (16) from low pressure bleed air duct (17) and remove duct.

m. Cut lockwire and remove upper coupling (18) and O-ring (19), lower coupling (20), and gasket (21) from gun gas purge duct (22). Remove duct from airplane.

n. Cut lockwire and remove forward coupling (23), O-ring (24), aft coupling (25), and gasket (26) from rain removal duct (27). Remove duct from airplane.

o. Disconnect nut (28) from suit air duct (29).

p. Remove coupling (30) and sleeve (31) from defog duct (32) at forward end of air-conditioning compartment.

q. Remove coupling (33) and gasket (34) from hot-air manifold (35).

r. Remove coupling (36) and sleeve (37) from top of cockpit air duct (38).

s. Remove coupling (39) and O-rings (40) from mid-section of cockpit air duct. Remove top section of air duct from airplane.

t. Disconnect control air line (41) from rain removal transmitter (42).

u. Remove coupling (43), gasket (44), coupling (45), and gasket (46) from interconnect manifold (47). Remove manifold from airplane.

v. Disconnect electrical connectors from pilot's suit valve (48), ejector air valve (49), cockpit temperature control valve (50), and temperature sensor (51).

w. Remove forward coupling (52), gasket (53), aft coupling (54) and sleeve (55) from W-section of cockpit air duct (56). Remove duct from airplane.

x. Remove cotter pin (57), nut (58), washer (59), and bolt (60) securing aft end of I-beam (61) to airframe.

y. Remove bolt (62), washer (63), and shim (64) securing C-bracket (65) and forward inboard section of air-conditioning package to airframe.

z. Disconnect control air lines (65A) from ejector dump valve (65B).

aa. Remove bolt (66), washer (67), bolt (68), washer (69), and shim (70) securing heat exchanger to keel. Remove straight brace, then remove yoke type brace and ejector dump valve as a unit.

ab. Disconnect anti-g suit line (71) at tee (72) inboard of control air manifold.

ac. Disconnect control air lines (73, 74, 75, 76, and 77) from control air manifold (78).

ad. Remove suit temperature control valve (paragraph 4-19).

ae. Remove bolt (79) and packings (79A) securing control air manifold to control air valve (80) and remove control air manifold from airplane.

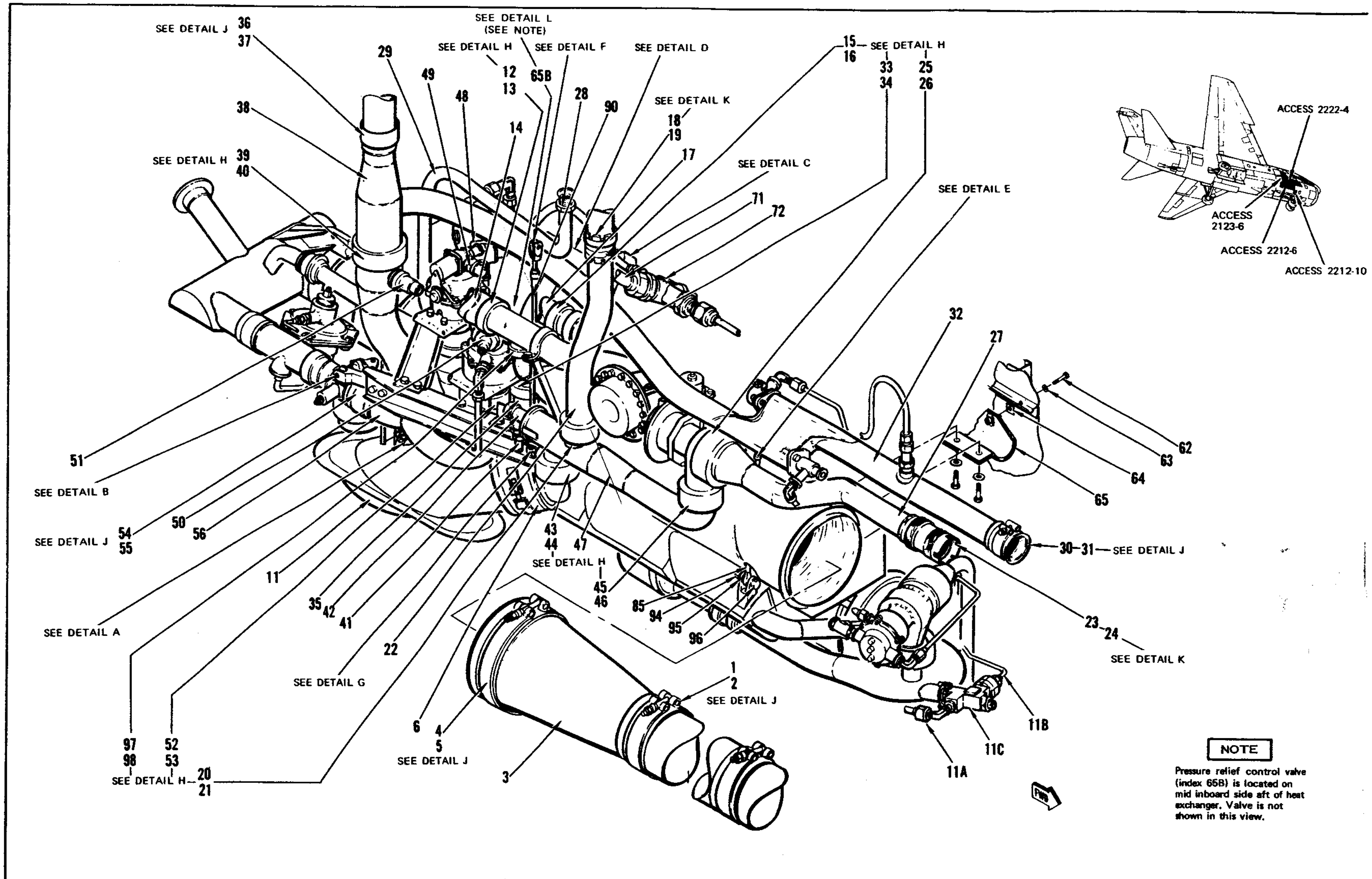

Figure 1-7. Heat Exchanger Removal and Installation (Sheet 1)

af. Support heat exchanger assembly. Remove cotter pin (81), nut (82), washer (83), and bolt (84) securing forward tie rod (85).

ag. Remove cotter pin (86), nut (87), washer (88), and bolt (89) securing aft tie rod (90). Lower heat exchanger and attached components from airplane.

ah. Disconnect control air lines to temperature control, cockpit temperature control valve, defog valve, and ejector air valve. Leave components attached to I-beam.

ai. Remove nut (91), washer (92), and bolt (93) securing I-beam (61) to heat exchanger. Remove I-beam and aft tie rod from heat exchanger.

aj. Remove nut (94), washer (95), and bolt (96) securing forward tie rod to airframe.

ak. Remove coupling (97) and gasket (98) connecting hot-air manifold (35) to high pressure bleed air duct (14). Remove heat exchanger from airplane.

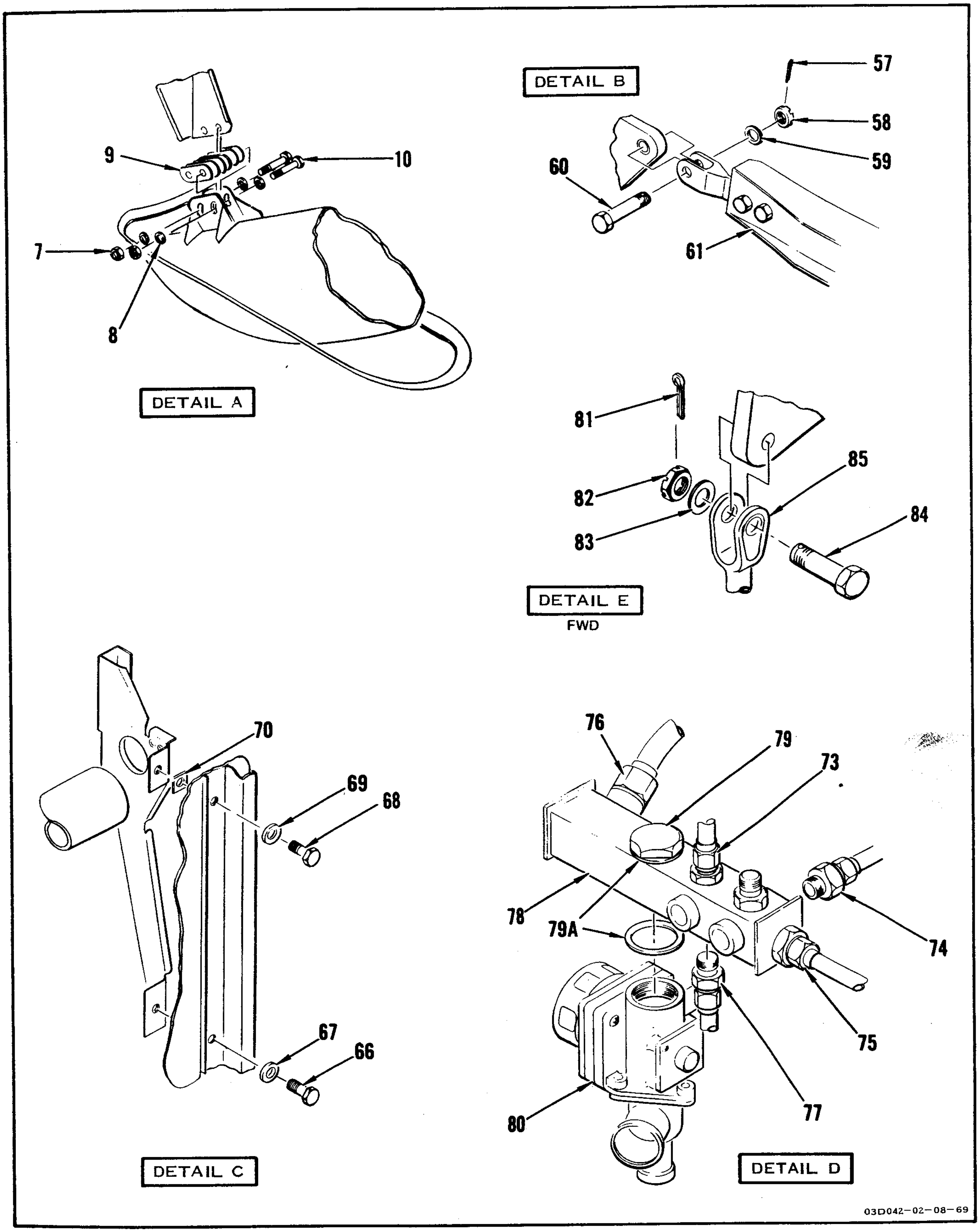

Figure 1-7. Heat Exchanger Removal and Installation (Sheet 2)

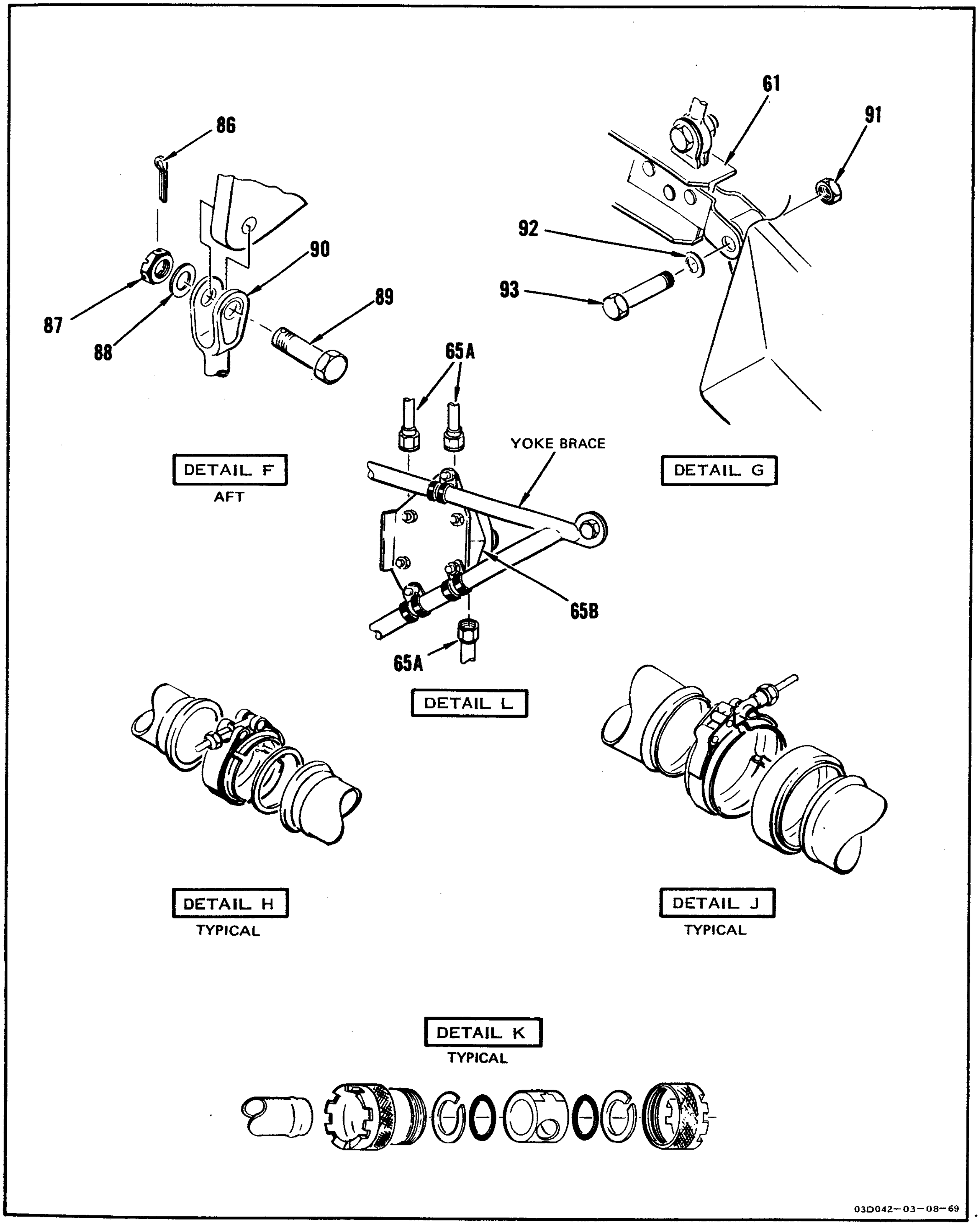

Figure 1-7. Heat Exchanger Removal and Installation (Sheet 3)

1. Coupling
2. Sleeve
3. Ram air inlet duct
4. Coupling
5. Sleeve
6. Coupling
7. Nut
8. Washer
9. Shim
10. Bolt
11. Exhaust duct
11A. Control air line
11B. Control air line
11C. Compressor inlet thermostat
12. Coupling
13. Gasket
14. High-pressure bleed air duct
15. Coupling
16. Gasket
17. Low-pressure bleed air duct
18. Upper coupling
19. O-ring
20. Lower coupling
21. Gasket
22. Gun gas purge duct
23. Forward coupling
24. O-ring
25. Aft coupling
26. Gasket
27. Rain removal duct
28. Nut
29. Suit air duct
30. Coupling
31. Sleeve
32. Defogger duct
33. Coupling
34. Gasket
35. Hot-air manifold
36. Coupling
37. Sleeve
38. Cockpit air duct
39. Coupling
40. O-ring
41. Control air line
42. Rain removal transmitter
43. Coupling
44. Gasket
45. Coupling
46. Gasket
47. Interconnect manifold
48. Pilot's suit valve
49. Ejector air valve
50. Cockpit temperature control valve
51. Cockpit temperature sensor
52. Forward coupling
53. Gasket
54. Aft coupling
55. Sleeve
56. Cockpit air duct
57. Cotter pin
58. Nut
59. Washer
60. Bolt
61. I-beam
62. Bolt
63. Washer
64. Shim
65. C-bracket
65A. Control air line
65B. Ejector dump valve
66. Bolt
67. Washer
68. Bolt
69. Washer
70. Shim
71. Anti-g suit line
72. Tee
73. Control air line
74. Control air line
75. Control air line
76. Control air line
77. Control air line
78. Control air manifold
79. Bolt
79A. Packing
80. Control air valve
81. Cotter pin
82. Nut
83. Washer
84. Bolt
85. Forward tie rod
86. Cotter pin
87. Nut
88. Washer
89. Bolt
90. Aft tie rod
91. Nut
92. Washer
93. Bolt
94. Nut
95. Washer
96. Bolt
97. Coupling
98. Gasket

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Figure 1-7. Heat Exchanger Removal and Installation (Sheet 4)

1-23. INSTALLATION. (See figure 1-7.)

NOTE

To facilitate installation, ducts may be installed with control air lines attached.

a. Position hot-air manifold (35) to high pressure bleed air duct (14). Using new self-locking nut, install new gasket (98) and coupling (97). Tighten coupling to 90 (± 10) pound-inches torque. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band and check that torque remains 90 (± 10) pound-inches.

b. Adjust forward tie rod (85) to 9.50 inches from center to center of mounting holes and secure with MS20 995C32 lockwire.

c. Adjust aft tie rod (90) to 12.60 inches from center to center of mounting holes and secure with MS209 95C32 lockwire.

d. Install bolt (96), washer (95), and nut (94) securing forward tie rod to heat exchanger.

e. Position I-beam (61), with temperature control valve, cockpit temperature control valve, defog valve, and ejector air valve attached, to heat exchanger. Install bolt (93), washer (92), and nut (91) securing I-beam to heat exchanger.

f. Lift heat exchanger and attached components into airplane.

g. Position aft tie rod to mounting bracket. Install bolt (89), washer (88), nut (87), and new cotter pin (86).

h. Position forward tie rod to mounting bracket. Install bolt (84), washer (83), nut (82), and new cotter pin (81).

i. Install suit temperature control valve (paragraph 4-19).

j. Secure control air manifold (78) to control air valve (80) with bolt (79) and new packings (79A). Connect control air lines (77, 76, 75, 74, and 73) to control air manifold.

k. Connect anti-g suit line (71) to tee (72) inboard of control air manifold.

l. Position straight brace and yoke type brace with attached ejector dump valve for installation. Secure braces to heat exchanger and airframe with bolt (66), washer (67), bolt (68), washer (69), and shim (70).

m. Connect control air lines (65A) to ejector dump valve (65B).

n. Position C-bracket (65) to airframe. Install bolt (62), washer (63), and shim (64).

o. Position aft end of I-beam (61) to airframe.

p. Install bolt (60), washer (59), nut (58), and new cotter pin (57).

q. Connect control air lines to temperature control valve, cockpit temperature control valve, defog valve, and ejector air valve.

r. Position W-section of cockpit air duct (56) to air-conditioning package. Using new self-locking nuts, install aft coupling (54), new sleeve (55), forward coupling (52), and new gasket (53).

s. Tighten couplings to 40 (±2) pound-inches torque. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band and check that torque remains 40 (±2) pound-inches.

t. Connect electrical connectors to cockpit temperature sensor (51), cockpit temperature control valve (50), ejector air valve (49), and to pilot's suit valve (48).

u. Position interconnect manifold (47) to heat exchanger. Using new self-locking nuts, install coupling (45), new gasket (46), coupling (43), and new gasket (44).

v. Tighten couplings to 90 (± 10) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band and check that torque remains 90 (± 10) pound-inches.

w. Connect control air line (41) to rain removal transmitter (42).

x. Position cockpit air duct (38) to air-conditioning package. Using new self-locking nut, install coupling (39) and new O-rings (40) to midsection of cockpit air duct. Using new self-locking nut, install coupling (36) and new sleeve (37) to top section of cockpit air duct.

y. Tighten top coupling (36) to 40 (±2) pound-inches torque. Tighten coupling (39) to 72 (± 12) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band and check that torque remains 40 (±2) pound-inches and 72 (± 12) pound-inches, respectively.

z. Position defog duct (32) to air-conditioning package. Using new self-locking nut, connect coupling (33) and new gasket (34) to hot-air manifold (35).

aa. Using new self-locking nut, connect coupling (30) and new sleeve (31) to forward end of defog duct (32).

ab. Tighten coupling (30) to 40 (±2) pound-inches torque and coupling (33) to 72 (±12) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band and check that torque remains 40 (±2) pound-inches and 72 (±12) pound-inches, respectively.

ac. Connect nut (28) to suit air duct (29).

ad. Position rain removal duct (27) to air-conditioning package. Using new self-locking nut, install aft coupling (25) and new gasket (27). Install forward coupling (23) and new O-ring (24).

ae. Tighten forward coupling to 40 (±2) pound-inches torque and aft coupling 72 (± 12) pound-inches. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band and check that torque remains 40 (±2) pound-inches and 72 (± 12) pound-inches, respectively.

af. Secure coupling (23) with MS20995NC40 lockwire.

ag. Position gun gas purge duct (22) to air-conditioning package. Using new self-locking nut, install lower coupling (20) and new gasket (21). Install upper coupling (18) and new O-ring (19).

ah. Tighten lower coupling to 90 (± 10) pound-inches torque and upper coupling to 48 (± 12) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band and check that torque remains 90 (± 10) pound-inches and 48 (± 12) pound-inches, respectively.

ai. Secure coupling (18) with MS20995NC40 lockwire.

aj. Position low pressure bleed air duct (17) to heat exchanger. Using new self-locking nut, install two couplings (15) and new gaskets (16).

ak. Tighten couplings to 75 (±10) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band and check that torque remains 75 (±10) pound-inches.

al. Position high pressure bleed air duct (14) to heat exchanger. Using new self-locking nut, install two couplings (12) and new gaskets (13).

am. Tighten couplings to 90 (±10) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band and check that torque remains 90 (±10) pound-inches.

an. Position duct and control air lines for installation of water separator anti-ice valve and turbine-compressor.

ao. Install turbine-compressor (paragraph 1-27).

ap. Install water separator (paragraph 1-52).

aq. Install water separator anti-ice valve (paragraph 1-39).

ar. Position exhaust duct (11) to ram air outlet. Install two bolts (10), shims (9), washers (8), and nuts (7).

as. Connect ram air exhaust duct coupling (6) and tighten hand-tight.

at. Position ram air inlet duct (3) to air-conditioning package. Using new self-locking nut, install coupling (4) and new sleeve (5) to aft end of ram air inlet duct. Using new self-locking nut, install coupling (1) and new sleeve (2) to forward end of ram air inlet duct.

au. Tighten couplings to 40 (±2) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band and check that torque remains 40 (±2) pound-inches.

av. Close access 2212-6.

aw. Through access 2222-4, tighten coupling (6) to 12 (±2) pound-inches torque.

ax. Connect right nose gear door lower link (T.O. 1A-7D-2-7).

ay. Perform air-conditioning supply system operational check (paragraph 1-16).

az. Perform defog system operational checkout (paragraph 6-12).

ba. Perform rain removal and anti-ice system operational checkout (paragraph 12-11).

bb. Perform pilot suit cooling system operational checkout (paragraph 4-12).

bc. Close accesses 2222-4, 2212-10, and 2123-6.

1-24. PRESSURE LIMITING AND SHUTOFF VALVE 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 couplings

1-25. REMOVAL.

NOTE

For component location, see figure 1-2.

a. Open access 6122-2.

a-1. Cut lockwire and remove insulation from valve and couplings.

b. Loosen and remove coupling from valve and forward Z-section duct.

c. Loosen and remove coupling from valve and high pressure gimbal duct.

d. Disconnect three pneumatic lines from pressure limiting and shutoff valve.

e. Remove four nuts, washers, and bolts securing valve to mounting bracket.

f. Remove two gaskets from forward Z-section and high pressure gimbal duct flanges.

g. Remove valve from airplane.

h. Install caps on forward and aft Z-section and high pressure gimbal ducts to prevent entry of foreign materials.

i. Remove unions and elbows.

1-26. INSTALLATION.

a. Install new O-rings on unions and elbows.

b. Install unions and elbows in pressure limiting and shutoff valve.

c. Remove caps and install new gaskets between forward Z-section and high pressure gimbal duct flanges.

d. Position valve in airplane and secure with four bolts, washers, and nuts.

WARNING

To prevent toxic vapors from entering air-conditioning system, use Fel Pro C5-A antiseize compound sparingly and do not apply to first three threads of union.

e. Apply Fel Pro C5-A antiseize compound (Felpro Inc, Division of Felts Products, Skokie Illinois) sparingly to threads of bleed air supply port union.

f. Connect three pneumatic lines to valve.

g. Using new self-locking nut, position coupling over mating flanges of valve and high pressure gimbal duct.

h. Using new self-locking nut, position coupling over mating flanges of valve and forward Z-section duct.

i. Tighten both couplings 90 (±10) pound-inches torque. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band and check that torque remains 90 (±10) pound-inches.

j. Start engine (T.O. 1A-7D-2-1) and operate at 80% rpm.

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from ram air exhaust duct after placing cockpit pressure switch in CABIN PRESS. If no flow occurs, place switch in CABIN DUMP, and troubleshoot air-conditioning supply system.

k. Place cockpit pressure switch in CABIN PRESS.

l. Check that air flows from the windshield defog vents and canopy rail cockpit air vents.

m. With manual override switch in MAN, rotate cockpit temperature control knob from HOT to COLD and COLD to HOT and check for change in airflow. Return knob to medium position.

WARNING

Personnel should wear heat resistant gloves and use small cloth flags to check for bleed air leakage. Hot airflow can cause severe burns.

n. Check valve connections for leaks.

o. Place cockpit pressure switch in CABIN DUMP.

p. Check that no air flows from the windshield defog vents or canopy rail cockpit air vents.

q. Shut down engine (T.O. 1A-7D-2-1)

r. Install insulation around couplings and valve and secure with MS20995C32 lockwire.

s. Close access 6122-2.

1-27. TURBINE-COMPRESSOR 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 couplings

1-28. REMOVAL. (See figure 1-8.)

CAUTION

Be careful when removing and handling the turbine to prevent damage to torus (turbine ends). Even minor dents may prevent reuse of the torus when the turbine is overhauled.

a. Disconnect right nose gear door lower link (T.O. 1A-7D-2-7).

b. Open accesses 2222-4 and 2212-6.

c. Cut lockwire and remove upper center couplings (1), O-rings (2), retainer rings (3), and retainer halves (4).

d. Cut lockwire and remove water separator anti-ice valve coupling (5), retainer rings (6), O-rings (7), and retainer halves (8).

e. Remove clamp (9) securing control air lines to anti-ice valve line.

f. Remove forward upper coupling (10) and gasket (11).

g. Remove forward coupling (12) and gasket (13).

h. Cut lockwire and remove aft coupling (14), retainer rings (15), O-rings (16), and retainer halves (17).

i. Remove nut (18), washers (19), and bolt (20) from turbine-compressor forward mounting bracket.

j. Support turbine-compressor and remove bolts (21) and washers (22) securing turbine-compressor (23) to aft mounting bracket. Remove turbine from airplane.

1-29. INSTALLATION. (See figure 1-8.)

CAUTION

If turbine is being replaced because of failure, it should be considered as a symptom of a possible malfunction elsewhere in the system. Before releasing airplane, perform ejector dump valve checkout (paragraph 1-19), flow control lines leak check (paragraph 1-20), and control air system leak check (paragraph 2-12). Check ram air inlet duct for obstruction. Clean control air valve filter (paragraph 2-16) and inspect water separator coalescer. If coalescer is charred, replace coalescer bag and low limit transmitter. Failure to accomplish these items may result in subsequent turbine failure or other system malfunctions.

a. Position turbine-compressor (23) to mounting brackets.

b. Secure turbine-compressor to aft mounting bracket with bolts (21) and washers (22). Do not tighten bolts.

NOTE

When securing turbine-compressor to forward mounting bracket, ensure turbine eccentric is adjusted to provide clearance between turbine-compressor, anti-ice duct (25), and aircraft structure.

c. Secure turbine-compressor to forward mount link (24) with bolt (20), washers (19), and nut (18). Do not tighten.

d. Using new self-locking nut and new gasket (11), install forward upper coupling (10). Tighten coupling to 90 (± 10) pound-inches torque. Tap coupling lightly with plastic or rawhide mallet at several points around outside band and check that torque remains 90 (± 10) pound-inches.

e. Using new locknut and new gasket (13), install forward coupling (12). Tighten coupling to 72 (± 12) pound-inches torque. Tap coupling lightly with plastic or rawhide mallet at several points around outside band and check that torque remains 72 (± 12) pound-inches.

f. Using new O-rings (16), install aft coupling (14), retainer halves (17), and retainer rings (15). Tighten coupling to 48 (± 12) pound-inches torque.

g. Secure coupling with MS20995C20 lockwire.

h. Using new O-rings (2), install upper center coupling (1), retainer halves (4), and retainer rings (3). Tighten coupling to 48 (± 12) pound-inches torque.

i. Secure coupling with MS20995C20 lockwire.

j. Using new O-rings (7), install coupling (5), retainer halves (8), and retainer rings (6). Tighten coupling to 48 (± 12) pound-inches torque.

k. Secure coupling with MS20995C20 lockwire.

l. Tighten turbine-compressor forward and aft mounting bolts.

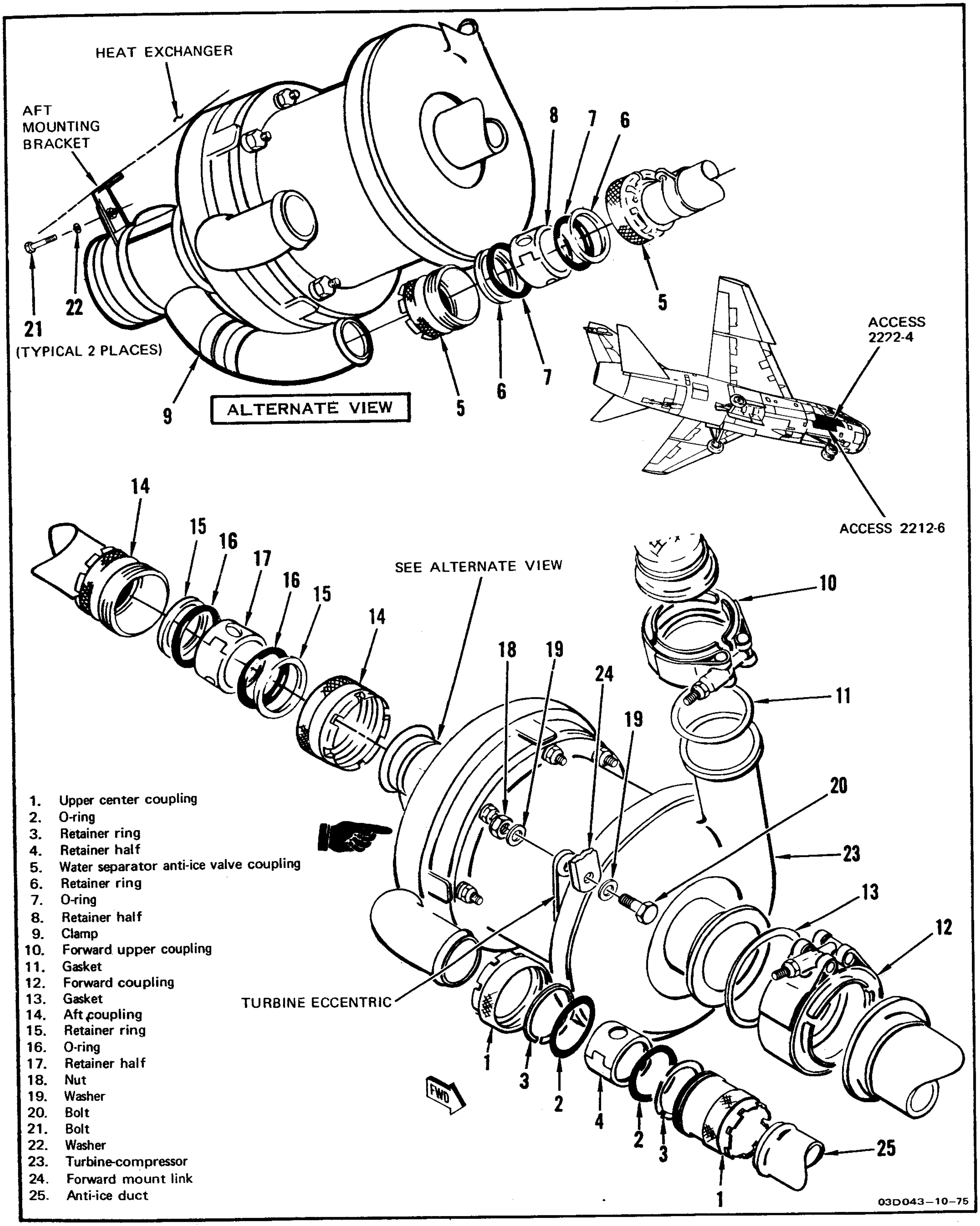
m. Attach control air lines to water separator anti-ice valve with clamp (9).

n. Service turbine (T.O. 1A-7D-2-1).

o. Perform air-conditioning supply system operational checkout (paragraph 1-16).

p. Close accesses 2222-4 and 2212-6.

q. Connect right nose gear door lower link (T.O. 1A-7D-2-7).



1. Upper center coupling
2. O-ring
3. Retainer ring
4. Retainer half
5. Water separator anti-ice valve coupling
6. Retainer ring
7. O-ring
8. Retainer half
9. Clamp
10. Forward upper coupling
11. Gasket
12. Forward coupling
13. Gasket
14. Aft coupling
15. Retainer ring
16. O-ring
17. Retainer half
18. Nut
19. Washer
20. Bolt
21. Bolt
22. Washer
23. Turbine-compressor
24. Forward mount link
25. Anti-ice duct

Figure 1-8. Turbine-Compressor Removal and Installation

1-30. EJECTOR AIR VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Check ejector air valve after installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Torque couplings

1-31. REMOVAL.

a. Disconnect lower link from right nosewheel door (T.O. 1A-7D-2-7).

b. Open accesses 2212-6 and 2222-4.

c. Disconnect electrical connector.

d. Disconnect control air line.

e. Remove coupling and gasket connecting ejector valve to hot-air bypass manifold.

f. Remove coupling and gasket directly below ejector air valve.

g. Remove two bolts, nuts, and washers securing ejector air valve mounting bracket to I-beam.

h. Remove ejector air valve and mounting bracket from airplane.

1-32. INSTALLATION.

a. Position ejector valve and mounting bracket to I-beam and secure with two bolts, washers, and nuts.

b. Using new self-locking nut, install coupling and new gasket directly below ejector valve and tighten coupling to 72 (± 12) pound-inches torque. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band and check that torque remains 72 (± 12) pound-inches.

c. Using new self-locking nut, install coupling and new gasket connecting ejector valve to hot-air bypass manifold. Tighten coupling to 72 (± 12) pound-inches torque. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band and check that torque remains 72 (± 12) pound-inches.

d. Connect control air line.

e. Connect electrical connector.

f. Start engine (T.O. 1A-7D-2-1) and operate at 80% rpm.

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from ram air exhaust duct after placing cockpit pressure switch in CABIN PRESS. If no flow occurs, place switch in CABIN DUMP, and troubleshoot ejector air valve electrical circuit.

g. Position cockpit environmental control panel controls as follows:

Control	*Position*
Cockpit pressure switch	CABIN PRESS
Cockpit temperature control knob	COLD
Rain removal switch	OFF
Defog switch	OFF
Manual override switch	AUTO

WARNING

Personnel shall wear heat resistant gloves and use small cloth flags to check for bleed air leaks. Hot airflow can cause severe burns.

h. Check ejector valve couplings for air leaks.

i. Shut down engine (T.O. 1A-7D-2-1).

j. Close accesses 2212-6 and 2222-4.

k. Connect lower link to right nosewheel door (T.O. 1A-7D-2-7).

1-33. HIGH PRESSURE BLEED AIR GIMBAL DUCT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational checkout after bleed air duct installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

1-34. REMOVAL. (See figure 1-9.)

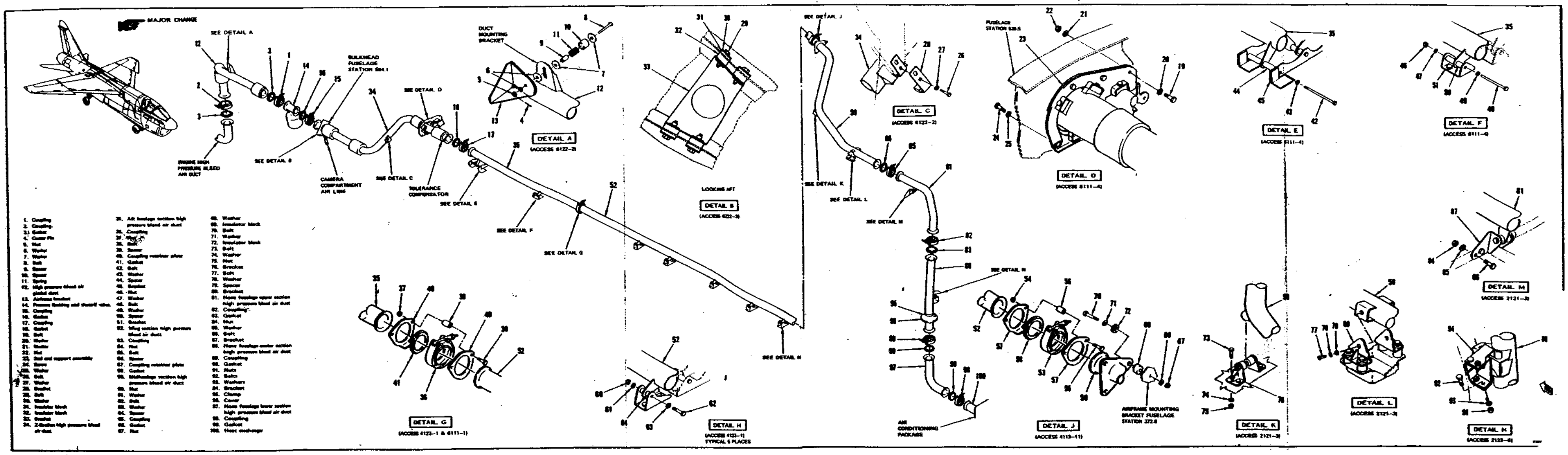
a. Open accesses 6122-3 and 6122-5.

b. Cut lockwire and remove insulation around upper coupling (1) and lower coupling (2).

c. Loosen and remove couplings (1 and 2) and gaskets (3). Discard gaskets.

NOTE

Exercise care when removing hardware attaching bleed air gimbal duct to airframe bracket to prevent hardware from falling into engine compartment.



1. Coupling
2. Coupling
3. Gasket
4. Cotter Pin
5. Nut
6. Washer
7. Washer
8. Bolt
9. Spacer
10. Spacer
11. Spring
12. High pressure bleed air gimbal duct
13. Airframe bracket
14. Pressure limiting and shutoff valve
15. Coupling
16. Gasket
17. Coupling
18. Gasket
19. Bolt
20. Washer
21. Washer
22. Nut
23. Seal and support assembly
24. Screw
25. Washer
26. Bolt
27. Washer
28. Bracket
29. Bolt
30. Washer
31. Insulator block
32. Insulator block
33. Bracket
34. Z-Section high pressure bleed air duct
35. Aft fuselage section high pressure bleed air duct
36. Coupling
37. Nut
38. Bolt
39. Spacer
40. Coupling retainer plate
41. Gasket
42. Bolt
43. Washer
44. Spacer
45. Bracket
46. Nut
47. Washer
48. Bolt
49. Washer
50. Spacer
51. Bracket
52. Wing section high pressure bleed air duct
53. Coupling
54. Nut
55. Bolt
56. Spacer
57. Coupling retainer plate
58. Gasket
59. Midfuselage section high pressure bleed air duct
60. Nut
61. Washer
62. Bolt
63. Washer
64. Spacer
65. Coupling
66. Gasket
67. Nut
68. Washer
69. Insulator block
70. Bolt
71. Washer
72. Insulator block
73. Bolt
74. Washer
75. Nut
76. Bracket
77. Bolt
78. Washer
79. Spacer
80. Bracket
81. Nose fuselage upper section high pressure bleed air duct
82. Coupling
83. Gasket
84. Nut
85. Washer
86. Bolt
87. Bracket
88. Nose fuselage center section high pressure bleed air duct
89. Coupling
90. Gasket
91. Nuts
92. Bolts
93. Washers
94. Bracket
95. Clamp
96. Cover
97. Nose fuselage lower section high pressure bleed air duct
98. Coupling
99. Gasket
100. Heat exchanger

Figure 1-6. High Pressure Bleed Air System Ducts Removal and Installation

d. Remove cotter pin (4), nut (5), washers (6 and 7), bolt (8), spacers (9 and 10), and spring (11) securing high pressure bleed air gimbal duct (12) to airframe bracket (13).

e. Remove duct from airplane.

f. Cut lockwire and remove insulation from duct.

1-35. INSTALLATION. (See figure 1-9.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	966A1	Micrometer, Optical	Measure defects nicks, scratches, etc.

WARNING

Compressed air used for cleaning and drying purposes can create airborne particles that can enter the eyes. Pressure shall not exceed 30 psi and use only with adequate chip guards and goggles.

NOTE

Repair of duct surface by welding is not authorized. Any duct which has been repaired by welding new material over the original duct tubing should be replaced.

a. Inspect high pressure bleed air duct for damage using optical micrometer. Replace duct if damage exceeds the following:

1. Scratches, nicks, gouges or defined areas deeper than 0.002 inches.

2. Any crack.

NOTE

Reference T.O. 338-1-1 and MIL-I-6866. Perform fluorescent penetrant spot check inspection in accordance with MIL-I-6866, Type I, Method C. Use penetrant material in accordance with MIL-I-25135 Group VII. Look for cracks in damaged areas of duct.

3. Any dents in excess of 0.03 inch in a bend area.

4. Smooth contour dents which are longer than 1.0 inch or deeper than 0.10 inch or dents of 0.03 to 0.10 inch depth which have a radius of over 0.04 inch. Smooth contour dents deeper than 0.03 inch, but otherwise acceptable, shall be carefully inspected for cracks using dye penetrant method.

CAUTION

Do not use glass beads that are treated with silicones and avoid excessive local blasting which may result in warpage or distortion.

NOTE

Stains and gray or tan light oxide films are not to be construed as corrosion. If cleaning is required to define corrosion/damage extent, use dry blasting with MIL-G-9954, size 13 glass beads. Rinse free of abrasive using water and air dry. Protect part number by placing tape over it prior to blasting.

5. Corroded or pitted areas that cannot be removed by polishing without metal loss in excess of 0.004 inch.

NOTE

On ducts Part No. 21656370-1 or -2 and Part No. 21646371, corroded or pitted areas should not be in excess of 0.002 inch deep.

6. Flanges that are bent or have nicks or gouges in gasket sealing area.

b. Hand-rub duct and coupling flanges with MIL-L-83483 molybdenum disulfide grease.

c. Lubricate surfaces of duct mounting bracket with MIL-L-83483 grease where washers (6 and 7) contact.

c-1. Install insulation on duct and secure with MS20995C32 lockwire.

d. Position duct in airplane.

e. Using new self-locking nut and new gasket (3), connect duct (12) to pressure limiting and shutoff valve (14) with coupling (1). Do not tighten coupling.

f. Using new self-locking nut and new gasket (3), connect duct (12) to engine high pressure bleed air duct with coupling (2). Do not tighten coupling.

g. Align duct mounting bracket with airframe bracket (13).

h. Install one washer (7), spacer (10), spring (11), spacer (9), and washer (7) on bolt (8) and install bolt through duct mounting bracket.

i. Install one washer (6) between duct mounting bracket and airframe bracket (13) and push bolt through airframe bracket.

j. Install washer (6) and nut (5) on bolt. Do not tighten nut.

k. Tighten couplings (1 and 2) to 90 (±10) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (±10) pound-inches.

l. Tighten nut (5) and secure with new cotter pin (4).

m. Start engine and operate at idle RPM (T.O. 1A-7D-2-1).

WARNING

Hot airflow can cause severe burns. Personnel should wear safety goggles and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

n. Check duct installation for leakage.

o. Shut down engine (T.O. 1A-7D-2-1).

p. Install insulation around couplings (1 and 2). Secure insulation with MS20995C32 lockwire.

q. Close accesses 6122-2 and 6122-5.

1-35A. Z-SECTION HIGH PRESSURE BLEED AIR DUCT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational checkout after bleed air duct installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

1-35B. REMOVAL. (See figure 1-9.)

a. Open accesses 6111-2, 6111-4, and 6122-2.

b. Remove battery (T.O. 1A-7D-2-11).

c. Cut lockwire and remove insulation around coupling (15). Loosen and remove coupling and gasket (16). Discard gasket.

d. Cut lockwire and remove insulation around coupling (17). Loosen and remove coupling and gasket (18). Discard gasket.

e. Remove three bolts (19), washers (20 and 21), and nuts (22) securing seal and support assembly (23) to forward side of fuselage station 526.5 bulkhead.

f. Remove screw (24) and washer (25) from aft side of fuselage station 526.5 bulkhead securing support assembly.

g. Cut lockwire and remove insulation from tolerance compensator.

h. Remove bolt (26) and washer (27) from forward duct attaching bracket (28).

i. Disconnect camera compartment air line.

j. Remove four bolts (29), washers (30), and insulator blocks (31 and 32) securing aft duct attaching bracket (33) to bulkhead.

k. Remove Z-section high pressure bleed air duct (34) from airplane.

l. Cut lockwire and remove insulation from duct.

1-35C. INSTALLATION. (See figure 1-9.)

a. Inspect replacement high pressure bleed air duct for damage using optical micrometer. Replace duct if damage exceeds limits set in paragraph 1-35.

a-1. Install insulation on replacement Z-section high pressure bleed air duct. Secure insulation with MS20995C32 lockwire.

b. Hand-rub duct and coupling flanges with MIL-L-83483 molybdenum disulfide grease.

c. Position duct in airplane and align with mounting brackets.

d. Using new self-locking nut and new gasket (16), connect duct (34) to pressure limiting and shutoff valve (14) with coupling (15). Do not tighten coupling.

e. Secure aft duct mounting bracket to fuselage station 554.1 bulkhead using four bolts (29), washers (30), and insulator blocks (31 and 32).

f. Connect camera compartment air line.

g. Apply light coat of MIL-L-83483 molybdenum disulfide grease to insulator blocks on seal and support assembly (23).

h. Install support assembly over high and low pressure bleed air ducts and secure support to bulkhead using three bolts (19), washers (20 and 21), and nuts (22).

i. Install screw (24) and washer (25) at aft side of fuselage station 526.5 bulkhead.

j. Secure duct at forward duct attaching bracket (28) using bolt (26) and washer (27).

NOTE

The tolerance compensator shall not be adjusted more than 0.30 inch in either direction to obtain required gap.

k. Adjust tolerance compensator to obtain 0.87-inch gap between flanges of Z-section duct (34) and bleed air duct (35).

l. Secure compensator with MS20995C32 lockwire.

m. Using new self-locking nut and new gasket (18), connect duct (34) to duct (35) with coupling (17).

n. Tighten couplings (17 and 15) to 90 (± 10) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (± 10) pound-inches.

o. Temporarily install battery for engine run and leak check.

p. Start engine and operate at 90% power (T.O. 1A-7D-2-1).

WARNING

Hot airflow can cause severe burns. Personnel should wear safety goggels and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

q. Check duct installation for leakage.

r. Shut down engine (T.O. 1A-7D-2-1).

s. Remove battery.

t. Install insulation around couplings (15 and 17) and tolerance compensator. Secure insulation with MS20995C32 lockwire.

u. Install battery (T.O. 1A-7D-2-11).

v. Close accesses 6111-2, 6111-4, and 6122-2.

1-35D. AFT FUSELAGE SECTION HIGH PRESSURE BLEED AIR DUCT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational checkout after bleed air duct installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

1-35E. REMOVAL. (See figure 1-9.)

a. Open accesses 6111-4, 6111-1, and 4123-1.

b. Cut lockwire and remove insulation around couplings (17 and 36).

c. Loosen and remove coupling (17) and gasket (18). Discard gasket.

d. Remove two nuts (37), bolts (38), and spacers (39) securing coupling retainer plates (40) around coupling (36).

e. Disconnect retainer plates pin and slot connection and position plates away from coupling (36).

f. Loosen and remove coupling (36) and gasket (41). Discard gasket.

g. Remove and retain coupling retainer plates (40).

h. Remove two bolts (42), washers (43), and spacers (44) securing aft fuselage section high pressure bleed air duct (35) to airframe support brackets (45).

i. Remove two nuts (46), washers (47), bolts (48), washers (49), and spacers (50) securing bleed air duct (35) to airframe support brackets (51).

j. Remove duct from airplane.

k. Cut lockwire and remove insulation from duct.

1-35F. INSTALLATION. (See figure 1-9.)

a. Inspect replacement high pressure bleed air duct for damage using optical micrometer. Replace duct if damage exceeds limits set in paragraph 1-35.

a-1. Install insulation on replacement aft fuselage section high pressure bleed air duct (35). Secure insulation with MS20995C32 lockwire.

b. Hand-rub duct and coupling flanges with MIL-L-83483 molybdenum disulfide grease.

c. Position duct in airplane and align with airframe support brackets (45 and 51).

d. Install two spacers (44) through airframe support brackets (45) and bleed air duct mounting flanges. Ensure that inboard spacer is installed through flange of adjacent low pressure bleed air duct.

e. Install washers (43) on bolts (42) and install bolts through support brackets. Do not tighten bolts.

f. Install two spacers (50) through airframe support brackets (51) and bleed air duct mounting flanges. Ensure that inboard spacer is installed through flange of adjacent low pressure bleed air duct.

g. Install washers (49) on bolts (48) and install bolts through support brackets. Install washers (47) and nuts (46) on bolts. Do not tighten nuts.

h. Using new self-locking nut and new gasket (18), connect duct (35) to duct (34) using coupling (17). Do not tighten coupling.

i. Position coupling retainer plates on duct (35) and duct (52).

j. Using new self-locking nut and new gasket (41), connect duct (35) to duct (52) using coupling (36).

k. Tighten coupling (36) to 90 (±10) pound-inches torque. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (±10) pound-inches.

l. Position retainer plates (40) around coupling (36) and connect plates together at pin and slot connection.

m. Install spacers (39) between retainer plates and install bolts (38) and nuts (37). Rotate plates to obtain maximum clearance with adjacent hardware and tighten nuts (37).

n. Tighten coupling (17) to 90 (±10) pound-inches torque. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (±10) pound-inches.

o. Tighten bolts (42) and nuts (46).

p. Start engine and operate at 90% power (T.O. 1A-7D-2-1).

WARNING

Hot airflow can cause severe burns. Personnel should wear safety goggles and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

q. Check duct installation for leakage.

r. Shut down engine (T.O. 1A-7D-2-1).

s. Install insulation around couplings (17 and 36). Secure insulation with MS20995C32 lockwire.

t. Close accesses 6111-4, 6111-1, and 4123-1.

1-35G. WING SECTION HIGH PRESSURE BLEED AIR DUCT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational checkout after bleed air duct installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

1-35H. REMOVAL. (See figure 1-9.)

a. Open accesses 4123-1 and 4113-11.

b. Cut lockwire and remove insulation around couplings (36 and 53).

c. Remove two nuts (37), bolts (38), and spacers (39) securing coupling retainer plates (40) around coupling (36).

d. Disconnect retainer plates pin and slot connection and position away from coupling (36).

e. Loosen and remove coupling (36) and gasket (41) connecting wing section high pressure bleed air duct (52) to duct (35). Discard gasket.

f. Remove two nuts (54), bolts (55), and spacers (56) securing coupling retainer plates (57) around coupling (53).

g. Disconnect retainer plates pin and slot connection and position away from coupling (53).

h. Loosen and remove coupling (53) and gasket (58) connecting bleed air duct (52) to duct (59). Discard gasket.

i. Remove and retain coupling retainer plates (40 and 57).

NOTE

Detail H of figure 1-9 provides a typical installation for attaching the wing section high pressure bleed air duct to five support brackets. Since the bolts and spacers used differ in length for each installation, it is recommended that small cloth or plastic bags be used to retain parts removed from each support bracket for identification during installation of the bleed air duct.

j. Using small cloth or plastic bags to retain removed parts, remove two nuts (60), two washers (61), two bolts (62), two washers (63), and two spacers (64) connecting bleed air duct (52) to each of the five support brackets.

k. Remove bleed air duct from airplane.

l. Cut lockwire and remove insulation from duct.

1-35J. INSTALLATION. (See figure 1-9.)

a. Inspect replacement high pressure bleed air duct for damage using optical micrometer. Replace duct if damage exceeds limits set in paragraph 1-35.

a-1. Install insulation on replacement wing section high pressure bleed air duct. Secure insulation with MS20995C32 lockwire.

b. Hand-rub duct and coupling flanges with MIL-L-83483 molybdenum disulfide grease.

c. Position bleed air duct in airplane and align duct mounting flanges with the five support brackets.

d. Connect bleed air duct to each of the support brackets as follows:

1. Install spacers (64) through support brackets and duct mounting flanges. Ensure that inboard spacer is installed through flange of adjacent low pressure bleed air duct.

2. Install washers (63) on bolts (62) and install bolts through support brackets and spacers.

3. Install washers (61) and nuts (60) on bolts (62). Do not tighten nuts.

e. Position coupling retainer plates (40) on duct (35) and duct (52).

f. Using new self-locking nut and new gasket (41), connect duct (52) to duct (35) using coupling (36). Do not tighten coupling.

g. Position coupling retainer plates (57) on duct (52) and (59).

h. Using new self-locking nuts and new gasket (58), connect duct (52) to duct (59) using coupling (53).

i. Tighten coupling (53) to 90 (± 10) pound-inches. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (± 10) pound-inches.

j. Position coupling retainer plates (57) around coupling (53) and connect plates together at pin and slot connection.

k. Install spacers (56) between retainer plates and install bolts (55) and nuts (54). Rotate plates to obtain maximum clearance with adjacent hardware and tighten nuts (54).

l. Tighten coupling (36) to 90 (± 10) pound-inches torque. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (± 10) pound-inches.

m. Position coupling retainer plates (40) around coupling (36) and connect plates together at pin and slot connection.

n. Install spacers (39) between retainer plates and install bolts (38) and nuts (37). Rotate retainer plates to obtain maximum clearance with adjacent hardware and tighten nuts (37).

o. Tighten nuts (60) at each of the five bleed air duct support brackets.

p. Start engine and operate at 90% power (T.O. 1A-7D-2-1).

WARNING

Hot airflow can cause severe burns. Personnel should war safety goggels and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

q. Check duct installation for leakage.

r. Shut down engine (T.O. 1A-7D-2-1).

s. Install insulation around couplings (36 and 53). Secure insulation with MS20995C32 lockwire.

t. Close accesses 4123-1 and 4113-11.

1-35K. MIDFUSELAGE SECTION HIGH PRESSURE BLEED AIR DUCT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational checkout after bleed air duct installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

1-35L. REMOVAL. (See figure 1-9.)

a. Open accesses 4113-11 and 2121-3.

b. Cut lockwire and remove insulation around couplings (53 and 65).

c. Loosen and remove coupling (65) and gasket (66). Discard gasket.

d. Remove two nuts (54), bolts (55), and spacers (56) securing coupling retainer plates (57) around coupling (53).

e. Disconnect retainer plates pin and slot connection and position plates away from coupling.

f. Loosen and remove coupling (53) and gasket (58). Discard gasket.

g. Disconnect midfuselage section high pressure bleed air duct (59) from airframe mounting bracket at fuselage station 372.8 by removing three nuts (67), washers (68), insulator blocks (69), bolts (70), washers (71), and insulator blocks (72).

h. Remove two bolts (73), washers (74), and nuts (75) securing bracket (76) to airframe.

i. Remove two bolts (77), washers (78), and spacers (79) securing bleed air duct (59) to airframe bracket (80).

j. Remove bleed air duct from airplane.

k. Cut lockwire and remove insulation from bleed air duct.

1-35M. INSTALLATION. (See figure 1-9.)

a. Inspect replacement high pressure bleed air duct for damage using optical micrometer. Replace duct if damage exceeds limits set in paragraph 1-35.

a-1. Install insulation on replacment midfuselage section high pressure bleed air duct (59). Secure insulation with MS20995C32 lockwire.

b. Hand-rub duct and coupling flanges with MIL-L-83483 molybdenum disulfide grease.

c. Position duct in airplane and align with fuselage station 372.8 airframe mounting bracket and airframe bracket (80).

d. Using new self-locking nut and new gasket (66), connect duct (59) to duct (81) using coupling (65). Do not tighten coupling.

e. Position coupling retainer plates (57) on duct (59 and 52).

f. Using new self-locking nut and new gasket (58), connect duct (59) to duct (52) using coupling (53).

g. Tighten coupling (53) to 90 (± 10) pound-inches torque. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (± 10) pound-inches.

h. Tighten coupling (65) to 90 (± 10) pound-inches torque. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (± 10) pound-inches.

i. Connect bleed air duct (59) to airframe bracket (80) using two bolts (77), washers (78), and spacers (79).

j. Install bracket (76) using two bolts (73), washers (74), and nuts (75). Ensure duct vane is firmly seated between brackets.

k. Position insulator blocks (69) between duct mounting flange and airframe mounting bracket at fuselage station 372.8.

l. Install washers (71) and insulator blocks (72) on bolts (70) and install bolts through duct flange and airframe bracket. Secure bolts using washers (68) and nuts (67).

m. Position retainer plates (57) around coupling (53) and connect plates together at pin and slot connection.

n. Install spacers (56) between retainer plates and install bolts (55) and nuts (54). Rotate plates to obtain maximum clearance with adjacent hardware and tighten nuts (54).

o. Start engine and operate at 90% power (T.O. 1A-7D-2-1).

WARNING

Hot airflow can cause severe burns. Personnel should wear safety goggles and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

p. Check duct installation for leakage.

q. Shut down engine (T.O. 1A-7D-2-1).

r. Install insulation around couplings (53 and 65). Ensure that a minimum clearance of ¼ inch is obtained between insulation and aircraft lines. Secure insulation with MS20995C32 lockwire.

s. Close accesses 4113-11, and 2121-3.

1-35N. NOSE FUSELAGE UPPER SECTION HIGH PRESSURE BLEED AIR DUCT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational checkout after bleed air duct installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

1-35P. REMOVAL. (See figure 1-9.)

a. Open accesses 2121-3 and 2123-6.

b. Cut lockwire and remove insulation around couplings (65 and 82).

c. Loosen and remove coupling (82) and gasket (83). Discard gasket.

d. Remove two nuts (84), washers (85), and bolts (86) securing bracket (87) to airframe.

e. Loosen and remove coupling (65) and gasket (66). Discard gasket.

f. Remove nose fuselage upper section high pressure bleed air duct (81) from airplane.

g. Cut lockwire and remove insulation from bleed air duct.

1-35Q. INSTALLATION. (See figure 1-9.)

a. Inspect replacement high pressure bleed air duct for damage using optical micrometer. Replace duct if damage exceeds limits set in paragraph 1-35.

a-1. Install insulation on replacement nose fueselage upper section high pressure bleed air duct.

b. Hand-rub duct and coupling flanges with MIL-L-83483 molybdenum disulfide grease.

c. Position duct in airplane.

d. Using new self-locking nut and new gasket (83), connect duct (81) to duct (88) with coupling (82).

e. Using new self-locking nut and new gasket (66), connect duct (81) to duct (59) with coupling (65).

f. Tighten couplings (65 and 82) to 90 (±10) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90(±10) pound-inches.

g. Secure bracket (87) to airframe using two bolts (86), washers (85), and nuts (84). Ensure that duct vane is firmly seated between brackets.

h. Start engine and operate at 90% power (T.O. 1A-7D-2-1).

WARNING

Hot airflow can cause severe burns. Personnel should wear safety goggles and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

i. Check duct installation for leakage.

j. Shut down engine (T.O. 1A-7D-2-1).

k. Install insulation around couplings (65 and 82). Secure insulation with MS20995C32 lockwire.

l. Close accesses 2121-3 and 2123-6.

1-35R. NOSE FUSELAGE CENTER SECTION HIGH PRESSURE BLEED AIR DUCT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational checkout after bleed air duct installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

1-35S. REMOVAL. (See figure 1-9.)

a. Open accesses 2123-6 and 2222-4.

b. Cut lockwire and remove insulation around couplings (82 and 89).

c. Loosen and remove coupling (89) and gasket (90). Discard gasket.

d. Remove four nuts (91), bolts (92), and eight washers (93) securing nose fuselage center section high pressure bleed air duct (88) and bracket (94) to airframe.

e. Remove clamp (95) securing cover assembly (96) around bleed air duct (88). Remove cover assembly.

f. Loosen and remove coupling (82) and gasket (83). Discard gasket.

g. Remove bleed air duct from airplane.

h. Cut lockwire and remove insulation from bleed air duct.

i. Remove bracket (94) from bleed air duct.

1-35T. INSTALLATION. (See figure 1-9.)

a. Inspect replacement high pressure bleed air duct for damage using optical micrometer. Replace duct if damage exceeds limits set in paragraph 1-35.

a-1. Install bracket (94) on replacement nose fuselage center section high pressure bleed air duct (88).

b. Install insulation on duct and secure with MS20995C32 lockwire.

c. Hand-rub duct and coupling flanges with MIL-L-83483 molybdenum disulfide grease.

d. Position bleed air duct in airplane and align bracket (94) with mounting holes in airframe.

e. Secure bracket to airframe using bolts (92), washers (93), and nuts (91).

f. Using new self-locking nut and new gasket (90), connect duct (88) to duct (97) using coupling (82).

g. Using new self-locking nut and new gasket (83), connect duct (88) to duct (81) using coupling (82).

h. Tighten couplings (82 and 89) to 90 (±10) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (±10) pound-inches.

i. Install cover assembly (96) around bleed air duct and secure cover with clamp (95).

j. Start engine and operate at 90% power (T.O. 1A-7D-2-1).

WARNING

Hot airflow can cause severe burns. Personnel should wear safety goggles and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

k. Check duct installation for leakage.

l. Shut down engine (T.O. 1A-7D-2-1).

m. Install insulation around couplings (82 and 89). Secure insulation with MS20995C32 lockwire.

n. Close accesses 2123-6 and 2222-4.

1-35U. NOSE FUSELAGE LOWER SECTION HIGH PRESSURE BLEED AIR DUCT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational checkout after bleed air duct installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

1-35V. REMOVAL. (See figure 1-9.)

a. Open access 2222-4.

b. Cut lockwire and remove insulation around coupling (89).

c. Loosen and remove coupling (89) and gasket (90). Discard gasket.

d. Loosen and remove coupling (98) and gasket (99). Discard gasket.

e. Remove nose fuselage lower section high pressure bleed air duct (97) from airplane.

f. Cut lockwire and remove insulation from bleed air duct.

1-35W. INSTALLATION. (See figure 1-9.)

a. Inspect replacement high pressure bleed air duct for damage using optical micrometer. Replace duct if damage exceeds limits set in paragraph 1-35.

a-1. Install insulation on replacement nose fuselage lower section high pressure bleed air duct (97).

b. Hand-rub duct and coupling flanges with MIL-L-83483 molybdenum disulfide grease.

c. Position bleed air duct in airplane.

d. Using new self-locking nut and new gasket (90), connect duct (97) to duct (88) with coupling (89).

e. Using new self-locking nut and new gasket (99), connect duct (97) to heat exchanger connection (100) with coupling (98).

f. Tighten couplings (89 and 98) to 90 (± 10) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (± 10) pound-inches.

g. Start engine and operate at 90% power (T.O. 1A-7D-2-1).

WARNING

Hot airflow can cause severe burns. Personnel should wear safety goggles and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

h. Check duct installation for leakage.

i. Shut down engine (T.O. 1A-7D-2-1).

j. Install insulation around coupling (89) and secure with MS20995C32 lockwire.

k. Close access 2222-4.

1-36. HIGH AND LOW PRESSURE BLEED AIR GIMBAL DUCT INSULATION REMOVAL AND INSTALLATION.

1-37. REMOVAL.

a. Open access 6122-2.

b. Before removing insulation from high pressure bleed air gimbal duct, remove insulation from high pressure bleed air manifold coupling.

c. Cut and remove lockwire securing insulation on bleed air duct.

d. Remove insulation from duct.

1-38. INSTALLATION.

a. Position insulation on duct. Check that insulation flaps overlap properly.

b. Secure insulation to duct with MS20995C32 lockwire. Lockwire must make two complete turns around each capstan.

c. Close access 6122-2.

1-39. WATER SEPARATOR ANTI-ICE VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 15 pound-inches	Tighten couplings

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

a. Disconnect right nose gear door lower link (T.O. 1A-7D-2-7).

b. Open accesses 2222-4, 2212-10, and 2212-6.

c. Remove forward coupling (1) and sleeve (2) from ram air inlet duct (3).

d. Remove aft coupling (4) and sleeve (5) from ram air inlet duct. Remove duct.

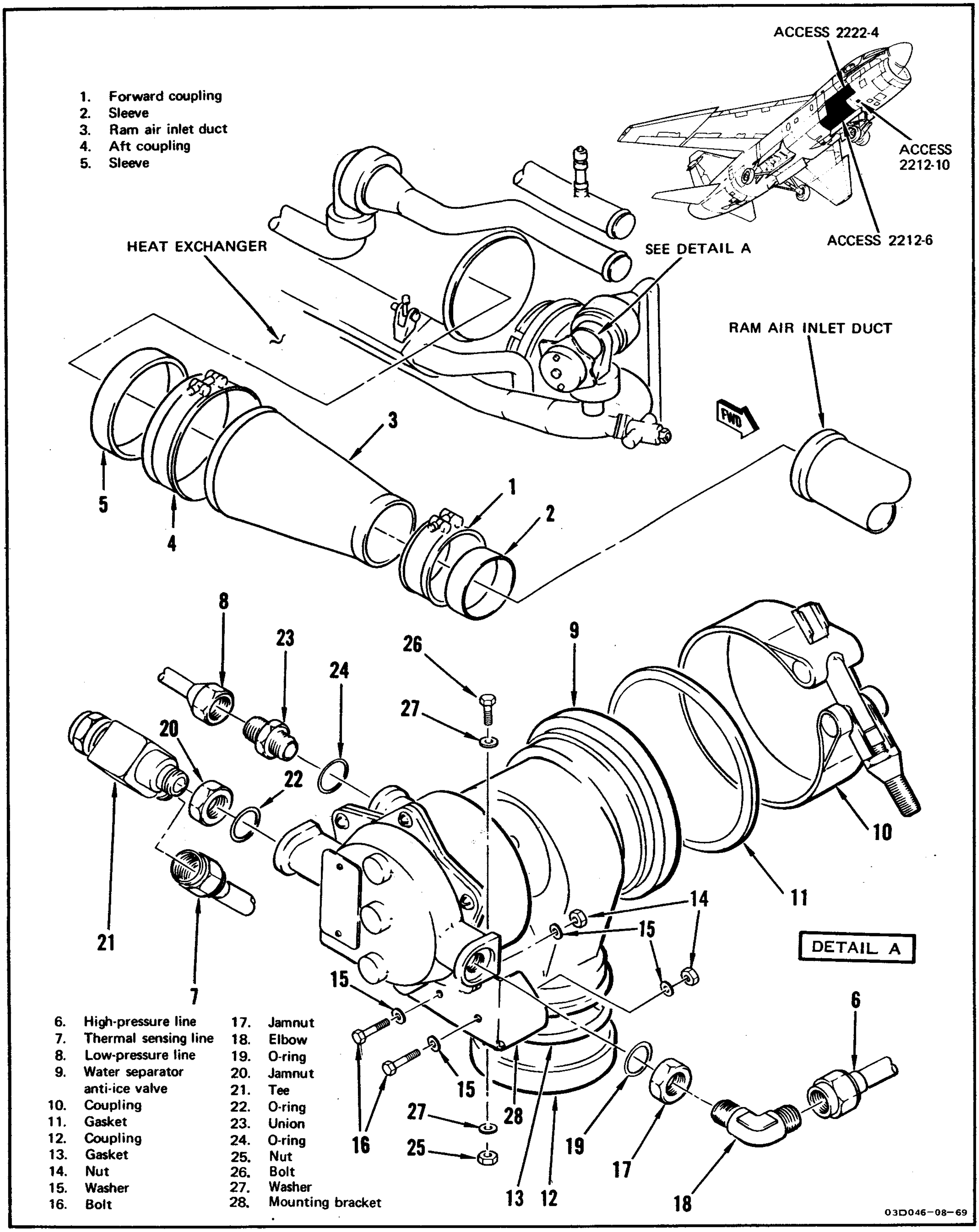


Figure 1-10. Water Separator Anti-Ice Valve Removal and Installation

e. Disconnect high pressure line (6), thermal sensing line (7), and low pressure line (8) from water separator anti-ice valve (9).

f. Remove coupling (10) and gasket (11) from anti-ice valve.

g. Remove coupling (12) and gasket (13) from anti-ice valve.

h. Remove two nuts (14), washers (15), and bolts (16) securing anti-ice valve to mounting bracket and airplane. Remove anti-ice valve and mounting bracket from airplane.

i. Loosen jamnut (17) and remove elbow (18) and O-ring (19) from anti-ice valve.

j. Cut lockwire, loosen jamnut (20), and remove tee (21) and O-ring (22) from anti-ice valve.

k. Remove union (23) and O-ring (24) from anti-ice valve.

l. Remove two nuts (25), bolts (26), and washers (27) securing anti-ice valve to mounting bracket (28).

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

a. Install union (23) and new O-ring (24) in anti-ice valve low pressure port.

b. Install jamnut (20), tee (21), and new O-ring (22) in anti-ice valve thermal sensing port. Do not tighten jamnut.

c. Install jamnut (17), elbow (18), and new O-ring in anti-ice high pressure port. Do not tighten jamnut.

d. Position water separator anti-ice valve (9) to mounting bracket (28) and install two bolts (26), washers (27), and nuts (25).

e. Position anti-ice valve and mounting bracket in airplane and secure with two bolts (16), washers (15), and nuts (14).

f. Using new self-locking nut, install coupling (12) and new gasket (13). Tighten coupling to 90 (±10) pound-inches torque and tap coupling lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (±10) pound-inches.

g. Using new self-locking nut, install coupling (10) and new gasket (11). Tighten coupling to 90 (±10) pound-inches torque and tap coupling lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (±10) pound-inches.

h. Position elbow (18) and tee (21), and tighten jamnuts (17 and 20).

i. Secure jamnut (20) with MS20995C32 lockwire.

j. Connect low pressure line (8), thermal sensing line (7), and high pressure line (6) to anti-ice valve.

k. Position ram air inlet duct (3) in airplane.

l. Using new self-locking nuts, install aft coupling (4), new sleeve (5), forward coupling (1), and new sleeve (2).

m. Tighten couplings (1 and 4) to 40 (±2) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 40 (±2) pound-inches.

n. Perform air-conditioning supply system operational checkout (paragraph 1-16).

o. Close accesses 2222-4, 2212-10, and 2212-6.

p. Connect right nose gear door lower link (T.O. 1A-7D-2-7).

1-42. LOW LIMIT TRANSMITTER REMOVAL AND INSTALLATION.

1-43. REMOVAL.

a. Disconnect right nose gear door lower link (T.O. 1A-7D-2-7).

b. Open access 2212-6.

c. Disconnect two control air lines.

d. Remove four nuts and washers securing low limit transmitter to cold air manifold.

e. Remove low limit transmitter and gasket from airplane.

1-44. INSTALLATION.

a. Using a new gasket, position low limit transmitter to cold air manifold.

b. Install four washers and nuts securing low limit transmitter to cold air manifold.

c. Connect two control air lines.

d. Close access 2212-6.

e. Connect right nose gear door lower link (T.O. 1A-7D-2-7).

f. Perform air-conditioning supply system operational checkout (paragraph 1-16).

1-45. EMERGENCY VENT AIR SCOOP REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	*Part Number*	*Nomenclature*	*Use and Application*
	0013 (John Chatillon and Sons, Kew Garden, N.Y.)	Spring scale, 0 to 50 pounds	Check control knob tension

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

a. Pull and turn emergency vent control knob to extend air scoop door. Remove thermal insulation covering from around control knob.

b. Remove cotter pin (1), nut (2), washers (3), and bolt (4) securing air scoop door at pivot point.

c. Remove screw (5) and washers (6) securing control knob (7) to eyebolt.

d. Remove cotter pin (8), nut (9), washers (10), and bolt (11) securing door to control eyebolt. Remove door (12) from airplane.

e. Remove core retaining nut (13) and washer (14), and remove control core (15) from airplane.

1-47. INSTALLATION. (See figure 1-11.)

a. Position control core (15) in mounting bracket and secure with washer (14) and nut (13).

b. Position air scoop door (12) and secure to eyebolt with bolt (11), washers (10), and nut (9).

c. Tighten nut finger-tight and install new cotter pin (8).

d. Install control knob (7) and secure with washers (6) and screw (5).

e. Position door at pivot point and secure with bolt (4), washers (3), and nut (2). Tighten nut finger-tight and secure with new cotter pin (1).

f. Close door and push emergency vent control knob outboard. Check that door fits flush with airplane skin.

g. Adjust control mechanism by screwing out two spring plungers in head until knob slides freely.

h. Adjust control mechanism by screwing spring plungers in until force indicated on spring scale to pull knob inboard is 15 to 22 pounds. Push knob outboard.

i. Pull and rotate control knob to extend air scoop door. Check that knob is securely attached to shaft. Stake eyebolt in button.

j. Close door and push emergency vent control knob outboard. Using spring scale, check that force required to pull knob inboard remains 15 to 22 pounds.

k. Fill holes and screwdriver slots with MIL-S-8802 sealant.

l. Close door, push control knob outboard, and position thermal insulation around knob.

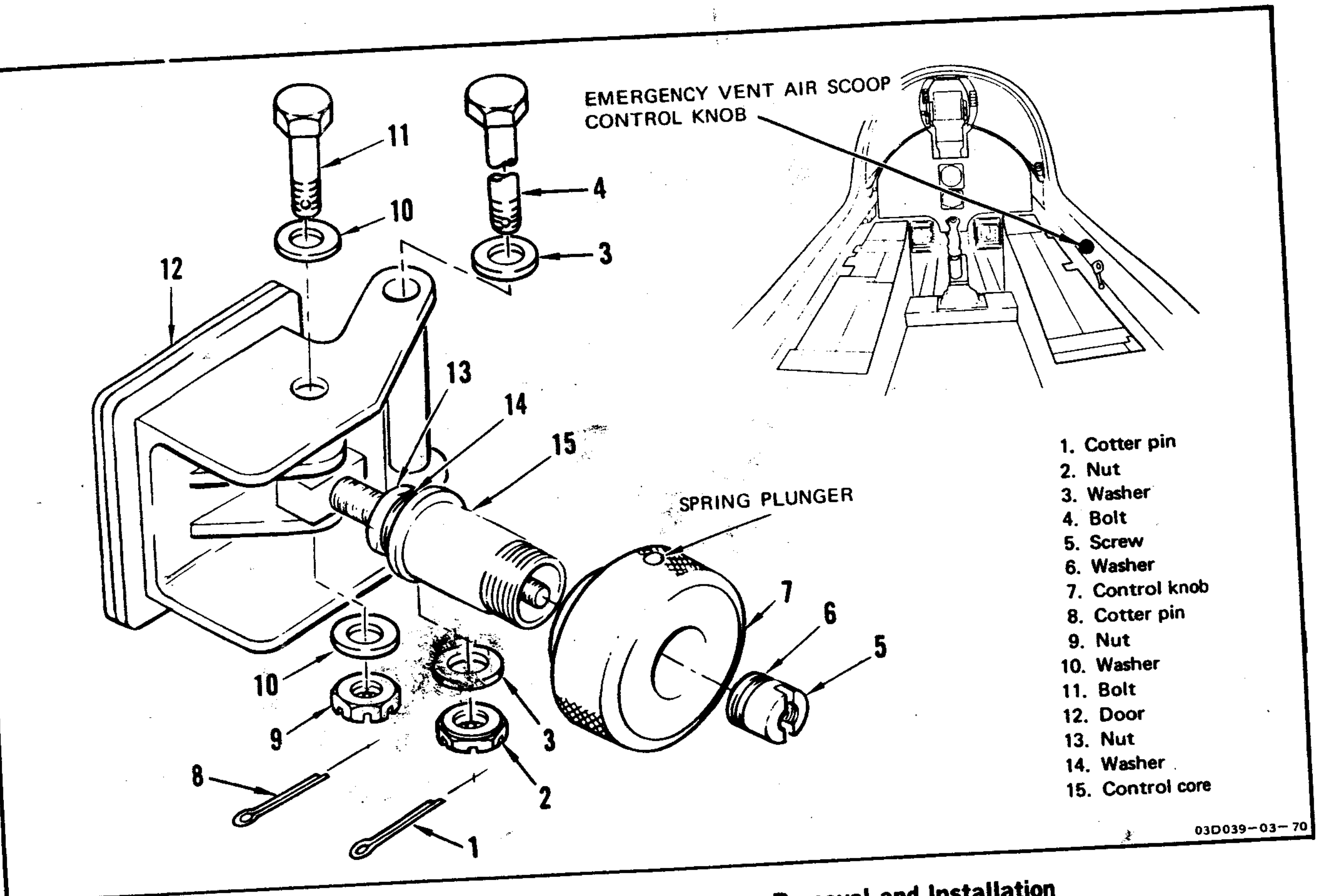


Figure 1-11. Emergency Vent Air Scoop Removal and Installation

1-48. EMERGENCY VENT AIR SCOOP SEALING GASKET REPLACEMENT.

WARNING

P-D-680, Type II, is combustible and moderately toxic to eyes, skin and respiratory tract. Eye and skin protection required. Use in well ventilated area.

a. Open air scoop and remove old gasket from door. Clean gasket area with P-D-680 drycleaning solvent and allow to dry. When area is dry, apply MMM-A-1617 adhesive to mating surfaces.

b. When adhesive becomes tacky, install gasket around door opening. Observe that cut section is facing aft.

c. Apply VV-P-236 petrolatum to outer portion of skin to prevent door from being sealed closed.

d. Close door and keep closed until adhesive dries. Then open door and remove VV-P-236 petrolatum.

e. Close air scoop door and push control knob outboard.

1-49. EJECTOR DUMP VALVE 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 couplings

1-50. REMOVAL. (See figure 1-12.)

a. Disconnect right nose gear door lower link (T.O. 1A-7D-2-7).

b. Open accesses 2222-4 and 2212-6.

c. Remove heat exchanger exhaust duct coupling (1).

d. Remove nuts (2), washers (3), shims (4), and bolts (5) securing duct to mounting bracket. Remove exhaust duct (6) from airplane.

e. Cut lockwire and remove coupling (7), retainer rings (8), O-rings (9), and retainer halves (10) securing turbine outlet duct (11) to water separator.

f. Remove coupling (12) and O-ring (13).

g. Remove clamp (14) from control air line.

h. Support turbine outlet duct, remove bolt (15) and washer (16) attaching duct to heat exchanger bracket, and remove turbine outlet duct.

i. Disconnect and remove drainline (17) between control air valve and heat exchanger outlet.

j. Disconnect control air lines (18, 19, and 20) from ejector dump valve.

k. Remove nuts (21), bolts (22), and washers (23) from clamps (24) attaching valve mounting bracket to heat exchanger bracket (25).

NOTE

Removal of the ejector dump valve from mounting bracket must be accomplished in airplane.

l. Remove bolts (26), nuts (27), and washers (28) securing valve (29) to mounting bracket (30).

m. Remove valve and mounting bracket from airplane.

n. Remove unions (31) and O-rings (32) from valve.

o. Note position of elbow, loosen jamnut (33), and remove elbow (34) and O-ring (35) from valve.

1-51. INSTALLATION. (See figure 1-12.)

a. Install jamnut (33) and new O-ring (35) on elbow (34) and install elbow in ejector dump valve (29). Do not tighten jamnut.

b. Using new O-rings (32), install unions (31) in valve.

c. Position valve and mounting bracket (30) in airplane and secure valve to mounting bracket with bolts (26), nuts (27) and washers (28).

d. Position valve and mounting bracket to heat exchanger support (25) and secure with clamps (24), bolts (22), washers (23) and nuts (21).

e. Position elbow (34) as noted during removal and tighten jamnut (33).

1. Coupling
2. Nut
3. Washer
4. Shim
5. Bolt
6. Exhaust duct
7. Coupling
8. Retainer ring
9. O-ring
10. Retainer half
11. Turbine outlet duct
12. Coupling
13. O-ring
14. Clamp
15. Bolt
16. Washer
17. Drain line
18. Control air line
19. Control air line
20. Control air line
21. Nut
22. Bolt
23. Washer
24. Clamp
25. Support
26. Bolt
27. Nut
28. Washer
29. Ejector dump valve
30. Bracket
31. Union
32. O-ring
33. Jamnut
34. Elbow
35. O-ring

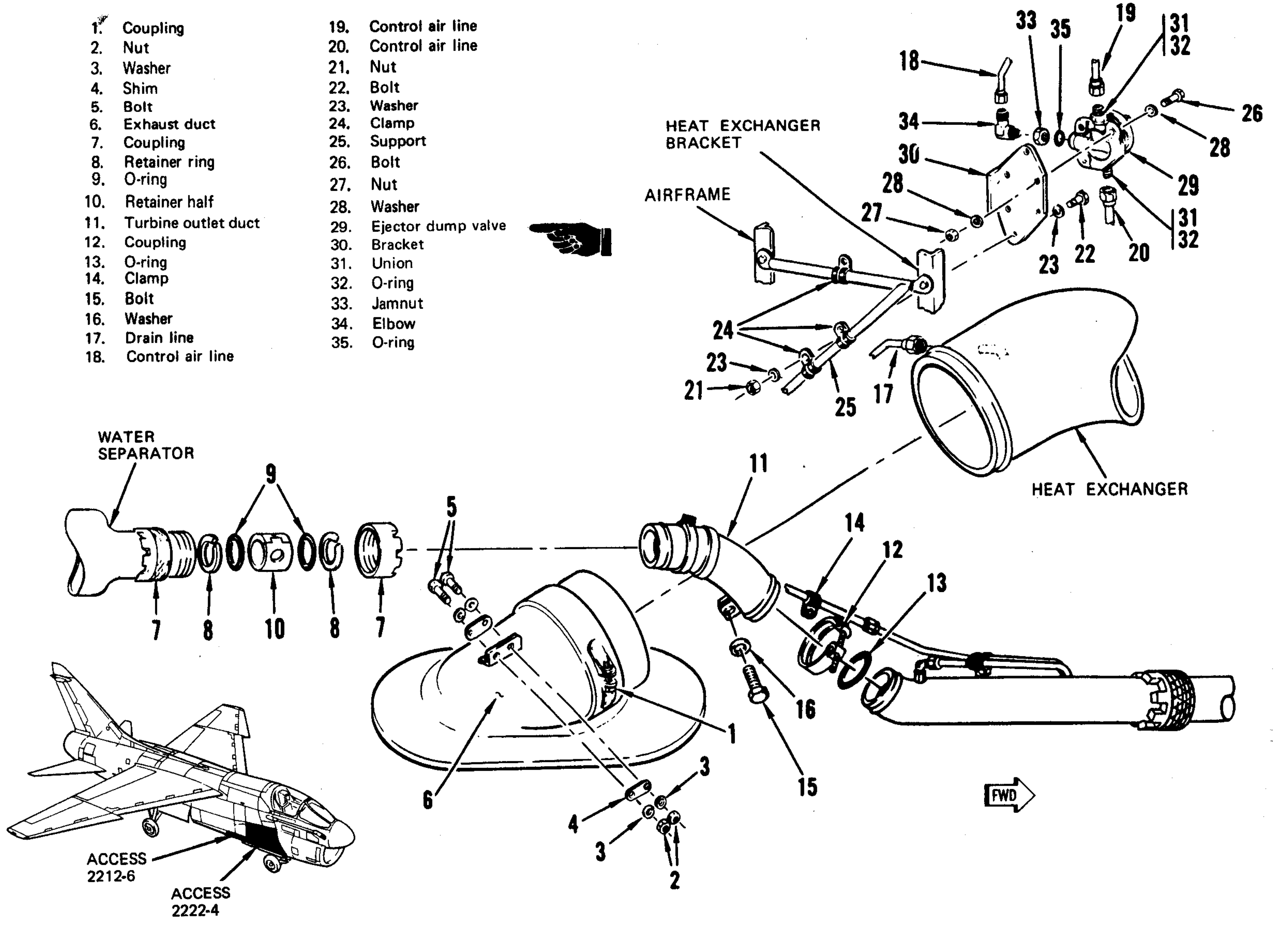


Figure 1-12. Ejector Dump Valve Removal and Installation

f. Connect control air lines (18, 19, and 20) to valve.

g. Connect drainline (17) between control air valve and heat exchanger outlet.

h. Position turbine outlet duct (11) for installation and secure to heat exchanger bracket with bolt (15) and washer (16).

i. Using new O-rings (9), connect turbine outlet duct to water separator with coupling (7), retainer rings (8), and retainer halves (10). Tighten coupling to 48 (±12) pound-inches torque.

j. Secure coupling with MS20995C20 lockwire.

k. Using new O-ring (13), and new locknut, install coupling (12). Tighten coupling to 72 (±12) pound-inches torque. Tap coupling lightly with plastic or rawhide mallet at several points around outside band and check that torque remains 72 (±12) pound-inches.

l. Perform ejector dump valve checkout (paragraph 1-19).

m. Position heat exchanger exhaust duct (6) in airplane and secure duct to mounting bracket with bolts (5), shims (4), washers (3), and nuts (2).

n. Using new locknut install coupling (1). Tighten hand-tight.

o. Close access 2212-6.

p. Through access 2222-4, torque coupling (1) to 12 (±2) pound-inches torque.

q. Close access 2222-4.

r. Connect right nose gear door lower link (T.O. 1A-7D-2-7.

1-52. WATER SEPARATOR 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 couplings

1-53. REMOVAL. (See figure 1-13.)

a. Disconnect right nose gear door lower link (T.O. 1A-7D-2-7).

b. Open accesses 2212-6 and 2222-4.

c. Remove heat exchanger exhaust duct coupling (1).

d. Remove nuts (2), washers (3), shims (4), and bolts (5) securing duct to mounting bracket. Remove exhaust duct (6) from airplane.

e. Remove clamp (7) securing control air line to turbine outlet duct (8).

f. Disconnect water drainline (9).

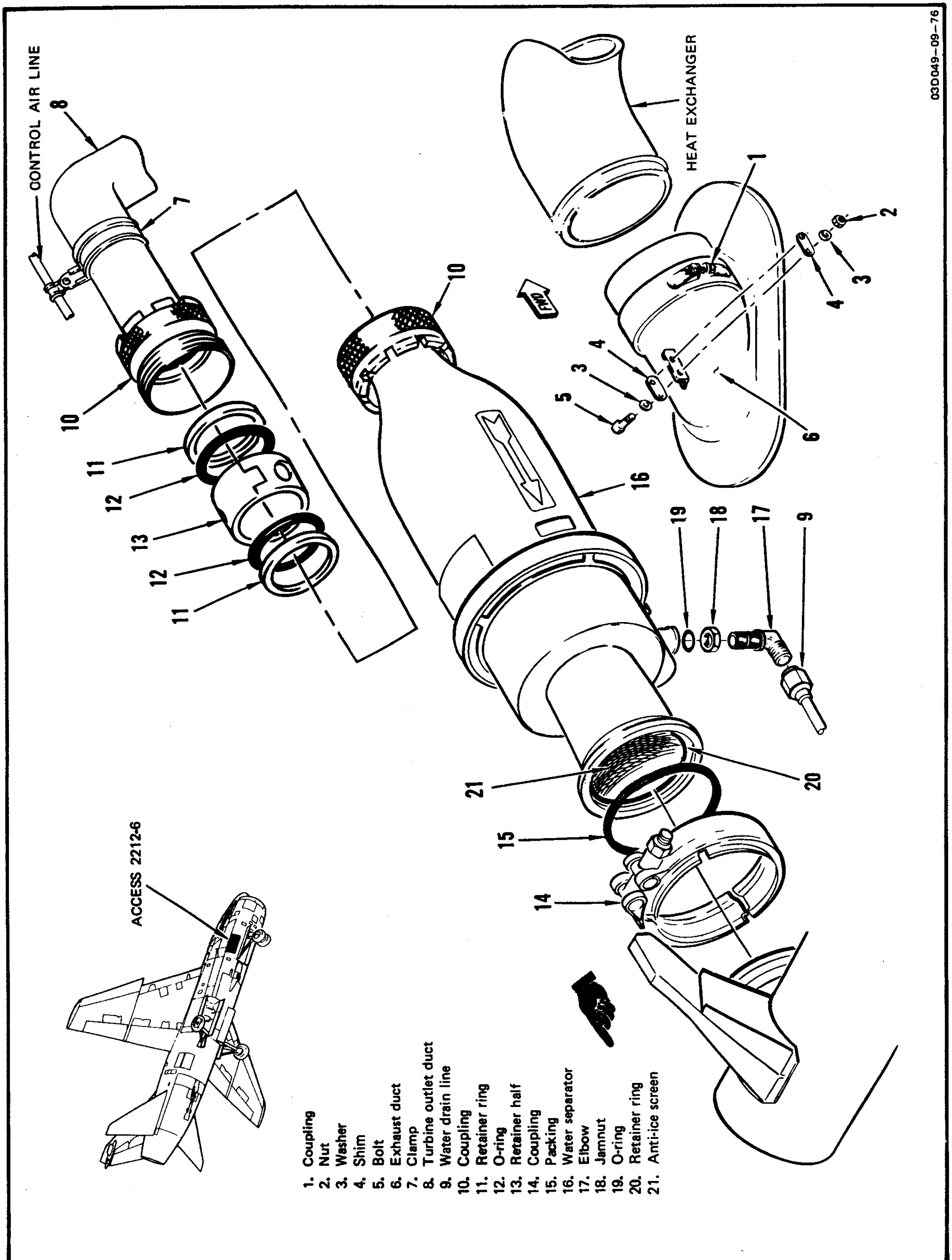
g. Cut lockwire and remove coupling (10), retainer rings (11), O-rings (12), and retainer halves (13).

h. Remove coupling (14) and gasket (15).

i. Remove water separator (16) from airplane.

j. Remove elbow (17), jamnut (18), and O-ring (19) from water separator.

k. Remove retainer ring (20) and anti-ice screen (21) and retain for installation.



1. Coupling
2. Nut
3. Washer
4. Shim
5. Bolt
6. Exhaust duct
7. Clamp
8. Turbine outlet duct
9. Water drain line
10. Coupling
11. Retainer ring
12. O-ring
13. Retainer half
14. Coupling
15. Packing
16. Water separator
17. Elbow
18. Jamnut
19. O-ring
20. Retainer ring
21. Anti-ice screen

Figure 1-13. Water Separator Removal and Installation

1-54. INSTALLATION. (See figure 1-13.)

a. Position anti-ice screen (21) in aft end of water separator and secure with retainer ring (20). Ensure that retainer ring is properly seated in recess of water separator flange.

b. Install new O-ring (19), jamnut (18), and elbow (17) in water separator. Do not tighten jamnut.

c. Position water separator (16) in airplane.

d. Using new self-locking nut, install coupling (14) and new gasket (15). Tighten coupling to 72 (±12) pound-inches torque. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band and check that torque remains 72 (±12) pound-inches.

e. Using new O-rings (12), install coupling (10), retainer halves (13), and retainer rings (11). Tighten coupling to 48 (±12) pound-inches torque.

f. Secure coupling with MS20995C20 lockwire.

g. Position elbow (17), tighten jamnut, and connect water drainline (9).

h. Secure control air line to turbine outlet duct (8) using clamp (7).

i. Position heat exchanger exhaust duct (6) in airplane and secure to mounting bracket using bolts (5), shims (4), washers (3) and nuts (2).

j. Using new locknut, install exhaust duct coupling (1) and hand-tighten.

k. Close access 2212-6.

l. Through access 2222-4, tighten coupling to 12 (±2) pound-inches torque.

m. Close access 2222-4.

n. Connect right nose gear door lower link (T.O. 1A-7D-2-7).

1-55. WATER SEPARATOR CLEANING. (See figure 1-14.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

a. Disconnect right nose gear door lower link (T.O. 1A-7D-2-7).

b. Open accesses 2222-4 and 2212-6.

c. Remove heat exchanger exhaust duct.

d. Remove turbine duct coupling (1) and packing (2).

e. Remove screw (3), washers, and nut securing turbine duct clamp to control air line clamp.

f. Remove coupling (4) securing inlet shell and outlet shell together.

g. Remove bolt from duct (6) and remove inlet shell (5) and duct (6) from aircraft.

h. Remove support (7) from inlet shell.

i. Remove packings (8 and 9) from recess of inlet and outlet shell. Discard packings.

j. Remove spring (10) securing forward end of coalescer (11) to support.

k. Deleted.

All data on pages 1—47 and 1—48 deleted.

1. Coupling
2. Packing
3. Screw
4. Coupling
5. Inlet shell
6. Duct
7. Support
8. Packing
9. Packing
10. Spring
11. Coalescer
12. Drawstring

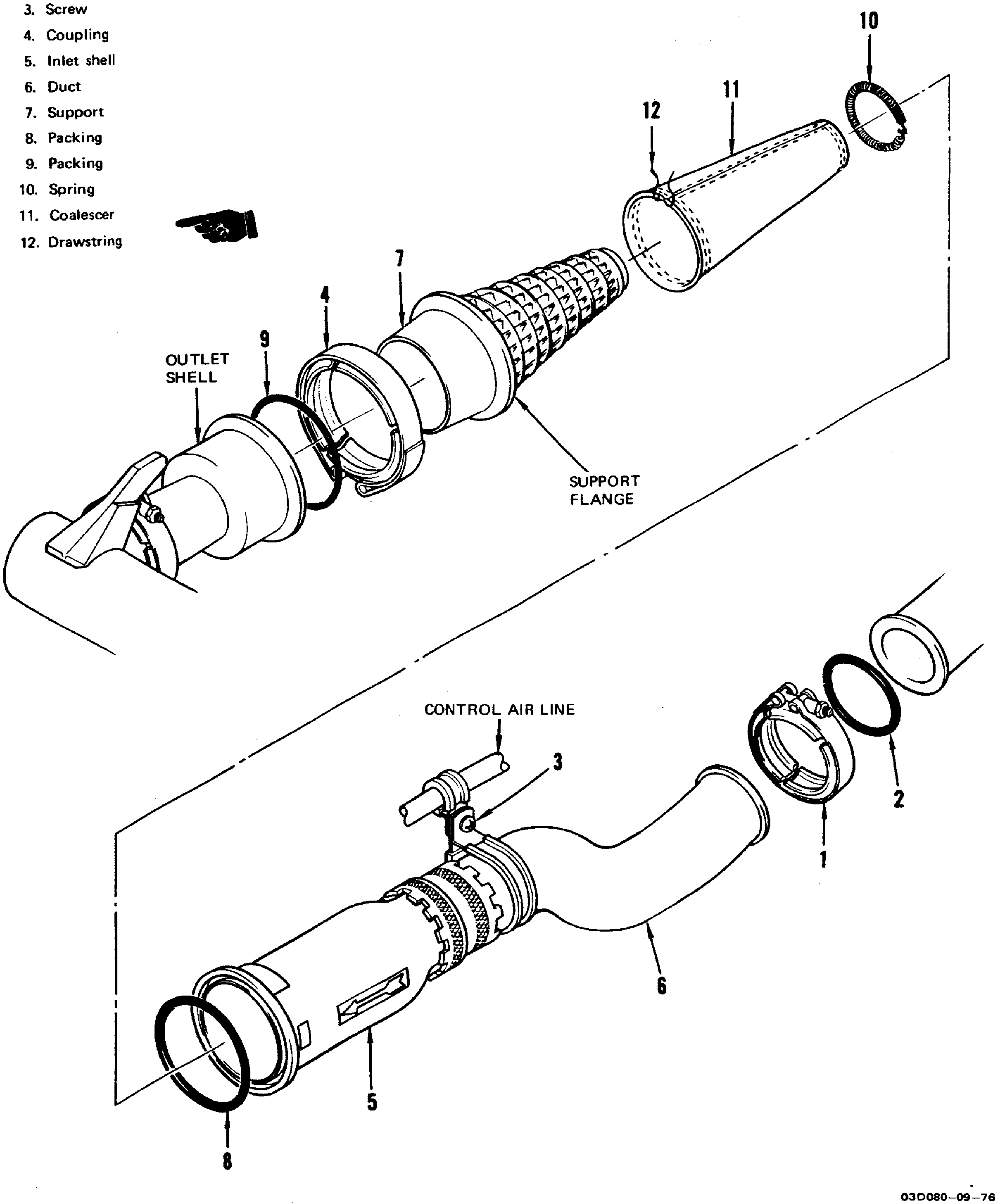


Figure 1-14. Water Separator Cleaning

l. Untie ends of drawstring (12) and remove coalescer (11) from support.

WARNING

P-D-680 drycleaning solvent is toxic and flammable. Use solvent in a well ventilated area. Avoid breathing fumes. Keep away from flame.

m. Clean all parts except coalescer (11) with P-D-680 drycleaning solvent and dry thoroughly.

n. Wash coalescer in MIL-D-12182B detergent, or equivalent, and cool water. Rinse thoroughly in clean, cool water and allow to air dry.

o. Install coalescer (11) on support (7). Position coalescer so that hem is snug against support flange.

p. Deleted.

q. Tie ends of drawstring (12) together.

r. Pull coalescer toward forward end of support until taut.

s. Install spring (10) around coalescer and position spring in groove of support.

t. Install new packings (8 and 9) in recess of flanges on outlet shell and inlet shell (5). Carefully seat packings around entire circumference of shells.

u. Install support (7) and coalescer in inlet shell.

v. Install bolt partially in duct (6) and position inlet shell (5) and duct (6). Install new packings (2), ensuring that packings are evenly compressed against support flange, and securely tighten bolt to airframe.

w. Secure inlet and outlet shell together with coupling (4). Tighten coupling to 40 (±10) pound-inches torque. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 40 (±10) pound-inches.

x. Secure turbine duct clamp to control air line clamp with screw (3), washers, and nut.

y. Install turbine duct coupling (1). Tighten coupling to 70 (+15, -10) pound-inches torque. Tap coupling lightly with plastic or rawhide mallet at several points around outside band. Check that torque remains 70 (+15, -10) pound-inches.

NOTE

If coalescer was burned, or other evidence of turbine overtemperature, perform supply system checkout (paragraph 1-16).

z. Install heat exchanger exhaust duct and tighten duct coupling hand-tight.

aa. Close access 2212-6.

ab. Through access 2222-4, tighten exhaust duct coupling to 12 (±2) pound-inches torque.

ac. Close access 2222-4.

ad. Connect right nose gear door lower link (T.O. 1A-7D-2-7).

1-56. FLOW CONTROL VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Torque couplings

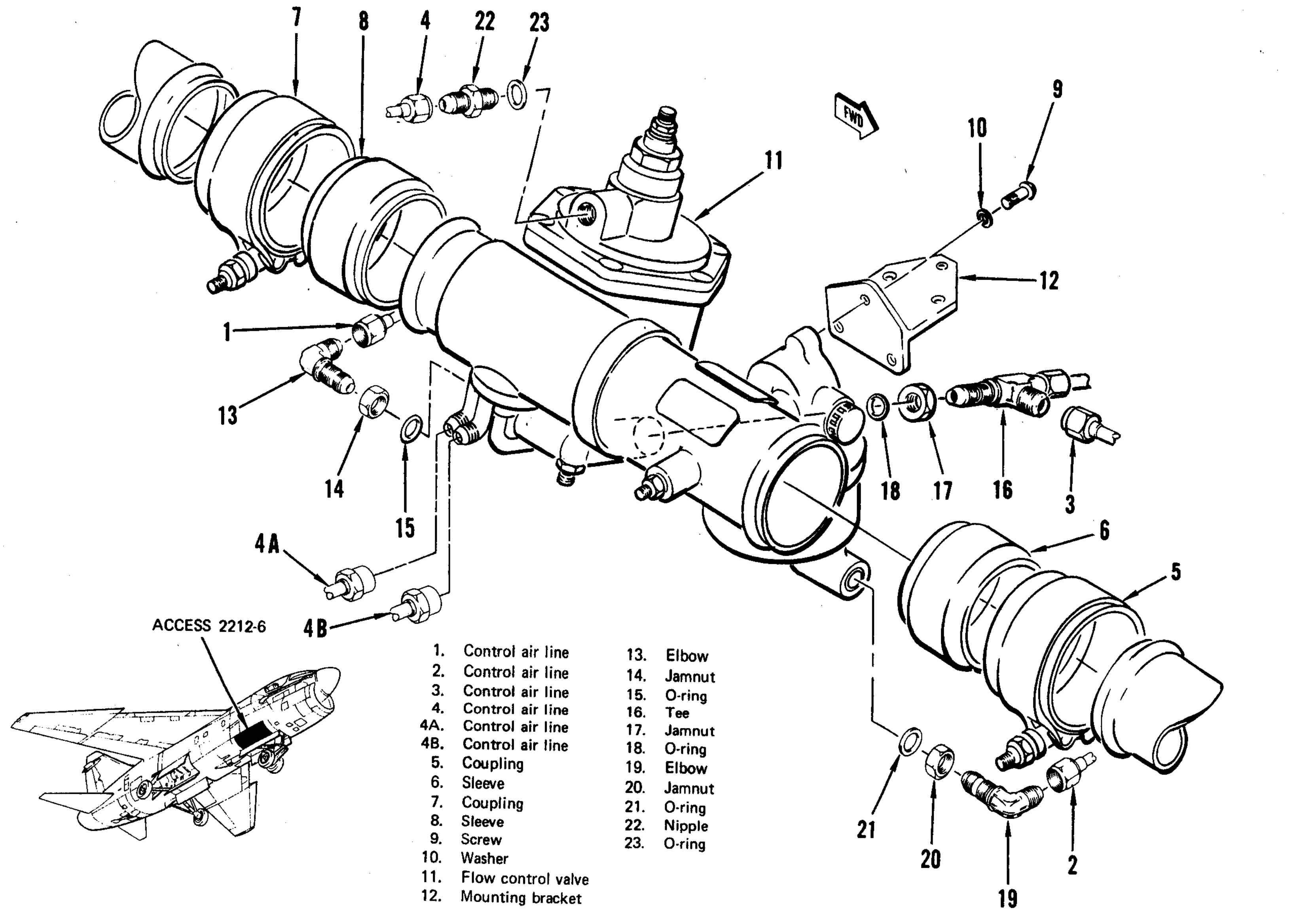
1-57. REMOVAL. (See figure 1-15.)

a. Disconnect right nose gear door lower link (T.O. 1A-7D-2-7).

b. Open access 2212-6.

c. Disconnect control air lines (1, 2, 3, 4, 4A, and 4B) from flow control valve.

d. Remove coupling (5) and sleeve (6).



1. Control air line
2. Control air line
3. Control air line
4. Control air line
4A. Control air line
4B. Control air line
5. Coupling
6. Sleeve
7. Coupling
8. Sleeve
9. Screw
10. Washer
11. Flow control valve
12. Mounting bracket
13. Elbow
14. Jamnut
15. O-ring
16. Tee
17. Jamnut
18. O-ring
19. Elbow
20. Jamnut
21. O-ring
22. Nipple
23. O-ring

Figure 1-15. Flow Control Valve Removal and Installation

e. Remove coupling (7) and sleeve (8).

f. Disconnect line clamps from flow control valve.

g. Remove three nuts, washers, and bolts securing flow control valve (11) to mounting bracket (12). Remove flow control valve from airplane.

h. Remove elbow (13), jamnut (14), and O-ring (15) from flow control valve.

i. Remove tee (16), jamnut (17), and O-ring (18) from valve.

j. Remove elbow (19), jamnut (20), and O-ring (21) from valve.

k. Remove nipple (22) and O-ring (23) from flow control valve.

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

a. Install new O-ring (23) and nipple (22) in flow control valve.

b. Install new O-ring (21), jamnut (10), and elbow (19) in flow control valve. Do not tighten jamnut.

c. Install new O-ring (18), jamnut (17), and elbow (13) in flow control valve. Do not tighten jamnut.

d. Install new O-ring (15), jamnut (14), and elbow (13) in flow control valve. Do not tighten jamnut.

e. Position flow control valve (11) to mounting bracket (12) and secure flow control valve to mounting bracket (12) with washers, bolts, and nuts.

f. Connect line clamps to flow control valve.

g. Using new self-locking nut, install coupling (7) and new sleeve (8). Tighten coupling to 40 (±2) pound-inches torque and tap lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 40 (±2) pound-inches.

h. Using new self-locking nut, install coupling (5) and new sleeve (6). Tighten coupling to 40 (±2) pound-inches torque and tap coupling lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 40 (±2) pound-inches.

i. Position elbows (13 and 19) and tee (16) and tighten jamnuts.

j. Connect control air lines (1, 2, 3, 4, 4A and 4B).

k. Perform air-conditioning supply system operational checkout (paragraph 1-16).

l. Close access 2212-6.

m. Connect right nose gear door lower link (T.O. 1A-7D-2-7).

1-59. COMPRESSOR INLET THERMOSTAT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	*Part Number*	*Nomenclature*	*Use and Application*
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Torque couplings

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

a. Disconnect right nose gear door lower link (T.O. 1A-7D-2-7).

b. Open accesses 2212-6, 2212-10, and 2222-4.

c. Disconnect couplings (1) and remove sleeves (2).

d. Remove ram air inlet duct (3).

e. Disconnect high pressure air inlet line (4) from anti-ice valve (5).

f. Disconnect control air lines (6 and 7) from compressor inlet thermostat (8).

g. Disconnect coupling (9) and remove retainer halves (10), O-rings (11), and retainer rings (12).

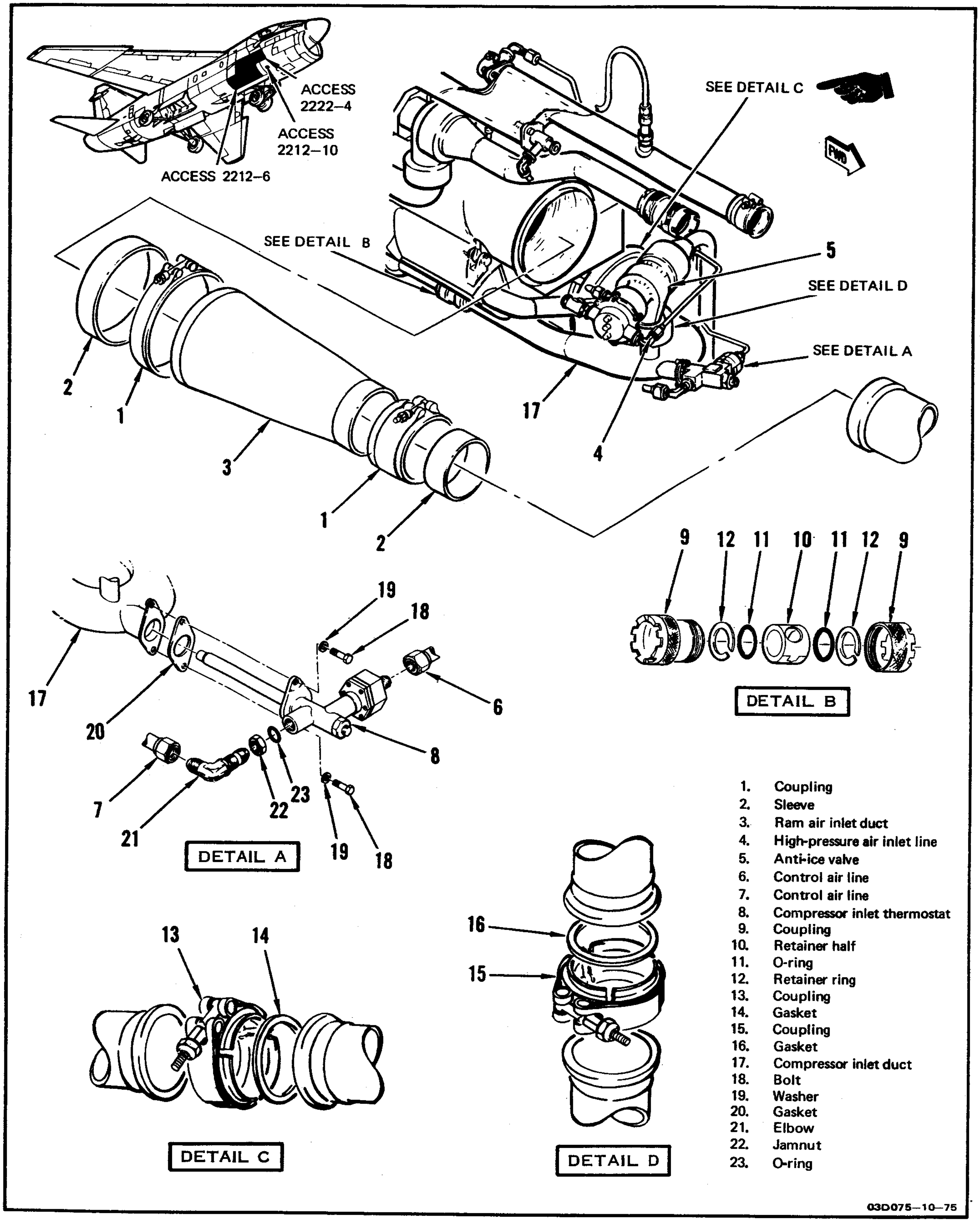


Figure 1-16. Compressor Inlet Thermostat Removal and Installation

h. Disconnect coupling (13) from turbine-compressor inlet. Discard gasket (14).

i. Disconnect coupling (15) from anti-ice valve. Discard gasket (16).

j. Position compressor inlet duct (17) as necessary to gain access to thermostat.

k. Remove bolts (18) and washers (19) securing thermostat to compressor inlet duct. Discard gasket (20). Remove thermostat from airplane.

l. Note position of elbow (21), loosen jamnut (22), and remove elbow (21) and O-ring (23).

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

a. Install jamnut (22) and new O-ring (23) on elbow (21) and install elbow in compressor inlet thermostat. Do not tighten jamnut.

b. Using new gasket (20), position thermostat (8) in compressor inlet duct (17) and secure with bolts (18) and washers (19).

c. Using new O-rings (11), connect coupling (9) using retainer rings (12) and retainer halves (10). Tighten coupling to 48 (±12) pound-inches torque. Secure coupling with MS20995C32 lockwire.

d. Connect compressor inlet duct (17) to turbine-compressor inlet with coupling (13), new gasket (14), and new locknut. Tighten coupling to 72 (±12) pound-inches torque. Tap coupling lightly with plastic or rawhide mallet around outside band at several points and check that torque remains 72 (±12) pound-inches.

e. Connect anti-ice valve (5) to compressor inlet duct with coupling (15), new gasket (16), and new locknut. Tighten coupling to 72 (±12) pound-inches torque. Tap coupling lightly with plastic or rawhide mallet around outside band at several points and check that torque remains 72 (±12) pound-inches.

f. Connect control air line (6) to thermostat.

g. Position elbow (21) as noted during removal and tighten jamnut (22).

h. Connect control air line (7) to elbow.

i. Connect high pressure air inlet line (4) to anti-ice valve.

j. Position ram air inlet duct (3) in airplane and secure with sleeves (2) and couplings (1). Tighten couplings to 40 (±2) pound-inches torque.

k. Perform air-conditioning supply system operational checkout (paragraph 1-16).

l. Close accesses 2212-6, 2212-10, and 2222-4.

m. Connect right nose gear door lower link (T.O. 1A-7D-2-7).

1-61A. COMPRESSOR INLET THERMOSTAT REPAIR. (See figure 1-17.)

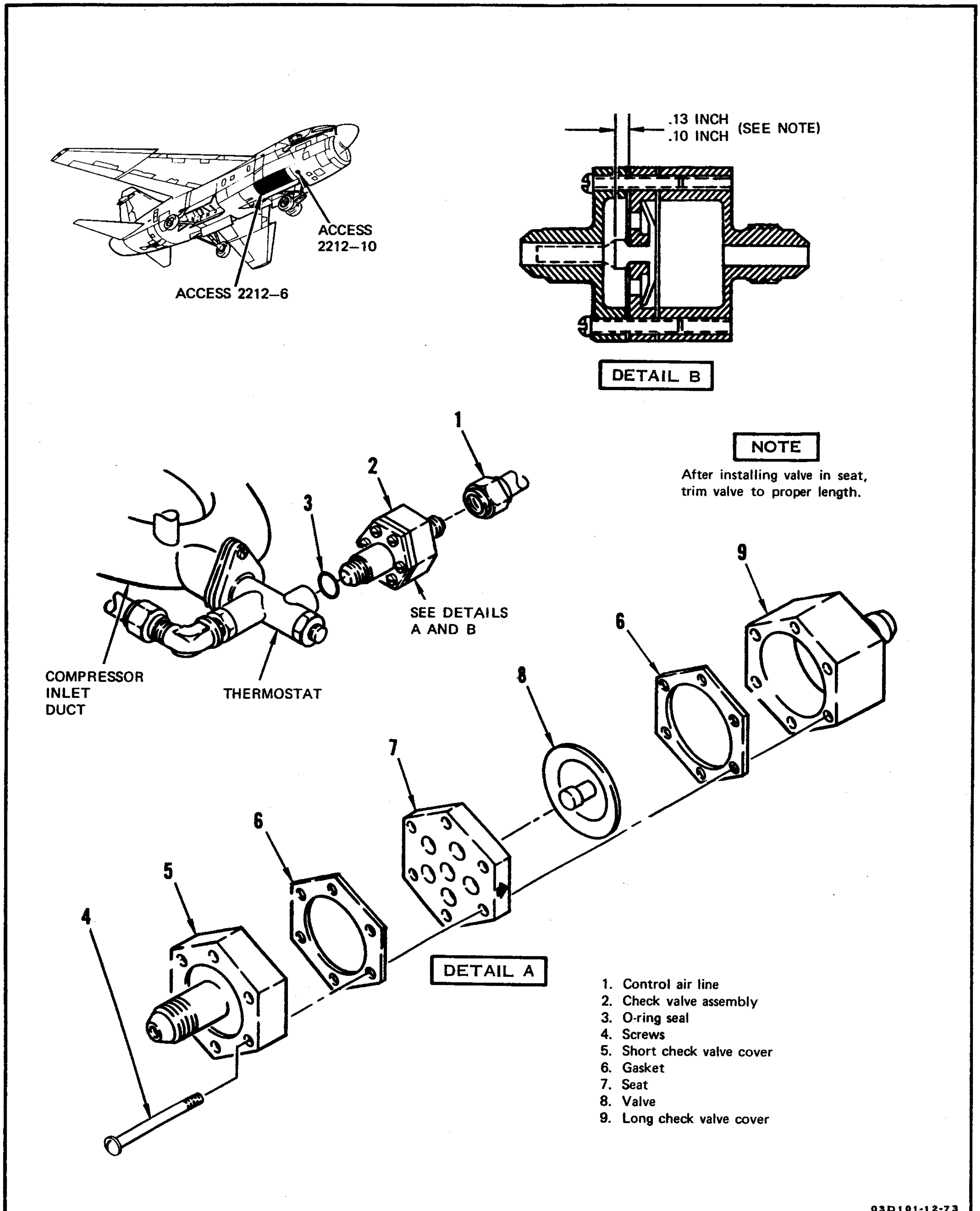
Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
1-3A		Test gage B	Check pressure decay
	MIL-T-26772	Air/nitrogen trailer	Provide pressure for leak check

a. Open accesses 2212-10 and 2212-6.

b. Disconnect control air line (1) from check valve assembly at compressor inlet thermostat.

c. Remove check valve assembly (2) from compressor inlet thermostat. (Use crowfoot racheting wrench.)



1. Control air line
2. Check valve assembly
3. O-ring seal
4. Screws
5. Short check valve cover
6. Gasket
7. Seat
8. Valve
9. Long check valve cover

Figure 1-17. Compressor Inlet Thermostat Repair

d. Cut safety wire and remove screws (4) securing short and long check valve covers (5 and 9) and seat (7).

e. Replace rubber check valve (8) and trim to proper length (0.10 to 0.13 inch above seat).

CAUTION

Ensure valve is properly installed in seat and valve is properly assembled. Radial orientation of arrow on check valve seat is optional, but arrow must point toward the long check valve cover.

f. Reassemble check valve assembly using new gaskets (6). Secure screws with MS20995C20 lockwire.

g. Reinstall check valve assembly, using new O-ring (3), in compressor inlet thermostat.

h. Connect control air line (1) to check valve assembly at inlet thermostat.

i. Disconnect control air line to compressor inlet thermostat at tee of flow control valve (port marked CONTROL).

j. Connect 0 to 30 psig test gage B to disconnected control air line.

k. Connect regulated air source to test gage assembly and apply 18 psi.

l. Shut off pressure source and check that pressure decay does not exceed 4 psi in 1 minute.

m. Disconnect air source and remove gage.

n. Connect control air line to tee on flow control valve.

o. Close accesses 2212-10 and 2212-6.

1-62. SURGE TANK REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	MIL-T-26772	Air/nitrogen trailer	Supply air/nitrogen for surge tank leak check

1-63. REMOVAL.

a. Open accesses 2121-3 and 2212-6.

b. Disconnect two control air lines from tank.

c. Disconnect two clamps and remove tank from airplane.

d. Remove fittings and plug from tank.

1-64. INSTALLATION.

a. Using new gaskets, install fittings and plug on tank.

b. Position tank in airplane and secure with clamps.

c. Connect two control air lines to tank.

d. Disconnect control air line from CONT port on flow control valve and connect air source to control line.

e. Apply 27 (±3) psig to line.

f. Check tank connections for leaks.

g. Reduce air pressure to zero and disconnect air line.

h. Connect control air line to flow control valve.

i. Close accesses 2121-3 and 2212-6.

SECTION II
CONTROL AIR SYSTEM

2-1. DESCRIPTION.

2-2. The control air system supplies pressurized air for operation of air-conditioning and pressurization subsystem control valves and for pressurization of the radar waveguide and pilot's anti-g suit. High pressure engine bleed air is routed through a control air valve and into a control air manifold. From the manifold, the air is supplied to the appropriate pneumatically operated valves and actuation switches in the air-conditioning supply system. From the same manifold, air pressure is supplied to the radar waveguide through a desiccator and pressure regulator. The manifold also provides secondary air supply for the pilot's anti-g suit. For system controls and indicators, see figure 1-1. For system arrangement, see figure 1-2.

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

2-4. With the engine operating, high pressure engine bleed air is picked from the pressure limiting and shutoff valve, upstream of the valve butterfly, and routed to the control air valve. The bleed air enters the water separator portion of the control air valve and passes through a trap that retains water particles and contaminants. The water particles collect and drain to the bottom of the separator where they are forced overboard by air pressure.

2-5. The filtered bleed air is then directed to the pressure regulating section of the control air valve which regulates pressure to the control air manifold at 18 (+ 3, -2) psig. Two relief valves at the control air manifold limit pressure to 50 psig in case of control air valve failure.

2-6. The control air manifold distributes the control air to the air-conditioning and pressurization subsystems. These include the cockpit air temperature, antiblackout, pilot suit cooling, defog, radar pressurization, and rain removal systems.

2-7. COMPONENTS.

2-8. For a list of components, their locations (accesses), and functions, refer to table 2-1.

Table 2-1. Control Air System Components

Component	Access	Function
Manifold, control air	2222-4	Distributes pressurized control air to cockpit temperature control valve, suit temperature control valve, anti-g valve, radar waveguide, ejector air valve, flow control valve, low limit transmitter, rain remove temperature control valve, and cockpit environmental control panel. Two relief valves start relieving at 25 (±1) psig and will limit manifold pressure to 50 psig.
Separator, control air valve water	2222-4	Traps and disposes of water and contaminants from engine bleed air before entering control air system.
Valve, control air	2212-6 and 2222-4	Maintains control air pressure at 18 (+ 3, -2) psig.

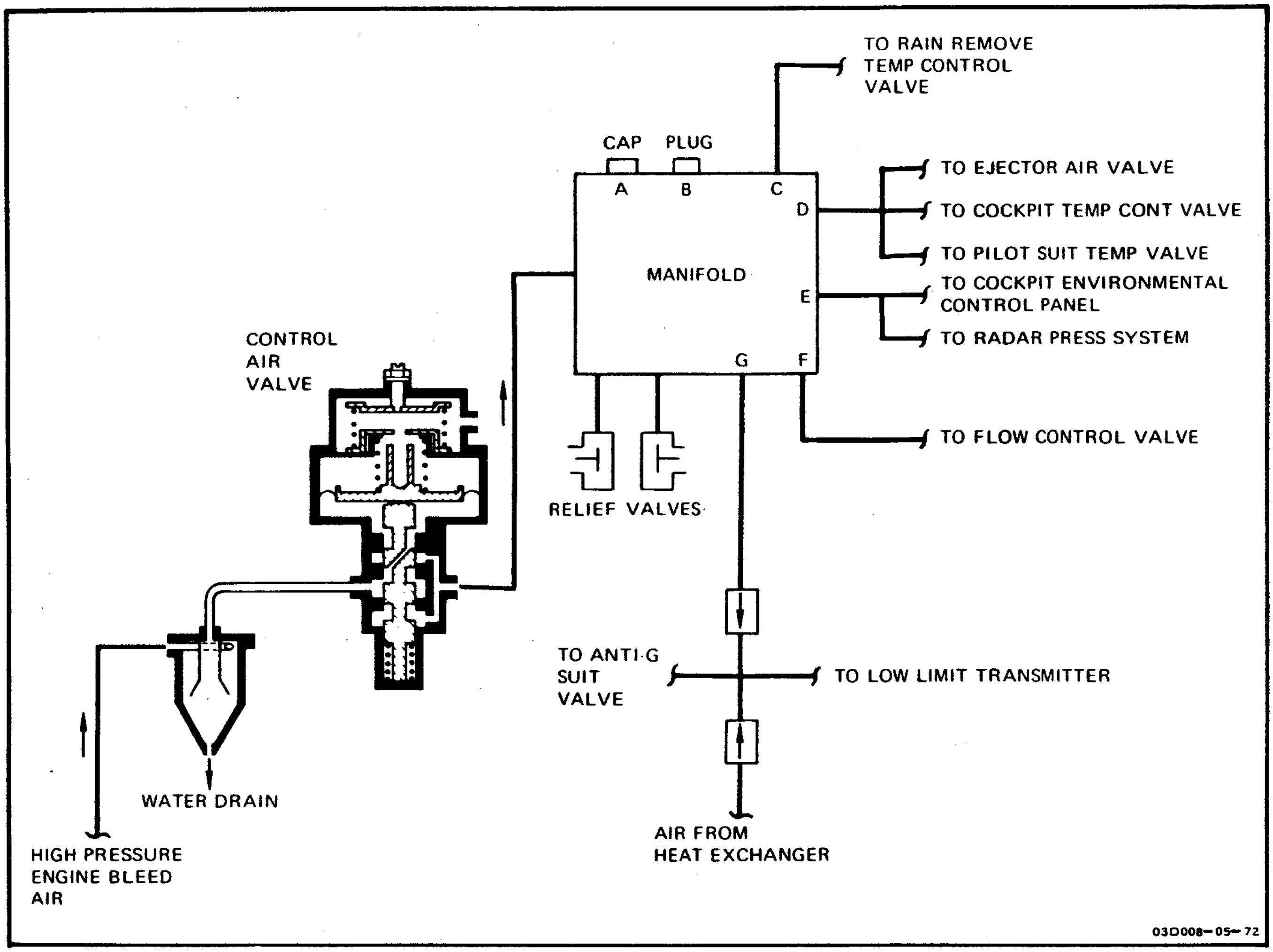


Figure 2-1. Control Air System Schematic Diagram

2-9. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine during air-conditioning and pressurization control operational checkout
1-3A	Test gage C		Indicate control air pressure

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 figure 2-1B.

a. Locate control air line that connects to port E of control air manifold. Disconnect line at fittings above manifold and install 0- to 30-psi test gage C in line (figure 2-1A).

b. Start engine (T.O. 1A-7D-2-1).

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from ram air exhaust duct after placing cockpit pressure switch in CABIN PRESS. If no flow occurs, place switch in CABIN DUMP, and troubleshoot air-conditioning supply system.

c. Position controls on cockpit environmental control panel as follows:

Control	*Position*
Cockpit pressure switch	CABIN PRESS
Rain removal switch	OFF
Defog switch	DEFOG

d. Check that gage indicates minimum 10 psig at idle and 18 (+3, -2) psi at 70% rpm and above. {1, 2}

e. Shut down engine (T.O. 1A-7D-2-1).

f. Remove gage and reconnect line to elbow.

2-10. TROUBLESHOOTING. (See figures 1-4 and 1-5.)

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Air/nitrogen trailer	MIL-T-26772	Supply air/nitrogen for troubleshooting

NOTE

Anytime component removal is required, inspect corrugated clamps for evidence of chafing on lines, clamp out-of-roundness or sharp edges on clamp corrugations. Replace clamp if any of these conditions exist.

2-11. Refer to figure 2-1B for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout. Instructions for isolating system malfunction to a specific component are provided in the troubleshooting figure .

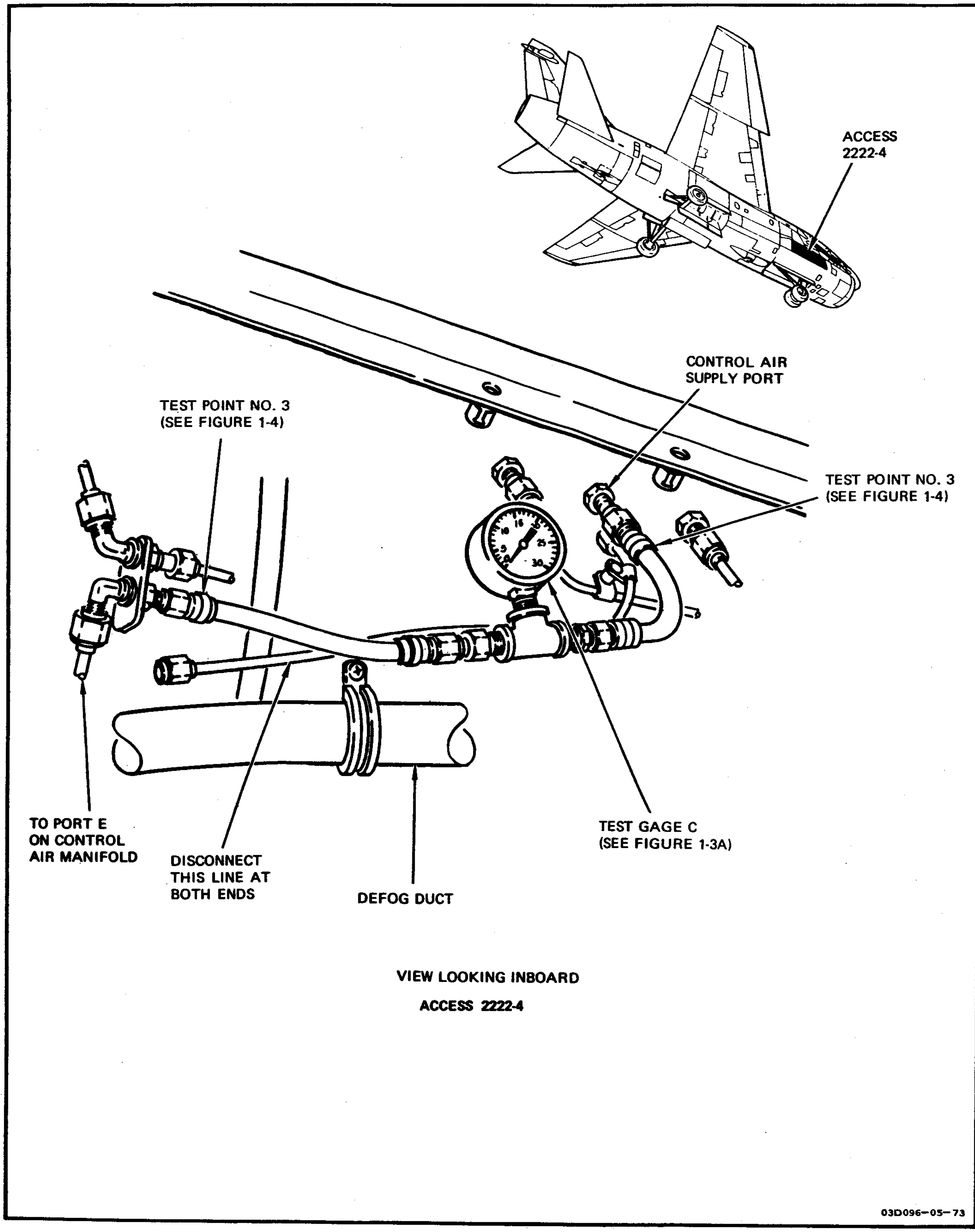


Figure 2-1A. Control Air System Pressure Gage Placement

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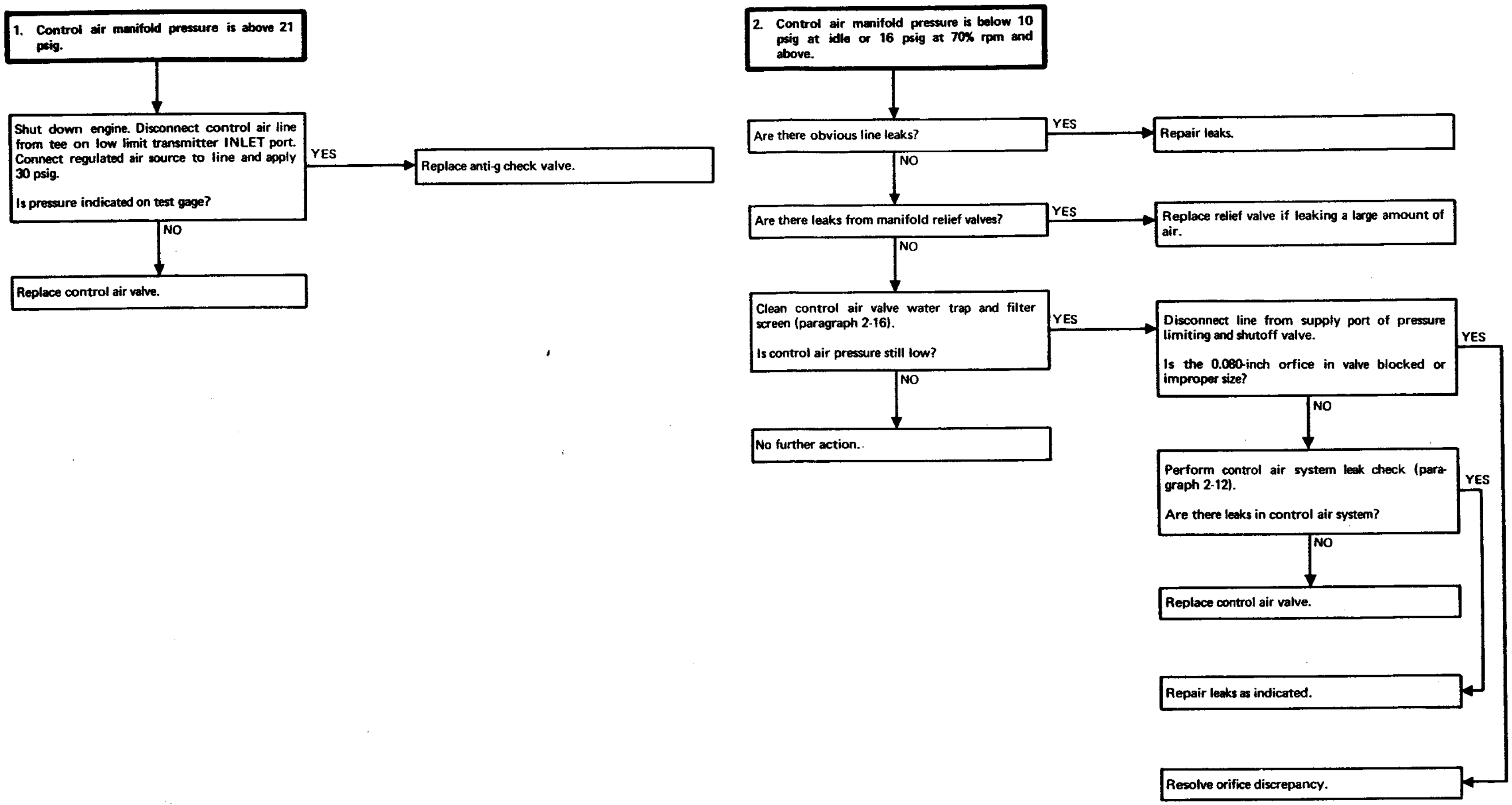

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Figure 2-1B. Control Air System Troubleshooting

2-12. CONTROL AIR SYSTEM LEAK CHECK.

(See figure 1-4.)

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	1-3A	Test gage C	Check pressure while testing system
	Air/nitrogen trailer	MIL-T-26772	Supply nitrogen during leak check

NOTE

If forward-looking radar is not installed, cap radar pressurization line.

a. Disconnect right nose gear door lower link (T.O. 1A-7D-2-7).

b. Open accesses 2222-4, 2212-6, and 6122-2.

c. Disconnect control air line from SUPPLY port of pressure limiting and shutoff valve. Connect air/nitrogen trailer servicing hose to control air supply line. Do not apply pressure at this time.

d. Install 0 to 30 psi test gage C in line from port E of control air manifold (figure 2-1A).

e. Disconnect and cap control air line from SUPPLY port on rain removal temperature control valve.

f. Disconnect drainlines from tee fitting at DRAIN port of control air valve. Cap tee fitting.

g. Disconnect and cap control air line from REG port on flow control valve.

h. Position controls on environmental control panel as follows:

Control	*Position*
Cockpit pressure switch	CABIN PRESS
Rain removal switch	RAIN REM
Defog switch	DEFOG

NOTE

Slight leakage from control air manifold relief valves, rain removal valve, and low limit transmitter is allowable.

If leak is detected, at any point in the following procedures, correct problem, recheck for correct pressure indication (step i), and restore airplane to normal configuration by placing controls on environmental control panel in normal positions and proceeding to step t.

i. Slowly apply and maintain 30 psig air/nitrogen pressure to system. Pressure gage must indicate 18 (+3, -2) psi.

j. Isolate possible leakage downstream of cockpit pressure switch by placing switch in CABIN DUMP. If pressure indication is now 18 (+3, −2) psi, proceed to step o.

k. Isolate possible leakage downstream of rain removal switch by placing switch in OFF. If pressure indication is now 18 (+3, −2) psi, proceed to step o.

l. Isolate possible leakage downstream of defog switch by placing switch in OFF. If pressure indication is now 18 (+3, −2) psi, proceed to step o.

m. If pressure indications obtained in steps j, k, and l were below minimum, check fittings and lines between following points using leak detection solution.

Control Air Manifold	Component
Port C	Rain Removal temperature control (line capped)
Port D	1. Ejector dump valve 2. Suit temperature control valve 3. Cockpit temperature control valve
Port E	1. Dessicator 2. Environmental control panel (inlet connections)
Port F	Flow control valve (line capped)
Port G	1. Anti-G valve 2. Low limit transmitter

n. If no leaks were detected in step m, replace control air valve (paragraph 2-13).

o. Release fasteners securing environmental control panel to right console, and lift panel from console.

p. Using leak detection fluid, check for air leakage at control panel connections marked RAIN REM, DEFOG, CABIN PRESS, and DUMP.

q. If no leakage was detected in step p, check for airflow from ambient vent (A) or vent orifices (V) of the following components:

NOTE

Airflow from vent orifices (V) of defog, rain remove, and ejector dump valves is normal. Airflow from other vents is a malfunction.

1. Defog valve
2. Defog temperature anticipator
3. Defog temperature transmitter
4. Compressor inlet thermostat
5. Pressure limiter and shutoff valve
6. Rain remove valve
7. Ejector dump valve

r. If no leakage was detected in step q, locate leak by testing all fittings and lines downstream of the environmental control panel, using leak detection solution.

s. Position control panel in right console and secure with fasteners.

t. Shut off and disconnect air/nitrogen source.

u. Connect supply line to pressure limiter and shutoff valve. Close access 6122-2.

v. Connect control air line to SUPPLY port of rain removal temperature control valve.

w. Connect control air line to REG port of flow control valve.

x. Connect drain lines to tee fitting of DRAIN port on control air valve.

y. Remove test gage and reconnect system lines. Close accesses 2222-4 and 2212-6.

z. Connect right nose gear door lower link (T.O. 1A-7D-2-7).

2-13. CONTROL AIR VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	Equipment required for engine operation		Operate engine during operational checkout after valve installation

2-14. REMOVAL.

a. Disconnect lower link from right nose gear door (T.O. 1A-7D-2-7).

b. Open accesses 2212-6 and 2222-4.

c. Remove heat exchanger exhaust duct from airplane.

d. Remove cockpit temperature control valve (paragraph 3-18).

e. Disconnect hot air inlet supply line from elbow on valve.

f. Disconnect water drainlines from tee on valve.

g. Remove bolt and packing securing control air valve to control air manifold.

h. Remove two screws and washers securing control air manifold and control air valve to mounting bracket.

i. Remove control air valve and packing from control air manifold.

NOTE

Check position of elbow and tee before removing from control air valve.

j. Remove elbow, tee, and packings from control air valve and plug ports.

2-15. INSTALLATION.

a. Remove plugs from ports and install tee, elbow, and new packings in control air valve.

b. Position control air valve and new packing on control air manifold.

c. Install two screws and washers securing control air valve and control air manifold to mounting bracket, and tighten.

d. Install bolt and new packing securing control air valve to control air manifold.

e. Connect water drainlines to tee on valve.

f. Connect hot air inlet supply line to elbow on valve.

g. Install cockpit temperature control valve (paragraph 3-18).

h. Install heat exchanger exhaust duct.

i. Perform control air system operational checkout (paragraph 2-9). Check for leaks at connections during checkout.

j. Close accesses 2212-6 and 2222-4.

k. Connect lower link to right nose gear door (T.O. 1A-7D-2-7).

2-16. CONTROL AIR VALVE WATER TRAP AND FILTER SCREEN CLEANING. (See figure 2-2.)

a. Disconnect lower link from right nose gear door (T.O. 1A-7D-2-7).

b. Open accesses 2212-6 and 2222-4.

c. Remove heat exchanger exhaust duct.

d. Remove water separator (paragraph 1-52).

NOTE

If desired, cockpit temperature control valve can be removed to provide more access to the control air valve.

e. Disconnect drainlines from tee on bottom of valve.

f. Disconnect air inlet supply line from elbow on valve.

NOTE

A 12-inch cross-point screwdriver is recommended for removing screws from valve body.

g. Remove screws (1) and washers (2) securing valve body (3) to control air valve. Remove valve body.

h. Remove and discard packing (4).

NOTE

Number of shim washers (7) may vary. To ensure correct installation, record number removed.

i. Remove retaining ring (5), washer (6), shim washers (7), spring washer (8), and filter screen (9) from control air valve.

j. If available, clean filter screen (9) with ultrasonic cleaner.

WARNING

P-D-680, Type II, is combustible and moderately toxic to eyes, skin and respiratory tract. Eye and skin protection required. Use in well ventilated area.

k. Clean all removed parts with P-D-680 drycleaning solvent and allow to air dry.

l. Inspect filter screen (9) with a strong bright light to ensure that all visible foreign particles are removed. Check that orfice inside drain port in valve body is clean and free of obstruction.

NOTE

Do not use any compound to hold parts together while assembling and installing.

m. Installation of parts (9 through 5) may be simplified by fabrication of tool shown in figure 2-3.

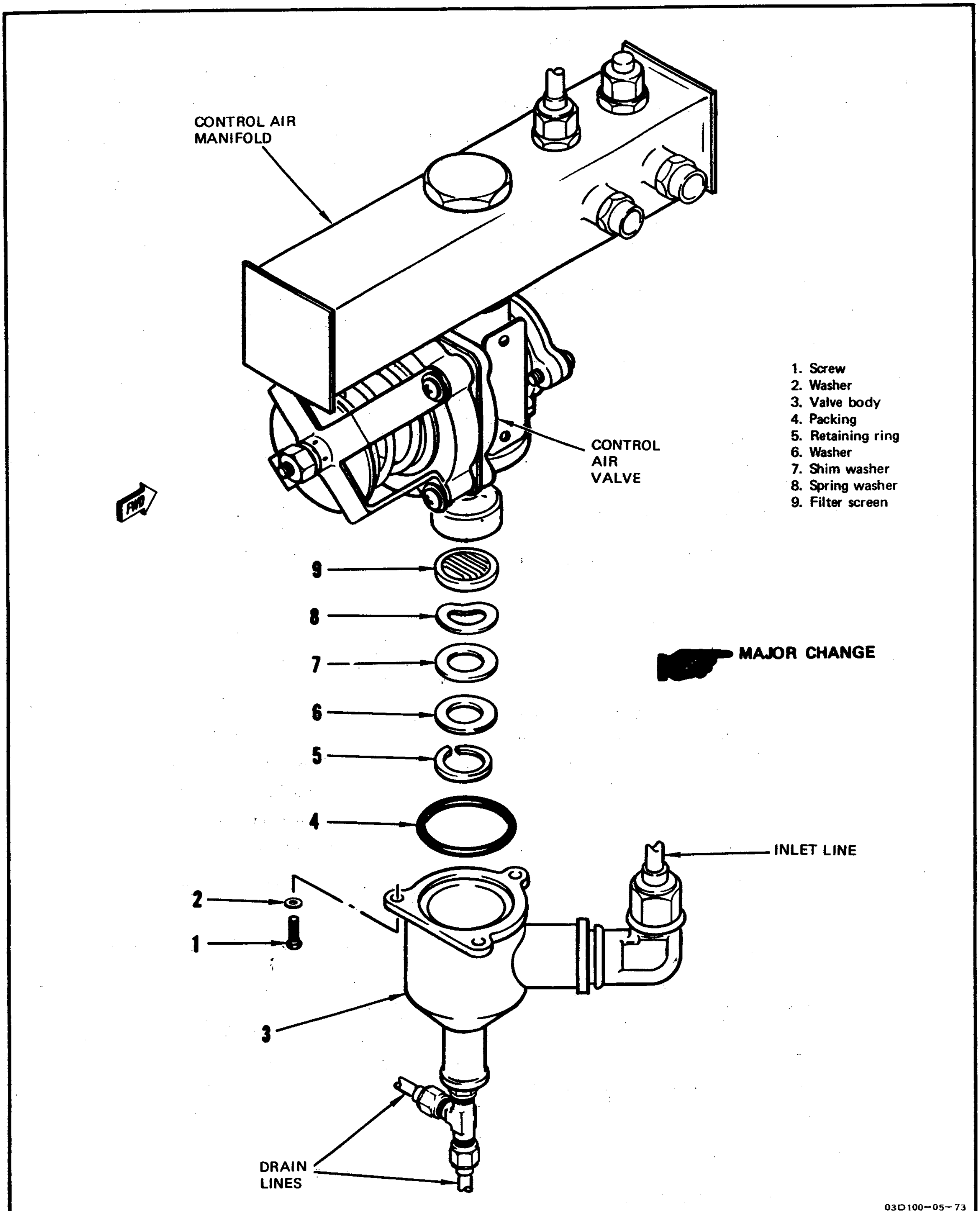
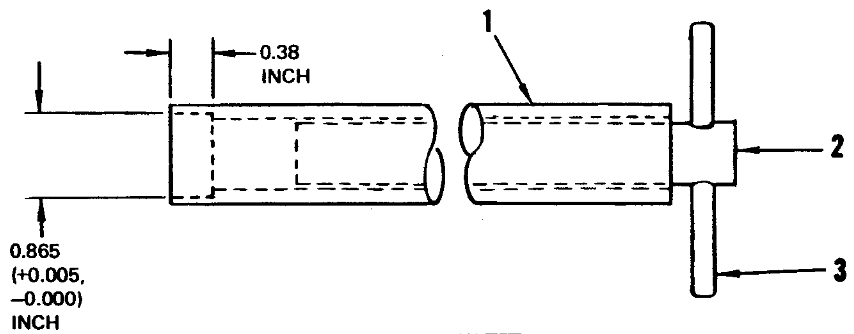


Figure 2-2. Control Air Valve Water Trap and Filter Screen Cleaning



NOTE

1. Fabricate item No. 1 from 18 inch length of aluminum tubing with 1.0 inch outside diameter and 0.125 wall thickness. Machine one end to dimensions shown.
2. Fabricate item No. 2 from 20 inch length of aluminum rod with 0.75 diameter. Provide slip fit with item No. 1.
3. Fabricate item No. 3 from 1/4 inch rod. Weld to item No. 2.

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Figure 2-3. Control Air Valve Filter Screen Installation Tool

n. Place retaining ring (5), washer (6), shim washers (7, as recorded during disassembly), spring washer (8), and filter screen (9) into open end of installation tool. Align tool with control air valve and press components into valve. Ensure retaining ring (5) is properly seated in valve groove.

o. Using new packing (4), connect valve body (3) to control air valve with washers (2) and screws (1).

p. Connect air inlet line to elbow.

q. Connect drainlines to tee.

r. Install water separator (paragraph 1-52).

s. Install heat exchanger exhaust duct.

t. Perform control air system operational checkout (paragraph 2-9). Check for leaks at connections during checkout.

u. Close accesses 2212-6 and 2222-4.

v. Connect lower link to right nose gear door (T.O. 1A-7D-2-7).

SECTION III

COCKPIT AIR TEMPERATURE SYSTEM

3-1. DESCRIPTION.

3-2. The cockpit air temperature system regulates the temperature of air flowing into the cockpit. Conditioned air flows to the cockpit through ducts and enters the cockpit through two directional air outlets at the forward end of the canopy rail, through manifolds along the lower edge of the windshield panels, and through two floor outlets near the rudder pedals. Automatic or manual temperature control can be selected by a manual override switch on the environmental control panel. In the automatic mode, the system maintains cockpit air temperature as selected with the cockpit temperature control knob on the environmental control panel. If desired, or if any of the automatic components fail, inlet air temperature can be controlled manually. The cockpit air temperature system consists of the cockpit temperature control valve, cockpit temperature thermostatic valve, environmental control panel, cockpit temperature anticipator, and cockpit temperature sensor.

3-3. For system controls and indicators, see figure 1-1. For system arrangement, see figure 1-2.

3-4. OPERATION. (See figures 3-1, 3-2 and 3-2A.)

3-5. Placing the cockpit pressure switch in CABIN PRESS when the engine is operating initiates air-conditioning supply system operation. Refrigerated air from the cold air manifold is delivered to the cockpit through inlet air ducts. Hot air from the hot-air manifold is delivered to the cockpit temperature control valve for mixing with refrigerated air. A temperature anticipator in the cockpit inlet duct and a temperature sensor in the cockpit affect control system operation. The anticipator provides a stabilizing signal which is a function of changes in cockpit inlet temperatures and serves to regulate cabin inlet temperatures during selection or load changes.

3-6. AUTOMATIC MODE. With the manual override switch in AUTO, cockpit temperature is automatically controlled to within ±3°F of the setting of the cockpit temperature control knob. The cockpit temperature sensor, mounted near the cockpit pressure regulator, senses temperature of air exiting the cockpit. The sensor resistance is compared with the resistance of the rheostat on the cockpit temperature control knob. The resulting output from the environmental control panel is a dc voltage which varies from a minimum to a maximum value over a 6°F range. As the output voltage changes (temperature change), the cockpit temperature control valve is modulated to regulate the flow of hot air.

3-7. The voltage from the environmental control panel to the torque motor of the cockpit temperature control valve results in a proportional change in the control air pressure which is admitted into the valve. Initial control air pressure applied to the valve does not open the valve. The pressure is routed to the flow control valve, which will reduce the flow of cold air into the cockpit. If this reduction in cold air is not enough to meet system requirements, control air pressure will continue to increase until the temperature control valve opens to mix hot and cold airflow.

3-8. The cockpit temperature anticipator in the cockpit inlet duct also affects control system operation. The anticipator contains two sensing elements that provide a stabilizing signal to regulate cockpit inlet temperature and prevent temperature surges.

3-9. During automatic operation, the cockpit temperature anticipator automatically limits cockpit inlet temperature. Circuitry in the environmental control panel performs a discrimination function so that when the inlet temperature resulting from normal control approaches 200°F, the voltage input to the torque motor will be decreased, allowing the control valve to close. The system maintains inlet temperature between 180°F to 200°F.

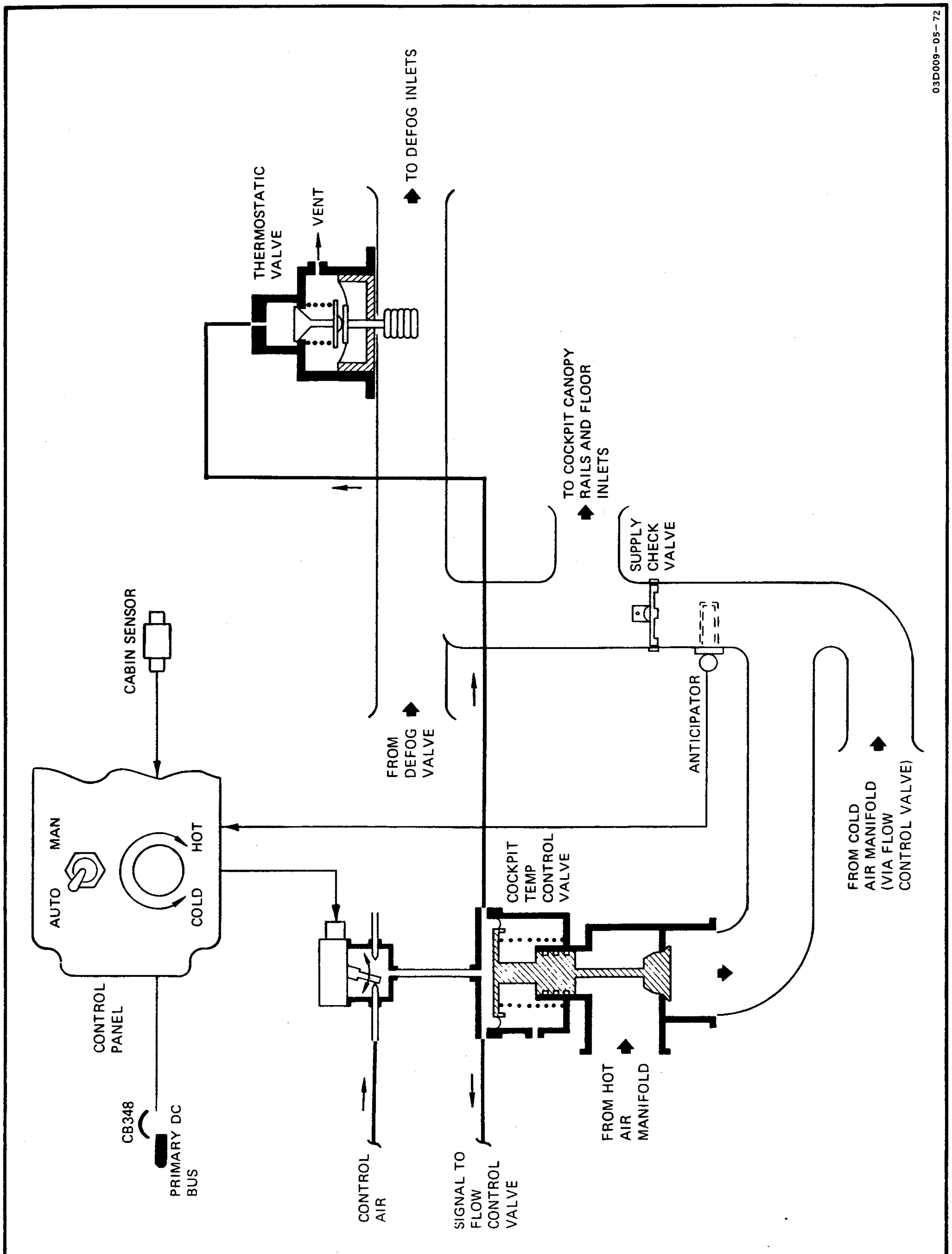

Figure 3-1. Cockpit Air Temperature System Schematic Diagram

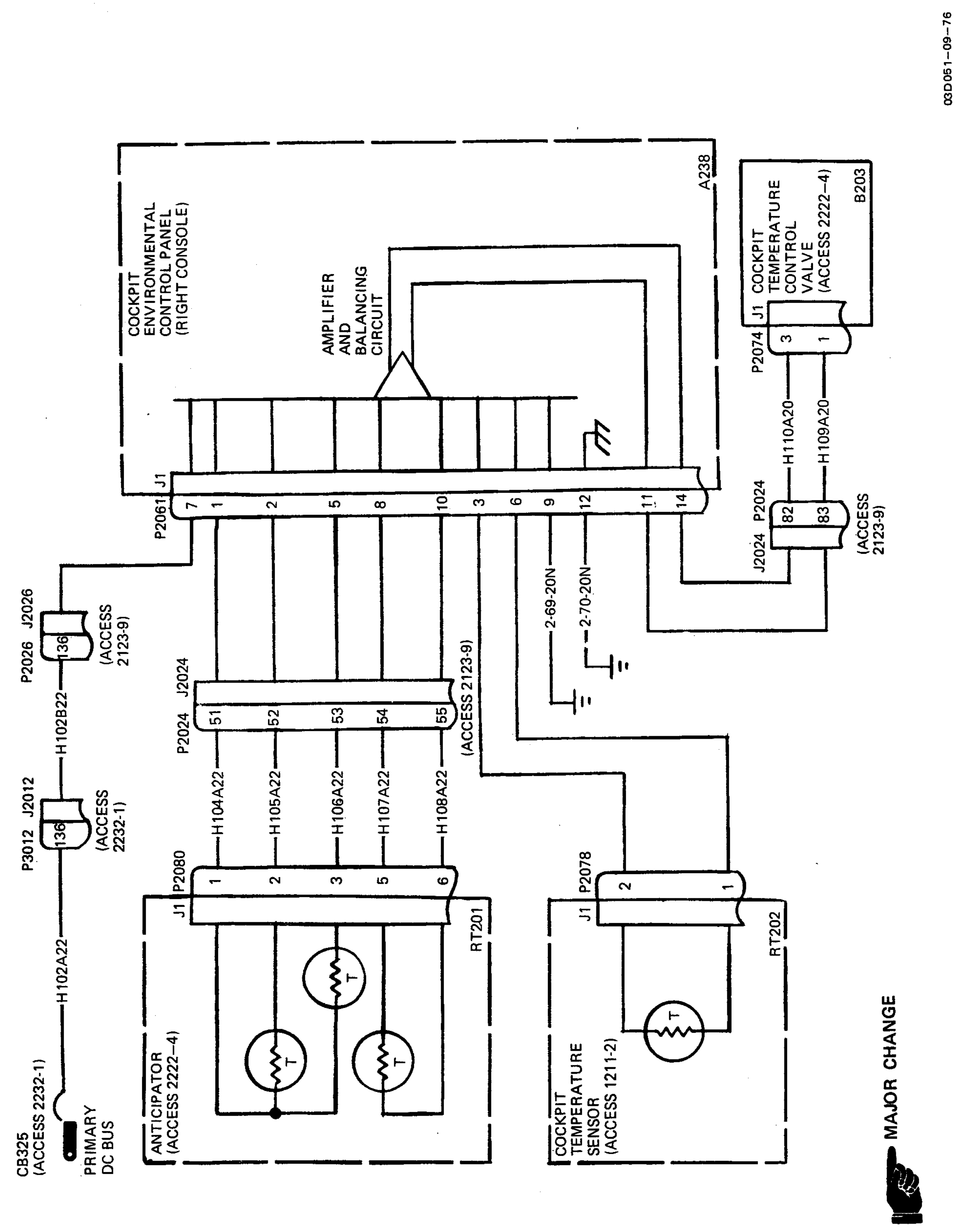

Figure 3-2. Cockpit Air Temperature System Electrical Troubleshooting Schematic Diagram (Airplanes Through AF69-6196)

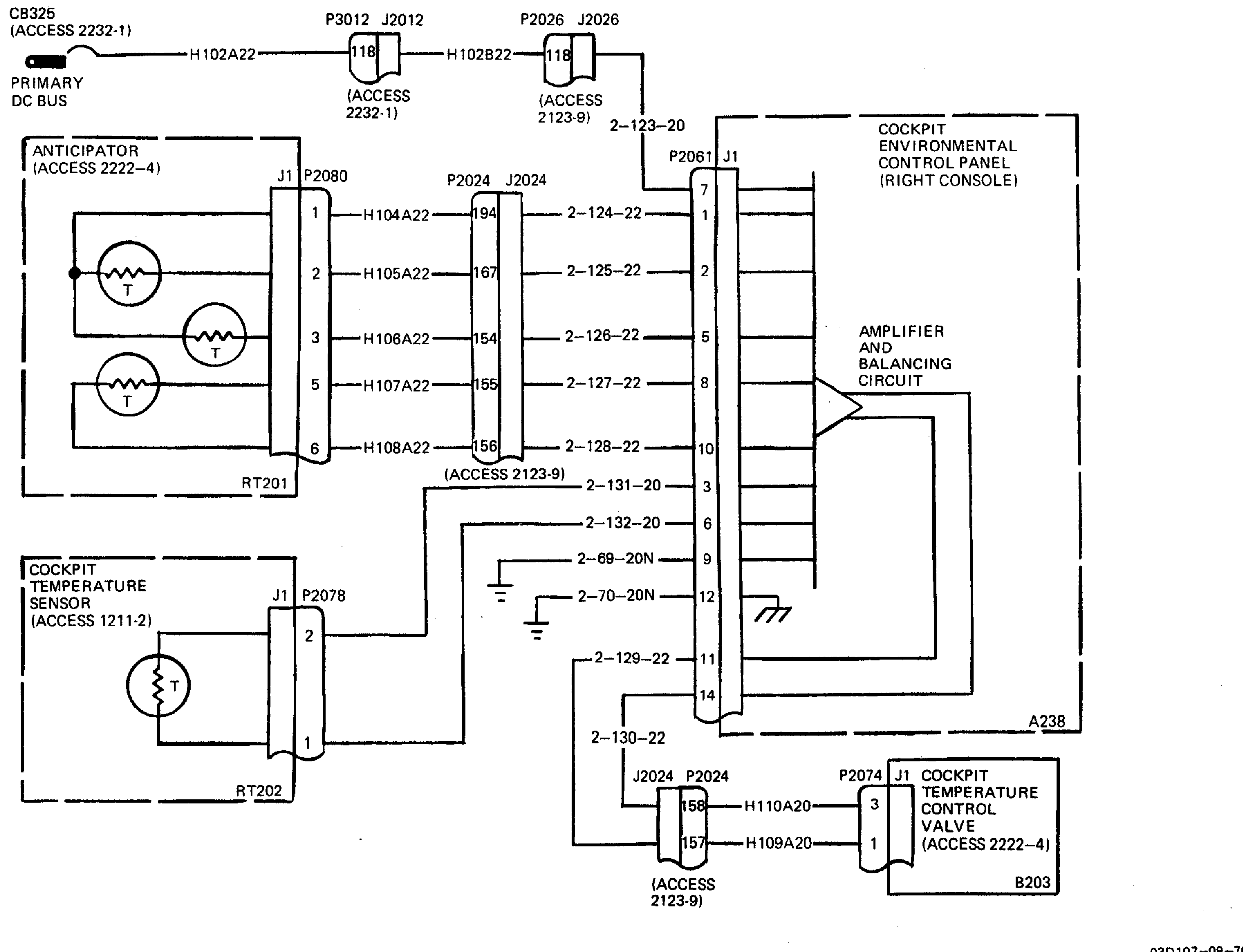

Figure 3-2A. Cockpit Air Temperature System Electrical Troubleshooting Schematic Diagram (Airplanes AF69-6197 and Subsequent)

3-10. MANUAL MODE. Manual control is achieved by means of a second rheostat mounted on the same shaft as the automatic temperature selector rheostat. Placing the manual override switch in MAN isolates the automatic control circuitry and connects the temperature control knob to the manual control wiper terminal. The voltage applied to the torque motor on the cockpit temperature control valve positions the poppet and controls the amount of hot air to be mixed with refrigerated air going to the cockpit. Temperature can thus be manually controlled.

3-11. During manual operation and if anticipator circuit fails during automatic operation, inlet temperature overheat protection is provided by the cockpit temperature thermostatic valve. The valve opens and vents control air pressure to close the cockpit temperature control valve if duct temperatures above 210°F are sensed. In case of such an overtemperature condition, the system will cycle between hot and cold as the cockpit temperature thermostatic valve successively actuates and resets, until a desired valve setting is selected.

3-12. COMPONENTS.

3-13. For a list of components, their locations (accesses), and functions, refer to table 3-1.

Table 3-1. Cockpit Air Temperature System Components

Component	Access	Function
Anticipator, cockpit temperature	2222-4	Senses cockpit inlet temperature in auto mode and provides stabilizing and high limit electrical signal to cockpit environmental control panel.
Manifold, hot-air	2222-4	Supplies hot air to the ejector valve, defog valve, cockpit temperature control valve, and suit temperature control valve.
Panel, cockpit environmental control	Right console	Provides for automatic or manual control of cockpit temperature. In automatic, compares signals from anticipator sensor, and temperature control rheostat and provides amplified signal to cockpit temperature valve. In manual, signal to valve is provided by temperature control rheostat. Also provides rain removal defog, cabin PRESS/ DUMP and rain repellent control.
Seal, canopy rail	Cockpit canopy rail	Provides seal between canopy rail inlet and air inlet tube.
Sensor, cockpit temperature	1211-2	Senses cockpit temperature and provides electrical reference signal to cockpit environmental control panel.
Valve, cockpit temperature control	2212-6 and 2222-4	Maintains cockpit temperature by opening or closing to change amount of hot air being mixed with refrigerated air flowing into cockpit. Electrical signal from environmental control panel controls valve position.

Table 3-1. Cockpit Air Temperature System Components (continued)

Component	Access	Function
Valve, cockpit temperature thermostatic	2222-4	Prevents excessive cockpit temperature. Vents control air from cockpit temperature control valve, allowing valve to close, when duct temperature is 200° (+ 10°, -5°)F.
Valve, floor inlet shutoff	Cockpit, below floorboard	Controls conditioned airflow from floor inlets.

3-14. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine during operational checkout of cockpit temperature system
1-3A	Test gage B		Indicate control air pressure
	Thermometer, 0° to 250°F	71275 (United States Gauge, Division of Ametek Inc., Sellersville, Pa.)	Check cockpit temperature
	Pyrometer, indicating	4000 and 4020 and 4017-66-00086	Check air temperature

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 figure 3-2C.

a. Position cockpit environmental control panel switches and controls as follows:

Control	*Position*
Manual override switch	AUTO
Cockpit temperature control	Medium
Cockpit pressure switch	CABIN DUMP
Rain removal switch	OFF
Defog switch	OFF

a-1. If checkout is being performed to isolate a malfunction, install 0 to 30 psi test gage B in control air line at REMOTE port of temperature control valve (figure 3-2B).

b. Start engine (T.O. 1A-7D-2-1) and operate at 90% rpm.

c. Close and secure canopy.

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from ram air exhaust duct after placing cockpit pressure switch in CABIN PRESS. If no flow occurs, place switch in CABIN DUMP, and troubleshoot air-conditioning system.

d. Place cockpit pressure switch in CABIN PRESS.

e. Check that air flows from cockpit canopy rail and windshield defog inlets. {1}

f. Place thermometer near windshield defog inlet. Position so it does not touch metal.

g. Place thermocouple near cockpit temperature sensor. Position so it does not touch metal.

h. Ensure foot inlet valve is open and that cockpit temperature will stabilize in an intermediate range. {2}

NOTE

At extremely high ambient temperature (above 120°F), step i cannot be performed.

i. Rotate temperature control knob to COLD. Check that cockpit air temperature responds accordingly and stabilizes at 40°F (±10) when ambient is below 80°F. Add 1°F to the tolerance of stabilized temperature for each 1°F ambient above 80°F. If installed, check that gage indicates 0. {2,3,8}

j. Rotate temperature control toward HOT. Check that cockpit temperature responds accordingly. With temperature control in full HOT, check that cockpit temperature stabilizes at 90°F (± 10°). If installed, check that gage indicates increasing pressure after control is rotated toward HOT. {2,4}

k. Place manual override switch in MAN. Check that cockpit temperature responds accordingly to movement of temperature control. {5,8}

CAUTION

If cockpit air temperature exceeds 230°F for a period of 15 seconds, place cockpit pressure switch in CABIN DUMP and shut down engine.

NOTE

At extremely low ambient temperatures, the duct temperature may not be hot enough to perform step l.

l. Advance throttle to MIL and rotate temperature control to HOT. Check that air inlet temperature fluctuates between 150° and 220°F. Allow temperature to cycle several times. (Flow fluctuations during this check are normal.) {6}

m. Return power setting to idle rpm. Place manual override switch in AUTO and rotate temperature control to medium position.

n. Move floor inlet control knob to closed position and then to open position. Check that airflow from floor inlet stops and starts, and control knob does not bind. {7}

o. Place cockpit pressure switch in CABIN DUMP.

CAUTION

Ensure that cockpit is completely depressurized before opening canopy. A positive check may be accomplished by opening emergency vent air scoop.

p. Open canopy.

q. Shut down engine.

r. Remove thermocouple. Remove gage, if installed, and connect system line to valve.

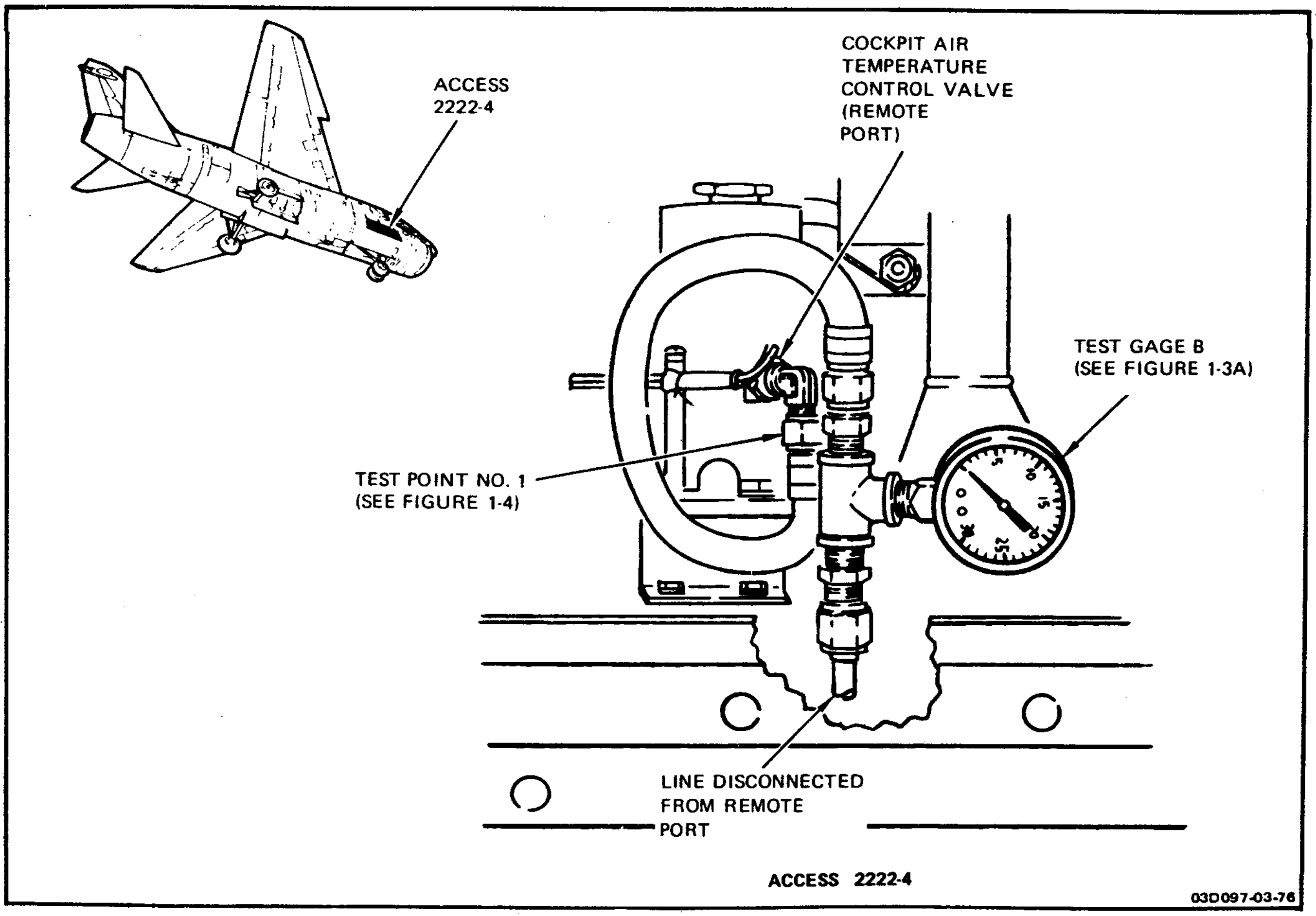

Figure 3-2B. Cockpit Air Temperature Control Valve Pressure Gage Placement

3-15. TROUBLESHOOTING. (See figures 1-4, 1-5, 3-2, 3-2A, and 3-2B.)

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
1-3A	Test gage B		Indicate control air pressure
	Multimeter	AN/PSM-6	Check voltage

3-16. Refer to figure 3-2C for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout. Instructions for isolating system malfunctions to a specific component are provided in the troubleshooting figure.

3-17. COCKPIT AIR TEMPERATURE ELECTRICAL SYSTEM CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Supply electrical power during operational checkout of cockpit air temperature system
	Environmental control system test set	AN/ASM-390	Check cockpit air temperature system
	Multimeter	AN/PSM-6	Check continuity and voltage
	Stopwatch	GG-S-764A	Time voltage checks

NOTE

The following checkout should be performed only when required in figure 3-2C to troubleshoot airplane wiring or cockpit environmental control panel. 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 figure 3-2D.

a. Release fasteners securing panels adjacent to cockpit environmental control panel.

b. Release fasteners securing cockpit environmental control panel to right console and lift panel out.

c. Disconnect electrical connector P2061 from panel connector.

d. Connect test set to airplane as follows:

1. Rotate all test set switch controls counterclockwise to 1.

2. Place test set PWR switch in OFF.

3. Rotate test set SUIT TEMP CONT counterclockwise to 000.

4. Connect test cable connector W6P1 to test set receptacle J2 and connector W6P2 to cockpit environmental control panel receptacle.

5. Connect test cable connector W1P1 to test set receptacle J3 and connector W1P2 to electrical connector P2061.

e. Connect multimeter to test jacks J12 and J13.

f. Place test set RESISTANCE control in positions indicated below and check for corresponding resistance.

Position	*Indication*
1	20 to 100 ohms {1}
2	100 to 25K ohms {2}
3	100 to 25K ohms {2}
4	100 to 25K ohms {3}
5	100 to 25K ohms {2}
6	65 to 85 ohms {4}

g. Place RESISTANCE control in 7.

h. Press RAIN REPEL switch on cockpit environmental control panel. Resistance shall be 1 ohm or less. {5}

i. Release RAIN REPEL switch. Resistance shall be 10 megohms or greater. {5}

j. Place RESISTANCE control in 1.

k. Disconnect multimeter from test jacks J12 and J13.

WARNING

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

CAUTION

To prevent damage to test equipment ensure that multimeter leads or other wiring is not inserted in test jacks J18 and J19 when external electrical power is connected.

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

m. Connect multimeter to test jacks J14 and J15 for ac voltage check. Place positive multimeter lead in test jack J14 and negative lead in test jack J15.

n. Rotate console lights control knob on cockpit interior lights control panel to full clockwise position.

o. Place test set VOLTAGE control in 1 and check for 8 (±2) volts ac. {6}

p. Visually check that intensity of edge-lighted panel lights on cockpit environmental control panel is uniform. {7}

q. Disconnect positive (+) lead of multimeter from test jack J14 and select 50-volt dc scale on multimeter.

r. Place VOLTAGE control in 2. Connect positive (+) lead of multimeter to test jack J14 and check for 27 (±2) volts dc. {8}

s. Place test set PWR switch in ACFT.

t. Place VOLTAGE control in 3 and check for 27 (±2) volts dc. {9}

u. If dc voltage indication is zero, perform the following:

1. Place test set PWR switch in OFF.

2. Connect test cable W5 cable connector W5P2 to test set receptacle J1.

3. Open access 1232-1.

4. Connect test cable connector W5P1 to ARW-77 test receptacle J308.

5. Place test set PWR switch in EXT. Check for 27 (±2) volts dc.

v. Place VOLTAGE control in 4.

NOTE

The following steps check the applied voltage from the cockpit environmental control panel to associated controls and circuitry in the cockpit air temperature system. Steps should be performed in sequence leaving controls in position until directed to change position.

w. Position test set control panel as follows:

Control	*Position*
CABIN	2
HI-LIMIT	7
ANTICIPATOR	3
ANTICIPATOR/SUIT TEMP	9

x. Place manual override switch on cockpit environmental control panel in AUTO.

NOTE

Due to long time constants involved, it will be necessary to wait from 1 to 5 minutes before a final voltage indication can be obtained in the following steps. The voltage shall be considered stable when the rate of change is not greater than 0.2 volt dc in 30 seconds.

y. Rotate cockpit temperature control knob on cockpit environmental control panel to HOT and check for 5.4 to 6.3 volts dc. {10}

z. Place CABIN control in 10.

NOTE

Check that voltage change is linear and does not fluctuate as control is rotated. Tap control lightly and check for voltage fluctuation.

aa. Rotate cockpit temperature control knob on cockpit environmental control panel to COLD and check for 2.0 to 9.7 volts dc. {10}

ab. Place CABIN control in 5 and adjust cockpit temperature control knob on cockpit environmental control panel as required to obtain 5.9 (±0.3) volts dc indication. {10}

ac. Place CABIN control in positions indicated below and check for corresponding voltage.

Position	*Indication*
7	7.7 to 10.6 volts dc {10}
8	10.5 to 12.9 volts dc {10}
4	1.3 to 4.7 volts dc {10}
3	0.0 to 1.2 volts dc {10}

ad. Place CABIN control in 5 and allow voltage to stabilize. Check for 5.9 (±0.3) volts dc. {10}

ae. Place CABIN control in 6. After 1 minute check that voltage is 7.3 to 10.4 volts dc and slowly increasing. {10}

af. Place CABIN control in 5 and ANTICIPATOR control in 4 and allow voltage to stabilize. Check for 7.3 to 10.0 volts dc. {10}

ag. Place ANTICIPATOR control in 2 and allow voltage to stabilize. Check for 0.2 to 4.1 volts dc. {10}

ah. Place ANTICIPATOR control in 3 and CABIN control in 9.

ai. Place test set HI-LIMIT control in positions indicated below and check for corresponding voltage.

Position	*Indication*
2	0.0 to 2.4 volts dc {10}
3	2.4 to 5.6 volts dc {10}
5	5.8 to 9.0 volts dc {10}
6	8.7 to 12.6 volts dc {10}

aj. Place HI-LIMIT control in 3 and allow voltage to stabilize. Check for 2.4 to 5.6 volts dc. {10}

ak. Place HI-LIMIT control in 4. After 30 seconds check that voltage is 4.3 to 7.9 volts dc and slowly increasing. {10}

al. Place cockpit environmental control panel override switch in MAN and rotate cockpit temperature control knob through full range from COLD to HOT. Voltage indication shall vary from 0.0 to 8.0 (±1.6) volts dc. {10}

am. Place test set PWR switch in OFF.

an. Disconnect external electrical power.

ao. Disconnect all test cables from test set and cockpit environmental control panel. Disconnect test cable W5 from ARW-77 test receptacle, if used, and close access 1232-1.

ap. Connect electrical connector P2061 to cockpit environmental control panel receptacle.

aq. Position control panel to right console and secure fasteners.

ar. Tighten fasteners on panels loosened in step a.

3-17A. COCKPIT TEMPERATURE THERMOSTATIC VALVE CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine during checkout
	Pyrometer, indicating	4000 and 4020 and 4017-66-00086	Indicate temperature during checkout

a. Open access 2222-4.

b. Position thermocouple on defog duct at cockpit thermostatic valve. Secure thermocouple to duct with high temperature tape or other suitable method. Insulate around thermocouple and duct to retain heat and provide accurate reading.

c. Start engine (T.O. 1A-7D-2-1).

d. Position cockpit environmental control panel switches and controls as follows:

Control	*Position*
Manual override switch	MAN
Cockpit temperature control	HOT
Cockpit pressure switch	CABIN PRESS

e. Advance throttle to MIL.

f. Place finger over vent hole in thermostatic valve.

g. Check that valve starts venting at 200° (+10°, -5°) F. As temperature drops, check that valve resets (stops venting) above 155°F.

h. Rotate temperature control to medium setting and place pressure switch in CABIN DUMP.

i. Shut down engine.

j. Replace thermostatic valve if valve failed to operate properly.

k. Remove thermocouple.

l. Close access 2222-4.

3-18. COCKPIT TEMPERATURE CONTROL VALVE 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 couplings
	413-900-020 (American Tool and Engineering Co., Kalamazoo, Mich.)	Torque wrench, 100 to 750 pound-inches	Tighten connection

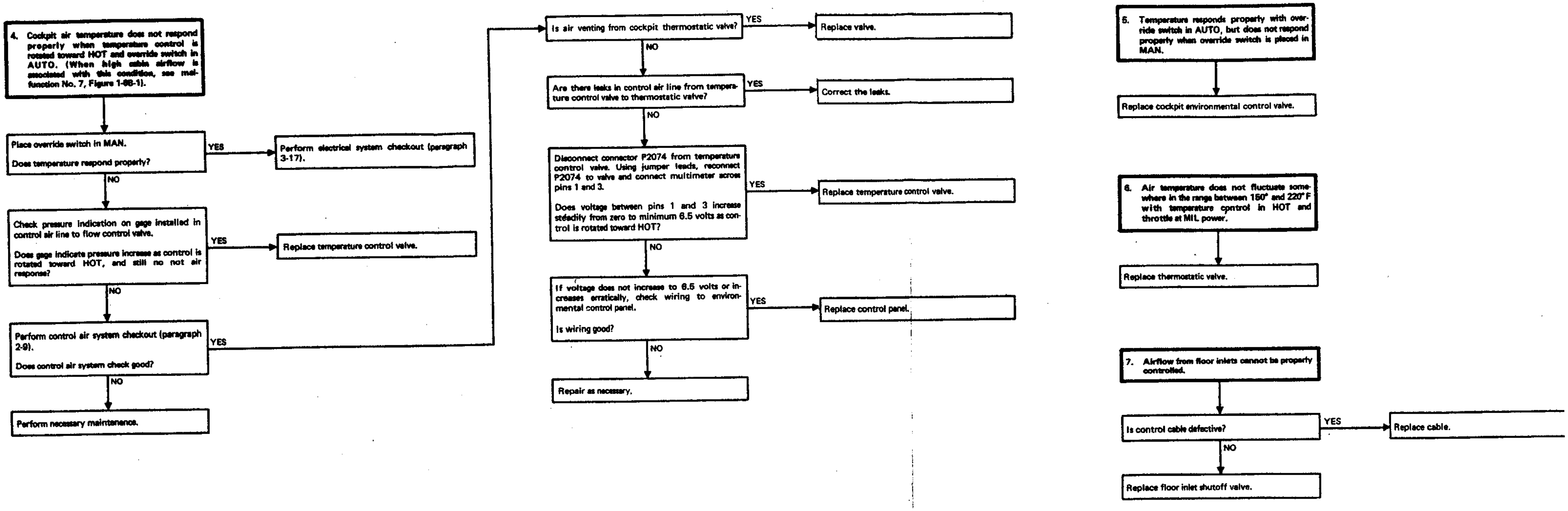

Figure 3-2C. Cockpit Air Temperature System Troubleshooting (Sheet 2)

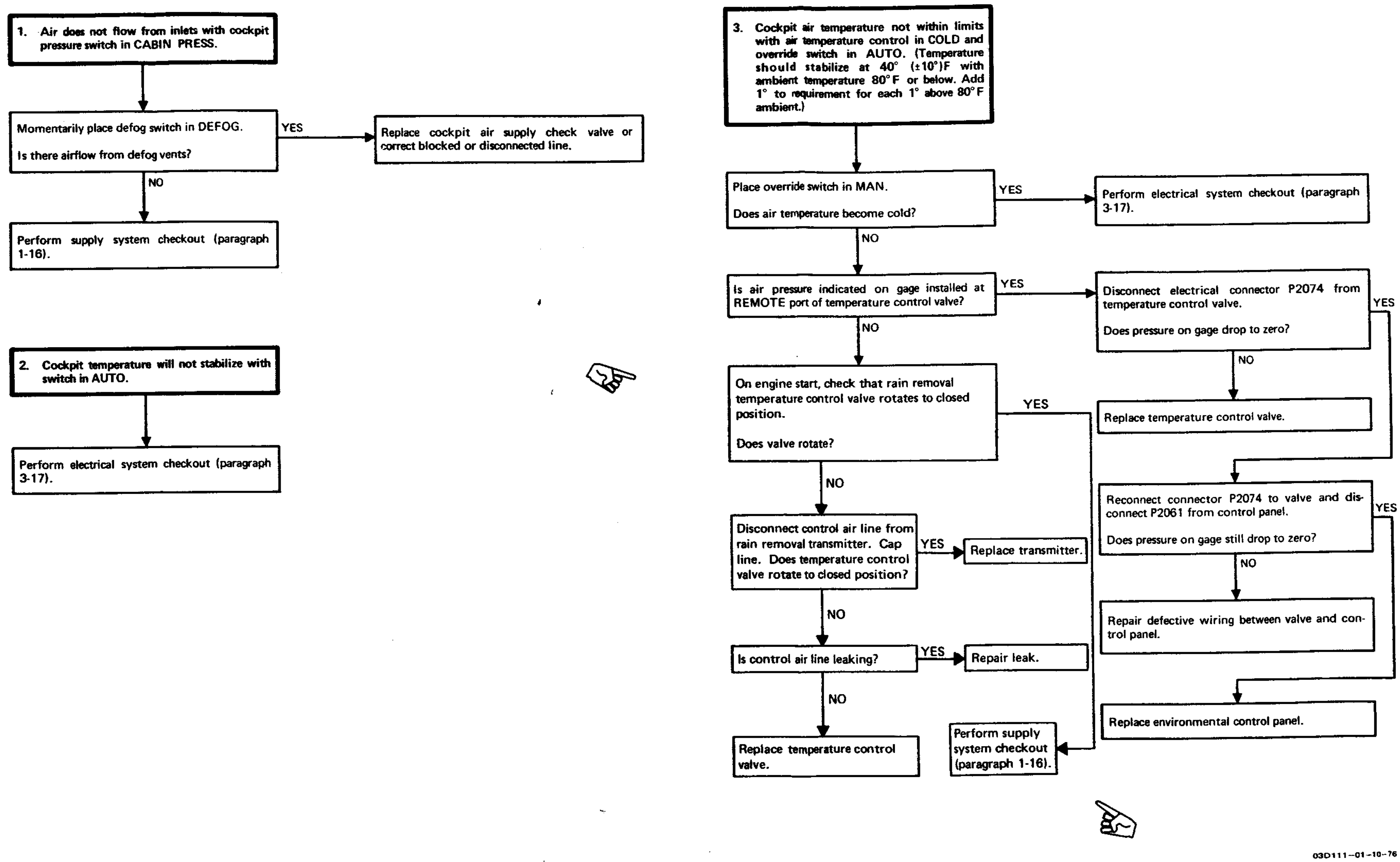

Figure 3-2C. Cockpit Air Temperature System Troubleshooting (Sheet 1)

NOTE

Assure that both knobs on the Suit Vent Air Control Panel (figure 4-1) are in full counterclockwise position.

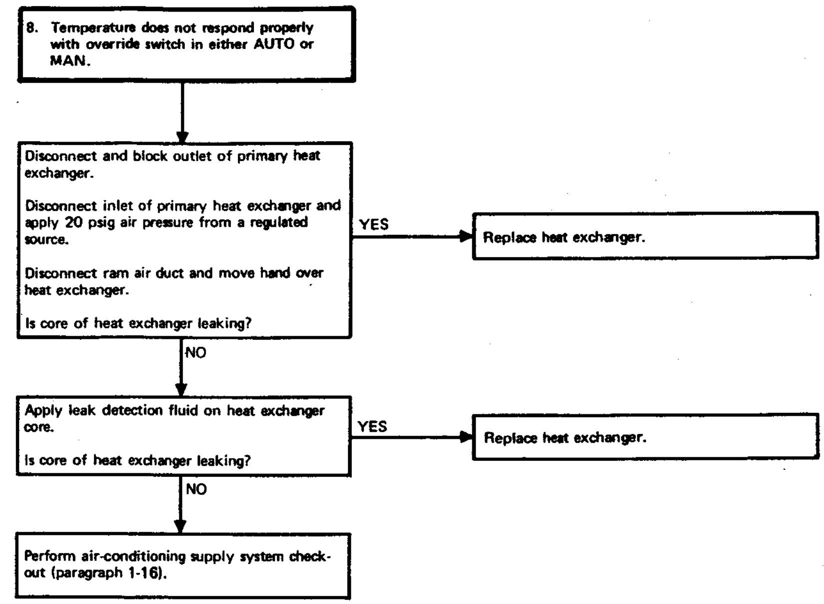

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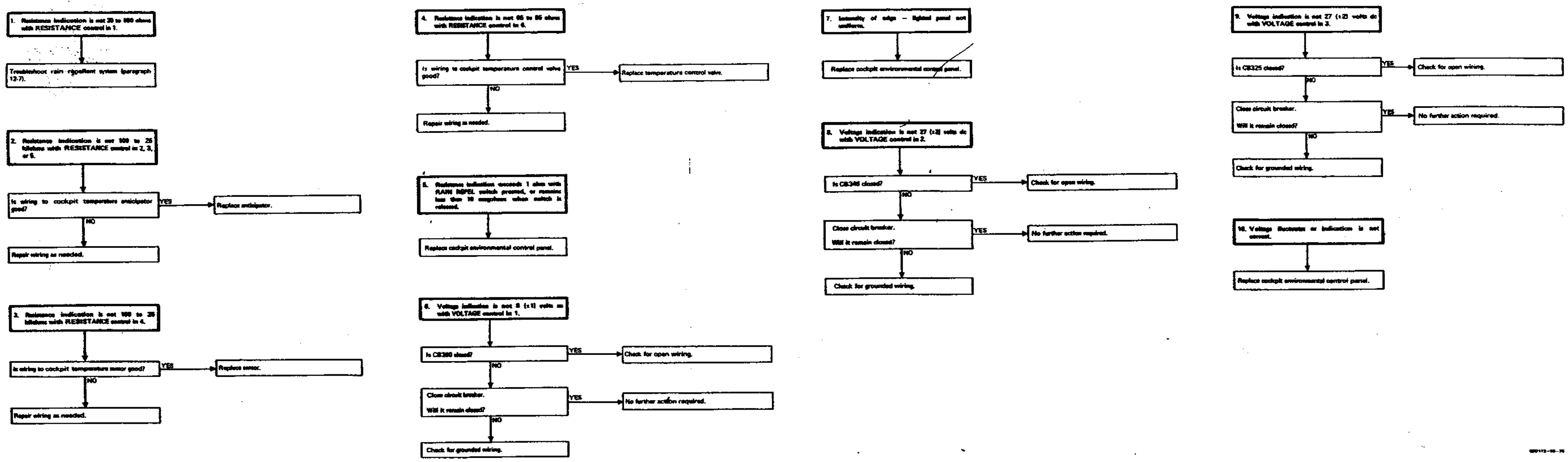
Figure 3-2C. Cockpit Air Temperature System Troubleshooting (Sheet 3)



3-2D. Cockpit Air Temperature Electrical System Troubleshooting

3-19. REMOVAL. (See figure 3-3.)

a. Disconnect lower link from right nosewheel door (T.O. 1A-7D-2-7).

b. Open accesses 2222-4 and 2212-6.

c. Disconnect electrical connector (1).

d. Disconnect remote pressure line (2).

e. Disconnect control pressure line (3) and thermostat line (4).

f. Disconnect inlet duct (5) from valve.

g. Disconnect outlet duct from valve by removing coupling (6) and gasket (7). Discard gasket.

h. Remove two nuts (8), four washers (9), and two bolts (10) securing valve (11) to mounting bracket. Remove valve from airplane.

i. Remove unions (15), O-rings (16), elbow (12), O-ring (13), and jamnut (14) from valve. Discard O-rings.

3-20. INSTALLATION. (See figure 3-3.)

a. Install new O-rings (16) on unions (15) and install unions in valve.

b. Install jamnut (14) and new O-ring (13) on elbow (12) and install elbow in valve.

c. Position valve (11) on mounting bracket and secure with two bolts (10), four washers (9), and two nuts (8).

d. Connect outlet port of valve to outlet line with new gasket (7) and coupling (6).

e. Tighten coupling to 90 (± 10) pound-inches torque. Tap lightly with plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (± 10) pound-inches.

f. Connect inlet duct (5) to valve. Tighten fitting to 675 (±25) pound-inches torque.

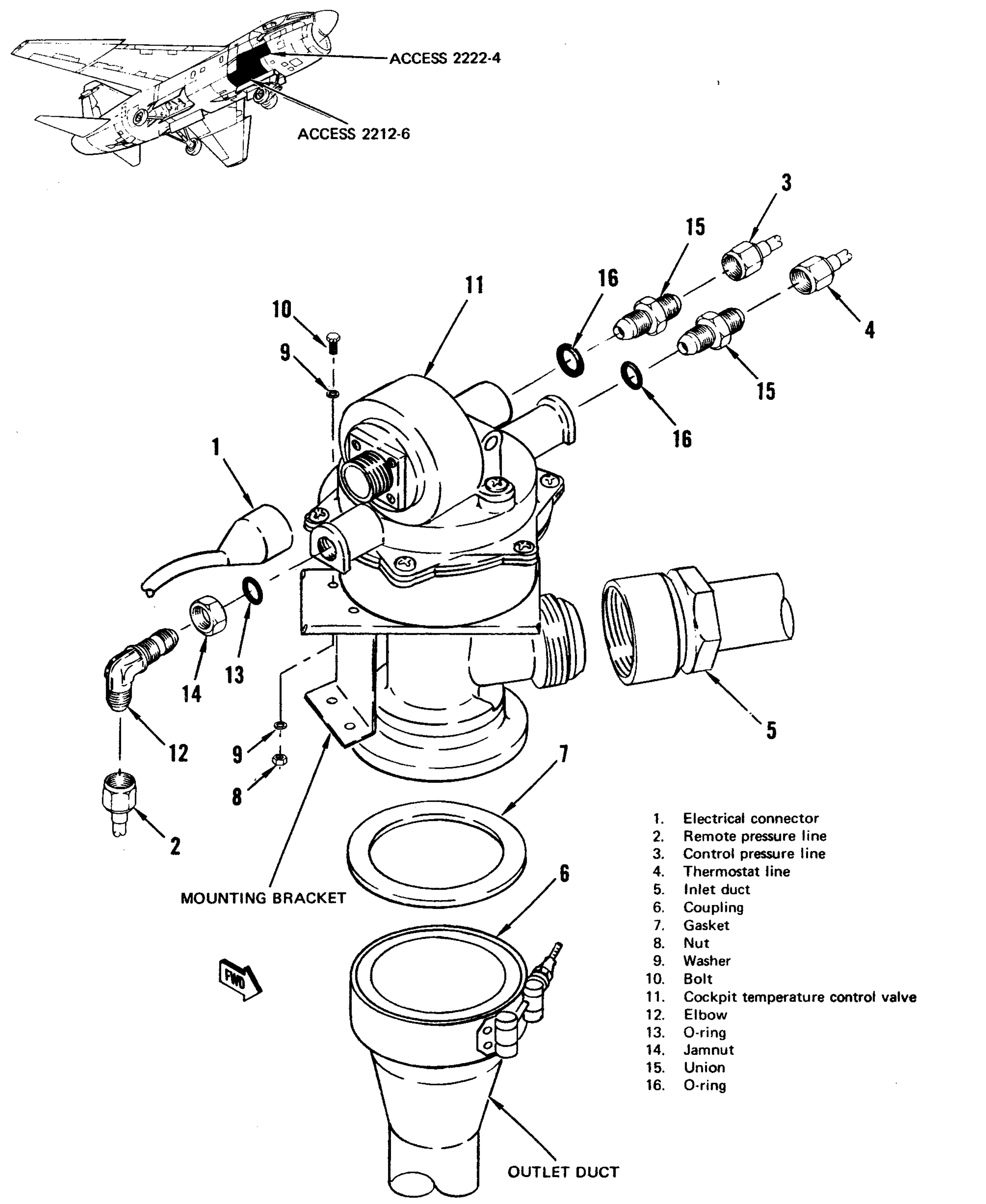
g. Connect thermostat line (4), control pressure line (3), and remote pressure line (2) to valve.

h. Connect electrical connector (1) to valve.

i. Perform cockpit air temperature system operational checkout (paragraph 3-14).

j. Close accesses 2222-4 and 2212-6.

k. Connect lower link to right nosewheel door (T.O. 1A-7D-2-7).



1. Electrical connector
2. Remote pressure line
3. Control pressure line
4. Thermostat line
5. Inlet duct
6. Coupling
7. Gasket
8. Nut
9. Washer
10. Bolt
11. Cockpit temperature control valve
12. Elbow
13. O-ring
14. Jamnut
15. Union
16. O-ring

Figure 3-3. Cockpit Temperature Control Valve Removal and Installation

3-20A. COCKPIT TEMPERATURE CONTROL VALVE REPAIR. (See figure 3-3A.)

a. Open access 2222-4.

b. Disconnect electrical connector (1).

c. Disconnect control pressure line (2).

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

e. Remove torque motor (5).

f. Remove packing (6) and discard.

g. Remove union (7).

h. Remove packing (8) and discard.

i. Install new packing (8) on union (7) and install union in replacement torque motor (5).

j. Install new packing (6) and install torque motor (5) with screws (3) and washers (4).

k. Connect control pressure line (2) and electrical connector (1).

l. Perform cockpit air temperature system operational checkout (paragraph 3-14).

m. Close access 2222-4.

3-21. COCKPIT TEMPERATURE SENSOR REMOVAL AND INSTALLATION.

3-22. REMOVAL.

NOTE

For component location, see figure 1-2.

a. Open access 1211-2.

b. Disconnect electrical connector P2078 from sensor.

c. Cut lockwire; remove nut and washer securing sensor to mounting bracket. Remove sensor from airplane.

3-23. INSTALLATION.

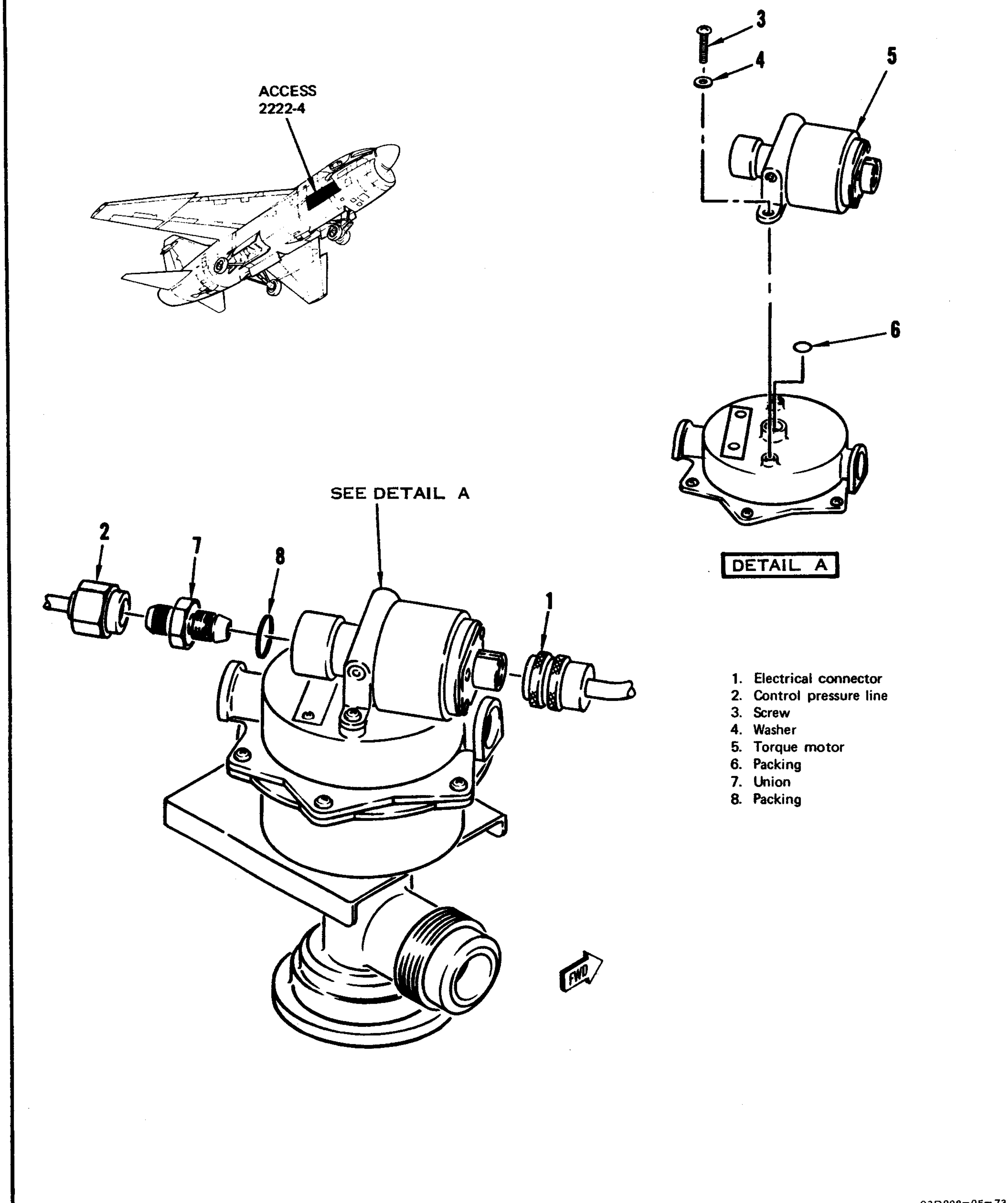
a. Position sensor in mounting bracket and secure with washer and nut.

b. Tighten nut and secure with MS20995C32 lockwire.

c. Connect electrical connector P2078 to sensor.

d. Perform cockpit air temperature system operational checkout (paragraph 3-14).

e. Close access 1211-2.



1. Electrical connector
2. Control pressure line
3. Screw
4. Washer
5. Torque motor
6. Packing
7. Union
8. Packing

Figure 3-3A. Cockpit Temperature Control Valve Repair

3-24. COCKPIT ENVIRONMENTAL CONTROL PANEL REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	Equipment required for engine operation		Operate engine during cockpit environmental control panel operational checkout

3-25. REMOVAL. (See figure 3-4.)

a. On airplanes before AF69-6197, remove environmental control panel from right console as follows:

1. Remove blank panel aft of environmental control panel.

2. Release fasteners securing environmental control panel to right console. Move panel aft, and lift from console.

a-1. On airplanes AF69-6197 and subsequent, remove environmental control panel from right console as follows:

1. Release fasteners securing radar beacon control panel to right console. Lift panel from console, but do not electrically disconnect.

2. Remove center bolt from armorplate bracket above right console.

3. Release fasteners securing environmental control panel to right console. Move panel aft, and lift from console.

4. Remove TISL control panel (T.O. 1A-7D-2-14).

NOTE

Tag lines with port nomenclature for identification during installation. Cap lines as disconnected.

b. Disconnect electrical connector (1).

c. Disconnect vent line (2).

d. Disconnect cockpit pressure control air supply line (3).

e. Disconnect rain removal control line (4).

f. Disconnect dump control line (5).

g. Disconnect defog control line (6).

h. Disconnect control air supply line (7).

i. Remove panel (8) from airplane.

NOTE

The following step is to be accomplished only if new control box is to be installed in aircraft.

j. Remove temperature control knob and three screws securing face plate to control box. Remove face plate.

3-26. INSTALLATION. (See figure 3-4.)

NOTE

Steps a. and b. are to be accomplished only if a new control box is being installed.

a. Remove temperature control knob and three screws securing face plate to control box. Remove face plate.

b. Install face plate containing modified dump switch guard (8629438-01) from previously removed control box.

NOTE

Installed control box should have modified dump switch guard (8629438-01). Control boxes being turned in for overhaul should be unmodified.

c. Position panel (8) above console.

d. Connect control air supply line (7).

e. Connect defog control line (6).

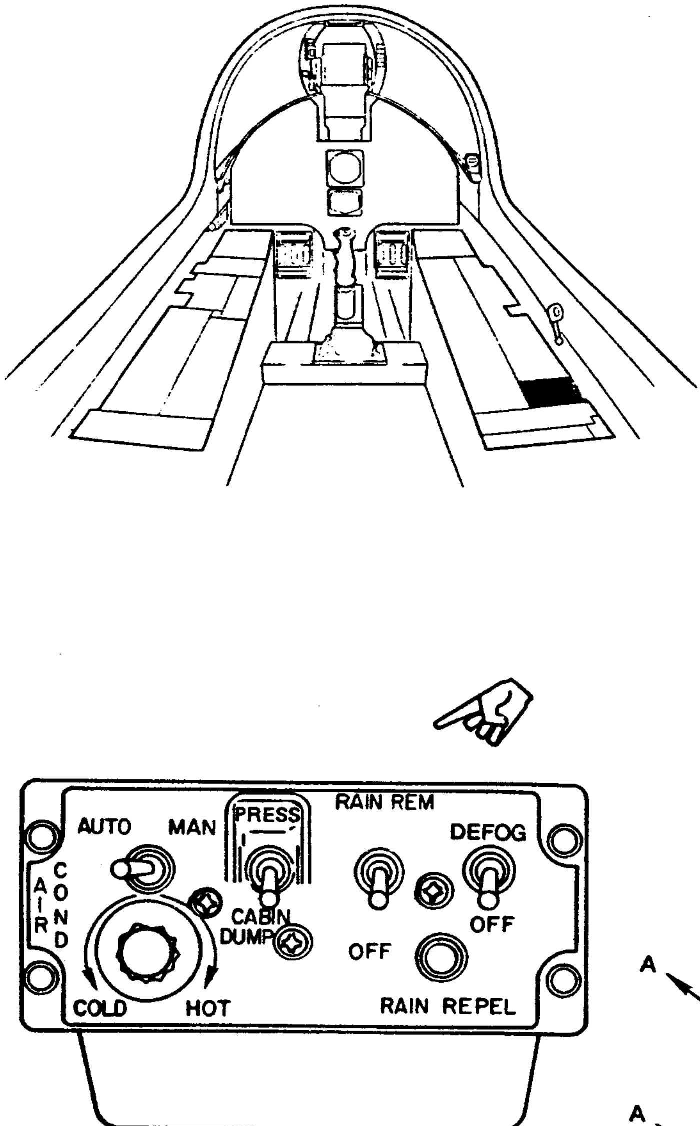
f. Connect dump control line (5).

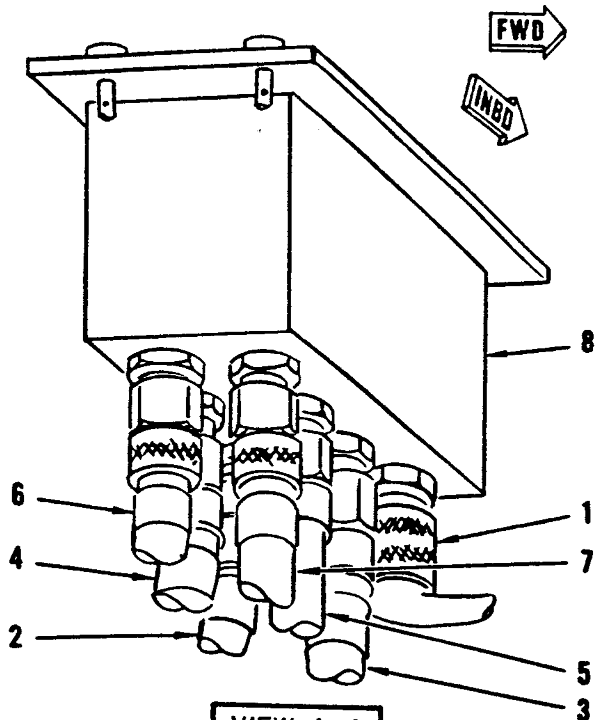
g. Connect rain removal control line (4).

h. Connect cockpit pressure control air supply line (3).

i. Connect vent line (2).

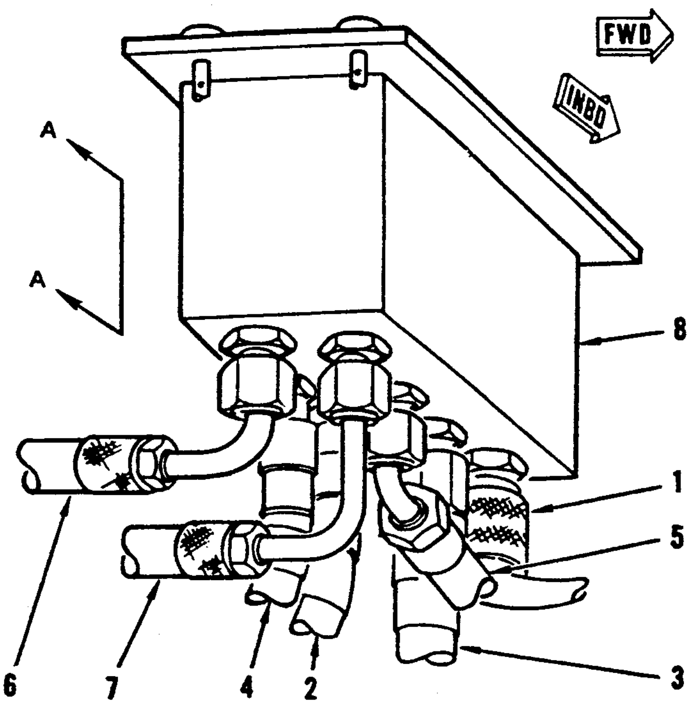
j. Connect electrical connector (1).





VIEW A-A

Airplanes through AF69-6196.



ALTERNATE VIEW A-A

Airplanes AF69-6197 and subsequent.

1. Electrical connector
2. Vent line
3. Cockpit pressure control air supply line
4. Rain removal control line
5. Dump control line
6. Defog control line
7. Control air supply line
8. Environment control panel

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Figure 3-4. Cockpit Environmental Control Panel Removal and Installation

k. Leave panel out of console so that connections can be checked for air leakage.

l. Position panel switches as follows:

Control	*Position*
Manual override switch	MAN
Cockpit pressure switch	CABIN DUMP
Rain removal switch	OFF
Defog switch	OFF

m. Start engine (T.O. 1A-7D-2-1) and operate at 80% rpm.

n. Check for air leaks at control air supply line and cockpit pressure control air supply line connections.

o. Close and secure canopy.

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from ram air exhaust duct after placing cockpit pressure switch in CABIN PRESS. If no flow occurs, place switch in CABIN DUMP, and troubleshoot air-conditioning supply system.

p. Check that cockpit air vent is open and place cockpit pressure switch in CABIN PRESS. Gradually close air vent and check that cockpit pressure altimeter indicates decreasing altitude. Open air vent.

q. Check for air leakage at dump control line connection.

r Vary position of temperature control knob and check that air temperature increases and decreases accordingly.

s. Place manual override switch in AUTO and repeat step p.

t. Position temperature control knob so that air temperature stabilizes at a comfortable level.

u. Place defog switch in DEFOG and check that temperature of air from defog inlets increases.

v. Check for air leakage at defog control line connection. Place defog switch in OFF.

WARNING

Due to high pressure and temperature of rain removal airflow, check airflow using small cloth flag.

w. Place rain removal switch in RAIN REMOVE and check for high velocity air flow from rain removal nozzles.

x. Check for air leakage at rain removal control line connection. Place rain removal switch in OFF.

y. Press and release rain repellent switch. Check that fluid flows on left and center windshield. Wash fluid off with clean water.

CAUTION

Ensure that cockpit is completely depressurized before opening canopy. A positive check may be accomplished by opening emergency vent air scoop.

z. Place cockpit pressure switch in CABIN DUMP and open canopy.

aa. Shut down engine (T.O. 1A-7D-2-1).

ab. On airplanes before AF69-6197, install environmental control panel as follows:

1. Position environmental control panel in right console, and secure with fasteners.

2. Install blank panel.

ac. On airplanes AF69-6197 and subsequent, install environmental control panel as follows:

1. Install TISL control panel (T.O. 1A-7D-2-14).

2. Position environmental control panel in right console, and secure with fasteners.

3. Position radar beacon control panel in right console, and secure with fasteners.

4. Install center bolt in armorplate bracket above right console.

3-27. COCKPIT TEMPERATURE ANTICIPATOR REMOVAL AND INSTALLATION.

3-28. REMOVAL.

NOTE

For component location, see figure 1-2.

a. Open access 2222-4.

b. Disconnect electrical connector P2080 from anticipator.

c. Cut lockwire.

d. Unscrew and remove anticipator from duct. Remove O-ring from anticipator and discard.

3-29. INSTALLATION.

a. Install new O-ring on anticipator.

b. Install anticipator in duct and tighten.

c. Secure anticipator with MS20995C32 lockwire.

d. Perform cockpit air temperature system operational checkout (paragraph 3-14).

e. Close access 2222-4.

3-30. FLOOR INLET SHUTOFF VALVE 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 couplings

3-31. REMOVAL. (See figure 3-5.)

a. Remove ejection seat (T.O. 1A-7D-2-2).

b. Remove floorboard and cockpit floor armorplate (T.O.1A-7D-2-1).

c. Loosen setscrew in retaining pin (1) and disconnect control cable from valve lever.

d. Disconnect inlet duct from valve by removing coupling (2) and gasket (3). Discard gasket.

e. Disconnect outlet ducts from valve by removing coupling nuts (4), split rings (5), O-rings (6), retainer halves (7), and coupling bodies (8). Discard O-rings.

f. Remove four nuts (9), eight washers (10), and four bolts (11) securing valve to airplane structure.

g. Slide valve (12) aft to clear airplane structure and remove from airplane.

3-32. INSTALLATION. (See figure 3-5.)

a. Position valve in airplane and secure with four bolts (11), eight washers (10), and four nuts (9).

b. Connect outlet ducts to valve with coupling bodies (8), retainer halves (7), new O-rings (6), split rings (5), and coupling nuts (4).

c. Tighten couplings to 72 (± 12) pound-inches torque and secure with MS20995C32 lockwire.

d. Connect inlet duct to valve with new gasket (3) and coupling (2).

e. Tighten coupling to 90 (± 10) pound-inches torque. Tap lightly with plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (± 10) pound-inches.

f. Place control handle and valve lever in fully closed positions.

g. Connect control cable to valve lever with retaining pin (1); tighten setscrew in pin so that valve is held closed by slight pressure from control cable.

h. Operate valve control and check for full and smooth operation.

i. Perform cockpit air temperature system operational checkout (paragraph 3-14).

j. Install floorboard and cockpit floor armorplate (T.O. 1A-7D-2-1).

k. Install ejection seat (T.O. 1A-7D-2-2).

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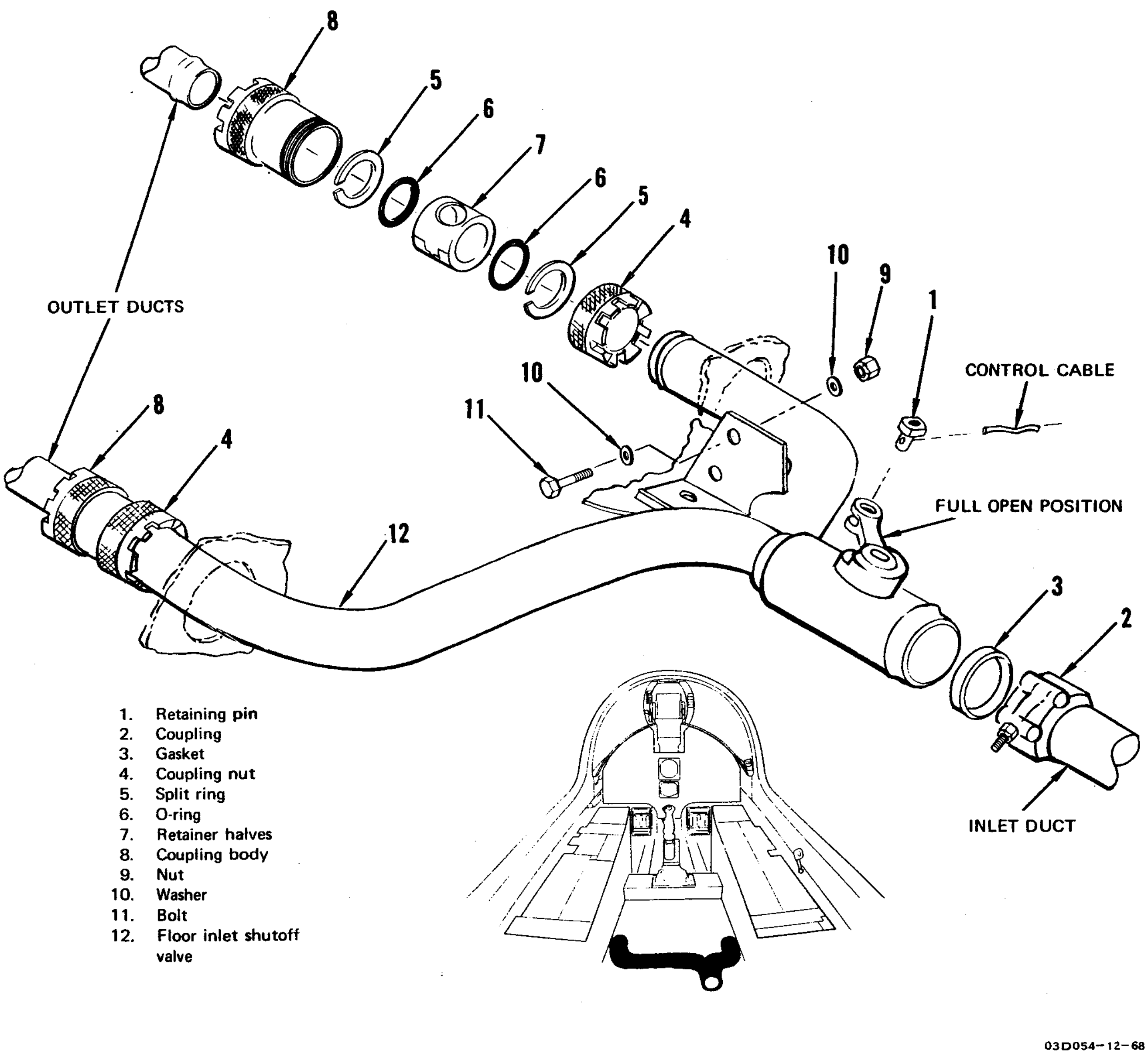

1. Retaining pin
2. Coupling
3. Gasket
4. Coupling nut
5. Split ring
6. O-ring
7. Retainer halves
8. Coupling body
9. Nut
10. Washer
11. Bolt
12. Floor inlet shutoff valve

Figure 3-5. Floor Inlet Shutoff Valve Removal and Installation

3-33. CANOPY RAIL AIR INLET SEAL REMOVAL AND INSTALLATION.

NOTE

The following procedures are applicable to left and right seals.

3-34. REMOVAL. (See figure 3-6.)

a. Open canopy.

b. Loosen clamp securing seal to canopy air inlet tube and remove seal.

c. Remove clamp from seal.

3-35. INSTALLATION. (See figure 3-6.)

a. Place ring of molded clay (approximately 1.5 inches thick) around collar of air inlet tube.

b. Close and lock canopy to compress clay.

c. Open canopy and measure height of compressed clay. Record measurement and remove clay.

d. Install clamp on seal.

e. Position seal on canopy air inlet tube leaving approximately 0.6 inch of tube collar exposed. Do not tighten clamp.

NOTE

Dimension Y equals measurement recorded in step c plus 0.12 (±0.02) inch.

f. Adjust seal to dimension Y. Tighten clamp securing seal to air inlet tube leaving approximately 0.12 inch of seal exposed below bottom edge of clamp.

g. Perform cockpit leakage test (T.O. 1A-7D-2-1).

3-36. COCKPIT TEMPERATURE THERMOSTATIC VALVE REMOVAL AND INSTALLATION.

CAUTION

To prevent lockpins from being damaged and possible change in valve calibration, use hex nut on port end to hold valve while disconnecting and connecting line. Use only the hex nut on duct end to remove and install valve.

3-37. REMOVAL.

NOTE

For component location, see figure 1-2.

a. Open access 2222-4.

b. Disconnect control air line from valve.

c. Unscrew and remove valve from duct. Remove O-ring from valve and discard.

3-38. INSTALLATION.

a. Install new O-ring on valve.

b. Install valve in duct and tighten.

c. Connect control line to valve.

d. Perform cockpit air temperature system operational checkout (paragraph 3-14).

e. Close access 2222-4.

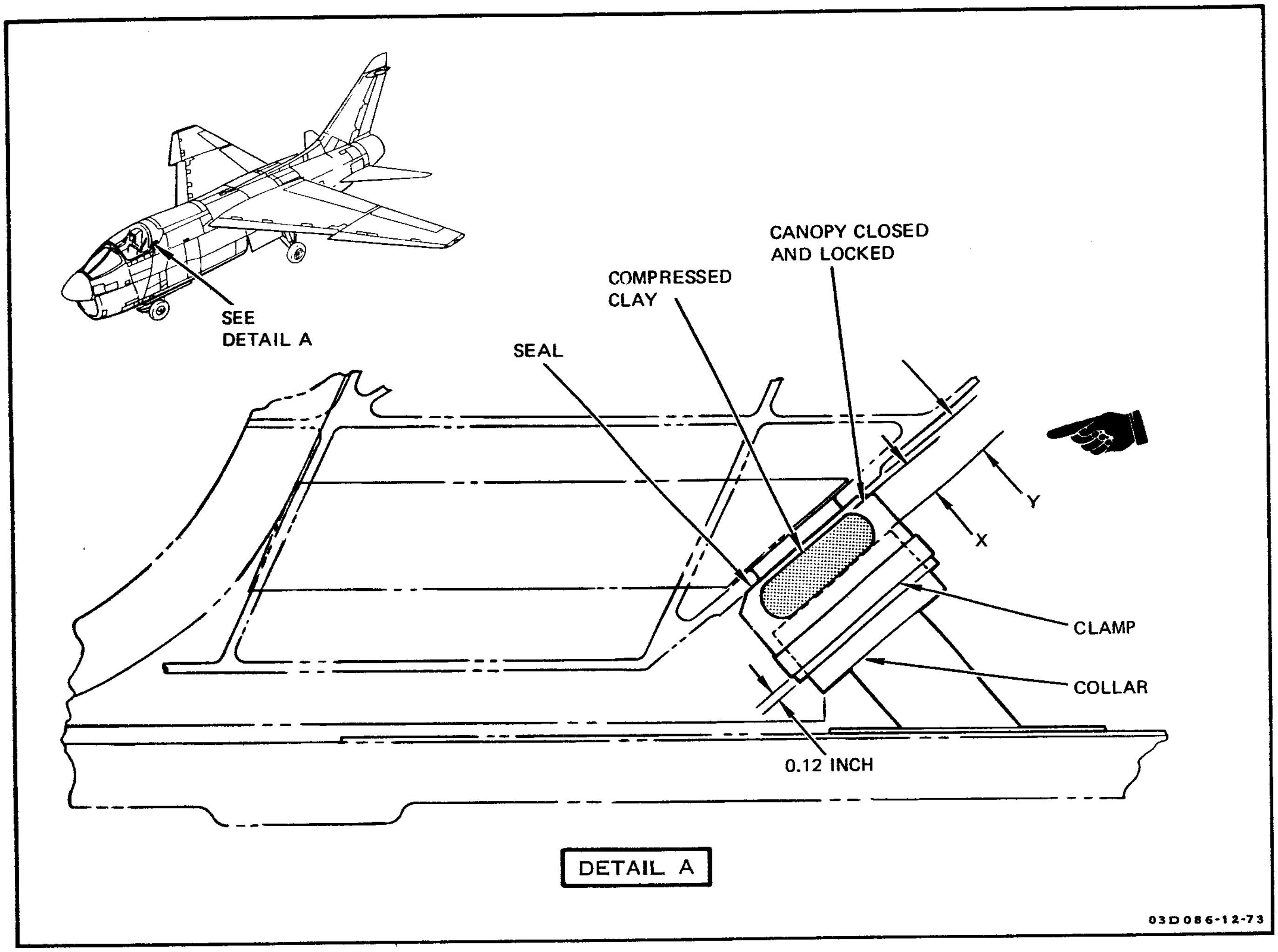

Figure 3-6. Canopy Rail Air Inlet Seal Removal and Installation

SECTION IV

PILOT SUIT COOLING SYSTEM

4-1. DESCRIPTION.

4-2. The pilot suit cooling system provides low pressure temperature controlled air to ventilate the pilot's antiexposure suit. The system automatically maintains suit inlet air temperature as selected by the suit air temperature selector knob on the suit vent air control panel. Suit inlet air temperature between 50° and 100°F can be selected and maintained under normal flight conditions. With the engine operating at idle, air temperatures that can be maintained are limited to approximately 70° to 100°F. The flow of air to the pilot's antiexposure suit is controlled by the suit flow control knob on suit vent air control panel. Airflow to the suit is adjustable from 0 to 14 cfm. The pilot suit cooling system consists of the suit temperature control valve, suit temperature sensor, suit flow control valve, electrical suit temperature control, and suit temperature control.

4-3. For system controls and indicators, see figure 1-1. For system arrangement, see figure 1-2.

4-4. OPERATION. (See figure 4-1.)

4-5. Placing the cockpit pressure switch in CABIN PRESS when the engine is operating initiates operation of the air-conditioning supply system. The suit temperature control valve mixes hot air from the hot-air manifold with refrigerated air from the cold air manifold to provide conditioned air to the pilot's suit. Opening of the suit temperature control valve is controlled by the electrical suit temperature control according to inputs from the suit temperature control and suit temperature sensor.

4-6. Adjusting the suit temperature control varies the signal to the electrical suit temperature control. The suit temperature sensor is a thermistor (thermal resistor) and an increase in the temperature of the air around it decreases the resistance of the sensor. A bridge circuit in the electrical suit temperature control determines the electrical error between the suit temperature sensor and the suit temperature control. The electrical suit temperature control supplies an amplified signal to the torque motor of the suit temperature control valve.

4-7. The torque motor controls flow of the control air pressure that is used to open and close the suit temperature control valve, regulating the amount of hot air being added to the refrigerated air flowing to the suit. With zero current from the electrical suit temperature control through the torque motor, no control air is applied to the valve actuator diaphragm and the suit temperature control valve is closed. As current through the torque motor increases, the amount of control air proportionally increases on the valve actuator diaphragm. The greater the pressure applied to the diaphragm, the more the valve opens to let hot air into the suit inlet air duct. Loss of control air pressure or electrical power causes the valve to close, shutting off hot air.

4-8. The mixed hot and cold air is ducted through the pilot suit cooling duct, past the suit temperature sensor, and through a check valve to the suit flow control valve. When the suit flow control knob is in OFF, the valve shuts off airflow to the suit. A switch in the valve opens to disconnect power from the temperature control valve torque motor, shutting off hot air to the inlet air duct. Moving the knob from OFF toward HIGH opens the suit flow control valve, permitting airflow through the valve to the suit and applying electrical power to the suit temperature control valve torque motor. To provide sufficient pressure for suit airflow under all flight conditions, suit air pressure temperature is maintained to within ±2°F of a selected temperature within the range of 50° to 100°F.

4-9. Ground cooling of the antiexposure suit is provided through the ground cooling socket.

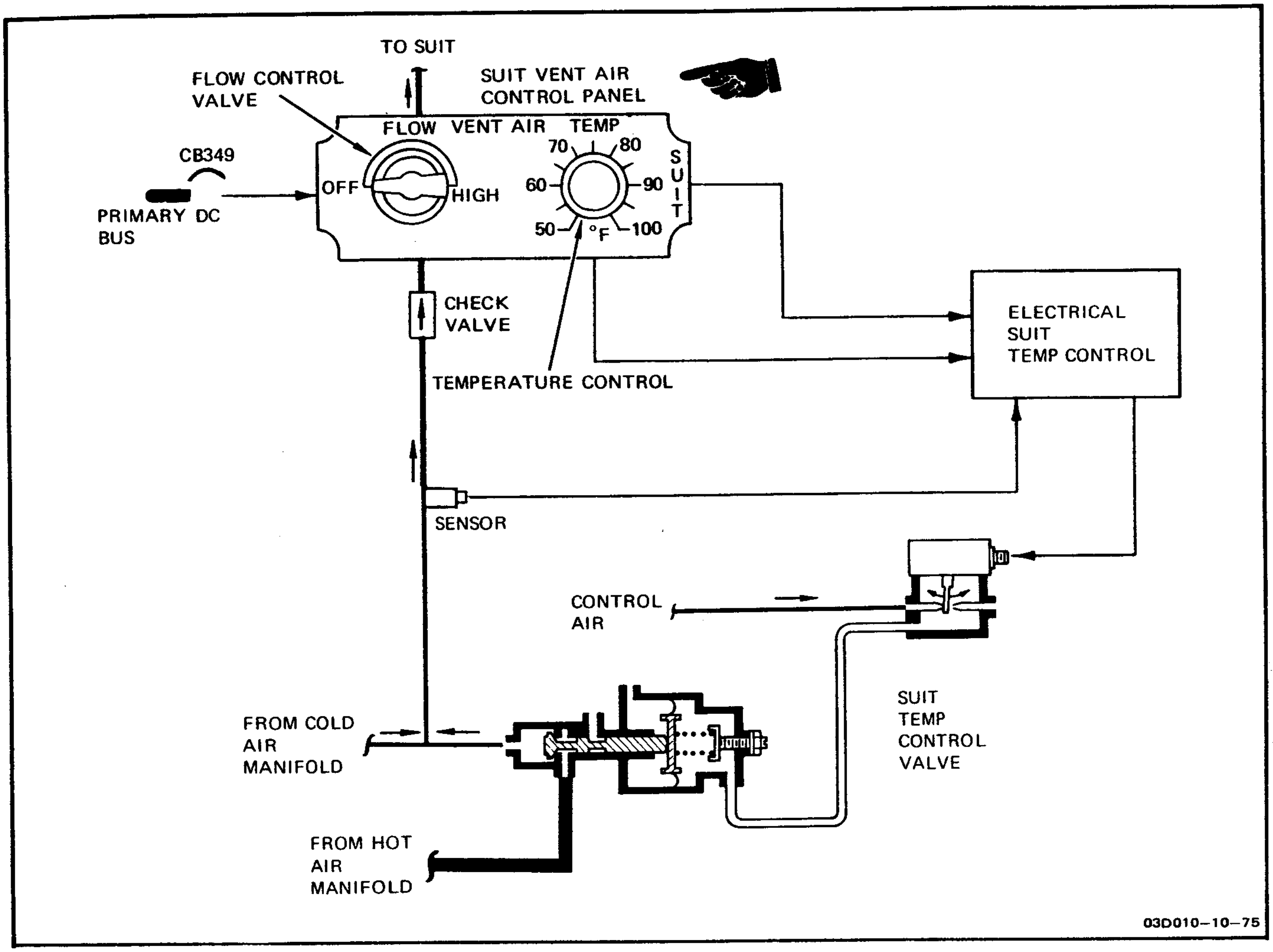

Figure 4-1. Pilot Suit Cooling System Schematic Diagram

4-10. COMPONENTS.

4-11. For a list of components, their locations (accesses), and functions, refer to Table 4-1.

Table 4-1. Pilot Suit Cooling System Components

Component	Access	Function
Control, suit temperature	Left console	Provides electrical signal to electrical suit temperature control to control suit temperature.
Control, electrical suit temperature	2212-7	Compares command signal from suit temperature control with signal from the temperature sensor and transmits amplified error signal to the suit temperature control valve.
Panel, suit vent air control	Left console	Provides a mounting panel for the suit temperature control and the suit flow control valve.
Sensor, suit temperature	1123-1	Senses duct temperature and sends electrical signals to the suit temperature electronic controller.
Valve, check	2222-4	Prevents backflow of air from suit cooling duct air-conditioning system.
Valve, suit flow control	Left console	Regulates flow of air to antiexposure suit. When flow control knob is in OFF, an integral switch disconnects power valve, closing the suit flow control valve.
Valve, suit temperature control	2212-6 and 2222-4	Admits hot air to the suit inlet duct according to error signal received from the suit electrical temperature control.

4-12. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine during pilot suit cooling system operational checkout
	Thermometer, 0° to 250°F	71275 (United States Gauge, Division of Ametek, Inc., Sellersville, Pa.)	Check temperature of pilot suit cooling system

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 figure 4-4.

a. Start engine (T.O. 1A-7D-2-1) and operate at idle rpm.

b. Insert tube end of direct reading thermometer in suit vent air connection on left console.

c. Advance throttle until 25 inches Hg is indicated on the turbine outlet pressure gage.

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from ram air exhaust duct after placing cockpit pressure switch in CABIN PRESS. If no flow occurs, place switch in CABIN DUMP and troubleshoot air-conditioning supply system.

d. Position cockpit environmental control panel controls as follows:

Control	*Position*
Cockpit pressure switch	CABIN PRESS
Suit flow control	HIGH
Suit air temperature selector knob	50

e. Check that air flows from suit vent air connection. {1}

f. When ambient temperature is below 80°F, check that air temperature at suit vent air connection is 50° (±10°)F. If ambient temperature is above 80°F, add 1°F to temperature requirement for each 1°F above 80°F. {2}

g. Position suit air temperature selector knob to 100 and check that air temperature at suit vent air connection is 100° (±10°)F. {2}

h. Rotate suit flow control knob to OFF and check that airflow stops. {3}

i. Place cockpit pressure switch in CABIN DUMP.

j. Shut down engine.

k. Remove thermometer from suit vent air connection.

4-13. TROUBLESHOOTING. (See figures 4-2 and 4-3.)

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Supply power for pilot suit cooling system troubleshooting
	Multimeter	AN/PSM-6	Check voltage and continuity

4-14. Refer to figure 4-4 for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

4-15. PILOT SUIT COOLING ELECTRICAL SYSTEM CHECKOUT

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Supply power for pilot suit cooling electrical system checkout
	Cockpit environmental system test set	AN/ASM-390	Check pilot suit cooling system
	Multimeter	AN/PSM-6	Check continuity and voltage
	Stopwatch	GG-S-764	Time voltage checks

NOTE

The following checkout should be performed only when required in figure 4-4 to troubleshoot airplane wiring of electrical suit temperature control. 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 figure 4-5.

a. Rotate suit temperature control knob on suit vent air panel fully counterclockwise to 50.

b. Rotate suit flow control knob on suit vent air panel clockwise to HIGH.

c. Remove access 2212-7.

d. Disconnect electrical connector P2075 from electrical suit temperature control.

e. Connect test set to airplane as follows:

1. Rotate all test set switch controls counterclockwise to 1.

2. Place test set PWR switch in OFF.

3. Rotate test set SUIT TEMP CONT counterclockwise to 000.

4. Connect test cable connector W4P1 to test set receptacle J2 and connector W4P2 to electrical suit temperature control.

5. Connect test cable connector W3P1 to test set receptacle J3 and connector W3P2 to electrical connector P2075.

f. Connect multimeter to test set jacks J12 and J13.

g. Place test set RESISTANCE control in positions indicated below and check for corresponding resistance.

Position	*Indication*
2	4,800 to 5,200 ohms {1}
3	0 to 100 ohms {1}
4	100 to 25K ohms {2}
5	65 to 85 ohms {3}

h. Place RESISTANCE control in 1.

i. Disconnect multimeter from test jacks J12 and J13.

CAUTION

To prevent damage to test equipment ensure that multimeter leads or other wiring is not inserted in test jacks J18 and J19 when external electrical power is connected.

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

k. Connect multimeter to test jacks J14 and J15 for dc voltage checks. Place positive lead of multimeter in test jack J14 and negative lead in test jack J15.

l. Place test set VOLTAGE control in 3.

m. Place PWR switch in ACFT and check for 27 (±2) volts dc. {4}

n. If dc voltage indication is zero, perform the following:

1. Connect test cable W5 cable connector W5P2 to test set receptacle J1.

2. Open access 1232-1.

3. Connect cable connector W5P1 to ARW-77 test receptacle J308.

4. Place test set PWR switch in EXT. Check for 27 (±2) volts dc.

o. Place VOLTAGE control in 4.

p. Place test set ANTICIPATOR/SUIT TEMP control in 2.

NOTE

Due to long time constants involved, it will be necessary to wait from 1 to 5 minutes before a stable voltage indication can be obtained in the following steps. Voltage shall be considered stable when the rate of change is not greater than 0.2 volt dc in 30 seconds.

q. Rotate SUIT TEMP CONT clockwise to 999 and check for 4.6 to 8.2 volts dc. {5}

r. Place ANTICIPATOR/SUIT TEMP control in 3.

s. Rotate SUIT TEMP CONT counterclockwise to 000 and check for 4.2 to 9.1 volts dc. {5}

t. Place ANTICIPATOR/SUIT TEMP control in 4.

u. Rotate SUIT TEMP CONT clockwise to 500 and check for 0.4 to 3.4 volts dc. {5}

v. Place ANTICIPATOR/SUIT TEMP control in 5 and allow voltage to stabilize. Check for 9.1 to 12.2 volts dc. {5}

w. Place ANTICIPATOR/SUIT TEMP control in 7 and allow voltage to stabilize. Check for 5.6 to 6.8 volts dc. {5}

x. Place ANTICIPATOR/SUIT TEMP control in 6. After 1 minute, check that voltage is 2.4 to 4.5 volts dc and slowly decreasing. {5}

y. Place ANTICIPATOR/SUIT TEMP control in 7 and allow voltage to stabilize. Check for 5.6 to 6.8 volts dc. {5}

z. Place ANTICIPATOR/SUIT TEMP control in 8. After 1 minute, check that voltage is 7.9 to 9.9 volts dc and slowly increasing. {5}

aa. Place test set PWR switch in OFF.

ab. Disconnect external electrical power.

ac. Disconnect all test cables from test set and electrical suit temperature control.

ad. Connect electrical connector P2075 to electrical suit temperature control.

ae. Close access 2212-7.

af. Disconnect test cable W5 from ARW-77 test receptacle, if used, and close access 1232-1.

4-16. ELECTRICAL SUIT TEMPERATURE CONTROL REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	*Part Number*	*Nomenclature*	*Use and Application*
		Equipment required for engine operation	Check electrical suit temperature control after installation

4-17. REMOVAL.

a. Open access 2212-7.

b. Disconnect electrical connector.

c. Remove four bolts and washers securing electrical suit temperature control to mounting bracket.

d. Remove electrical suit temperature control from airplane.

4-18. INSTALLATION.

a. Position electrical suit temperature control to mounting bracket.

b. Install four bolts and washers which secure electrical suit temperature control to mounting bracket and tighten.

c. Connect electrical connector.

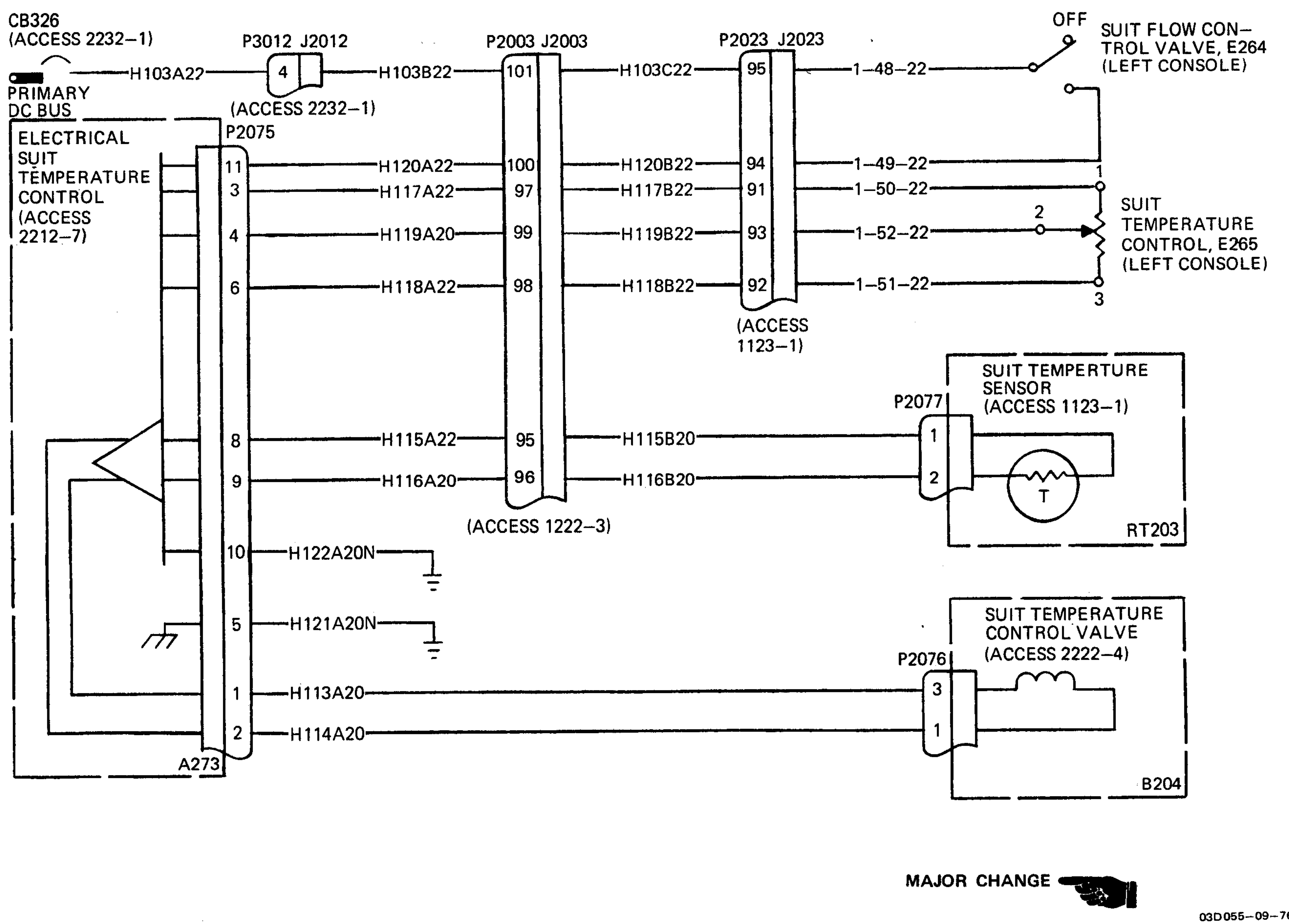

Figure 4-2. Pilot Suit Cooling System Electrical Troubleshooting Schematic Diagram
(Airplanes Through AF69-6196)

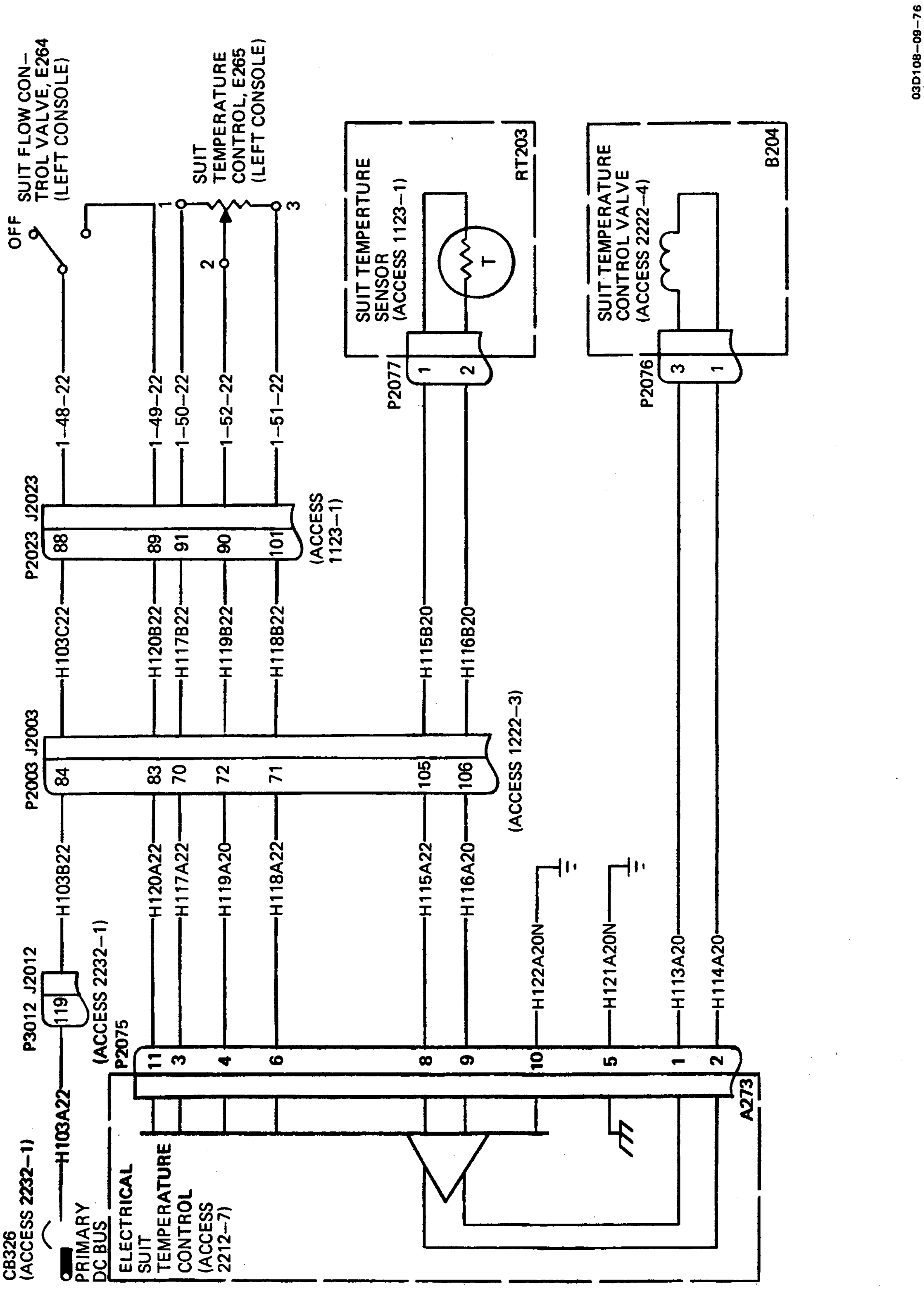

Figure 4-3. Pilot Suit Cooling System Electrical Troubleshooting Schematic Diagram (Airplanes AF69-6197 and Subsequent)

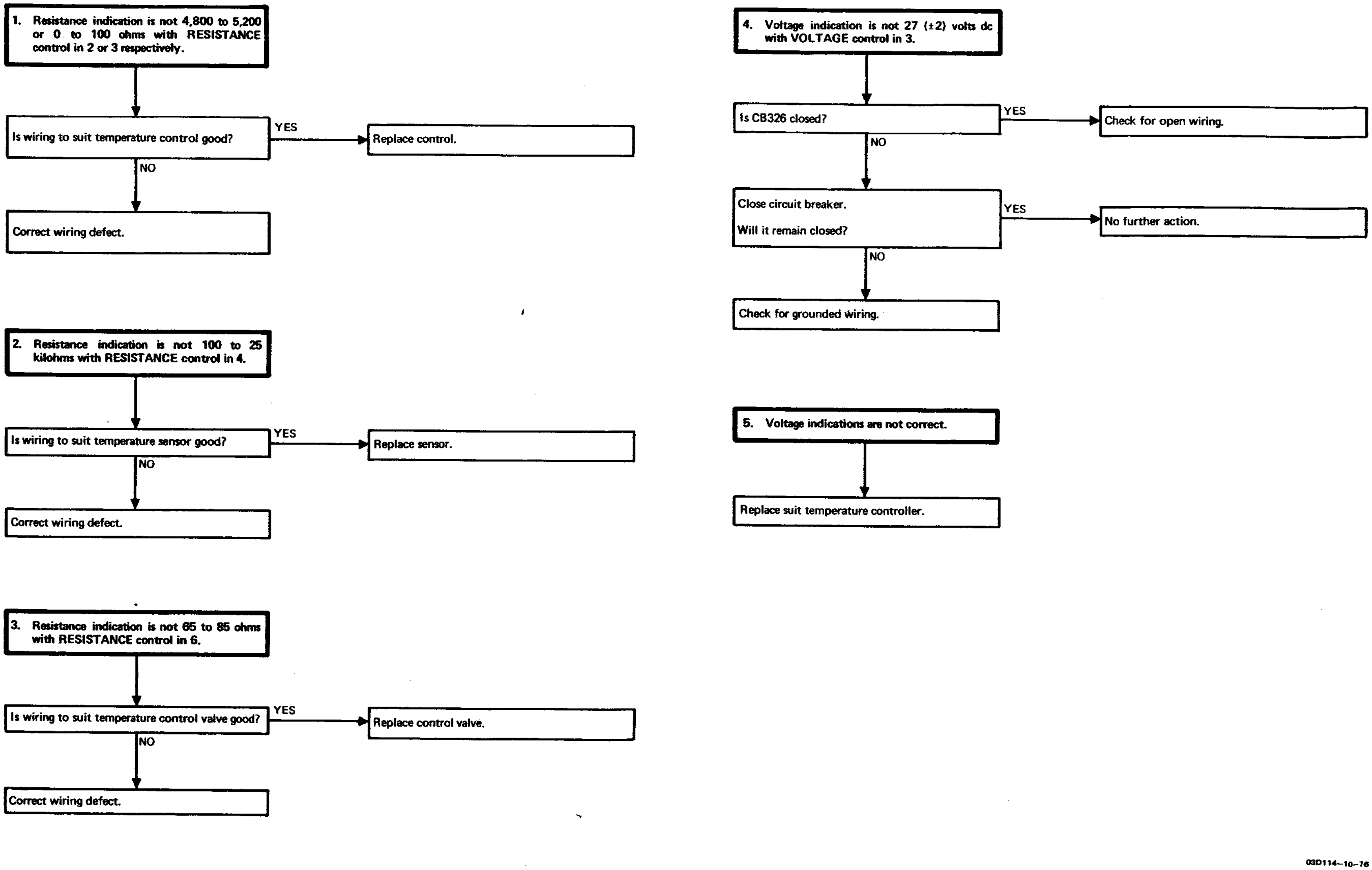

Figure 4-5. Pilot Suit Cooling Electrical System Troubleshooting

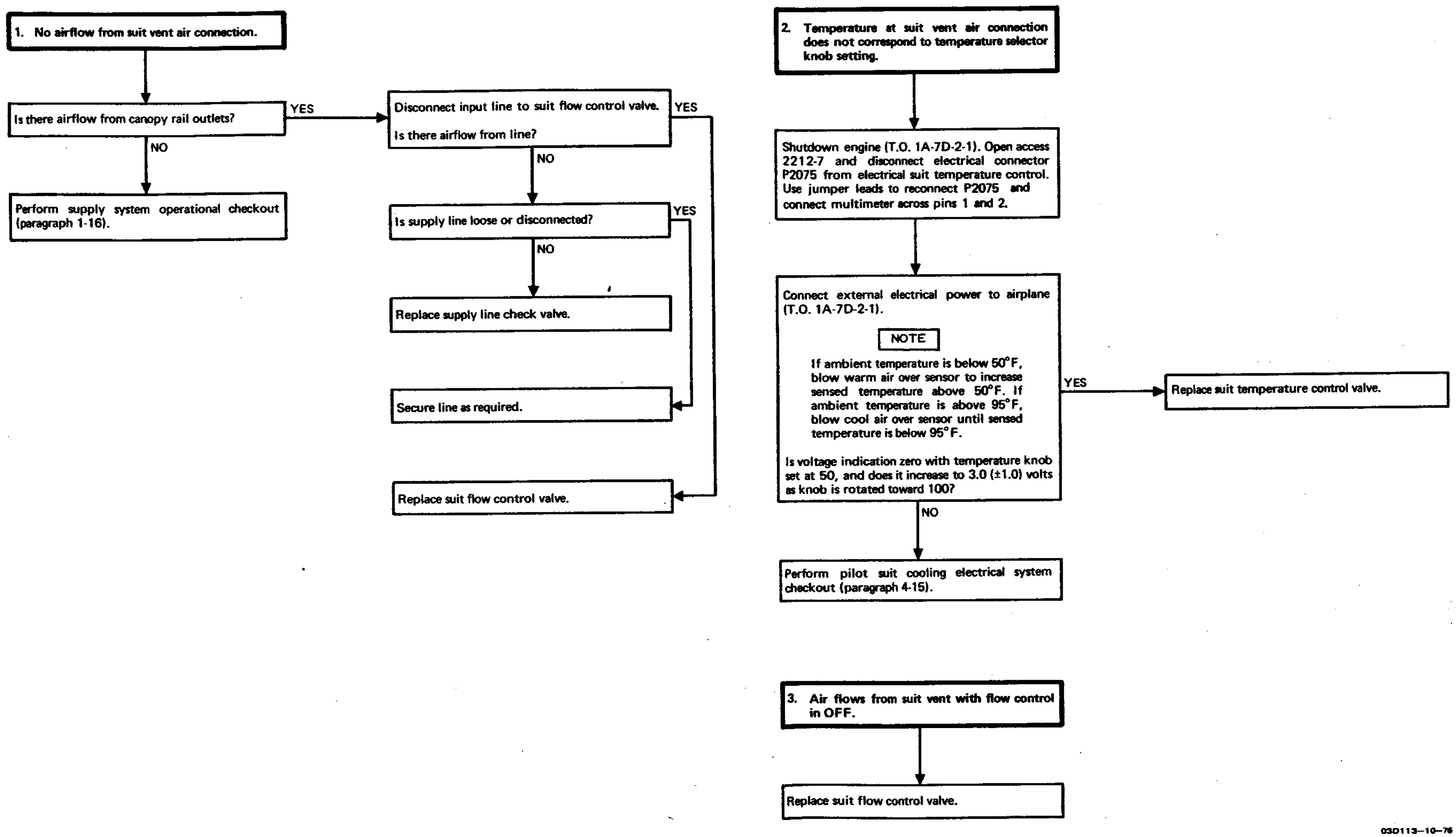

Figure 4-4. Pilot Suit Cooling System Troubleshooting

d. Close access 2212-7.

e. Perform pilot suit cooling system operational checkout (paragraph 4-12).

4-19. SUIT TEMPERATURE CONTROL VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Check pilot suit temperature control valve after installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

4-20. REMOVAL.

a. Disconnect lower link from right nosewheel door (T.O. 1A-7D-2-7).

b. Open accesses 2212-6 and 2222-4.

c. Remove ejector air valve (paragraph 1-30).

d. Disconnect electrical connector.

e. Disconnect control air line.

f. Loosen nut and disconnect upper hot air line.

g. Remove coupling and gasket and disconnect lower hot air line below mounting bracket.

h. Lift control valve from mounting bracket and remove from airplane.

4-21. INSTALLATION.

a. Position suit temperature control valve to mounting bracket.

b. Using new gasket, install coupling and connect lower hot air line to control valve.

c. Tighten coupling to 40 ($\pm$2) pound-inches torque.

d. Connect upper hot air line to control valve and tighten nut.

e. Connect control air line.

f. Connect electrical connector.

g. Install ejector air valve (paragraph 1-30).

h. Perform pilot suit cooling system operational checkout (paragraph 4-12).

i. Close accesses 2212-6 and 2222-4.

j. Connect lower link to right nosewheel door (T.O. 1A-7D-2-7).

4-21A. SUIT TEMPERATURE CONTROL VALVE REPAIR. (See figure 4-6.)

a. Open access 2222-4.

b. Disconnect electrical connector from duct temperature anticipator.

c. Remove ejector air valve (paragraph 1-30).

d. Disconnect electrical connector (1).

e. Disconnect control pressure line (2).

f. Remove screws (3) and washers (4).

g. Remove torque motor (5).

h. Remove packing (6) and discard.

i. Remove elbow (7), nut (8), and packing (9) from torque motor (5). Discard packing.

j. Install nut (8) and new packing (9) on elbow (7) and install elbow in replacement torque motor (5).

k. Install new packing (6) and install torque motor (5) with screws (3) and washers (4).

l. Connect control pressure line (2) and electrical connector (1).

m. Install ejector air valve (paragraph 1-30).

n. Connect electrical connector to duct temperature anticipator.

o. Perform pilot suit cooling system operational checkout (paragraph 4-12).

p. Close access 2222-4.

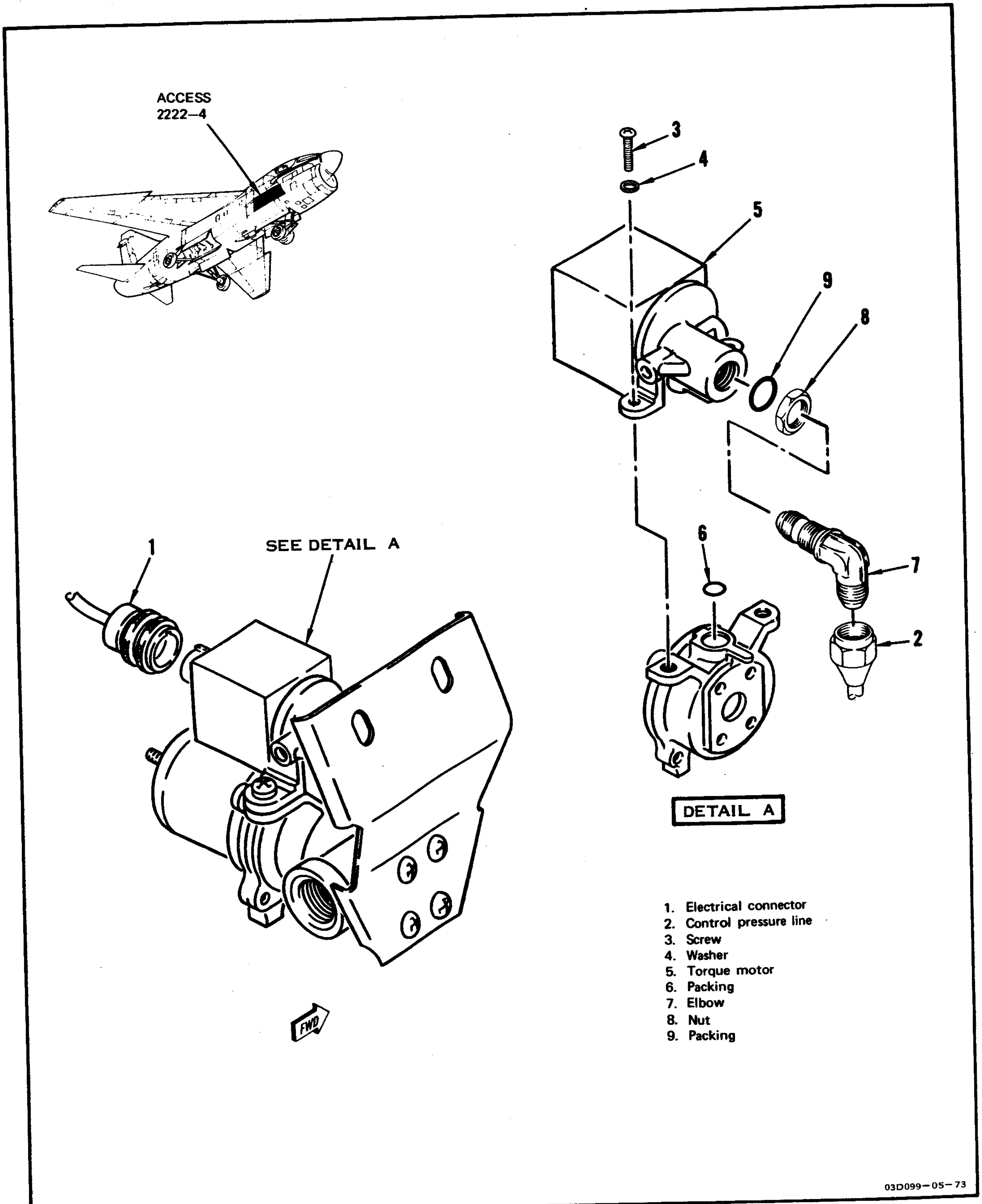

Figure 4-6. Suit Temperature Control Valve Repair

4-22. SUIT TEMPERATURE SENSOR REMOVAL AND INSTALLATION.

4-23. REMOVAL.

a. Open access 1123-1.

b. Remove electrical connection from suit temperature sensor.

c. Cut lockwire securing suit temperature sensor, and unscrew and remove suit temperature sensor from cooling duct.

4-24. INSTALLATION.

a. Position suit temperature sensor in suit cooling duct.

b. Tighten suit temperature sensor and secure with MS20995C20 lockwire.

c. Connect electrical connection.

d. Perform pilot suit cooling system operational checkout (paragraph 4-12).

e. Close access 1123-1.

4-25. SUIT TEMPERATURE CONTROL REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Check suit temperature after suit temperature control installation

4-26. REMOVAL.

a. Remove suit flow control knob and suit air temperature selector knob.

b. To facilitate suit vent panel removal, release fasteners securing panel forward of suit temperature control panel.

c. Release four fasteners securing suit vent panel to left console and lift suit vent panel out.

d. Disconnect electrical leads from suit temperature control.

e. Remove nut and washer securing suit temperature control to suit vent panel.

f. Remove suit temperature control from panel.

4-27. INSTALLATION.

a. Position suit temperature control in suit vent panel.

b. Install nut and washer, securing suit temperature control to suit vent panel and tighten.

NOTE

When connecting electrical leads, ensure base nut is tight against the control body.

c. Connect electrical leads to suit temperature control.

d. Position suit vent air panel in left console.

e. Install four fasteners securing suit vent panel to left console.

f. Secure panel forward of suit temperature control panel.

g. Install suit flow control knob and suit air temperature selector knob.

h. Perform pilot suit cooling system operational checkout (paragraph 4-12).

4-28. SUIT FLOW CONTROL VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting air-conditioning cooling unit	Check flow control valve after installation

4-29. REMOVAL.

a. Remove suit flow control knob and suit air temperature selector knob.

b. To facilitate suit vent panel removal, release fasteners securing panel forward of suit vent air panel.

c. Release four fasteners securing suit vent air panel to left console and lift out.

d. Loosen clamps securing control air lines and remove lines.

e. Remove nut, washers, and screws securing suit flow control valve to suit vent air panel.

f. Disconnect electrical wiring from valve.

g. Remove suit flow control valve from panel.

4-30. INSTALLATION.

a. Position suit flow control valve to panel.

a-1. Connect electrical wiring to valve.

b. Install nut, washer, and screws securing suit flow control valve to suit vent air panel.

c. Install lines to suit flow control valve.

d. Connect ground cooling air supply (T.O. 1A-7D-2-1).

e. Check line connections at flow control valve to ensure that no leaks are present.

f. Secure suit control panel to left console with four fasteners.

g. Secure panel forward of suit vent air panel.

h. Install suit flow control knob and suit air temperature selector knob.

i. Rotate suit flow control knob from OFF to HIGH and check that airflow from suit vent connection increases.

j. Disconnect ground cooling air supply.

SECTION V

GROUND COOLING SYSTEM

5-1. DESCRIPTION.

5-2. When the airplane engine is not operating, the ground cooling system provides cooling air from an external ground cooling unit. Cooling air from the external ground cooling unit is supplied to the cockpit, antiexposure suit, camera compartment, radar signal data converter, and specific equipment in the avionic compartments. Much of the ducting through which the cooling air is directed is common to other air-conditioning subsystems. Ground cooling system components consists of the ground cooling air socket, system check valve, and ducting.

5-3. For system arrangement, see figure 1-2.

5-4. OPERATION. (See figure 5-1.)

5-5. When the air-conditioning ground cooling unit is connected to the ground cooling air socket, cooling air flows through air-conditioning ducts to the antiexposure suit, cockpit, radar signal data converter, camera compartment, and specific equipment in the avionic compartments. In the avionic compartments, conditioned air is routed to electronic equipment requiring a direct supply of cooling air. To cool the antiexposure suit, the air is directed through the suit flow control valve to the suit vent air connection. Airflow to the suit can be controlled from OFF to HIGH by adjustment of the suit flow control knob; suit air temperature can be controlled only at the ground cooling unit.

5-6. Cooling air is also directed to the air-conditioning ducts leading to the canopy rail vents and windshield defog vents where it is discharged into the cockpit. Air also enters the cockpit through two floor inlets controlled by the floor inlet shutoff valve.

5-7. During ground operation with the canopy closed, the radar in the nose cone is cooled in the normal manner by cockpit air being vented into the nose cone by the cockpit pressure regulator. Ground cooling of the forward-looking radar, when the canopy is open, is accomplished by opening the nose cone to allow air circulation around the radar.

5-8. During ground operation, air temperature and airflow to the cockpit, radar signal data converter, avionic compartments, and camera compartment are controlled by the ground cooling unit.

5-9. The loss of air-conditioning air through the ground cooling system during operation of the airplane air-conditioning supply system is prevented by a check valve installed in the duct downstream from the ground cooling air socket.

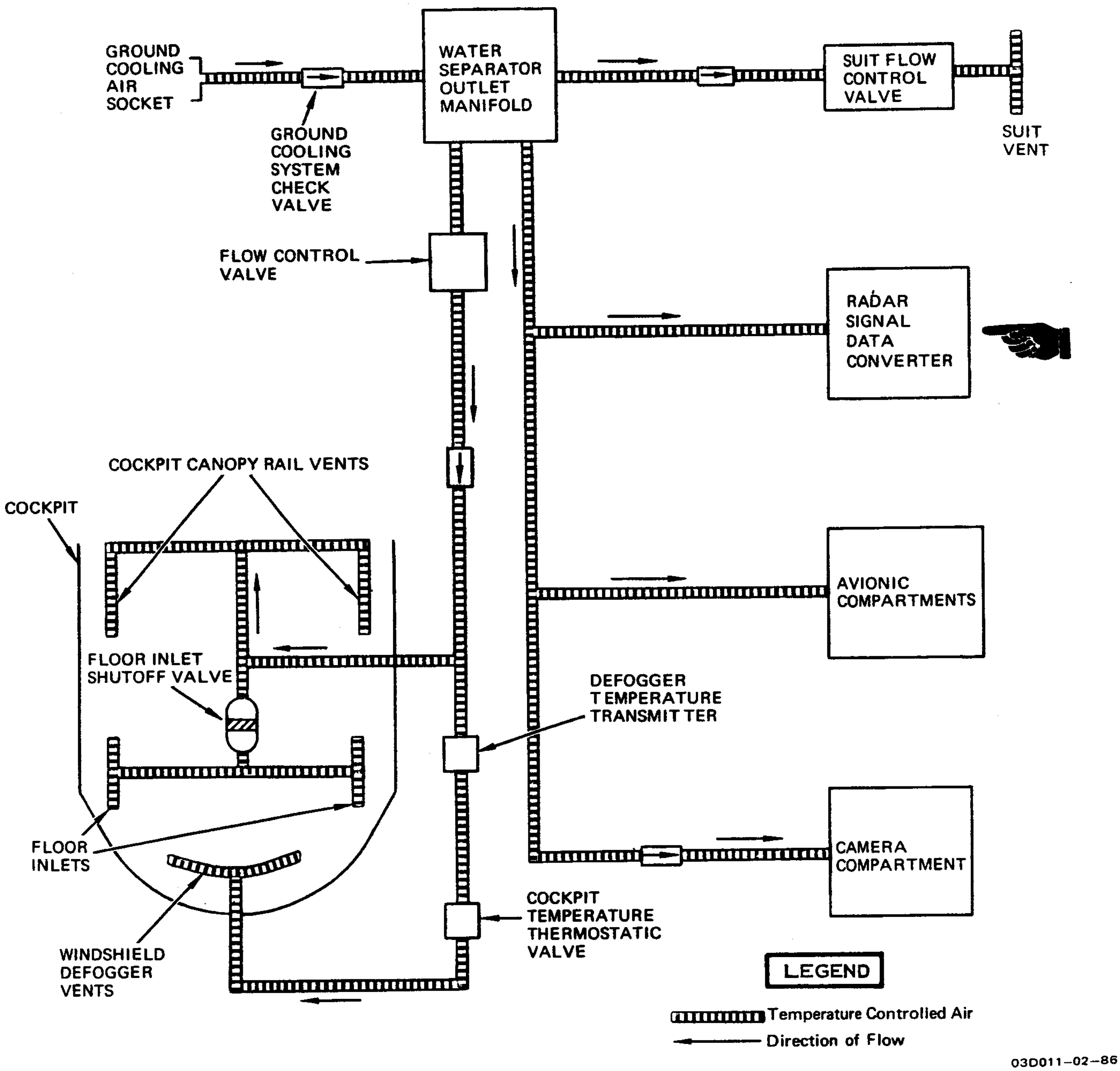

Figure 5-1. Ground Cooling System Flow Diagram

5-10. COMPONENTS.

5-11. For a list of system components, their locations (accesses), and functions, refer to table 5-1.

5-12. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine during ground cooling socket operational checkout
	Equipment required for connecting air-conditioning unit		Check ground cooling system during operational checkout

NOTE

A number, or numbers, enclosed in braces at the end of a step in the following test is a reference to a corresponding number in troubleshooting figure 5-1A.

a. Open access 2232-1.

b. Start engine (T.O. 1A-7D-2-1) and operate 80% rpm. Check that no air flows from ground cooling socket. {1}

c. Shut down engine (T.O. 1A-7D-2-1).

d. Connect external ground cooling unit (T.O. 1A-7D-2-1). Start ground cooling unit.

e. Close canopy. Check for airflow from cockpit canopy rail vents. {2}

f. Shut down and disconnect ground cooling unit (T. O. 1A-7D-2-1).

g. Close access 2232-1.

5-13. TROUBLESHOOTING. (See figure 1-5.)

5-14. Refer to figure 5-1A for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

Table 5-1. Ground Cooling System Components

Component	Access	Function
Socket, ground cooling air	Lower right fuselage midsection	Provides airplane connection point for external source of cooling air.
Valve, check	2212-6 and 2222-4	Prevents loss of air-conditioning supply system air through ground cooling air socket.

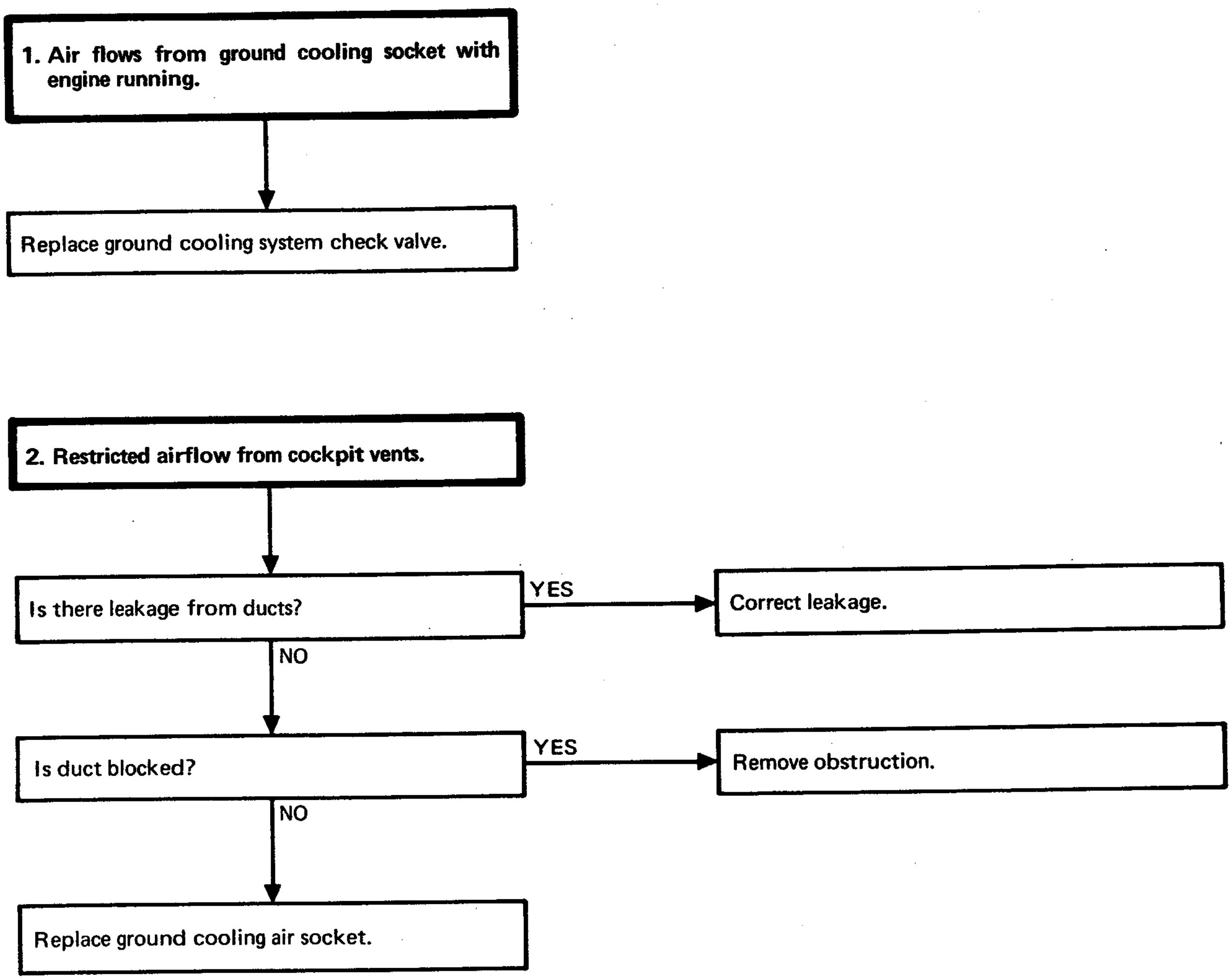

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Figure 5-1A. Ground Cooling System Troubleshooting

5-15. GROUND COOLING AIR SOCKET REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	*Part Number*	*Nomenclature*	*Use and Application*
		Equipment required for connecting air-conditioning unit	Check ground cooling air socket after installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

5-16. REMOVAL. (See figure 5-2.)

a. Open access 2233-1.

b. Cut lockwire and loosen couplings (1 and 2) at upper and lower ends of duct (3).

c. Remove couplings, duct, sleeve (4), split rings (5), and O-ring (6) from airplane.

d. Remove six screws (7) and remove ground cooling air socket (8) from airplane.

5-17. INSTALLATION. (See figure 5-2.)

a. Position ground cooling air socket (8) in airplane and install six screws (7).

b. Install coupling (2), new O-ring (6), and split rings (5) on lower end of duct.

c. Install new sleeve (4) and coupling (1) on upper end of duct.

d. Position duct in airplane and connect couplings.

e. Tighten coupling (2) to 48 (± 12) pound-inches torque and secure with MS20995C32 lockwire.

f. Tighten coupling (1) to 40 (±5) pound-inches torque.

g. Connect external ground cooling unit to airplane (T.O. 1A-7D-2-1).

h. Apply external cooling air and check for air leaks around socket and duct connections.

i. Shut down and disconnect ground cooling unit (T. O. 1A-7D-2-1).

j. Close access 2233-1.

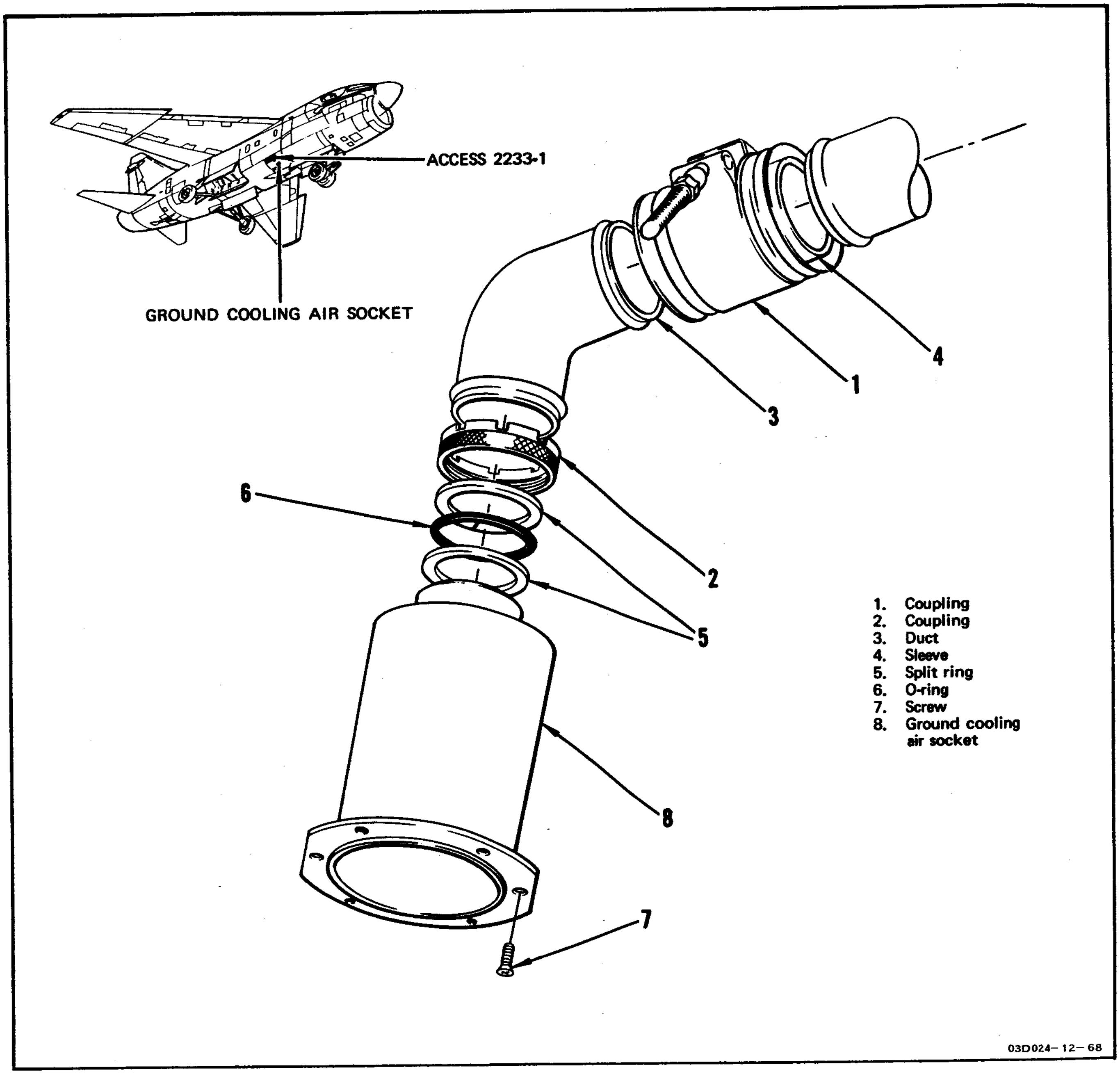

Figure 5-2. Ground Cooling Air Socket Removal and Installation

SECTION VI
DEFOG SYSTEM

6-1. DESCRIPTION.

6-2. The defog system provides hot air at a constant temperature to prevent or remove fog and frost from the interior surface of the windshield. The system is actuated by the defog switch. Hot air from the hot-air manifold flows through the defog valve, mixes with cooled air, and flows to the windshield defog vents. Operation of the defog valve is controlled by the defog temperature transmitter and anticipator. Defog system components are the defog valve, defog temperature transmitter, defog switch, temperature anticipator, and ducting.

6-3. For system controls and indicators, see figure 1-1. For system arrangement, see figure 1-2.

6-4. OPERATION. (See figure 6-1.)

6-5. Placing the cockpit pressure switch in CABIN PRESS, with the engine operating, places the air-conditioning supply system in operation. Temperature-controlled air is delivered to the cockpit through the canopy rail vents, the windshield vents, and the floor inlets. When windshield defogging or defrosting is needed, placing the defog switch in DEFOG opens the defog valve to start hot air flowing to the windshield.

6-6. When placed in DEFOG, the defog switch connects control air from the control air manifold to the defog valve and the defog temperature transmitter and anticipator. The control air pressure acts on the defog valve actuator to open the valve, admitting hot air from the hot-air manifold into the air ducts to the windshield. Control air pressure opens the valve. Low or zero control air pressure allows the valve to close.

6-7. Pressure on the defog valve is controlled by the defog temperature anticipator and temperature transmitter. With the temperature in the defog duct below approximately 170°F, all control air pressure is applied to the defog valve, fully opening the valve. As the temperature in the duct rises above 170°F, the control air pressure to the defog valve is vented by the anticipator and transmitter, reducing the defog valve pressure and moving the valve toward the closed position. The valve opens when a low temperature is sensed. The transmitter and anticipator are designed to hold the temperature of the air flowing to the windshield at 180° (±10°)F. During normal air-conditioning system operation, approximately 25% to 30% of total airflow to the cockpit passes through the defog duct. At high altitudes (30,000 feet and above) and with corresponding low ambient temperatures, it is possible during the normal process of heating the cockpit to raise the defog duct temperatures above that which limits defog operation. Under these conditions defog may not turn on when selected because of normal thermostat limiting operation. This is not a discrepant condition.

6-8. When the defog switch is in OFF, control air pressure to the defog valve is vented and the valve closes. The valve also closes to prevent overtemperature operation of the system if control air pressure is lost.

6-9. Additional overtemperature protection is provided by the cockpit temperature thermostatic valve in the windshield inlet air duct. The valve prevents extremely hot air from blowing on the windshield and canopy. When the temperature around the cockpit thermostatic valve reaches 210°(+10°,-5°)F, the temperature sensor (integral to the valve) opens the valve and control air pressure vents from the cockpit temperature control valve. The cockpit temperature control valve will close, allowing more cold air to the cockpit. When the temperature decreases, the thermostatic valve closes allowing control air pressure to open the cockpit temperature control valve.

6-10. COMPONENTS.

6-11. For a list of system components, their locations (accesses), and functions, refer to table 6-1.

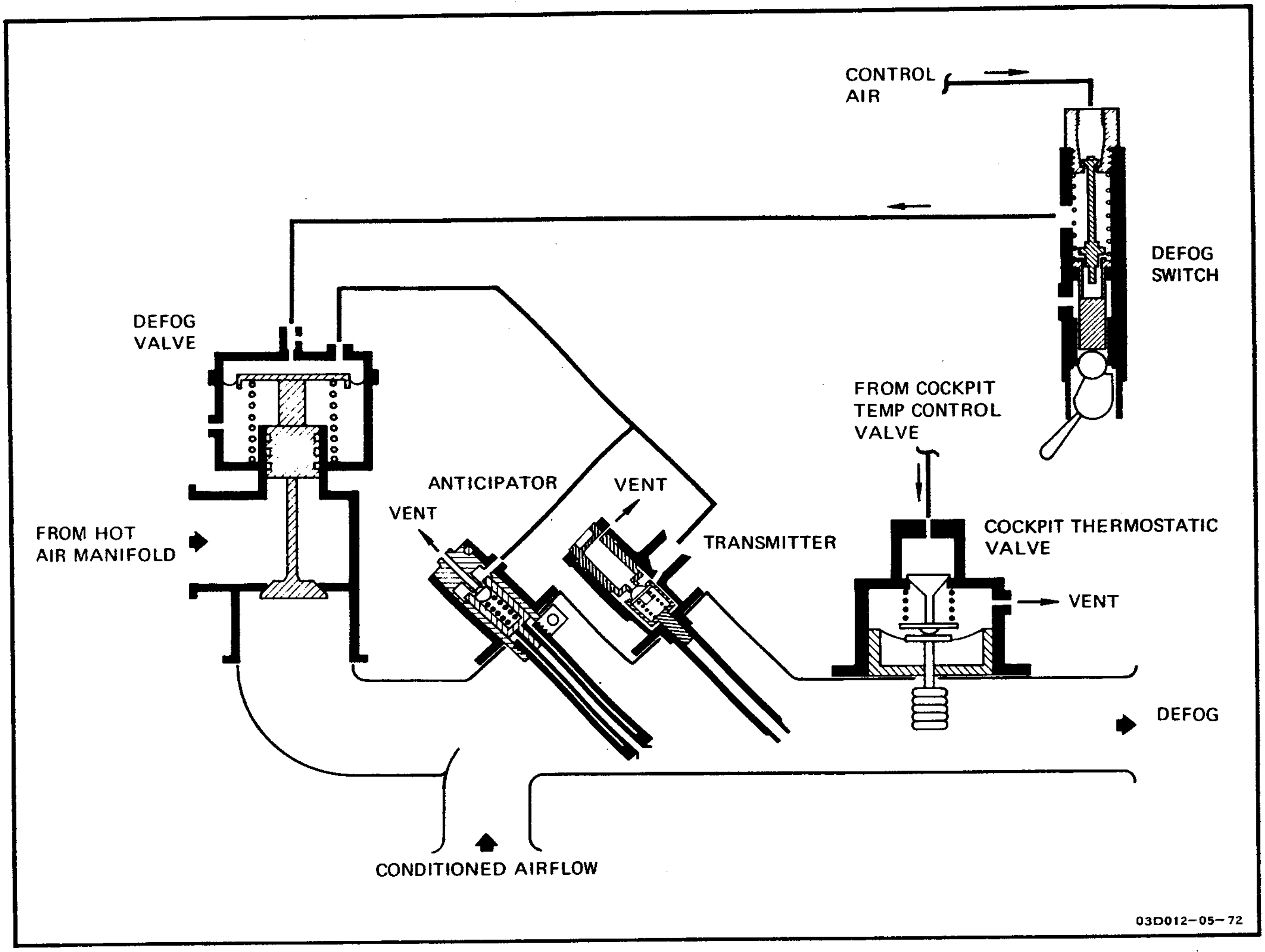

Figure 6-1. Defog System Schematic Diagram

Table 6-1. Defog System Components

Component	Access	Function
Anticipator, defog temperature	2222-4	Senses rapid inlet duct temperature changes and regulates control air to open and close the defog valve to eliminate temperature surges.
Switch, defog	Environmental control panel	Admits control air pressure to the defog valve.
Transmitter, defog temperature	2222-4	Maintains defog air temperature at 180° (±10°)F by regulating control air pressure to open and close the defog valve.
Valve, defog	2212-6 and 2222-4	Controls the amount of hot air entering defog system duct from the hot-air manifold.

6-12. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine during operational checkout of defog system
	Thermometer, 0° to 250°F	71275(United States Gauge, Division of Ametek, Inc., Sellersville, Pa.)	Check defog temperature

NOTE

A number, or numbers, enclosed in braces at the end of a step in the following test is a reference to a corresponding number in troubleshooting figure 6-2.

a. Start engine. (T.O. 1A-7D-2-1) and operate at 80% rpm.

b. Close and lock canopy.

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from ram air exhaust duct after placing cockpit pressure switch in CABIN PRESS. If no flow occurs, place switch in CABIN DUMP, and troubleshoot air-conditioning supply system.

c. Position cockpit environmental control panel controls as follows:

Control	*Position*
Cockpit temperature control knob	COLD
Cockpit pressure switch	CABIN PRESS
Rain removal switch	OFF
Defog switch	OFF
Manual override switch	AUTO

CAUTION

If defog inlet air temperature exceeds 230°F for more than 15 seconds, return defog switch to OFF to prevent damage to windshield and troubleshoot cockpit air temperature system.

d. Place defog switch in DEFOG. Using thermometer, check that air at windshield defog vent becomes hot and temperature stabilizes at 180° (+20°,-40°)F. {1, 2, and 3}

e. Place defog switch in OFF. Check that air at windshield defog vents returns to canopy rail inlet temperature. {4}

f. Place cockpit pressure switch in CABIN DUMP.

CAUTION

Ensure that cockpit is completely depressurized before opening canopy. A positive check may be accomplished by opening emergency vent air scoop.

g. Open canopy.

h. Shut down engine (T.O. 1A-7D-2-1).

6-13. TROUBLESHOOTING. (See figures 1-4 and 1-5.)

6-14. Refer to figure 6-2 for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the defog system operational checkout.

6-15. DEFOG VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational check of defog valve after installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings
	413-900-020	Torque wrench, 100 to 750 pound-inches (American Tool and Engineering Co., Kalamazoo, Mich.)	Tighten connection

6-16. REMOVAL.

a. Disconnect lower link from right nosewheel door (T.O. 1A-7D-2-7).

b. Open accesses 2212-6 and 2222-4.

c. Disconnect two control air lines.

d. Remove coupling and gasket securing defog valve to defog duct.

e. Loosen nut and disconnect line from hot-air manifold.

f. Remove two bolts securing defog valve mounting bracket to I-beam.

g. Remove defog valve and mounting bracket from airplane.

h. Remove four bolts, nuts, and washers securing defog valve to mounting bracket.

6-17. INSTALLATION.

a. Secure defog valve to mounting bracket with four bolts, washers, and nuts.

b. Position defog valve and mounting bracket to I-beam. Install two bolts and tighten.

c. Connect line to hot-air manifold and tighten nut to 675 (±25) pound-inches torque.

d. Position defog duct to defog valve.

e. Install coupling and new gasket and tighten coupling to 72 (±12) pound-inches torque. Tap coupling once lightly with plastic or rawhide mallet at several points around the outside band. Check that torque remains 72 (±12) pound-inches.

f. Connect two control air lines and tighten.

g. Perform defog system operational checkout (paragraph 6-12).

h. Check for air leaks around defog valve.

i. Close accesses 2212-6 and 2222-4.

j. Connect lower link to right nosewheel door (T.O. 1A-7D-2-7)

6-18. DEFOG TEMPERATURE TRANSMITTER REMOVAL AND INSTALLATION.

6-19. REMOVAL.

a. Open access 2222-4.

b. Disconnect control air line from temperature transmitter.

c. Remove two screws and washers securing temperature transmitter to defog duct.

d. Remove defog temperature transmitter and gasket from defog duct.

6-20. INSTALLATION.

a. Using new gasket, install defog temperature transmitter in defog duct.

b. Install two screws and washers securing defog temperature transmitter to defog duct and tighten.

c. Perform defog system operational checkout (paragraph 6-12).

d. Check for air leaks around temperature transmitter.

e. Close access 2222-4.

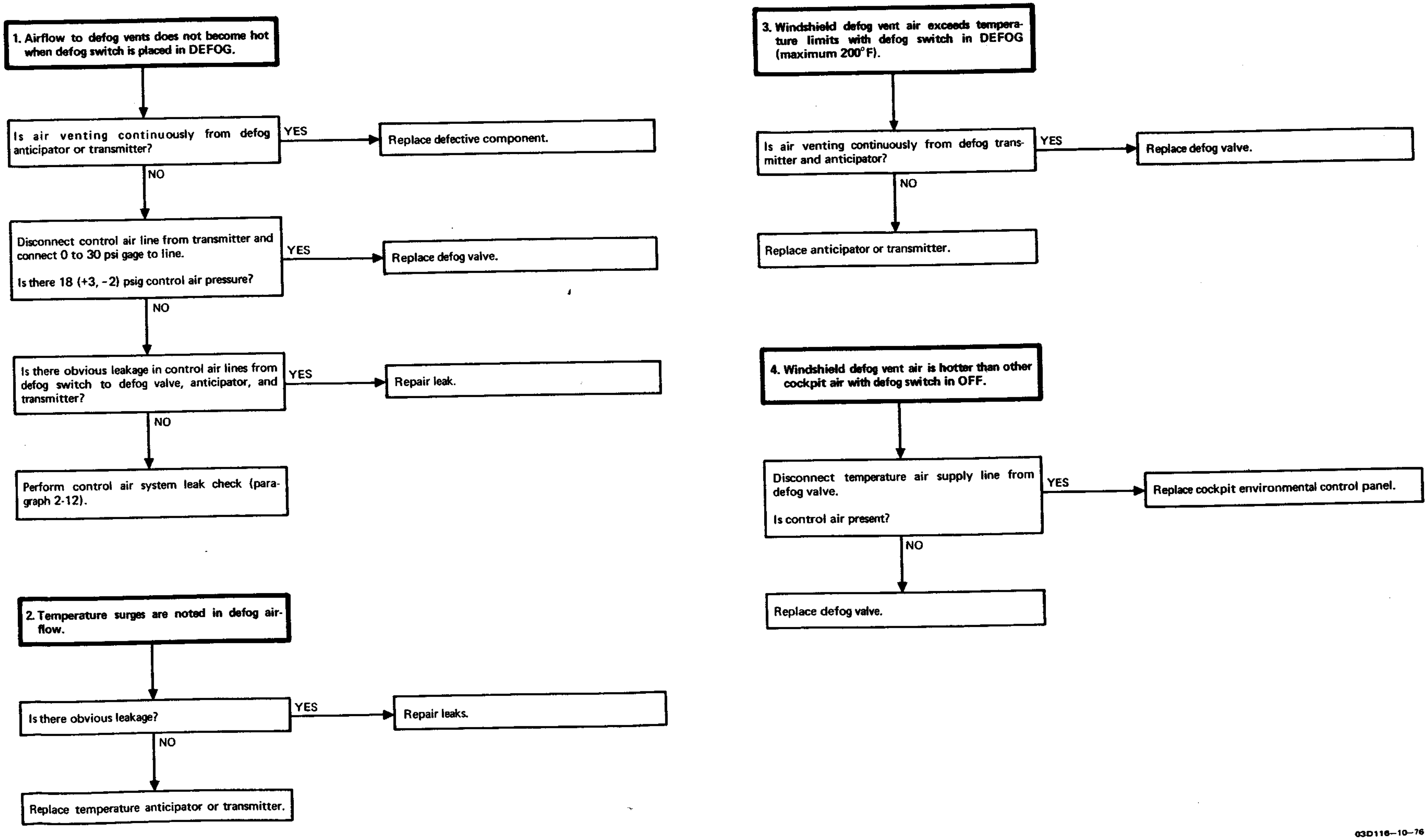

Figure 6-2. Defog System Troubleshooting

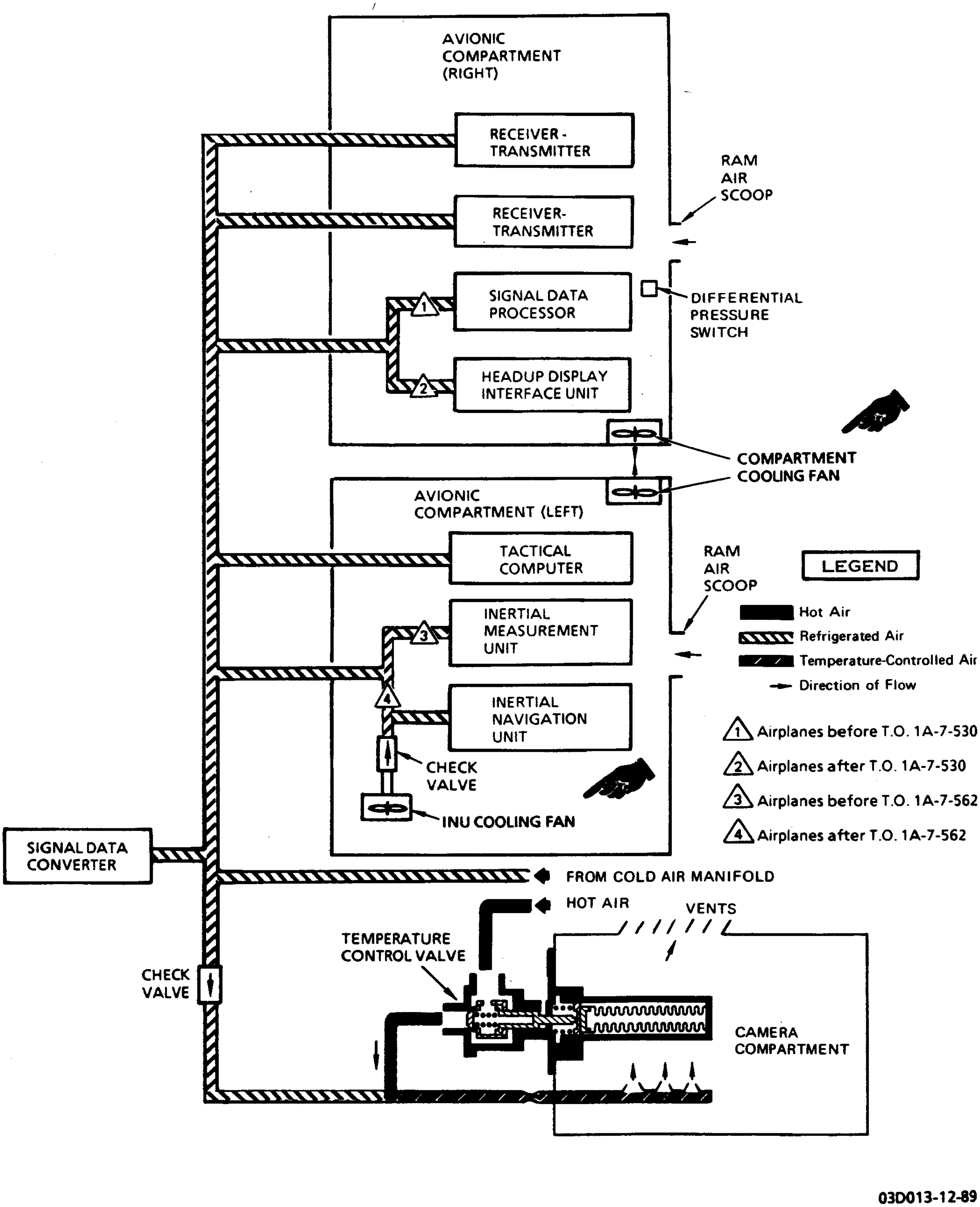

Figure 7-1. Electronic Equipment and Camera Compartment Cooling System Schematic Diagram

SECTION VII
ELECTRONIC EQUIPMENT AND CAMERA COMPARTMENT COOLING SYSTEM

7-1. DESCRIPTION.

7-2. The cooling air system provides cooling for the electronic equipment in both right and left avionic compartments and the radar signal data converter in the midequipment compartment. Cooling air is provided directly to the UHF radio receiver-transmitter, the VHF radio receiver-transmitter, the head-up display (HUD) signal data processor (airplanes before T.O. 1A-7-530), the HUD interface unit (airplanes after T.O. 1A-7-530), the inertial measurement unit (airplanes before T.O. 1A-7-562), the inertial navigation unit (airplanes after T.O. 1A-7-562), and the tactical computer. Cooling air is provided directly to these equipment items from the air-conditioning supply system to ensure adequate cooling at all times. On airplanes after T.O. 1A-7-562, a vaneaxial fan provides cooling air directly to the inertial navigation unit whenever the air-conditioning supply system is not operating.

7-3. Cooling of other equipment in the avionic compartments is provided by a ram air system which is supplemental by vaneaxial compartment fans. Ground cooling of electronic equipment, except for the equipment cooled directly from the air-conditioning supply system, is accomplished by convection if the compartment doors are open. When the compartment doors are closed, the vaneaxial compartment fans provide cooling air.

7-4. Camera compartment cooling is provided by refrigerated air from the air-conditioning supply system mixed with hot engine bleed air and directed into the compartment. Temperature in the compartment is controlled by regulating the flow of hot air. The camera compartment consists of the camera temperature control valve, mixing manifold, and compartment nozzle.

7-5. For system controls and indicators, see figure 1-1. For system arrangement, see figure 1-2.

7-6. OPERATION. (See figure 7-1.)

7-7. Placing the cockpit pressure switch in CABIN PRESS, when the engine is operating, initiates operation of the air-conditioning supply system. Refrigerated air is ducted to the electronic equipment receiving direct cooling (paragraph 7-2). The air flows through the units into the avionic compartments to aid in cooling the compartments. Refrigerated air is also ducted to the radar signal data converter in the midequipment compartment. For ground cooling requirement of avionic equipment, refer to T.O. 1A-7D-2-1.

7-8. The electronic equipment in the right and left avionic compartments, except for the equipment cooled directly from the air-conditioning supply system, is ram air cooled. The ram air systems of the right and left avionic compartments are identical. For positive flow, ram air enters the aft end of the upper levels of each compartment through a scoop which ducts ram air from the engine air inlet duct. The cooling air flows forward, around the equipment on the upper shelf, and exhausts to the lower shelf through holes in the forward end of the upper shelf. The holes are spaced to prevent dead air spaces on the lower shelf.

7-9. The cooling air flows aft through the lower shelf and exhausts overboard through a louvered exit in the compartment door. A vaneaxial compartment fan is contained in the exhaust duct of each compartment. When air pressure in the engine inlet duct is above compartment pressure, positive flow ram air cooling occurs as described. When compartment pressure is above inlet duct pressure, reverse flow cooling occurs.

7-10. When the differential air pressure between the inlet duct and the compartments is near zero, a cooling airflow is provided by the vaneaxial compartment fan in the exhaust ducts. Differential pressure is sensed by a compartment cooling differential pressure switch near the right compartment ram air scoop. When a differential air pressure near zero is sensed, the switch connects 28-volt dc power from the secondary dc bus to the avionic compartment fan relay. The closed relay contacts connect 115 volts ac to the right and left avionic compartment door switches. With the doors closed, power is connected to the vaneaxial compartment fans which draw air from the engine air inlet duct, through the compartment, and exhaust it overboard. Because two-phase operation of the fan motors can result in damage to the fans the fan circuit breakers should not be opened or closed when external electrical power is connected to the airplane. If it becomes necessary to open or close the circuit breakers with external electrical power connected to the airplane, use the order designated in the maintenance procedures.

7-11. On airplanes after T.O. 1A-7-562, a vaneaxial fan provides cooling air directly to the inertial navigation unit (INU) whenever the air conditioning supply system is not operating. Fan operation is controlled by a pressure switch (A261) that senses pressure in the refrigeration unit cold air outlet duct. When outlet pressure is below 1 psi, the switch connects 28-volt dc power from the secondary dc bus to the coil of relay A301K3. The closed relay contacts connect 115 volts ac to the INU fan, causing the fan to come on. When cold air outlet pressure at the refrigeration unit exceeds 2 psi, the switch deactivates relay A301K3, causing the fan to shut off. A check valve in the ducting system between fan and INU prevents refrigerated air from escaping through the fan when the fan is not operating.

7-12. Placing the cockpit pressure switch in CABIN PRESS, when the engine is operating, initiates operation of the air-conditioning supply system. Refrigerated air for camera compartment cooling is ducted from the conditioned-air manifold to the camera compartment where it mixes with hot air and is then directed into the camera compartment by a nozzle. The hot air flows through the temperature control valve before mixing with the refrigerated air. Camera compartment temperature is controlled by air venting from the compartment and flowing around the camera compartment temperature control valve. The temperature sensor (integral to the valve) will open or close the temperature control valve to control the amount of hot air being mixed with refrigerated air.

7-13. COMPONENTS.

7-14. For a list of system components, their locations (accesses), and functions, refer to table 7-1.

Table 7-1. Electronic Equipment and Camera Compartment Cooling System Components

Component	Access	Function
Fan, compartment cooling (vaneaxial) (2)	1232-1 and 2232-1	Draws cooling air through the avionic compartments when actuated by differential pressure switch.
Fan, INU cooling (vaneaxial)[1]	1232-1	Forces cooling air from avionic compartment through inertial navigation unit when air-conditioning supply system is not operating.
Relay, compartment cooling fan	2232-1	Connects 115-volt, three-phase ac power to compartment cooling fans when energized by the differential pressure switch.
Relay, INU cooling fan[1]	1232-1	Connects 115-volt, three-phase ac power to INU cooling fan when energized by the pressure switch.
Scoop, ram air	Engine inlet duct	Directs ram air from engine inlet duct to upper level of avionic compartment for equipment cooling.
Switch, differential pressure (compartment cooling fan)	2232-1	Connects 28-volt dc power to energize compartment cooling fan relay when differential air pressure between engine inlet duct and avionic compartment is ± 4 in H_2O.
Switch, pressure (INU cooling fan)[1]	2222-4	Connects 28-volt dc power to energize INU cooling fan relay when refrigeration unit cold air output pressure is less than 1 psi.
Switch, right and left avionic compartment door	1232-1 and 2232-1	Disconnects 115-volt ac power to compartment cooling fan when compartment door is open.
Valve, camera compartment temperature control	6222-1	Maintains temperature of camera compartment at 80° (+10°, -15°)F by regulating amount of hot engine bleed air being mixed with refrigerated air flowing into the compartment.
Valve, check[1]	1232-1	Prevents INU refrigerated air from escaping through the cooling fan when the fan is not operating.

[1]Airplanes after T.O. 1A-7-562

7-15. OPERATIONAL CHECKOUT.

7-16. ELECTRONIC EQUIPMENT COOLING SYSTEM.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine during operational checkout of electronic equipment cooling system
	Equipment required for connecting external electrical power		Supply electrical power for operational checkout

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 figure 7-2B.

CAUTION

If compartment cooling fan circuit breakers are to be closed with external electrical power connected to the airplane or with engine operating, circuit breakers shall be closed in the following sequence to prevent damage to fans: CB386, CB3004, CB3021, and CB335.

On airplanes after T.O. 1A-7-562, if INU cooling fan circuit breakers are to be closed with external electrical power connected to the airplane or with engine operating, circuit breakers shall be closed in the following sequence: CB399, CB3001, CB3002, and CB335.

a. Check that accesses 1232-1 and 2232-1 are closed.

b. Start engine (T.O. 1A-7D-2-1) and operate at 80% rpm.

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from ram air exhaust duct after placing cockpit pressure switch in CABIN PRESS. If no flow occurs, place switch in CABIN DUMP, and troubleshoot air-conditioning supply system.

c. Place cockpit pressure switch in CABIN PRESS.

d. Check that compartment cooling fans are not operating. {1}

e. On airplanes after T.O. 1A-7-562, open access 1232-1 and check that INU cooling fan is not operating. {5}

f. On airplanes after T.O. 1A-7-562, check that refrigerated air is not escaping from aft end of INU cooling fan. {6}

g. Place cockpit pressure switch in CABIN DUMP.

h. On airplanes after T.O. 1A-7-562, check that INU cooling fan is operating. {7}

i. On airplanes after T.O. 1A-7-562, close access 1232-1.

j. Shut down engine (T.O. 1A-7D-2-1).

WARNING

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

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

l. Check that compartment cooling fans are operating. {2 and 3}

m. Open accesses 1232-1 and 2232-1 and check that compartment cooling fans are not operating. {4}

n. On airplanes after T.O. 1A-7-562, check that INU cooling fan is operating. {7}

CAUTION

If compartment cooling fan circuit breakers are to be opened with external electrical power connected to airplane, circuit breaker CB335 shall be opened first to prevent damage to fans.

On airplanes after T.O. 1A-7-562, if INU cooling fan circuit breakers are to be opened with external electrical power connected to the airplane, circuit breaker CB335 shall be opened first to prevent damage to fan.

o. Disconnect external electrical power.

p. Close accesses 1232-1 and 2232-1.

7-17. CAMERA COMPARTMENT COOLING SYSTEM.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine during operational checkout of camera compartment cooling system
	Thermometer, 0° to 250°F	71275 (United States Gauge, Division of Ametek, Inc., Sellersville, Pa.)	Check temperature of camera compartment

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 figure 7-2C.

a. Open access 6222-1.

b. Install thermometer into camera compartment exit louvers. Ensure that thermometer does not touch metal.

c. Start engine (T.O. 1A-7D-2-1) and operate at 25 inHg.

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from ram air exhaust duct after placing cockpit pressure switch in CABIN PRESS. If no flow occurs, place switch in CABIN DUMP, and troubleshoot air-conditioning supply system.

d. Position cockpit environmental control panel controls as follows:

Control	*Position*
Cockpit pressure switch	CABIN PRESS
Cockpit temperature control knob	MEDIUM
Manual override switch	AUTO
Rain removal switch	OFF
Defog switch	OFF

e. Verify that air flows from camera compartment louvers. {1}

f. Check that temperature of airflow art camera compartment exit stabilizes at 80° (+10°, -15°)F. {2}

g. Place cockpit pressure switch in CABIN DUMP. Verify that airflow stops from camera compartment exit louvers. {3}

h. Shut down engine (T.O. 1A-7D-2-1).

i. Remove thermometer from camera compartment exit louvers.

j. Close access 6222-1.

7-18. TROUBLESHOOTING.

7-19. ELECTRONIC EQUIPMENT COOLING SYSTEM. (See figures 7-2 and 7-2A.)

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Multimeter	AN/PSM-6	Check voltage

WARNING

Shut down external electrical power before disconnecting electrical connectors. Personnel could receive a severe shock, or arcing of contacts could cause a fire.

CAUTION

If compartment cooling fan circuit breakers are to be closed with external electrical power connected to airplane or with engine operating, circuit breakers shall be closed in the following sequence to prevent damage to fans: CB386, CB3004, CB3021, and CB335.

On airplanes after T.O. 1A-7-562, if INU cooling fan circuit breakers are to be closed with external electrical power connected to the airplane or with engine operating, circuit breakers shall be closed in the following sequence: CB399, CB3001, CB3002, and CB335.

NOTE

Voltage checks specified in figure 7-2B are performed with reference to ground except as noted. Ground connections can be made directly to airframe.

7-20. See figure 7-2B for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

7-21. CAMERA COMPARTMENT COOLING SYSTEM. See figure 7-2C for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

7-22. COMPARTMENT COOLING FAN REMOVAL AND INSTALLATION.

7-23. REMOVAL. (See figure 7-3.)

a. Open accesses 1232-1 or 2232-1.

b. Disconnect electrical connector (1) from compartment cooling fan.

c. Remove mounting bolts (2) and washers (3) securing fan (4) and remove fan from airplane.

7-24. INSTALLATION. (See figure 7-3.)

a. Position fan (4) in compartment so that electrical connector points down with access door closed.

b. Secure fan with four bolts (2) and washers (3) in accordance with MIL-B-5087A (ASC) for static discharge.

c. Connect electrical connector (1) to fan.

d. Perform electronic equipment cooling system operational checkout (paragraph 7-15).

7-25. COMPARTMENT COOLING DIFFERENTIAL PRESSURE SWITCH REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Furnish electrical power to airplane
		Equipment required for engine operation	Operate engine during operational checkout of differential pressure switch after installation

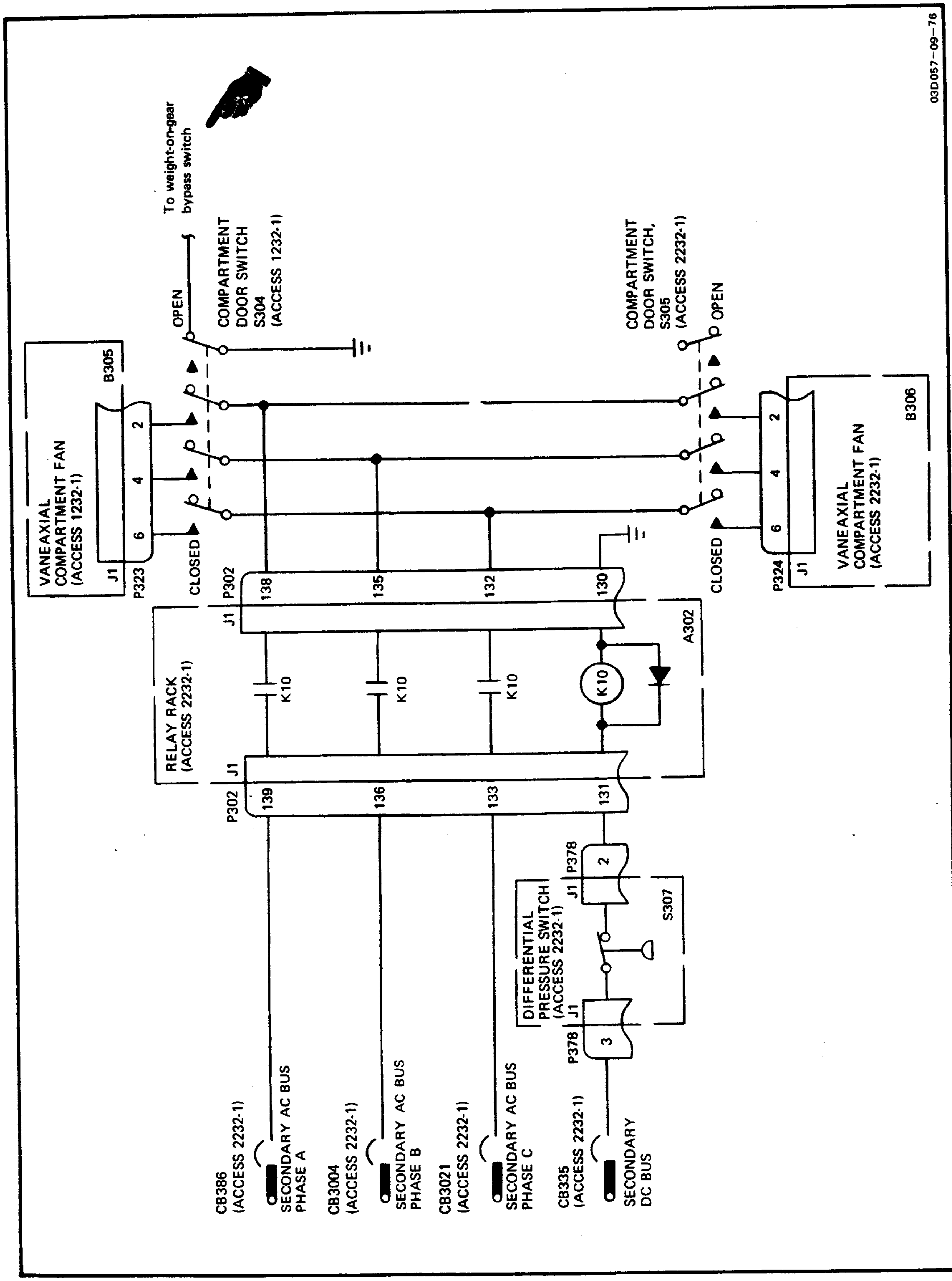

Figure 7-2. Electronic Equipment Cooling System Electrical Troubleshooting Schematic Diagram

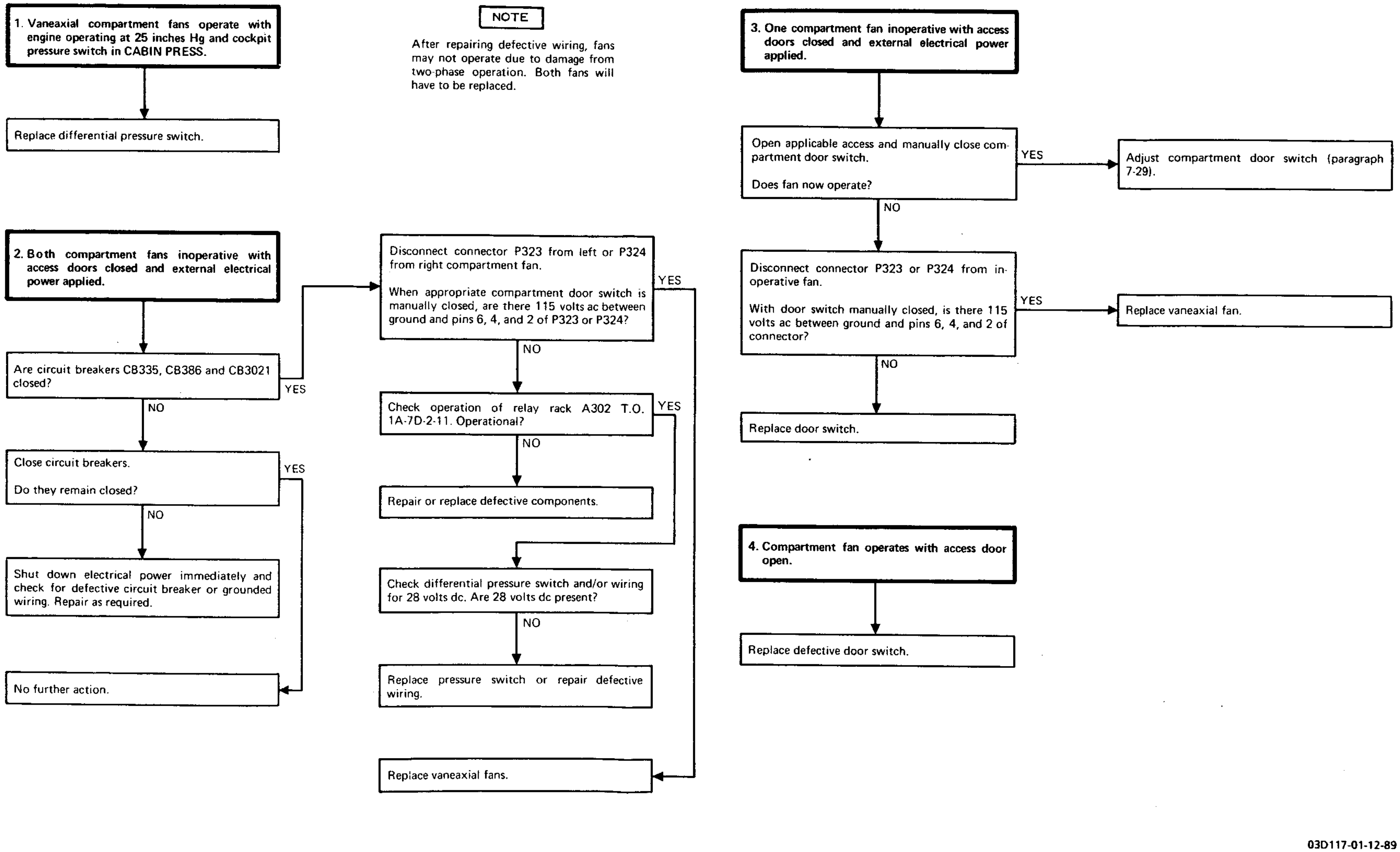

Figure 7-28. Electronic Equipment Cooling System Troubleshooting (Sheet 1)

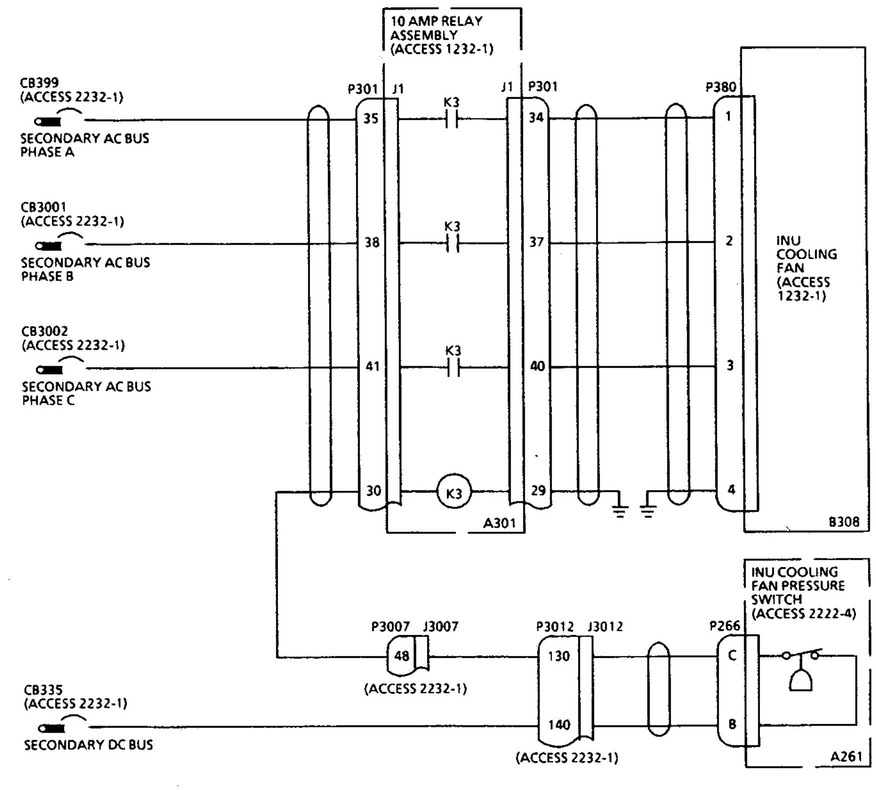

Figure 7-2A. INU Cooling Fan Electrical Troubleshooting Schematic Diagram (Airplanes After T.O. 1A-7-562)

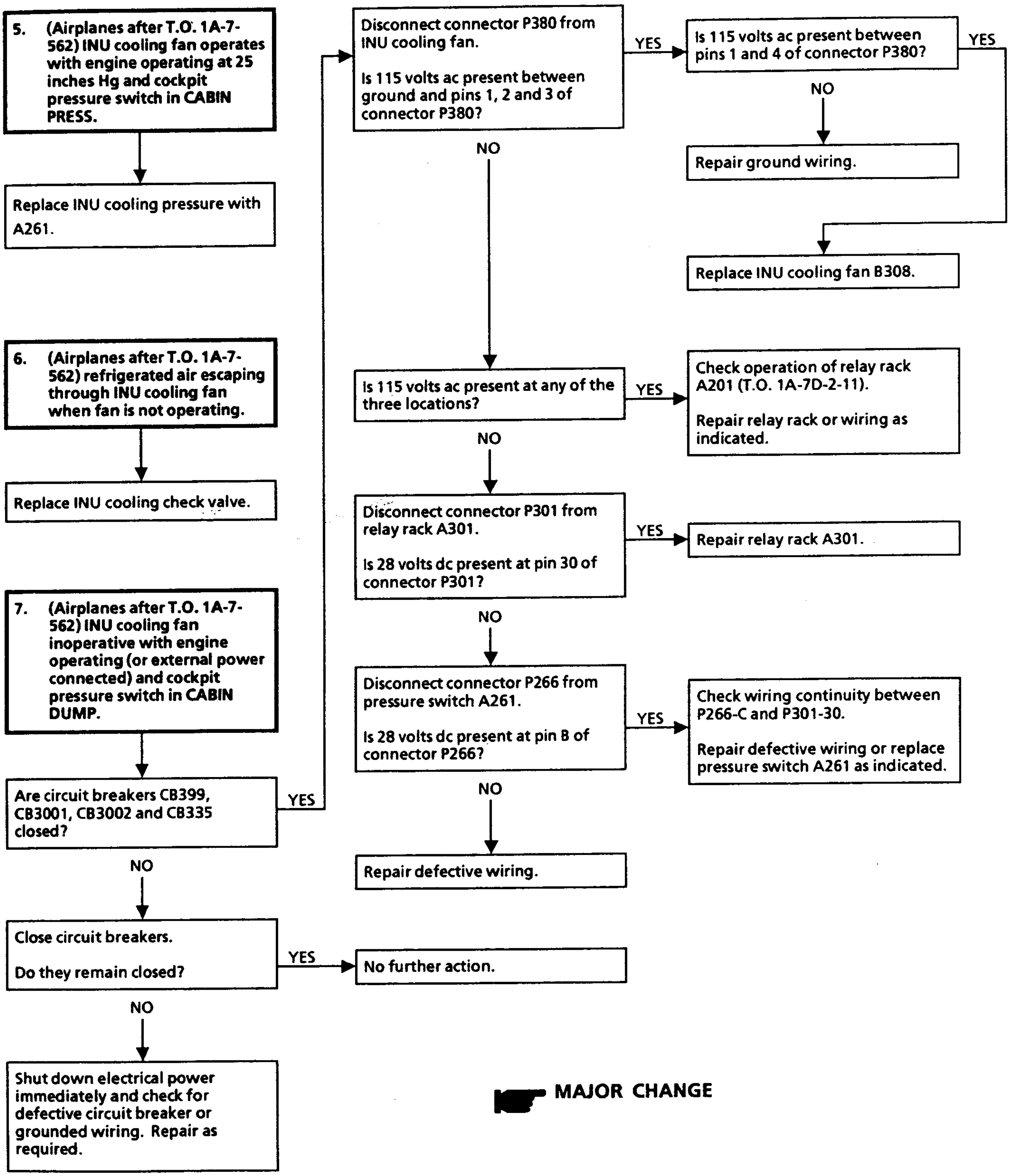

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Figure 7-2B. Electronic Equipment Cooling System Troubleshooting (Sheet 2)

1. No airflow through camera compartment louvers.

Is there airflow at canopy rails?

YES

Are there disconnected lines to the camera compartment or excessive leakage?

YES

Repair leakage as required.

NO

Replace cold air supply check valve.

NO

Troubleshoot air-conditioning supply system (paragraph 1-17).

2. Airflow through camera does not stabilize within temperature limits of 80° (+10° -15°) F.

Is there leakage around camera compartment?

YES

Correct leakage or replace defective seal as required (T.O. 1A-7D-23).

NO

Replace temperature control valve.

3. Airflow does not stop when pressure switch is placed in CABIN DUMP.

Troubleshoot air-conditioning supply system (paragraph 1-17).

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Figure 7-2C. Camera Compartment System Troubleshooting

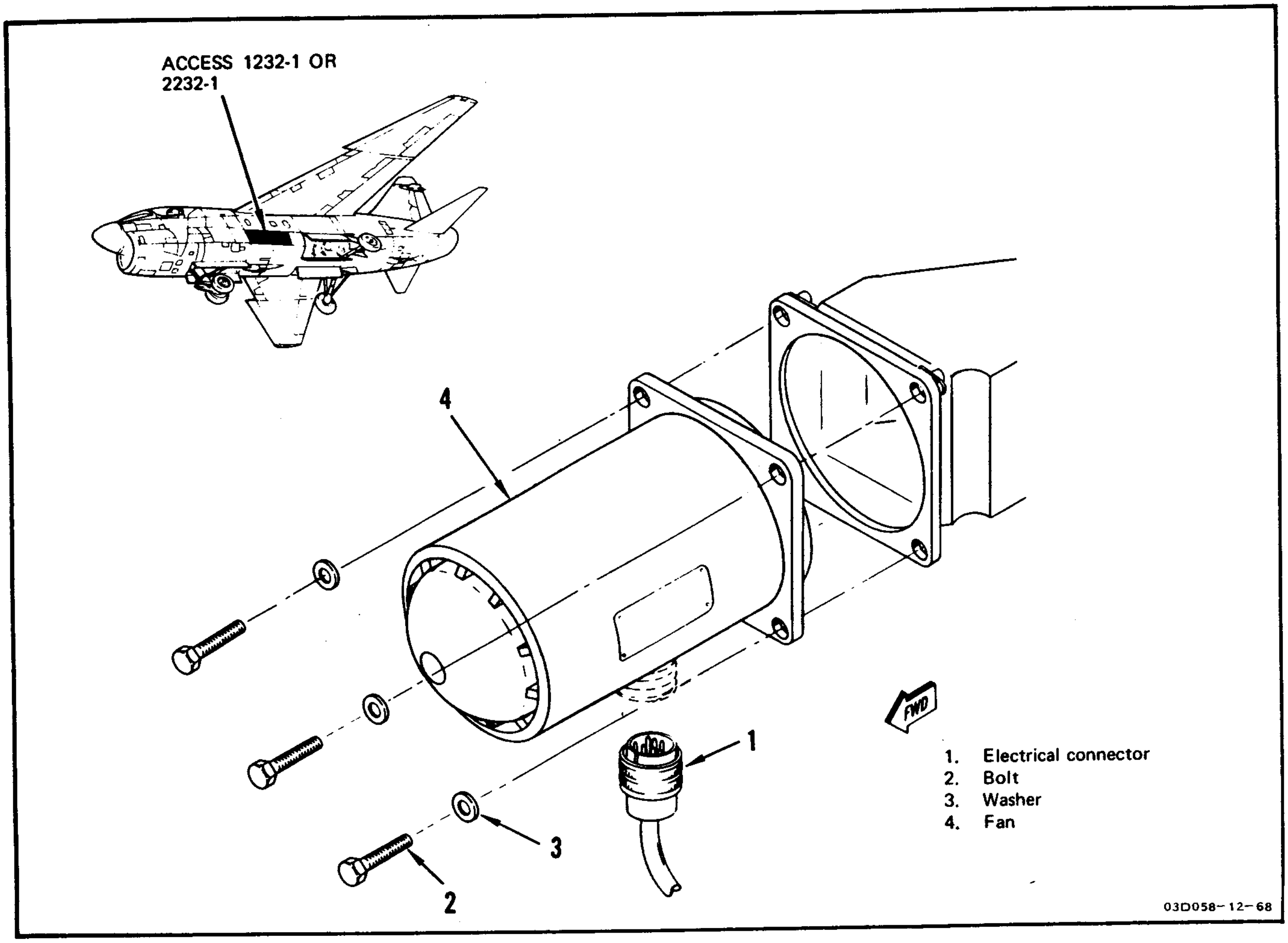


Figure 7-3. Compartment Cooling Fan Removal and Installation

7-26. REMOVAL.

a. Open access 2232-1.

b. Remove RE-978/ARC relay box (T.O. 1A-7D-2-12).

c. Cut lockwire and disconnect electrical connector from pressure switch.

d. Disconnect sensing line from pressure switch.

e. Remove four mounting nuts and washers securing pressure switch to mounting bracket.

f. Remove pressure switch from avionic compartment.

7-27. INSTALLATION.

a. Position pressure switch on mounting bracket and secure with four nuts and washers.

b. Connect sensing line to pressure switch.

c. Connect electrical connector to pressure switch and secure with MS20995C32 lockwire.

d. Install RE-978/ARC relay box (T.O. 1A-7D-2-12).

e. Close access 2232-1.

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

g. Check that compartment cooling fans are operating.

h. Disconnect external electrical power.

i. Start engine (T.O. 1A-7D-2-1) and operate at 80% rpm.

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from ram air exhaust duct after placing cockpit pressure switch in CABIN PRESS. If no flow occurs, place switch in CABIN DUMP, and troubleshoot air-conditioning supply system.

j. Place cockpit pressure switch in CABIN PRESS.

k. Check that compartment cooling fans are not operating during engine operation.

l. Place cockpit pressure switch in CABIN DUMP.

m. Shut down engine (T.O. 1A-7D-2-1).

7-28. CAMERA COMPARTMENT TEMPERATURE CONTROL VALVE REMOVAL AND INSTALLATION.

7-29. REMOVAL. (See figure 7-4.)

a. Open access 6222-1.

b. Cut and strip back insulation (1) from couplings (2 and 3) and disconnect inlet and outlet air lines from temperature control valve (4).

c. Remove screws (5) and washers (6) securing valve to camera compartment.

d. Remove valve and insulator (7) from airplane. Retain insulator.

7-30. INSTALLATION. (See figure 7-4.)

a. Install insulator (7) on temperature control valve (4) and position valve in camera compartment.

b. Install screws (5) and washers (6).

c. Connect inlet and outlet air lines to valve with couplings (2 and 3).

d. Cover couplings and lines with insulation (1) and repair damaged insulation, as required as follows:

1. Cover couplings and tubing with two layers of 3/16-inch thick insulation (Type E, Johns Manville Corporation, New York, New York).

2. Compress insulation to a thickness of approximately 1/4-inch by wrapping with 1 1/2-inch wide glass yarn tape (EHGA07112, Essex International Inc., IWI Division, Dallas, Texas).

3. Wrap complete insulation with MIL-A-148 aluminum foil (0.005 thick) with minimum overlap of 1/2-inch at each joint.

4. Secure aluminum foil at ends, around support brackets, and at 5-inch minimum intervals along length of tube with 3/4-inch wide fiber glass tape (No. 27, 3M Company, St. Paul, Minnesota).

e. Perform camera compartment cooling system operational checkout (paragraph 7-17).

7-31. CAMERA HOT AIR LINE INSULATION AND HEAT SHIELD INSTALLATION.

a. Open accesses 6122-2, 6122-4, and 6222-2 as required.

b. Cover camera hot air line with two layers of 3/16-inch thick insulation (Type E, Johns-Manville Corporation, New York, New York).

c. Compress insulation to a thickness of approximately 1/4-inch by wrapping with 1 1/2-inch wide glass yarn tape (EHGA07112, Essex International Inc., IWI Division, Dallas, Texas).

d. At clamp locations on hot air line, wrap glass yarn tape approximately 3 inches each side of clamp with 0.004-inch thick teflon tape (No. 5490, 3M Company, St. Paul, Minnesota). Use a double wrap at each end and approximately 50% overlap between ends.

e. Use heat shield material (BL15729-1, Johns-Manville Corporation, New York, New York) to make hot air line heat shield.

f. Cut two heat shield halves to desired length and position halves together. Fold down and crimp flanges on one side.

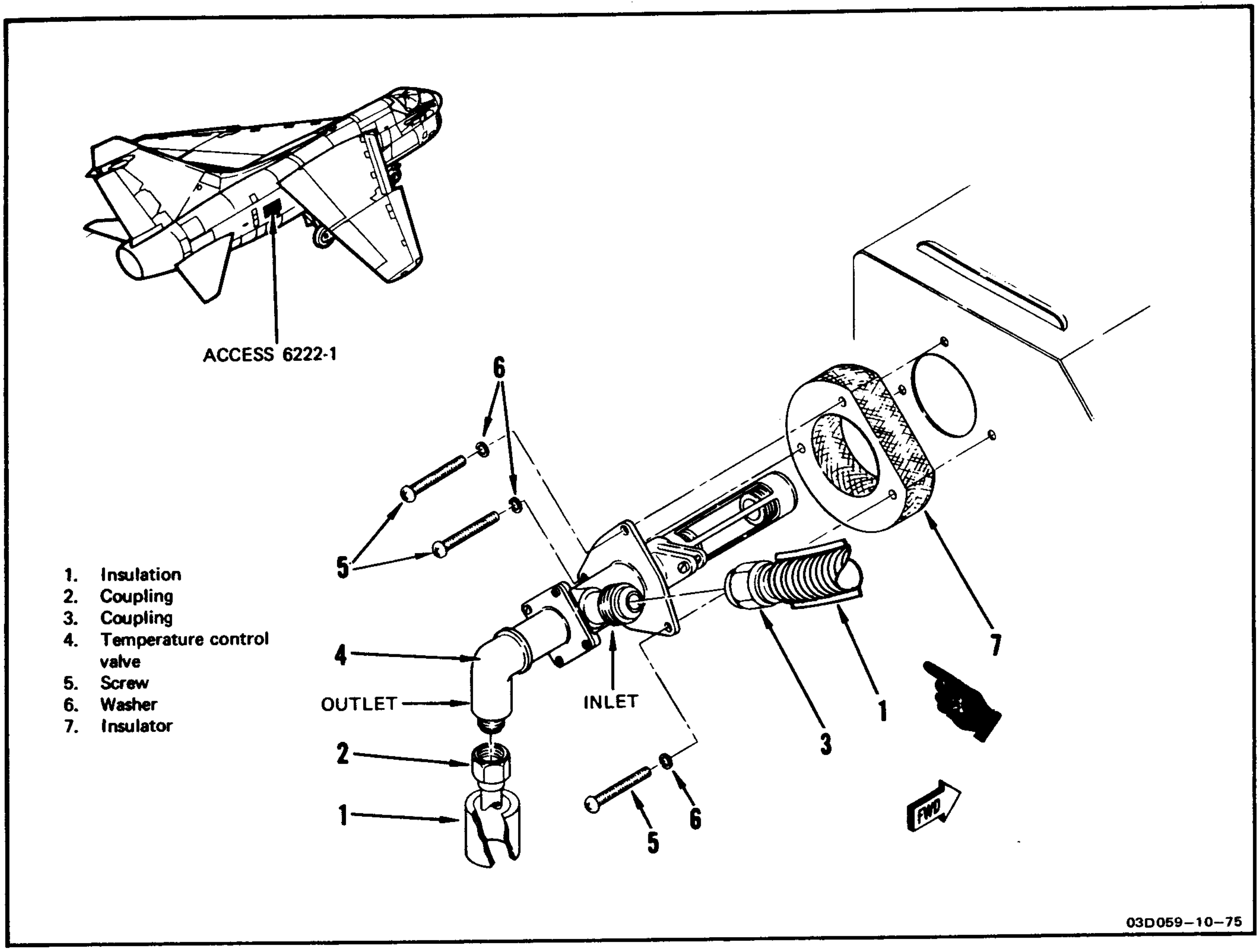


Figure 7-4. Camera Compartment Temperature Control Valve Removal and Installation

g. At clamp locations on hot air line, trim heat shield to allow installation of clamps.

h. Install heat shield around hot air line and secure shield by folding down and crimping remaining flanges.

i. Close accesses opened in step a.

7-32. CAMERA HOT AIR LINE COUPLING INSULATION AND HEAT SHIELD INSTALLATION.

a. Open accesses 6122-2, 6122-4, and 6222-2 as required.

b. Cover camera hot air line coupling with two layers of 3/16-inch thick insulation (Type E, Johns-Manville Corporation, New York, New York).

c. Compress insulation to a thickness of approximately 1/4-inch by wrapping with 1 1/2-inch wide glass yarn tape (EHGA07112, Essex International Inc., IWI Division, Dallas, Texas).

d. Cut two pieces of heat shield material (BL15729-1, Johns-Manville Corporation, New York, New York) to proper length. Fold down all four flanges of heat shield to make two U-shaped halves.

e. Position heat shield halves around coupling and orient flaps to prevent fluid trap.

f. Secure heat shield halves around coupling with MS20995C32 lockwire.

g. Close accesses removed in step a.

7-33. CAMERA COLD AIR LINE INSULATION INSTALLATION.

a. Open applicable accesses.

b. Use 3/8-inch thick MIL-P-15280E, Type II tubular or sheet foam insulation to insulate camera cold air lines. Cut insulation 1/2-inch longer than line length to ensure adequate coverage.

c. On long lengths, join two or more pieces of insulation by bonding with adhesive (A-851B, B.F. Goodrich Inc., Akron, Ohio).

d. At clamp locations on the cold air line, use butt joints to allow installation of clamps. Bond butt joints with A-851B adhesive after installation of clamps.

e. If possible, install tubular insulation on new lines before installation end fittings. Compress insulation to allow sleeve and nut installation.

f. On lines installed in the airplane or lines with end fittings installed, split the tubular insulation or use sheet insulation. Install insulation on line and bond the seam with A-851B adhesive.

g. Cut excess material from ends of insulation.

h. Close accesses opened in step a.

7-34. CAMERA COLD AIR LINE COUPLING INSULATION INSTALLATION.

a. Open applicable accesses.

b. Use 3/8-inch thick MIL-P-15280E, Type II sheet foam insulation to insulate each camera cold air line coupling.

c. Wrap insulation around coupling with ends slightly overlapping insulation on line. Overlap should not exceed 1/4-inch.

d. Apply adhesive (A-851B, B.F. Goodrich Inc., Akron, Ohio) to both surfaces of the axial seam and allow sufficient drying time to give a slight track.

e. Butt edges of seam together and press firmly.

f. If additional strength is required after bonding, compress insulation to a thickness of approximately 1/4-inch by wrapping with 1 1/2-inch wide glass yarn tape (EHGA07112, Essex International Inc., IWI Division, Dallas, Texas).

g. Close accesses opened in step a.

7-35. AVIONIC COMPARTMENT DOOR SWITCH ADJUSTMENT.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Furnish electrical power for vaneaxial fan switch adjustment

NOTE

The following procedure is applicable for left or right avionic compartment door switch adjustment.

a. Open access 1232-1 to adjust left door switch or access 2232-1 to adjust right door switch.

CAUTION

If vaneaxial fan circuit breakers are to be closed with external electrical power connected to airplane, circuit breakers shall be closed in the following sequence to prevent damage to fans: CB386, CB3004, CB3021, and CB335.

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

c. Cut and remove lockwire securing switch jamnuts. Loosen jamnuts.

d. Turn jamnuts to adjust switch inboard until vaneaxial fan will not operate with access closed.

e. Adjust switch outboard one-half turn of jamnuts and check fan for operation with access closed.

f. Repeat step e until fan just operates.

g. When fan operation is noted, turn jamnuts three additional turns to adjust switch outboard. Tighten jamnuts.

h. If three full turns cannot be accomplished, perform the following:

1. Drill out two rivets securing door switch striker plate to access door. Retain striker plate.

2. Add 0.125 inch shim (2024-T3 material or equivalent) same size as striker plate and drill.

3. Rivet striker plate and shim to access door.

4. Repeat steps d through g.

i. Check that fan operates with access closed and does not operate with access open.

CAUTION

If compartment cooling fan circuit breakers are to be opened with external electrical power connected to airplane, circuit breaker CB335 shall be opened first to prevent damage to fans.

j. Disconnect external electrical power.

k. Secure jamnuts with MS20995C32 lockwire.

l. Close access 1232-1 or 2232-1.

7-36. INU COOLING FAN REMOVAL AND INSTALLATION. (Airplanes After T.O. 1A-7-562.)

7-37. REMOVAL. (See figure 7-5.)

a. Open access 1232-1.

b. Remove CP-1775/A tactical computer (T.O. 1A-7D-2-14).

c. Remove CN-1656/ASN or CN-1656A/ASN inertial navigation unit (T.O. 1A-7D-2-12).

d. Disconnect two inboard MUX bus connectors (P3121 and P3141) from coupler (T.O. 1A-7D-2-14).

e. Disconnect electrical connector P380 from cooling fan.

f. Loosen clamp securing flex duct on forward fan support. Slide clamp forward onto duct.

CAUTION

Dropped screws and washers can easily get under lower avionic shelf and become very difficult to retrieve.

g. Place a shop cloth or similar material beneath fan mounting area to catch falling objects.

h. Support fan, and remove four screws and washers securing fan supports on upper avionic shelf.

i. Separate fan support from flex duct and remove fan from airplane.

j. Remove four nuts, washers, and screws securing forward support on fan.

k. Remove forward support from fan.

l. Remove four nuts, washers, and screws securing aft support on fan.

m. Remove aft support from fan.

7-38. INSTALLATION. (See figure 7-5.)

NOTE

One mounting hole in each fan support is offset to prevent misorientation of fan.

a. Position forward fan support on exhaust end of fan and secure with four screws, washers, and nuts.

b. Position aft fan support on intake end of fan and secure with four screws, washers, and nuts.

CAUTION

Dropped screws and washers can easily get under lower avionic shelf and become very difficult to retrieve.

c. Place a shop cloth or similar material beneath fan mounting area to catch falling objects.

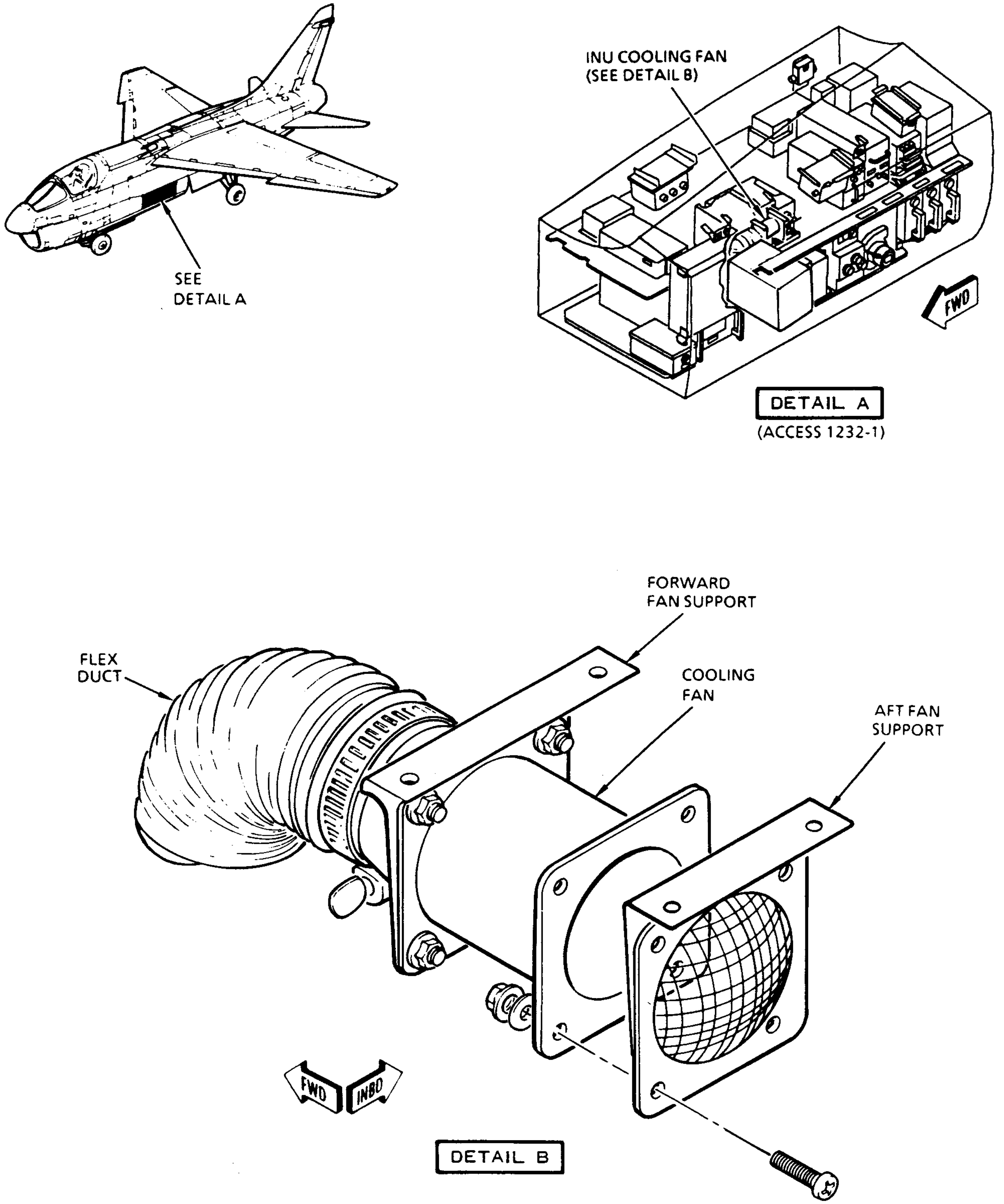


Figure 7-5. INU Cooling Fan Removal and Installation (Airplanes After T.O. 1A-7-562)

d. Position fan and supports in avionic bay and slide flex duct onto forward fan support.

NOTE

Drill wax or grease can be used to hold screws and washers in place as they are installed to prevent dropping.

e. Position fan supports on upper avionic shelf and secure with four screws and washers.

f. Position and tighten clamp that secures flex duct on forward fan support.

g. Remove shop cloth (foreign object catcher) from avionic bay.

h. Install electrical connector P380 on fan receptacle.

i. Install two inboard MUX bus connectors (P3121 and P3141) on couplers (T.O. 1A-7D-2-14).

j. Install CN-1656/ASN or CN-1656A/ASN inertial navigation unit (T.O. 1A-7D-2-12).

k. Install CP-1775/A tactical computer (T.O. 1A-7D-2-14).

l. Perform electronic equipment cooling system operational checkout (paragraph 7-14).

m. Close access 1232-1.

7-39. INU COOLING AIR CHECK VALVE REMOVAL AND INSTALLATION. (Airplanes After T.O. 1A-7-562.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-666	Torque wrench 10 to 150 inch-pounds	Tighten cooling air duct coupling

7-40. REMOVAL. (See figure 7-6.)

a. Open access 1232-1.

b. Remove CN-1656/ASN or CN-1656A/ASN inertial navigation unit (T.O. 1A-7D-2-12).

c. Loosen hose clamp and separate fan air flex duct from adapter.

d. Loosen coupling securing fan air adapter on transition assembly.

e. Remove coupling and adapter from transition assembly.

f. Remove check valve and O-ring from open end of transition assembly.

g. Discard O-ring.

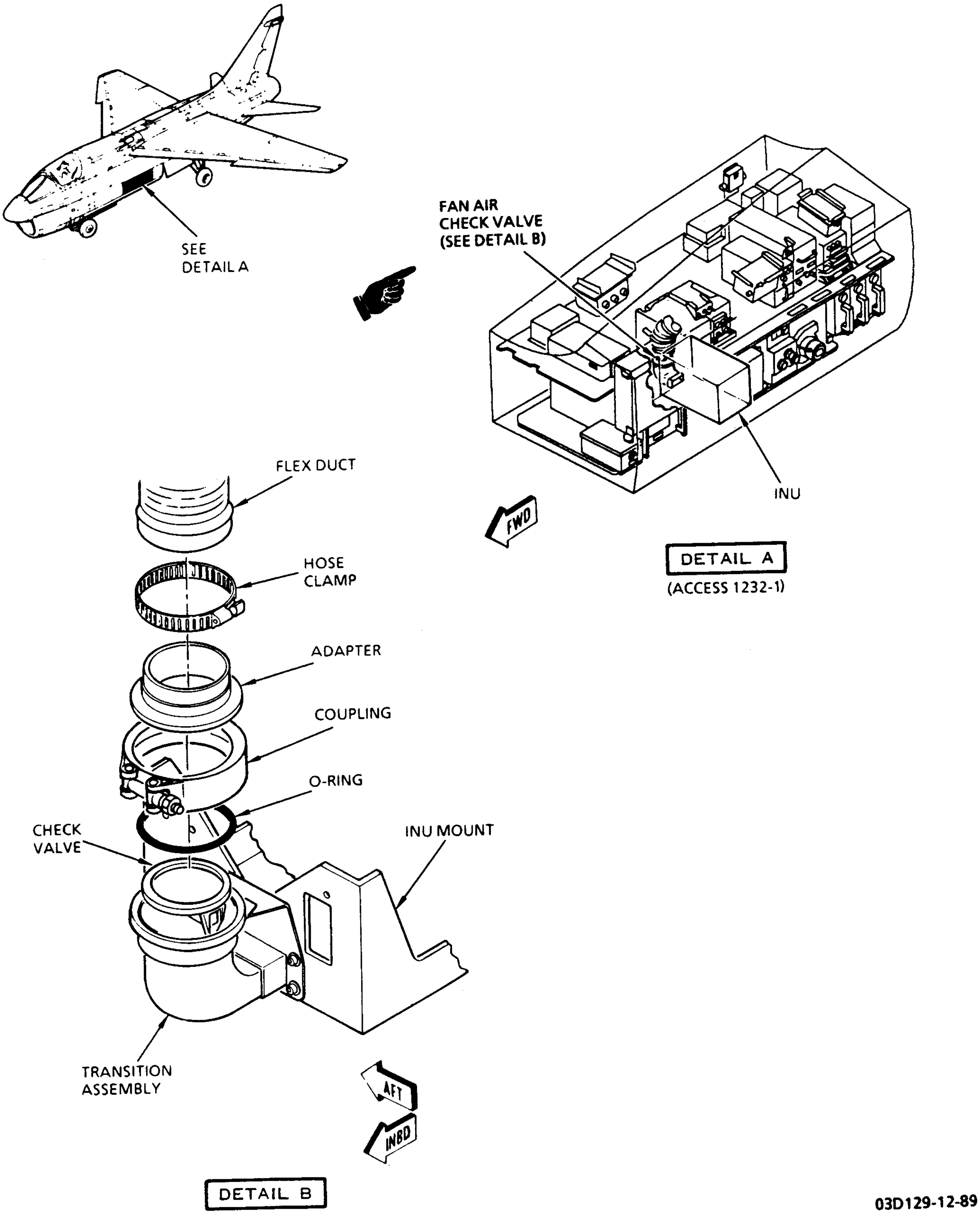


Figure 7-6. INU Cooling Air Check Valve Removal and Installation (Airplanes After T.O. 1A-7-562)

7-41. INSTALLATION. (See figure 7-6.)

a. In avionic bay, ensure that open end of transition assembly and flex duct are free from dirt and foreign matter.

b. Install new O-ring in groove at open end of transition assembly.

NOTE

When installing check valve, ensure that valve flappers are free to swing downward and are not obstructed in any way.

The check valve is installed with arrow (on side of valve) pointing toward transition assembly.

c. Insert check valve into open end of transition assembly until fully seated.

d. Position fan air adapter on open end of transition assembly.

NOTE

Coupling must be positioned with T-bolt inboard and nut forward to avoid interference with INU.

e. Install coupling securing adapter on transition assembly.

f. Tighten coupling 60 to 85 inch-pounds torque.

g. Position hose clamp on flex duct and install flex duct on open end of adapter.

h. Position hose clamp to secure flex duct on adapter and tighten.

i. Install CN-1656/ASN or CN-1656A/ASN inertial navigation unit (T.O. 1A-7D-2-12).

j. Perform electronic equipment cooling system operational checkout (paragraph 7-14).

k. Close access 1232-1.

7-42. INU COOLING PRESSURE SWITCH REMOVAL AND INSTALLATION. (Airplanes After T.O. 1A-7-562.)

7-43. REMOVAL. (See figure 7-7.)

a. Open access 2222-4.

b. Disconnect P266 electrical connector from upper end of pressure switch.

c. Cut lockwire and unscrew pressure switch from tee fitting.

d. Remove pressure switch and O-ring from airplane.

e. Discard O-ring.

7-44. INSTALLATION. (See figure 7-7.)

a. Using new O-ring, install pressure switch on tee fitting.

b. Secure pressure switch on tee fitting as shown using MS20995C32 lockwire.

c. Install electrical connector P266 on pressure switch.

d. Perform electronic equipment cooling system operational checkout (paragraph 7-14).

e. Close access 2222-4.

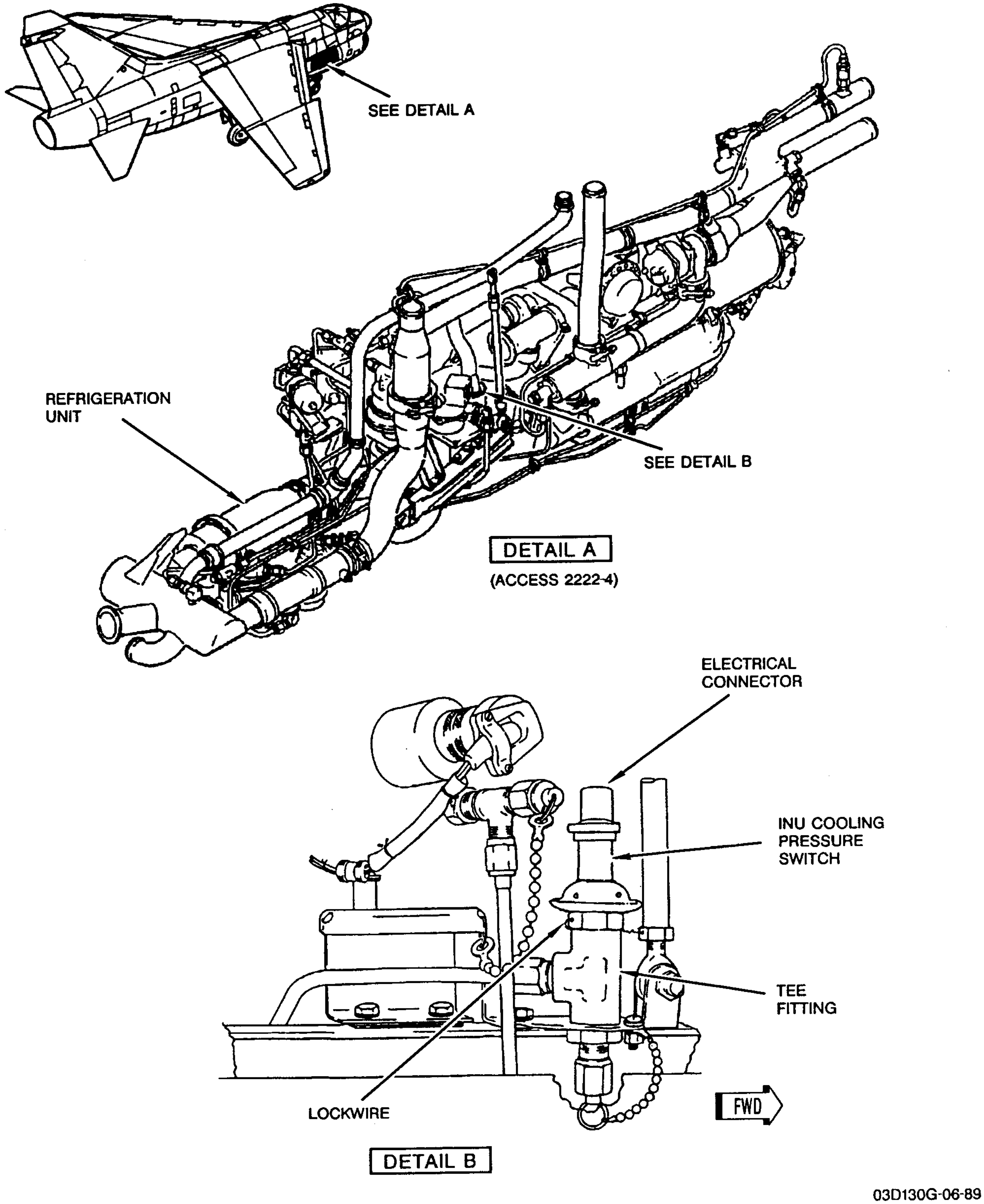


Figure 7-7. INU Cooling Pressure Switch Removal and Installation (Airplanes After T.O. 1A-7-562)

SECTION VIII
RADAR PRESSURIZATION SYSTEM

8-1. DESCRIPTION.

8-2. The radar pressurization system supplies air pressure for internal pressurization of the waveguide and transmitter of the forward-looking radar. Waveguide and transmitter pressure is maintained at 17 (±2) psia regardless of airplane altitude. Air used for pressurization is supplied through a desiccator and a pressure regulator to ensure delivery of dry air within the proper pressure limits. The radar pressurization system consists of a desiccator, depressurizing valve and pressure regulator.

8-3. For system arrangement, see figure 1-2.

8-4. OPERATION. (See figure 8-1.)

8-5. When the airplane engine is operating, high pressure engine bleed air is filtered, reduced in pressure, and then directed to components in the air-conditioning and pressurization system by the control air manifold. Control air for pressurization of the waveguide and transmitter of the radar flows from the control air manifold to the desiccator where the humidity of the air is reduced. A radar pressure regulator, installed downstream of the desiccator, regulates the pressure to the radar waveguide. The regulator will maintain outlet pressure at 17 (±2) psia regardless of the airplane altitude. The regulator incorporates a check valve to prevent flow back into the air-conditioning control air supply system and a relief valve on the outlet which operates at 22 (±2) psia. A depressurizing valve installed in the pressure line between the regulator and the radar permits depressurizing the unit for removal.

8-6. COMPONENTS.

8-7. For a list of components, their locations (accesses), and functions, refer to table 8-1.

Table 8-1. Radar Pressurization System Components

Component	Access	Function
Desiccator	1211-2[1] 1211-1[2]	Prevents moisture accumulation in the pressure regulator and radar.
Regulator, radar pressure	1211-2 and 2211-2	Maintains air pressure in radar waveguide and transmitter at 17 (±2) psia at all altitudes.
Valve, depressurizing	1211-1	Permits depressurizing of radar transmitter and waveguide for removal.

[1]Airplanes through AF69-6196
[2]Airplanes AF69-6197 and subsequent

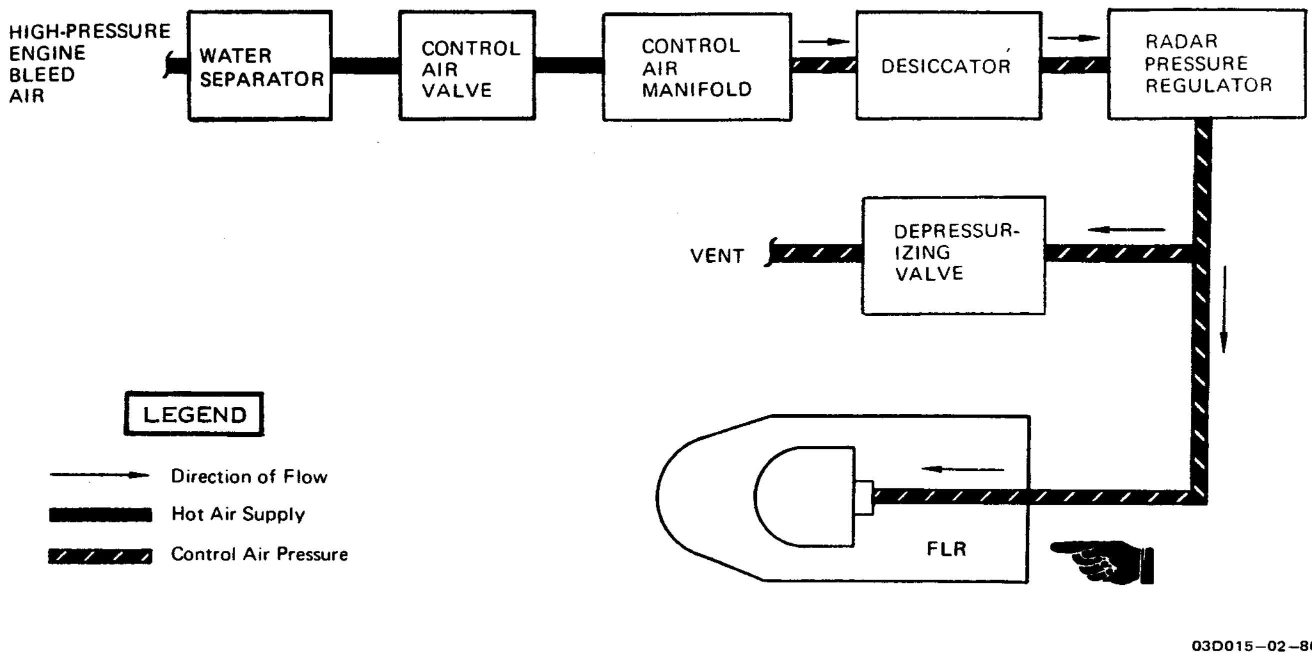


Figure 8-1. Radar Pressurization System Flow Diagram

8-8. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Air/nitrogen trailer	MIL-T-26772	Supply air/nitrogen to radar pressurization system for operational checkout
8-2	Gage, air pressure, 0 to 10 psi	545-5405-002 (Collins Radio, Cedar Rapids, Iowa)	Check pressure during operational checkout of radar pressurization system
8-2	Adapter	(Local fabrication)	Connect air pressure gage to radar depressurizing valve for operational checkout

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 figure 8-4.

If forward-looking radar is not installed, cap radar pressurization line.

a. On airplanes through AF69-6196, open accesses 1211-1, 1211-2, and 2222-4.

b. On airplanes AF69-6197 and subsequent, open accesses 1211-1 and 2222-4.

b-1. Remove cap from depressurizing valve.

c. Using locally fabricated adapter, connect pressure gage to radar depressurizing valve (figure 8-2).

d. Disconnect inlet line to desiccator and connect air/nitrogen pressure line. Apply 25 (±3) psig air pressure.

NOTE

Add pressure gage indication (figure 8-2, psig) to barometric pressure (psi) to obtain absolute pressure (psia). See figure 8-3 for barometric pressure information.

e. Check that absolute pressure at radar depressurizing valve is 17 (±2) psia. {1}

f. Shut off air/nitrogen pressure source at trailer. Do not reduce servicing line pressure. Check that pressure indication remains steady for 4 minutes. {2}

g. Reduce line pressure and disconnect pressure line inlet port of desiccator.

h. Connect air line to inlet port of desiccator.

i. Disconnect pressure gage and adapter from radar depressurizing valve.

j. Install cap on radar depressurizing valve.

k. On airplanes through AF69-6196, close accesses 1211-1, 1211-2, and 2222-4.

l. On airplanes AF69-6197 and subsequent, close accesses 1211-1 and 2222-4.

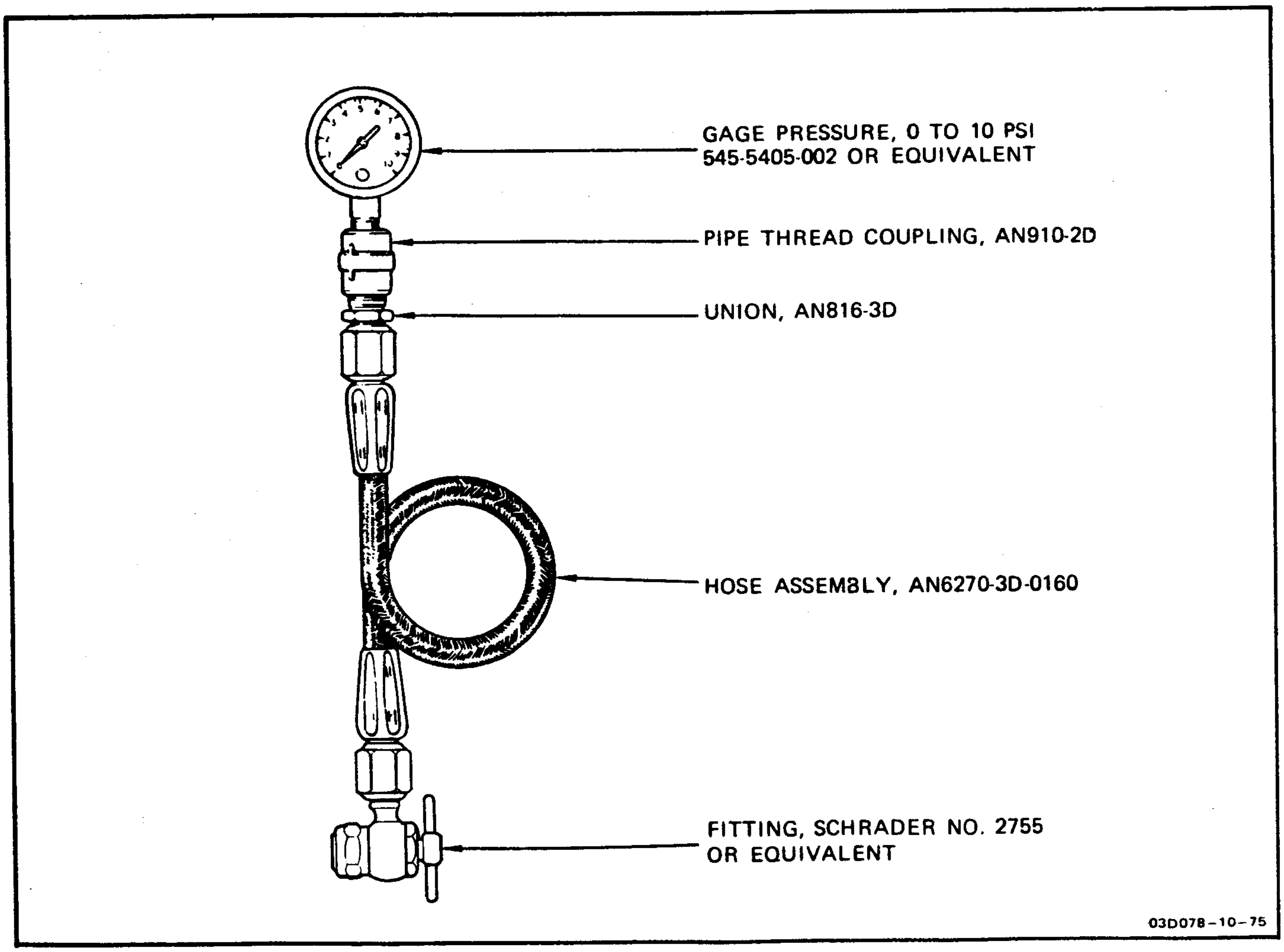
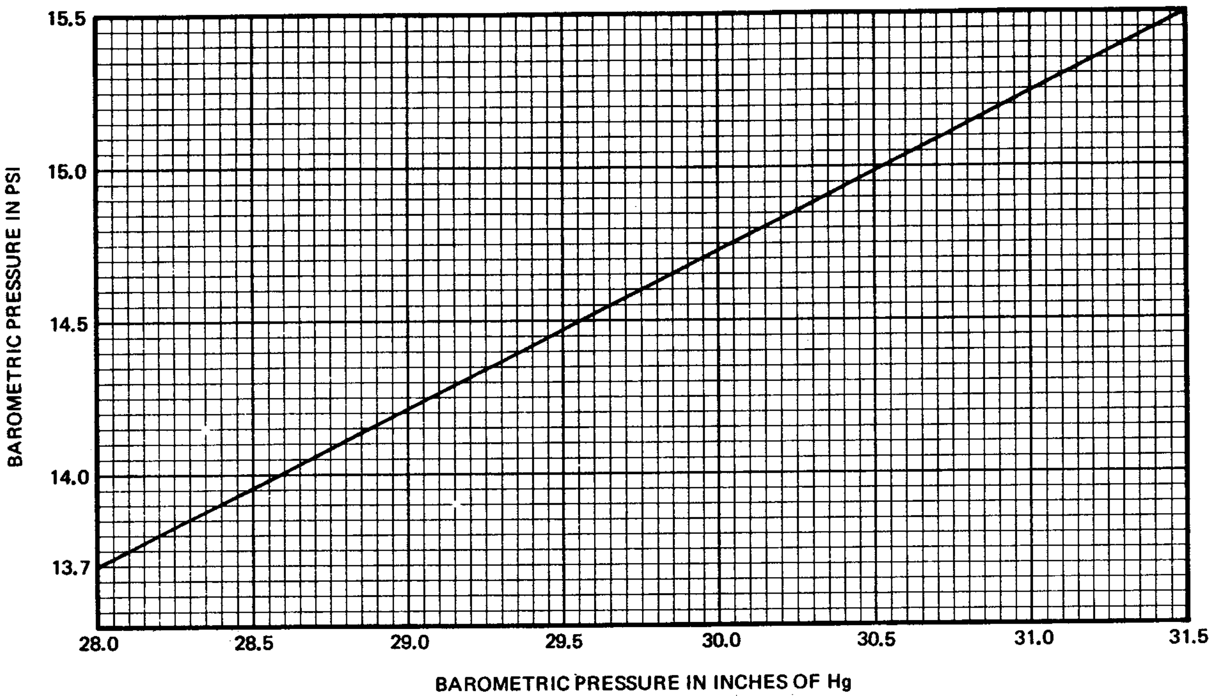


Figure 8-2. Radar Pressurization System Pressure Test Gage and Adapter



NOTE

Absolute pressure is equal to barometric pressure in psi, plus reading on pressure gage (psig).

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Figure 8-3. Barometric Pressure in Inches of Hg to Barometric Pressure in PSI Conversion Graph

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8-9. TROUBLESHOOTING.

8-10. Refer to figure 8-4 for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

8-11. DESICCATOR REMOVAL AND INSTALLATION. (Refer to T.O. 1A-7D-2-14-3.)

8-12. and 8-13. Deleted.

8-14. RADAR PRESSURE REGULATOR REMOVAL AND INSTALLATION (Airplanes Before T.O. 1A-7D-708).

8-15. REMOVAL. (See figure 8-5.)

a. Open accesses 1211-2 and 2211-2.

b. Adjust rudder pedals to full aft.

c. Remove screw (1) and spacer (2) from clamp attaching wire bundle to right side of radar pressure regulator mounting bracket.

NOTE

If replacement radar pressure regulator is not available for immediate replacement, cap pneumatic lines to prevent moisture from entering system.

d. Disconnect pneumatic lines (3 and 4) from pressure regulator.

e. Remove four bolts (5) and eight washers (6) from pressure regulator mounting bracket.

f. Remove pressure regulator and pressure regulator mounting bracket (7) from airplane.

g. Remove two attaching bolts (8) and two washers (9) that secure pressure regulator (10) to mounting bracket.

h. Remove unions (11) and O-rings (12) from pressure regulator.

8-16. INSTALLATION. (See figure 8-5.)

a. Using new O-rings (12), install unions (11) in radar pressure regulator (10).

b. Position pressure regulator on mounting bracket (7). Install two washers (9) and two bolts (8) and tighten.

c. Position mounting bracket (7) in airplane. Install eight washers (6) and four bolts (5). Do not tighten.

d. Connect pneumatic lines (3 and 4) to unions finger-tight.

e. Tighten four mounting bolts.

f. Tighten pneumatic lines.

g. Position wire bundle to pressure regulator mounting bracket and secure with spacer (2) and screw (1).

h. Return rudder pedals to neutral position.

i. Perform radar pressurization system operational checkout (paragraph 8-8).

j. Close accesses 1211-2 and 2211-2.

8-17. RADAR PRESSURE REGULATOR REMOVAL AND INSTALLATION (Airplanes After T.O. 1A-7D-708).

8-18. REMOVAL. (See figure 8-6.)

a. Open accesses 1211-2 and 2211-2.

b. Adjust rudder pedals to full aft.

NOTE

If replacement regulator is not available for immediate replacement, cap pneumatic lines to prevent moisture from entering system.

c. Disconnect pneumatic lines (1 and 2) from pressure regulator.

d. Loosen clamps and move cable bundle as necessary to gain access to top right screw (3).

e. Remove four screws (3) securing regulator and mounting bracket to airplane. Remove regulator and bracket from airplane.

f. Remove two bolts (4) and washers (5) securing regulator (6) to mounting bracket (7).

g. Remove union (8) and O-ring (9) from regulator.

h. Loosen jamnut (10) and remove elbow (11) and O-ring (12) from regulator.

1. Pressure gage indication is not within limits of 17 (±2) psia.

Disconnect outlet line from desiccator and check for 25 (±3) psig.

Is air pressure low?

YES

Replace desiccator.

NO

Replace regulator.

2. Pressure gage indication does not remain steady.

Disconnect inlet pressure line from radar transmitter and cap line.

Apply 25 (±3) psig.

Does gage remain steady?

YES

Troubleshoot transmitter (T.O. 1A-7D-2-14-3).

NO

Check for leaks.

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Figure 8-4. Radar Pressurization System Troubleshooting

Figure 8-5. Deleted.

8-19. INSTALLATION. (See figure 8-6.)

a. Install jamnut (10) and new O-ring (12) on elbow (11) and install elbow in regulator. Do not tighten jamnut.

b. Using new O-ring (9), install union (8) in regulator.

c. Position regulator (6) on mounting bracket (7) and secure with two washers (5) and bolts (4).

d. Position regulator and bracket in airplane and secure with four screws (3).

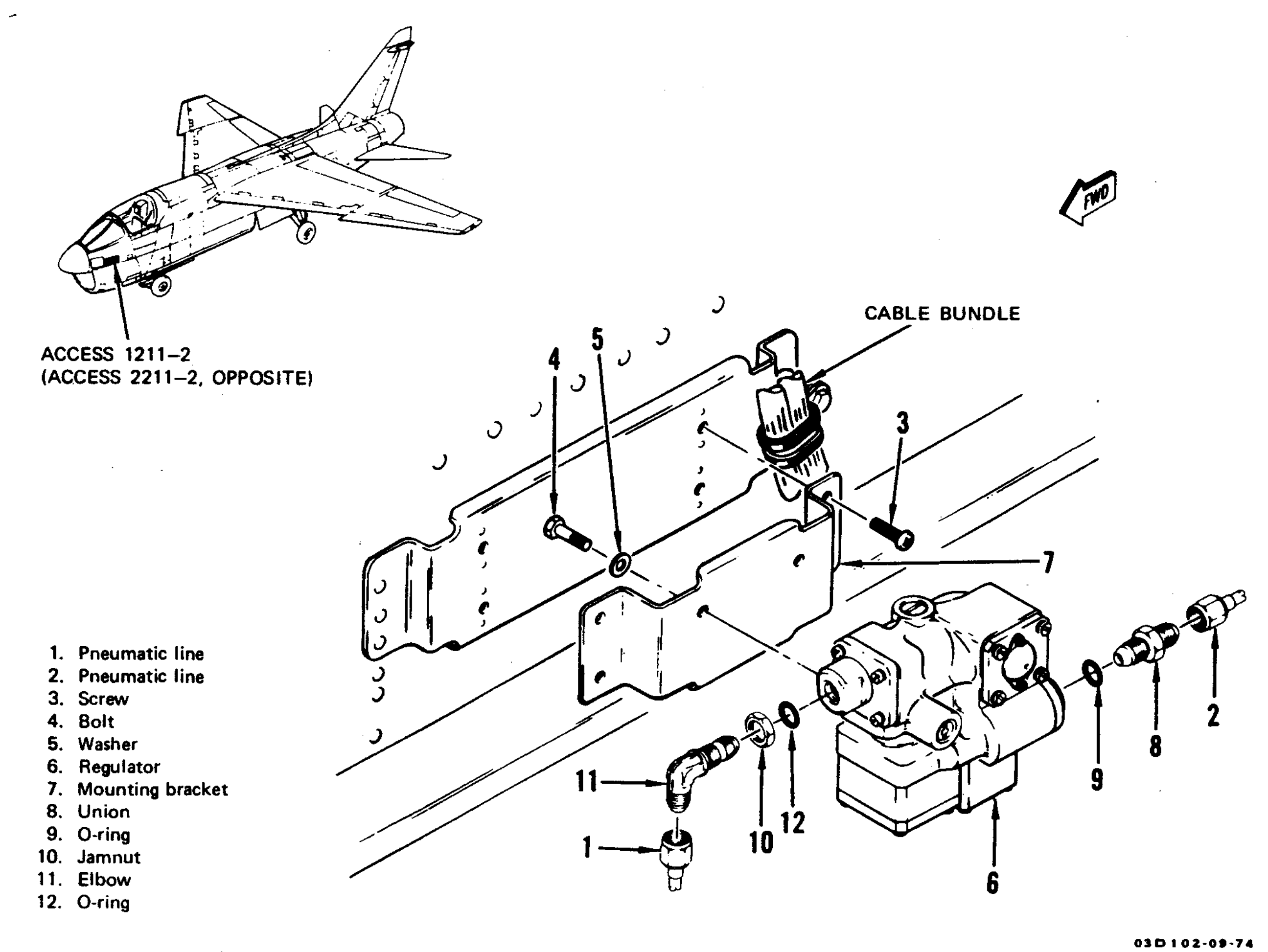
e. Secure cable bundle clamps.

f. Connect pneumatic lines (1 and 2) to regulator. Tighten jamnut (10).

g. Return rudder pedals to neutral position.

h. Perform radar pressurization system operational checkout (paragraph 8-8).

i. Close accesses 1211-2 and 2211-2.



1. Pneumatic line
2. Pneumatic line
3. Screw
4. Bolt
5. Washer
6. Regulator
7. Mounting bracket
8. Union
9. O-ring
10. Jamnut
11. Elbow
12. O-ring

Figure 8-6. Radar Pressure Regulator Removal and Installation

SECTION IX
ANTIBLACKOUT SYSTEM

9-1. DESCRIPTION.

9-2. The antiblackout system automatically controls air pressure to inflate the pilot's anti-g suit during maneuvers exceeding 1.5g to 2.0g. The system consists of a regulating anti-g valve with an integral system test (override) button and a pilot services disconnect panel on the left console, which provides anti-g and vent air quick-disconnect receptacles.

9-3. For system controls and indicators, see figure 1-1. For system arrangement, see figure 1-2.

9-4. OPERATION. (See figure 9-1.)

9-5. When the airplane engine is operating, high pressure engine bleed air is filtered, reduced in pressure, and directed to the control air manifold. Air at 18 (+ 3, -2) psi flows from the control air manifold to the anti-g valve. This air pressure is sufficient to operate the antiblackout system under normal operating conditions when the pressure limiting and shutoff valve is closed. When the valve opens, engine bleed air flows from the primary core of the heat exchanger, overrides the air from the control air manifold, and flows to the anti-g valve. This air pressure ensures that the anti-g valve will maintain sufficient pressure to the anti-g suit during extreme airplane maneuvers. The anti-g valve opens when airplane vertical acceleration exceeds 1.5g to 2.0g to provide air to the pilot's anti-g suit through the anti-g receptacle. The anti-g valve automatically regulates the amount of air admitted to the suit to counteract blackout effect on the pilot due to g-loads. As g-forces increase, the valve correspondingly increases air pressure in the anti-g suit at the rate of 1.5 psi per 1.0g. When the acceleration decreases below 1.5g to 2.0g, the valve closes and vents suit air pressure into the cockpit.

9-6. The anti-g valve is designed to utilize control air or system air for operation of the pilot's anti-g suit during positive acceleration. The anti-g valve contains a relief valve to maintain suit pressure between 9 and 11 psi at g-loads above 8g.

9-7. Check valves prevent high pressure airflow to the control air manifold and a loss of air pressure through the heat exchanger primary core from the control air manifold when the pressure limiting and shutoff valve is closed.

9-8. An override button can be depressed to test the system on the ground or in flight. On long flights, this feature makes it possible for the pilot to lessen fatigue by inflating the suit occasionally for body massage.

9-9. COMPONENTS.

9-10. For a list of system components, their locations (accesses), and functions, refer to table 9-1.

Table 9-1. Antiblackout System Components

Component	Access	Function
Valve, anti-g	1221-1	Regulates air pressure to pilot's anti-g suit in proportion to acceleration.

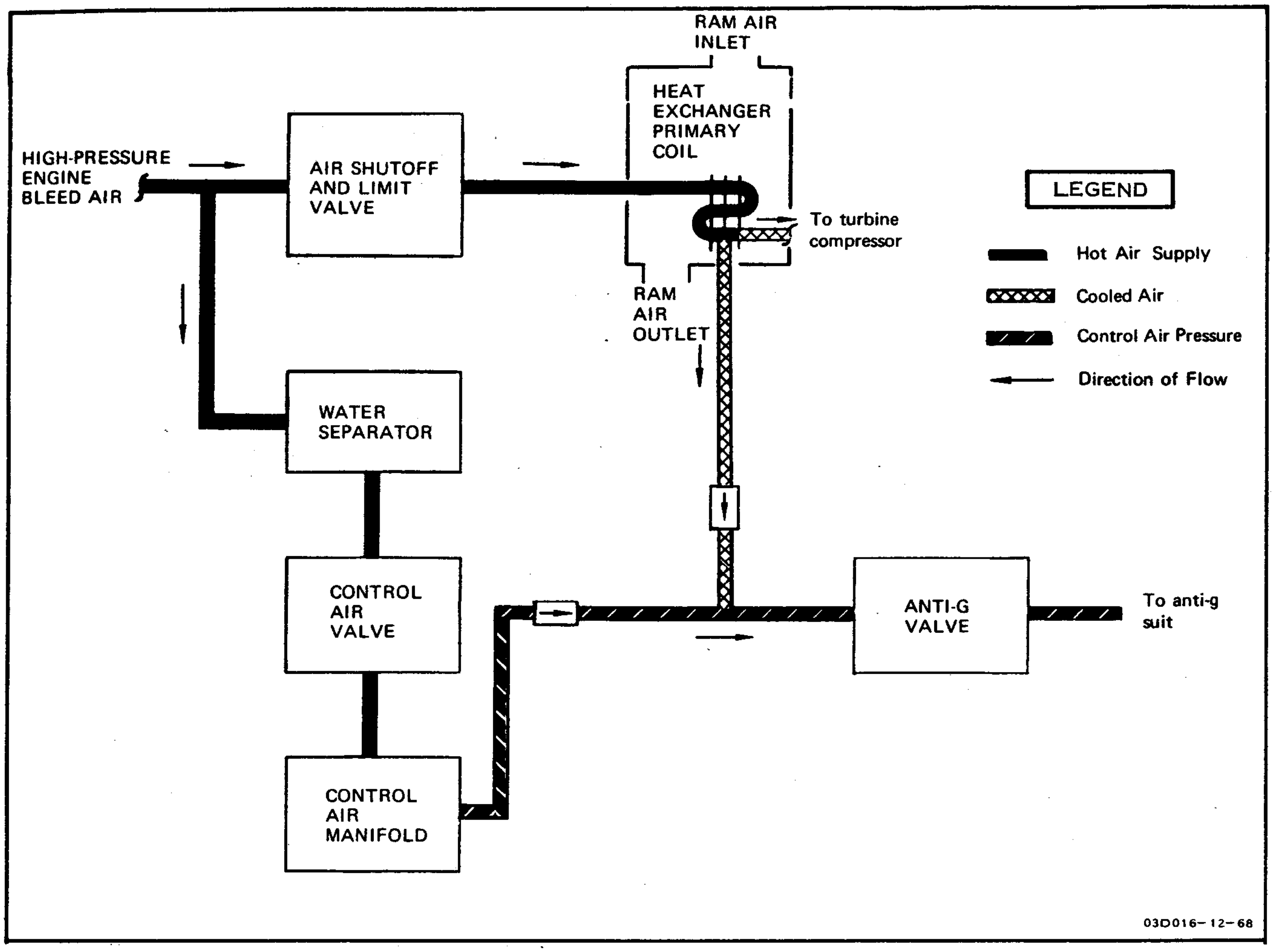


Figure 9-1. Antiblackout System Flow Diagram

9-11. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine during operational checkout of antiblackout system
1-3A	Test gage D		Check pressure during checkout

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 figure 9-1A.

a. Open access 2212-6.

b. Disconnect line to relief valve on low limit transmitter and connect test gage D to line.

c. Start and operate engine at idle RPM (T.O. 1A-7D-2-1).

d. Place cockpit pressure switch in CABIN DUMP.

e. Press anti-g valve manual override button and check that air flows freely from antiblackout receptacle on pilot services disconnect panel. {1}

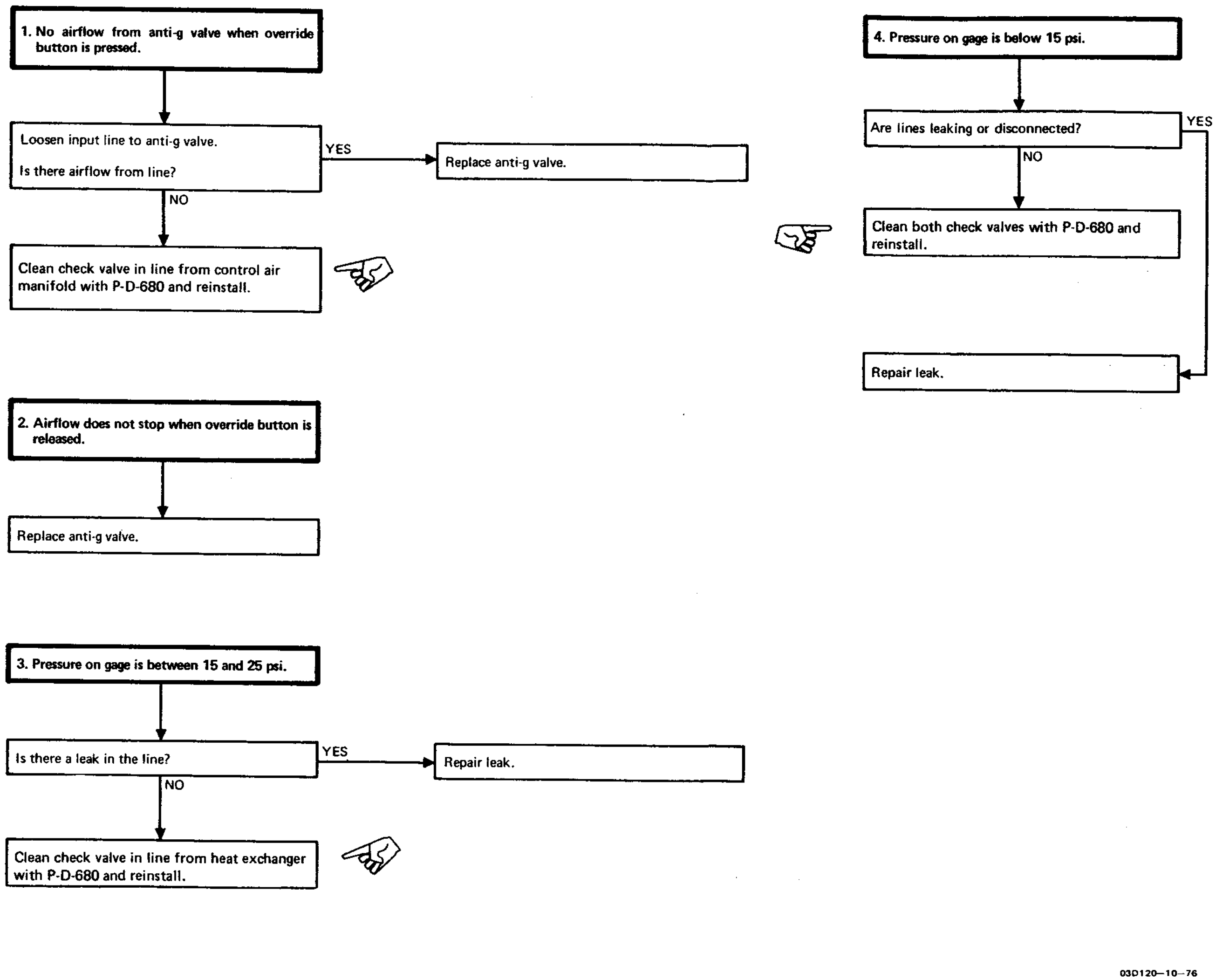


Figure 9-1A. Antiblackout System Troubleshooting

f. Release manual override button and check that airflow stops. {2}

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from ram air exhaust duct after placing cockpit pressure switch in CABIN PRESS. If no flow occurs, place switch in CABIN DUMP, and troubleshoot air-conditioning supply system.

g. Place cockpit pressure switch in CABIN PRESS and advance throttle to 80% rpm.

h. Check that pressure on gage exceeds 25 psi. {3, 4}

i. Shut down engine. (T.O. 1A-7D-2-1)

j. Remove gage and connect line to low limit transmitter.

k. Close access 2212-6.

9-12. TROUBLESHOOTING. (See figures 1-4 and 1-5.)

9-13. Refer to figure 9-1A for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

9-14. ANTI-G VALVE REMOVAL AND INSTALLATION.

9-15. REMOVAL. (See figure 9-2.)

a. Open access 1221-1.

b. Disconnect pneumatic lines (1 and 2) from outlet and inlet ports of anti-g valve. Plug valve ports and cap lines.

c. Cut lockwire and remove two screws (3) securing anti-g valve to bracket.

d. Lower anti-g valve (5) from console and remove from airplane.

9-16. INSTALLATION. (See figure 9-2.)

a. Remove line caps and valve plugs.

b. Hold valve in vertical position and give sudden downward shake. The piston and lower weight shall drop and return to original position. Weight movement can be heard and felt.

c. Secure valve (5) to airframe bracket with screws (3). Secure screws with MS20995C32 lockwire.

d. Connect lines (1 and 2) to outlet and inlet ports of valve.

e. Close access 1221-1.

f. Perform antiblackout system operational checkout (paragraph 9-11).

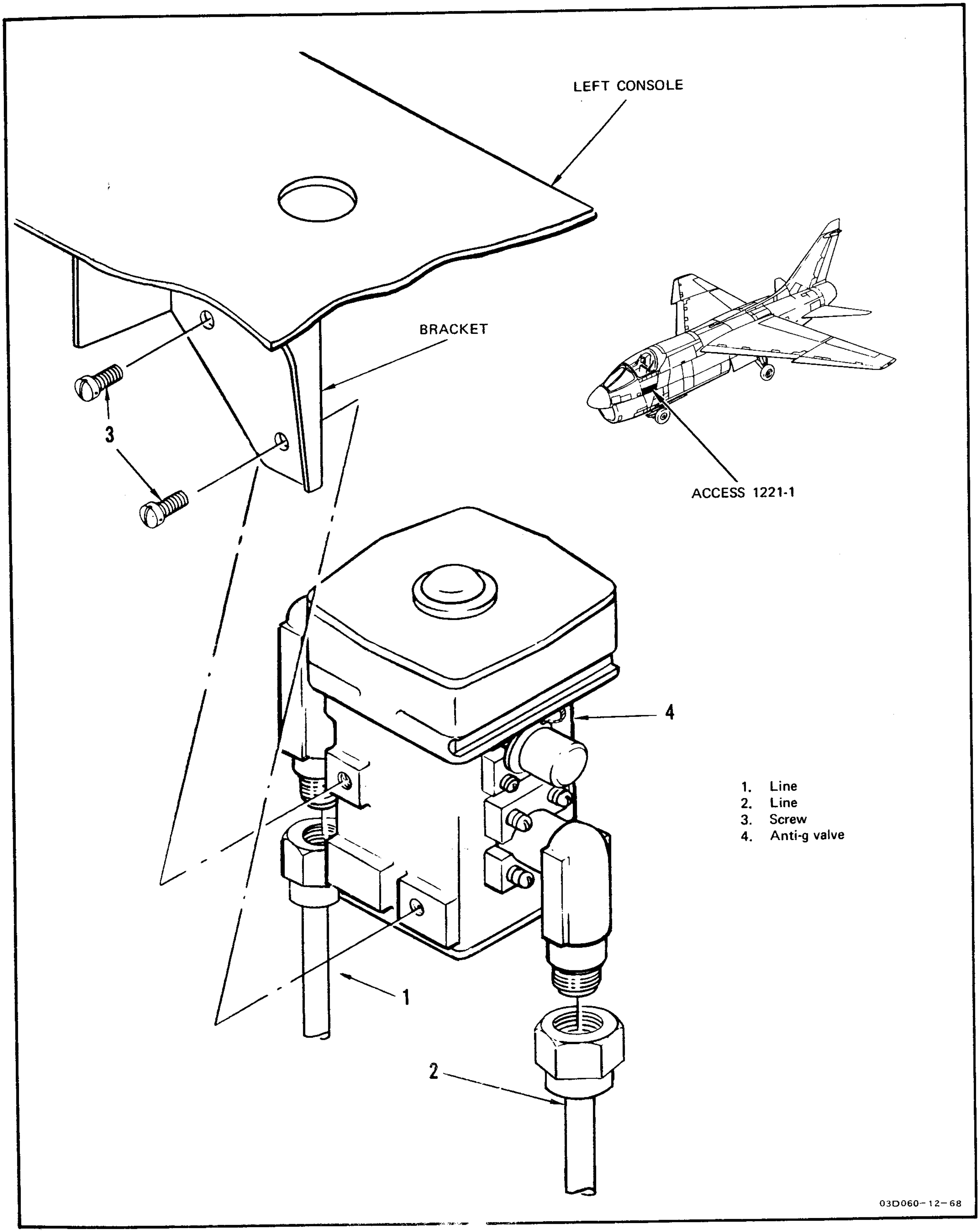


Figure 9-2. Anti G Valve Removal and Installation

SECTION X
COCKPIT PRESSURE REGULATOR SYSTEM

10-1. DESCRIPTION.

10-2. The cockpit pressurization system maintains a pressurized environment in the cockpit any time the air-conditioning system is operating and the canopy is closed. The cockpit pressurization system consists of an air pressure regulator, a safety valve, a pressure altimeter, and an emergency ram air scoop. Excessive positive and negative pressure differentials are prevented by controlling the amount of air leaving the cockpit. In event of system failure or contamination, ram air ventilation may be selected through the emergency vent air scoop. For description of controls and indicators, see figure 1-1. For system arrangement, see figure 1-2.

10-3. OPERATION. (See figures 10-1, 10-1A, and 10-1B.)

10-4. When the cockpit pressure switch is placed in CABIN PRESS, 18 psi is applied to the ball check valve and the cockpit air safety valve closes, allowing pressurization above 8,000 feet, and the pressure limiting and shutoff valve opens, placing the air-conditioning system in operation. From 8,000 to 23,000 feet, the system maintains cockpit pressure equivalent to an altitude of 8,000 feet. Above 23,000 feet, cockpit pressure remains relatively constant at 5 psi differential (5 psi above ambient). Cockpit pressure is indicated by a pressure altimeter, from 0 to 50,000 feet in increments of 1,000 feet. Cockpit pressurization is normally controlled by the air pressure regulator which discharges outflow air into the nose cone. If rapidly changing flight conditions or malfunction prevents the regulator from functioning properly, the cockpit safety valve will dump any excessive pressure. The safety valve will also prevent excessive negative pressure. If the air-conditioning system is inoperative or becomes contaminated, placing the cockpit pressure switch selector in CABIN DUMP will dump cockpit pressure and shut down the air-conditioning system. Emergency vent air may then be selected by actuating the emergency vent knob which mechanically positions the emergency vent air scoop into the slipstream. See figure 1-1 for cockpit controls and indicators location.

10-5. When the cockpit is not pressurized, between sea level and 8,000 feet, the pressure regulator evacuated isobaric bellows is contracted which positions the isobaric metering valve pin off-seat. This allows regulator head pressure to be vented to atmosphere, reducing head pressure to approximately that of atmospheric pressure. Cockpit pressure is slightly greater than atmospheric pressure because of the flow resistance characteristics of the regulator valve. The differential between cockpit and regulator head pressure acts upon the actuator diaphragm, which moves the outflow valve against the valve return spring to maintain cockpit pressure slightly above head pressure (approximately atmospheric pressure).

10-6. As 8,000 feet is approached, absolute pressure in the regulator head chamber decreases, permitting the bellows to expand, which moves the metering valve pin toward its seat. The bellows positions the metering valve pin on-seat and off-seat as necessary to maintain a constant absolute pressure head within an 8,000-to 23,000-foot range operation. The differential between head pressure and cockpit pressure acts upon the actuator diaphragm to position the outflow valve as required to maintain the cockpit within range.

10-7. As the constant differential range (23,000 feet and up) is approached, expansion of the bellows sufficiently positions and hold the metering valve pin fully on-seat, sealing off the connection to true atmospheric during the entire differential pressure range operation. In the constant differential range, the differential pressure from the regulator head to atmosphere across the differential control diaphragm is sufficient to overcome the spring load, and the differential valve metering pin is positioned on-seat or off-seat as necessary to maintain a constant differential pressure from head to atmospheric. The differential from head to cockpit pressure (5 psi), acting upon the actuator diaphragm, positions the regulator outflow valve to control cockpit pressure.

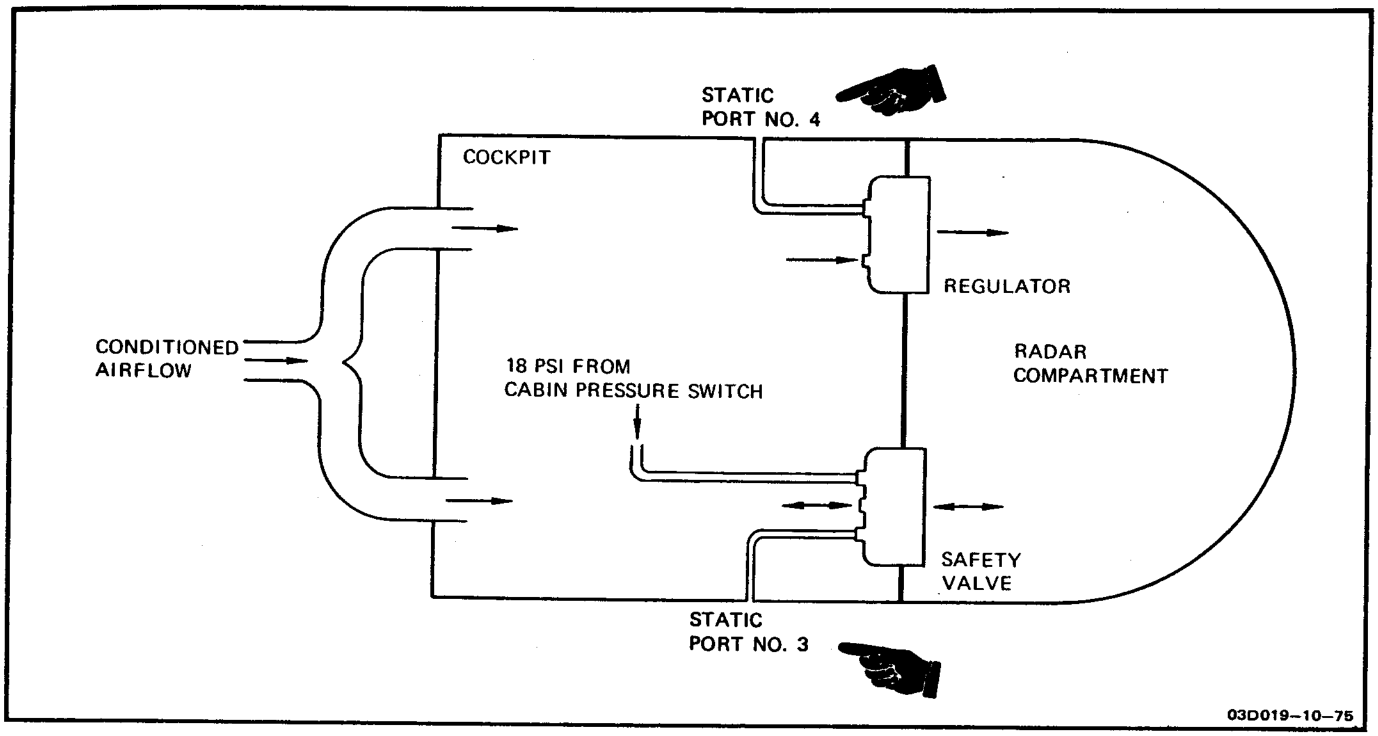


Figure 10-1. Cockpit Pressure Regulator System Flow Diagram

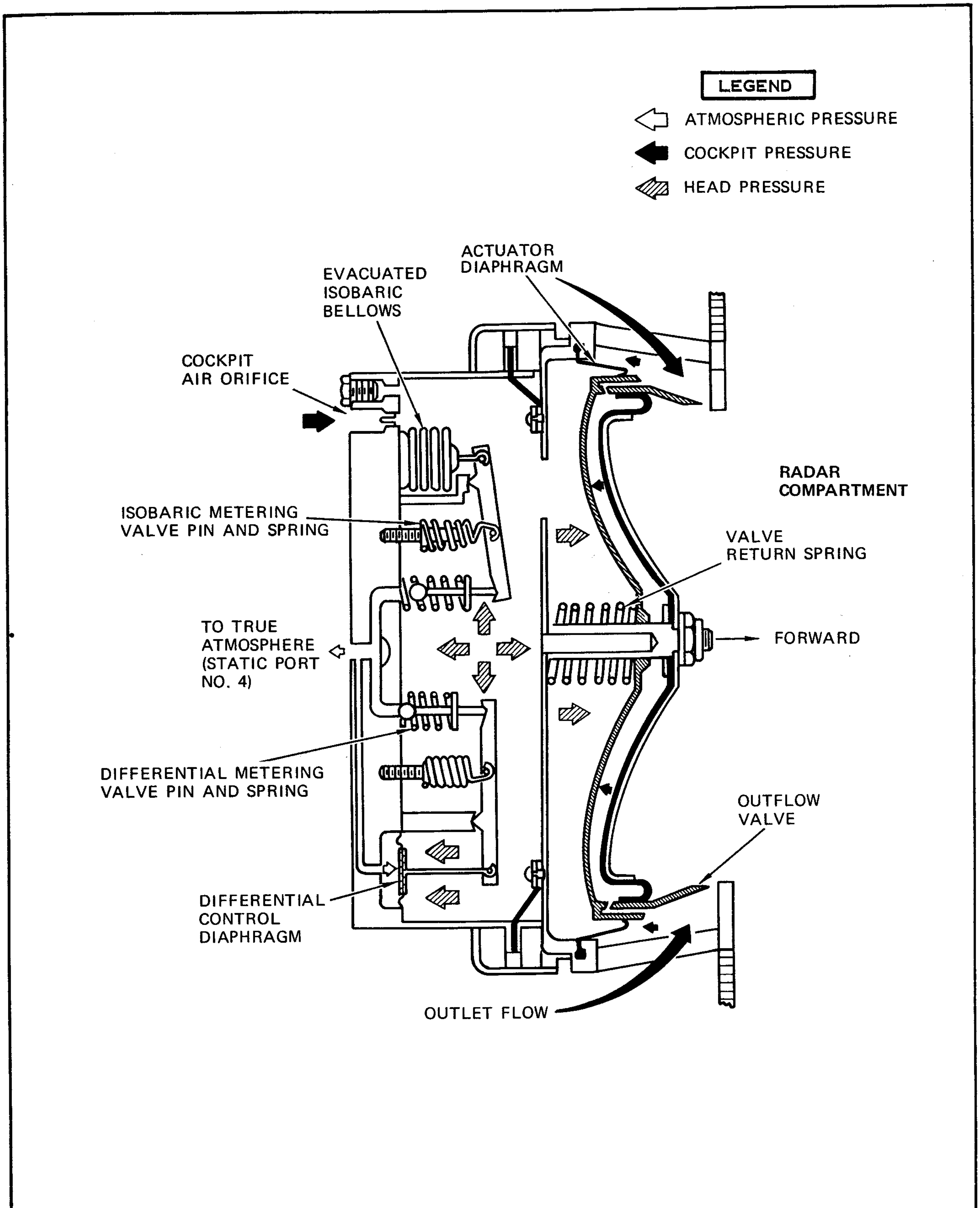


Figure 10-1A. Cockpit Air Pressure Regulator Schematic

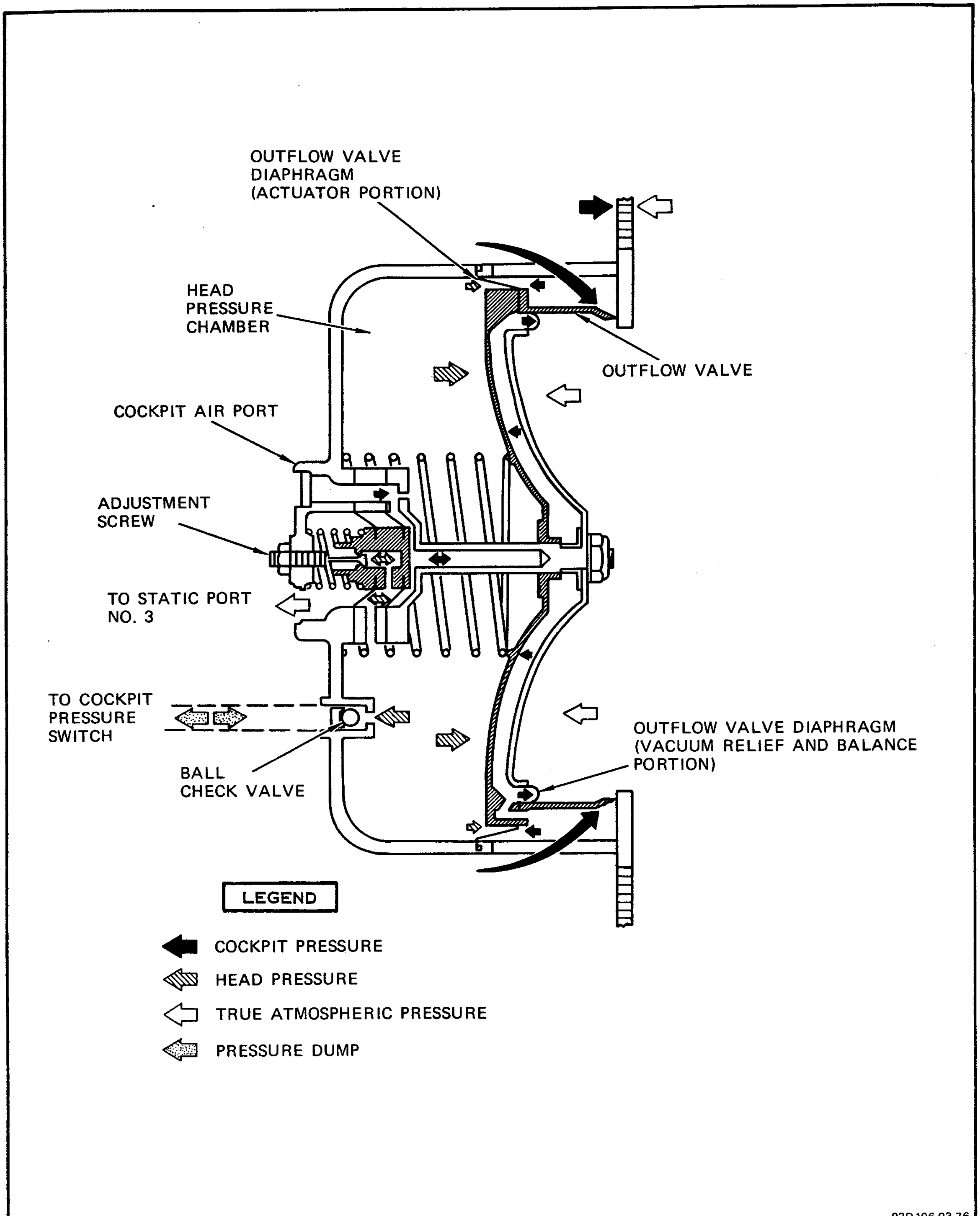


Figure 10-1B. Cockpit Air Safety Relief Valve Schematic

10-8. The safety valve limits cabin differential pressure to a maximum of +5.5 psi and a minimum of -0.25 psi during all ranges of operation. When the differential between cockpit and atmospheric pressure reaches 5.5 psi, the force on the spring-loaded double diaphragm in the cockpit safety valve overcomes the spring load and moves a poppet valve against an adjustment screw. This vents the safety valve head to atmosphere, reducing head pressure which pneumatically unbalances the outflow valve diaphragm. The differential between cockpit and head pressure acting upon the upper diaphragm positions the outflow valve to maintain the differential. When atmospheric pressure exceeds cockpit pressure, the lower diaphragm moves the valve off-seat, allowing atmospheric air to flow into the cockpit. Upon selecting CABIN DUMP, a ball check valve dumps head pressure to atmosphere, causing the outflow valve diaphragm to become pneumatically unbalanced, opening the outflow valve, and depressurizing the cockpit.

10-9. COMPONENTS.

10-10. For a list of components, their locations (accesses), and functions, refer to table 10-1.

Table 10-1. Cockpit Pressure Regulator System Components

Component	Access	Function
Altimeter, cockpit pressure	Instrument panel[1]	Indicates cockpit pressure in terms of equivalent pressure altitude.
	Pilot services disconnect panel[2]	
Regulator, cockpit air pressure	1211-2	Controls cockpit pressurization when airplane is above 8,000 feet.
Scoop, emergency ram air	Above right forward console	Allows cockpit ventilation to atmosphere in event of air-conditioning system contamination or failure.
Valve, cockpit air safety	2211-1	Allows cockpit to pressurize and automatically dumps excessive pressure in event of cockpit air pressure regulator failure.

[1]Airplanes through AF69-6196
[2]Airplanes AF69-6197 and subsequent

10-11. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Pressurized cabin leakage tester	AF/M 32T-1 (See Table 10-1A)	Check cockpit pressure regulator and safety valve during operational checkout
	Adapter hose	7525472 (Oklahoma City ALC)	Connect ground fitting to leakage tester blower hose
	Air data simulator	SM-565/ASM or SM-565A/ASM	Check cockpit pressure altimeter during operational checkout
	Canopy retaining net	8246288-10 (USAF)	Retain canopy assembly in case of retention system failure.

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 figure 10-3A.

10-12. COCKPIT PRESSURE REGULATOR SYSTEM. (See figure 10-2.)

a. Open accesses 1211-1, 1211-2, 2222-4, and nose radome.

b. Check that static ports are unobstructed and static lines and connections are tight and not damaged.

c. Cut lockwire on cockpit pressure regulator handle.

d. Place regulator handle in TEST ONLY ALL OFF.

e. Close access 1211-2.

f. Remove pressure caps (1 and 2) from ground test fitting (3) and pressure sensing line fitting (4) located on forward pressure bulkhead left side.

(1) See Table 10-1A for applicable operating instructions for cabin tester being used.

g. Connect hose (4A) to ground test fitting (3). Attach blower hose between adapter hose and tester.

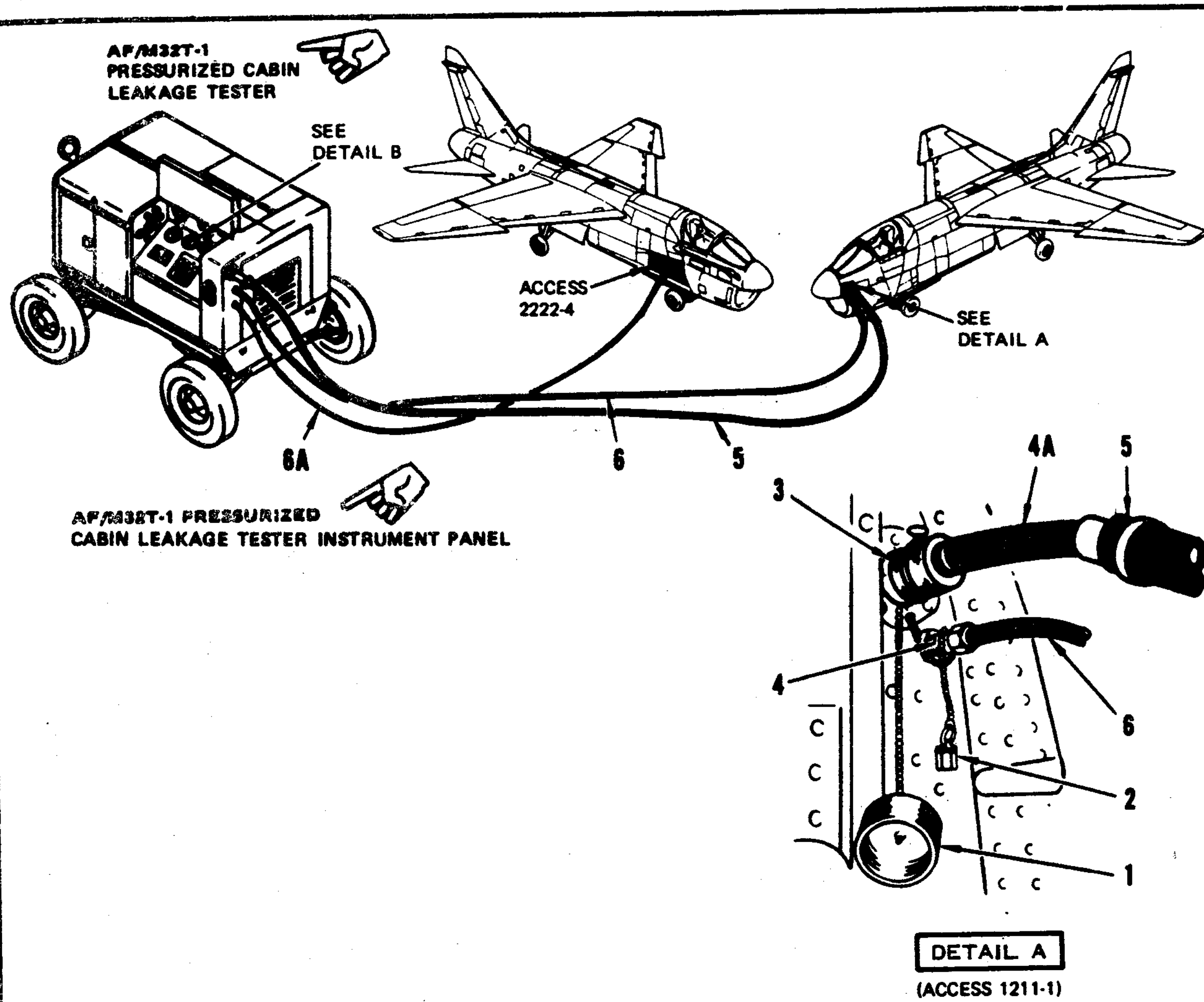
h. Connect test hose (6) between the CABIN PRESSURE outlet and pressure sensing fitting.

i. Remove cockpit pressure altimeter (paragraph 10-32).

j. Close cockpit emergency vent air scoop.

Table 10-1A. Cabin Pressure Testers

Part No.	MFC	T.O.
1123-100	89307	33A4-4-8-1
33A1	70210	33A4-4-8-11
155	09045	33A4-4-8-21
76100	89307	33A4-4-29-1
88825	89307	33D2-28-10-1
89405	89307	33A4-4-27-1



1. Pressure cap
2. Pressure cap
3. Ground test fitting
4. Pressure sensing line fitting
4A. Adapter hose
5. Blower hose
6. Test hose
6A. Test hose

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Figure 10-2. Cockpit Pressure Regulator System Test

k. Position cockpit environmental control panel as follows:

Control	*Position*
Cockpit pressure switch	CABIN PRESS
Defog switch	OFF
Rain removal switch	OFF

l. Close and secure canopy.

(1) Verify the interior handle is in the closed and locked position and is not jammed against the interior handle guard.

(2) Install canopy retaining net, Part No. 8246288-10.

m. Disconnect control air line attached to elbow upstream from port E of control air manifold.

NOTE

Cabin pressure leakage tester CANOPY SEAL outlet pressure is used to hold the cabin dump valve closed.

n. Connect canopy seal test hose (6A) to control air line elbow and CANOPY SEAL outlet on leakage tester.

o. For pressure tester operating instructions, refer to applicable technical order (table 10-1A).

p. Check cockpit leakage rate indicated on flowmeter and check flowmeter conversion chart. Leakage rate shall not exceed 75 cubic feet per minute at 5.0 (±0.1) psig.

q. Rotate pressure adjustment control as required to increase airflow to 9.8 (±0.21) cubic feet per minute above measured cabin leakage rate. The cockpit air safety valve shall limit the maximum cockpit pressure to 5.5 (±0.2) psig.

r. Measure gap between center windshield glass and frame. Gap on each side of windshield shall not exceed 0.40 inch.

s. Decrease airflow to cockpit and shut down cabin leakage tester in accordance with applicable technical order.

t. Allow cockpit pressure to bleed off in accordance with applicable technical order.

u. Check that cabin pressure gage has returned to zero.

v. Open access 1211-1.

w. Place cockpit air pressure regulator handle in TEST ONLY DIFF ON.

x. Close access 1211-2.

y. Start cabin leakage tester and pressurize cockpit to 5.0 (±0.1) psig. Cockpit air pressure regulator shall limit cockpit pressure to 5.0 (±0.1) psig.

z. Shut down cabin leakage tester and bleed off cockpit pressure.

aa. Open access 1211-2, place cockpit air pressure regulator handle in FLIGHT, and secure handle with MS20995C32 lockwire.

ab. Close access 1211-1.

ac. Slowly rotate canopy seal regulator control to the open position.

ad. Disconnect test hose (6A) from control air line and tester.

ae. Connector control air line to part E of control air manifold.

af. Close access 222-4.

ag. Disconnect test hoses from airplane test fittings on forward pressure bulkhead.

ah. Install pressure caps.

ai. Remove canopy retaining net, Part No. 8246288-10, open canopy, and install cockpit pressure altimeter (paragraph 10-32).

aj. Close access 1211-1 and nose radome.

10-13. COCKPIT PRESSURE ALTIMETER.

a. Remove cockpit pressure altimeter (paragraph 10-32).

b. Position switches and controls on air data simulator (figure 10-3) as indicated in table 10-2.

c. Connect test hose quick-disconnect fitting (red) to Ps output on air data simulator and other end to cockpit pressure altimeter.

d. Open access 1232-1.

e. Connect power cable W2 cable connector W2P2 to simulator POWER receptacle J2 and cable connector W2P3 to power cable W4 cable connector W4J4. Connect cable connector W4P5 to ARW-77 test receptacle.

WARNING

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

f. Connect external electrical power to airplane (T.O. 1A-7D-2-1).

CAUTION

To prevent damage to air data simulator and cockpit pressure altimeter when power to simulator is interrupted or simulator malfunctions and electrical control is not possible, place POWER switch in OFF. Rotate altitude and airspeed BLEED valves counterclockwise to open. When simulator altimeter indicates local altitude and airspeed indicator indicates 60 knots, disconnect simulator from cockpit pressure altimeter. Repeat step c, then proceed to step g.

g. Place simulator POWER switch in ON. If PROGRAM light comes on, momentarily place PROGRAM START-STOP switch in STOP to turn light off.

h. Rotate DIM control for desired brilliance.

CAUTION

Do not disconnect test hose from simulator or system under test when lines are pressurized. Damage to instrument or simulator may occur.

NOTE

Do not adjust airspeed below 42 knots as LIMIT light will come on. If LIMIT light comes on during checkout, it will be necessary to adjust airspeed above 60 knots, place POWER switch in OFF, and repeat startup procedures.

i. Adjust AIRSPEED-MANUAL control until AIRSPEED digital display equals airspeed indication and A/S BALANCE light comes on. If light comes on, proceed to step j. If light will not come on, perform following procedure:

1. Adjust AIRSPEED-MANUAL control to approximately 60 on AIRSPEED digital display.

2. Open altitude BLEED valve.

3. Adjust AIRSPEED-MANUAL control to drive AIRSPEED digital display toward airspeed indication, then continue adjusting control in same direction until A/S BALANCE light comes on.

4. Close altitude BLEED valve. If A/S BALANCE light goes out, repeat substep 3.

CAUTION

The rate of change must not be adjusted to exceed 3,000 feet per minute rate of climb or descent as damage to instrument may result.

5. Verify that ALT BALANCE light is on. If light is off, adjust ALTITUDE-MANUAL control until ALTITUDE digital display is equal to altimeter indication and ALT BALANCE light comes on.

6. With both ALT and A/S BALANCE lights on, momentarily place START switch in up position. After a 7-second delay, the CONTROL light will come on indicating the simulator is ready for use.

7. Adjust AIRSPEED-MANUAL control until AIRSPEED digital display indicates above 60 knots and proceed to step l.

CAUTION

The rate of change must not be adjusted to exceed 3,000 feet per minute rate of climb or descent as damage to instrument may result.

j. Verify that ALT BALANCE light is on. If light is off, adjust ALTITUDE-MANUAL control until ALTITUDE digital display is equal to altimeter indication and ALT BALANCE light comes on.

k. With both ALT and A/S BALANCE lights on, momentarily place START switch in up position. After a 7-second delay, the CONTROL light will come on indicating the simulator is ready for use.

l. Place MODE switch in FIXED PT.

m. Adjust ALTITUDE and AIRSPEED-MANUAL controls to maximum UP position. Allow time for altitude and airspeed indications to stabilize to fixed point values.

n. Place FIXED PT switch in switch positions 4 through 8, allowing altitude indications time to settle for each position. Instrument indications must be within tolerances specified in table 10-3. {4}

o. Place FIXED PT switch in 1 and allow digital displays to stabilize.

CAUTION

Do not disconnect pneumatic hoses from simulator or instrument under test when lines are presurized. Damage to instrument may occur.

p. Adjust ALTITUDE- and AIRSPEED-MANUAL controls to 0.

q. Place simulator MODE switch in MANUAL-START.

r. Simultaneously adjust ALTITUDE- and AIRSPEED-MANUAL CONTROLS UNTIL ALTITUDE digital display indicates local altitude and AIRSPEED digital display indicates 60.

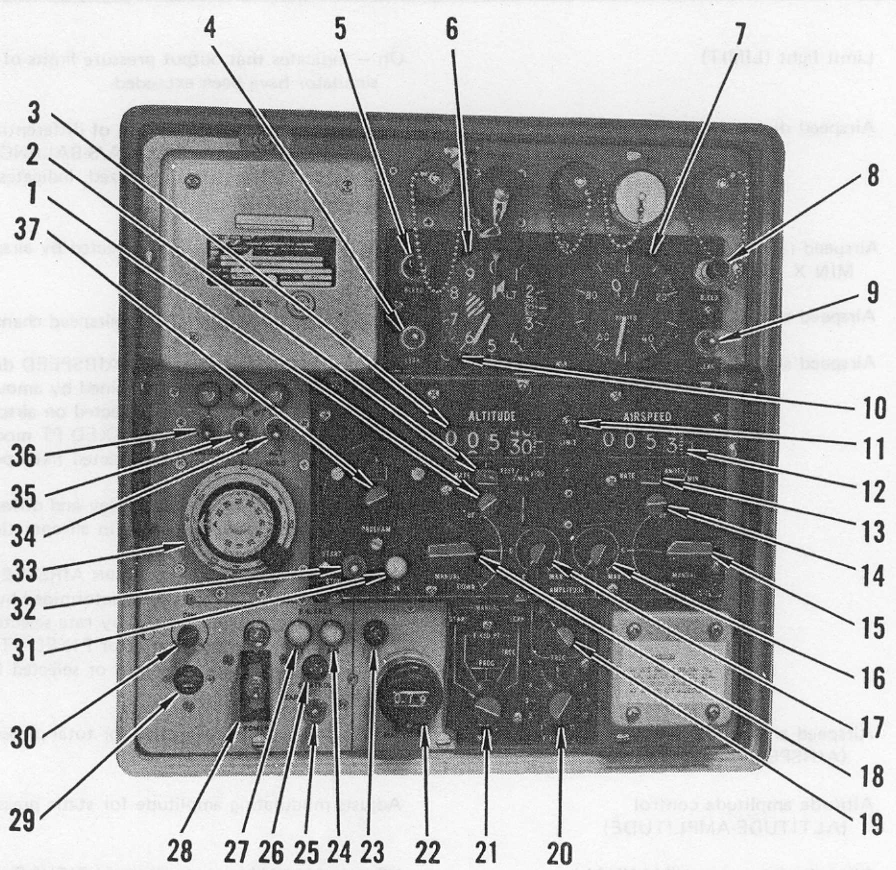
s. Place simulator POWER switch in OFF.

t. Disconnect external electrical power.

u. Disconnect simulator from airplane and cockpit pressure altimeter.

v. Close access 1232-1.

w. Install cockpit pressure altimeter (paragraph 10-32).



INDEX NO.	CONTROL/INDICATOR	FUNCTION
1	Altitude rate control	Adjusts maximum slew rate for altitude channel.
2	Altitude rate indicator (RATE FEET/ MIN X 100)	Indicates maximum slew rate selected by altitude rate control.
3	Altitude digital display (ALTITUDE)	Indicates mechanical positioning of static pressure sensor gear train. When ALT-BALANCE light is on and altimeter indication has stabilized, indicates static pressure output in feet.
4	Leak test switch (LEAK TEST)	When pressed, isolates unit under test from static and total pressures for leak testing.
5	Altitude bleed valve (BLEED)	Open – bleeds static pressure to atmosphere.
6	Altimeter	Provides a reference indication in feet of the static pressure output.
7	Airspeed Indicator	Provides a reference indication in knots of differential of total and static pressure outputs.
8	Airspeed bleed valve (BLEED)	Open – bleeds total pressure to atmosphere.
9	Leak test switch (LEAK TEST)	When pressed, isolates unit under test from static and total pressures for leak testing.
10	Barometric pressure control	Sets indicator barometric pressure reference.

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Figure 10-3. Air Data Simulator (SM-565/ASM) Controls and Indicators (Sheet 1)

INDEX NO.	CONTROL/INDICATOR	FUNCTION
11	Limit light (LIMIT)	On – indicates that output pressure limits of air data simulator have been exceeded.
12	Airspeed digital display (AIRSPEED)	Indicates mechanical positioning of differential pressure sensor gear train. When the A/S-BALANCE light is on and airspeed indication has stabilized, indicates differential pressure in knots.
13	Airspeed rate indicator (RATE KNOTS/ MIN X 100)	Indicates maximum slew rate selected by airspeed rate control.
14	Airspeed rate control	Adjusts maximum slew rate for airspeed channel.
15	Airspeed slew control (MANUAL)	UP – in MANUAL mode slews AIRSPEED digital display up scale. Rate of slew is determined by amount control is offset from 0 and by rate selected on airspeed rate control. In PROGRAM or FIXED PT mode, slews digital display to programmed or selected fixed point airspeed. 0 – disables airspeed digital display and differential pressure sensor gear train drive motor in all operating modes. DOWN – in MANUAL mode slews AIRSPEED digital display down scale. Rate of slew is determined by amount control is offset from 0 and by rate selected on airspeed rate control. In PROGRAM or FIXED PT mode slews digital display to programmed or selected fixed point airspeed.
16	Airspeed amplitude control (AIRSPEED-AMPLITUDE)	Adjusts modulating amplitude for total pressure output.
17	Altitude amplitude control (ALTITUDE-AMPLITUDE)	Adjusts modulating amplitude for static pressure output.
18	Altitude slew control (MANUAL)	UP – in MANUAL mode slews ALTITUDE digital display up scale. Rate of slew is determined by amount control is offset from 0 and by rate selected on altitude rate control. In PROGRAM or FIXED PT mode slews digital display to programmed or selected fixed point altitude. 0 – disables altitude digital display and differential pressure sensor gear train drive motor in all operating modes. DOWN – in MANUAL mode slews ALTITUDE digital display down scale. Rate of slew is determined by amount control is offset from 0 and by rate selected on altitude rate control. In PROGRAM or FIXED PT mode slews digital display to programmed or selected fixed point altitude.
19	Frequency switch (FREQ)	Selects modulating frequency for modulating static and total pressure outputs when in FIXED PT-FREQ mode.
20	Fixed point switch (FIXED PT)	Selects preset fixed static pressure, total pressure, and temperature resistance outputs when TS-2917/ASM-388 air data computer test set is operating in a fixed point mode.
21	Mode switch (MODE)	MANUAL-START – selects manual mode of operation. FIXED PT – selects fixed point mode of operation. PROG – selects program automatic mode of operation. FIXED PT-FREQ – selects fixed point frequency mode of operation. MANUAL-LEAK – selects manual leak mode of operation.

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Figure 10-3. Air Data Simulator (SM-565/ASM) Controls and Indicators (Sheet 2)

INDEX NO.	CONTROL/INDICATOR	FUNCTION
22	Mach limit control (MACH LIMIT)	Adjusts desired Mach limit to protect against overpressurizing unit under test.
23	Mach limit light	On – indicates airspeed is equal to, or has exceeded, Mach limit setting.
24	Airspeed balance light (A/S BALANCE)	On – indicates total pressure pneumatic servo loop has nulled and differential pressure output is equal to AIRSPEED digital display.
25	Start switch (START)	Initiates startup cycle when engaged after both ALT–and A/S–BALANCE lights come on.
26	Control light (CONTROL)	On – indicates that startup cycle has been completed and simulator is ready for use.
27	Altitude balance light (ALT BALANCE)	On – indicates static pressure pneumatic servo loop has nulled and static pressure output is equal to ALTITUDE digital display.
28	Power switch-light (POWER)	ON – connects AC power to simulator. Light comes on. OFF – removes AC power from simulator. Automatically switches to OFF in case of circuit overload. Light goes off.
29	Elapsed time indicator	Indicates number of hours simulator has been operated.
30	Dimmer control (DIM)	Adjusts panel light intensity.
31	Program light (ON)	ON – indicates program gear train drive motor is operating and programmed flight profile is controlling simulator outputs.
32	Program control switch (START-STOP)	START – when momentarily held in START, starts programming gear train drive motor. STOP – when momentarily held in STOP, stops programming gear train drive motor.
33	Temperature resistance control (TEMP RESISTANCE)	Sets resistance value to simulate temperature when INT/EXT switch is placed in INT.
34	Altitude hold switch-light (ALT HOLD)	Places the ADC in altitude hold mode and indicates air data simulator is in the altitude hold mode.
35	Temperature resistance internal/external switch-light (INT-EXT)	INT – selects internal resistance source for temperature simulator function. Light comes on. EXT – selects external resistance source for temperature simulator function. Light goes off.
36	Vacuum switch-light (VACUUM)	Applies vacuum output of simulator to system under test and indicates vacuum output is applied to system under test.
37	Program selector and indicator (PROGRAM)	When pressed and rotated, selects position of programming cams and indicates percent of programmed output that has not been completed.

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Figure 10-3. Air Data Simulator (SM-565/ASM) Controls and Indicators (Sheet 3)

Table 10-2. SM-565/ASM Air Data Simulator Preliminary Control Settings

Control	Setting
POWER ON/OFF	OFF
MACH LIMIT	1.00
MODE	MANUAL/START
FIXED PT	1
ALTITUDE-RATE FEET/MIN X 100	30
ALTITUDE-MANUAL	0
AIRSPEED-RATE KNOTS/MIN	350
AIRSPEED-MANUAL	0
PROGRAM START-STOP	Momentarily place in STOP
TEMP RESISTANCE	40.0
VACUUM	Off (down)
TEMP RESISTANCE-INT/EXT	INT
ALT HOLD	Off (down)
Altimeter	29.92
Bleed valve (altitude)	Clockwise (closed)
Bleed valve (airspeed)	Clockwise (closed)

Table 10-3. Cockpit Pressure Altimeter Test Limits

Air Data Simulator — Fixed PT Selection	Altimeter — Altitude Based on 77°F (25°C) Temp
1	0 (±200) ft
4	5,000 (±300) ft
5	10,000 (±400) ft
6	20,000 (±600) ft
7	30,000 (±800) ft
8	45,000 (±1,100) ft

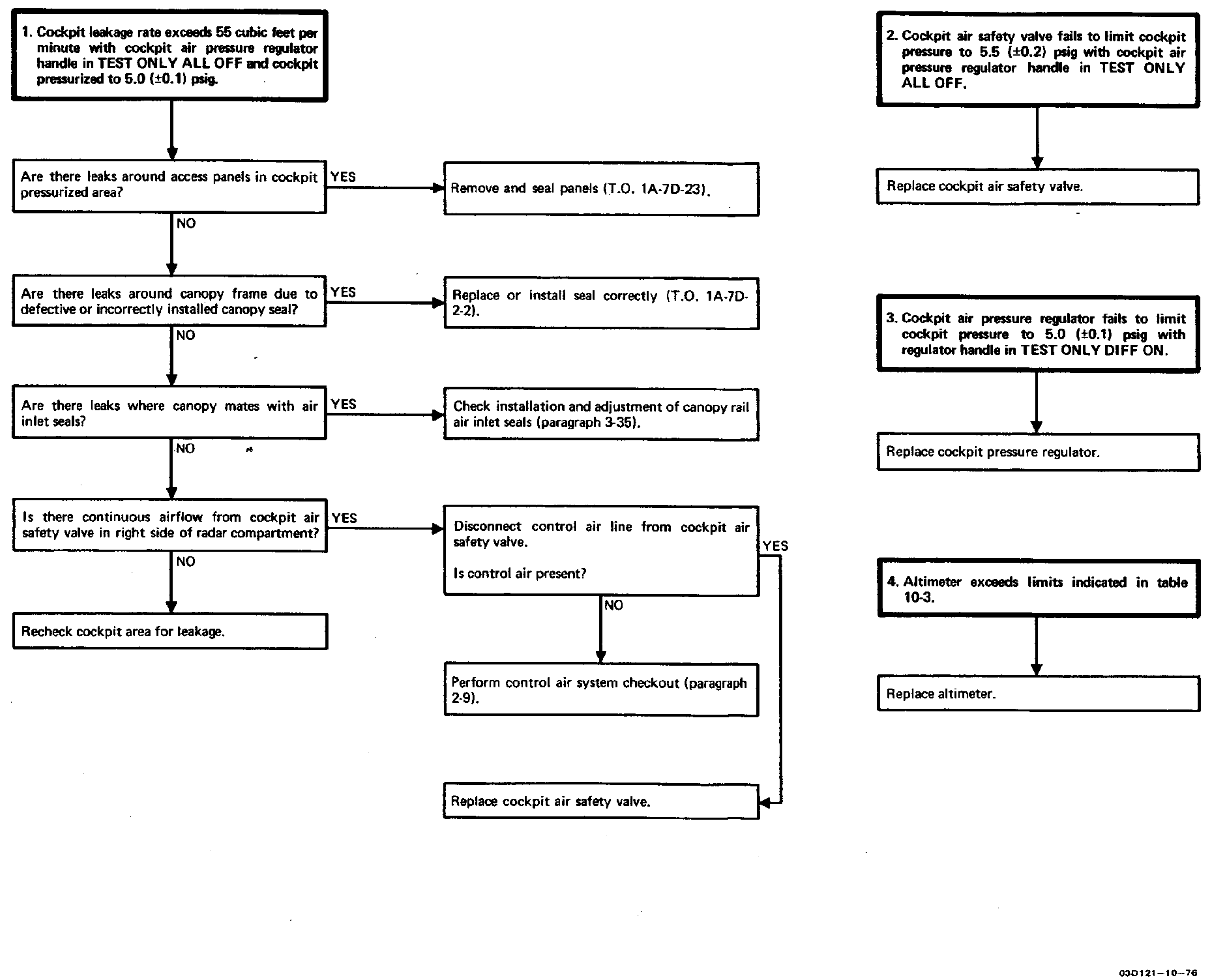


Figure 10-3A. Cockpit Pressure Regulator System Troubleshooting

10-14. TROUBLESHOOTING.

10-15. Refer to figure 10-3A for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

10-16. COCKPIT AIR PRESSURE REGULATOR STATIC LINE MOISTURE CHECK AND PURGING (Airplanes Before T.O. 1A-7D-708).

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Air/nitrogen trailer	MIL-T-26772	Furnish air/nitrogen for purging pressure regulator

a. Open access 1211-2 and unsnap curtain.

b. Remove left armorplate floorboard (T.O. 1A-7D-2-1).

c. Remove drain caps from tee installed in static line and from tee installed on pressure regulator. If moisture is present, purge line as instructed in the following steps. If purging is not required, install caps and left floorboard.

d. Disconnect static line from static port No. 4.

e. Connect purging source to static line and apply 10- to 25-psig pressure.

f. When moisture-free air flows from tee installed in static line, install cap on tee. When moisture-free air flows from tee installed on regulator, shut down and disconnect pressure source from purging point. Install cap on tee.

g. Connect static line to port No. 4.

h. Install left armorplate floor-board and snap curtain into position.

i. Close access 1211-2.

10-16A. COCKPIT AIR PRESSURE REGULATOR STATIC LINE MOISTURE CHECK AND PURGING (Airplanes After T.O. 1A-7D-708).

Test Equipment Required

Figure & Index No.	*Name*	*AN Type Designation*	*Use and Application*
	Air/nitrogen trailer	MIL-T-26772	Furnish air/nitrogen for purging pressure regulator

a. Open access 1213-14.

b. Remove cap from drain fitting for static port No. 4 and drain trapped water.

c. If no water is present, install cap and close access 1213-14. If water is present, purge static line in accordance with the following steps.

1. Open access 1211-2 and unsnap curtain.

2. Remove left armorplate floorboard (T.O. 1A-7D-2-1).

3. Remove drain cap from tee installed on pressure regulator.

4. Disconnect static line from static port No. 4.

5. Connect purging source to static line and apply 10- to 25-psig pressure.

6. When moisture-free air flows from drain fitting in access 1213-14, install cap on fitting. When moisture-free air flows from tee installed on regulator, shut down and disconnect pressure source from purging point. Install cap on tee.

7. Connect static line to port No. 4.

8. Install left armorplate floorboard and snap curtain into position.

9. Close accesses 1211-2 and 1213-14.

10-17. COCKPIT AIR SAFETY VALVE STATIC LINE MOISTURE CHECK AND PURGING (Airplanes Before T.O. 1A-7D-708).

Test Equipment Required

Figure & Index No.	*Name*	*AN Type Designation*	*Use and Application*
	Air/nitrogen trailer	MIL-T-26772	Furnish air/nitrogen for purging safety valve

a. Open access 2211-2 and unsnap curtain.

b. Remove drain caps from tee installed in static line and from tee installed on safety valve. If moisture is present, purge line as instructed in the following steps. If purging is not required, install caps.

c. Disconnect static line from static port No. 3.

d. Connect purging source to static line and apply 10- to 25-psig pressure.

e. When moisture-free air flows from tee installed in static line, install cap on tee. When moisture-free air flows from tee installed on safety valve, shut down and disconnect pressure source from purging point. Install cap on tee.

f. Connect static line to port No. 3.

g. Snap curtain into position.

h. Close accesses 1211-2 and 2211-2.

10-17A. COCKPIT AIR SAFETY VALVE STATIC LINE MOISTURE CHECK AND PURGING (Airplanes After T.O. 1A-7D-708).

Test Equipment Required

Figure & Index No.	*Name*	*AN Type Designation*	*Use and Application*
	Air/nitrogen trailer	MIL-T-26772	Furnish air/nitrogen for purging safety valve

a. Open access 1213-14.

b. Remove cap from drain fitting for static port No. 3 and drain trapped water.

c. If no water is present, install cap and close access 1213-14. If water is present, purge static line in accordance with the following steps.

1. Open access 2211-2 and unsnap curtain.

2. Remove drain cap from tee installed on safety valve.

3. Disconnect static line from static port No. 3.

4. Connect purging source to static line and apply 10- to 25-psig pressure.

5. When moisture-free air flows from drain fitting in access 1213-14, install cap on fitting. When moisture-free air flows from tee installed on safety valve, shut down and disconnect pressure source from purging point. Install cap on tee.

6. Connect static line to port No. 3.

7. Snap curtain into position.

8. Close accesses 1213-14 and 2211-2.

10-18. COCKPIT AIR PRESSURE REGULATOR FILTER REMOVAL, CLEANING, AND INSTALLATION.

10-19. REMOVAL.

a. Open access 1211-2.

b. Unsnap curtain and remove left armorplate floorboard (T.O. 1A-7D-2-1).

c. Cut lockwire on filter and remove filter and O-ring from cockpit air pressure regulator. Discard O-ring.

d. Plug regulator filter port.

e. Remove snapring, outer screen, copper ribbon, and inner screen from the filter.

10-20. CLEANING.

WARNING

P-D-680, Type II, is combustible and moderately toxic to eyes, skin and respiratory tract. Eye and skin protection required. Use in well ventilated area.

a. Clean all filter parts in P-D-680 drycleaning solvent and air dry.

b. Use 0.032-inch copper wire to clean orifice in filter housing.

10-21. INSTALLATION.

a. Replace damaged parts.

b. Install parts into filter in the following order: inner screen, copper ribbon, outer screen, and snapring.

c. Remove plug from regulator filter port.

d. Install new O-ring on filter.

e. Install filter in regulator and secure with MS20995C32 lockwire.

f. Replace left armorplate floorboard and snap curtain into place.

g. Close access 1211-2.

10-22. COCKPIT AIR PRESSURE REGULATOR REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	*Part Number*	*Nomenclature*	*Use and Application*
	215-00188-1	Forward radar support strut	Support radar assembly during cockpit air pressure regulator removal and installation
	850-2 1/2	Gun, sealant	Apply sealant on surface of spacer

10-23. REMOVAL. (See figure 10-4.)

a. Open access 1211-2.

b. Open nose radome.

c. Install shock mount support pins at left side of radar forward assembly (looking aft).

d. Release quick-release locking pins at right side of radar forward assembly (looking aft).

e. Loosen lower harness cable clamp.

f. Swing radar forward assembly out and install support strut.

g. Remove upper and lower armorplates from forward radar compartment bulkhead (T.O. 1A-7D-2-1).

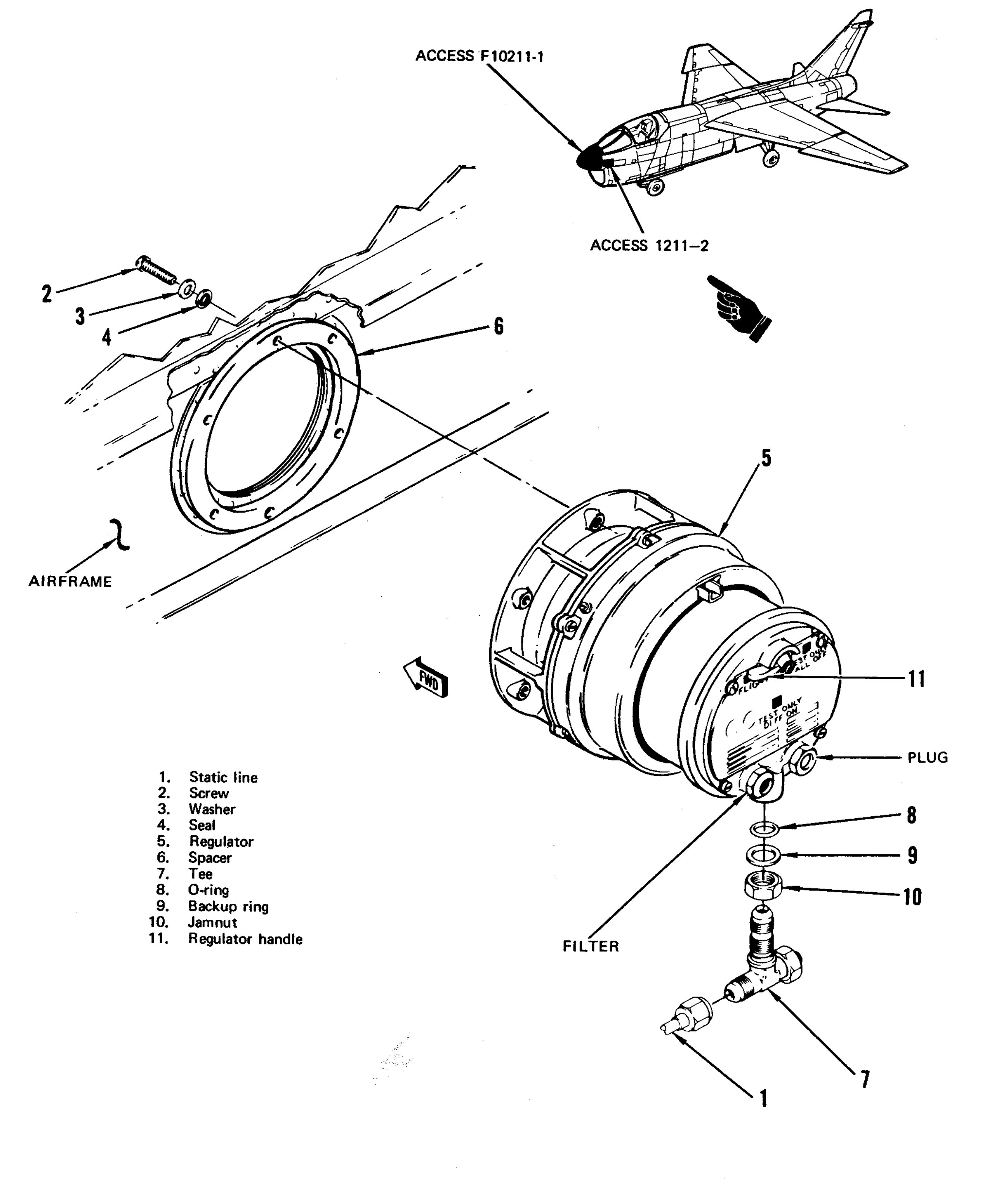
h. Unsnap curtain and remove left armor plate floorboard (T.O. 1A-7D-2-1).

i. Disconnect static line (1) at tee and loosen jamnut.

j. Cut lockwire and remove six screws (2), washers (3), and seals (4). Discard seals.

k. Remove regulator (5), leaving spacer (6) in place. Rotate tee as required to aid removal.

l. Remove tee (7), O-ring (8), backup ring (9), and jamnut (10) from regulator. Discard O-ring and backup ring.



1. Static line
2. Screw
3. Washer
4. Seal
5. Regulator
6. Spacer
7. Tee
8. O-ring
9. Backup ring
10. Jamnut
11. Regulator handle

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Figure 10-4. Cockpit Air Pressure Regulator Removal and Installation

10-24. INSTALLATION. (See figure 10-4.)

a. Install jamnut (10), new backup ring (9), and new O-ring (8) on tee (7).

b. Install tee (7) on regulator. Do not tighten jamnut.

c. Check sealant on spacer (6) for damage.

NOTE

If sealant is damaged or dirty, remove 1 inch of sealant on each side of damaged area and reseal with EC-1126 bead sealant. EC-1126 sealant may be replaced with MIL-S-11030E tape.

d. Apply a thin film of MIL-G-81322 grease to mounting surface of regulator.

e. Place washer (3) and new seal (4) on each mounting screw (2).

NOTE

Surface bond washer-to-airframe surface in accordance with MIL-B-5087 for static discharge.

f. Position regulator on spacer (6) and install mounting screws finger-tight.

g. Cross-tighten mounting screws.

h. Secure screws with MS20995C32 lockwire.

i. Connect and tighten static line (1) on tee (7), and then tighten jamnut (10).

j. Perform cockpit air pressure regulator system operational checkout (paragraph 10-11).

k. Install left armorplate floorboard and snap curtain into place.

l. Install upper and lower armorplates on forward radar compartment bulkhead.

m. Remove support strut.

n. Swing radar forward assembly into compartment and install quick-release locking pins at right mount (looking aft)

o. Remove shock mount support pins at left side of radar forward assembly (looking aft).

p. Close accesses 1211-2 and nose radome.

10-25. COCKPIT AIR SAFETY VALVE FILTER SCREEN REMOVAL, CLEANING, AND INSTALLATION.

10-26. REMOVAL.

a. Open access 2211-2.

b. Unsnap curtain and position rudder pedals to full aft position.

c. Remove snapring and filter screen (figure 10-5) from safety valve.

10-27. CLEANING.

WARNING

P-D-680, Type II, is combustible and moderately toxic to eyes, skin and respiratory tract. Eye and skin protection required. Use in well ventilated area.

a. Clean filter screen and snapring in P-D-680 drycleaning solvent or VV-K-221 kerosene.

b. Air dry parts before reinstalling.

10-28. INSTALLATION.

a. Install filter screen and snapring in safety valve.

b. Position rudder pedals to neutral and snap curtain into place.

c. Close access 2211-2.

10-29. COCKPIT AIR SAFETY VALVE REMOVAL AND INSTALLATION.

Test Equipment Required

Figure & Index No.	*Name*	*AN Type Designation*	*Use and Application*
		Equipment required for engine operation	Operate engine during checkout of cockpit air safety valve
	215-00188-1	Forward radar support strut	Support radar assembly during cockpit air safety valve removal and installation

Test Equipment Required (continued)

Figure& Index No.	Name	AN Type Designation	Use and Application
	850-2 1/2	Gun, sealant	Apply sealant on surface of spacer

10-30. REMOVAL. (See figure 10-5.)

a. Open access 2211-2.

b. Open nose radome.

c. Install shock mount support pins at left side of radar forward assembly (looking aft).

d. Release quick-release locking pins at right side of radar forward assembly (looking aft).

e. Loosen lower harness cable clamp. Swing radar forward assembly out and install support strut.

f. Remove upper and lower armorplates from forward radar compartment bulkhead (T.O. 1A-7D-2-1).

g. Unsnap curtain and position rudder pedals to full aft position.

h. Disconnect cabin pressure control line (1) from elbow (2) and static line (3) from tee (4) on safety valve.

i. Cut lockwire and remove mounting screws (5), washers (6), and seals (7) securing valve to bulkhead. Discard seals.

j. Remove safety valve (8), leaving spacer (9) in place.

k. Loosen jamnuts (12). Note position of tee and elbow, and remove fittings from valve.

l. Discard O-rings (10) and backup rings (11).

10-31. INSTALLATION. (See figure 10-5.)

a. Using depth micrometer, measure cockpit air safety valve dump port check valve installation depth.

b. If the distance measured from check valve cage to the face of the port is not 0.62 (+ 0.02, -0.01) inches, cockpit air safety valve shall be replaced.

c. Install jamnuts (12), new backup rings (11), and new O-rings (10) on elbow (2) and tee (4).

d. Install tee and elbow in valve in positions noted during removal. Tighten jamnuts finger-tight.

e. Check sealant on spacer (9) for damage.

NOTE

If sealant is damaged or dirty, remove 1 inch of sealant on each side of damaged area and reseal with EC-1126 bead sealant. EC-1126 sealant may be replaced with MIL-S-11030E tape.

f. Apply a thin film of MIL-G-81322 grease to mounting surface of safety valve.

g. Place washer (6) and new seal (7) on each mounting screw (5).

NOTE

Surface bond washer-to-airframe surface in accordance with MIL-B-5087 for static discharge.

h. Position valve on spacer (9) and install mounting screws finger-tight.

i. Cross-tighten mounting screws and secure with MS20995C32 lockwire.

j. Align tee (4) and connect static line (3).

k. Align elbow (2) and connect cabin pressure control line (1).

l. Tighten jamnuts (12).

m. Close access 2211-2 and perform cockpit air pressure regulator system operational checkout (paragraph 10-11).

n. Install upper and lower armorplates on forward radar compartment bulkhead.

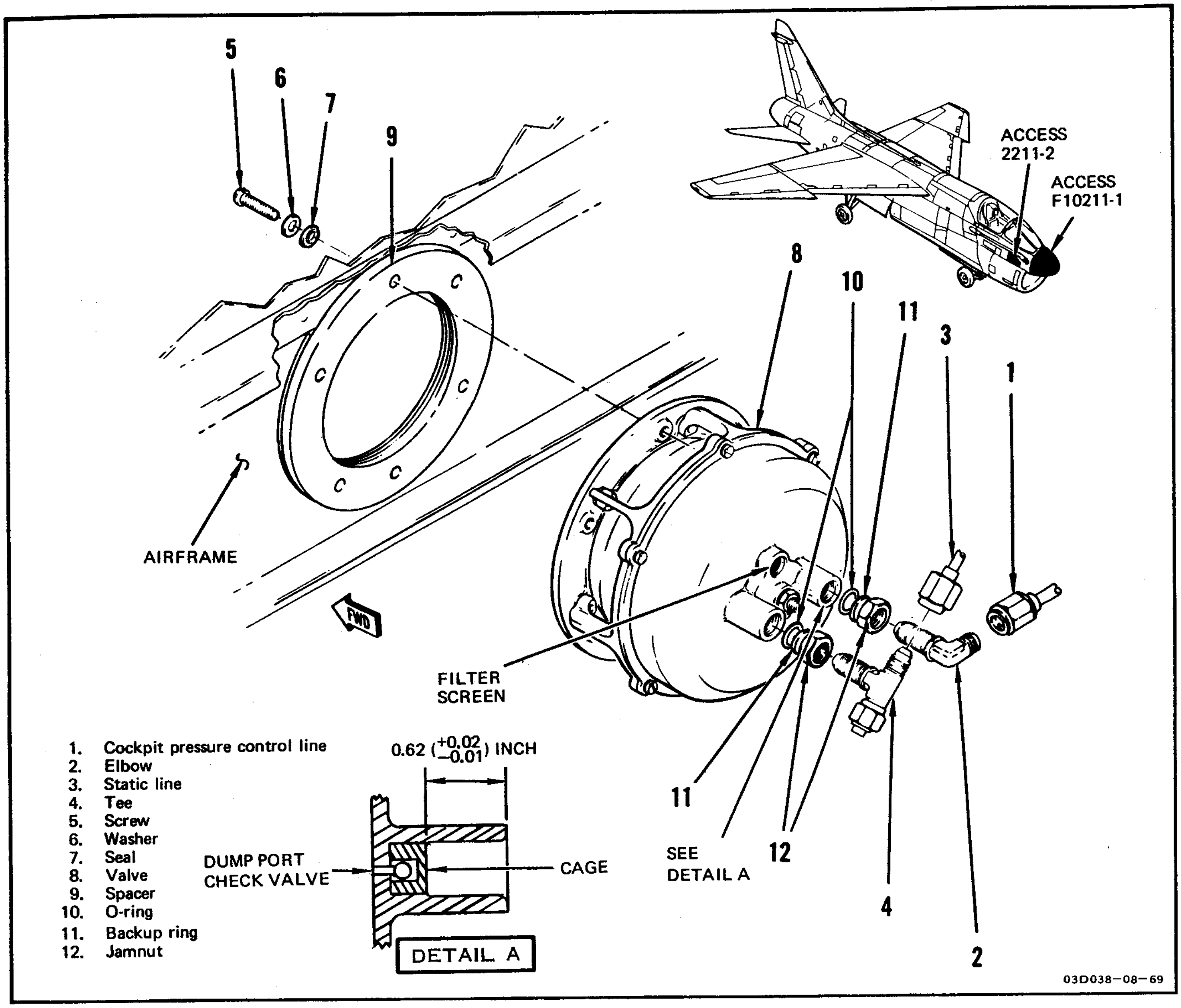
o. Position rudder pedal adjustment to neutral and snap curtain into place.

p. Remove support strut.

q. Swing radar forward assembly into compartment and install quick-release locking pins at right mount (looking aft).

r. Remove shock mount support pins at left side of radar forward assembly (looking aft).

s. Close nose radome.



1. Cockpit pressure control line
2. Elbow
3. Static line
4. Tee
5. Screw
6. Washer
7. Seal
8. Valve
9. Spacer
10. O-ring
11. Backup ring
12. Jamnut

Figure 10-5. Cockpit Air Safety Valve Removal and Installation

10-32. COCKPIT PRESSURE ALTIMETER REMOVAL AND INSTALLATION.

10-33. REMOVAL.

NOTE

For component location, see figure 1-1.

a. On airplanes through AF69-6196 except AF69-6189, remove four screws securing altimeter to right lower side of instrument panel.

b. On airplanes AF69-6189, AF69-6197 and subsequent, remove four screws securing altimeter to pilot services disconnect panel on left console.

c. Lift altimeter from panel and disconnect electrical connector.

10-34. INSTALLATION.

a. Before installation of altimeter, perform cockpit pressure altimeter check (paragraph 10-13).

b. Connect airplane harness connector to altimeter.

c. Check that pcrt on back of altimeter is open.

d. Install altimeter in panel and secure with four screws.

SECTION XI

LOW PRESSURE ENGINE BLEED AIR SUPPLY SYSTEM

11-1. DESCRIPTION.

11-2. The low pressure engine bleed air supply system provides air from the engine low pressure compressor section for windshield rain and ice removal, dilution and removal of explosive gases from the gun bay, and pressurization of the external fuel tanks for fuel transfer. The system consists of the low pressure bleed gimbal duct, linear motion compensator duct, and associated ducts and couplings. For system controls and indicators, see figure 1-1. For system arrangement, see figure 1-2.

11-3. OPERATION. (See figure 11-1.)

11-4. With the engine operating, low pressure engine bleed air is directed through the low pressure bleed gimbal duct to the linear motion compensator duct. From the compensator duct, the low pressure air is ducted through the heat exchanger rain removal core to the fuel pressurization, gun gas purge, and rain removal systems. The linear motion compensator duct allows for expansion and contraction of the ducts due to heat changes.

11-5. The engine low pressure supply system at 12 psi is used to pressurize the external fuel tanks. For operation of the fuel transfer and pressurization system, refer to T.O. 1A-7D-2-6.

11-6. COMPONENTS.

11-7. For a list of components, their locations (accesses), and functions, refer to table 11-1.

Table 11-1. Low Pressure Bleed Air Supply System Components

Component	Access	Function
Compensator, duct linear motion	6222-3	Permits thermal expansion and contraction of bleed air duct.
Duct, gimbal low pressure bleed	6122-2	Accommodates engine motion. Ducts low pressure engine bleed air to rain removal core of heat exchanger.

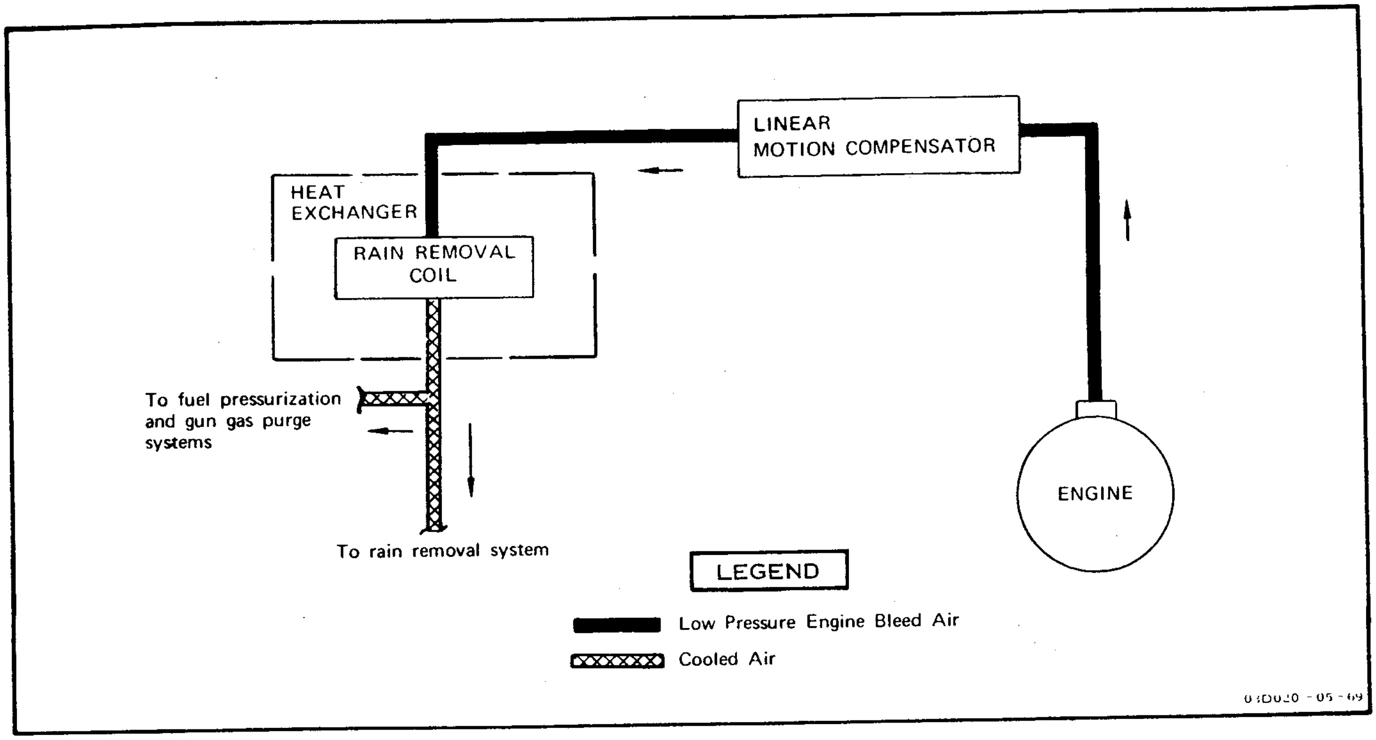


Figure 11-1. Low Pressure Bleed Air System Flow Diagram

11-8. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine during operational checkout of low pressure engine bleed air system

a. Disconnect right nose gear door lower link (T.O. 1A-7D-2-7).

b. Open accesses 2222-4, 2212-6, 6111-4, 6222-3, and 6122-2.

c. Start engine and operate at idle RPM (T.O. 1A-7D-2-1).

d. Advance throttle to 90% rpm.

WARNING

Hot airflow can cause severe burns. Personnel should wear safety goggles and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

e. Check low pressure supply system valves and ducts for air leaks, security, and condition.

f. Retard throttle to idle rpm.

g. Shut down engine.

h. Close accesses 2222-4, 2212-6, 6111-4, 6122-2, and 6222-3.

i. Connect right nose gear door lower link (T.O. 1A-7D-2-7).

11-9. TROUBLESHOOTING.

11-10. Troubleshooting of the low pressure supply system consists of checking ducts and components for leaks and obstructions. Perform operational checkout (paragraph 11-8) and tighten loose connections or replace defective components.

11-11. LINEAR MOTION COMPENSATOR DUCT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational checkout after bleed air duct installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

11-12. REMOVAL. (See figure 11-2.)

a. Open accesses 6222-3 and 6122-2.

b. Remove battery (T.O. 1A-7D-2-11).

c. Remove bolts (14), washers (15), and insulator blocks (16) securing top of linear motion compensator duct (17) to airframe mounting bracket.

d. Remove nut (18), washers (19), bolt (20), and insulator blocks (21) securing bottom of duct to airframe.

e. Disconnect compensator duct from fuselage station 552.7 sliding support bracket by removing cotter pin (22), nut (23), washers (24 and 25), insulator blocks (26), spacer (27), and bolt (28).

f. Cut lockwire and remove insulation around couplings (29 and 11).

g. Support compensator duct, remove couplings and gaskets (30 and 13). Remove compensator duct from airplane.

h. Discard gaskets (30 and 13).

i. Remove insulation from duct.

11-13. INSTALLATION. (See figure 11-2.)

NOTE

Inspect replacement low pressure bleed air duct for damage using optical micrometer. Replace duct if damage exceeds limits set in paragraph 11-16.

a. Install insulation on replacement duct. Secure insulation with MS20995C32 lockwire.

b. Hand-rub mating surface of compensator duct and coupling flanges with MIL-G-21164 molybdenum disulfide grease.

c. Position duct (17) in airplane. Using new self-locking nuts and new gaskets (30 and 13), install couplings (29 and 11). Do not tighten couplings.

d. Align compensator duct with airframe mounting brackets.

e. Install washer (25) and insulator block (26) on bolt (28) and install bolt through inboard duct mounting flange. Install insulator block (26) on bolt and spacer (27) in slot of sliding support bracket. Continue installing bolt through bracket and spacer (27) and install insulator block (26) on bolt. Push bolt through outboard duct mounting flange and install insulator block (26), washers (25 and 24), and nut (23). Do not tighten nut.

f. Position insulator block (21) between bottom of compensator duct mounting bracket and airframe bracket. Install bolt (20) through duct bracket and airframe bracket.

g. Install insulator block (21), washers (19), and nut (18) on bolt. Do not tighten nut.

h. Install insulator blocks (16) between top of compensator duct bracket and airframe mounting bracket.

i. Install insulator blocks (16) and washers (15) on bolts (14). Align insulator blocks installed in step h and install bolts (14) through airframe mounting bracket and duct bracket. Do not tighten bolts.

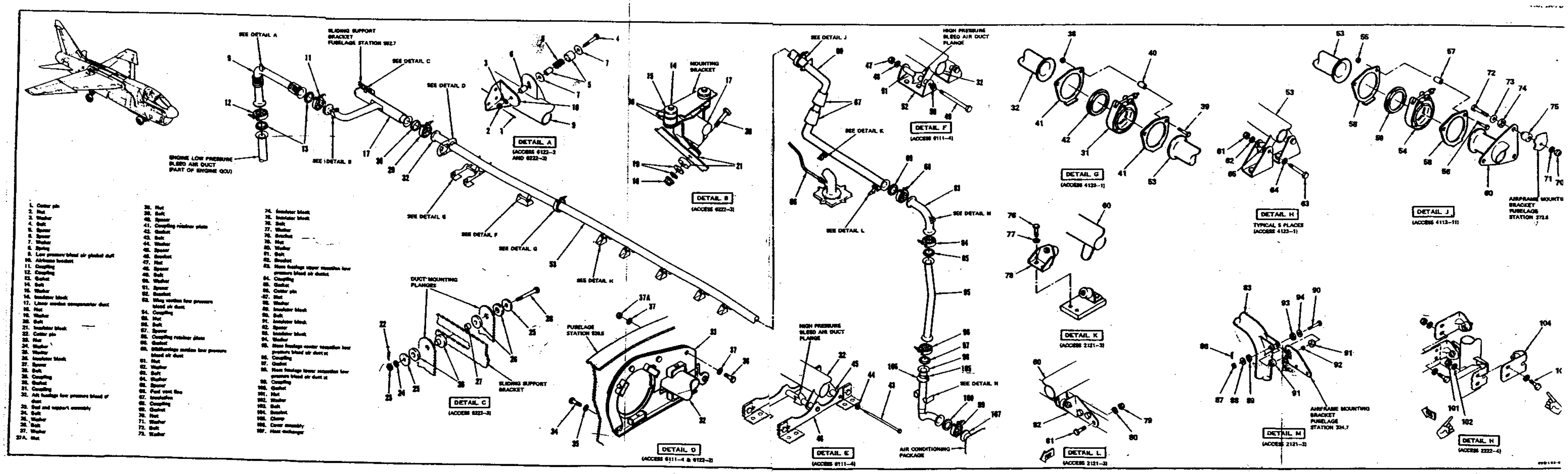


Figure 11-2. Low Pressure Bleed Air System Ducts Removal and Installation

j. Check that compensator duct is properly aligned and no binding exists at compensator sliding support.

k. Tighten couplings (29 and 11) to 90 (±10) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (±10) pound-inches.

l. Tighten nut (18) and bolts (14).

m. Tighten nut (23) and secure with new cotter pin (22).

n. Temporarily install battery for engine run and leak check.

o. Start engine and operate at idle RPM (T.O. 1A-7D-2-1).

WARNING

Hot airflow can cause severe burns. Personnel should wear safety goggles and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

p. Check compensator duct installation for leakage.

q. Shut down engine (T.O. 1A-7D-2-1).

r. Remove battery.

s. Install insulation around couplings (29 and 11). Secure insulation with MS20995C32 lockwire.

t. Install battery (T.O. 1A-7D-2-11).

u. Close accesses 6222-3 and 6122-2.

11-14. LOW PRESSURE BLEED AIR GIMBAL DUCT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational checkout after bleed air duct installation

Tools Required (continued)

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

11-15. REMOVAL. (See figure 11-2.)

a. Open accesses 6122-2 and 6222-5.

b. Remove battery (T.O. 1A-7D-2-11).

NOTE

Exercise care when removing hardware attaching bleed air gimbal duct to airframe bracket to prevent hardware from falling into engine compartment.

c. Remove cotter pin (1), nut (2), washer (3), bolt (4), two spacers (5), spacer (6), two washers (7), and spring (8) securing low pressure bleed air gimbal duct (9) to airframe bracket (10).

d. Cut lockwire and remove insulation from upper coupling (11) and lower coupling (12).

e. Loosen and remove couplings and gaskets (13). Discard gaskets.

f. Remove bleed air duct from airplane.

g. Cut lockwire and remove insulation from duct.

11-16. INSTALLATION. (See figure 11-2.)

NOTE

Repair of duct surface by welding is not authorized. Any duct which has been repaired by welding new material over the original duct tubing should be replaced.

a. Inspect high pressure bleed air duct for damage using optical micrometer. Replace duct if damage exceeds the following:

1. Scratches, nicks, gouges or defined areas deeper than 0.002 inches.

2. Any crack.

NOTE

Reference T.O. 338-1-1 and MIL-I-6866. Perform fluorescent penetrant spot check inspection in accordance with MIL-I-6866, Type I, Method C. Use penetrant material in accordance with MIL-I-25135 Group VII. Look for cracks in damaged area of duct.

3. Any dent in excess of 0.03 inch in a bend area.

4. Smooth contour dents which are longer than 1.0 inch or deeper than 0.10 inch or dents of 0.03 to 0.10 inch depth which have a radius of over 0.04 inch. Smooth contour dents deeper than 0.03 inch, but otherwise acceptable, shall be carefully inspected for cracks using dye penetrant method.

WARNING

Compressed air used for cleaning and drying purposes can create airborne particles that can enter the eyes. Pressure shall not exceed 30 psi and use only with adequate chip guards and goggles.

CAUTION

Do not use glass beads that are treated with silicones and avoid excessive local blasting which may result in warpage or distortion.

NOTE

Stains and gray or tan light oxide films are not to be construed as corrosion. If cleaning is required to define corrosion/damage extent, use dry blasting with MIL-G-9954, size 13 glass beads. Rinse free of abrasive using water and air dry. Protect part number by placing tape over it prior to blasting.

5. Corroded or pitted areas that cannot be removed by polishing without metal loss in excess of 0.004 inch.

6. Flanges that are bent or have nicks or gouges in gasket sealing area.

b. Install insulation on duct and secure with MS20995C32 lockwire.

c. Hand-rub mating surface of duct and coupling flanges with MIL-L-83483 molybdenum disulfide grease.

c-1. Lubricate surfaces of duct mounting bracket with MIL-L-83483 grease where spacer (6) and washer (7) contact.

d. Position duct in airplane.

e. Using new self-locking nuts and new gaskets (13), install upper coupling (11) and lower coupling (12). Do not tighten couplings.

f. Assemble washer (7), spacer (5), spring (8), spacer (5), and washer (7) on bolt (4).

g. Install bolt (4) through duct bracket and install spacer (6) between duct bracket and airframe bracket (10).

h. Push bolt through spacer (6) and airframe bracket and install washer (3) and nut (2). Do not tighten nut.

i. Tighten couplings (11 and 12) to 90 (±10) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band and check that torque remains 90 (±10) pound-inches.

j. Tighten nut (2) and secure with new cotter pin (1).

k. Temporarily install battery for engine run.

l. Start engine and operate at 90% power (T.O. 1A-7D-2-1).

WARNING

Hot airflow can cause severe burns. Personnel should wear safety goggles and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

m. Check duct installation for leakage.

n. Shut down engine (T.O. 1A-7D-2-1).

o. Remove battery.

p. Install insulation around couplings (11 and 12). Secure insulation with MS20995C32 lockwire.

q. Install battery (T.O. 1A-7D-2-11).

r. Close accesses 6122-2 and 6222-5.

11-17. AFT FUSELAGE LOW PRESSURE BLEED AIR DUCT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational checkout after bleed air duct installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

11-18. REMOVAL. (See figure 11-2.)

a. Open accesses 6122-2, 6111-4, 6111-1, and 4123-1.

b. Cut lockwire and remove insulation around couplings (29 and 31).

c. Remove coupling (29) and gasket (30) securing aft fuselage low pressure bleed air duct (32) to linear motion compensator duct (17). Discard gasket (30).

d. Remove top half of seal and support assembly (33) by removing screw (34) and washer (35) from aft ide of fuselage station 526.5 bulkhead. Remove three bolts (36), washers (37), and nuts (37A) securing support assembly to forward side of fuselage station 526.5 bulkhead.

e. Remove two nuts (38), bolts (39), and spacers (40) securing coupling retainer plates (41) around coupling (31).

f. Disconnect retainer plates (41) and slot connection and position plates away from coupling (31).

g. Loosen and remove coupling (31) and gasket (42). Discard gasket. Remove and retain coupling retainer plates (41).

h. Remove two bolts (43), washers (44), and spacers (45) securing bleed air duct (32) to brackets (46).

i. Remove two nuts (47), washers (48), bolts (49), washers (50), and spacers (51) securing duct (32) to brackets (52).

j. Remove bleed air duct from airplane.

k. Cut lockwire and remove insulation from duct.

11-19. INSTALLATION. (See figure 11-2.)

NOTE

Inspect replacement low pressure bleed air duct for damage using optical micrometer. Replace duct if damage exceeds limits set in paragraph 11-16.

a. Install insulation on replacement aft fuselage low pressure bleed air duct. Secure insulation with MS20995C32 lockwire.

b. Hand-rub duct and coupling flanges with MIL-L-83483 molybdenum disulfide grease.

c. Position bleed air duct (32) in airplane and align duct mounting flanges with brackets (46 and 52).

d. Install two spacers (45) through brackets (46) and flanges on bleed air duct (32). Ensure that outboard spacer is installed through flange on adjacent high pressure bleed air duct.

e. Install washers (44) on bolts (43) and install bolts through brackets (46). Do not tighten bolts.

f. Install two spacers (51) through brackets (52) and flanges on bleed air duct (32). Ensure that outboard spacer is installed through flange on adjacent high pressure bleed air duct.

g. Install washers (50) on bolts (49) and install bolts through brackets (52).

h. Install washers (48) and nuts (47) on bolts (49). Do not tighten nuts.

i. Hand-rub insulator blocks on top half of seal and support assembly (33) with MIL-L-83483 molybdenum disulfide grease.

j. Position support assembly (33) over low and high pressure bleed air ducts.

k. Install washer (35) on screw (34) and install screw through aft side of fuselage station 526.5 bulkhead into support (33). Do not tighten screw.

l. Install washers (37) on bolts (36) and install bolts in support (33) at forward side of fuselage station 526.5 bulkhead. Install nuts (37A) on bolts (36). Do not tighten nuts.

m. Position coupling retainer plates (41) on duct (32) and bleed air duct (53).

n. Using new self-locking nut and new gasket (42), connect bleed air duct (32) and (53) with coupling (31). Do not tighten coupling.

o. Using new self-locking nut and new gasket (30), connect bleed air duct (32) to linear motion compensator with coupling (29).

p. Tighten couplings (29 and 31) to 90 (±10) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (±10) pound-inches.

q. Position coupling retainer plates (41) around coupling (31) and connect plates together at pin and slot connection.

r. Install spacers (40) between retainer plates and install bolts (39) and nuts (38). Rotate plates to obtain maximum clearance with adjacent hardware and tighten nuts (38).

s. Tighten screw (34) and nuts (37A).

t. Tighten bolts (43) and nuts (47).

u. Start engine and operate at 90% power (T.O. 1A-7D-2-1).

WARNING

Hot airflow can cause severe burns. Personnel should wear safety goggles and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

v. Check duct installation for leakage.

w. Shut down engine (T.O. 1A-7D-2-1).

x. Install insulation around couplings (29 and 31). Secure insulation with MS20995C32 lockwire.

y. Close accesses 6122-2, 6111-4, 6111-1, and 4123-1.

11-20. WING SECTION LOW PRESSURE BLEED AIR DUCT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational checkout after bleed air duct installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

11-21. REMOVAL. (See figure 11-2.)

a. Open accesses 4123-1 and 4113-11.

b. Cut lockwire and remove insulation around couplings (31 and 54).

c. Remove two nuts (38), bolts (39), and spacers (40) securing coupling retainer plates (41) around coupling (31).

d. Disconnect retainer plates pin and slot connection and position away from coupling (31).

e. Loosen and remove coupling (31) and gasket (42) connecting wing section low pressure bleed air duct (53) to duct (32). Discard gasket.

f. Remove two nuts (55), bolts (56), and spacers (57) securing coupling retainer plates (58) around coupling (54).

g. Disconnect retainer plates pin and slot connection and position away from coupling (54).

h. Loosen and remove coupling (54) and gasket (59) connecting bleed air duct (53) to duct (60). Discard gasket (59).

i. Remove coupling retainer plates (41 and 58).

NOTE

Detail H of figure 11-2 provides a typical installation for attaching the wing section low pressure bleed air duct to five support brackets. Since the bolts and spacers used differ in length for each installation, it is recommended that small cloth or plastic bags be used to retain parts removed from each support bracket for identification during installation of the bleed air duct.

j. Using small cloth or plastic bags to retain removed parts, remove two nuts (61), two washers (62), two bolts (63), two washers (64), and two spacers (65) connecting bleed air duct (53) to each of the five support brackets.

k. Remove bleed air duct from airplane.

l. Cut lockwire and remove insulation from duct.

11-22. INSTALLATION. (See figure 11-2.)

NOTE

Inspect replacement low pressure bleed air duct for damage using optical micrometer. Replace duct if damage exceeds limits set in paragraph 11-16.

a. Install insulation on replacement wing section low pressure bleed air duct. Secure insulation with MS20995C32 lockwire.

b. Hand-rub duct and coupling flanges with MIL-L-83483 molybdenum disulfide grease.

c. Position bleed air duct in airplane and align duct mounting flanges with the five support brackets.

d. Connect bleed air duct to each of the support brackets as follows:

1. Install spacers (65) through support brackets and duct mounting flanges. Ensure that outboard spacer is installed through flange on adjacent high pressure bleed air duct.

2. Install washers (64) on bolts (63) and install bolts through support brackets and spacers.

3. Install washers (62) and nuts (61) on bolts (63). Do not tighten nuts.

e. Position coupling retainer plates (41) on ducts (32 and 53).

f. Using new self-locking nut and new gasket (42), connect ducts (32 and 53) with coupling (31). Do not tighten coupling.

g. Position coupling retainer plates (58) on ducts (53 and 60).

h. Using new self-locking nut and new gasket (59), connect ducts (53 and 60) with coupling (54).

i. Tighten couplings (54 and 31) to 90 (±10) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (±10) pound-inches.

j. Position coupling retainer plates (41) around coupling (31) and connect plates together at pin and slot connection.

k. Install spacers (40) between retainer plates and install bolts (49) and nuts (38). Rotate plates to obtain maximum clearance with adjacent hardware and tighten nuts (38).

l. Position coupling retainer plates (58) around coupling (54) and connect plates together at pin and slot connection.

m. Install spacers (57) between retainer plates and install bolts (56) and nuts (55). Rotate plates to obtain maximum clearance with adjacent hardware and tighten nuts (55).

n. Tighten nuts (61) at each of the five bleed air duct support brackets.

o. Start engine and operate at 90% power (T.O. 1A-7D-2-1).

WARNING

Hot airflow can cause severe burns. Personnel should wear safety goggles and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

p. Check duct installation for leakage.

q. Shut down engine (T.O. 1A-7D-2-1).

r. Install insulation around couplings (31 and 54). Secure insulation with MS20995C32 lockwire.

s. Close accesses 4123-1 and 4113-11.

11-23. MIDFUSELAGE SECTION LOW PRESSURE BLEED AIR DUCT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational checkout after bleed air duct installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

11-24. REMOVAL. (See figure 11-2.)

a. Open accesses 4113-11 and 2121-3.

b. Remove transformer rectifier (T.O. 1A-7D-2-11).

c. Note position of electrical wiring clamps on transformer rectifier mounting plate and remove mounting plate.

d. Disconnect fuel vent line (66).

e. Cut lockwire and remove insulation (67) around universal units on midfuselage section low pressure bleed air duct (60).

f. Cut lockwire and remove insulation around coupling (54).

g. Remove two nuts (55), bolts (56), and spacers (57) securing coupling retainer plates (58) around coupling (54).

h. Disconnect retainer plates pin and slot connection and position plates away from coupling.

i. Loosen and remove coupling (54) and gasket (59). Discard gasket.

j. Cut lockwire and remove insulation around coupling (68).

k. Loosen and remove coupling (68) and gasket (69). Discard gasket.

l. Remove three nuts (70), washers (71), bolts (72), washers (73), and insulator blocks (74 and 75) securing bleed air duct (60) to airframe mounting brackets at fuselage station 372.8.

m. Remove two bolts (76) and washers (77) securing bracket (78) to airframe mounting bracket.

n. Remove three nuts (79), washers (80), and bolts (81) securing bracket (82) to airframe mounting bracket.

o. Position fuel vent line (66) as required and remove bleed air duct from airplane.

p. Cut lockwire and remove insulation from bleed air duct.

11-25. INSTALLATION. (See figure 11-2.)

NOTE

Inspect replacement low pressure bleed air duct for damage using optical micrometer. Replace duct if damage exceeds limits set in paragraph 11-16.

a. Install insulation on replacement midfuselage section low pressure bleed air duct (60). Secure insulation with MS20995C32 lockwire.

b. Hand-rub mating surface of bleed air duct and coupling flanges with MIL-L-83483 molybdenum disulfide grease.

c. Install bleed air duct in airplane.

d. Using new self-locking nut and new gasket (69), connect bleed air ducts (60 and 83) with coupling (68). Do not tighten coupling.

e. Install insulator blocks (75) between mounting flange of duct (60) and airframe mounting brackets at fuselage station 372.8.

f. Install washers (73) and insulator blocks (74) on bolts (72) and install bolts through duct mounting flange and airframe brackets.

g. Install washers (71) and nuts (70) on bolts (72). Do not tighten nuts.

h. Position retainer plates (58) on ducts (53 and 60).

i. Using new self-locking nut and new gasket (59), connect ducts (53 and 60) with coupling (54).

j. Tighten coupling (54) to 90 (± 10) pound-inches torque. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (± 10) pound-inches.

k. Position retainer plates (58) around coupling (54) and connect plates together at pin and slot connection.

l. Install spacers (57) between coupling retainer plates and install bolts (56) and nuts (55). Rotate plates to obtain maximum clearance and adjacent hardware and tighten nuts (55).

m. Tighten coupling (68) to 90 (± 10) pound-inches torque. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (± 10) pound-inches.

n. Position bleed air duct and install bracket (78) using bolts (76) and washers (77). Ensure that bleed air duct vane is firmly seated between the insulator blocks.

o. Using bolts (81), washers (80), and nuts (79), install bracket (82). Ensure that bleed air duct vane is firmly seated between the insulator blocks.

p. Tighten nuts (70).

NOTE

Ensure that a minimum clearance of ¼ inch is obtained between insulation (67) and fuel vent line (66).

q. Install insulation (67) around universal units on bleed air duct (60). Secure insulation with MS20995C32 lockwire.

r. Connect fuel vent line (66).

s. Position electrical wiring clamps as noted during removal and install transformer rectifier mounting plate.

t. Install transformer rectifier (T.O. 1A-7D-2-11).

u. Start engine and operate at 90% power (T.O. 1A-7D-2-1).

WARNING

Hot airflow can cause severe burns. Personnel should wear safety goggles and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

v. Check duct installation for leakage.

w. Shut down engine (T.O. 1A-7D-2-1).

x. Install insulation around couplings (54 and 68). Secure insulation with MS20995C32 lockwire.

y. Close accesses 4113-11 and 2121-3.

11-26. NOSE FUSELAGE UPPER SECTION LOW PRESSURE BLEED AIR DUCT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational checkout after bleed air duct installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

11-27. REMOVAL. (See figure 11-2.)

a. Open accesses 2121-3 and 2123-6.

b. Remove transformer rectifier (T.O. 1A-7D-2-11).

c. Note position of electrical wiring clamps and remove transformer rectifier mounting plate.

d. Cut lockwire and remove insulation around coupling (68).

e. Loosen and remove coupling (68) and gasket (69). Discard gasket.

f. Cut lockwire and remove insulation around coupling (84).

g. Loosen and remove coupling (84) and gasket (85). Discard gasket.

h. Remove cotter pin (86), nut (87), washer (88) and insulator block (89) from bolt (90) at fuselage station 324.7 airframe mounting bracket.

i. Remove bolt (90), insulator blocks (91), spacer (92), insulator block (93), and washer (94) securing nose fuselage upper section low pressure bleed air duct (83) to airframe mounting bracket.

j. Remove bleed air duct from airplane.

k. Cut lockwire and remove insulation from bleed air duct.

11-28. INSTALLATION. (See figure 11-2.)

NOTE

Inspect replacement low pressure bleed air duct for damage using optical micrometer. Replace duct if damage exceeds limits set in paragraph 11-16.

a. Install insulation on replacement nose fuselage upper section low pressure bleed air duct (83). Secure insulation with MS20995C32 lockwire.

b. Hand-rub duct and coupling flanges with MIL-L-83483 molybdenum disulfide grease.

c. Install duct in airplane and align with fuselage station 324.7 airframe mounting bracket.

d. Install washer (94) and insulator block (93) on bolt (90).

e. Install bolt through inboard duct flange and install insulator block (91) on bolt, between duct flange and mounting bracket.

f. Install spacer (92) in airframe mounting bracket, push bolt through spacer and bracket, and install insulator block (91) on bolt (90) between bracket and outboard duct flange.

g. Push bolt through flange and install insulator block (89), washer (88), and nut (87) on bolt. Do not tighten nut.

h. Using new self-locking nut and new gasket (85), connect duct (83) to duct (95) with coupling (84).

i. Using new self-locking nut and new gasket (69), connect duct (83) to duct (60) with coupling (68).

j. Tighten couplings (68 and 84) to 90 (±10) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (±10) pound-inches.

k. Tighten nut (87) and install new cotter pin (86).

l. Position electrical wiring clamps as noted in removal and install transformer rectifier mounting plate.

m. Install transformer rectifier (T.O. 1A-7D-2-11).

n. Start engine and operate at 90% power (T.O. 1A-7D-2-1).

WARNING

Hot airflow can cause severe burns. Personnel should wear safety goggles and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

o. Check duct installation for leakage.

p. Shut down engine (T.O. 1A-7D-2-1).

q. Install insulation around couplings (68 and 84). Secure coupling with MS20995C32 lockwire.

r. Close accesses 2121-3 and 2123-6.

11-29. NOSE FUSELAGE CENTER SECTION LOW PRESSURE BLEED AIR DUCT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational checkout after bleed air duct installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

11-30. REMOVAL. (See figure 11-2.)

a. Open access 2123-6.

b. Cut lockwire and remove insulation around couplings (84 and 96).

c. Loosen and remove coupling (84) and gasket (85). Discard gasket.

d. Loosen and remove coupling (96) and gasket (97). Discard gasket.

e. Remove nose fuselage center section low pressure bleed air duct (95) from airplane.

f. Cut lockwire and remove insulation from bleed air duct.

11-31. INSTALLATION. (See figure 11-2.)

NOTE

Inspect replacement low pressure bleed air duct for damage using optical micrometer. Replace duct if damage exceeds limits set in paragraph 11-16.

a. Install insulation on replacement nose fuselage center section low pressure bleed air duct (95). Secure insulation with MS20995C32 lockwire.

b. Hand-rub duct and coupling flanges with MIL-L-83483 molybdenum disulfide grease.

c. Install bleed air duct in airplane.

d. Using new self-locking nut and new gasket (85), connect duct (95) to duct (83) with coupling (84).

e. Using new self-locking nut and new gasket (97), connect duct (95) to duct (98) with coupling (96).

f. Tighten couplings (84 and 96) to 90 (± 10) pound-inches torque. Tap couplings lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (± 10) pound-inches.

g. Start engine and operate at 90% power (T.O. 1A-7D-2-1).

WARNING

Hot airflow can cause severe burns. Personnel should wear safety goggles and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

h. Check duct installation for leakage.

i. Shut down engine (T.O. 1A-7D-2-1).

j. Install insulation around couplings (84 and 96). Secure insulation with MS20995C32 lockwire.

k. Close access 2123-6.

11-32. NOSE FUSELAGE LOWER SECTION LOW PRESSURE BLEED AIR DUCT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for engine operation	Operate engine during operational checkout after bleed air duct installation
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten couplings

11-33. REMOVAL. (See figure 11-2.)

a. Open accesses 2123-6 and 2222-4.

b. Cut lockwire and remove insulation around coupling (96).

c. Loosen and remove coupling (96) and gasket (97). Discard gasket.

d. Loosen and remove coupling (99) and gasket (100). Discard gasket.

e. Disconnect nose fuselage lower section low pressure bleed air duct (98) from airframe mounting bracket by removing four nuts (101), eight washers (102), four bolts (103) and brackets (104).

f. Remove clamp (105) securing cover assembly (106) around bleed air duct (98). Remove cover assembly.

g. Remove bleed air duct from airplane.

h. Cut lockwire and remove insulation from bleed air duct.

11-34. INSTALLATION. (See figure 11-2.)

NOTE

Inspect replacement low pressure bleed air duct for damage using optical micrometer. Replace duct if damage exceeds limits set in paragraph 11-16.

a. Install insulation on replacement nose fuselage lower section low pressure bleed air duct (98). Secure insulation with MS20995C32 lockwire.

b. Hand-rub duct and coupling flanges with MIL-L-83483 molybdenum disulfide grease.

c. Position duct in airplane.

d. Align duct vanes with airframe mounting brackets and loosely install brackets (104) using bolts (103), washers (102), and nuts (101).

e. Using new self-locking nut and new gasket (100), connect bleed air duct (98) to heat exchanger (107) with coupling (99).

f. Using new self-locking nut and new gasket (97), connect duct (98) to duct (95) with coupling (96).

g. Tighten coupling (96) to 90 (±10) pound-inches torque. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 90 (±10) pound-inches.

h. Tighten coupling (99) to 75 (±10) pound-inches torque. Tap coupling lightly with a plastic or rawhide mallet at several points around outside band. Check that torque remains 75 (±10) pound-inches.

i. Install cover (106) around bleed air duct (98). Secure cover with clamp (105).

j. Ensure that duct vanes are seated between insulator blocks and secure brackets (104) loosely installed in step d.

k. Start engine and operate at 90% power (T.O. 1A-7D-2-1).

WARNING

Hot airflow can cause severe burns. Personnel should wear safety goggles and heat resistant gloves when checking for duct air leaks. Use small cloth flags to check airflow.

l. Check duct installation for leakage.

m. Shut down engine (T.O. 1A-7D-2-1).

n. Install insulation around coupling (96). Secure insulation with MS20995C32 lockwire.

o. Close accesses 2123-6 and 2222-4.

SECTION XII

RAIN REMOVAL AND ANTI-ICE SYSTEM

12-1. DESCRIPTION.

12-2. The rain removal and anti-ice system is an air blast system, using warm air supplied by the low pressure engine bleed air supply system. The system is capable of keeping ice from forming, but less effective in removing ice. A rain removal valve controls the warm airflow to the center and left windshield panels. The valve is actuated by the rain removal switch. A caution light indicates RAIN REMOVE HOT when actuated by a thermal switch. The system consists of a temperature control valve, transmitter, rain removal valve, center, and left windshield nozzles and thermal switch. For system controls and indicators, see figure 1-1. For system arrangement, see figure 1-2.

12-3. OPERATION. (See figures 12-1, 12-2, 12-3, and 12-4.)

12-4. Placing the rain removal switch in RAIN REM when the engine is operating connects control air pressure from the air-conditioning and pressurization control air system to the rain removal valve. Control air pressure opens the valve, admitting warm, low pressure engine bleed air to the rain removal air duct. The air is directed against the exterior surface of the center and left windshield at high velocity for anti-icing on the windshield. Placing the rain removal switch in RAIN REM causes the ejector dump valve to dump ejector air valve closing pressure, opening the ejector air valve to ensure adequate cooling airflow through the rain removal heat exchanger.

12-5. Placing the rain removal switch in OFF closes the rain removal valve. Loss of control air pressure or valve failure will cause the valve to close. The rain removal valve allows hot air to enter the rain removal system when selected from the cockpit.

12-6. The transmitter senses temperature changes and controls the temperature control valve. As duct temperature increases to 250° (±20°)F, the transmitter opens, reducing the temperature control valve closing pressure and permitting spring force to modulate the butterfly toward the open position to permit the flow of cool air through the heat exchanger rain removal core. Conversely, a reduction in sensed temperature results in movement of the butterfly toward the closed position to decrease the flow of cool air. In this manner, the transmitter and temperature control valve function will maintain the duct temperature at a prescribed level.

12-7. If duct air temperature reaches 290° (±10°)F, a thermal switch connects emergency dc bus power to the rain removal caution light. As duct air temperature decreases to 270°F minimum, the thermal switch opens, breaking the circuit to the caution light.

12-8. Deleted.

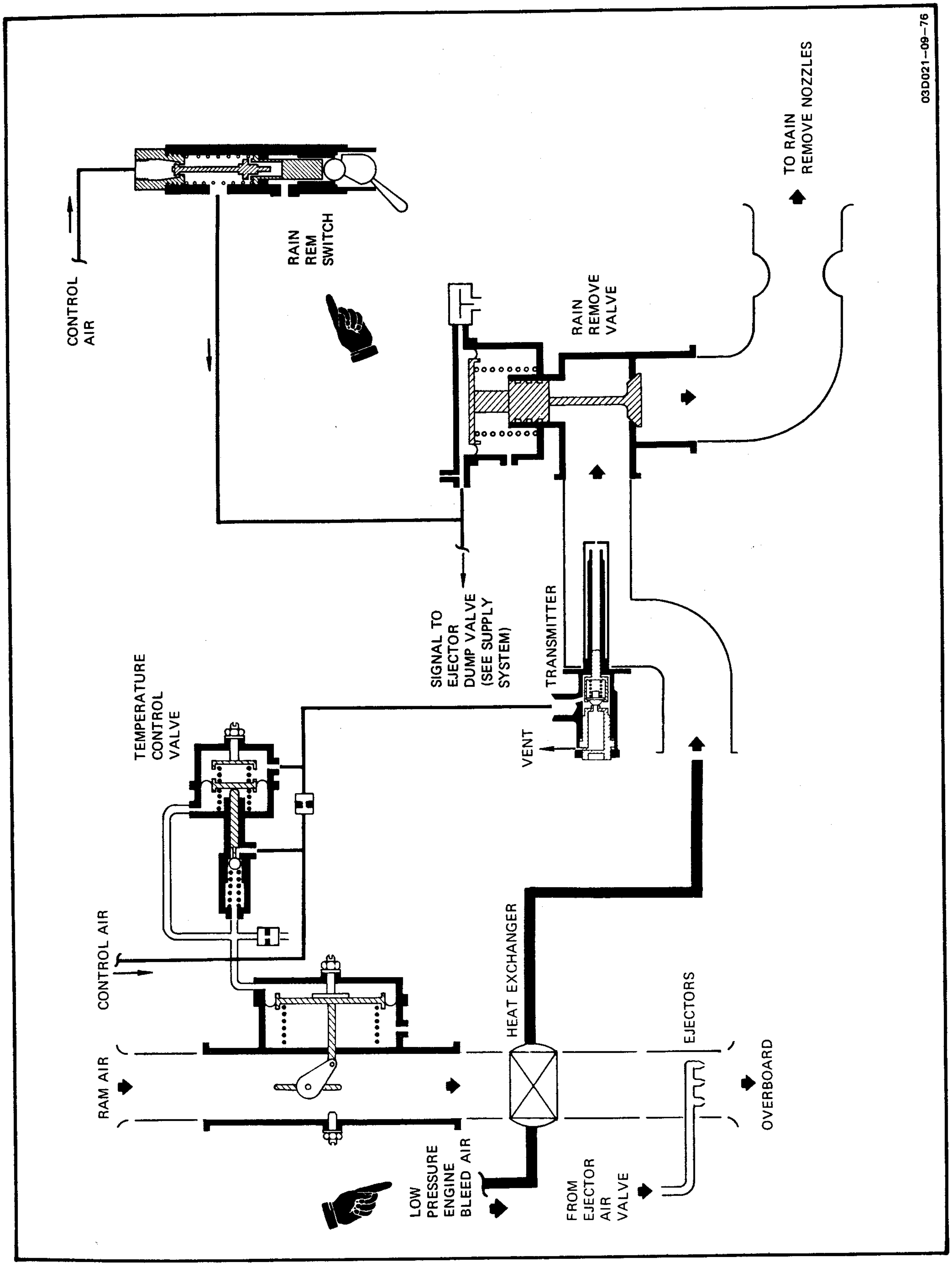


Figure 12-1. Rain Removal and Anti-Ice System Schematic Diagram

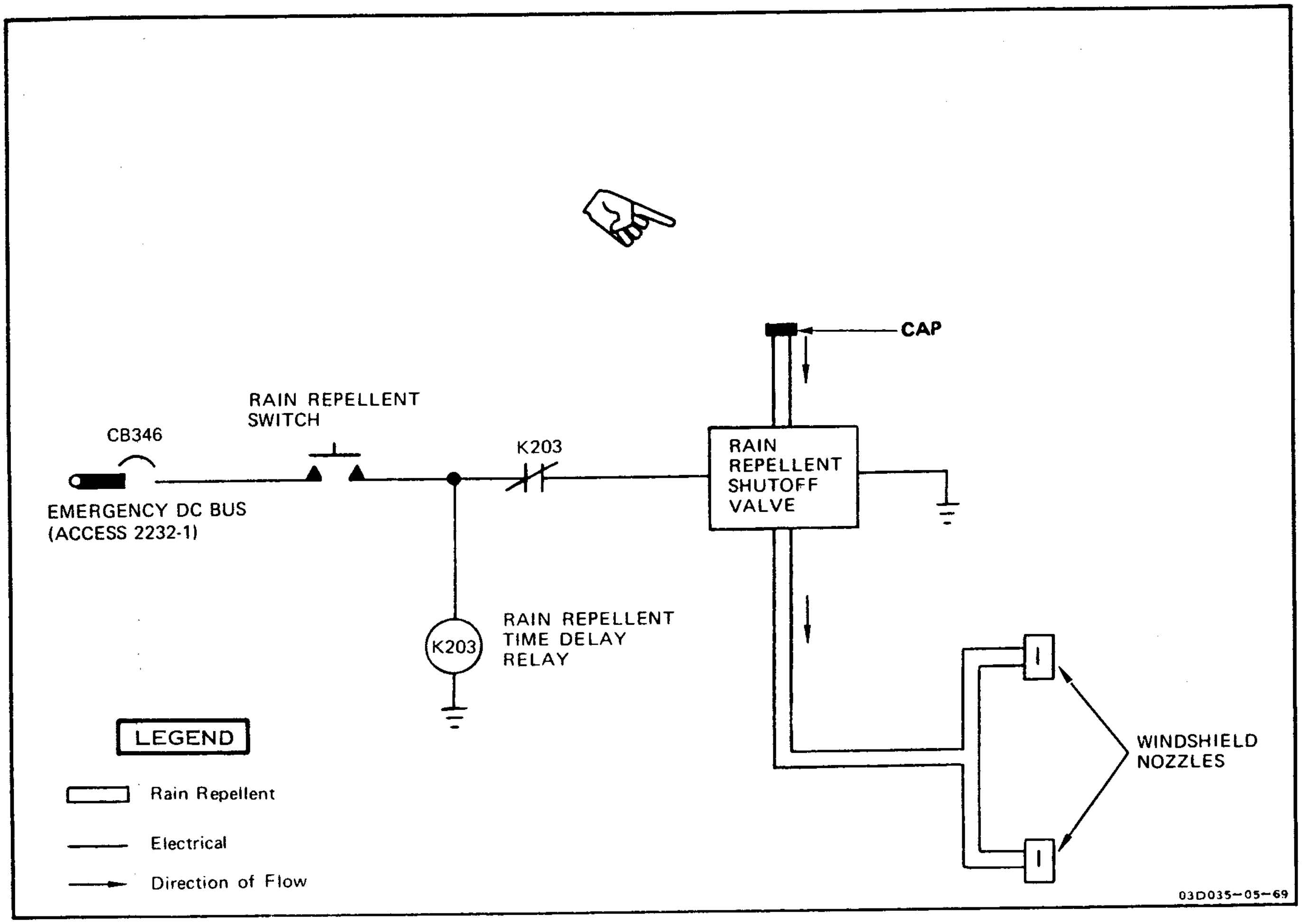


Figure 12-2. Rain Repellent System Schematic Diagram

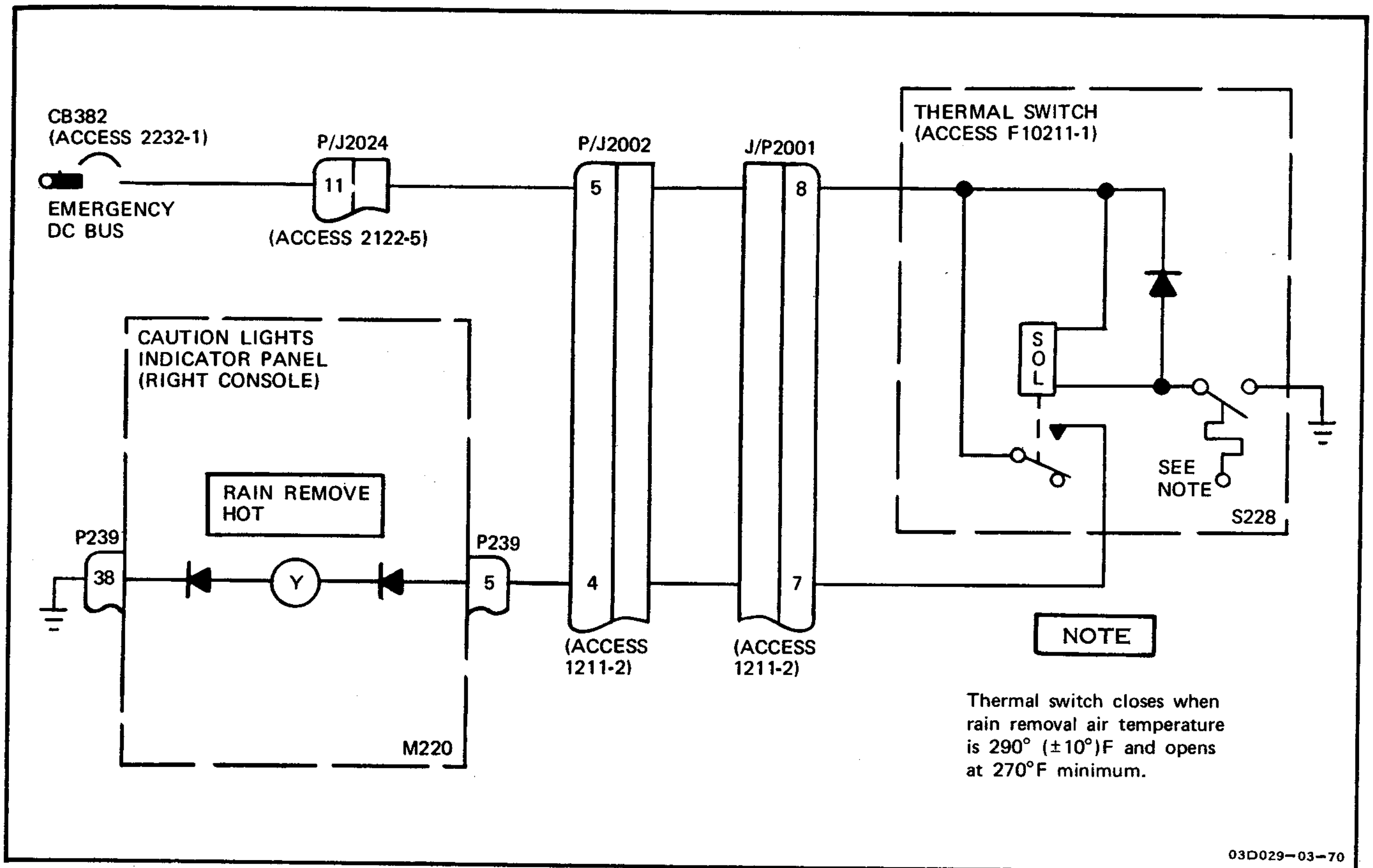


Figure 12-3. Rain Removal and Anti-Ice System Electrical Troubleshooting Schematic Diagram (Airplanes Through AF69-6196)

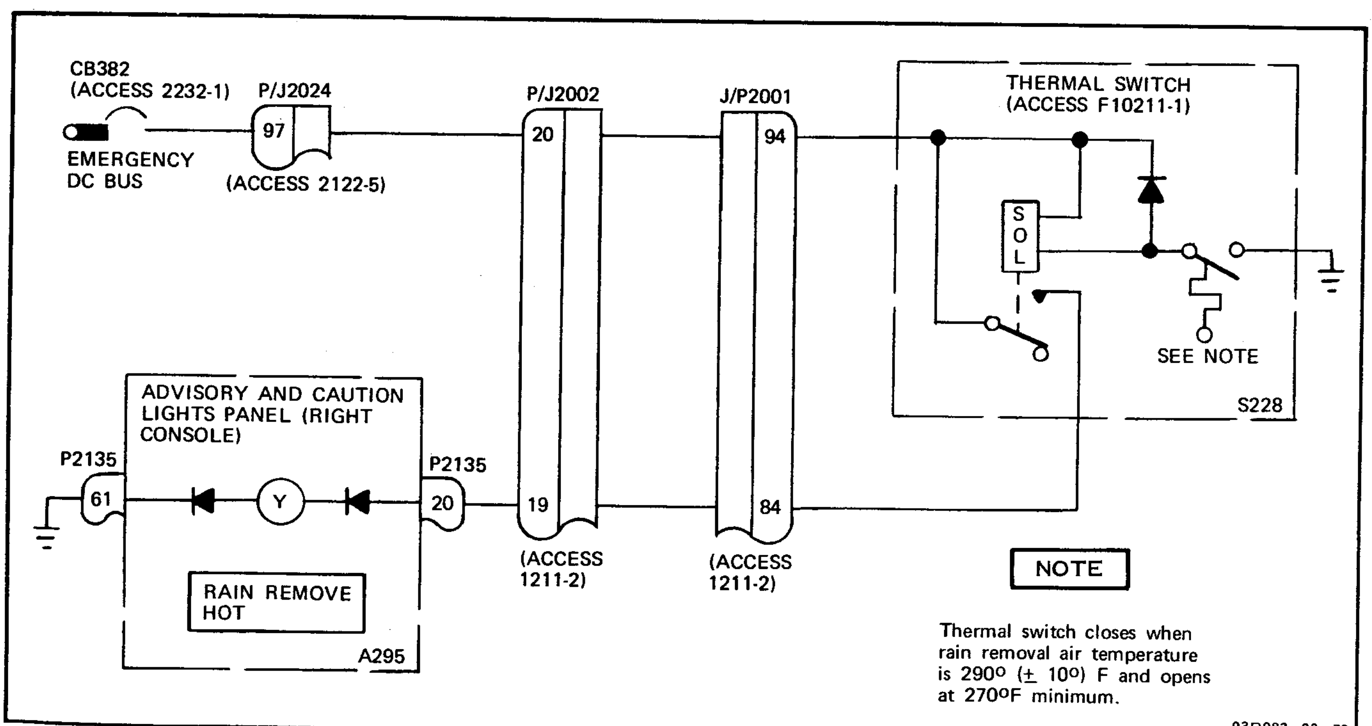


Figure 12-4. Rain Removal and Anti-Ice System Electrical Troubleshooting Schematic Diagram (Airplanes AF69-6197 and Subsequent)

12-9. COMPONENTS.

12-10. For a list of components, their locations (accesses), and functions, refer to table 12-1.

Table 12-1. Rain Removal and Anti-Ice System Components

Component	Access	Function
Duct, rain removal	Forward radar compartment	Directs low pressure engine bleed air from rain removal valve to rain removal nozzles.
Light, rain removal	Caution light panel on right console	When RAIN REMOVE HOT indicates rain removal air temperature is above 290° (± 10°)F.
Nozzles, rain repellent	Forward of windshield panels	Inactive.
Nozzle, rain removal, center and left windshield	Forward of center and left windshield	Directs warm, high velocity airstream over center and left windshield panels.
Relay, time-delay	Forward radar compartment	Interrupts circuit to the rain repellent shutoff valve approximately 0.2 second after rain repellent switch is pressed.
Switch, rain removal	Cockpit environmental control panel	Admits control air pressure to the rain removal valve.
Switch, rain repellent	Cockpit environmental control panel	Inactive.
Switch, thermal	Forward radar compartment	Completes circuit to rain removal caution light when duct temperature exceeds 290° (± 10°)F.
Transmitter, rain removal temperature	2222-4	Senses temperature of rain removal air and controls temperature control valve by regulating control air pressure applied to the valve.
Valve, rain removal	2222-4	Controls airflow to rain removal nozzles.

Table 12-1. Rain Removal and Anti-Ice System Components (continued)

Component	Access	Function
Valve, rain repellent shutoff	Forward radar compartment	Inactive.
Valve, temperature control (ram air shutoff)	2222-4	Maintains temperature of rain removal air by regulating flow of cooling ram air through the rain removal heat exchanger. Valve is controlled by the rain removal transmitter.

12-11. OPERATIONAL CHECKOUT.

12-12. RAIN REMOVAL SYSTEM.

Test Equipment Required

Figure & Index No.	*Name*	*AN Type Designation*	*Use and Application*
	Equipment required for engine operation		Operate engine during operational checkout of rain removal system
	Thermometer, 70°F to 370°F	Model 311F (Pacific Transducer Corporation, Los Angeles, Calif.)	Check temperature of air flowing to center and left windshield during rain removal operational checkout

NOTE

A number, or numbers, enclosed in braces at the end of a step in the following test is a reference to a corresponding number in troubleshooting figure 12-5A.

a. Start engine (T.O. 1A-7D-2-1). Advance throttle to obtain 80% rpm.

WARNING

Personnel shall wear safety goggles and heat resistant gloves while working on rain removal system. Hot airflow from rain removal nozzles can cause severe burns. Use small cloth flag to check for airflow or leaks.

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from ram air exhaust duct after placing cockpit pressure switch in CABIN PRESS. If no flow occurs, place switch in CABIN DUMP, and troubleshoot air-conditioning supply system. After actuation of rain removal system, the rain removal caution light may come on momentarily. If light remains on longer than 10 seconds, place rain removal switch in OFF. Continued overtemperature operation can damage windshield. If ice or moisture is visible on windshield, rain removal system may be left on with caution light on.

To prevent damage to windshield during extended operational checkout or troubleshooting of the rain removal system, cover windshield with locally fabricated asbestos protective covering (or equivalent material).

b. Position controls on cockpit environmental control panel as follows:

Control	*Position*
Cockpit temperature control knob	Medium
Cockpit pressure switch	CABIN PRESS
Rain removal switch	RAIN REM
Defog switch	OFF
Manual override switch	AUTO

c. Check for hot airflow from center and left windshield rain removal nozzles. {1}

d. Position thermometer into rain removal nozzle, ensuring that thermometer does not touch metal. Check that rain removal temperature stabilizes at 230° to 270°F. {2}

e. Momentarily press indicator lights test switch. Check that rain removal caution light comes on and then goes off when switch is released. {3 and 4}

f. Place rain removal switch in OFF. Airflow at rain removal nozzles should stop within two seconds. {5}

g. Cycle rain removal switch three times, for 1 minute maximum each time, to ensure consistency of operation.

h. Place rain removal switch in OFF and cabin pressure switch in CABIN DUMP.

i. Shut down engine.

12-13. RAIN REPELLENT SYSTEM.

12-14. DELETED.

12-15. RAIN REMOVAL SYSTEM.

Test Equipment Required

Figure & Index No.	*Name*	*AN Type Designation*	*Use and Application*
	Equipment required for engine operation		Operating engine during troubleshooting rain removal system
	Air gage, 0 to 30 psi	P500 (United States Gauge, Division of Ametek, Inc., Sellersville, Pa.)	Check pressure while troubleshooting system

12-16. Refer to figure 12-5A for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

12-17. DELETED.

12-18. Refer to figure 12-5B for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

12-19. RAIN REMOVAL VALVE 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 couplings

12-20. REMOVAL. (See figure 12-6.)

a. Open access 2222-4.

b. Disconnect control air lines (1).

c. Remove forward coupling (2) and gasket (3).

d. Remove lower coupling (4) and gasket (5).

e. Remove four nuts (6), eight washers (7), and four bolts (8) securing valve flange to air-conditioning package.

f. Remove rain removal valve (9) from airplane.

g. Loosen jamnut (10) and remove tee (11), O-ring (12), and jamnut from control port of valve.

12-21. INSTALLATION. (See figure 12-6.)

a. Using new O-ring (12), install tee (11), with jamnut (10) in control port of valve. Do not tighten jamnut.

b. Install new gaskets (3 and 5) and position rain removal valve (9) to air-conditioning package.

c. Install four bolts (8), eight washers (7), and four nuts (6) securing valve flange to air-conditioning package. Do not tighten nuts.

d. Using new self-locking nut on couplings, install lower coupling (4) and forward coupling (2).

e. Tighten lower coupling (4) to 90 (±10) pound-inches torque. Tap coupling lightly with a rawhide or plastic mallet at several points around outside band and check that torque remains 90 (±10) pound-inches.

f. Tighten forward coupling (2) to 72 (±12) pound-inches torque. Tap coupling lightly with a rawhide or plastic mallet at several points around outside band and check that torque remains 72 (±12) pound-inches.

g. Tighten four nuts (6).

h. Position tee (11), connect control air lines (1), and tighten jamnut (10).

i. Perform rain removal system operational checkout (paragraph 12-12).

j. Close access 2222-4.

Figure 12-5. Deleted.

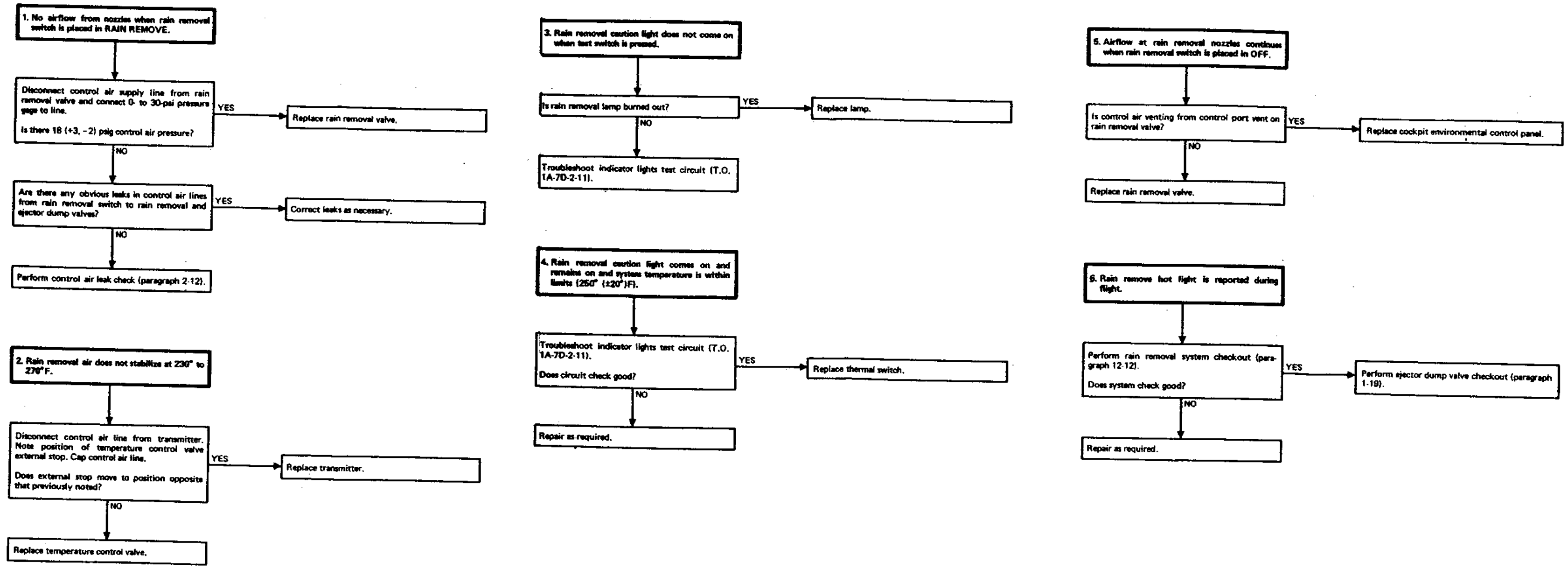


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Figure 12-5A. Rain Removal and Anti-Ice System Troubleshooting

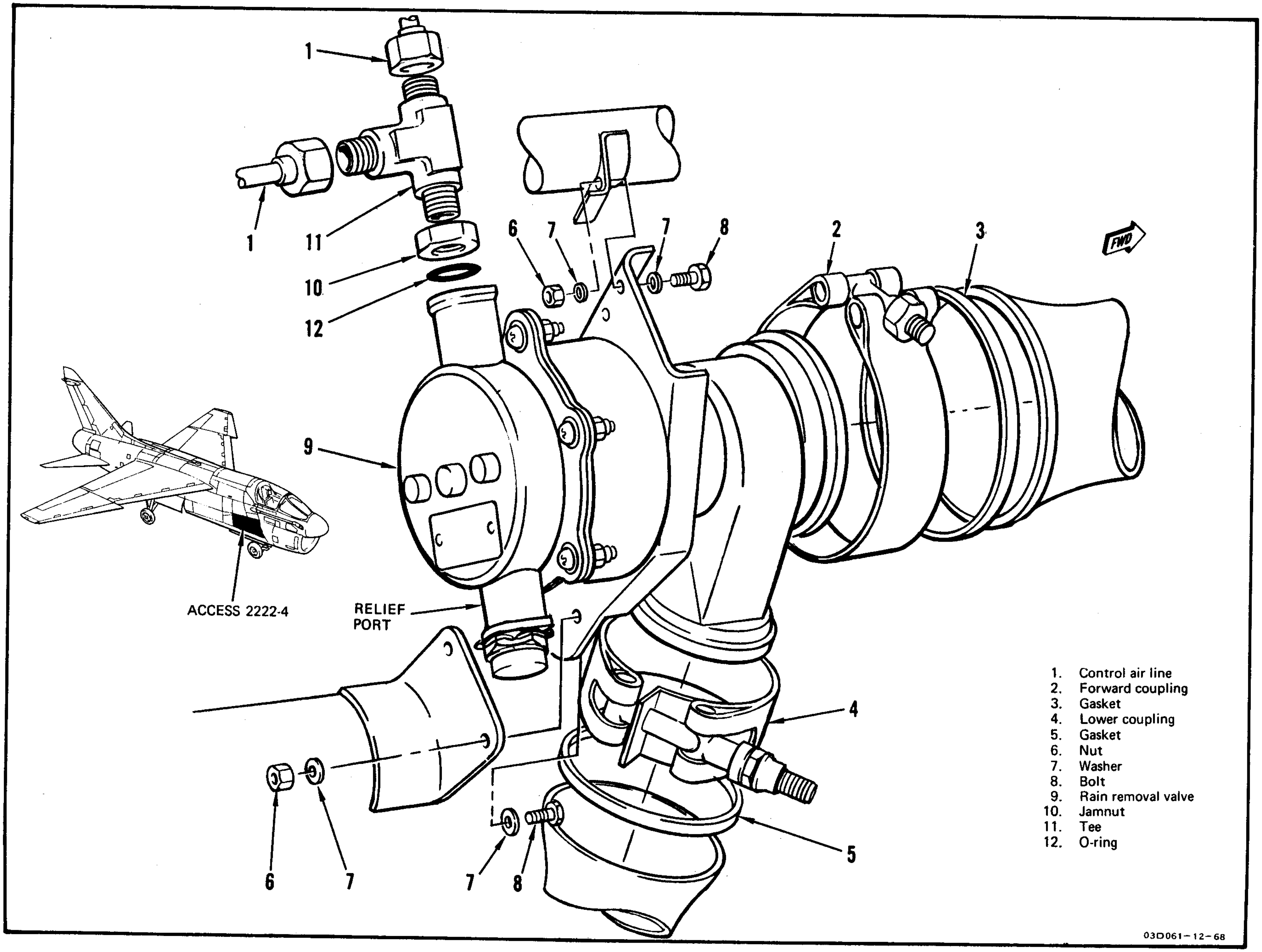

Figure 12-6. Rain Removal Valve Removal and Installation

12-22. TEMPERATURE CONTROL VALVE 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 couplings

12-23. REMOVAL. (See figure 12-7.)

a. Open access 2222-4.

b. Remove rain removal valve (paragraph 12-19).

c. Disconnect air lines (1).

d. Remove forward coupling (2) and gasket (3).

e. Remove aft coupling (4) and gasket (5). Remove temperature control valve (6) from airplane.

f. Loosen jamnut (7) and remove elbow (8), O-ring (9), and jamnut from valve supply port.

g. Remove union (10) and O-ring (11) from valve control port.

12-24. INSTALLATION. (See figure 12-7.)

a. Install union (10) and new O-ring (11) in valve control port.

b. Install new O-ring (9), jamnut (7), and elbow (8) in valve supply port. Do not tighten jamnut.

c. Install new gaskets (3 and 5) between flanges and position temperature control valve (6) on air-conditioning package.

d. Install aft coupling (4) and forward coupling (2) using new self-locking nuts on coupling bolts.

e. Tighten aft coupling to 72 (± 12) pound-inches torque. Tap coupling lightly with a rawhide or plastic mallet at several points around outside band. Check that torque remains 72 (± 12) pound-inches.

f. Tighten forward coupling to 40 (±2) pound-inches torque. Tap coupling lightly with a rawhide or plastic mallet at several points around outside band. Check that torque remains 40 (±2) pound-inches.

g. Position elbow (8), connect air lines (1), and tighten jamnut.

h. Install rain removal valve (paragraph 12-19).

i. Perform rain removal system operational checkout (paragraph 12-12).

j. Close access 2222-4.

12-25. RAIN REMOVAL TRANSMITTER REMOVAL AND INSTALLATION.

12-26. REMOVAL.

NOTE

For component location, see table 12-1.

a. Open access 2222-4.

b. Disconnect control air line from transmitter.

c. Cut lockwire and remove two bolts and washers securing transmitter to rain removal duct.

d. Remove transmitter from duct. Remove O-ring from transmitter.

e. Remove reducer from transmitter control port. Remove O-ring from reducer.

1. Air line
2. Forward coupling
3. Gasket
4. Aft coupling
5. Gasket
6. Temperature control valve
7. Jamnut
8. Elbow
9. O-ring
10. Union
11. O-ring

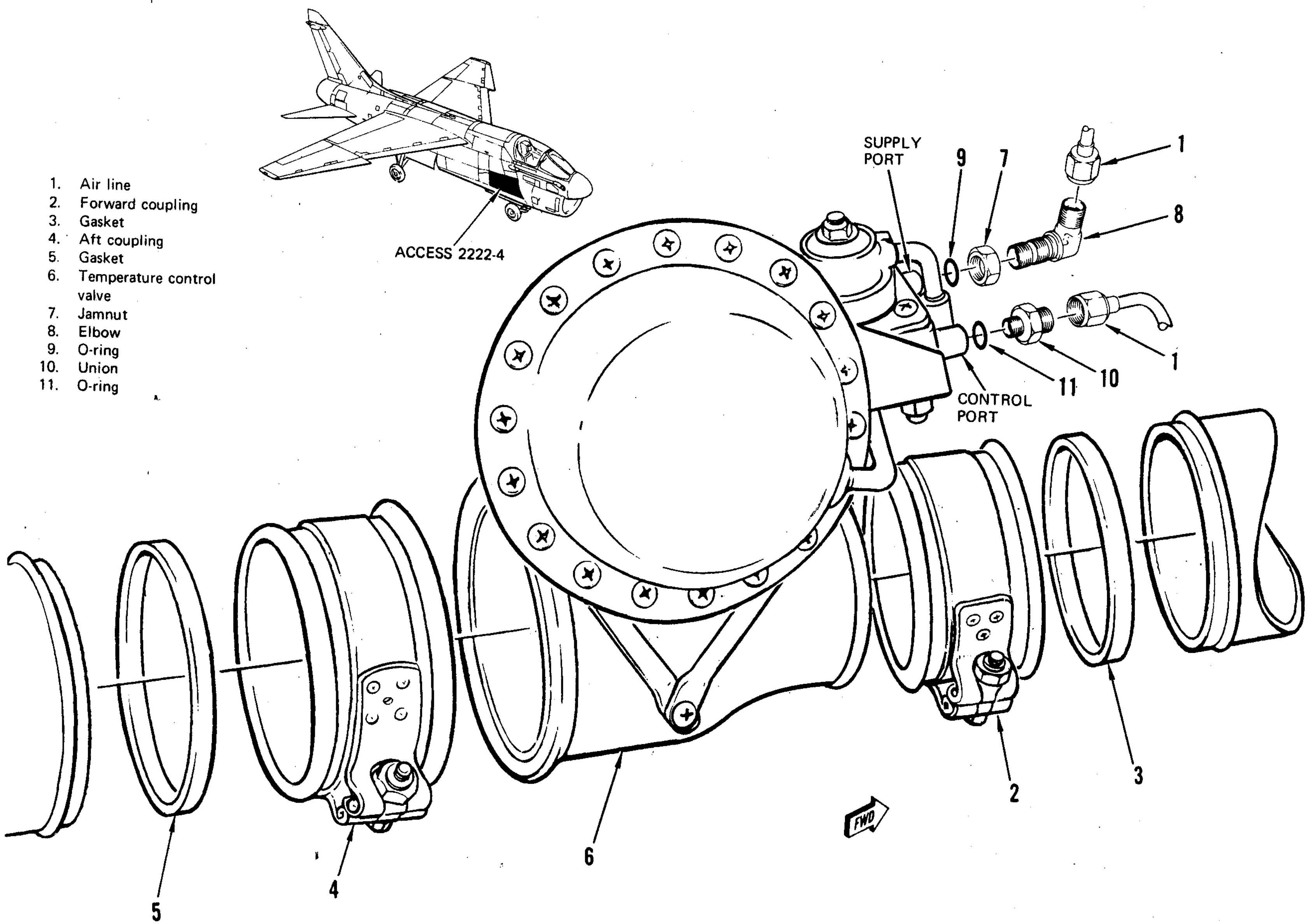

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Figure 12-7. Temperature Control Valve Removal and Installation

12-27. INSTALLATION.

a. Install reducer with new O-ring in transmitter control port.

b. Install transmitter with new O-ring in rain removal duct.

c. Install two bolts and washers and secure with MS20995C20 lockwire.

d. Connect control air line to reducer.

e. Perform rain removal system operational checkout (paragraph 12-12).

f. Close access 2222-4.

12-28. THERMAL SWITCH REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	215-00188-1	Forward radar support strut	Support radar assembly during thermal switch removal and installation

12-29. REMOVAL.

NOTE

For component location, see figure 1-2.

a. Open nose radome.

b. Install shock mount support pins at left side (looking aft) of radar forward assembly. Release quick-release locking pins at right side of assembly.

c. Loosen lower harness cable clamp, swing radar forward assembly out and install support strut.

d. Note wire color code for installation and cut switch wires.

e. Remove switch from rain removal duct. Remove O-ring from switch.

12-30. INSTALLATION.

NOTE

Prior to installation of rain removal switch, measure distance from beginning of threads to end of probe, assuring that when probe is installed it will not contact adjacent wall of duct. If probe measures too long, replace existing packing with M83248-109 and washer AN 960-816 and secure.

a. Install switch with new O-ring in rain removal duct.

b. Splice switch wires to airplane wires.

c. Remove support strut, swing radar forward assembly in, and tighten lower harness cable clamp.

d. Install quick-release locking pins at right mount (looking aft) and remove shock mount support pins at left mount of radar forward assembly.

e. Close nose radome.

f. Perform rain removal system operational checkout (paragraph 12-12).

12-31. LEFT RAIN REMOVAL NOZZLE REMOVAL AND INSTALLATION.

12-32. REMOVAL. (See figure 12-8.)

a. Remove left rain repellant nozzle (paragraph 12-46).

B. Remove mounting screws (1) from left rain removal nozzle (2).

CAUTION

Use care in breaking nozzle loose from sealant or mounting flanges can be damaged.

c. Slowly work rain removal nozzle up and outboard until tube (3) slips out of center nozzle.

d. Remove left nozzle, tube, and O-rings (4) from airplane. Remove tube from nozzle and discard O-rings.

12-33. INSTALLATION. (See figure 12-8.)

a. Clean airframe and left nozzle mating surfaces.

b. Apply MIL-S-8802 sealant to nozzle mating surface.

c. Coat new O-rings (4) with VV-P-236 petrolatum. Install one O-ring in center rain removal nozzle outlet and one in left rain removal nozzle inlet.

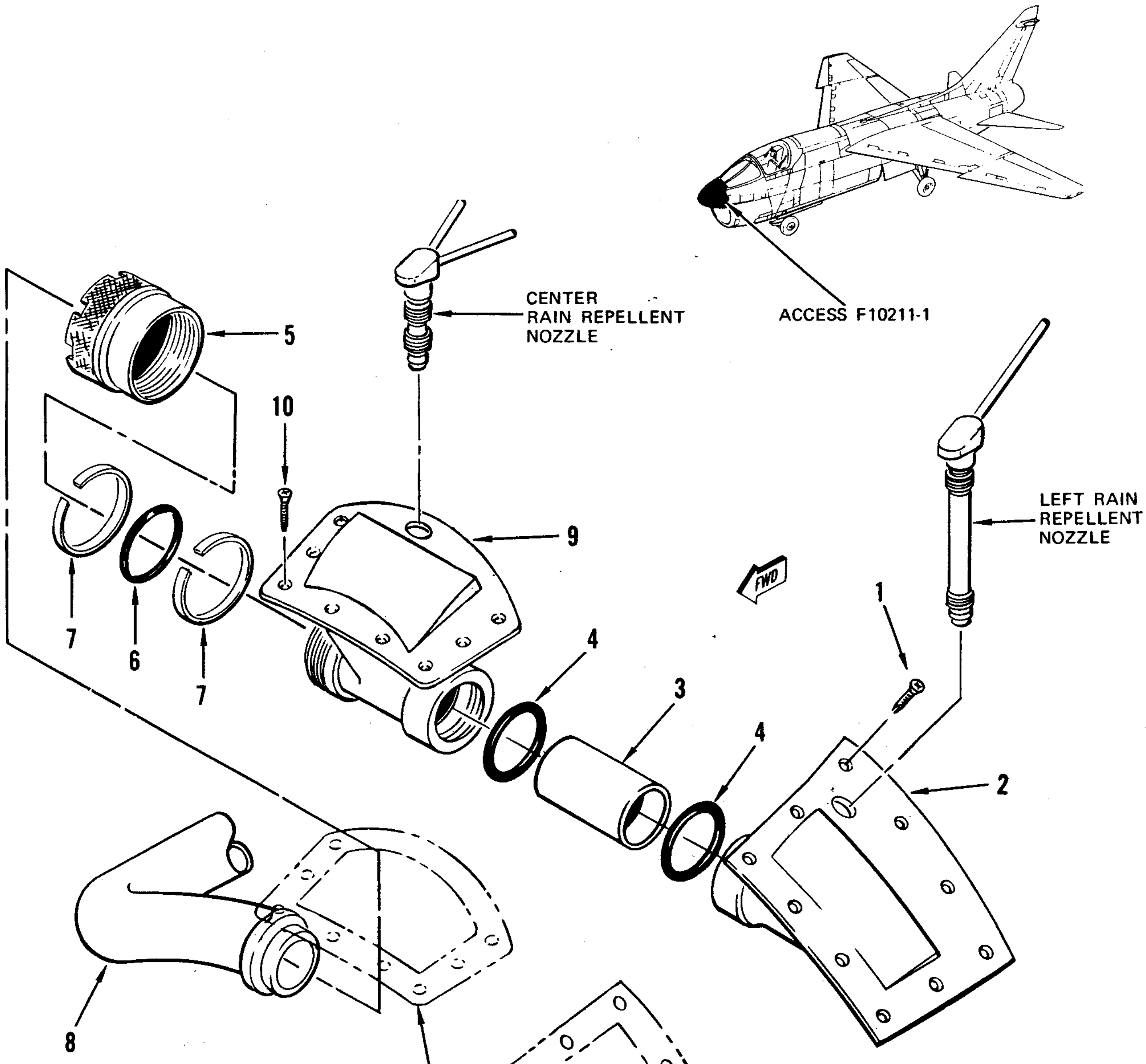
d. Install tube (3) in center nozzle outlet. Position tube to mate with left nozzle.

e. Install left nozzle (2) through airframe opening. Work nozzle inboard and down until nozzle mates with tube (3).

f. Secure left nozzle with mounting screws (1).

g. Install left rain repellent nozzle (paragraph 12-46).

h. Perform rain removal system operational checkout (paragraph 12-12).



1. Screw
2. Left nozzle
3. Tube
4. O-ring
5. Coupling
6. O-ring
7. Split ring
8. Duct
9. Center nozzle
10. Screw

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Figure 12-8. Center and Left Rain Removal Nozzles Removal and Installation

12-34. CENTER RAIN REMOVAL NOZZLE 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 couplings

12-35. REMOVAL. (See figure 12-8.)

a. Remove center rain repellent nozzle (paragraph 12-43).

b. Remove left rain removal nozzle (paragraph 12-31).

c. Cut lockwire and remove coupling (5), O-ring (6), and split rings (7) securing rain removal duct (8) to center rain removal nozzle (9). Discard O-ring.

CAUTION

Use care in breaking nozzle loose from sealant or mounting flanges may be damaged.

d. Remove mounting screws (10) securing nozzle to airframe and remove nozzle.

12-36. INSTALLATION. (See figure 12-8.)

a. Clean airframe and center nozzle (9) mating surfaces.

b. Apply MIL-S-8802 sealant to nozzle mating surface.

c. Position center nozzle through airframe opening and install mounting screws (10).

d. Connect rain removal duct (8) to center nozzle using new O-ring (6), split rings (7), and coupling (5).

e. Tighten coupling to 48 (± 12) pound-inches torque and secure with MS20995C32 lockwire.

f. Install left rain removal nozzle (paragraph 12-31).

g. Install center rain repellent nozzle (paragraph 12-43).

h. Perform rain removal system operational checkout (paragraph 12-12).

12-37. DELETED.

12-38. DELETED.

12-39. DELETED.

12-40. RAIN REPELLENT SHUTOFF VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	*Part Number*	*Nomenclature*	*Use and Application*
	215-00188-1	Forward radar support strut	Support radar assembly during rain repellent shutoff valve removal and installation

12-41. REMOVAL. (See figure 12-9.)

a. Open nose radome.

b. Install shock mount support pins at left side of radar forward assembly (looking aft).

c. Release quick-release locking pins at right side of radar forward assembly (looking aft).

d. Loosen lower harness cable clamp.

e. Swing radar forward assembly out and install support strut.

f. Disconnect electrical connector (1) from rain repellent shutoff valve.

g. Remove rain repellent container (paragraph 12-37).

NOTE

Ensure that rain repellent fluid does not drain into radar compartment.

h. Disconnect fluid lines (2) from valve fittings. Cap or plug fittings and lines.

i. Remove screws (3) and washers (4) securing valve to mounting bracket, and remove rain repellent shutoff valve (5).

j. Loosen jamnuts (6) and remove elbows (7), O-rings (8), and split rings (9) from valve ports. Place elbows and nuts in clean plastic bag. Discard O-rings and split rings.

12-42. INSTALLATION. (See figure 12-9.)

a. Install jamnuts (6), new split rings (9), and new O-rings (8) on elbows (7) and install elbows into ports of rain repellent shutoff valve. Do not tighten jamnuts.

b. Place shutoff valve (5) in mounting position in airplane and install washers (4) and screws (3). Tighten mounting screws.

c. Align elbows with fluid lines (2) and connect lines. Tighten fluid line fittings.

d. Tighten jamnuts.

e. Connect electrical connector (1) to rain repellent shutoff valve.

f. Install rain repellent container (paragraph 12-37).

g. Perform rain repellent system operational checkout (paragraph 12-13).

h. Remove support strut.

i. Swing radar forward assembly into compartment and install quick-release locking pins at right mount (looking aft).

j. Remove shock mount support pins at left side of radar forward assembly (looking aft).

k. Install lower harness cable clamp and ensure no harness obstructions exist to interfere with antenna movement.

l. Close nose radome.

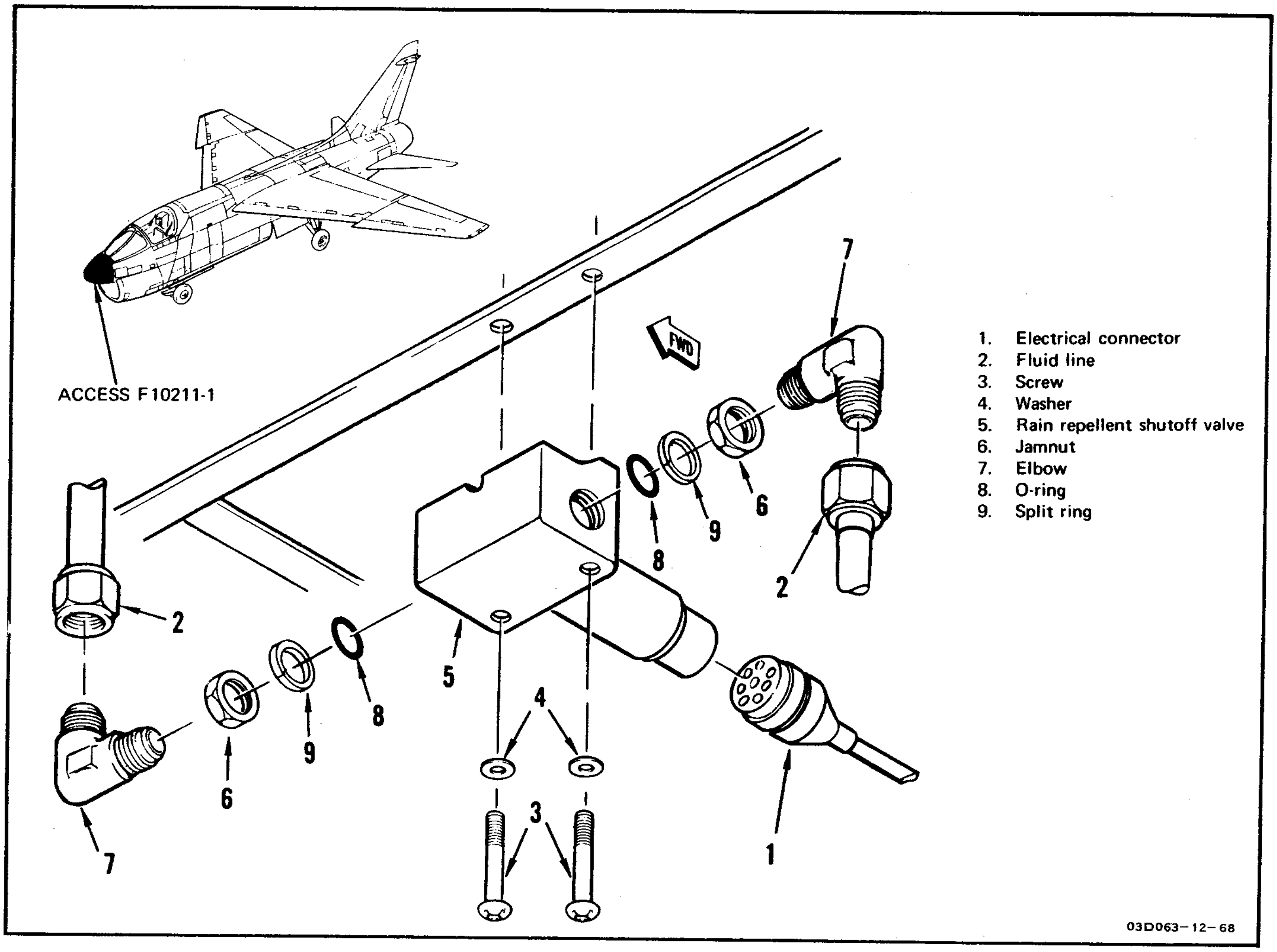


Figure 12-9. Rain Repellent Shutoff Valve Removal and Installation

12-43. CENTER RAIN REPELLENT NOZZLE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	*Part Number*	*Nomenclature*	*Use and Application*
	215-00188-1	Forward radar support strut	Support radar assembly during center rain repellent nozzle removal and installation

12-44. REMOVAL. (See figure 12-10.)

a. Open nose radome.

b. Install shock mount support pins at left side of radar forward assembly (looking aft).

c. Release quick-release locking pins at right side of radar forward assembly (looking aft).

d. Loosen lower harness cable clamp.

e. Swing radar forward assembly out and install support strut.

f. Remove rain repellent container (paragraph 12-37).

NOTE

Ensure that rain repellent fluid does not drain into radar compartment.

g. Disconnect fluid line (1) from rain repellent nozzle. Cap or plug fitting and line.

h. Remove jamnut (2), washer (3), and nylon washer (4) from rain repellent nozzle (5).

i. Remove sealant along nozzle and next to windshield (T.O. 1A-7D-3).

j. Slowly remove nozzle and nylon washer (6) from center windshield section. Discard nylon washers.

12-45. INSTALLATION. (See figure 12-10.)

a. Install new nylon washer (6) on rain repellent nozzle (5) and position nozzle through center windshield section.

b. Install new nylon washer (4), washer (3), and jamnut (2) on nozzle.

c. Align nozzle and tighten jamnut.

d. Connect fluid line (1) to nozzle (5).

e. Install rain repellent container (paragraph 12-37).

f. Perform rain repellent system operational checkout (paragraph 12-13).

NOTE

Ensure that sealant does not enter rain removal nozzle.

g. Apply MIL-S-8802 sealant along center rain repellent nozzles (T.O. 1A-7D-3).

h. Remove support strut.

i. Swing radar forward assembly into compartment and install quick-release locking pins at right mount (looking aft).

j. Remove shock mount support pins at left side of radar forward assembly (looking aft).

k. Replace lower harness cable clamp and ensure no harness obstructions exist to interfere with antenna movement.

l. Close nose radome.

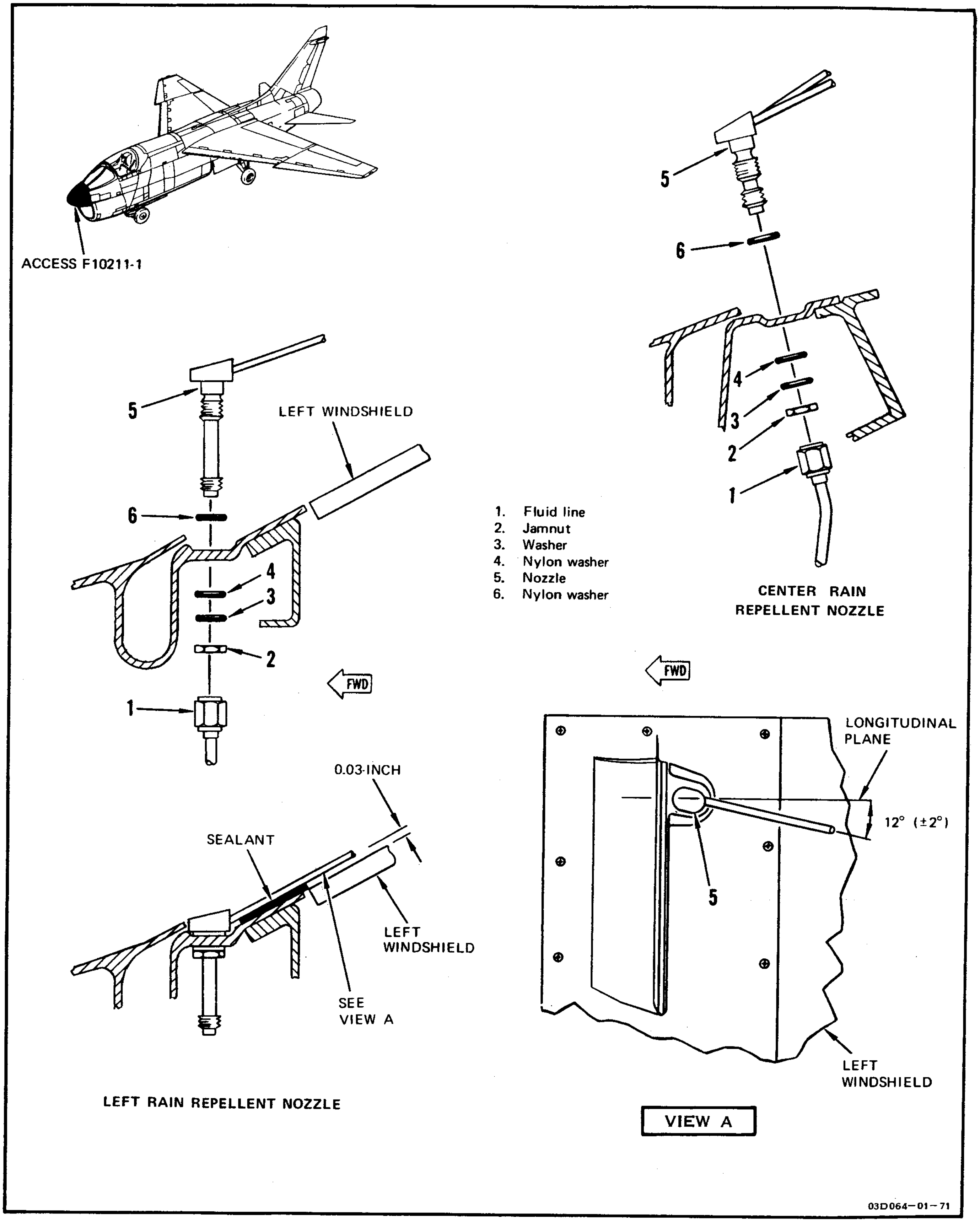


Figure 12-10. Center and Left Rain Repellent Nozzles Removal and Installation

12-46. LEFT RAIN REPELLENT NOZZLE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	*Part Number*	*Nomenclature*	*Use and Application*
	215-00188-1	Forward radar support strut	Support radar assembly during left rain repellent nozzle removal and installation

12-47. REMOVAL. (See figure 12-10.)

a. Open nose radome.

b. Install shock mount support pins at left side of radar forward assembly (looking aft).

c. Release quick-release locking pins at right side of radar forward assembly (looking aft).

d. Loosen lower harness cable clamp.

e. Swing radar forward assembly out and install support strut.

f. Remove rain repellent container (paragraph 12-37).

NOTE

Ensure that no rain repellent fluid drains into radar compartment.

g. Disconnect fluid line (1) from rain repellent nozzle. Cap or plug fitting and line.

h. Remove jamnut (2), washer (3), and nylon washer (4) from rain repellent nozzle (5).

i. Remove sealant along nozzle (T.O. 1A-7D-3).

j. Slowly remove nozzle and nylon washer (6) from left windhsield section. Discard nylon washers.

12-48. INSTALLATION. (See figure 12-10.)

a. Install new nylon washer (6) on rain repellent nozzle (5) and position nozzle through left windshield section.

b. Install new nylon washer (4), washer (3), and jamnut (2) on nozzle.

c. Position tube of left rain repellent nozzle 12° (±2°) from longitudinal plane and not more than 0.03 inch from surface of windshield. Tighten jamnut.

d. Connect fluid line (1) to nozzle.

e. Install rain repellent container (paragraph 12-37).

f. Perform rain repellent system operational checkout (paragraph 12-13).

NOTE

Ensure that sealant does not enter rain removal nozzle.

g. Apply MIL-S-8802 sealant along tube of left rain repellent nozzle to edge of windshield (T.O. 1A-7D-3).

h. Remove support strut.

i. Swing radar forward assembly into compartment and install quick-release locking pins at right mount (looking aft).

j. Remove shock mount support pins at left side of radar forward assembly (looking aft).

k. Replace lower harness cable clamp and ensure no harness obstructions exist to interfere with antenna movement.

l. Close nose radome.

SECTION XIII
OXYGEN SYSTEM

13-1. DESCRIPTION.

13-2. The oxygen system consists of a liquid oxygen system, liquid oxygen quantity indicating system, and emergency oxygen system. Liquid oxygen is converted to a gaseous state and supplied to the pilot. The liquid oxygen indicating system measures quantity of oxygen in the converter. The emergency oxygen system provides a temporary supply of gaseous oxygen to the pilot if failure of the primary liquid oxygen system occurs. See figure 13-1 for system controls and indicators. For system arrangement, see figure 13-2.

13-3. The liquid oxygen system supplies 100% oxygen in a gaseous state to the regulator (mounted on the right console) from the converter. System liquid oxygen is stored in the converter at -297°F. The converter is designed for rapid replacement during fast turnaround operations. Liquid oxygen is converted to a gaseous state within the converter and delivered to a pressure-demand type oxygen regulator located in the right console. The rate at which liquid oxygen is converted to gas depends on system demand. Two type of liquid oxygen converters may be used in the system. One type of converter provides an econony feature in the system by incorporation of a pressure opening and closing valve and a converter check valve. The second type of converter has a pressure closing valve and does not use a converter check valve thereby eliminating the economy feature. The pressure closing valve provided in both types of converter controls the rate of liquid evaporation during flow. Either type of converter is interchangeable in the airplane.

13-4. A capacitance type gaging and pressure indicating circuit continuously monitors the liquid oxygen system and indicates the quantity of liquid oxygen in the converter on an instrument panel indicator. The indicator dial is graduated from 0 to 10 liters in increments of 1/2 liter with numerals on even numbered increments. The indicating circuit also includes an oxygen low level caution light located on the caution light panel. The caution light will come on if converter level is 1 liter or less.

13-5. The emergency oxygen system consists of an oxygen cylinder, pressure gage mounted on the cylinder, filler and pressure reducer valve, quick-disocnnect, oxygen hose, and cable lanyard used to activate the system. The shatter proof high pressure emergency oxygen cylinder is attached to the right side of the ejection seat support structure. The cylinder is charged with gaseous oxygen to a pressure of 1,800 to 2,200 psi. The duration of the oxygen in the cylinder is approximately 10 minutes. A quick-disconnect in the emergency oxygen supply hose provides a means of separation during seat ejection and the cylinder remains with the aircraft. An extension hose from the quick-disconnect connects to the primary oxygen system hose at the pilot's oxygen mask. A retainer pin (with caution tag attached) is inserted through a hole on the filler and pressure reducer valve, and renders the system inoperative. The caution tag and retainer pin is removed before flight.

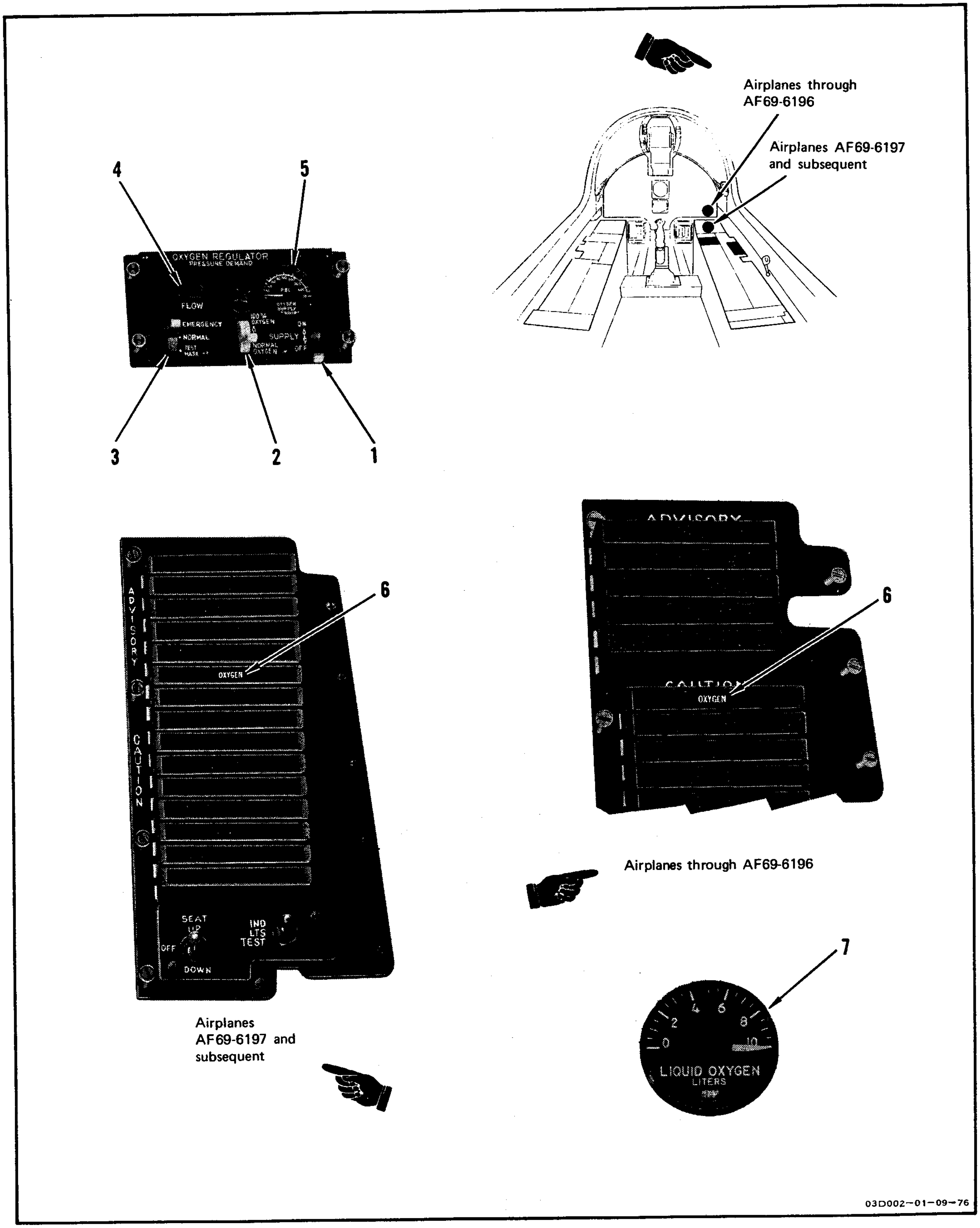
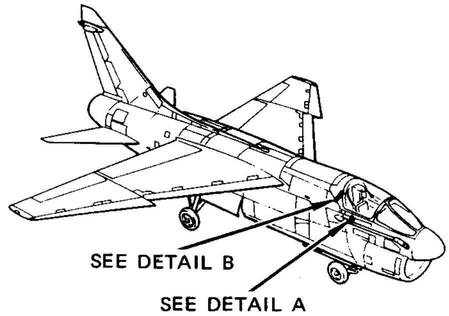
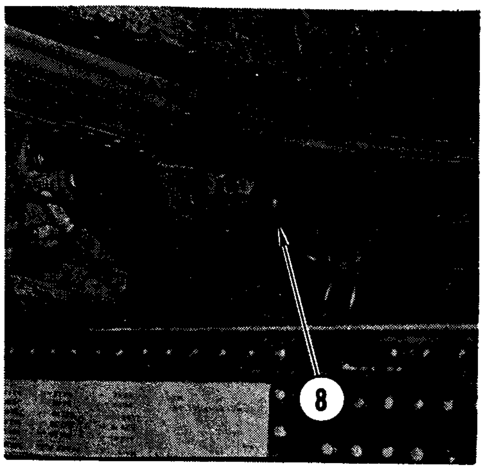
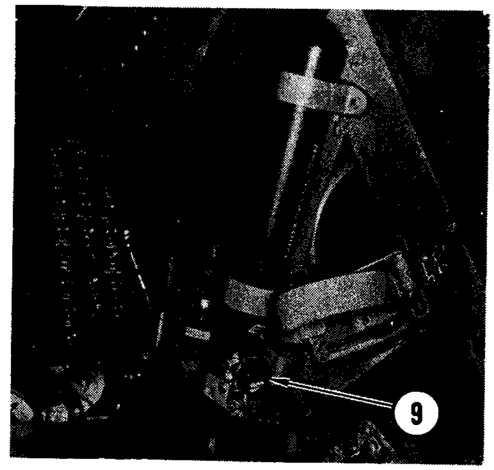


Figure 13-1. Oxygen System Controls and Indicators (Sheet 1)





DETAIL A



DETAIL B

INDEX NO.	CONTROL/INDICATOR	FUNCTION
1	Oxygen supply lever (SUPPLY)	ON – allows oxygen to flow through console-mounted oxygen regulator to pilot's face mask. OFF – stops flow of oxygen through regulator.
2	Oxygen diluter lever	NORMAL OXYGEN – supplies mixed cockpit air and oxygen for breathing. 100% OXYGEN – supplies undiluted 100% oxygen for breathing.
3	Oxygen flow lever	NORMAL – supplies oxygen flow under pressure upon normal demand breathing. EMERGENCY – supplies positive oxygen pressure for emergencies. TEST MASK – provides ground level mask test.
4	Oxygen flow indicator (FLOW)	Indicates normal operation of oxygen regulator.
5	Oxygen supply pressure indicator	Indicates liquid oxygen system pressure .
6	Oxygen low-level caution light (OXYGEN)	On – indicates level of liquid oxygen in converter is 1 liter or less.
7	Liquid oxygen quantity indicator	Indicates quantity of liquid oxygen in converter in liters when OFF flag is not in view.
8	Emergency oxygen (green ball) handle	Supplies emergency oxygen to pilot's face mask when pulled.
9	Emergency oxygen cylinder pressure gage	Indicates emergency oxygen pressure.

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Figure 13-1. Oxygen System Controls and Indicators (Sheet 2)

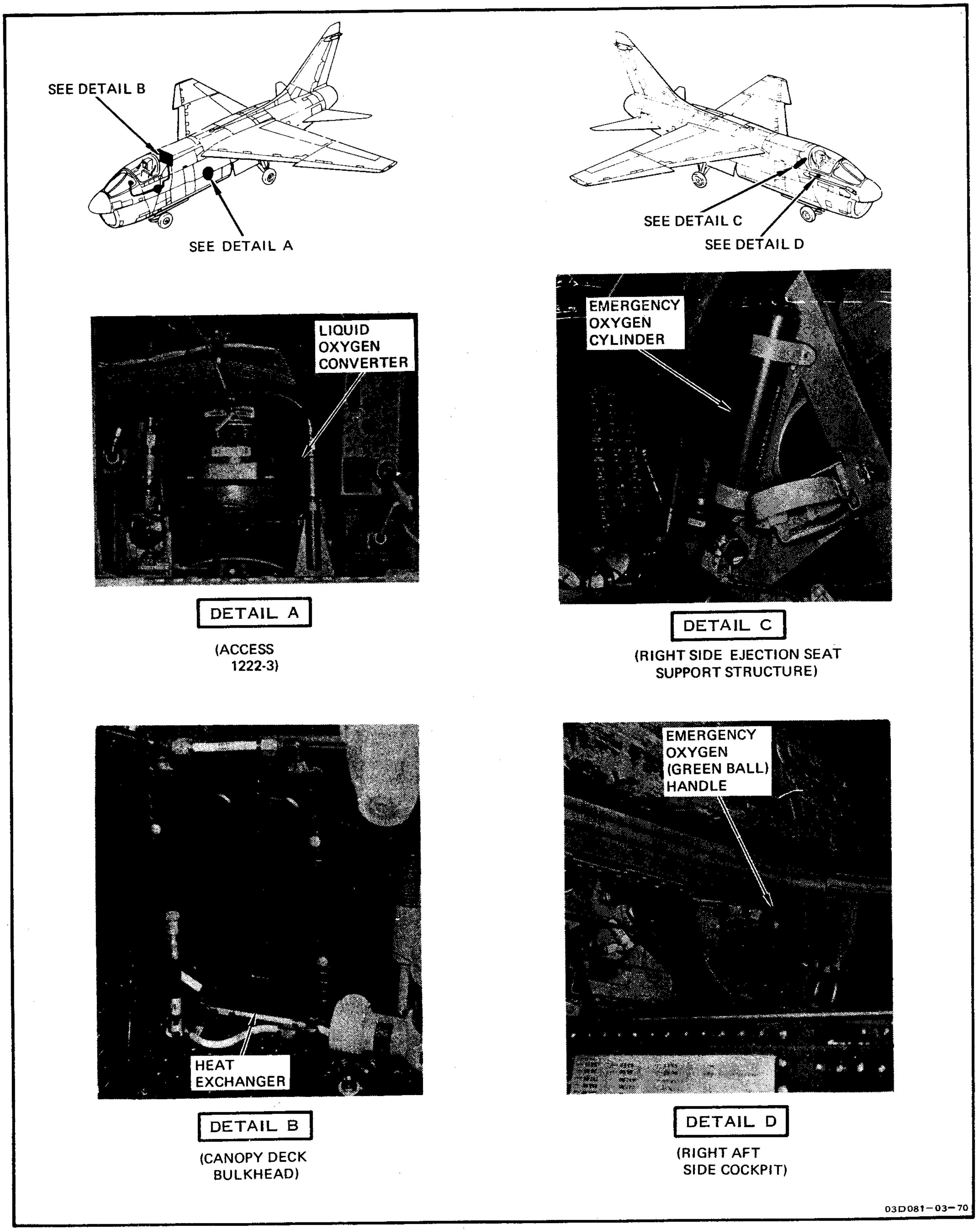

Figure 13-2. Oxygen System Arrangement

13-6. OPERATION. (See figures 13-3, 13-4, 13-5, and 13-6.)

13-7. FILL STAGE. When the filler cart line fitting is connected to the fill, buildup, and vent valve, the accumulation of gaseous oxygen in the converter is vented overboard through the system vent line. When connected, the filler cart line fitting depresses a plunger in the fill, buildup, and vent valve which simultaneously opens a vent port in the valve and blocks the system buildup line port. The converter is filled with liquid oxygen through a line which runs from the fill, buildup, and vent valve to the bottom of the converter. As the liquid level in the converter rises, the open vent line port in the fill, buildup, and vent valve permits the escape of gaseous oxygen resulting from converter cooldown. Baffling in the converter prevents loss of liquid oxygen during the filling operation. The converter is full when liquid oxygen flows out the overboard vent in a steady stream. When the filler cart line is disengaged from the fill, buildup, and vent valve, the valve plunger returns to the extended position, blocking the vent port and opening the system buildup line port.

13-8. BUILDUP STAGE. (Converter with pressure closing valve.) (See figure 13-5.) When the filler cart line is disengaged from the fill, buildup, and vent valve, static head pressure in the converter forces liquid oxygen from the converter to the buildup coil. Liquid oxygen in the buildup coil absorbs heat from the coil, changing liquid oxygen to a gaseous state and causing system pressure to rise. Gaseous oxygen passes through a line to the pressure closing valve. This valve contains a bellows-actuated and spring-adjusted pressure closing valve. As pressure in the system increases, gaseous oxygen passes through the pressure closing valve and the open buildup line port in the fill, buildup, and vent valve into the top or gaseous side of the converter. The gas pressure forces additional liquid oxygen from the fill port in the bottom of the converter into the buildup coil until a system operating pressure of 70 (+ 5, -0) psi is obtained. When system operating pressure is reached, the bellows in the pressure closing valve will go to the closed position and remain closed unless converter pressure decreases below 70 (+ 5, -0) psi.

13-9. Under standby conditions, when no gaseous oxygen is being used, the liquid oxygen absorbs heat from the system causing converter pressure to increase. If no demands are made of the system, the pressure may continue to increase until approximately 100 psi is reached. At 110 psi, the pressure relief valve opens and vents oxygen overboard.

13-10. SUPPLY STAGE. (Converter with pressure closing valve.) (See figure 13-5.) Once system pressure has stabilized and a demand for oxygen is made on the system, flow is from the top or gaseous side of the converter through the pressure closing valve and the two heat exchangers in the pilot supply line. The heat exchangers ensure the complete conversion of liquid oxygen to a gaseous state and bring liquid oxygen to a breathable temperature. From the heat exchanger, the oxygen flows to the console-mounted oxygen regulator. If the oxygen supply lever is in ON, the oxygen flows through the oxygen regulator and to the face mask.

13-11. BUILDUP STAGE. (Converter with pressure opening and closing valve.) (See figure 13-6.) When the filler cart line is disengaged from the fill, buildup, and vent valve, static head pressure in the converter forces liquid oxygen from the converter to the buildup coil. Liquid oxygen in the buildup coil absorbs heat from the coil, changing liquid oxygen to a gaseous state and causing system pressure to rise. Gaseous oxygen passes through a line to the pressure opening and closing valve. This valve contains two bellows-actuated and spring-adjusted valves, a pressure closing valve, and a pressure opening valve. As pressure in the system increases, gaseous oxygen passes through the pressure closing portion of the valve and the open buildup line port in the fill, buildup, and vent valve into the top or gaseous side of the converter. The gas pressure forces additional liquid oxygen from the fill port in the bottom of the converter into the buildup coil until a system operating pressure of 70 (+ 5, -0) psi is obtained. When system operating pressure is reached, the bellows in the pressure closing portion of the valve will go to the closed position and remain closed unless converter pressure decreases below 70 (+ 5, -0) psi. A 5-psi differential pressure converter check valve, downstream of the converter and buildup coil, prevents inadvertent flow of liquid and gaseous oxygen to the rest of the system and maintains a supply of liquid oxygen in the buildup coil during the fill and buildup stage. The differential converter check valve opens and closes periodically during the buildup stage to maintain a pressure differential of 5 (±2) psi.

13-12. Under standby conditions, when no gaseous oxygen is being used, the liquid oxygen absorbs heat from the system, causing converter pressure to increase until a pressure of 85 (±1) psi is reached. At 85 (±1) psi, the pressure opening portion of the valve opens to supply gaseous oxygen through the two heat exchangers to the oxygen regulator valve on the right console. If no demands are made of the system, the pressure may continue to increase until approximately 110 psi is reached. At

110 psi, the pressure relief valve opens and vents oxygen overboard.

13-13. SUPPLY STAGE. (Converter with pressure opening and closing valve.) (See figure 13-6.) Once system pressure has stabilized and a demand for oxygen is made on the system, flow is from top or gaseous side of the converter through the pressure opening valve and the two heat exchangers in the pilot's supply line. If demands reduce system pressure to less than 85 (± 1) psi, the pressure opening valve closes. In this position, flow is from the bottom or liquid side of the converter through the converter check valve. The check valve opens when supply line pressure is 5 (+ 2, -1) psi below converter pressure, 70 (+ 5, -0) psi. Liquid oxygen flows into the two heat exchangers in the supply line. The heat exchangers ensure the complete conversion of liquid oxygen to a gaseous state and bring it to a breathable temperature. Oxygen flows from the heat exchanger to the console-mounted oxygen regulator. If the oxygen supply lever is in ON, oxygen flows through the oxygen regulator to the pilot's face mask.

13-14. LIQUID OXYGEN QUANTITY INDICATING SYSTEM. (See figure 13-3.) The liquid oxygen quantity indicating system measures the quantity of oxygen contained in the converter. A capacitance probe senses the dielectric value of oxygen in the converter. Total capacitance sensed by the probe is compared with a fixed reference capacitance in the bridge amplifier section of the oxygen quantity indicator. The resulting differential signal is amplified and used to energize an indicator motor, which rotates to balance the bridge circuit and move the indicator pointer to the correct quantity indication. Indicator power is obtained from the ac bus.

13-15. The quantity indicator contains a low level switch. Whenever the quantity indicator indicates one liter or less, the switch contacts close, turning on the oxygen low level caution light which is powered by the primary dc bus.

13-16. EMERGENCY OXYGEN SYSTEM. After the caution tag and retainer pin have been removed, the emergency oxygen system can be activated by pulling straight forward on the green ball handle located at the lower right edge of the ejection seat leg brace. A force of 12 to 20 pounds is required to activate the system. Upon activation the emergency oxygen cylinder releases a continuous flow of gaseous oxygen through the emergency oxygen system hose directly to the pilot's oxygen mask. When the system is activated there is no provision for shutoff, and depletion of the system will occur in approximately 10 minutes. The emergency oxygen cylinder should be replaced when the pressure gage indicates less than 1,800 psi.

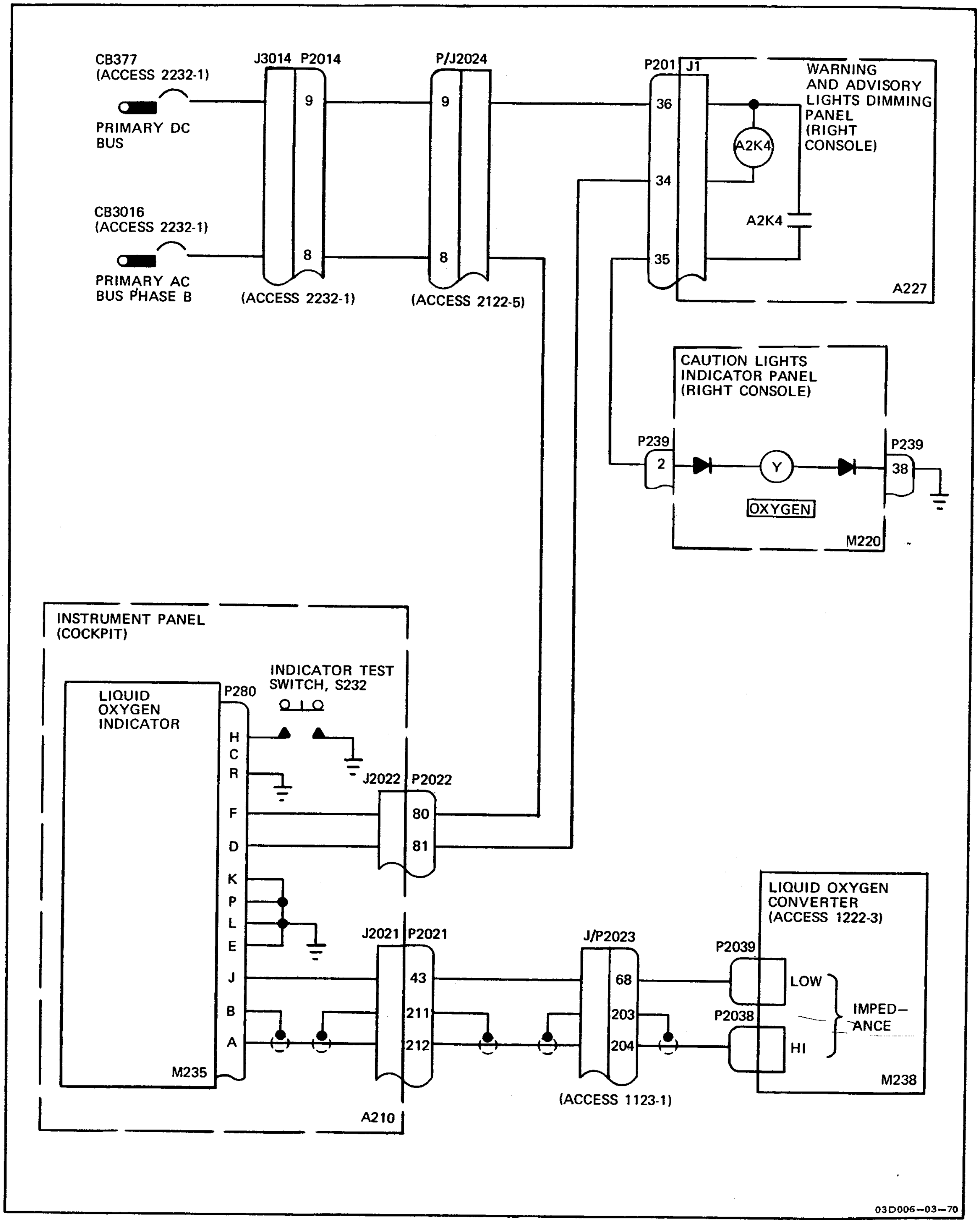

Figure 13-3. Liquid Oxygen System Electrical Schematic Diagram (Airplanes Through AF69-6196)

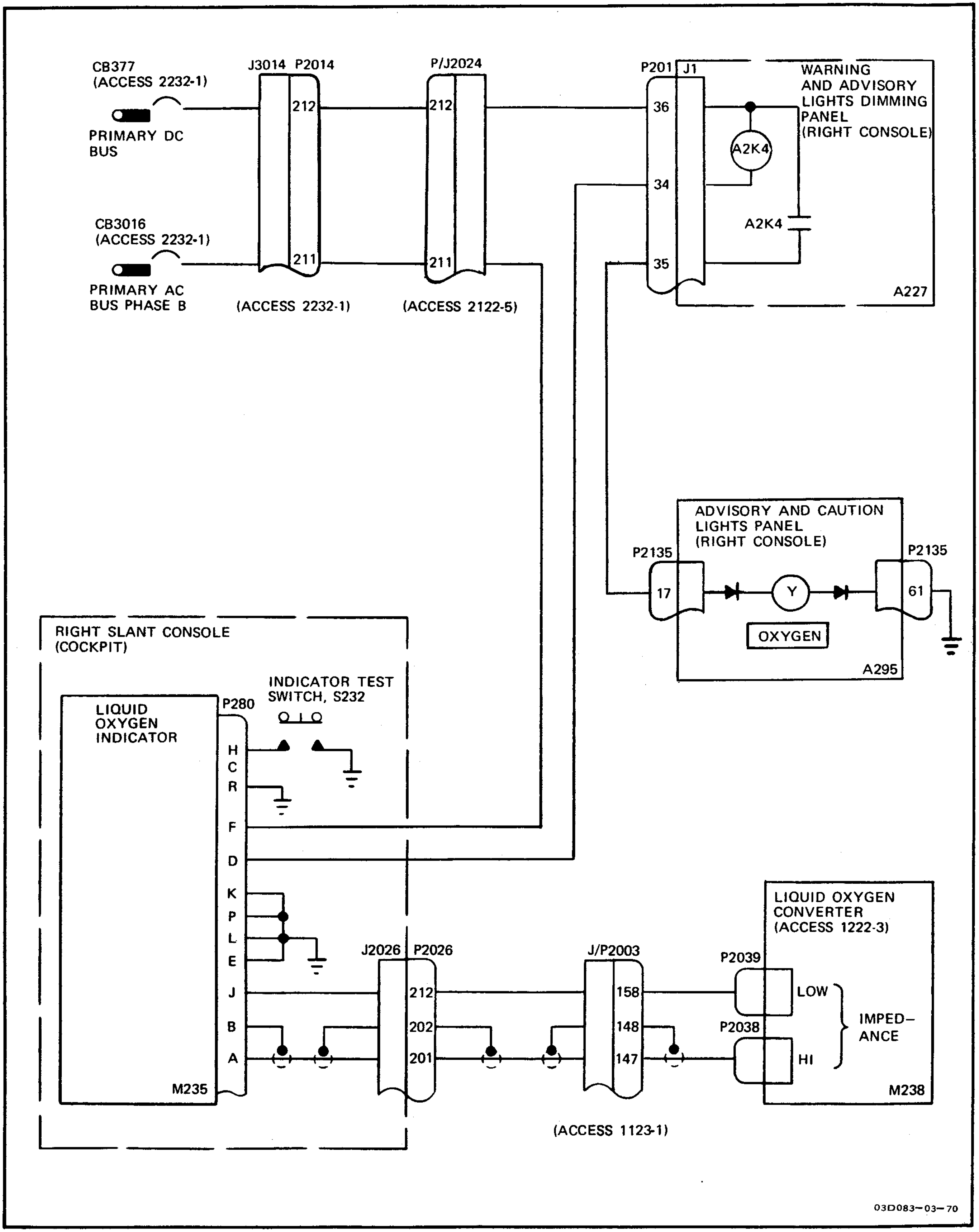

Figure 13-4. Liquid Oxygen System Electrical Schematic Diagram (Airplanes AF69-6197 and Subsequent)

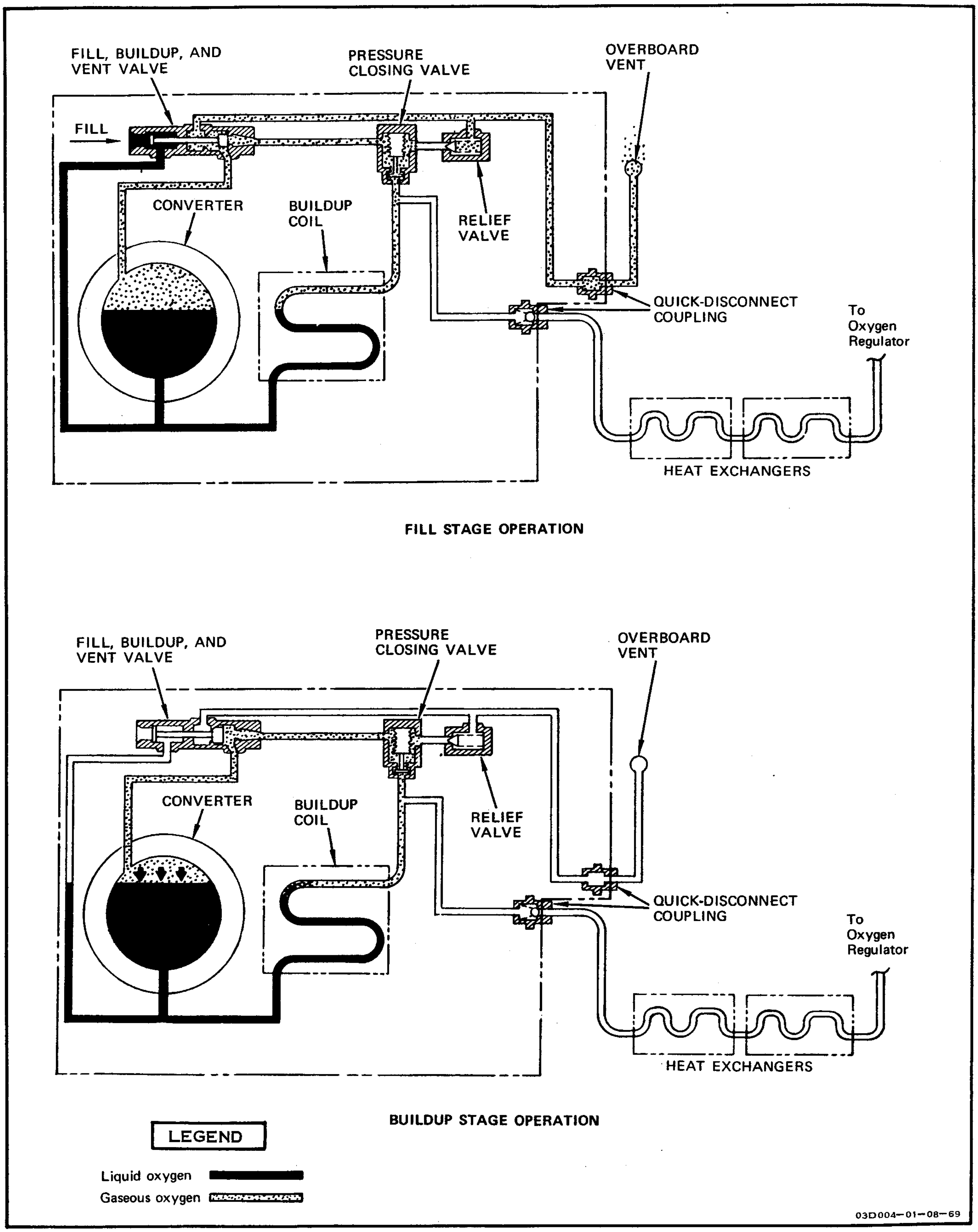

Figure 13-5. Liquid Oxygen System Flow Diagram (Converter with Pressure Closing Valve) (Sheet 1)

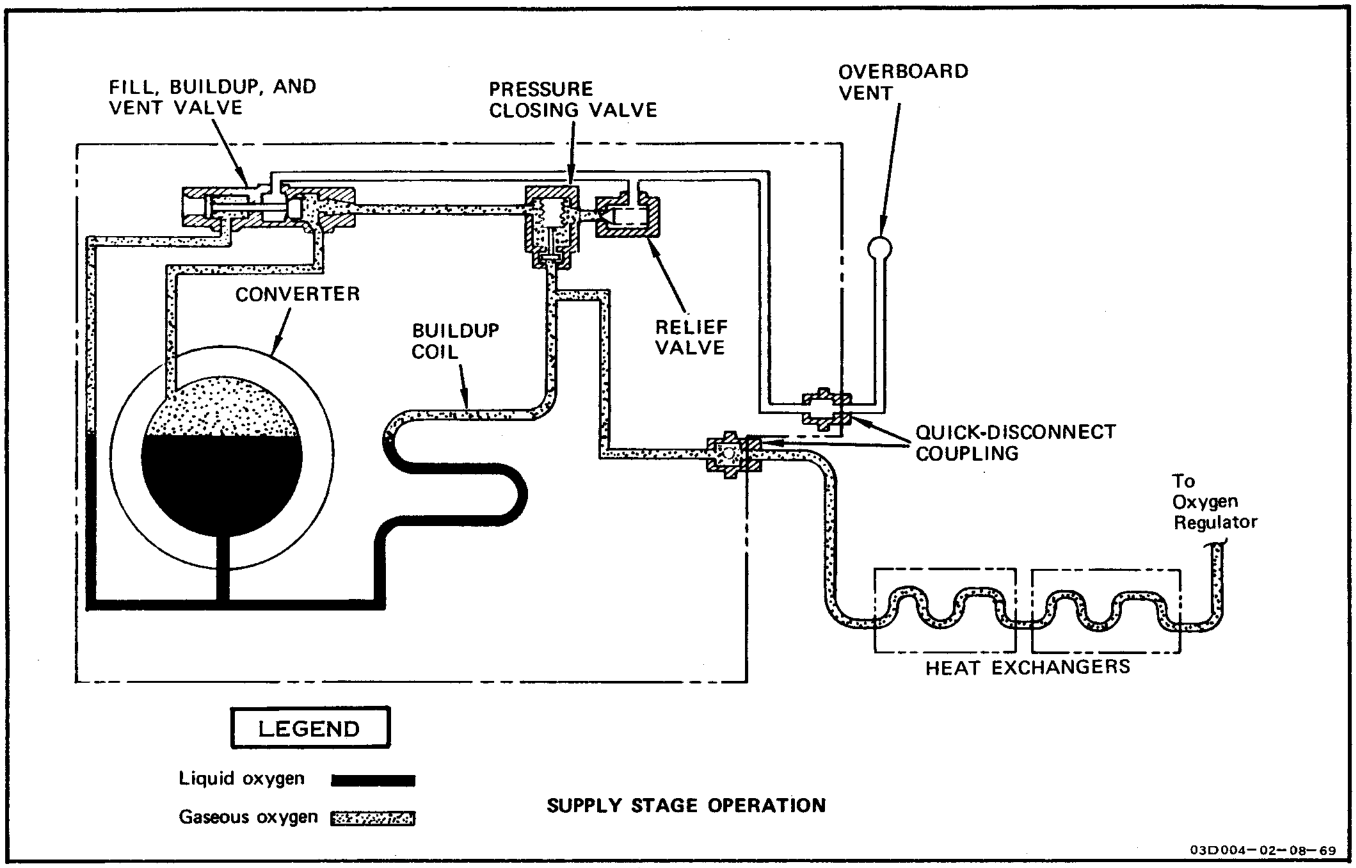

Figure 13-5. Liquid Oxygen System Flow Diagram (Converter with Pressure Closing Valve) (Sheet 2)

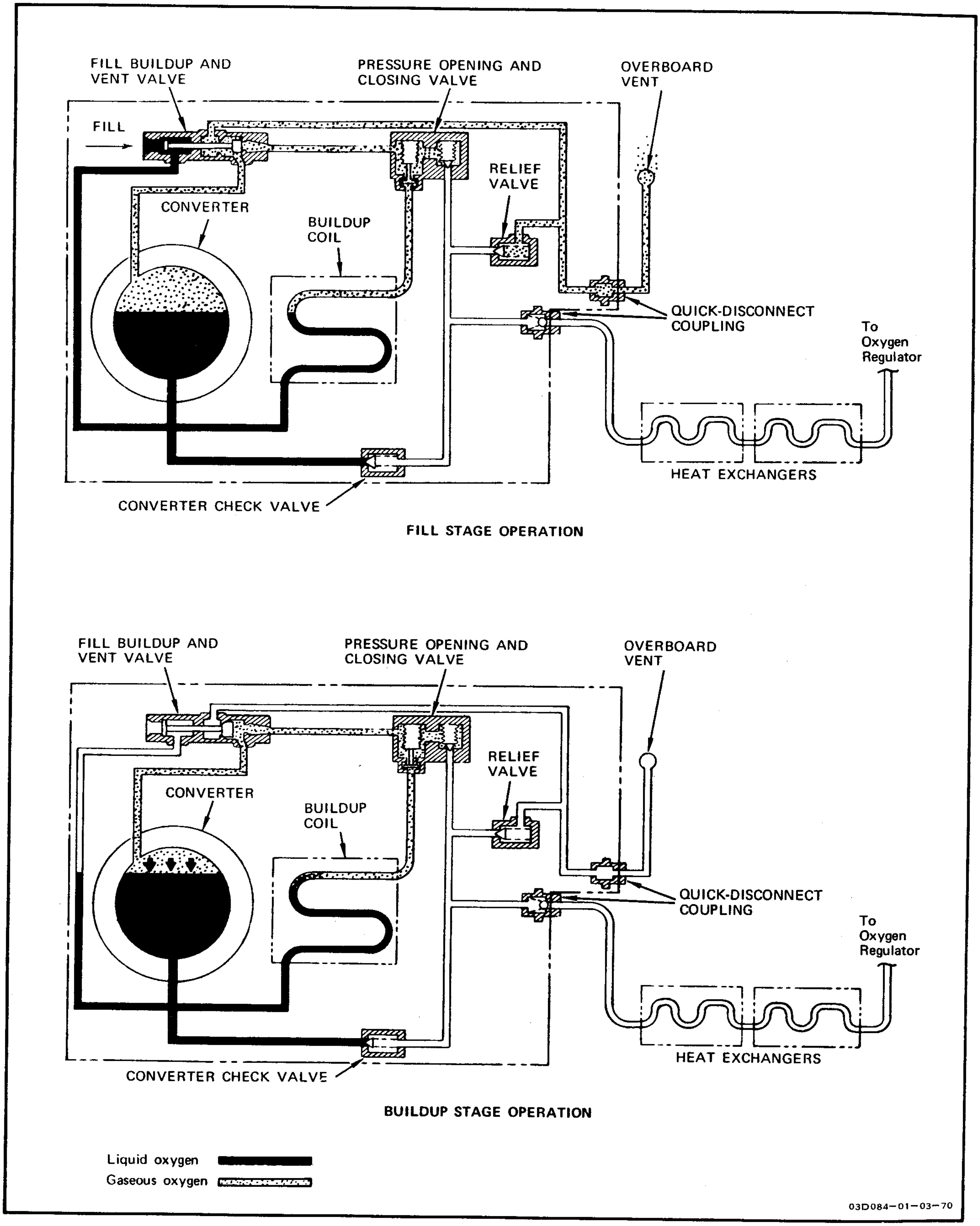

Figure 13-6. Liquid Oxygen System Flow Diagram (Converter with Pressure Opening and Closing Valve (Sheet 1)

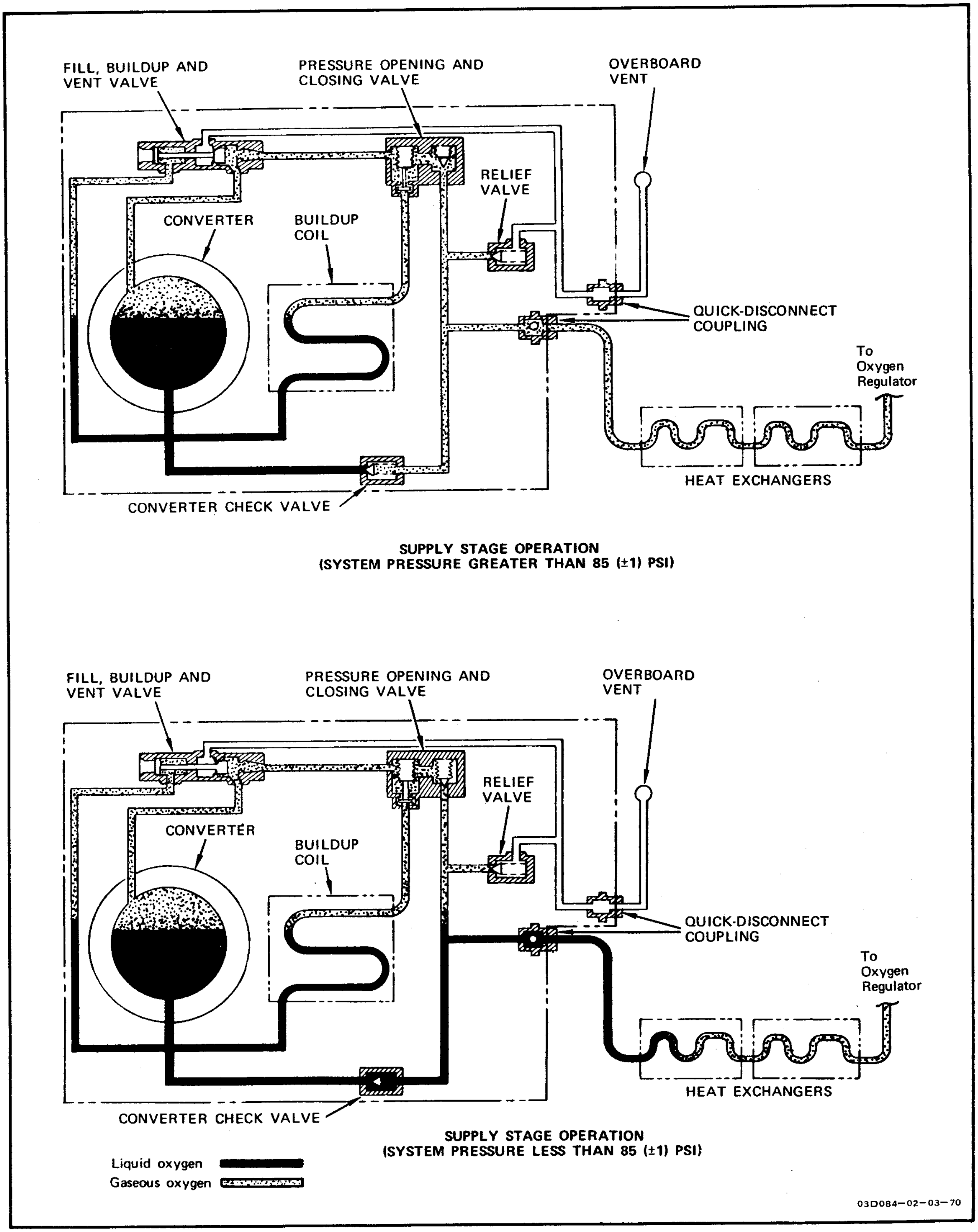

Figure 13-6. Liquid Oxygen System Flow Diagram (Converter with Pressure Opening and Closing Valve (Sheet 2)

13-17. COMPONENTS.

13-18. For a list of components, their locations (accesses), and functions, refer to table 13-1.

Table 13-1. Oxygen System Components

Component	Access	Function
Converter, liquid oxygen	1222-3	Stores 10 liters of liquid oxygen at -297°F at 70 psi minimum to 110 (±5) psi maximum.
Coil, buildup		Converts liquid oxygen to gaseous state through heat absorption.
Valve, converter check (converter with pressure opening and closing valve)		Ensures supply of liquid oxygen to buildup coil during buildup stage. Prevents drain of liquid and gaseous oxygen to system heat exchanger until differential pressure is greater than 5 (+ 2, -1) psi.
Valve, fill, buildup and vent		Automatically vents converter gaseous oxygen as converter is filled. Serves as a filler cart line connection for converter filling and blocks system buildup line during converter filling operation. Blocks converter vent line at completion of converter filling operation to permit pressure buildup.
Valve, pressure closing (converter with pressure closing valve)		Controls flow of liquid oxygen to buildup coil and maintains converter pressure at 70 (+ 5, -0) psi.
Valve, pressure opening and closing (converter with pressure opening and closing valve)		Pressure opening valve controls source of oxygen during system operation. Pressure closing valve maintains converter pressure at 70 (+ 5, -0) psi.
Valve, pressure relief		Vents oxygen overboard as system pressure exceeds 100 (+ 5) psi.
Cylinder, emergency oxygen	Right side of ejection seat support structure	Stores approximately 10-minute supply of gaseous oxygen for emergency purpose.
Exchangers, heat	Canopy deck bulkhead	Ensures that all liquid oxygen is changed to gaseous condition and warmed before reaching the pilot face mask.
Handle, emergency oxygen (green ball)	Lower right edge of ejection seat leg brace	Activates emergency oxygen system when pulled.

Table 13-1. Oxygen System Components (continued)

Component	Access	Function
Hose assembly, oxygen, and communication	Cockpit	Provides for interface of the pilot's personal equipment with airplane oxygen system and communication panel.
Indicator, oxygen quantity	Instrument panel[1] Right slant console[2]	Indicates quantity of liquid oxygen in liquid oxygen converter.
Light, oxygen low level caution	Right console (caution light panel)	On indicates that quantity of liquid oxygen in converter is 1 liter or less.
Quick-disconnect, buildup and vent	1222-3	Facilitates rapid removal of converter package from airplane.
Regulator, oxygen	Right console	Automatically supplies pilot with gaseous oxygen upon demand.
Vent, overboard	Bottom of fuselage	Vents oxygen overboard from converter during filling operation and from relief valve if system pressure exceeds 110 psi.

[1]Airplanes through AF69-6196
[2]Airplanes AF69-6197 and subsequent

13-19. OPERATIONAL CHECKOUT.

13-20. LIQUID OXYGEN SYSTEM.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Provide electrical power during operational checkout of liquid oxygen system

NOTE

A number, or numbers enclosed in braces at the end of a step in the following test is a reference to a corresponding number in troubleshooting figure 13-6A.

a. Service liquid oxygen system (T.O. 1A-7D-2-1) and check that oxygen regulator pressure gage indication is 70 to 110 psi. {1}

WARNING

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

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

c. Check that liquid oxygen quantity indicator indicates 10 liters and that oxygen low level light is off. {2 and 3}

d. Actuate IND TEST push-to-test switch and observe that indicator pointer moves to zero and that caution light comes on as indicator pointer passes through 1 (±0.1) liter. Release press-to-test switch and check that indicator pointer returns to 10 liters. {4 and 5}

Table 13-2 deleted.

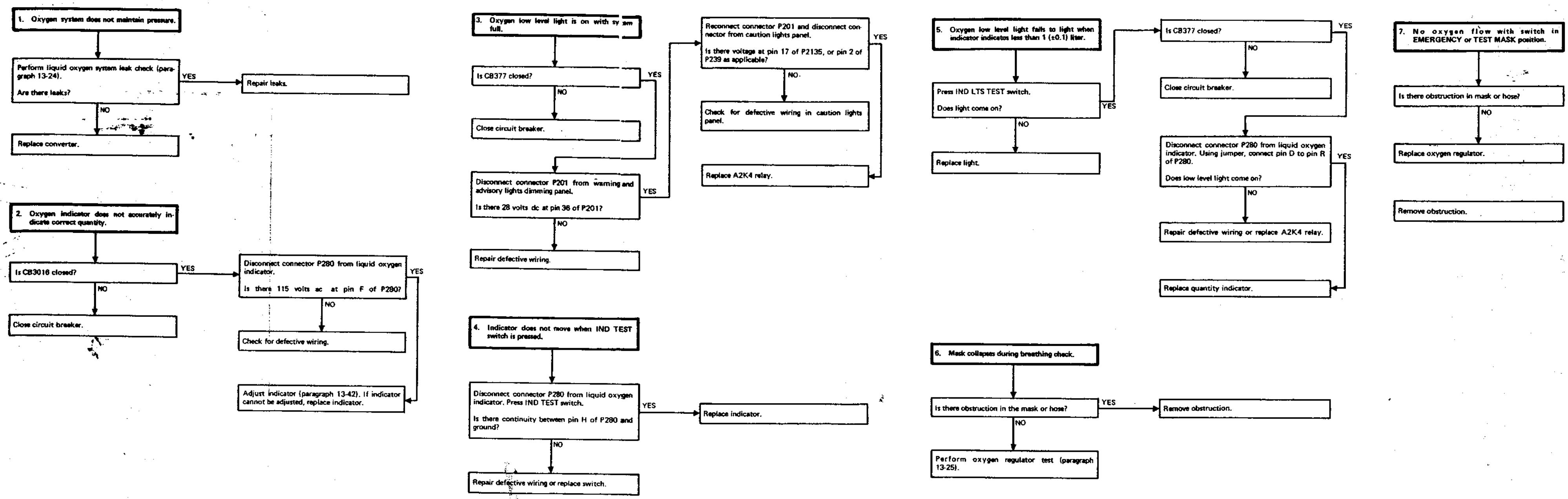

Figure 13-6A. Liquid Oxygen System Troubleshooting

e. Place oxygen regulator supply lever in ON.

f. Place oxygen regulator diluter lever in 100% OXYGEN and oxygen flow lever in NORMAL.

g. Hold demand breathing mask to face, connect mask to regulator tubing, and breathe oxygen normally. Check that flow indicator functions freely with each breath. {6}

h. Place oxygen regulator diluter lever in NORMAL OXYGEN.

i. Place the oxygen regulator flow lever in EMERGENCY for 10 to 20 seconds. Check that a free continuous flow of oxygen exists with no evidence of line blockage. {7}

j. Place oxygen regulator flow lever in NORMAL.

k. Place and hold oxygen regulator flow lever in TEST MASK for 10 to 20 seconds. Check that a noticeable increase of pressure exists at face mask. {7}

l. Release the oxygen regulator flow lever and check that lever returns to NORMAL.

m. Remove mask from face and disconnect mask to regulator tubing.

n. Place oxygen regulator supply lever in OFF.

n-1. (If Applicable) When oxygen system servicing is complete, safety wire oxygen supply lever in ON position using copper wire MS20995CY20.

o. Disconnect external electrical power.

13-21. TROUBLESHOOTING.

13-22. LIQUID OXYGEN SYSTEM. Refer to figure 13-6A for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

Test Equipment Required

Figure & Index No.	*Name*	*AN Type Designation*	*Use and Application*
	Equipment required for connecting external electrical power		Supply electrical power for troubleshooting
	Multimeter	AN/PSM-6	Check voltage
	Gaseous oxygen trailer	MB4	Furnish gaseous oxygen for troubleshooting liquid oxygen system

13-23. PURGING (USING GASEOUS OXYGEN).

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Supply power source for LOX purging heater
	31TB2105-1A (Bendix Corp., Pioneer Central Division, Davenport, Iowa)	Electric LOX purging heater	Purge liquid oxygen system
	MB4	Gaseous oxygen trailer	Purge liquid oxygen system

NOTE

The liquid oxygen system shall be purged to ensure that the pilot receives pure gaseous oxygen. Purging is required when contamination due to moisture, odors, or foreign materials is suspected; when the system is empty and closed for 2 hours or more; or when the system is empty for 30 minutes or more with the oxygen regulator supply lever in ON. Purging is also required when (a) system has been broken into, or (b) connections have been capped or covered with plastic bags for over 2 hours.

a. Open access 1222-3.

NOTE

Purging of liquid oxygen system requires system to be empty.

b. Remove oxygen filler valve cap.

c. Connect electric purging heater to liquid oxygen filler valve.

d. Connect gaseous oxygen supply to heater inlet port.

e. Connect heater to 115-volt single-phase ac power.

WARNING

If using a Type KMU-78/E purging heater, start gas flow prior to turning on heat switch. Failure to start gas flow prior to turning on heat switch may cause damage to purging heater or fire/explosion hazard.

f. Apply 80 to 100 psi gaseous pressure to heater if using Type KMU-78/E, Part No. E-6400, purging heater and turn on heat switch. If using Part No. 31TB2105-1A purging heater, proceed to step g.

g. Place heater control switch in ON and allow a 10-minute warmup period.

CAUTION

Ensure gaseous oxygen is flowing through converter by feeling for air at the liquid oxygen overboard vent.

h. Apply 80 to 100 psi gaseous oxygen pressure to heater.

i. Purge liquid oxygen converter for 1 hour with hot gaseous oxygen MIL-O-27210, Type 1 at a temperature of 110° to 120°C (230° to 250°F).

j. Place heater control switch to OFF and shut down gaseous supply.

k. Place oxygen supply lever on oxygen regulator to ON, flow lever in EMERGENCY and diluter lever in 100% OXYGEN.

l. Open dust cover on oxygen hose and position end of hose outside cockpit.

m. Disconnect vent line quick disconnect coupling from converter.

n. Fabricate purge accessory fixture No. 1 as shown in T.O. 15X-1-1, figure 8-16.

o. Install purge accessory fixture No. 1 on the converter vent disconnect and close the globe valve to prevent oxygen from venting overboard.

p. Apply 80 to 100 psi gaseous oxygen to heater.

q. Place heater control switch to ON.

r. Purge liquid oxygen distribution system for 15-20 minutes with gaseous oxygen MIL-O-27210, Type 1 at a temperature of 100° to 121°C (230° to 250°F).

s. Place heater control switch to OFF and cold purge oxygen system for 5 minutes with MIL-O-27210, Type 1 gaseous oxygen.

t. Shut down gaseous oxygen supply.

u. Disconnect electric purging heater from liquid oxygen filler valve.

v. Remove purge accessory fixture No. 1 from the converter vent disconnect.

w. Connect vent line quick disconnect coupling to converter.

x. Place oxygen supply lever in OFF, flow lever in NORMAL and diluter lever in NORMAL OXYGEN.

y. Store oxygen hose.

NOTE

Some purge heaters currently in use have an internal pressure limiter of 55 psi. When this is the only type purging unit available, disconnect the heater from the source regulator and install the heater outlet line and female filler adapter to the source regulator outlet line using a line fitting.

z. Install shop fabricated accessory fixture No. 1 and No. 2 (shown in T.O. 15X-1-1, figure 8-16) in the converter vent and supply outlet.

aa. With the accessory fixtures installed, close the globe valve on the vent fixture, install the CRU-59E connector to the female filler valve (CRU-50A), open the MIL-O-27210 supply and adjust source regulator to induce a source pressure of approximately 130 psi as indicated on the supply fixture pressure gage.

ab. Close the source supply valve, disconnect the CRU-59E filler adapter and open the globe valve on the vent fixture. Allow the converter backpress to deplete until notable exhaust from the vent stops. A pressure of approximately 110 psi will remain.

ac. Repeat the process stated in steps aa and ab a minimum of 4 times then remove the vent accessory fixture, reconnect the CRU-59E adapter to the CRU-50A female filler valve, adjust the source pressure to 75 psi and continue to cold purge for an additional 5 minutes.

ad. Turn off the gaseous supply, disconnect all fixtures and connect aircraft vent and supply lines to converter.

ae. Close access panel 1222-3.

NOTE

Servicing of the system may be delayed a maximum of 72 hours if at least 10 psi of gaseous oxygen is maintained in the system and if the oxygen system lines are purged by a 30- to 40-second free flow after servicing.

af. (If Applicable) When oxygen system servicing is complete, safety wire oxygen supply lever in ON position using copper wire MS20995CY20.

13-23A. PURGING (USING GASEOUS NITROGEN).

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
		Equipment required for connecting external electrical power	Supply power source for LOX purging heater
	Liquid oxygen converter system purging kit	31TB2105-1A	Purge LOX system with gaseous nitrogen
	Gaseous nitrogen cart	55D6496	Purge liquid oxygen system

WARNING

Purge kits KMU-78E, Part No. 2101, NSN 1730-01-057-4863 manufactured by Stewart-Thomas Industries are known to have design deficiencies which could result in loss of aircraft or personal injury. These units will not be utilized.

a. Remove liquid oxygen converter (paragraph 13-28).

b. Connect purging adapter assembly to the aircraft supply line quick disconnect coupling.

c. Connect the purging heater assembly to the purging adapter assembly.

d. Connect the nitrogen servicing trailer to the purging heater assembly.

e. Place oxygen supply lever on oxygen regulator in ON, flow lever in EMERGENCY, and diluter lever in 100% OXYGEN.

f. Connect 115-volt, 60 or 400 cycle electrical power source, rated at 500 watts or more, to the purging heater.

g. Turn heater on and regulate nitrogen inlet pressure to the purging heater to 50 psig.

h. Allow hot nitrogen to flow through the aircraft system for 15 to 35 minutes.

i. Turn off purging heater and nitrogen supply.

j. Place supply lever in OFF, diluter lever in NORMAL OXYGEN, and flow lever in NORMAL.

k. Disconnect purging adapter assembly from aircraft supply line quick disconnect coupling.

l. Perform system pressure leakage test (paragraph 13-24).

WARNING

Do not reinstall contaminated converter in aircraft.

m. Install a full liquid oxygen converter (paragraph 13-28).

n. Place supply lever in ON, diluter lever in 100% OXYGEN, and flow lever in EMERGENCY.

o. Allow gaseous oxygen to flow freely through the system for not less than 3 minutes.

p. Place diluter lever in NORMAL OXYGEN, flow lever in NORMAL, and supply lever in OFF.

q. (If Applicable) When oxygen system servicing is complete, safety wire oxygen supply lever in ON position using copper wire MS20995CY20.

13-23B. PURGING (CONVERTER REMOVED FROM AIRCRAFT).

For purging converter, see T.O. 15X-1-1 Section VII and VIII.

13-24. LIQUID OXYGEN SYSTEM LEAK TEST.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	MB4	Gaseous oxygen trailer	Supply gaseous oxygen for leak test
	TTU-28/E	Oxygen system tester	Leak check liquid oxygen system

a. Open access 1222-3.

b. Drain liquid oxygen from system.

c. Check that oxygen regulator supply lever is in OFF.

d. Disconnect vent line quick-disconnect coupling from converter.

e. Fabricate vent shutoff assembly by installing an AN929-8 cap on an MS22068-8 vent coupling.

f. Install vent shutoff assembly on converter vent disconnect. Close cap to prevent oxygen from venting overboard.

g. Remove liquid oxygen filler valve cap and connect oxygen system tester to liquid oxygen filler valve.

h. Connect gaseous oxygen supply to tester.

i. Apply gaseous oxygen pressure to fill liquid oxygen system to a pressure of 95 (±5) psi as indicated on oxygen supply pressure indicator.

j. Check that gaseous oxygen pressure stabilizes at 95 (±5) psi.

k. Shut off gaseous oxygen supply and disconnect oxygen system tester from converter,

l. Remove cap from vent shutoff assembly on vent disconnect.

m. Record time and after 30 minutes check oxygen supply pressure on oxygen demand regulator pressure indicator in cockpit. Maximum allowable pressure drop should be no more than 10 psi.

n. If pressure drop exceeds 10 psi after 30 minutes, check liquid oxygen system components and lines for leaks using MIL-L-25567 leak detector solution.

o. Repair leaks as required.

p. Place oxygen regulator supply lever in ON.

q. Place oxygen regulator flow lever in TEST MASK and hold to relieve oxygen pressure. Release flow lever.

r. Place oxygen regulator supply lever in OFF.

r-1. (If Applicable) When oxygen system servicing is complete, safety wire oxygen supply lever in ON position using copper wire MS20995CY20.

s. Remove vent shutoff coupling from vent disconnect.

t. Connect vent line coupling to converter.

u. Service liquid oxygen system (T.O. 1A-7D-2-1).

v. Close access 1222-3.

13-25. Deleted.

13-26. CRU-73/A OXYGEN REGULATOR LEAK TEST.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Stopwatch	GG-S-764A	Perform outward leakage and demand valve leakage test
	Oxygen regulator test set	31TA2655-2	Check oxygen regulator operation

All data on page 13-18B deleted.

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13-26A. PREPARATION. (See figure 13-6B.)

a. Before proceeding with tests, connect hoses between field tester outlets C3 and C4 and the CRU-73 oxygen regulator. Leave them connected throughout the tests.

b. The outlet hose must be steady during readings.

c. Field tester operating instructions appear in tabulated form on the instruction plate attached inside the cover.

NOTE

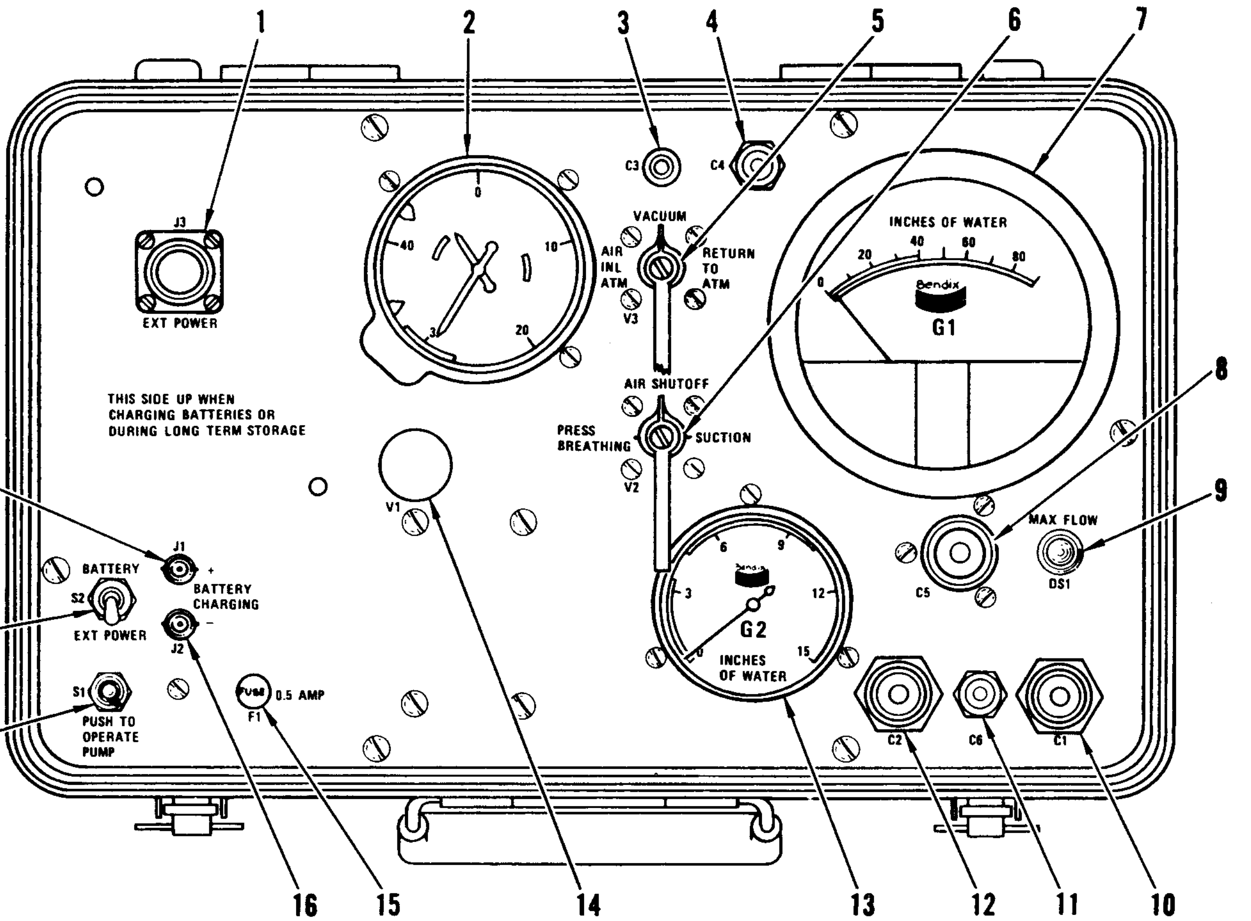
Field tester pump operation is automatically limited to 35 seconds. Minimum inlet pressure to the regulator must be 70 psi for testing. When the pump cannot generate 43,000 feet, charge the batteries. (See T.O. 33D2-10-55-1.

d. Testing A-12, A-14, D2A, CRU-68, CRU-69, CRU-73, CRU-60R and CRU-8 for oxygen regulator testing procedures and test limits. Refer to T.O. 15X-1-1.

13-26B. Deleted.

13-26C. Deleted.

13-26D. Deleted.



INDEX NO.	CONTROL/INDICATOR	REFERENCE DESIGNATOR	FUNCTION
1	Connector	J3	To connect to external power source.
2	Altimeter	G3	Indicates altitude.
3	Hose adapter	C3	To connect field tester to CRU-73 regulator.
4	Hose adapter	C4	To connect field tester to CRU-73 regulator.
5	Three-way valve	V3	To perform specific regulator tests.
6	Three-way valve	V2	To perform specific regulator tests.
7	Gage	G1	Indicates pressure.
8	Outlet hose adapter	C5	To connect field tester to regulator.
9	Lamp	DS1	Lights (maximum flow).
10	Outlet hose adapter	C1	To connect field tester to regulator.
11	Hose adapter	C6	To connect pressure bulb to field tester.
12	Outlet hose adapter	C2	To connect field tester to regulator.
13	Gage	G2	Indicates pressure.
14	Valve	V1	To control amount of vacuum to regulator and altimeter.

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Figure 13-6B. Oxygen Regulator Field Tester (31TA2655-2) Controls and Indicators (Sheet 1)

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INDEX NO.	CONTROL/INDICATOR	REFERENCE DESIGNATOR	FUNCTION
15	Fuse	F1	To protect field tester components.
16	Jack	J2	For battery charging (–).
17	Switch	S1	To operate pump.
18	Switch	S2	To select mode of power (battery or external).
19	Jack	J1	For battery charging (+).

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Figure 13-6B. Oxygen Regulator Field Tester (31TA2655-2) Controls and Indicators (Sheet 2)

13-26E. Deleted.

13-26F. Deleted.

13-26G. Deleted.

Table 13-2A. Deleted.

13-26H. Deleted.

Table 13-2B. Deleted.

13-26J. Deleted.

13-26K. Deleted.

13-27. CLEANING.

WARNING

Use only MIL-C-8638 cleaning compound to clean oxygen components. Do not use any cleaning compound with a hydrocarbon base. Explosions may occur causing damage to equipment and injury or loss of life.

a. Clean components as necessary with a clean, oil-free cloth saturated with MIL-C-8638 cleaning compound.

WARNING

Compressed air used for cleaning and drying purposes can create airborne particles that can enter the eyes. Pressure shall not exceed 30 psi and use only with adequate chip guards and goggles.

b. Immediately after cleaning, dry all parts with warm, dry air until odors are eliminated.

13-28. LIQUID OXYGEN CONVERTER REMOVAL AND INSTALLATION.

13-29. REMOVAL. (See figure 13-7.)

a. Open access 1222-3.

b. Disconnect electrical connectors (1) from converter.

WARNING

Liquid oxygen temperature is 297°F and will cause serious burns if allowed to contact skin. Wear protective clothing and heat resistant gloves when disconnecting liquid oxygen system lines.

c. Disconnect overboard vent line (2) and supply line (3) from converter and cap lines.

CAUTION

To prevent possible wiring damage assure adequate clearance during removal of converter.

d. Loosen wingnut (4) and pivot mounting bolt clear of holddown lug slot.

e. Remove converter (5) and cover vent, supply and filler connections with protective covers.

13-30. INSTALLATION. (See figure 13-7.)

CAUTION

To prevent possible wiring damage assure adequate clearance during removal of converter.

NOTE

The converter may be serviced before installation in airplane (T.O. 1A-7D-2-1). If converter has not been serviced before installation, system will require purging after installation.

a. Position converter (5) in airplane, engage mounting bolt with holddown lug slot, and tighten wingnut (4).

WARNING

Do not use oil, grease or other hydrocarbon substance on oxygen fittings. Explosions may occur causing injury or loss of life to servicing personnel.

b. Remove protective caps and connect supply line (3) and overboard vent line (2) to converter.

c. Connect electrical connectors (1) to converter.

d. Perform liquid oxygen system operational checkout (paragraph 13-19).

e. Close access 1222-3.

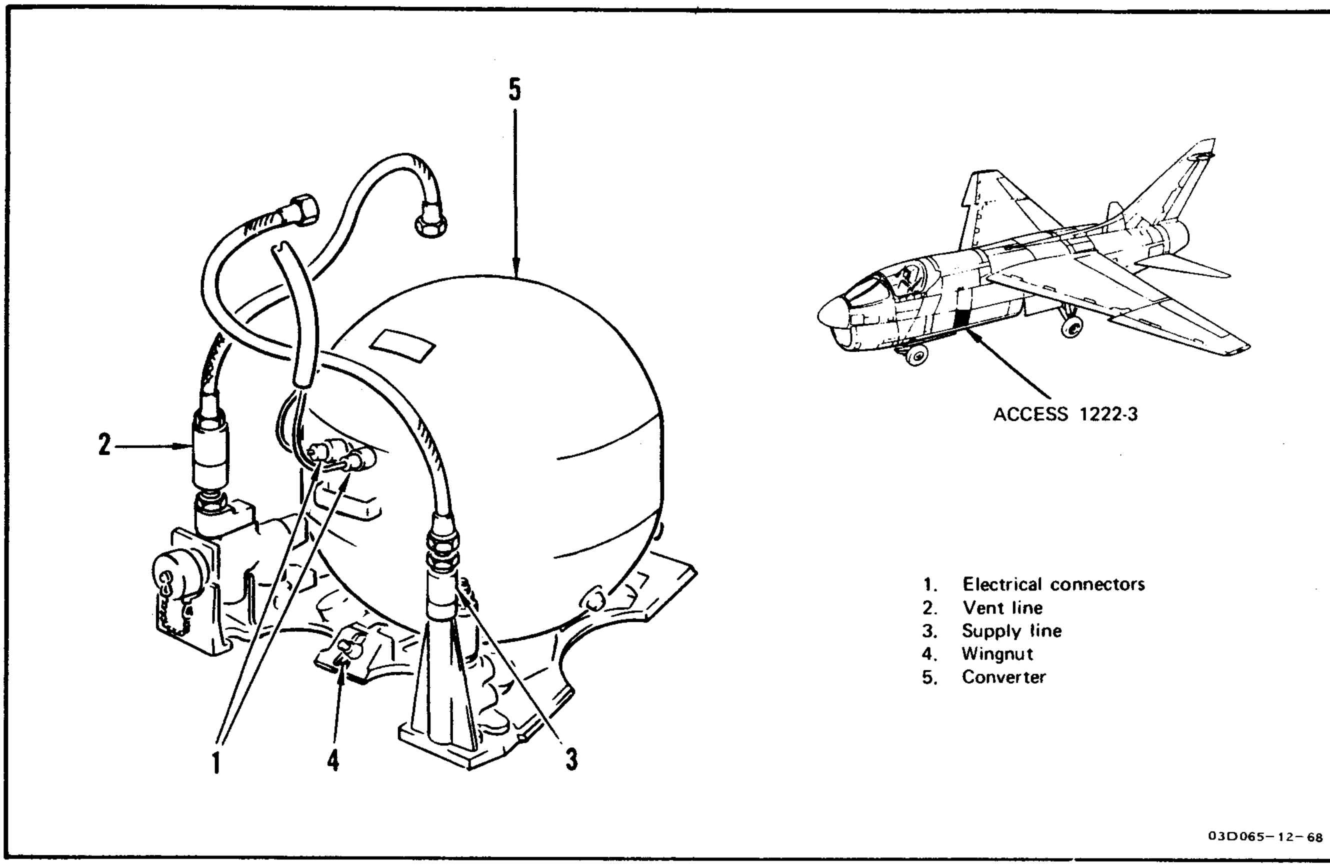

Figure 13-7. Liquid Oxygen Converter Removal and Installation

13-31. LIQUID OXYGEN HEAT EXCHANGER REMOVAL AND INSTALLATION.

13-32. REMOVAL. (See figure 13-8.)

a. Open access 1222-3.

WARNING

Liquid oxygen temperature is -297°F and will cause serious burns if allowed to contact skin. Wear protective clothing and heat resistant gloves when disconnecting liquid oxygen system lines.

b. Disconnect liquid oxygen converter pressure line quick-disconnect.

c. Place oxygen supply lever in ON, oxygen diluter lever in 100%, and oxygen flow lever in TEST MASK and hold to relieve oxygen pressure.

d. Disconenct electrical connector (1) from instrument lights trimming resistor panel.

e. Remove six bolts (2) and washers (3) securing resistor panel (4) to canopy deck bulkhead. Remove panel.

f. Disconnect input line (5) and output line (6) from heat exchanger.

g. Remove mounting screws (7), washers (8), spacers (9), and heat exchangers (10) from airplane.

h. Cap or plug open lines and fittings.

i. Disconnect and remove upper heat exchanger line (11). Cap or plug open line and fittings.

13-33. INSTALLATION. (See figure 13-8.)

a. Clean area around heat exchanger mounting holes to ensure bonding surface.

b. Install upper heat exchanger line (11) finger-tight.

c. Install four screws (7) with washers (8) through heat exchanger mounting holes. Place four long spacers (9) between heat exchangers (10).

d. Position heat exchangers (10) in airplane. Place four short spacers (9) between assembly and mounting brackets, and tighten screws.

e. Connect oxygen input line (5) and output line (6).

f. Tighten nuts on upper heat exchanger connecting line (11).

g. Purge oxygen system (paragraph 13-23).

h. Connect liquid oxygen converter pressure line quick-disconnect.

i. Perform liquid oxygen system operational checkout (paragraph 13-19).

j. During operational checkout, apply MIL-L-25567 leak detector solution to heat exchanger connections and check for leaks.

k. Wipe off leak detector solution.

l. Secure instrument lights trimming resistor panel (4) to canopy deck bulkhead using six bolts (2) and washers (3).

m. Connect electrical connector (1) to resistor panel.

n. Perform interior lightning system operational checkout (T.O. 1A-7D-2-11).

o. Close access 1222-3.

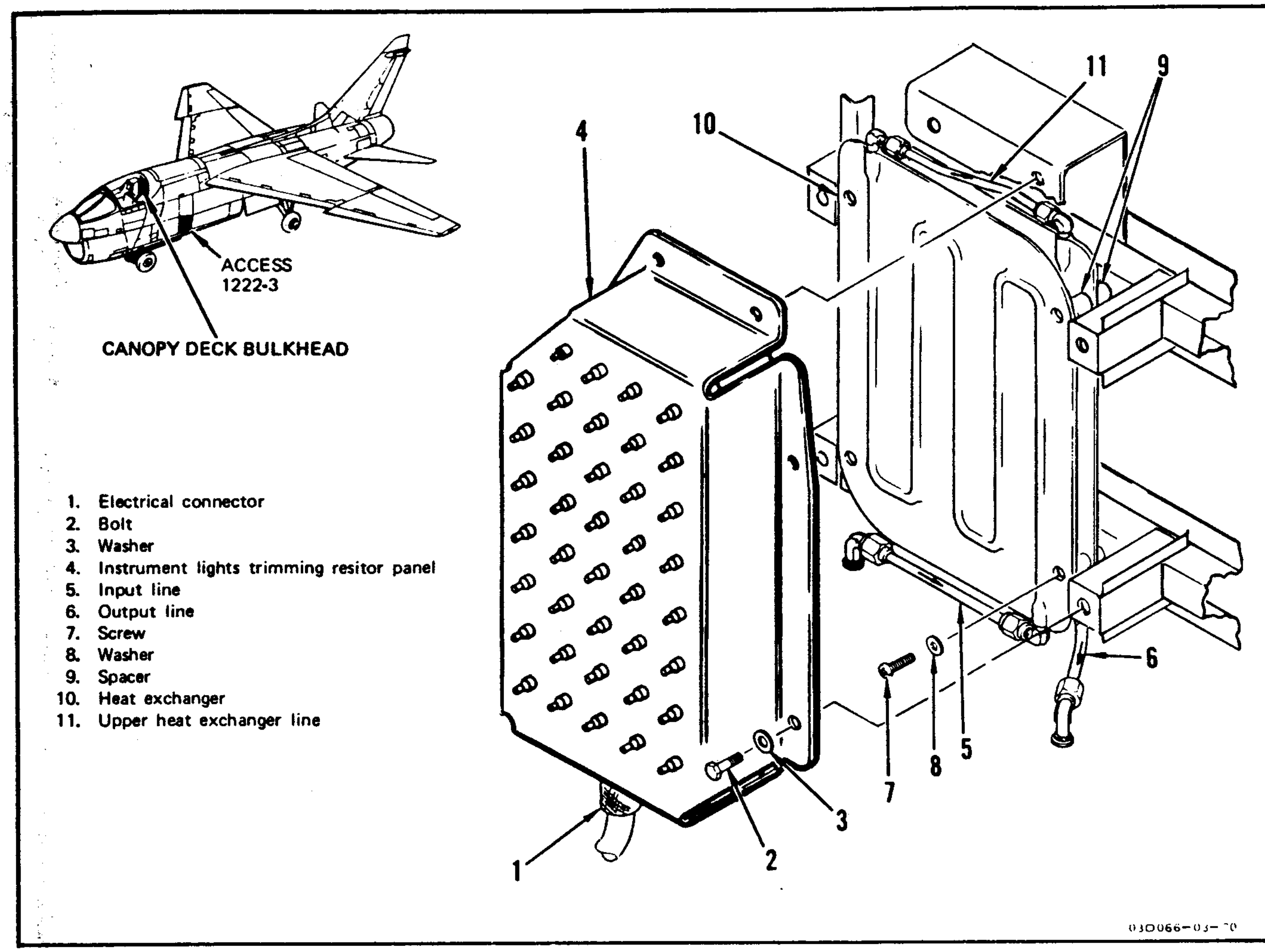

Figure 13-8. Liquid Oxygen Heat Exchanger Removal and Installation

13-34. OXYGEN REGULATOR REMOVAL AND INSTALLATION.

CAUTION

Care must be taken during the removal and installation of the oxygen regulator to prevent kinking of the lines.

13-35. REMOVAL.

a. Remove access 1222-3.

WARNING

Liquid oxygen temperature is -297°F and will cause serious burns if allowed to contact skin. Wear protective clothing and heat resistant gloves when disconnecting liquid oxygen system lines.

b. Disconnect liquid oxygen converter pressure line quick-disconnect.

c. Place oxygen regulator supply lever in ON.

d. Place oxygen diluter lever in 100% and oxygen flow lever in TEST MASK and hold until oxygen pressure indicator on regulator indicates 0 psi. Release oxygen flow lever.

e. Release fasteners securing control panel to right console forward of oxygen regulator to facilitate regulator removal.

f. Release fasteners securing control panel to right console aft of oxygen regulator to facilitate regulator removal.

CAUTION

When removing/replacing oxygen regulator or lifting regulator from console for any reason, be careful to stretch oxygen hoses only the minimum amount necessary to accomplish task. Excessive stretching can cause crimping of hoses and result in restriction of oxygen flow.

g. Release four mounting Dzus fasteners and lift regulator assembly out of console far enough to disconnect hose connections.

h. Disconnect inlet and outlet hoses from regulator.

i. Disconnect electrical connector from regulator edge-lighted panel.

j. Remove regulator from airplane.

13-36. INSTALLATION.

NOTE

Prior to installing oxygen regulator, inspect for safety wire hole in on/off leaver. If undrilled, it will be necessary to drill safety wire holes large enough for 0.020 copper wire.

a. Connect electrical connector to regulator edge-lighted panel.

b. Connect inlet and outlet hoses to regulator.

c. Position regulator in console and secure four Dzus fasteners.

d. On airplanes through AF69-6196 except AF69-6189, install C-7765/APN-190(V) control-indicator panel (T.O. 1A-7D-2-12).

e. On airplanes through AF69-6196 except AF69-6189, install C-7854/ALQ control-indicator panel (T.O. 1A-7D-2-15).

f. Place oxygen regulator supply lever in OFF.

g. Connect liquid oxygen converter pressure line quick-disconnect.

h. Perform liquid oxygen system operational checkout (paragraph 13-19).

i. Close access 1222-3.

13-37. LIQUID OXYGEN QUANTITY INDICATOR REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	*Part Number*	*Nomenclature*	*Use and Application*
		Equipment required for connecting external electrical power	Supply electrical power to check liquid oxygen quantity indicator

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13-38. Remove and install the liquid oxygen quantity indicator as follows:

a. On airplanes through AF69-6196, remove screws securing indicator to right lower side of instrument panel.

b. On airplanes AF69-6197 and subsequent, remove screws securing indicator to right slant console panel.

c. Pull indicator out and disconnect electrical connector.

d. Following indicator installation, connect external electrical power (T.O. 1A-7D-2-1) and check indicator for operation using IND TEST push-to-test switch.

13-39. EMERGENCY OXYGEN CYLINDER REMOVAL AND INSTALLATION.

13-40. REMOVAL.

a. Open canopy and install 40° canopy support strut (T.O. 1A-7D-2-2).

b. Deleted.

c. Open five clamps securing emergency oxygen hose to ejection seat support structure. Remove neoprene inserts and retain for installation.

d. Disconnect emergency oxygen hose quick-disconnect.

e. Open three clamps securing cable lanyard to ejection seat structure. Remove neoprene inserts and retain for installation.

f. Note position of cylinder and remove screws from two clamps securing cylinder to right side of ejection seat support structure.

g. Remove oxygen cylinder from clamps.

h. Remove emergency oxygen cylinder, oxygen hose, and cable lanyard from airplane.

13-41. INSTALLATION.

a. Check that emergency oxygen cylinder pressure gage indicates 1,800 to 2,200 psi.

b. Position oxygen cylinder in clamps on seat structure. Position oxygen cylinder as noted in removal and tighten clamps using screws removed in step f.

c. Place five neoprene inserts around oxygen hose. Position oxygen hose and inserts in clamps and secure clamps.

d. Connect oxygen hose quick-disconnect.

e. Place three neoprene inserts around cable lanyard. Position lanyard and inserts in clamps and secure clamps.

CAUTION

Ensure retainer pin is removed from cable housing on cylinder. Unit will not operate if pin is installed.

f. Remove retainer pin and caution tag from cylinder.

g. Remove 40° canopy support strut.

13-42. LIQUID OXYGEN QUANTITY INDICATING SYSTEM ADJUSTMENT. (USING TF-20-1 TEST SET.) (See figure 13-9.)

Tools Required

Figure & Index No.	*Part Number*	*Nomenclature*	*Use and Application*
		Equipment required for connecting external electrical power	Supply electrical power during quantity indicating system adjustment
	TF-20-1	Liquid quantity gaging test set	Adjust quantity indicating system
	215-00367-1	Liquid oxygen gaging system cable set	Adjust quantity indicating system
	215-00366-5	Power cable	Adjust quantity indicating system

WARNING

Failure to ground the TF-20-1 fuel quantity gaging test set to both aircraft and earth, could result in damage to aircraft and injury to personnel.

a. Open access 1232-1.

b. Connect power cable (215-00366-5) connector W4P2 to test set power receptacle (1), cable connector W4P3 to test set ground receptacle (2), and cable connector W4P1 to airplane ARW-77 test receptacle J308.

c. Open access 1222-3. Disconnect connector P2038 from HI connector on converter. Connect gaging system cable (215-00367-2) connector W1J1 to connector P2038 and cable connector W1P1 to test set TEST/IND COAX receptacle (3).

d. Disconnect connector P2039 from LO connector on converter. Connect gaging system cable (215-003 67-3) connector W2J1 to connector P2039 and cable connector W2P1 to test set TEST IND/UNSH receptacle (4).

e. Connect cable 100038 (part of TF-20-1 test set) banana plug to test set ground receptacle (2). Connect alligator clip to shell of connector P2038.

f. Ensure test set power switch (5) is in OFF.

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

h. Perform TF-20-1 calibration in accordance with paragraph 3, capacitance calibration, under calibration of TESTER FOR USE on instruction placard.

i. Place CAP-RES CHECK knob (6) in CAP.

j. Place RANGE SELECTOR knob (7) in X3.

k. Place FUNCTION SELECTOR knob (8) in TEST IND PROBE SET.

l. Place both PROBE MMF knobs (9) in OFF.

m. Loosen PROBE 25-250 MMF capacitor knob (10) to obtain an indication of 41.2 uuf on the CAPACITANCE INDICATOR (12) and tighten locking knob (11).

n. Place FUNCTION SELECTOR knob (8) in TEST IND-TEST and check that liquid oxygen quantity indicator indicates 0 liters.

NOTE

The true capacitance of converter probe when converter is empty is 123.5 uuf. With RANGE SELECTOR knob (7) in X3, capacitance shown on CAPACITANCE INDICATOR (12) will be one-third that of true capacitance.

o. If liquid oxygen quantity indicator fails to indicate 0 liters, remove indicator from instrument panel as required to gain access to indicator adjustment screws on back of indicator case.

p. Adjust empty adjustment screw as required to obtain a 0-liter indication. If full adjustment of empty adjustment screw does not bring indicator pointer to 0 liter, replace indicator.

q. Place FUNCTION SELECTOR knob (8) in TEST IND PROBE SET.

r. Position PROBE 25-250 MMF capacitor knob (10) to obtain indication of 60.5 uuf on CAPACITANCE INDICATOR (12).

s. Place FUNCTION SELECTOR KNOB (8) in TEST IND-TEST and observe that liquid oxygen quantity indicator indicates 10 liters.

t. If indicator does not indicate 10 liters, turn indicator adjustment screw as required. If complete adjustment does not bring indicator pointer to 10 liters, replace indicator.

u. Repeat steps q through t, adjusting as required to make liquid oxygen quantity indicator deflect first to 0 liters and then to 10 liters.

NOTE

To obtain a 0 liter indication on liquid oxygen quantity indicator, rotate PROBE 25-250 MMF capacitor knob (10) to obtain an indication of 41.2 uuf on CAPACITANCE INDICATOR (12). Since there is some interaction between settings of indicator empty and full adjustment screws, more than one series of adjustments is required to ensure that adjustment is correct for both adjustment points.

v. Repeat steps q through s for each indicator value shown in table 13-3.

NOTE

To check true capacitance value with liquid oxygen quantity indicator, rotate PROBE 25-250 MMF capacitor knob (10) to obtain capacitance indicator indication shown in table 13-3 and observe liquid oxygen quantity indicator for specified value.

w. Install liquid oxygen quantity indicator if removed (paragraph 13-37).

x. Place test set power switch (5) in OFF.

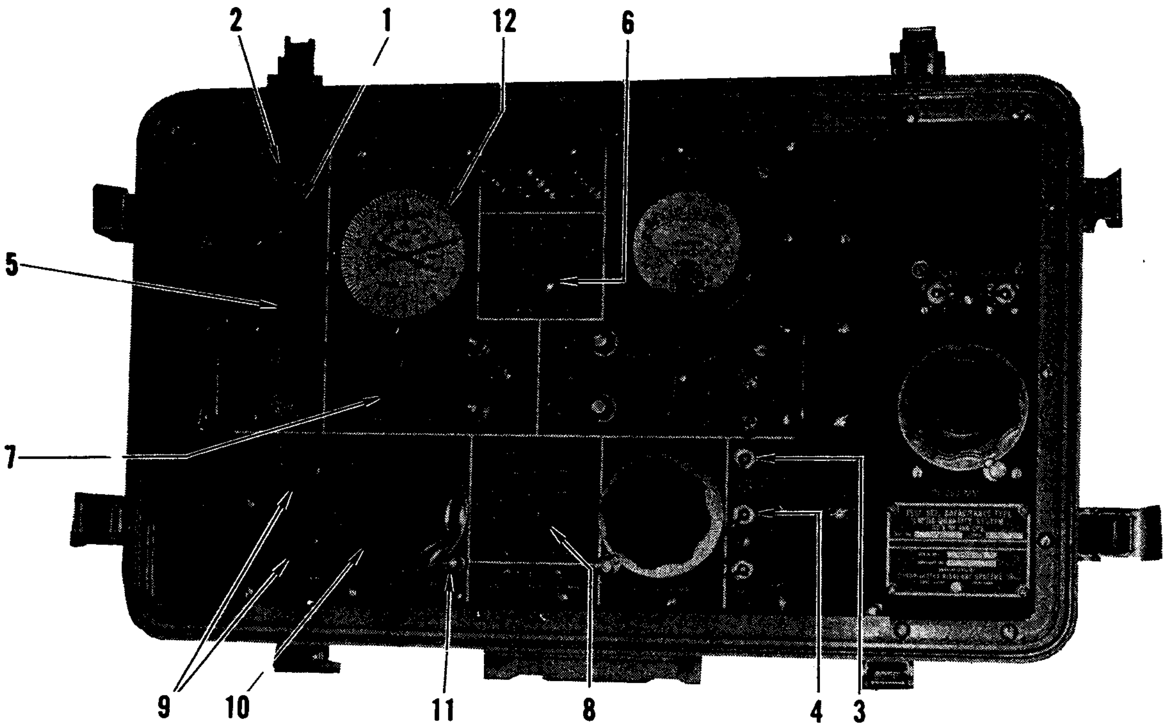
y. Disconnect external electrical power.

z. Disconnect all test cables and connect connectors P2038 and P2039 to the converter electrical connectors.

aa. Close accesses 1222-3 and 1232-1.

Table 13-3. Liquid Oxygen System Capacitance/Indicator Values

Indicator Indication (Liters)	True Capacitance (UUF)	TF-20-1 Capacitance Indicator Indication (UUF)
0	123.50 (± 1.0)	41.2
2	135.09 (± 1.0)	45.1 (±0.3)
4	146.68 (± 1.0)	48.9 (±0.3)
6	158.28 (± 1.0)	52.8 (±0.3)
8	169.87 (± 1.0)	56.6 (±0.3)
10	181.46 (± 1.0)	60.5



1. Power receptacle
2. Ground receptacle
3. Coaxial receptacle
4. Unshielded receptacle
5. Power switch
6. Capacitance-resistance check knob
7. Range selector knob
8. Function selector knob
9. Probe MMF knob
10. Probe 25-250 MMF knob
11. Probe MMF locking knob
12. Capacitance indicator

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Figure 13-9. Liquid Oxygen Quantity Indication System Test Set (TF-20-1)

13-43. LIQUID OXYGEN QUANTITY INDICATING SYSTEM ADJUSTMENT (USING GTF-6 TEST SET). (See figure 13-10.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Supply electrical power during quantity indicating system adjustment
	GTF-6	Liquid quantity gaging set	Adjust quantity indicating system
	215-00367-1	Liquid oxygen gaging system cable set	Adjust quantity indicating system

WARNING

Failure to ground the GTF-6 test set to both airplane and earth, could result in damage to airplane and injury to personnel.

a. Open access 1232-1.

b. Ensure test set power switch (24) is in OFF.

c. Connect power cable W1 (467-102-002) to test set power receptacle (17) and to ARW-77 test receptacle J308. Connect test cable W2 (467-114-002) to test set ground receptacle (18) and to aircraft ground.

d. Open access 1222-3. Disconnect connector P2038 from HI connector on converter. Connect gaging system cable (215-00367-2) connector W1J1 to connector P2038 and cable connector W1P1 to test set test/indicator coax receptacle (26).

e. Disconnect connector P2039 from LO connector on converter. Connect gaging system cable (215-00367-3) connector W2J1 to connector P2039 and cable connector W2P1 to test set test/indicator unshielded receptacle (27).

f. Connect alligator clip of W2 cable to shell of connector P2038.

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

h. Perform GTF-6 calibration in accordance with CALIBRATION OF TEST SET on instruction placard.

i. Place DISPLAY SELECT switch (9) in CAP (PF).

j. Place CAPACITANCE FUNCTION switch (2) in SIM SET PROBE position.

k. Adjust PROBE SIMULATORS (PF) 15-390 control (15) to obtain an indication of 123.5 pF on digital display (8).

l. Place CAPACITANCE FUNCTION switch (2) in IND TEST A/C + PROBE SIM position and check that liquid oxygen quantity indicator in cockpit indicates 0 liters.

m. If liquid oxygen quantity indicator fails to indicate 0 liters, remove indicator from instrument panel as required to gain access to indicator adjustment screws on back of indicator case.

n. Adjust empty adjustment screw as required to obtain a 0-liter indication. If full adjustment of empty adjustment screw does not bring indicator pointer to 0-liter, replace indicator.

o. Place CAPACITANCE FUNCTION switch (2) in SIM SET PROBE position.

p. Adjust PROBE SIMULATORS (PF) 15-390 control (15) to obtain an indication of 181.5 pF on digital display (8).

q. Place CAPACITANCE FUNCTION switch (2) in IND TEST A/C + PROBE SIM position and observe that liquid oxygen quantity indicator in cockpit indicates 10 liters.

r. If indicator does not indicate 10 liters, turn indicator adjustment screw as required. If complete adjustment does not bring indicator pointer to 10 liters, replace applicable indicator.

NOTE

Since there is some interaction between settings of indicator empty and full adjustment screws, more than one series of adjustments is required to ensure that adjustment is correct for both adjustment points.

s. Repeat steps o through r, adjusting as required to make liquid oxygen quantity indicator deflect first to 0 liters and then to 10 liters. To obtain a 0 liter indication on liquid oxygen quantity indicator repeat steps k, l and o.

t. Repeat steps o through q for each indicator value shown in table 13-4.

Table 13-4. Liquid Oxygen System Capacitance/Indicator Values (Using GTF-6 Test Set)

Indicator Indication (Liters)	True Capacitance (pF)	GTF-6 Capacitance Indicator Indication (pF)
0	123.50 (±1.0)	123.50 (±1.0)
2	135.09 (±1.0)	135.09 (±1.0)
4	146.68 (±1.0)	146.68 (±1.0)
6	158.28 (±1.0)	158.28 (±1.0)
8	169.87 (±1.0)	169.87 (±1.0)
10	181.46 (±1.0)	181.46 (±1.0)

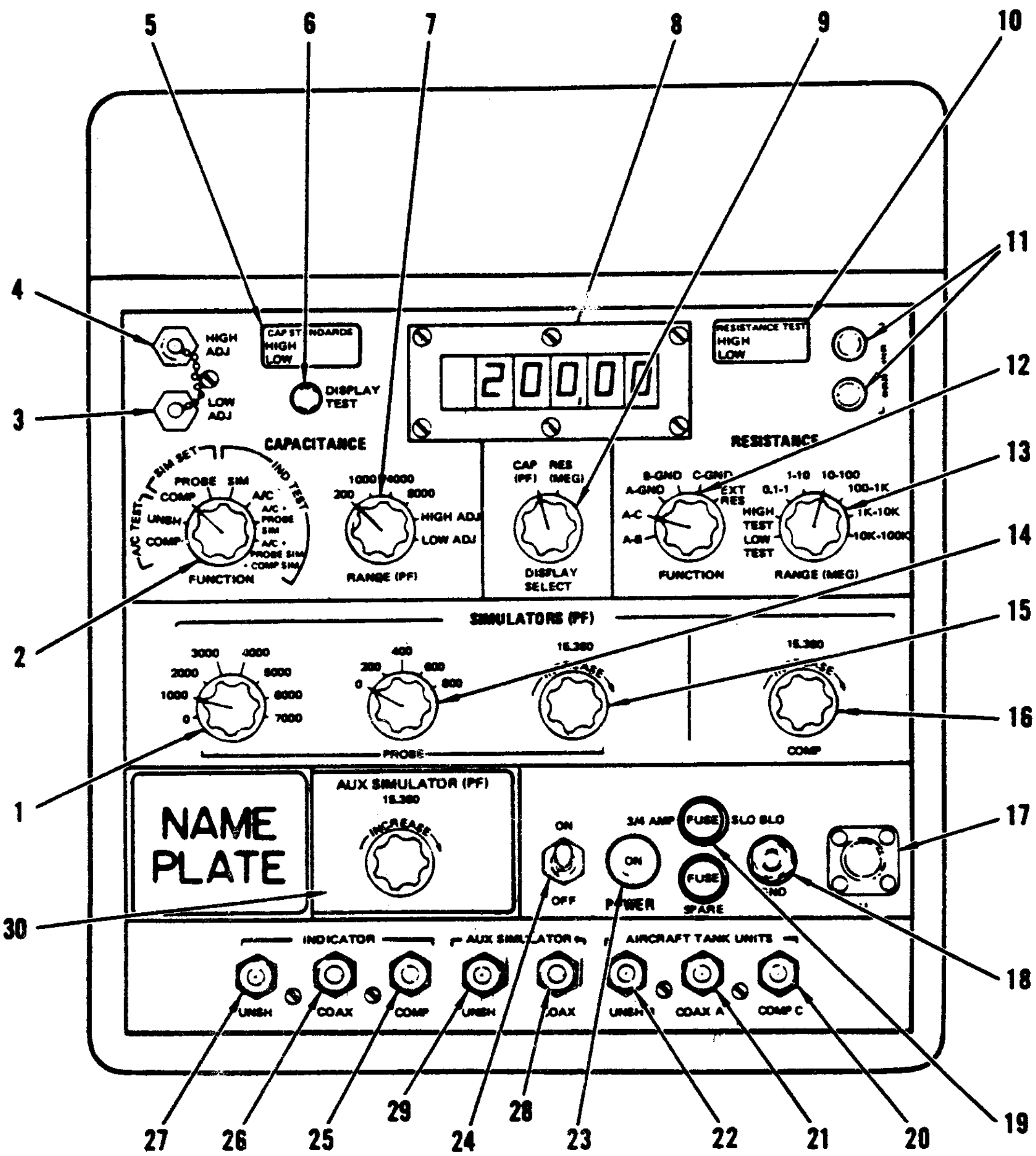
u. Install liquid oxygen quantity indicator if removed (paragraph 13-37).

v. Place test set power switch (24) in OFF.

w. Disconnect external electrical power.

x. Disconnect all test cables and connect connectors P2038 and P2039 to the converter electrical connectors.

y. Close accesses 1222-3 and 1232-1.



1. Simulator — probe 0—7000 pf control
2. Capacitance — function switch
3. Capacitance — low adjustment control
4. Capacitance — high adjustment control
5. Capacitance standards placard
6. Display test switch
7. Capacitance — range (pf) switch
8. Digital display
9. Display select switch
10. Resistance test placard
11. External resistance terminals
12. Resistance — function switch
13. Resistance range switch
14. Simulator — probe 0—800 pf control
15. Simulator — probe 15—390 control
16. Simulator — compensator control
17. Connector
18. Ground terminal
19. 3/4 amp fuse
20. Aircraft tank units comp—C receptacle
21. Aircraft tank units coax—A receptacle
22. Aircraft tank units unsh—B receptacle
23. Power on indicator
24. Power on/off switch
25. Indicator receptacle — comp
26. Indicator receptacle — coax
27. Indicator receptacle — unsh
28. Aux simulator — coax
29. Aux simulator — unsh
30. Aux simulator (pf) control

03K113—06—82

Figure 13-10. Liquid Oxygen Quantity Indicating System Test Set (GTF-6)

SECTION XIV
GUN GAS PURGE SYSTEM

14-1. DESCRIPTION.

14-2. The gun gas purge system dilutes the explosive gases in the ammunition drum and forward barrel compartments by automatically admitting ventilating air from the low pressure engine bleed air supply system when the gun is fired. Ventilating air is also admitted to the breech area in the gun compartment to dilute and purge explosive gases. The ventilating air and explosive gases are vented overboard. The system consists of gun gas purge valve, gun gas purge door, hydraulic selector valve, purge door switch, and vent nozzles in the compartments.

14-3. For system arrangement, refer to figure 1-2.

14-4. OPERATION. (See figure 14-1.)

14-5. When the gun trigger switch is pressed to the first detent, 28-volt dc power is connected to the solenoid of the purge door hydraulic selector valve. The valve opens directing hydraulic pressure to extend the gun gas purge door actuating cylinder. As the door opens, the door switch connects 28-volt dc power to energize the solenoid of the gun gas purge valve and allows the valve to open if engine bleed air is available. When the valve opens, an integral switch closes, allowing electrical current flow for operation of the M61A1 gun when the trigger is pressed to the second detent. If bleed air is not available to the purge valve, the valve will not open and the gun cannot be operated. Approximately 30 seconds after the trigger switch is released, the electrical circuit opens, gun gas purge valve closes, and the hydraulic selector valve is repositioned to retract the door actuating cylinder. The gun gas purge valve closes and shuts off the low pressure air supply and electrical current for gun operation. Retraction time of the gun gas purge cylinder is increased by an extend line restrictor. In event of system electrical failure, the restrictor ensures that all gas is exhausted before gun gas door closes.

14-6. COMPONENTS.

14-7. For a list of components, their locations (accesses), and functions, refer to table 14-1.

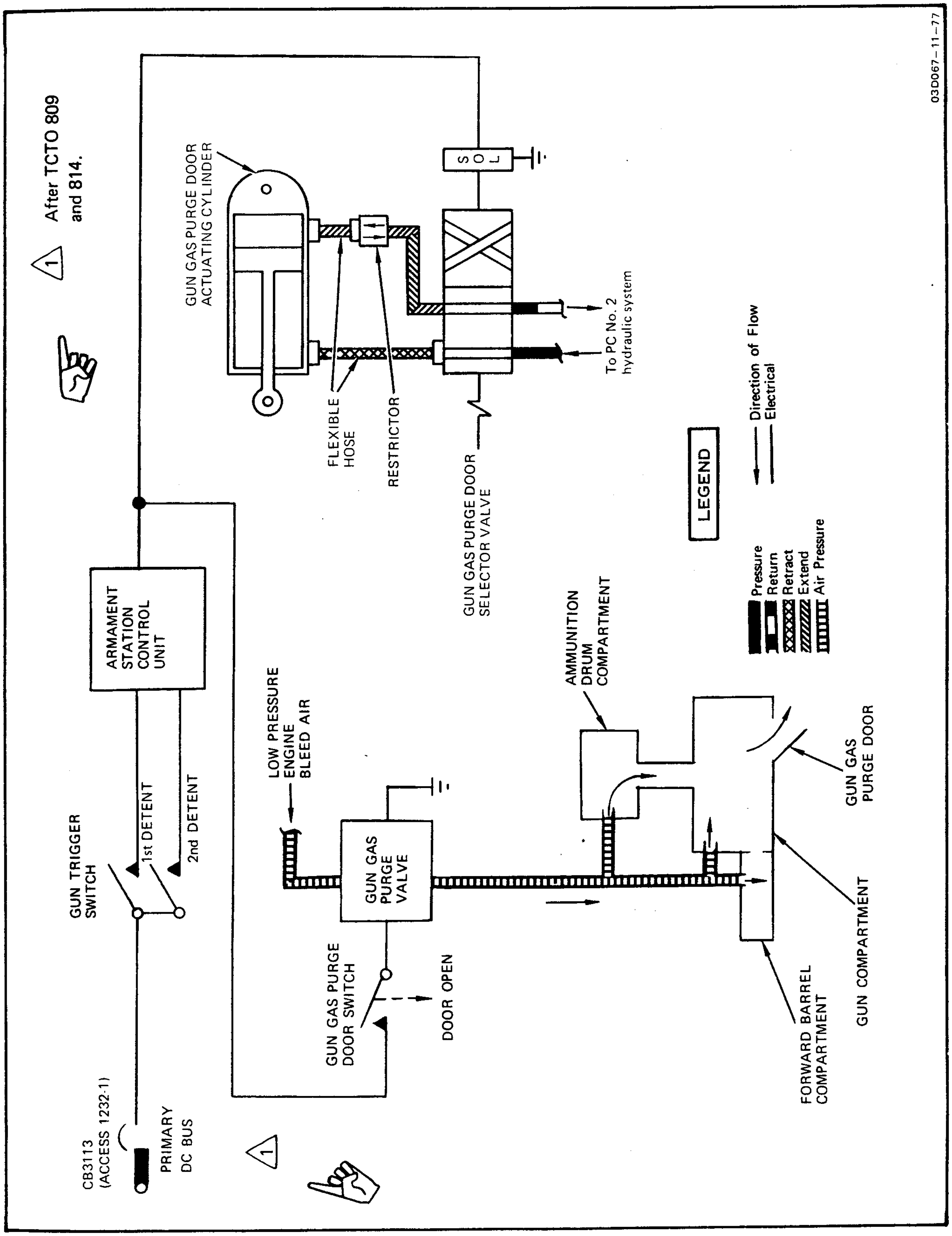


Figure 14-1. Gun Gas Purge System Schematic Diagram

Table 14-1. Gun Gas Purge System Components

Component	Access	Function
Cylinder, gun gas purge door actuating	1222-6	Opens and closes gun gas purge door.
Door, gun gas purge	1222-6	Opens to provide overboard exhaust of diluted gases from the ammunition drum, forward barrel, and gun compartments.
Nozzle, vent (2)	1222-4 and 1121-4[1] or 1121-9[2]	Directs the flow of gun gas purge air entering the ammunition drum and forward barrel compartments.
Nozzle, vent	1222-8	Directs purge air entering the breech area in the gun compartment.
Restrictor, gun gas purge door	1222-6	Ensures adequate gun gas purge by slowing closure rate of gun gas door after time delay relay has deenergized.
Switch, gun gas purge door	1222-6	Completes circuit to energize gun gas purge valve when purge door has opened approximately 13°.
Valve, gun gas purge	2123-6	Admits low pressure engine bleed air to the ammunition drum, forward barrel, and gun compartment vent nozzles and electrical current for gun operation.
Valve, gun gas purge hydraulic selector	1222-6	Controls extension and retraction of gun gas purge door actuating cylinder. Energized when gun trigger switch is pressed.

[1]Airplanes through AF69-6196

[2]Airplanes AF69-6197 and subsequent

14-8. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for engine operation		Operate engine during operational checkout of gun gas purge system
	Clearing sector clamp	216-01884-1	Prevent firing of gun
	Handcrank	216-01885-1	Rotate gun
	Multimeter	AN/PSM-6	Check voltage

Test Equipment Required (continued)

Figure & Index No.	Name	AN Type Designation	Use and Application
	Stopwatch	GG-S-764	Check airflow time

WARNING

To prevent firing of gun, ensure that electrical connector is disconnected from the gun control unit and clearing sector clamp is installed.

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 figure 14-2A.

a. Open access 1222-3 and ensure that electrical connector P209 is disconnected from the gun control unit and stowed. Close access.

b. Open access 1222-8. Gain access through gun shroud cover and install clearing sector clamp (T.O. 1A-7D-2-13).

CAUTION

Turn handcrank in clockwise direction only. Turning crank counterclockwise may result in damage to the gun system.

c. Open access 1222-6-2 and connect handcrank to drive socket. Rotate gun and ensure that gun bolts are in clearing cam path. Remove crank and close access.

d. Open access 1123-3 and disconnect connector P219 from gun control electronic component assembly A272.

d-1. Open accesses 1222-4 and 1121-4 (airplanes through AF69-6196) or 1121-9 (airplanes AF69-6197 and subsequent).

e. Start engine (T.O. 1A-7D-2-1) and operate at 70% rpm.

f. Place master armament switch to MASTER ARM.

g. Open access 1232-1 and momentarily actuate armament safety disable switch to DISABLE (T.O. 1A-7D-2-1).

h. Place gun high-low switch in LOW.

i. On airplanes through AF69-6196, check that GUN/GUN POD light on armament advisory lights panel comes on.

j. On airplanes AF69-6197 and subsequent, check that GUN RDY light on armament advisory lights panel comes on.

WARNING

Due to high pressure and temperature of purge air, personnel should wear safety goggles and heat resistant gloves when checking the gun gas purge system. Use flags to check airflow.
Keep hands clear of gun gas purge door.

k. Press gun trigger switch to first detent. Check that gun gas purge door opens and purge airflow is present at outlets in the forward barrel compartments and breech area of gun compartment. If maintenance or painting has been performed in ammunition drum compartment, in areas where drum purge line is routed, or maintenance has been performed on drum purge line, check for airflow from outlet in ammunition drum. {1 and 2}

l. Check for 0 volts dc on pin 3 of connector P219. {2A}

l-1. Press gun trigger switch to second detent.

l-2. Check for 28 volts dc on pin 3 of connector. {3}

m. Release trigger switch. Check that door starts closing and airflow ceases 30 seconds after trigger is released. Door should be completely closed 60 to 120 seconds after release of trigger. {4 and 5}

n. Check that purge door has closed flush with fuselage skin. {6}

o. Place master armament switch in OFF.

p. Place gun high-low switch in SAFE.

q. Shut down engine.

r. Remove clearing sector clamp and close gun shroud cover.

s. Connect connector P219 and close accesses 1123-3, 1222-4, 1222-8, 1232-1, and 1121-4 or 1121-9.

14-9. TROUBLESHOOTING. (See figure 14-2.)

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Multimeter	AN/PSM-6	Troubleshoot gun gas purge system
	Clearing sector clamp	216-01884-1	Prevent firing of gun

14-10. Refer to figure 14-2A for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

14-11. GUN GAS PURGE DOOR REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	216-01884-1	Clearing sector clamp	Prevent firing of gun
	216-01885-1	Handcrank	Rotate gun

14-12. REMOVAL. (See figure 14-3.)

WARNING

To prevent inadvertent firing of gun, ensure that electrical connector is disconnected from gun control unit and clearing sector clamp is installed.

a. Open access 1222-3 and ensure that electrical connector is disconnected from gun control unit. Close access.

b. Open access 1222-8-1. Gain access through gun shroud cover and install clearing sector clamp.

CAUTION

Turn handcrank in clockwise direction only. Turning crank counterclockwise may result in damage to the gun system.

c. Open access 1222-6-2 and connect handcrank to drive socket. Rotate gun and ensure that gun bolts are in clearing cam path. Remove crank.

d. Disconnect lower link from left nosewheel door (T.O. 1A-7D-2-7).

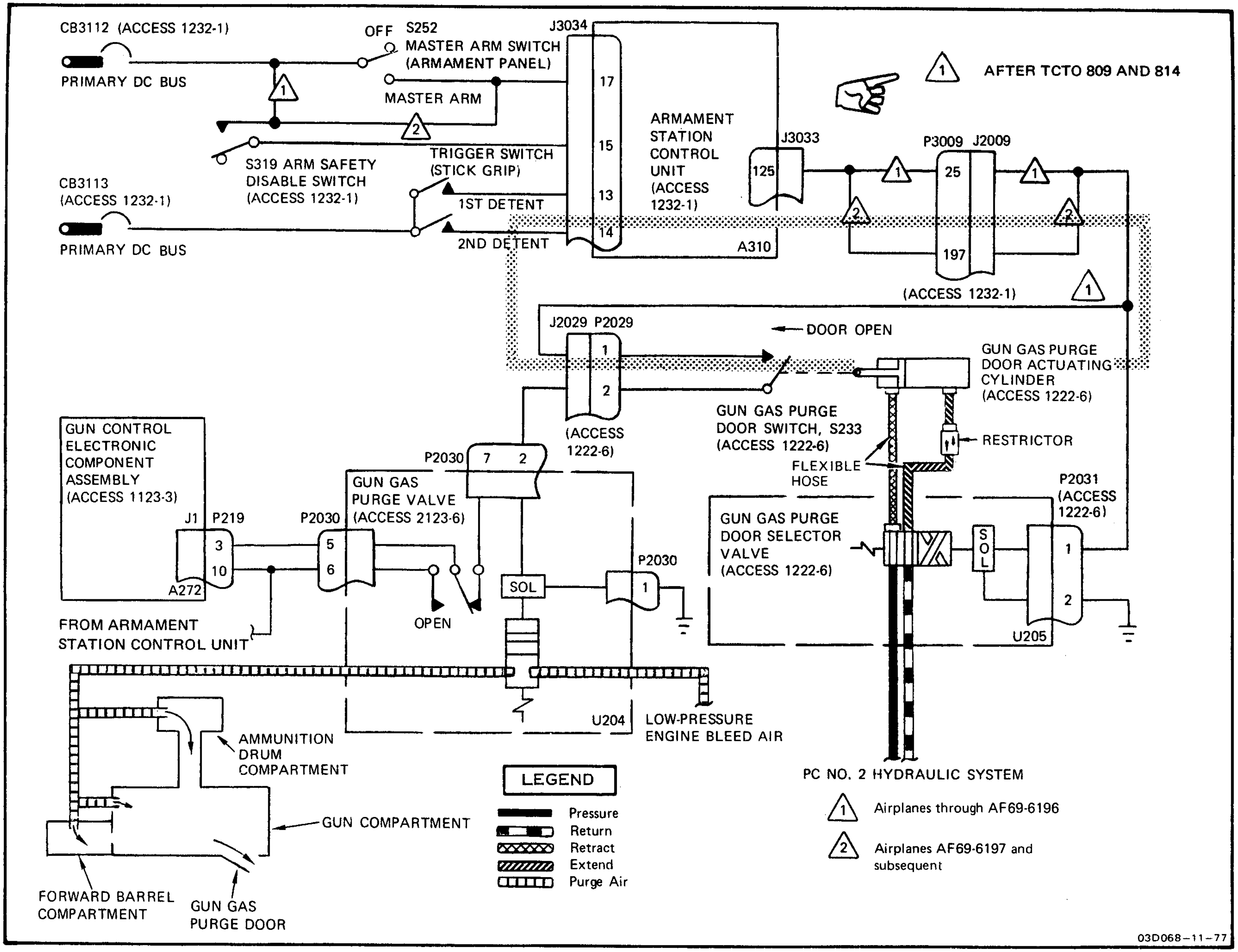


Figure 14-2. Gun Gas Purge System Troubleshooting Schematic Diagram

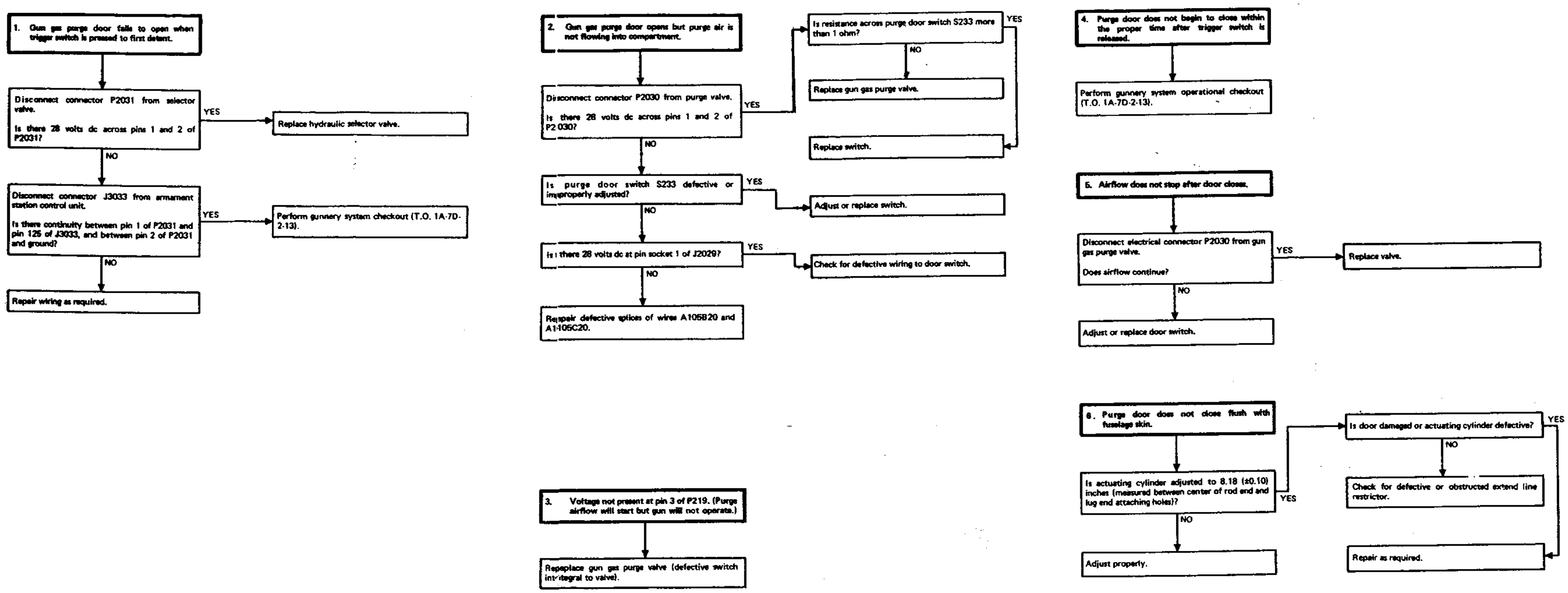


Figure 14-2A. Gun Gas Purge System Troubleshooting

e. Deleted.

WARNING

To prevent serious injury, ensure that hydraulic pressure to PC No. 2 hydraulic system is not applied while disconnecting actuating cylinder from purge door.

f. Manually pull gun access door open and disconnect hydraulic actuating cylinder from gun gas purge door by disconnecting quick release pin (14).

g. Disconnect clamp (5) securing door switch wiring harness to airframe and disconnect electrical connector P2029 (6).

h. Open access 1222-6.

i. Disconnect bonding jumper (7) from purge door.

j. Remove cotter pins (8), nuts (9), washers (10), bolts (11), and washers (12). Remove gun gas purge door (13) from access.

14-13. INSTALLATION. (See figure 14-3.)

a. Position gun gas purge door (13) in access and install washers (12), bolts (11), washers (10), and nuts (9). Do not tighten nuts.

b. Install washers (12), as required, to provide a 0.002- to 0.120-inch skin gap between purge door and access skin.

c. Tighten nuts (9) finger-tight and secure with new cotter pins (8).

d. Connect bonding jumper (7) to purge door.

e. Close accesses 1222-6-2, 1222-6, and 1222-8-1.

NOTE

If more adjustment is required than can be obtained by the following method, remove gas purge door, loosen the switch mounting bracket screws and bolts, and move the bracket as required to obtain the 2.34 (+1.10, -0.40) inch dimension. Tighten screws and bolts.

f. Remove plunger roller clip, cut lockwire, and adjust jamnuts so that switch actuation occurs when aft edge of purge door is 2.34 (+1.10, -0.40) inches from outside skin of access (figure 14-4). Tighten jamnuts, and secure with safety wire MS20995C32. Install plunger roller clip.

g. Connect electrical connector (6) and secure wiring harness with clamp (5).

h. Deleted.

WARNING

To prevent serious injury, ensure that hydraulic pressure to PC No. 2 hydraulic system is not applied while connecting actuating cylinder to purge door.

i. Connect hydraulic actuating cylinder to purge door with quick-release pin (14).

j. Connect lower link to left nosewheel door (T.O. 1A-7D-2-7).

k. Perform gun gas purge system operational checkout (paragraph 14-8).

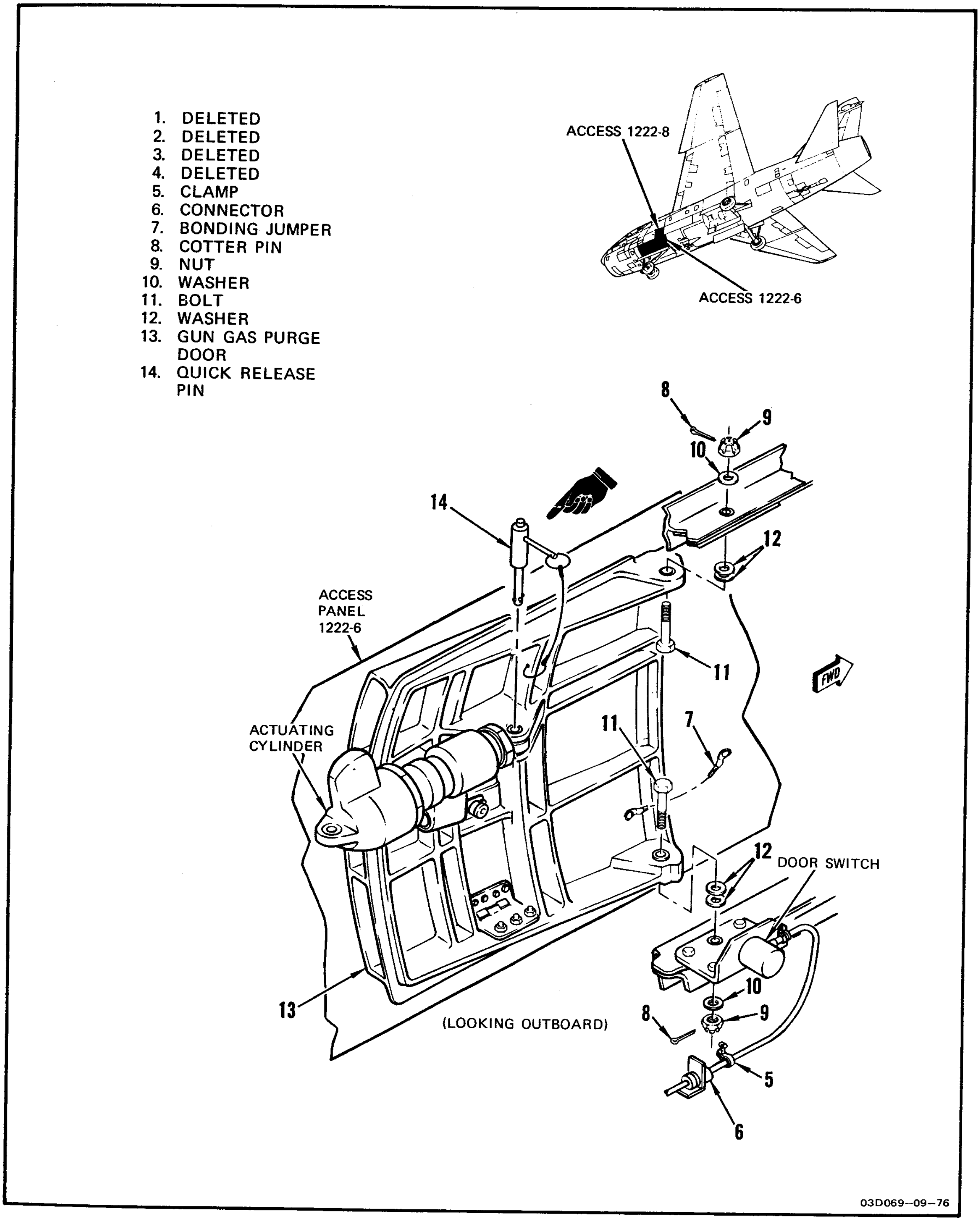


Figure 14-3. Gun Gas Purge Door Removal and Installation

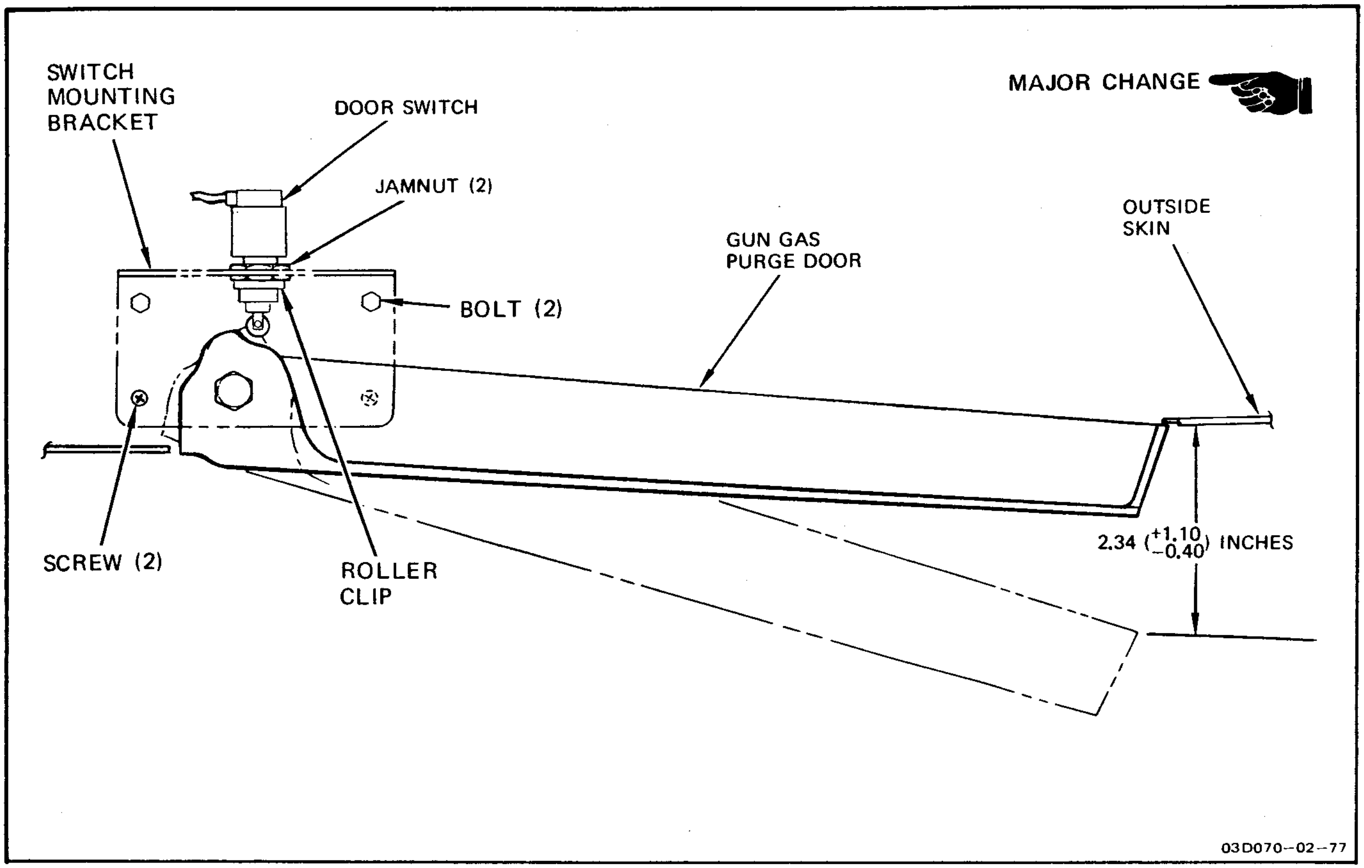


Figure 14-4. Gun Gas Purge Door Switch Adjustment

14-14. GUN GAS PURGE DOOR ACTUATING CYLINDER REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	*Part Number*	*Nomenclature*	*Use and Application*
		Equipment required for connecting external hydraulic power	Operate hydraulic actuating cylinder
		Equipment required for connecting external electrical power	Operate hydraulic selector valve
	216-01884-1	Clearing sector clamp	Prevent firing of gun

Tools Required (continued)

Figure& Index No.	Part Number	Nomenclature	Use and Application
	216-01885-1	Handcrank	Rotate gun
	413-900-020 (American Tool and Engineering Co., Kalamazoo, Mich.)	Torque wrench, 100 to 750 pound-inches	Adjust actuating cylinder

14-15. REMOVAL. (See figure 14-5.)

WARNING

To prevent inadvertent firing of gun, ensure that electrical connector is disconnected from gun control unit and clearing sector clamp is installed.

a. Open access 1222-3 and ensure that electrical connector is disconnected from gun control unit. Close access.

b. Open access 1222-8-1. Gain access through gun shroud cover and install clearing sector clamp.

CAUTION

Turn handcrank in clockwise direction only. Turning crank counterclockwise may result in damage to the gun system.

c. Open access 1222-6-2 and connect handcrank to drive socket. Rotate gun and ensure that gun bolts are in clearing cam path. Remove crank and close access.

d. Disconnect lower link from left nosewheel door (T.O. 1A-7D-2-7).

WARNING

To prevent serious injury, ensure that hydraulic pressure to PC No. 2 hydraulic system is not applied during removal of gun gas purge actuating cylinder.

e. Deleted.

f. Manually pull gun gas purge door open and disconnect actuating cylinder from gun purge door by disconnecting quick-release pin (13).

g. Remove clamp securing door switch wiring harness to airframe and disconnect electrical connector P2029.

h. Open access 1222-6.

i. Disconnect hydraulic lines (5) from cylinder.

j. Remove cotter pin (6), nut (7), washers (8), and bolt (9) securing actuating cylinder (10) to airframe. Remove cylinder.

k. Remove fittings (11) and O-rings (12) from cylinder parts. Discard O-rings.

14-16. INSTALLATION. (See figure 14-5.)

a. Install new O-rings (12) on fittings (11) and install fittings in cylinder ports.

b. Position actuating cylinder (10) in airplane and secure with bolt (9), washers (8), and nut (7).

c. Tighten nut (7) finger-tight and secure with new cotter pin (6).

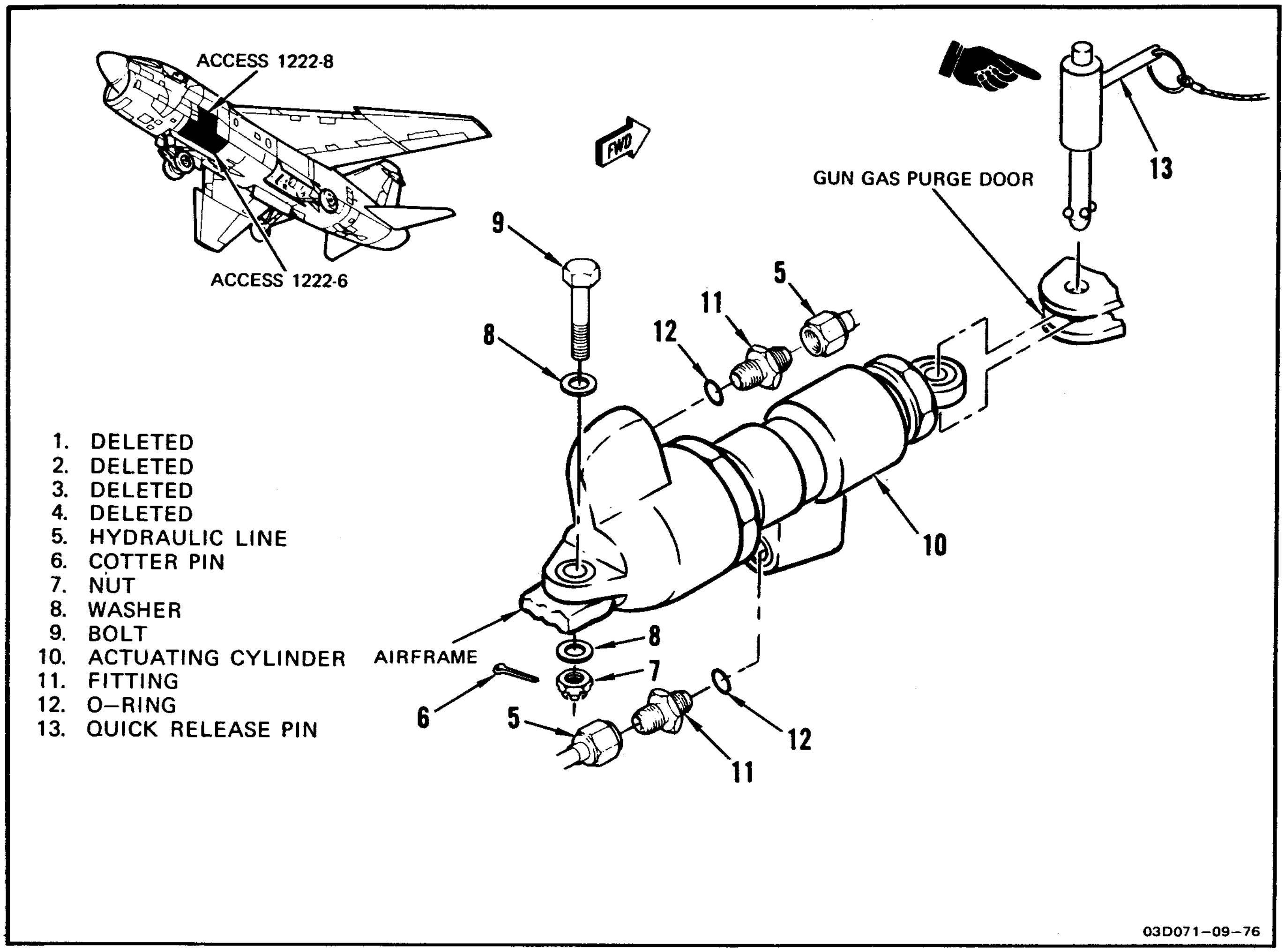


Figure 14-5. Gun Gas Purge Door Actuating Cylinder Removal and Installation

d. Adjust actuating cylinder as follows:

1. Using quick-release pin (13) as required to temporarily connect gun gas purge door to cylinder, bottom piston in actuating cylinder and adjust rod end on piston until gun gas purge door seats firmly against the gun access panel.

2. Turn the rod end into the piston 1/2 turn.

3. Check that actuating cylinder retracted length, measured between center of rod end and lug end attaching holes is 8.18 (±0.10) inches.

4. Tighten jamnut to 600 (±100) pound-inches torque. Secure jamnut with MS20995C32 lockwire.

e. Connect hydraulic lines (5).

f. Bleed actuating cylinder as follows:

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

2. Connect external hydraulic power to PC No. 2 hydraulic system (T.O. 1A-7D-2-1).

3. Place master armament switch in ON.

4. Open access 1232-1 and momentarily actuate armament safety disable switch to DISABLE.

5. Place gun high-low switch in LOW.

6. Apply 1,500 psi hydraulic power to PC No. 2 hydraulic system.

WARNING

To prevent serious injury, stay clear of gun gas purge door. Door will start closing after 30 seconds and will completely close 30 to 90 seconds later.

7. Press and hold gun trigger switch. With gun gas purge door in open position, decrease hydraulic power to zero. Release trigger switch.

8. Disconnect gun gas purge door actuating cylinder from gun gas purge door. Loosen fitting on extend port of cylinder.

9. Apply 1,500 psi hydraulic power to retract actuating cylinder and allow hydraulic fluid to flow from loosened fitting until cylinder piston bottoms. Tighten extend port fitting.

10. Loosen fitting on retract port of cylinder. Press and hold gun trigger switch. Allow hydraulic fluid to flow from loosened fitting until cylinder piston bottoms. Tighten retract port fitting. Release trigger switch.

11. Repeat substeps 9 and 10 until hydraulic fluid flow from loosened fittings is free of air.

12. Cycle actuating cylinder five complete cycles using 1,500 psi hydraulic power.

13. Press gun trigger switch. With gun gas purge door actuating cylinder fully extended, reduce hydraulic power to zero. Release trigger switch.

14. Place master armament switch in OFF.

15. Place gun high-low switch in SAFE.

16. Disconnect external electrical power.

17. Disconnect external hydraulic power.

g. Close accesses 1232-1, 1222-8-1, and 1222-6.

h. Connect electrical connector P2029 and secure door switch wiring harness with clamp.

WARNING

To prevent serious injury, ensure that hydraulic pressure to PC No. 2 hydraulic system is not applied while connecting gun gas purge actuating cylinder to purge door.

i. Connect hydraulic actuating cylinder to purge door with quick-release pin (13).

j. Connect lower link to left nosewheel door (T.O. 1A-7D-2-7).

k. Service PC No. 2 hydraulic system (T.O. 1A-7D-2-1).

l. Perform gun gas purge system operational checkout (paragraph 14-8).

14-17. GUN GAS PURGE HYDRAULIC SELECTOR VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	216-01884-1	Clearing sector clamp	Prevent firing of gun
	216-01885-1	Handcrank	Rotate gun

14-18. REMOVAL. (See figure 14-6.)

WARNING

To prevent inadvertent firing of gun, ensure that electrical connector is disconnected from gun control unit and clearing sector clamp is installed.

a. Open access 1222-3 and ensure that electrical connector is disconnected from gun control unit. Close access.

b. Open access 1222-8. Gain access through gun shroud cover and install clearing sector clamp.

CAUTION

Turn handcrank in clockwise direction only. Turning crank counterclockwise may result in damage to the gun system.

c. Open access 1222-6-2 and connect handcrank to drive socket. Rotate gun and ensure that gun bolts are in clearing cam path. Remove crank and close access.

d. Disconnect lower link from left nosewheel door (T.O. 1A-7D-2-7).

WARNING

To prevent serious injury, ensure that hydraulic pressure to PC No. 2 hydraulic system is not applied while disconnecting gun gas purge actuating cylinder from purge door.

e. Deleted.

f. Manually pull gun gas purge door open and disconnect actuating cylinder from gun purge door by disconnecting quick release pin.

g. Remove clamp securing door switch wiring harness to airframe and disconnect electrical connector P2029.

h. Open access 1222-6.

i. Disconnect electrical connector (1) from valve.

j. Disconnect hydraulic lines (2) from elbows.

k. Remove three screws (3), washers (4), and spacers (4A) securing valve to airframe and remove valve (5).

l. Loosen jamnuts and remove four elbows (6), O-rings (7), backup rings (8), and jamnuts (9) from valve. Discard O-rings and backup rings.

14-19. INSTALLATION. (See figure 14-6.)

a. Install jamnuts (9), new backup rings (8), and new O-rings (7) on elbows (6).

b. Install elbows in valve (5) pointing outboard. Do not tighten jamnuts.

c. Surface bond valve-to-airframe mounting surface in accordance with MIL-B-5087 for shock hazard and static discharge.

d. Position valve to airframe and secure with three screws (3), washers (4), spacers (4A).

e. Connect hydraulic lines (2) to elbows and tighten jamnuts.

f. Connect electrical connector (1) to valve.

g. Close access 1222-6.

h. Connect electrical connector P2029 to J2029 and secure wiring harness with clamp.

WARNING

To prevent serious injury, ensure that hydraulic pressure to PC No. 2 hydraulic system is not applied while connecting gun gas purge actuating cylinder to purge door.

i. Connect hydraulic actuating cylinder to purge door with quick release pin.

j. Connect lower link to left nosewheel door (T.O. 1A-7D-2-7).

k. Perform gun gas purge system operational checkout (paragraph 14-8).

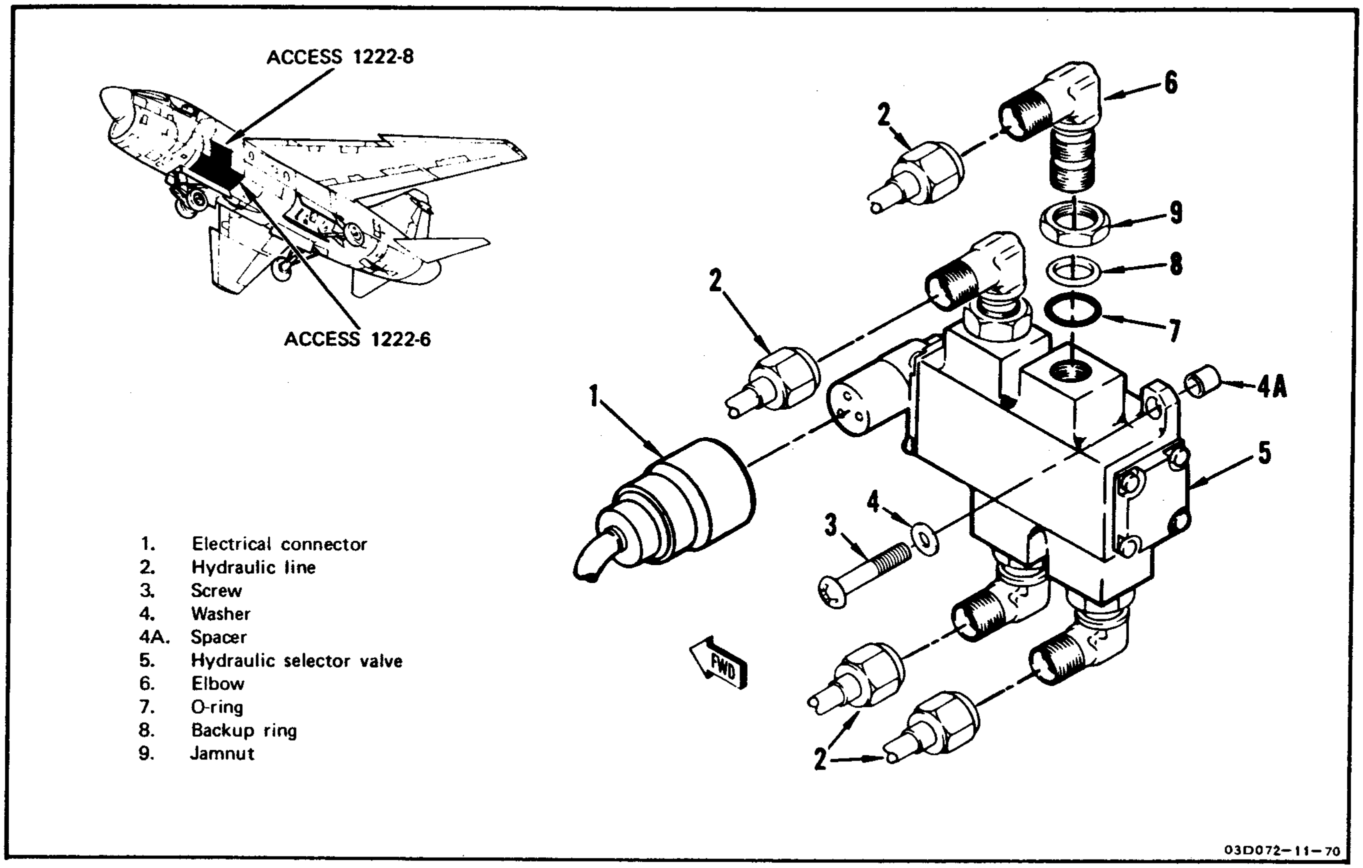


Figure 14-6. Gun Gas Purge Hydraulic Selector Valve Removal and Installation

14-20. GUN GAS PURGE VALVE 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 couplings
	413-900-020 (American Tool and Engineering Co., Kalamazoo, Mich.)	Torque wrench, 100 to 750 pound-inches	Tighten couplings

14-21. REMOVAL. (See figure 14-7.)

a. Open access 2123-6.

b. Disconnect electrical connector (1) from valve.

c. Disconnect coupling (2) from inlet port of valve. Remove gasket (3) and discard.

d. Disconnect coupling nut (9) from outlet line elbow.

e. Remove two bolts (4) and washers (5) securing valve (6) to mounting bracket. Remove valve from airplane.

f. Remove split rings (7), O-ring (8), and coupling nut (9) from valve. Discard O-ring.

14-22. INSTALLATION. (See figure 14-7.)

NOTE

Assure split rings (7) and O-ring (8) are installed completely over valve outlet bead.

a. Slide coupling nut (9) onto outlet port of valve; followed by one split ring (7), new O-ring (8), and one split ring (7).

b. Position valve (6) on mounting bracket and secure with two washers (5) and bolts (4).

c. Insert outlet port of valve, with attached parts (7), (8), (9) installed, into outlet line elbow. Tighten coupling nut (9) to 186 (± 18) pound-inches torque and secure with MS20995C32 lockwire.

d. Install new gasket (3) and connect valve inlet port to inlet line with coupling (2). Tighten coupling (2) to 40 (± 2) pound-inches torque.

e. Tap coupling (2) lightly with a plastic or rawhide mallet around the outside band and check that torque remains 40 (± 2) pound-inches.

f. Connect electrical connector (1) to valve.

g. Perform gun gas purge system operational checkout (paragraph 14-8). During engine operation check valve installation for evidence of bleed air leakage.

h. Close access 2123-6.

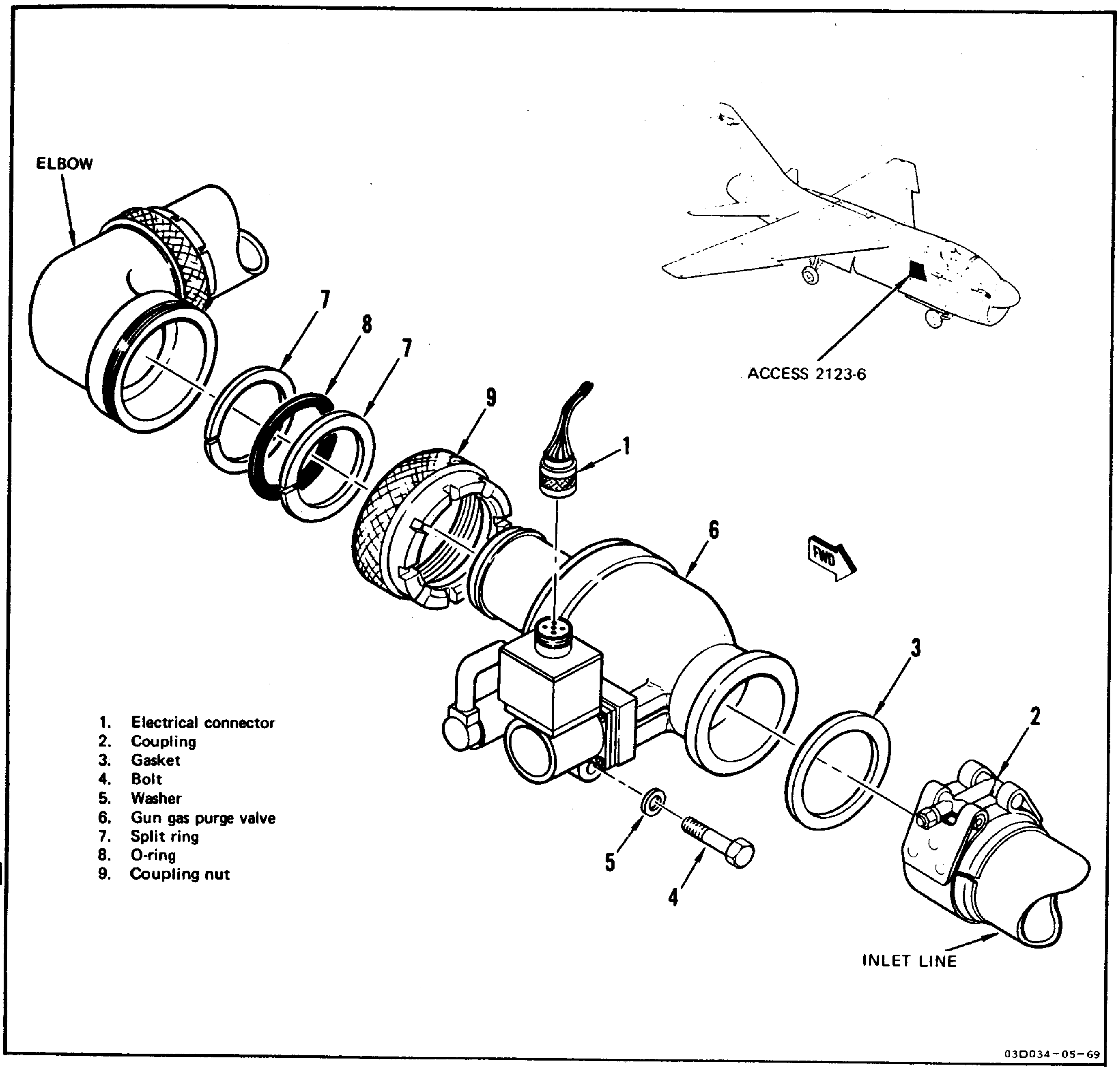


Figure 14-7. Gun Gas Purge Valve Removal and Installation

APPENDIX A

AIR-CONDITIONING SYSTEM OPERATIONAL CHECK

A-1. PURPOSE.

A-2. This check is for the purpose of determining that the subsystems of the air-conditioning system will operate. If any of the following systems do not operate as indicated, refer to the applicable section of this manual for troubleshooting information.

A-3. OPERATIONAL CHECK.

Test Equipment Required

Figure & Index No.	*Name*	*AN Type Designation*	*Use and Application*
	Equipment required for engine operation		Operate engine during check
	Equipment required for connecting external electrical power		Supply electrical power during check
	Pressure altimeter	MS25450-1	Check pressure regulator
	Equipment required for connecting air-conditioning unit		Check ground cooling system during check

a. Perform radar pressurization system checkout (paragraph 8-8).

b. Connect external ground cooling unit (T.O. 1A-7D-2-1). Start ground cooling unit.

c. Check for airflow from canopy rail donut seal.

d. Shut down and disconnect ground cooling unit (T.O. 1A-7D-2-1).

e. Open accesses 1232-1, 2211-2, 2232-1, and 6222-1.

f. Cover windshield with locally fabricated covering to protect windshield from hot airflow and repellant fluid.

g. Start engine (T.O. 1A-7D-2-1). Advance throttle to 75% rpm.

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from ram air exhaust duct after placing cockpit pressure switch in CABIN PRESS. If no flow occurs, place switch in CABIN DUMP, and troubleshoot air-conditioning supply system.

h. Place cockpit pressure switch in CABIN PRESS.

NOTE

Leakage which forms bubbles with leak detector solution is acceptable.

i. Through access 2211-2, check cockpit safety valve for leakage by placing a finger over valve filter screen port.

j. Retard throttle to idle rpm.

k. Close access 2211-2.

l. Depress manual override button on anti-g valve and check for airflow from antiblackout receptacle.

m. Release override button and check that airflow stops.

n. Rotate suit flow control knob through low to high flow position. Check for flow variation.

o. Rotate suit temperature control knob through scale of temperature markings. Check for temperature variations.

p. Rotate suit flow control to OFF and check that airflow stops.

q. Place hand at exit louvers of camera compartment and verify airflow.

r. In accesses 1232-1 and 2232-1, check that refrigerated air flows from outlets.

s. Check that no air flows from ground cooling socket.

t. With cockpit temperature selector in AUTO, rotate temperature control from COLD to HOT. Check airflow from canopy rail donut seal for temperature variations.

u. Open emergency vent air scoop and close canopy.

CAUTION

To prevent overpressurization, handle on cockpit pressure regulator must be in FLIGHT position.

v. Set test altimeter to zero.

w. Slowly close emergency vent air scoop and observe that altimeter does not exceed -600 feet.

CAUTION

To prevent damage to canopy actuator and hinge pins, manually restrain canopy during unlocking and opening operation.

x. Open and then close canopy. Pressure surge must not exceed -800 feet on altimeter and then stabilize below -600 feet.

y. Move floor inlet control knob to open and then to close. Check that airflow starts and then stops.

z. Place defog switch in DEFOG. Check that temperature at defog inlets increases.

aa. Place defog switch in OFF. Check that temperature at defog inlets returns to cockpit temperature.

ab. Place rain removal switch in RAIN REMOVE and check for airflow over center and left windshields.

ac. Place rain removal switch in OFF. Check that airflow stops.

ad. Press rain repellent button and check for fluid application from repellent nozzles.

ae. Place manual override switch in MAN. Rotate cabin temperature control through range from COLD to HOT. Check for temperature variations.

af. Place cockpit pressurization switch in DUMP. Check that all airflow to cockpit stops.

CAUTION

Ensure that cockpit is completely depressurized before opening canopy. A positive check may be accomplished by opening emergency vent air scoop.

ag. Open canopy.

ah. Perform gun gas purge system checkout (paragraph 14-8).

WARNING

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

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

aj. Verify that avionics bay fans are not operating.

ak. Close accesses 1232-1 and 2232-1 and verify that fans are now operating.

al. Disconnect external electrical power (T.O. 1A-7D-2-1).

am. Remove protective covering from windshield.

an. Close access 6222-1.

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APPENDIX B
HIGH AND LOW PRESSURE BLEED AIR DUCTING PRESSURE CHECK

B-1. PURPOSE.

B-2. The bleed air ducting pressure check is to determine the integrity of the high and low pressure bleed air ducts and to verify that the ducting and system will maintain adequate pressure for operation.

B-3. OPERATIONAL CHECK.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Ultrasonic detector	80018-M2	Detects and amplifies sound
	Test assembly	9081356-10	Regulates duct system air pressure
	Flange assemblies	9081353	Caps to block pressurize ducting during pressure check
	Engine duct cap	6868135	Cap for flat portion of engine duct

a. Ensure airplane is safe for maintenance and engine ground operational check in accordance with T.O. 1A-7D-2-1 and T.O. 1A-7D-2-5.

b. Remove access panels 2222-4, 2123-6, 6122-2, 6222-1, 6222-2, and 6122-5 in accordance with T.O. 1A-7D-2-1.

c. Remove engine bay high pressure gimbal duct (paragraph 1-34).

d. Remove pressure limiting and shutoff valve (paragraph 1-25).

e. Cap aft end of duct (34) (figure 1-9) with flange assembly, 9081353-70, using new gasket FGA625-13 and clamp 34H10-175.

f. Remove engine bay low pressure gimbal duct (paragraph 11-15).

g. Cap aft end of duct (17) (figure 11-2) with flange assembly 9081353-90, using new gasket FGA625-13 and clamp 34H10-175.

h. Remove camera cooling duct support bolt and spacers; disconnect and cap the camera cooling compartment air line using B nut cap.

i. Disconnect and cap forward end of high pressure duct (97) (figure 1-9) with flange assembly 9081353-50 using new gasket FGA625-13 and clamp 34H10-175.

j. Disconnect and cap forward end of low pressure duct (106) (figure 11-15) with flange assembly 9081353-10 using new gasket FGA625-7 and clamp 34H10-150.

k. Accomplish leak test on high and low pressure systems as follows:

1. Apply 100 psi to air inlet cap, using 9081356-10 hot air duct test assembly.

2. Close valve, let stabilize for 5 minutes, and take initial pressure reading.

3. Continue monitoring for 15 minutes. No more than 5 psi drop is permitted.

4. If a leak is detected, inspect system for defective duct or clamp joint.

5. If a duct is defective, replace duct and continue testing until all leaks have been repaired and system has stabilized.

l. Ducts removed to accomplish leak test shall be inspected off airplane individually. Accomplish leak check as follows:

1. Cap ends of duct with required flange assemblies and end cap.

2. Apply pressure and accomplish test as prescribed in paragraph k.

3. Perform NDI inspection (paragraph 1-35).

m. Remove flange assembly and install low pressure gimbal duct (paragraph 11-16).

n. Remove flange assembly and install pressure limiting and shutoff valve (paragraph 1-26).

o. Reinstall high pressure gimbal duct (paragraph 1-35).

p. Remove B nut cap in camera cooling line, connect line, and install spacers; bolt and secure in support bracket.

q. Remove cap assembly on forward low pressure bleed air duct and reconnect disturbed areas.

r. Remove cap assembly on forward high pressure bleed air duct and reconnect disturbed areas.

s. Accomplish engine running leak check in accordance with T.O. 1A-7D-2-1 with emphasis placed on the coupled areas of the ducting which were disconnected/removed during pressure check.

t. Install panels removed for maintenance (T.O. 1A-7D-2-1).

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