CHAPTER

21

PAGE	DATE	PAGE	DATE	PAGE	DATE	PAGE	DATE
CHAPTER 21 TAB		21- 1-151		202	DEC 15/62	202	MAR 15/59
		401	OCT 15/68			203	DEC 15/65
EFFECTIVE PAGES		402	OCT 15/68	21- 2- 201		204	DEC 15/65
SEE LAST PAGE OF LIST				201	MAR 15/59	205	JUL 15/68
FOR NUMBER OF PAGES		21- 2- 1		202	BLANK	206	DEC 15/65
		201	MAR 15/59			207	DEC 15/65
CONTENTS 21		202	MAR 15/59	21- 2- 211		208	BLANK
1	MAR 01/89	203	MAR 15/59	201	OCT 27/79		
2	MAR 01/89	204	MAR 15/59	202	OCT 27/79	21- 5- 61	
3	MAR 01/89					201	APR 15/65
4	MAR 01/89	21- 2- 21		21- 5- 0		202	DEC 15/65
5	MAR 01/89	201	MAR 15/59	1	DEC 15/64	203	APR 15/65
6	MAR 01/89	202	MAR 15/59	2	APR 15/70	204	JUL 15/68
7	MAR 01/89	203	MAR 15/59	2A	JUL 15/68	205	JUL 15/68
8	MAR 01/89	204	MAR 15/59	2B	MAR 01/89	206	BLANK
9	MAR 01/89			3	MAR 01/89		
10	BLANK	21- 2- 31		4	OCT 15/63	21- 6- 0	
		201	MAR 01/89	5	OCT 15/63	1	MAR 01/89
21- 0-		202	APR 15/63	6	DEC 15/64	2	JUL 15/68
1	OCT 15/69	203	MAR 15/59	7	MAR 15/65	3	JUL 15/68
2	OCT 15/68	204	MAR 01/89	8	APR 15/70	4	JAN 15/70
3	OCT 15/68			9	DEC 15/62	5	JUL 15/67
4	BLANK	21- 2- 51		10	JUL 15/69	6	JUL 15/68
		201	MAR 15/59	11	AUG 15/66	7	JUL 15/68
21- 1- 1		202	MAR 15/59	12	DEC 15/65	8	JUL 15/67
201	OCT 15/62	203	MAR 15/59	13	JUL 15/68	9	JUL 15/68
202	JUL 15/62	204	MAR 15/59	14	JUL 15/68	10	JUL 15/67
203	OCT 15/68	205	MAR 15/59	15	JUL 15/68	11	JUL 15/68
204	OCT 15/68	206	BLANK	16	JUL 15/68	12	JUL 15/67
205	OCT 27/79						
206	BLANK	21- 2-111		21- 5- 0		21- 6- 41	
		201	MAR 15/59	101	MAR 15/60	201	MAR 15/63
21- 1- 81		202	MAR 15/59	102	MAR 15/60	202	DEC 15/61
201	MAR 15/59			103	MAR 15/60		
202	MAR 15/59	21- 2-121		104	MAR 15/60	21- 6- 51	
		201	MAR 15/59			201	MAY 15/59
21- 1- 91		202	BLANK	21- 5- 0		202	MAR 15/59
401	OCT 15/68			201	JUL 15/59		
402	OCT 15/68	21- 2- 161		202	JUL 15/59	21- 6- 61	
		201	MAR 15/59	203	JUL 15/59	201	MAY 15/59
21- 1-101		202	MAR 15/59	204	APR 15/68	202	MAY 15/59
401	OCT 15/68						
402	OCT 15/68	21- 2- 171		21- 5- 21		21- 6- 71	
		201	MAR 15/59	401	APR 15/70	201	JAN 15/67
21- 1-131		202	OCT 27/79	402	APR 15/70	202	MAY 15/59
401	OCT 15/68					203	DEC 15/61
402	OCT 15/68	21- 2- 191		21- 5- 31		204	JAN 15/67
		201	DEC 15/62	201	MAR 15/59		

* = REVISED, ADDED OR DELETED PAGE F = FOLDOUT PAGE

PAGE	DATE
21- 6- 84	
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202	FEB 15/63
203	JUL 15/68
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21- 6- 91	
201	FEB 7/64
202	DEC 15/61
21- 6- 111	
201	NOV 27/80
202	MAY 15/62
203	NOV 27/80
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21- 6- 121	
801	JUN 15/64
802	JUN 15/64
803	JUN 15/64
804	BLANK
21- 6- 131	
201	JUL 15/68
202	MAY 15/66
21- 12- 0	
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2	JAN 15/70
3	JAN 15/70
4	OCT 15/69
5	OCT 15/69
6	JAN 15/62
7	JAN 15/64
8	APR 15/63
9	JAN 15/62
10	JAN 15/62
11	JAN 15/62
12	JAN 15/62
13	APR 15/62
14	MAR 15/65
15	MAR 15/65
16	APR 15/62
17	JUL 15/62
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21	APR 15/62
22	JAN 15/64
23	APR 15/62
24	JAN 15/62
25	JAN 15/62
26	JAN 15/62
27	MAR 01/89
28	APR 15/63
29	MAY 15/65
30	APR 15/62
31	JUL 15/63
32	JUL 15/69
21- 12- 0	
101	MAR 01/89
102	MAR 01/89
103	MAR 01/89
104	MAR 01/89
105	MAR 01/89
106	MAR 01/89
21- 12- 0	
201	DEC 15/64
202	APR 15/62
203	APR 15/62
204	APR 15/62
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206	APR 15/62
207	DEC 15/62
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210	APR 15/70
211	FEB 15/63
212	FEB 15/63
213	FEB 15/63
214	FEB 15/63
21- 12- 11	
201	MAR 01/89
202	DEC 15/62
203	DEC 15/62
204	MAR 01/89
21- 12- 32	
201	DEC 15/63
202	JAN 15/63
203	APR 15/65
204	APR 15/65
205	JAN 15/63
206	JAN 15/63
207	JAN 15/63
208	JAN 15/63
21- 12- 131	
201	DEC 15/63
202	APR 15/62
203	APR 15/62
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21- 12- 211	
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21- 31- 31	
401	JUL 15/67

PAGE	DATE
402	JUL 15/67
21- 31- 41	
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21- 40- 0	
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401	JAN 15/69
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21- 41- 42	
501	JAN 15/69

PAGE	DATE
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401	JAN 15/70
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21- 42- 21	
401	JUL 15/69
402	JUL 15/69
21- 58- 01	
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2	SEP 17/69
3	SEP 17/69
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5	JUL 15/69
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103	MAR 7/70
104	JAN 15/70
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106	MAR 7/70
107	JAN 15/70
108	JAN 15/70

PAGE	DATE
21- 58- 01	
501	JUL 15/69
502	JUL 15/69
21- 58- 12	
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21- 64- 11	
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* = REVISED, ADDED OR DELETED PAGE F = FOLDOUT PAGE

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21- 64- 21							
401	AUG 15/66						
402	AUG 15/66						
403	AUG 15/66						
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* = REVISED, ADDED OR DELETED PAGE F = FOLDOUT PAGE

CHAPTER 21 - AIR CONDITIONING

If maintenance has to be performed on a system affected by the modification listed below, refer to the Temporary Supplemental Doc. No.

Maintenance Manual Subject No.	Title	Temporary Supplemental Document No.	Date
N/A	UNIVERSIAL AEREAL REFUELING RECEPTACLE SLIPWAY INSTALLATION (UARRSI)	16	SEP.05/88

N/A= NOT APPLICABLE

CHAPTER 21

AIR CONDITIONING

TABLE OF CONTENTS

AIR CONDITIONING AND PRESSURIZATION SYSTEM - DESCRIPTION AND OPERATION

1. General

A. The air conditioning and pressurization systems provide temperature control, air pressure, and ventilation to the compartments for the crew, the passengers, the lower nose section and cargo areas. (See figure 1.) The air source for pressurization and ventilation is the pneumatic system. See Chapter 36, Pneumatic System.

B. This chapter considers the air conditioning and pressurization system under five subsystems. The subsystems are:

(1) Pressurization Control and Indicating System

(2) Air Conditioning System

(3) Air Conditioning Control and Indicating System

(4) Air Distribution System

(5) Heating Systems

2. Pressurization Control and Indicating System

A. The pressurization control and indicating system provides both automatic and manual control of cabin pressure. The components are mounted in pressurized areas of the cabin and are interconnected by pneumatic tubing or electrical wiring. (See figure 1.) The pressurization control system consists of automatic and manual controls, outflow valves, jet or vacuum pumps and related wiring or tubing. The indicating system includes a rate-of-climb indicator, an altitude warning horn, and a dual altimeter and differential pressure indicator. Controlled exhaust through outflow valves provides pressurization of the pressurized compartment.

3. Air Conditioning System

A. The air conditioning system includes air cycle cooling packs and temperature control valve assemblies. (See figure 1.)

B. The air cycle cooling packs are located below the wing center section. Each pack consists of a primary heat exchanger, a secondary heat exchanger, an air cycle machine, a water separator and an anti-ice control.

C. The temperature control valve assemblies are located in the air conditioning distribution bay. The temperature control valves are mixing valves through which hot air, directly from the pneumatic system, and cold air, from the air conditioning packs, are mixed to obtain the desired cabin temperature. The valves may be manually or automatically controlled.

4. Air Conditioning Control and Indicating System

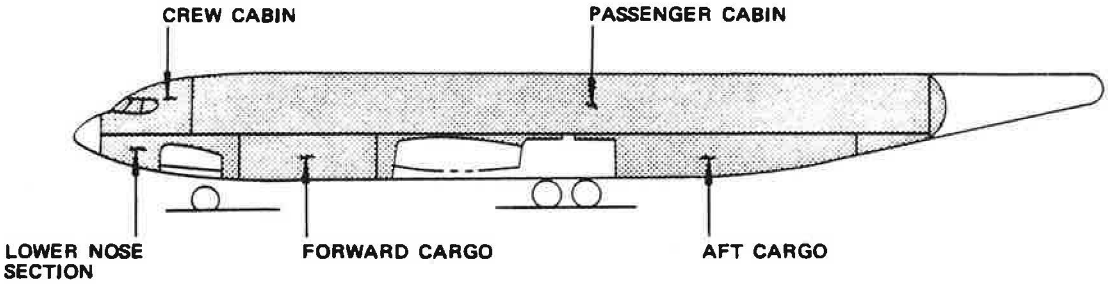
A. The air conditioning control and indicating system consist of temperature regulators, temperature selector, sensing elements for cabin, duct and ambient air temperature sensors, overheat controls and warning lights. These components provide automatic or manual control of cabin temperature.

5. Air Distribution System

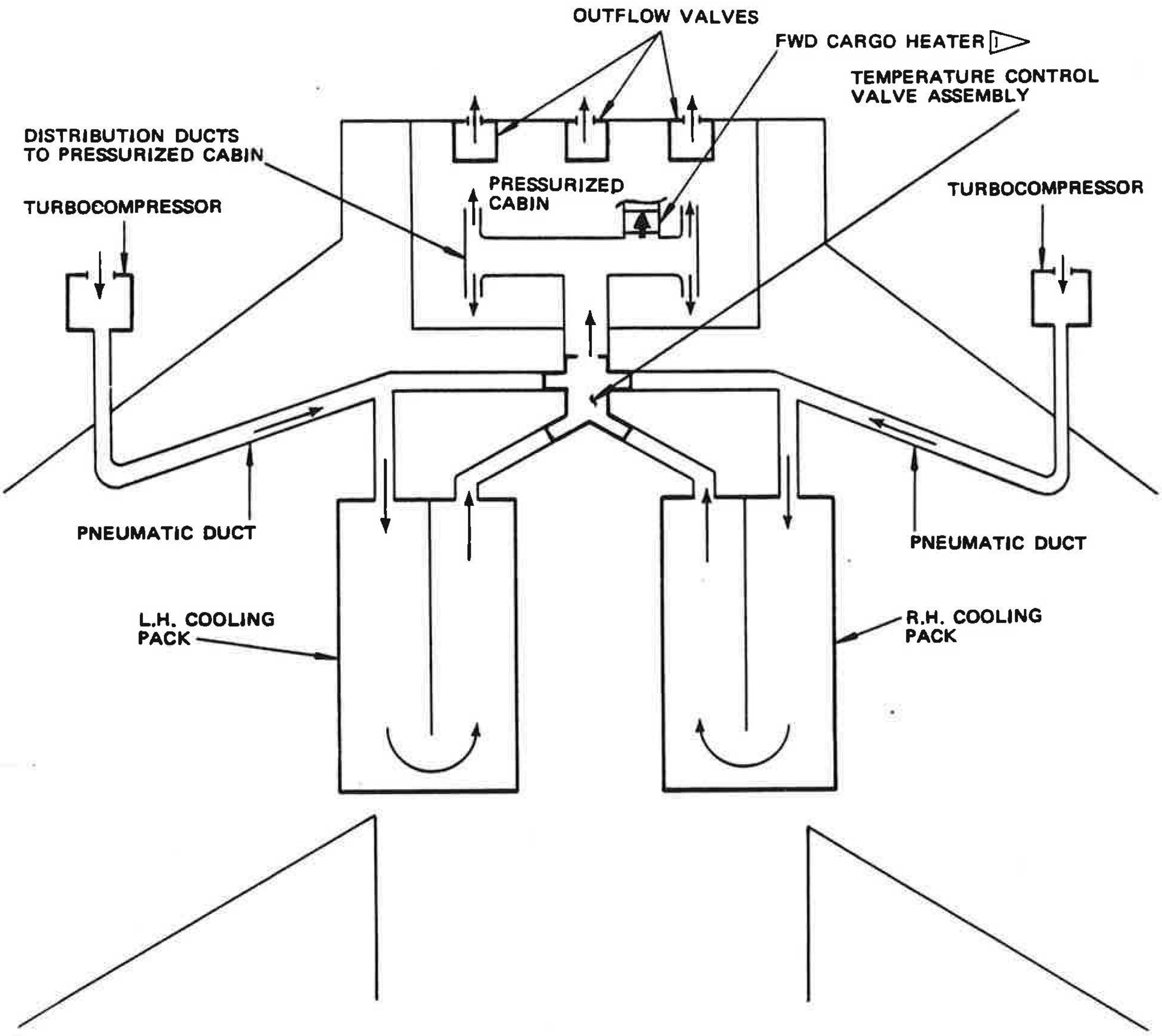
A. The air distribution system consists of the duct systems for directing conditioned air to the main and control cabins. The distribution system also includes the ducting to form the individual passenger air distribution system.

6. Heating System

A. Heating of the main cabin, control cabin, and cargo compartments is accomplished by controlled air distribution, electric heaters, and electric heating blankets.



PRESSURIZED AREA



1 *Not installed on all airplanes. Refer to cargo compartment heating system, 21-42-0 for effectivity.*

Air Conditioning System Schematic
Figure 1

MISCELLANEOUS PRESSURIZATION SYSTEM COMPONENTS - MAINTENANCE PRACTICES

1. Removal/Installation of Rotary Test Valves (TURBOJETS)

   A. Remove Static or Isobaric Rotary Test Valve (See figure 201.)

      (1) Open flight engineer's upper instrument panel, and locate valve on shelf behind automatic pressure controller.

      (2) Unscrew valve stem.

      (3) Detach two sensing line connections, cap and tag tube ends.

      (4) Remove valve by removing mounting screws.

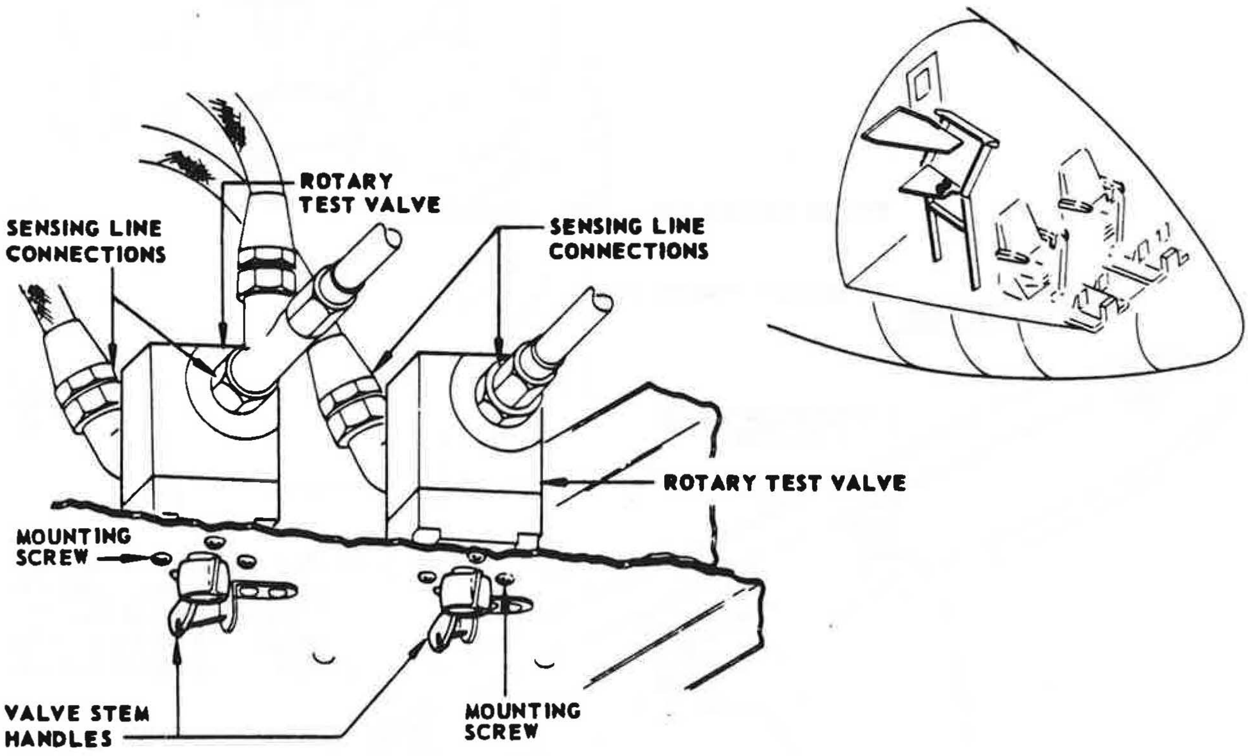
   B. Install Static or Isobaric Rotary Test Valve (See figure 201.)

      (1) Place valve body without stem in position on shelf behind automatic pressure controller and install valve mounting screws.

      (2) Remove caps from tube ends and attach sensing line connections.

      (3) Insert valve stem through hole in bracket and screw stem into valve.

      (4) Close flight engineer's upper instrument panel.



Rotary Test Valve Installation
Figure 201

2. Removal/Installation Filters

A. Remove Filters

NOTE: One filter is located on the manual control and one on each of the three outflow valves. (See figure 202.)

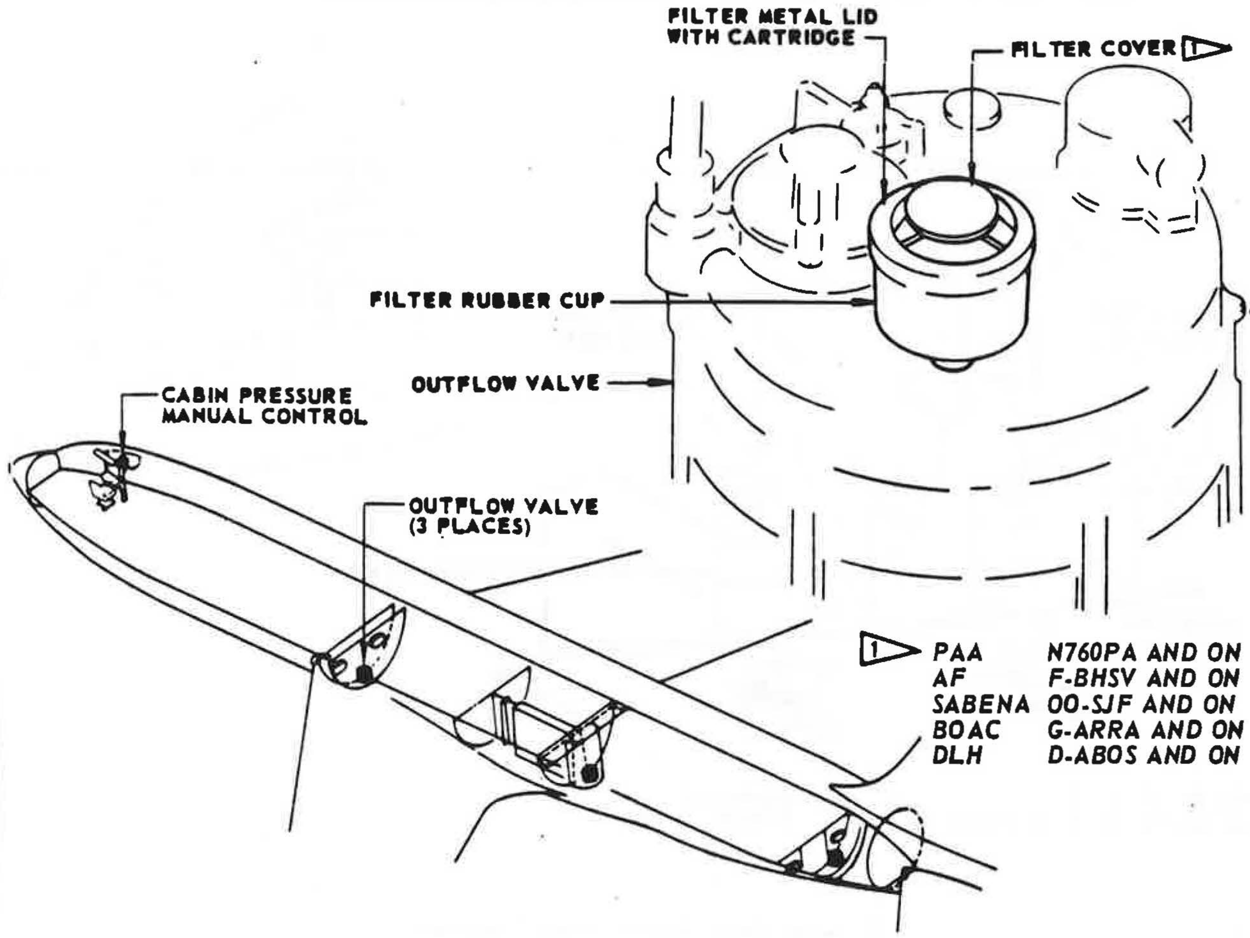
(1) Lift the cartridge out of the cup without tools.

NOTE: On airplanes PAA N760PA and on, AF F-BHSV and on, SABENA 00-SJF and on, BOAC G-ARRA and on, and DLH D-ABOS and on, a protective cover installed over the filter inlet must be removed along with the cartridge.

B. Install Filters (See figure 202.)

(1) Press new filter cartridge into cup without tools.

NOTE: On airplanes PAA N760PA and on, AF F-BHSV and on, SABENA 00-SJF and on, BOAC G-ARRA and on, and DLH D-ABOS and on, a protective cover is installed over the filter inlet. The legs of the cover should be slipped inside the rubber cup and the cup repositioned as necessary to insure a tight seal.



Filter Installation
Figure 202

3. Removal/Installation Cabin Altitude Warning Switch

A. Remove Cabin Altitude Warning Switch (See figure 203.)

(1) Unscrew two quick-release fasteners and lower flight engineer's upper panel.

(2) Disconnect switch electrical plug.

(3) Remove four screws attaching switch to hatrack.

(4) Remove switch.

B. Install Cabin Altitude Warning Switch (See figure 203.)

(1) Locate warning switch to underside of hatrack with terminal wires inboard.

(2) Secure switch to hatrack with four mounting screws.

(3) Connect switch electrical plug.

(4) Close flight engineer's upper panel and secure with two quick release fasteners.

4. Removal/Installation Cabin Altitude Warning Horn

A. Remove Cabin Altitude Warning Horn (See figure 203.)

(1) Remove mounting screws attaching horn assembly to mounting plate under the flight engineer's table.

(2) Remove nuts from two terminal studs at base of horn, remove wires from studs, and remove wires from horn through hole in case.

NOTE: Grommet in wire hole protects wires from being cut by edge of case and should be left in the case.

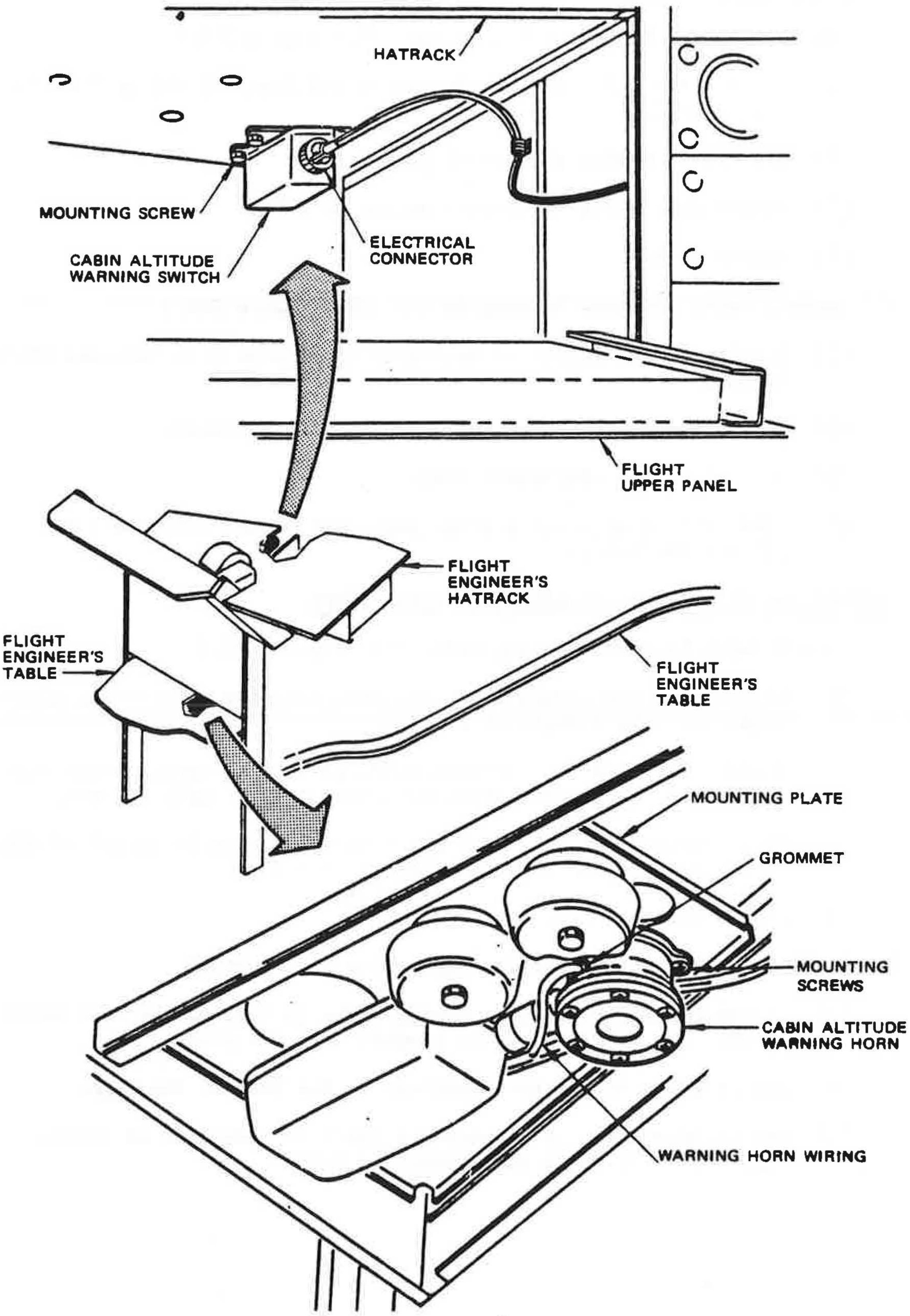
(3) Remove warning horn.

B. Install Cabin Altitude Warning Horn (See figure 203.)

(1) Thread warning horn wires through hole in side of the case being careful not to dislodge the grommet from the hole.

(2) Secure wires to the two terminals at the base of the horn.

(3) Secure horn assembly to mounting plate on underside of flight engineers table with three mounting screws.



Cabin Altitude Warning System Installation
Figure 203

5. Test Cabin Altitude Warning System

A. General

(1) Testing the cabin altitude warning system is accomplished during flight.

(2) Testing the altitude warning system requires decreasing cabin pressure below a comfortable level and should not be attempted with passengers aboard.

B. Flight Test Cabin Altitude Warning System

(1) At an airplane altitude above 11,250 feet move the manual controller to full decrease while watching the cabin altitude on the altimeter and differential pressure indicator.

(2) Horn should blow at 10,000 (± 1250) feet.

(3) Press cabin altitude warning horn cutout switch.

(4) Warning horn should become silent.

NOTE: Do not raise cabin altitude higher than required to perform test. Passenger service unit oxygen masks drop at approximately 14,000 feet cabin altitude.

C. Ground Test of Cabin Altitude Warning System

(1) Disconnect electrical plug of altitude warning switch.

(2) Install a jumper between pins A and B of airplane plug. Horn should blow.

(3) Press cabin altitude warning horn cutout switch. Horn should become silent.

(4) Remove jumper and reinstall electrical plug on altitude warning switch.

THRUST RECOVERY VALVES - MAINTENANCE PRACTICES

1. Removal/Installation Thrust Recovery Valves (See figure 201.)

   A. General

      (1) The three valves are located as follows: in the air conditioning distribution bay (access by removing aft bulkhead forward cargo compartment); in forward section of aft cargo compartment (access by removing shrouding installation) and aft of aft cargo compartment (access by removing aft cargo compartment aft bulkhead).

   B. Remove Thrust Recovery Valve (Typical)

      (1) Remove electrical connections to the thrust recovery valve.

      (2) Remove bonding jumper.

      (3) Detach ambient sensing line.

      (4) Remove Marman clamp around lower part of valve body.

      (5) Remove valve and gasket.

   C. Install Thrust Recovery Valve (Typical)

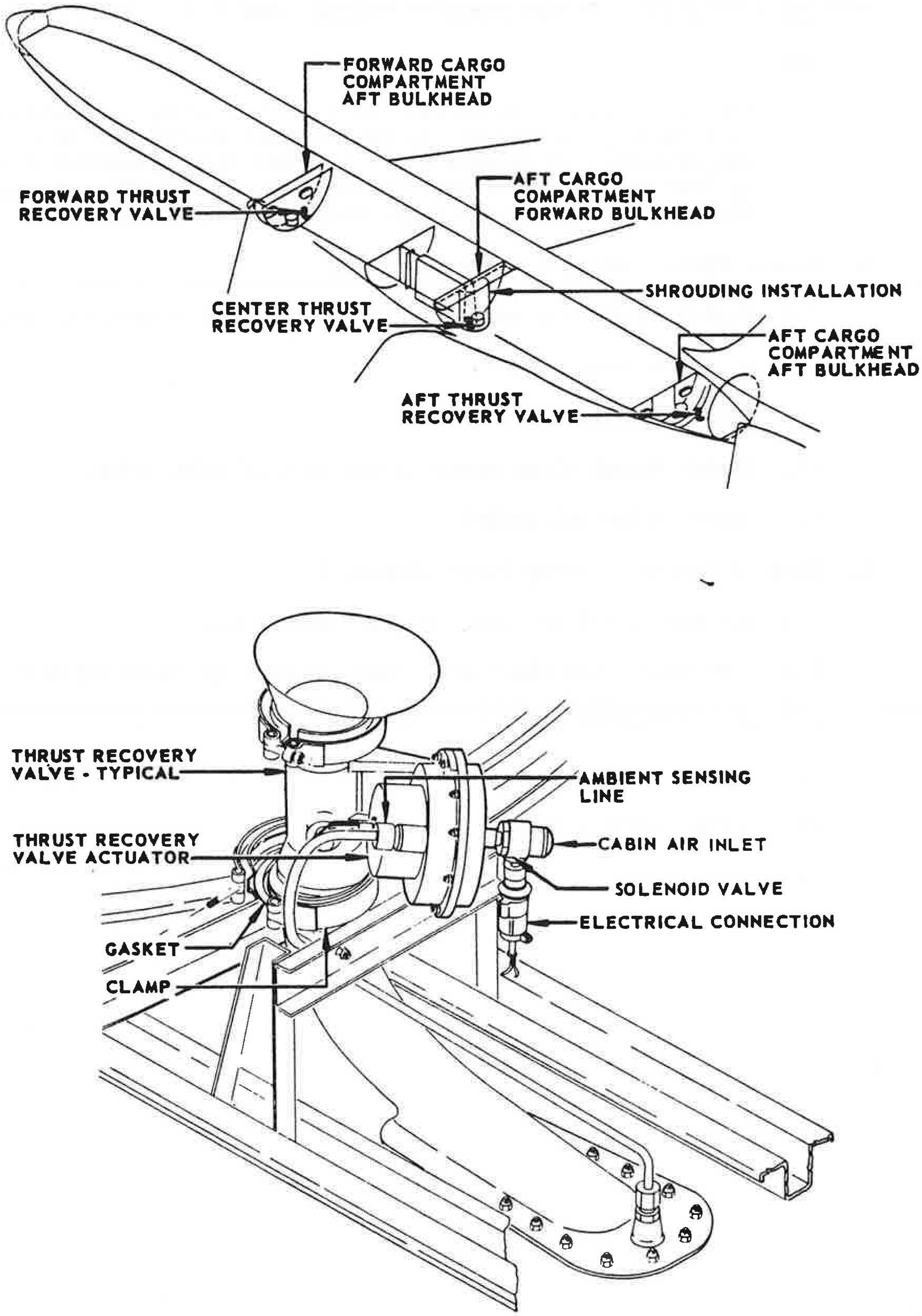
      (1) Set new gasket in place on valve body seat.

      (2) Move valve into place and attach to seat by fastening Marman clamp.

      (3) Attach electrical connections.

      (4) Attach ambient sensing line.

      (5) Attach bonding jumper.



Thrust Recovery Valve - Typical Installation
Figure 201

FORWARD CARGO COMPARTMENT
AFT WALL BLOWOUT PANEL - REMOVAL/INSTALLATION

1. Remove Forward Cargo Compartment Aft Wall Blowout Panel

   A. Remove screws around outside of frame and remove frame. (See figure 401.)

   B. Remove grille.

   C. Remove aft wall center panel.

   D. Remove blowout panel.

2. Install Forward Cargo Compartment Aft Wall Blowout Panel

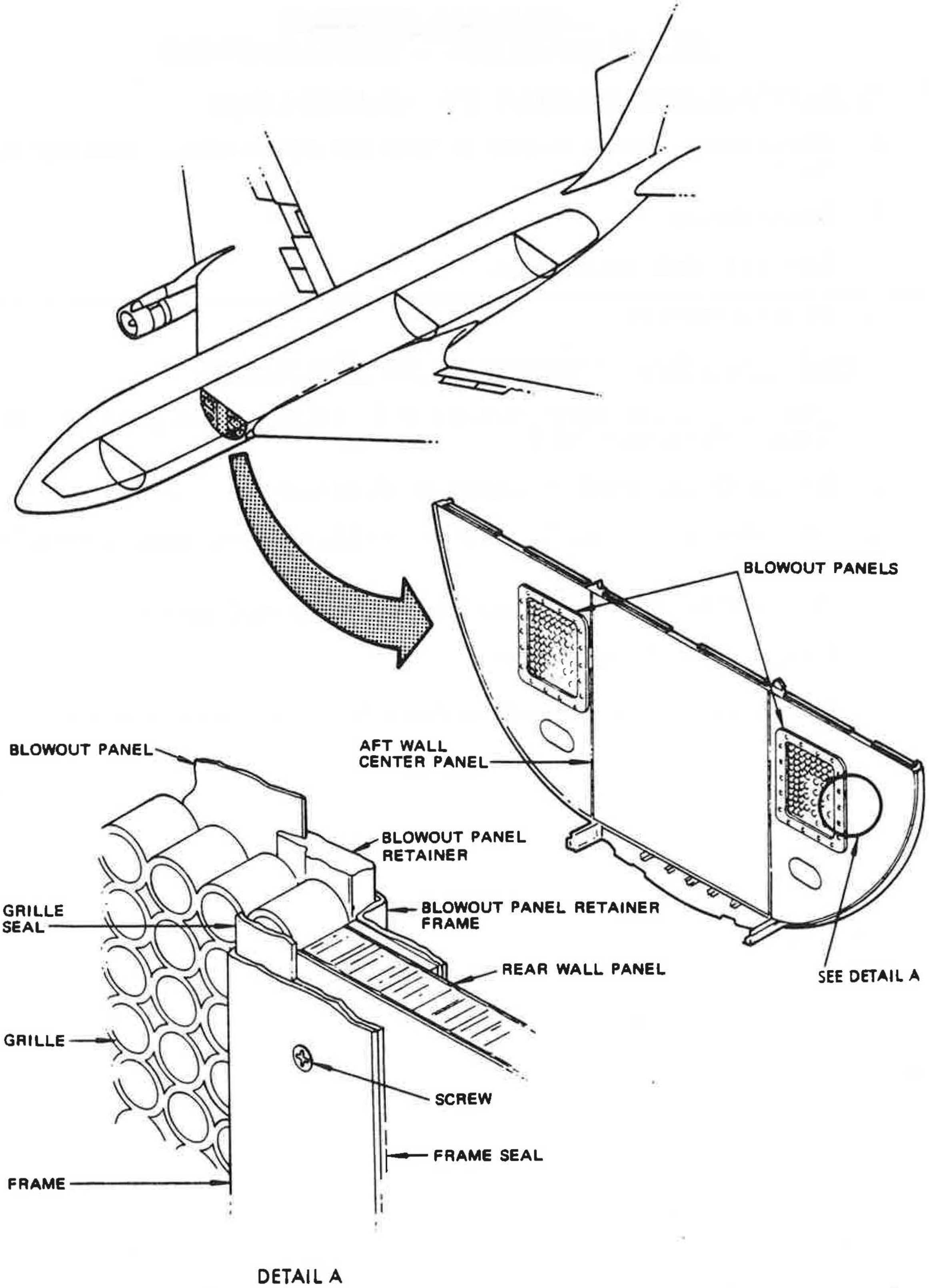
   A. Check that blowout panel retainer is bonded to blowout panel retainer frame. (See figure 401.)

   B. Install blowout panel in blowout panel retainer.

   C. Check that grille seal is bonded to grille and frame seal is bonded to frame.

   D. Place grille and frame in position and secure with screws.

   E. Install aft wall center panel.



Forward Cargo Compartment Aft Wall Blowout Panel
Figure 401

AFT CARGO COMPARTMENT AFT WALL BLOWOUT PANEL - REMOVAL/INSTALLATION

1. Remove Aft Cargo Compartment Aft Wall Blowout Panel

   A. Remove screws around outside of blowout panel assembly. (See figure 401.)

   B. Remove nuts, washers, and screws securing faceplate.

   C. Remove faceplate, filler and grille.

   D. Remove blowout panel from blowout panel retainer.

2. Install Aft Cargo Compartment Aft Wall Blowout Panel

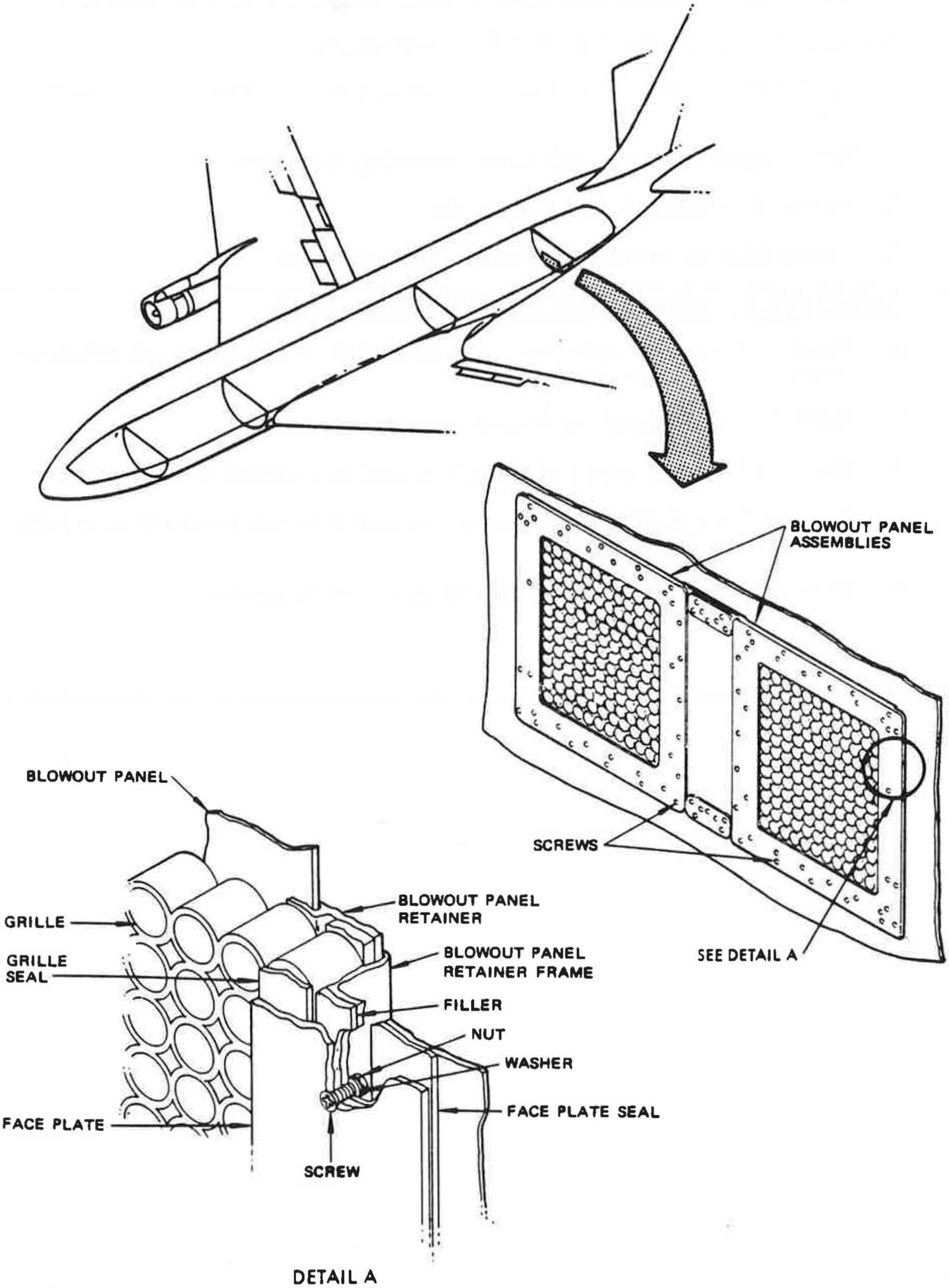
   A. Check that blowout panel retainer is bonded to blowout panel retainer frame. (See figure 401.)

   B. Install blowout panel in blowout panel retainer.

   C. Check that grille seal and faceplate seal are bonded to faceplate.

   D. Place grille, filler and faceplate in position and secure with screws, washers, and nuts.

   E. Install blowout panel assembly and secure with screws.



Aft Cargo Compartment Aft Wall Blowout Panel
Figure 401

FORWARD CARGO COMPARTMENT
PRESSURE EQUALIZATION VALVE - REMOVAL/INSTALLATION

EFFECTIVITY

Passenger/Cargo Convertible Airplanes

1. Remove Forward Cargo Compartment Pressure Equalization Valve

   A. Remove aft wall center panel to gain access to pressure equalization valve. (See figure 401.)

   B. Remove nuts and screws securing grille to aft bulkhead.

   C. Remove nuts and screws securing valve and gasket to aft bulkhead.

   D. Remove gasket and valve.

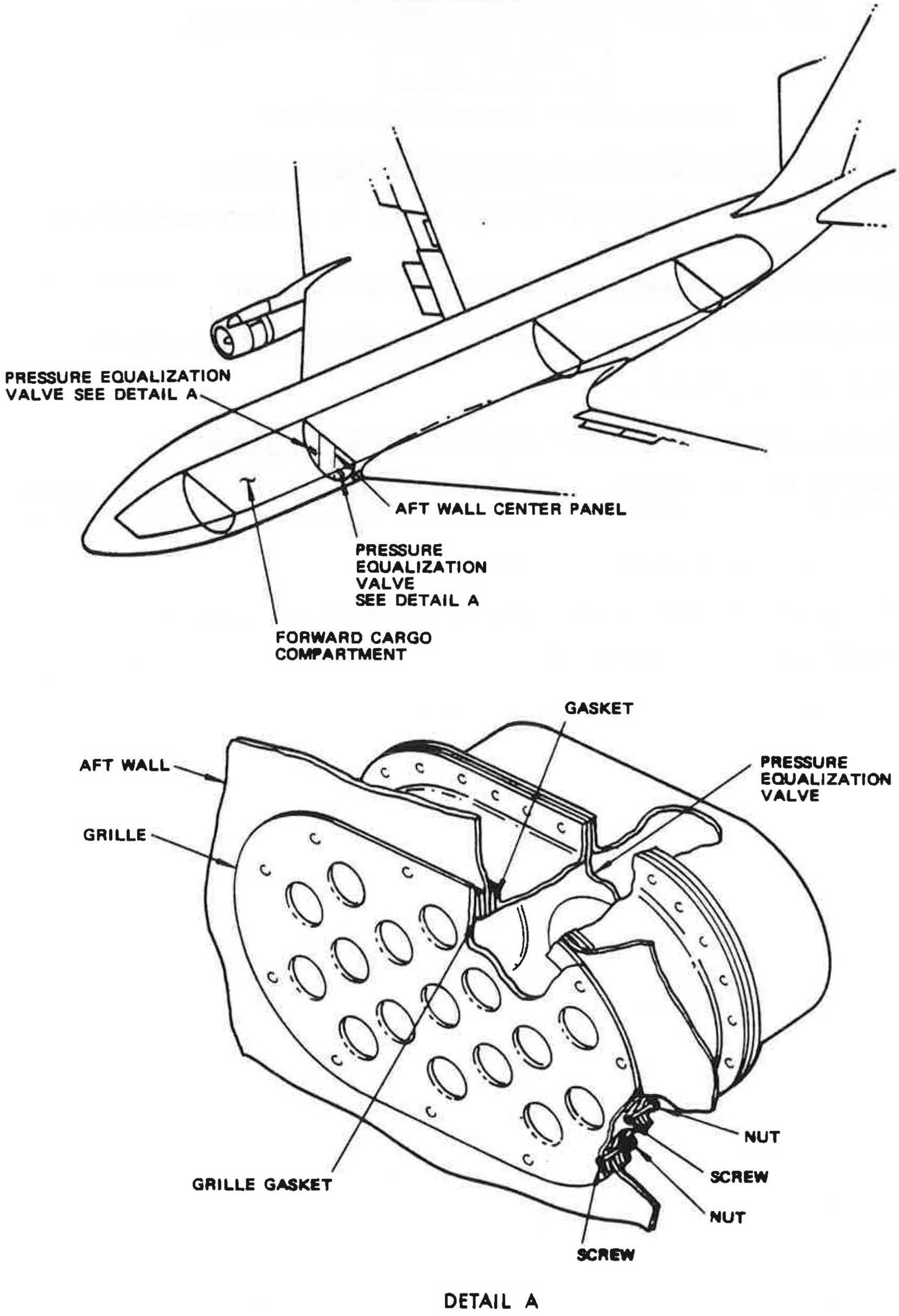
2. Install Forward Cargo Compartment Pressure Equalization Valve

   A. Place gasket and pressure equalization valve in place. Install screws and nuts securing gasket and valve to aft bulkhead. (See figure 401.)

   B. Check that grille gasket is bonded to grille.

   C. Place grille in position and secure with screws and nuts.

   D. Install aft wall center panel.



Forward Cargo Compartment Pressure Equalization Valve
Figure 401

WATER TANK SHROUD PRESSURE EQUALIZATION VALVE - REMOVAL/INSTALLATION

EFFECTIVITY

Passenger/Cargo Convertible Airplanes

1. Remove Water Tank Shroud Pressure Equalization Valve

   A. Remove screws securing water tank shroud panel and remove panel with pressure equalization valve attached. (See figure 401.)

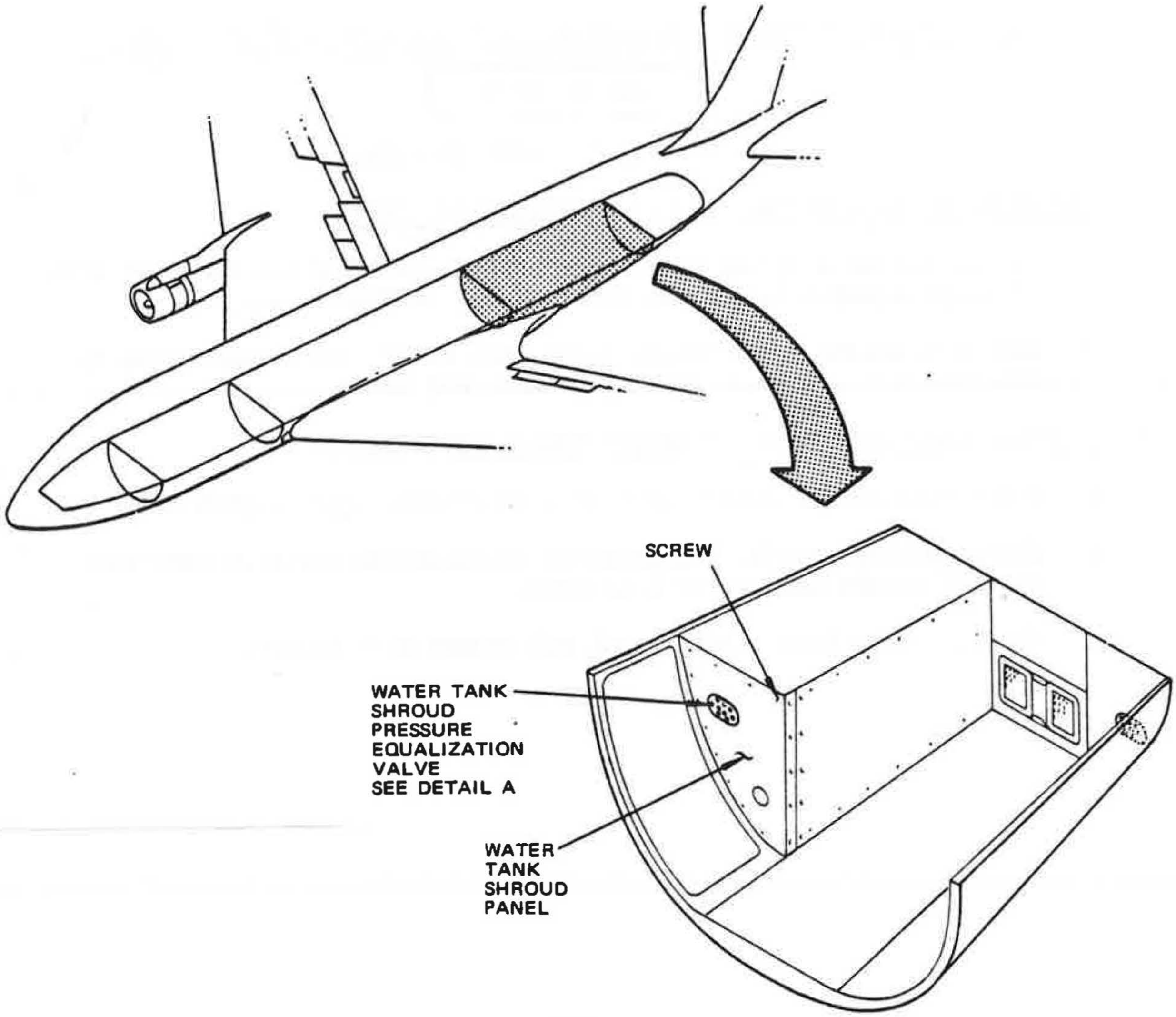
   B. Remove pressure equalization valve from water tank shroud panel by removing nuts, screws, grille, gasket, and valve.

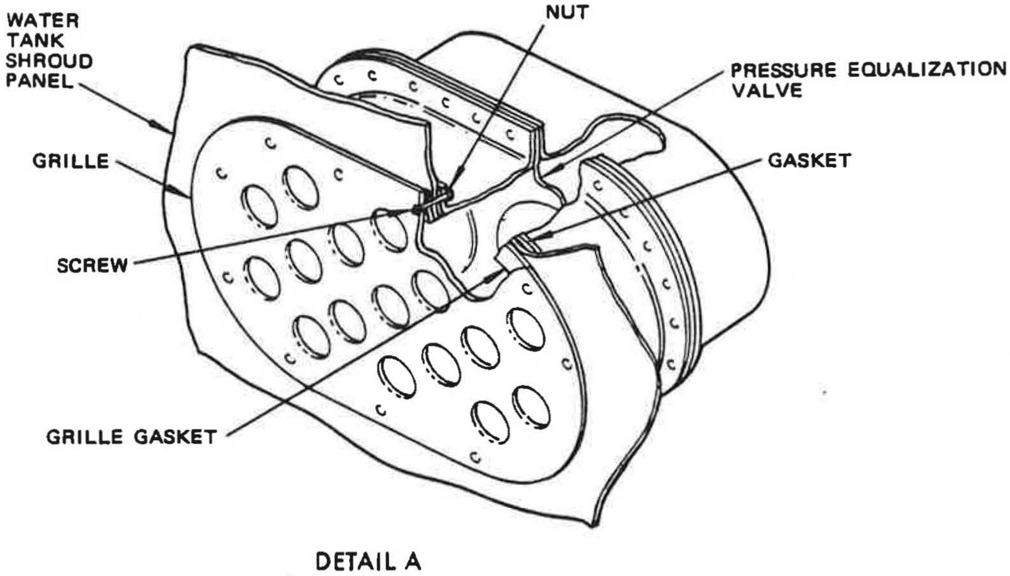
2. Install Water Tank Shroud Pressure Equalization Valve

   A. Check that grille gasket is bonded to grille. (See figure 401.)

   B. Place gasket, grille, and pressure equalization valve in position. Install screws and secure with nuts.

   C. Install water tank shroud panel and secure with screws.





DETAIL A

Water Tank Shroud Pressure Equalization Valve
Figure 401

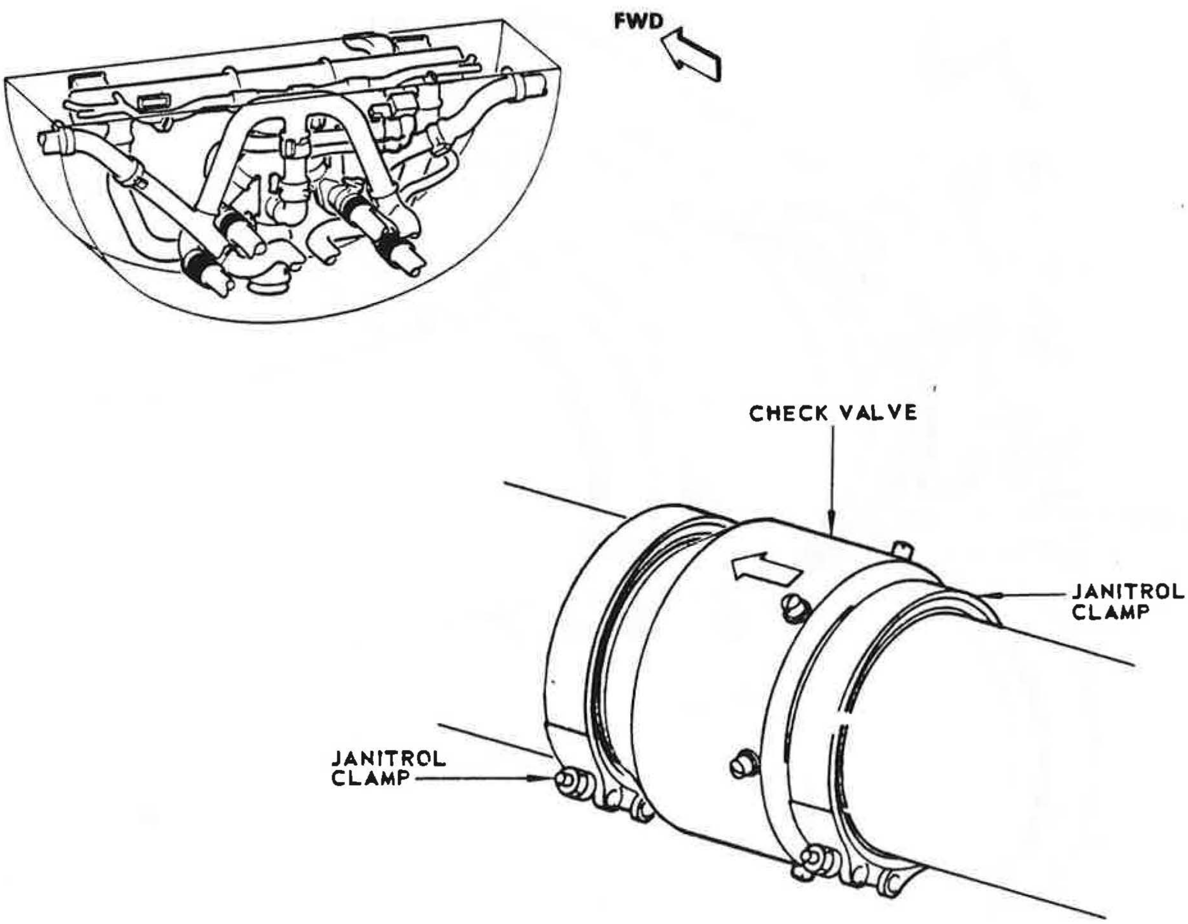
MISCELLANEOUS COMPONENTS - MAINTENANCE PRACTICES

1. Removal/Installation Air Conditioning System Check Valves

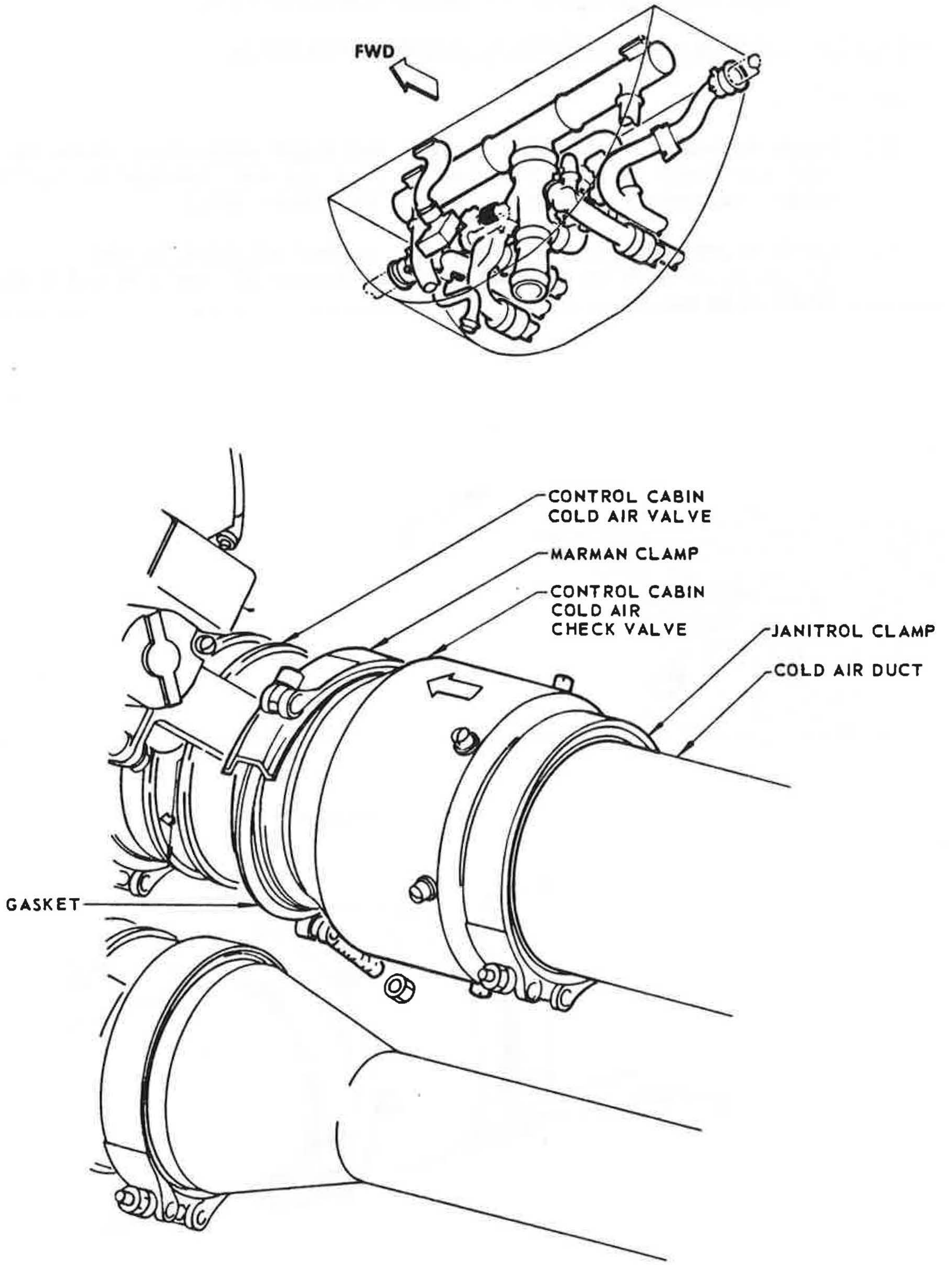
A. General

(1) Check valves are installed in left and right semi-conditioned and cold air ducts (figure 201) and in cold air duct leading to control cabin temperature control valve. (See figure 202.)

(2) Check valves must be installed with arrows pointing in the direction of airflow as indicated in figures 201 and 202 and with "TOP" side up.



Typical Check Valve Installation (Four Places)
Figure 201



Control Cabin Cold Air Check Valve Installation
Figure 202

2. Removal/Installation Air Conditioning Duct Adapter Section

A. Remove Air Conditioning Duct Adapter Section

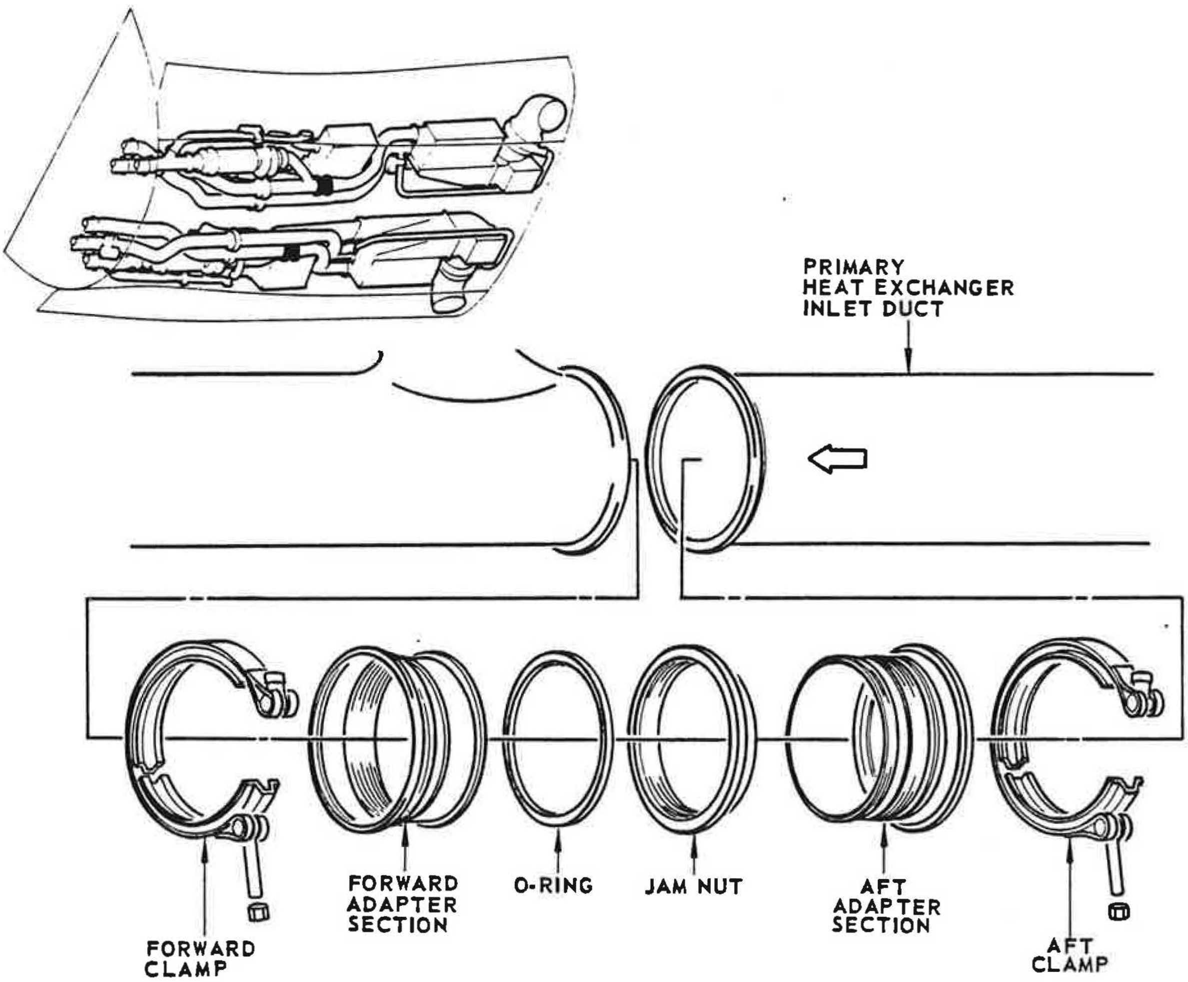
(1) Open air conditioning equipment bay door.

(2) Remove V-band clamps connecting adapter to ducting and remove adapter section. (See figure 201.)

B. Install Air Conditioning Duct Adapter Section

(1) Position adapter section and install with V-band clamps and lockwire as necessary.

(2) Close air conditioning equipment bay door.



Air Conditioning Duct Adapter Section Installation
Figure 203

3. Adjustment/Test Air Conditioning Duct Adapter Section

A. Equipment

(1) Wrench Assembly - F71268 or equivalent

B. Adjust Air Conditioning Duct Adapter Section

(1) Remove lockwire and back off jam nut.

(2) Adjust threaded sections as required to fit space between ducts.

(3) Position O-ring and lock adapter sections in position with jam nut. Torque to 100 (± 10) pound-inches with F71268 wrench or equivalent.

(4) Lockwire jam nut to threaded section.

END

AIR CYCLE MACHINE - MAINTENANCE PRACTICES

1. Unit Servicing Air Cycle Machine

   A. Service Air Cycle Machine (See figure 204.)

      (1) Check oil level. (See instruction plate.)

      (2) Refill with oil, MIL-L-6085.

2. Removal/Installation Air Cycle Machine

   A. Remove Air Cycle Machine

      (1) Open the air conditioning equipment bay door.

      (2) Remove four Marman clamps, the first on the turbine inlet duct, the second on the compressor outlet duct, the third on the duct to water separator, the fourth on the flexible duct from the primary heat exchanger. Remove O-rings. (See figures 203 and 204.)

      (3) Disconnect oil vent line by removing two clamps and disconnecting the vent line at the first joint forward of the machine. (See figure 204.)

      (4) Support air cycle machine.

      (5) Remove one pin from outboard and one pin from inboard sway brace, supporting machine. (See figures 202, 203, and 204.)

      (6) Remove four attaching bolts, one in each upper corner of the machine. (See figures 201 and 202.)

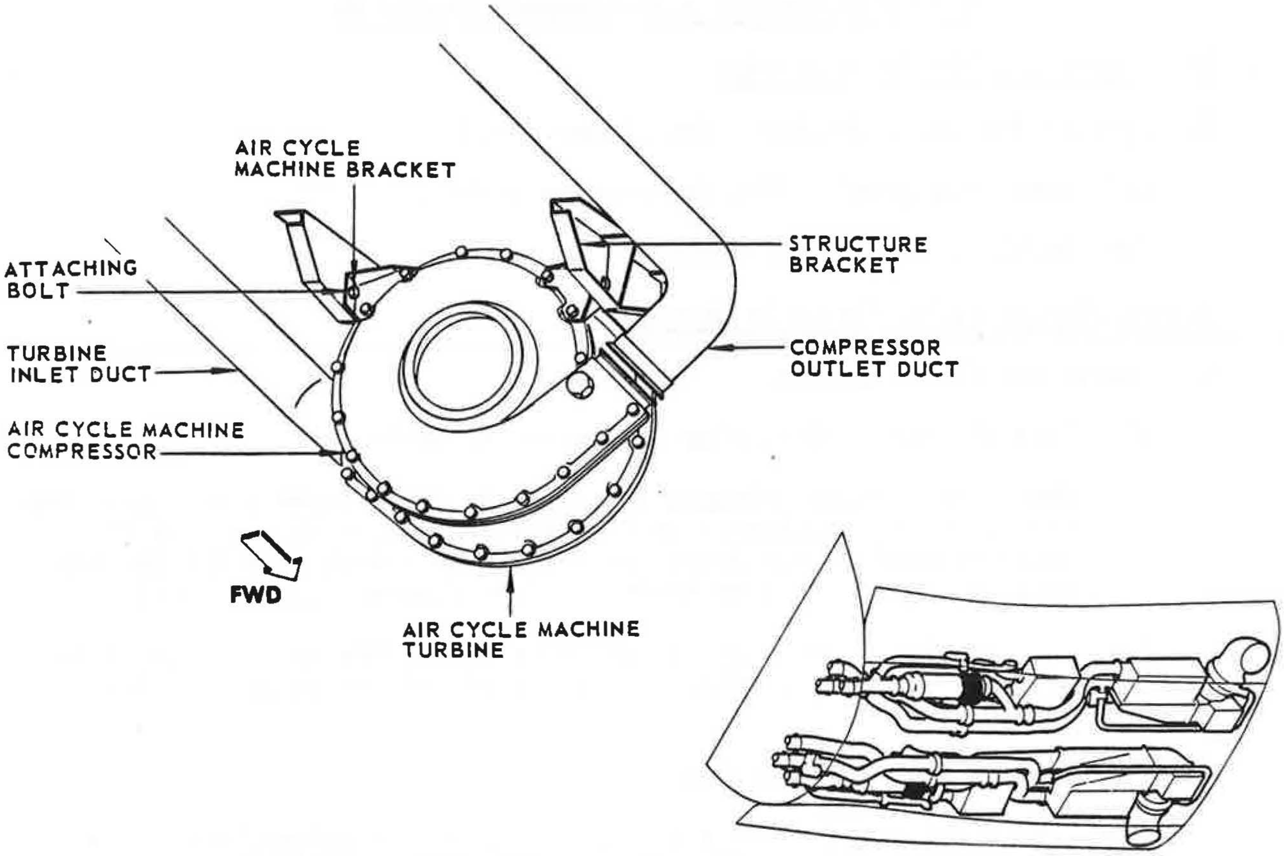
      (7) Lower and remove air cycle machine.

   B. Install Air Cycle Machine

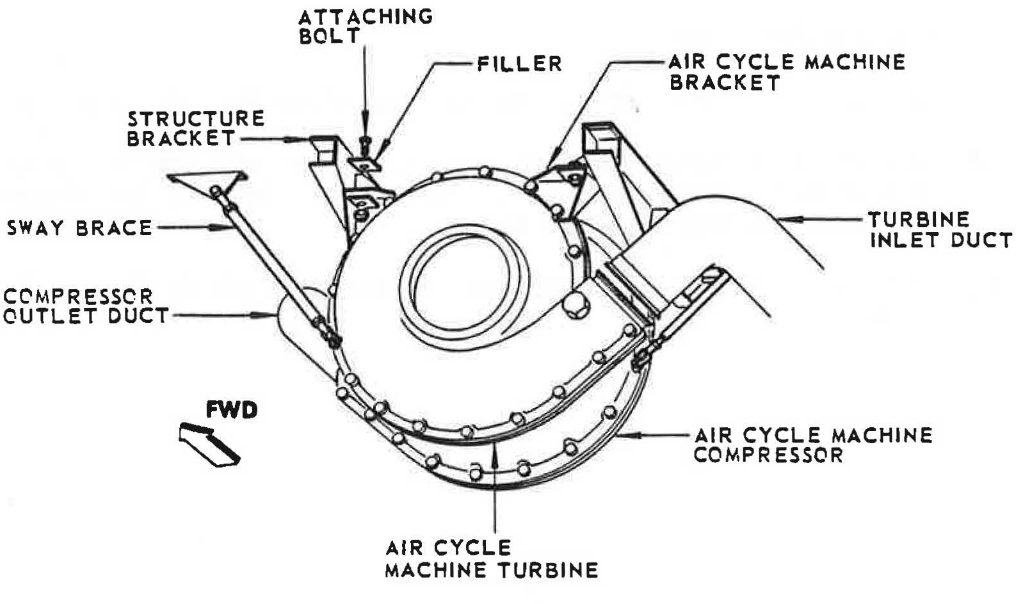
      (1) Remove all temporary covers and caps from the air cycle machine.

      (2) Remove from replacement air cycle machine any bracket sections equivalent to any left in the airplane. Install the removed sections on the replaced machine.

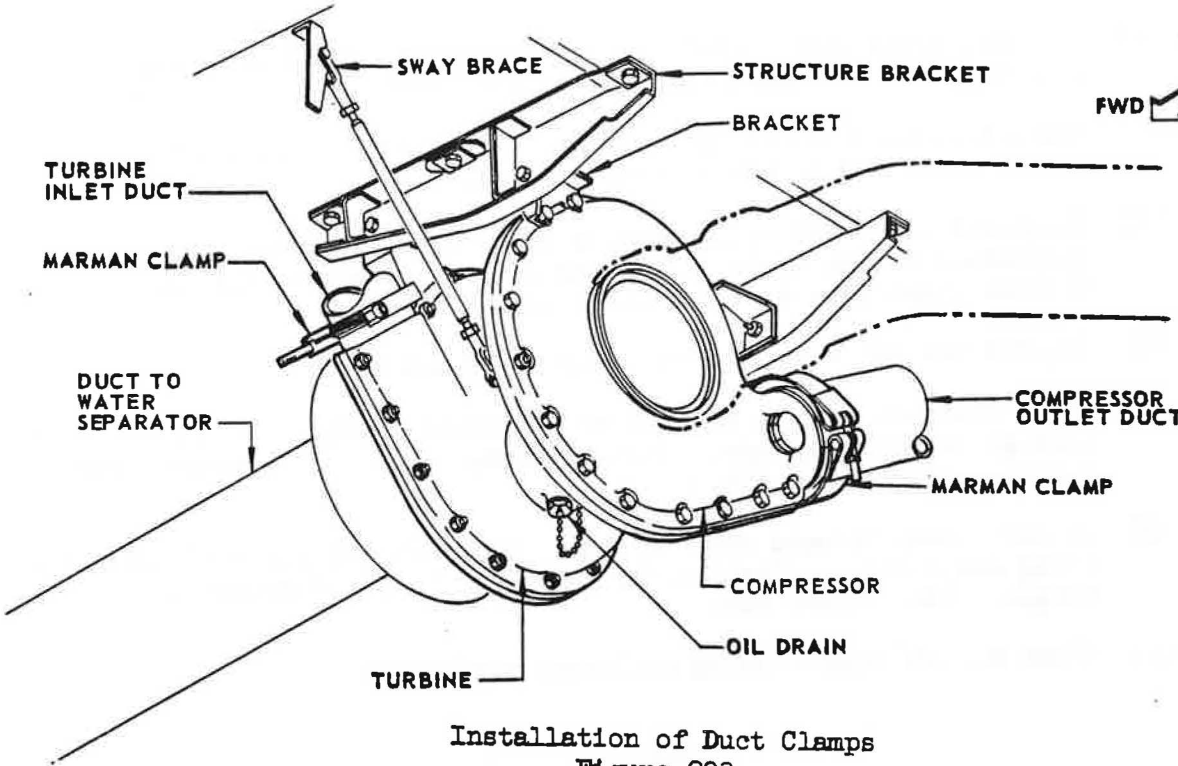
      (3) Connect oil vent line section to machine vent fitting. (See figure 204.)



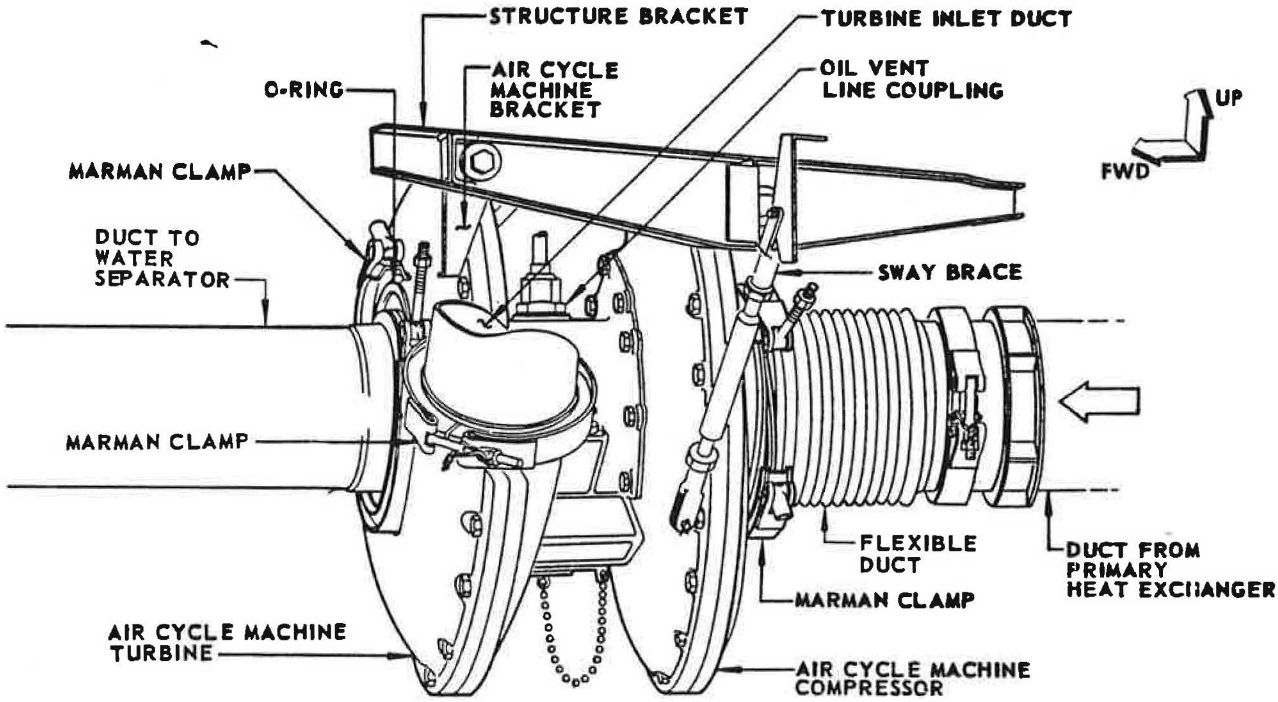
Installation of Support Bolts and Compressor Connection
Figure 201



Installation of Supports
Figure 202



Installation of Duct Clamps
Figure 203



Air Cycle Machine Installation
Figure 204

(4) Lift air cycle machine into place and attach sway braces and brackets without tightening bolts. (See figures 201, 202 and 203.)

(5) Connect forward end of oil vent line to section forward of machine, fasten one clamp to aft section of line.

(6) Align and clamp air cycle machine to turbine inlet and compressor outlet ducts, using new O-rings in Marman clamps. Tighten clamp nuts to 80-90 pound-inches torque.

(7) Tighten bracket bolts. (See figures 203 and 204.)

(8) Clamp flexible duct to aft end of air cycle machine using new O-rings in Marman clamps. Tighten clamp nut to 25-30 pound-inches torque. (See figure 204.)

(9) Install clamp between duct to water separator and air cycle machine, using new O-rings. Tighten the clamp nut to 25-30 pound-inches torque. (See figure 204.)

(10) Close the air conditioning equipment bay door.

END

SECONDARY HEAT EXCHANGER - MAINTENANCE PRACTICES

1. Removal/Installation Secondary Heat Exchanger

A. Remove Secondary Heat Exchanger

(1) Open the air conditioning equipment bay door.

(2) Remove primary heat exchanger inlet duct by removing Janitrol clamp at aft end near primary heat exchanger, clamp between turbofan shutoff valve and branch duct, Janitrol clamp on forward end of primary heat exchanger inlet duct, and six bolts on support clip.

(3) Remove primary heat exchanger outlet duct by removing Janitrol clamp on aft end near primary heat exchanger and clamp connecting forward part of duct to adapter section.

(4) Remove Y-duct forward of primary heat exchanger exhaust duct by removing Marman clamp connecting air cycle machine to one branch of the Y-duct, removing clamp connecting anti-icing control valve to control valve duct and removing clamp connecting other Y-duct branch to forward air conditioning duct. (See 21-2-21)

(5) Remove secondary heat exchanger inlet and outlet ducts by disconnecting two Janitrol clamps at forward end of exchanger and two Marman clamps at air cycle machine compressor outlet and turbine inlet. Remove O-rings on Marman clamps. (See figure 203.)

(6) On turbojet airplanes, disconnect three thermal switch electrical connections. On turbofan airplanes, disconnect two thermal switch electrical connections.

(7) Support secondary heat exchanger.

(8) Remove two bolts, one from each of two support brackets, on top inboard side of exchanger. (See figure 201.)

(9) Remove V-band clamps connecting heat exchanger outboard side to structure. (See figure 202.)

(10) Slide exchanger with cooling air exhaust duct about one inch forward, then lower and remove.

(11) Remove cooling air duct from exchanger (if necessary), by removing 38 flange bolts. Remove gasket. (See figure 201.)

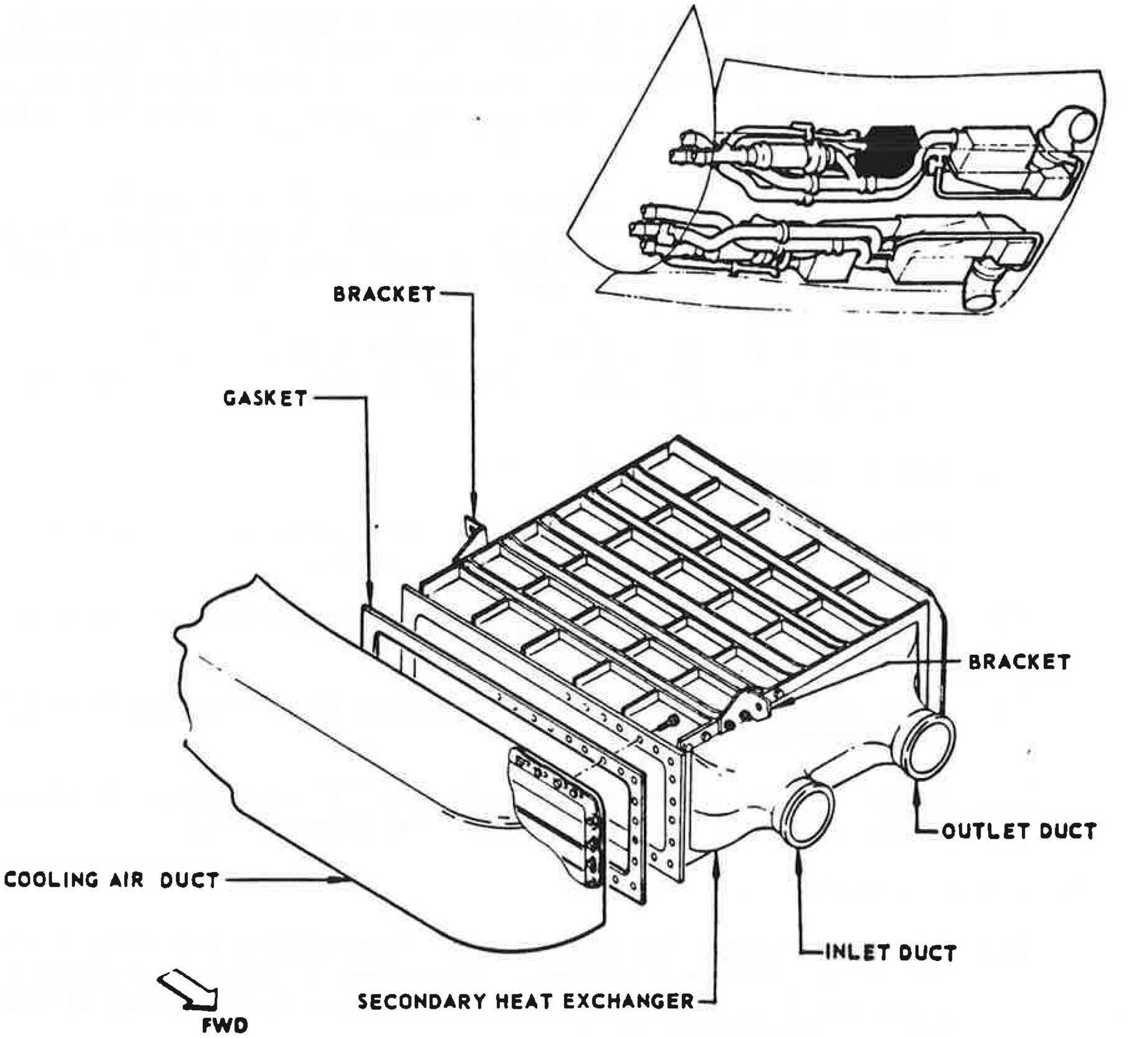
B. Install Secondary Heat Exchanger

(1) If heat exchanger has been detached from cooling air duct, cement new gasket in place with synthetic rubber cement MIL-L-4003 Grade I or equal quality, and attach duct to exchanger by fastening 38 flange bolts. (See figure 201.)

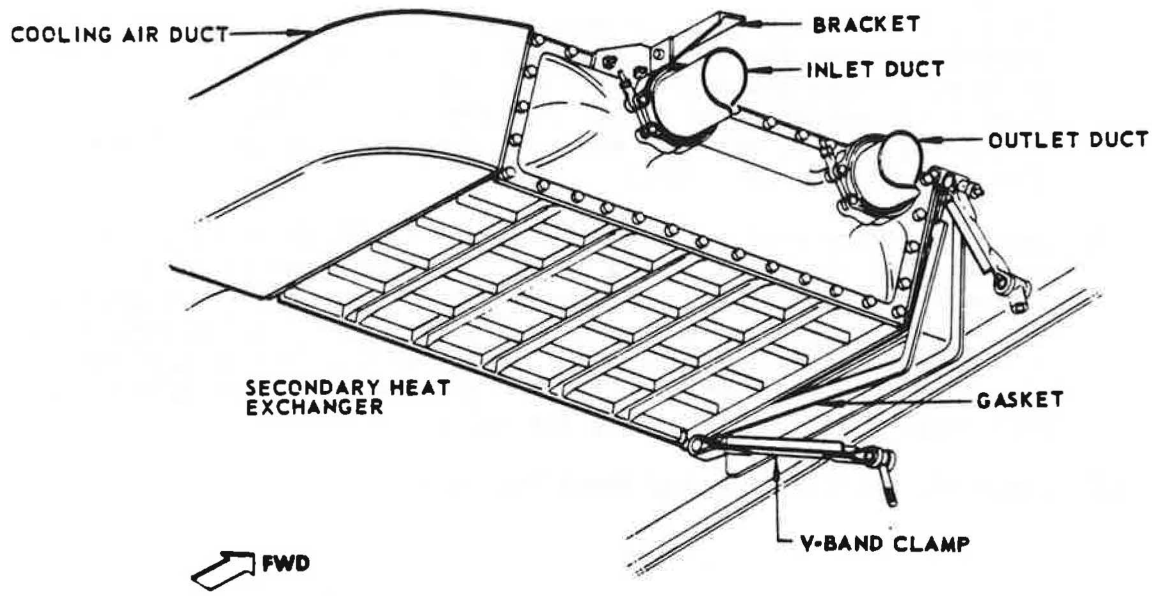
(2) Install two support clips on top inboard side of exchanger. Cement new gasket on exchanger outboard side with MIL-C-4003 or equal. (See figure 201.)

(3) Lift exchanger up to about one inch forward of installed position, slide back into position, fasten V-band clamp on outboard side and attach exchanger to two brackets on top inboard side by fastening one bolt in each bracket. (See figure 201, 202.)

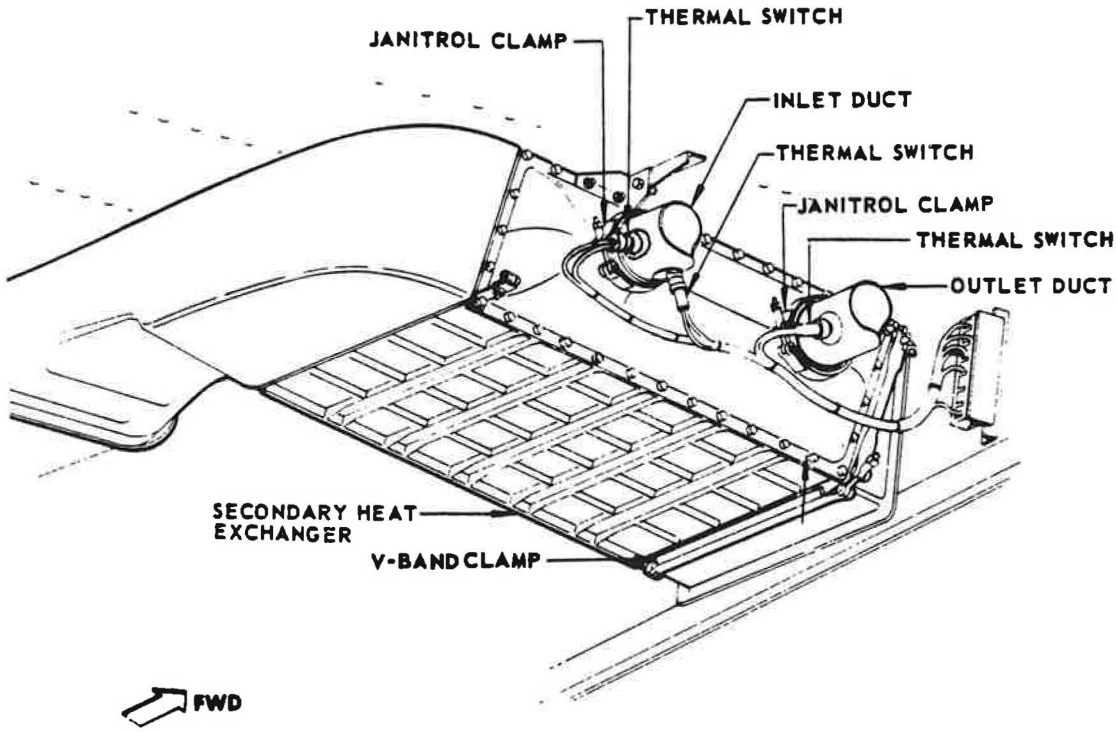
(4) Install secondary heat exchanger inlet and outlet ducts by fastening two Janitrol clamps attaching ducts to exchanger, fastening two Marman clamps attaching ducts to air cycle machine compressor outlet and turbine inlet, using new O-rings. On turbojet airplanes, connect three thermal switch electrical connections. On turbofan airplanes, connect two thermal switch electrical connections. (See figure 203.)



Installation of Gasket and Cooling Air Duct
Figure 201



Installation of Outboard Gasket and Clamp
Figure 202



Secondary Heat Exchanger Installation
Figure 203

(5) Install Y-duct forward of primary heat exchanger exhaust duct by fastening Marman clamp attaching one Y-branch to air cycle machine, using new O-ring and fastening clamp attaching other Y-branch to forward air conditioning duct, fastening Marman clamp attaching anti-icing control valve to control valve duct, using new O-ring. (See 21-2-21, figure 203.)

(6) Install primary heat exchanger inlet and outlet ducts by fastening two Janitrol clamps attaching ducts to primary heat exchanger, fastening two Janitrol clamps fastening adapter section to primary heat exchanger exhaust duct and to Y-duct, fastening Janitrol clamp attaching inlet duct to the duct forward of it, fastening clamp attaching turbofan shutoff valve to its branch duct and attaching duct support clip by fastening six bolts.

(7) Close air conditioning equipment bay door.

END

WATER SEPARATOR - MAINTENANCE PRACTICES

1. Removal/Installation Water Separator

   A. Remove Water Separator

      (1) Open the air conditioning equipment bay door.

      (2) Disconnect two control lines from anti-icing thermostat on forward end of separator. Disconnect other end of one of these control lines at the anti-icing valve. (See figures 202 and 203.)

      (3) Remove Marman clamp attaching anti-icing valve to separator.

      (4) Remove Marman clamp attaching separator to duct to air cycle machine. (See figure 202.)

      (5) Remove Marman clamp attaching separator to forward duct. (See figure 202.)

      (6) Support separator. Remove strap hanger on forward end.

      (7) Remove separator.

      (8) Remove thermostat for use on new separator.

   B. Install Water Separator

      (1) Clamp anti-icing valve control line to separator and attach thermostat. (See figure 201 and 202.)

      (2) Lift separator into place. Attach strap hanger on forward end. Separator may have to be rotated to fit anti-icing valve mounting. In that case, remove Marman clamp on water separator, twist separator halves to proper position, install Marman clamp and run leakage test.

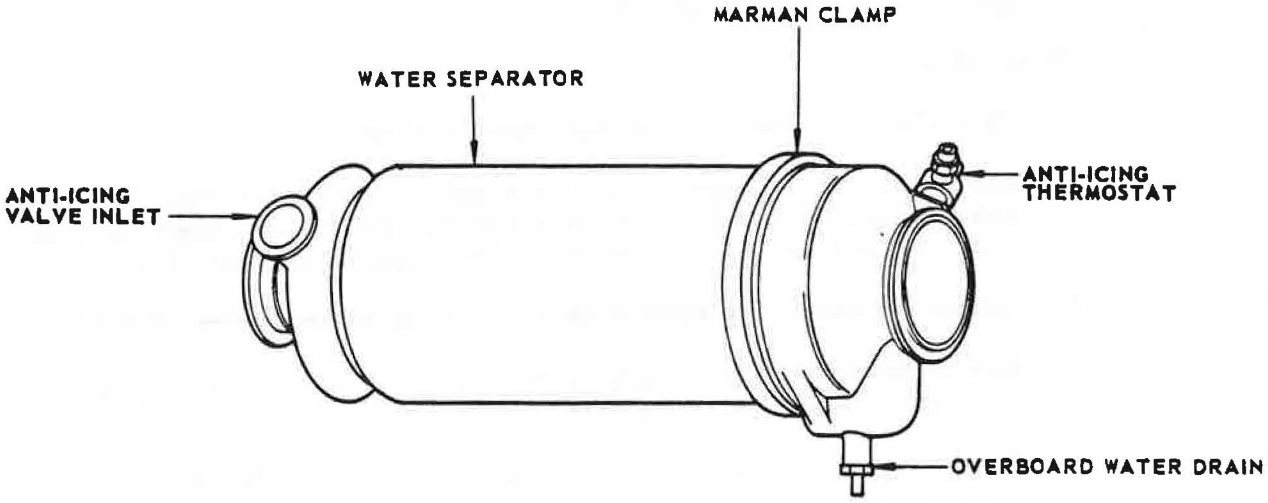
      (3) Insert new O-ring and fasten Marman clamp attaching separator to duct to air cycle machine.

      (4) Insert new O-ring and fasten Marman clamp attaching separator to forward duct. (See figure 202 and 203.)

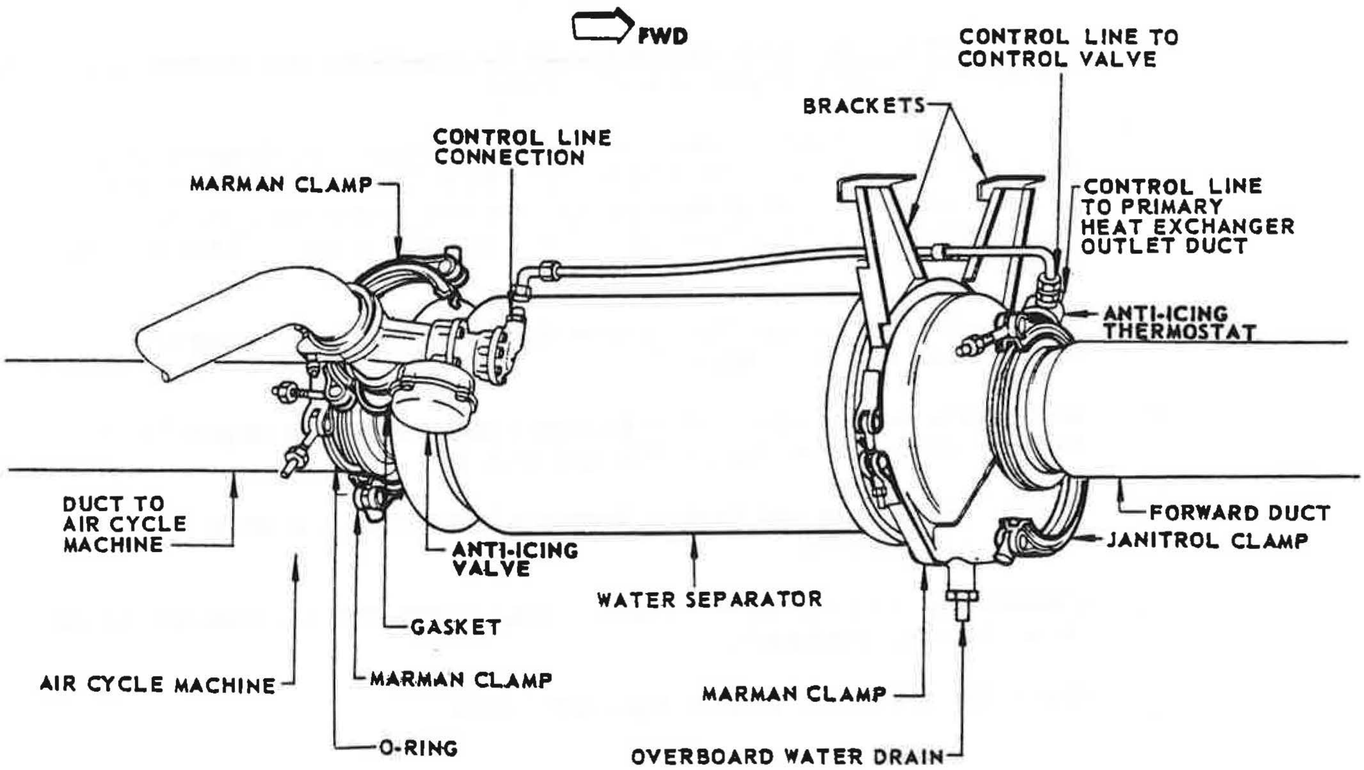
      (5) Insert new O-ring and fasten Marman clamp attaching anti-icing valve to separator.

      (6) Connect one control line to anti-icing valve and two control lines to anti-icing thermostat.

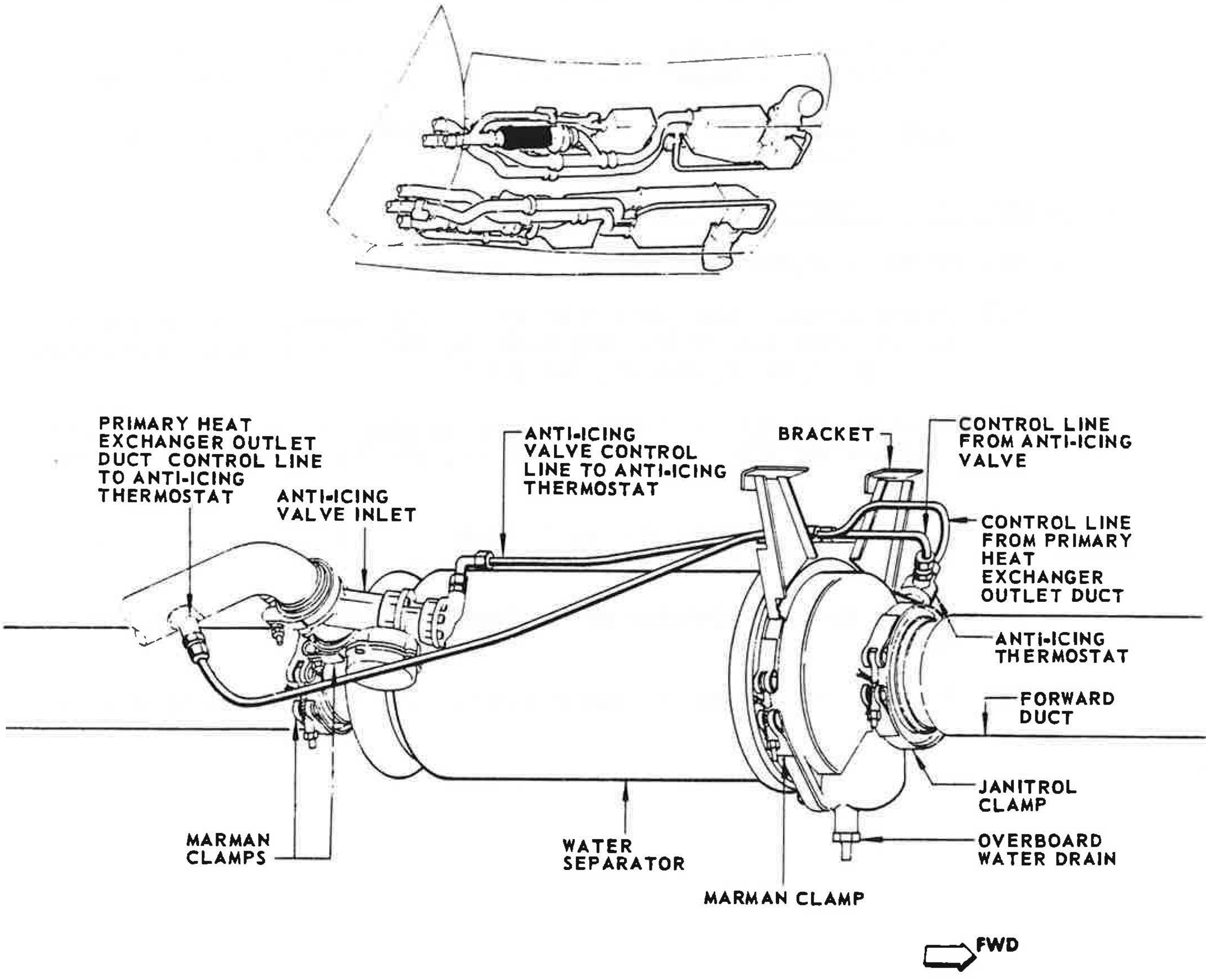
      (7) Close the air conditioning equipment door.



Water Separator Assembly
Figure 201



Installation of Separator Clamps and Tubing
Figure 202



Water Separator Installation
Figure 203

2. Adjustment/Test Water Separator

A. Leakage Test Water Separator

(1) Cap all ports, including water drain and thermostat port.

(2) Subject water separator to an internal air pressure of 16 ± 2 psig. The external leakage shall not exceed .3 pounds air per minute.

NOTE: Leakage test is performed when water separator screen has been replaced. (See following point 3. A. (5)

3. Approved Repair Water Separator

A. Replace Water Separator Screen

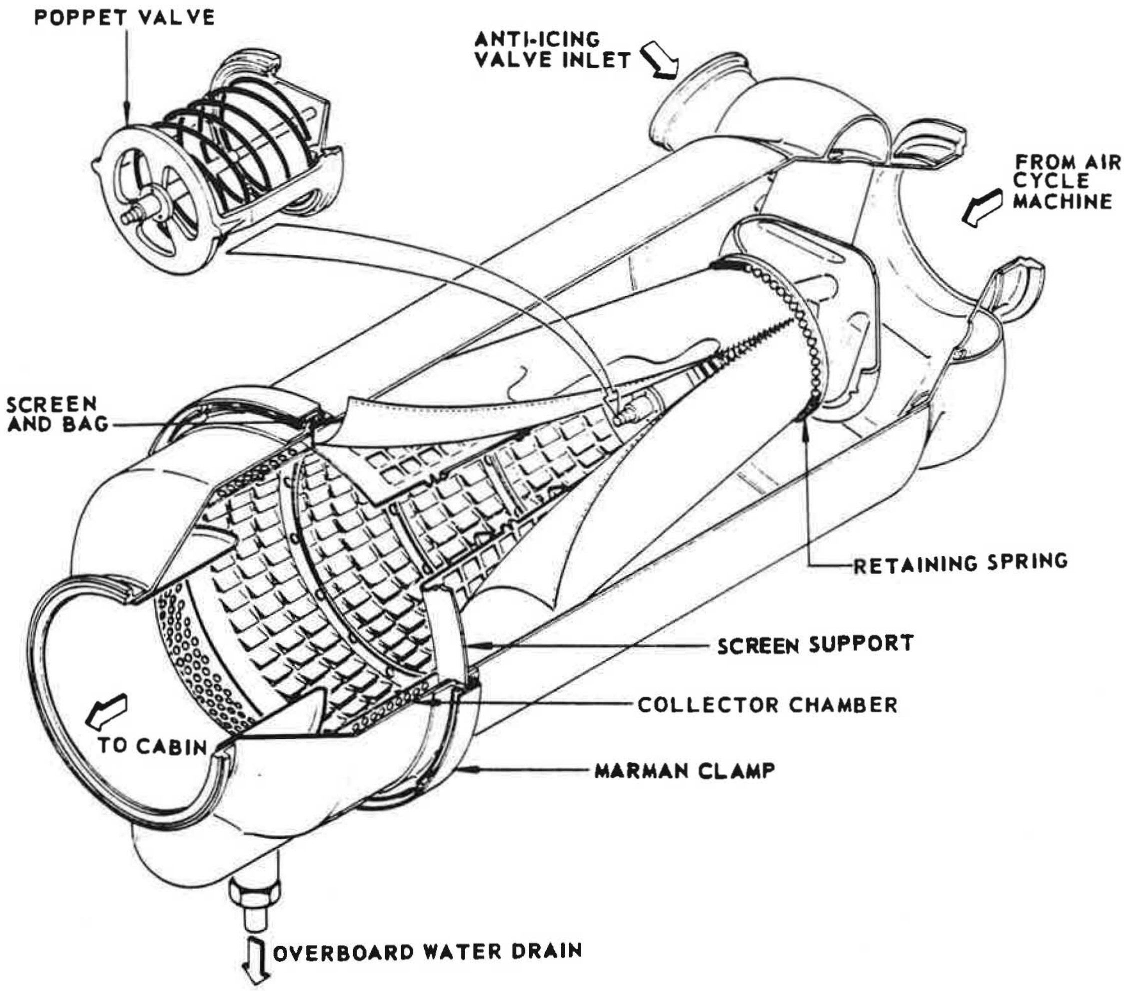
(1) Remove Marman clamp (with O-ring) holding together the two parts of the water separator. Separate the sections to expose the screen and bag. (See figures 203 and 204.)

(2) Unfasten the spring loaded chain which ties both ends of the screen in place and slide the screen and bag off its frame. (See figure 204.)

(3) Slide the new screen and bag in place over the frame and fasten the spring loaded chain over the screen ends.

(4) Rejoin the two separator parts, inserting O-ring, fasten Marman clamp.

(5) Perform leakage test of water separator. (See preceeding point 2.)



Water Separator Screen Replacement
Figure 204

END

ANTI-ICING CONTROL VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Anti-Icing Control Valve

   A. Remove Anti-Icing Control Valve

      (1) Open the air conditioning equipment bay access door.

      (2) Disconnect control line. (See figure 201.)

      (3) Remove Marman clamp attaching control valve to water separator. Remove gasket.

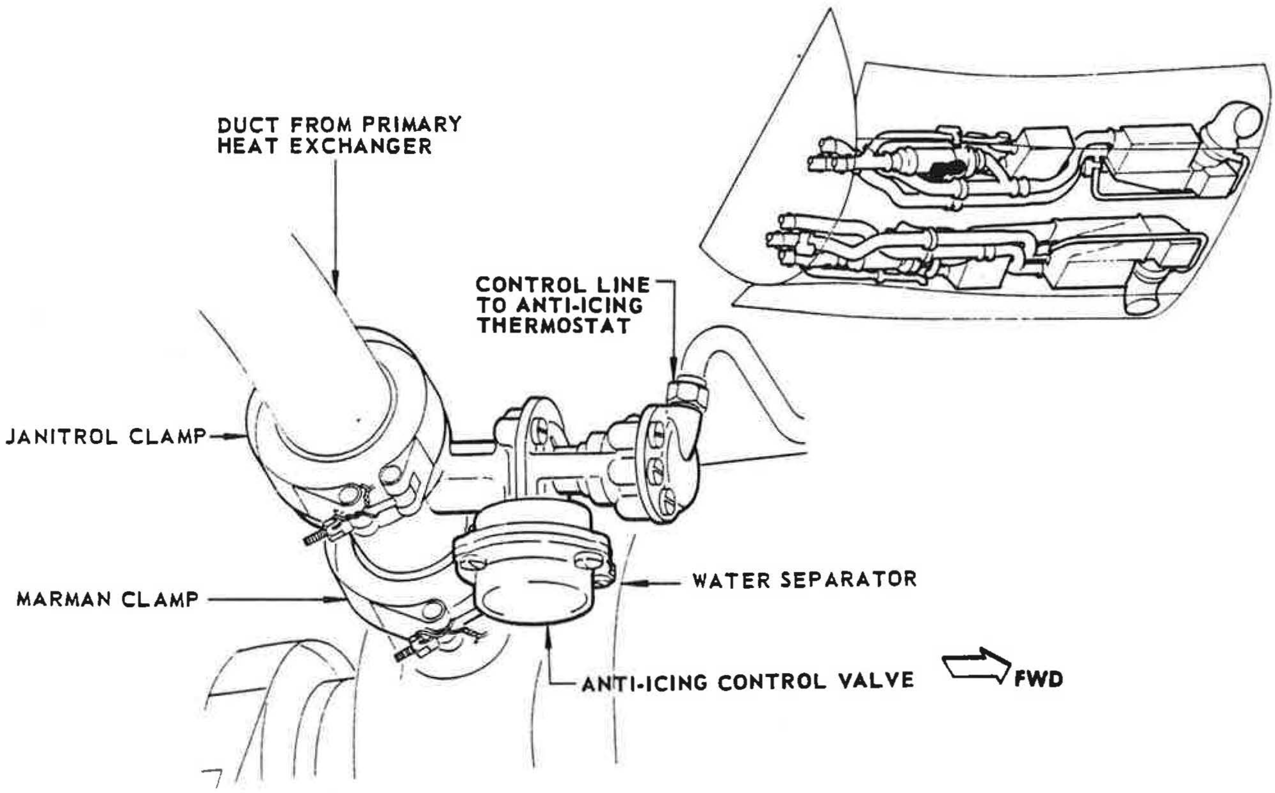
      (4) Remove water separator. (See 21-2-51)

      (5) Remove Janitrol clamp attaching control valve to duct.

      (6) Remove control valve.

   B. Install Anti-Icing Control Valve

      (1) Set valve in place against duct end, using a new gasket. The airflow direction arrow should point away from the duct. The valve control head should be on forward side of the duct. Connect Marmon clamp but do not tighten. (See figure 201.)



Anti-Icing Control Valve Installation
Figure 201

(2) Install water separator without tightening clamp attaching valve to separator. (See 21-2-51)

(3) Connect one control line to control valve, two to anti-icing thermostat. Make certain tube ends seat properly before tightening.

(4) Tighten clamps on both sides of valve.

(5) Close the air conditioning equipment bay access door.

END

ANTI-ICING THERMOSTAT - MAINTENANCE PRACTICES

1. Removal/Installation Anti-Icing Thermostat

   A. Remove Anti-Icing Thermostat

      (1) Open the air conditioning equipment bay access door.

      (2) Disconnect two control lines. (See figure 201.)

      (3) Unfasten forward control valve tube support clamp.

      (4) Remove anti-icing thermostat by removing three bolts. Remove gasket.

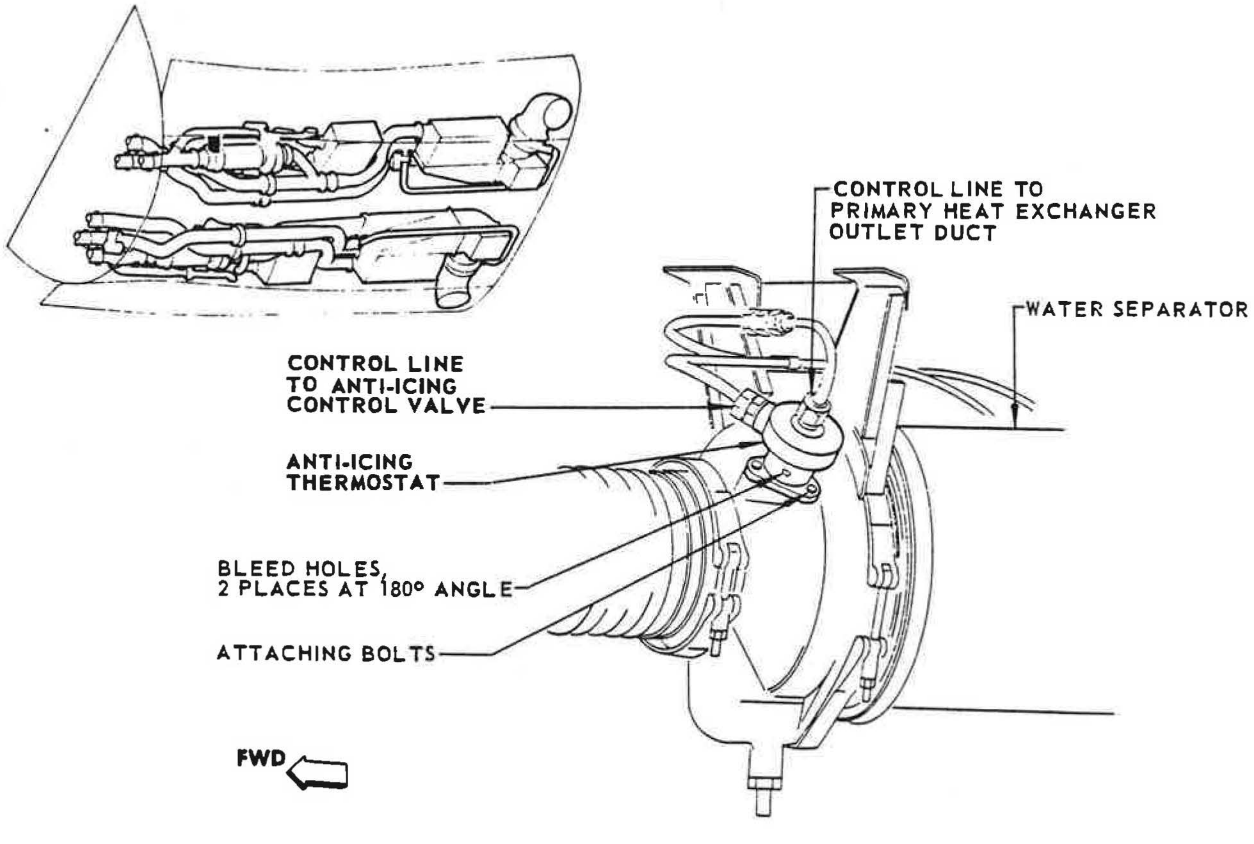
   B. Install Anti-Icing Thermostat

      (1) Place new gasket on thermostat base. (See figure 201.)

      (2) Attach thermostat by fastening three bolts.

      (3) Connect two control lines. Connect tube support clamp.

      (4) Close the air conditioning equipment bay access door.



Anti-Icing Thermostat Installation
Figure 201

AIR CONDITIONING PACK SHUTOFF VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Air Conditioning Pack Shutoff Valve

A. General

(1) Check valve position indicator.

(2) If valve is closed, remove as under B 1-5.

(3) If valve is not closed, connect electrical power, operate valve switches "OFF".

(4) If valve closes, proceed as under (2).

(5) If valve remains open, remove as under C 1-6.

B. Remove Air Conditioning Pack Shutoff Valve When Closed

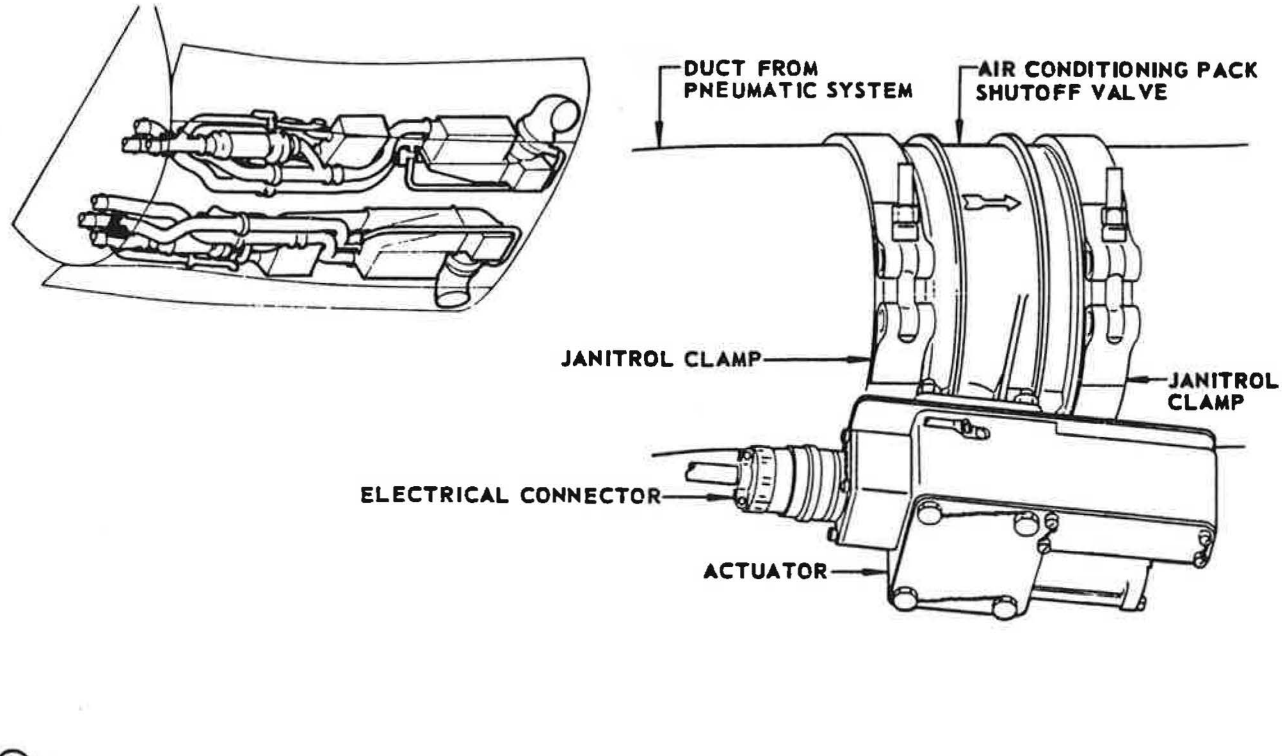
(1) Open air conditioning equipment bay door.

(2) Remove electrical connector at valve motor. (See figure 201.)

(3) Disconnect bonding jumper.

(4) Remove two Janitrol clamps, one upstream and one downstream of valve.

(5) Remove valve.



Air Conditioning Pack Shutoff Valve Installation
Figure 201

C. Remove Air Conditioning Pack Shutoff Valve When Open

(1) Open air conditioning equipment bay door.

(2) Remove electrical connector at valve motor. (See figure 201.)

(3) Disconnect bonding jumper.

(4) Remove Janitrol clamp downstream of valve.

(5) Remove second Janitrol clamp upstream of valve.

(6) Remove duct section.

(7) Remove Janitrol clamp upstream of valve.

(8) Remove valve.

D. Install Air Conditioning Pack Shutoff Valve

(1) Lift valve into place and fasten two janitrol clamps, one upstream, the other downstream. (See figure 201.)

(2) Install electrical connector.

(3) Attach bonding jumper.

(4) Check that valve position indicator shows "OPEN" or "CLOSED" when switch is "ON" or "OFF" respectively.

(5) Close air conditioning equipment bay door.

END

RAM AIR SHUTOFF VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Ram Air Shutoff Valve

A. Remove Ram Air Shutoff Valve

(1) Open air conditioning equipment bay door.

(2) Remove electrical connector. Disconnect bonding jumper. (See figure 201.)

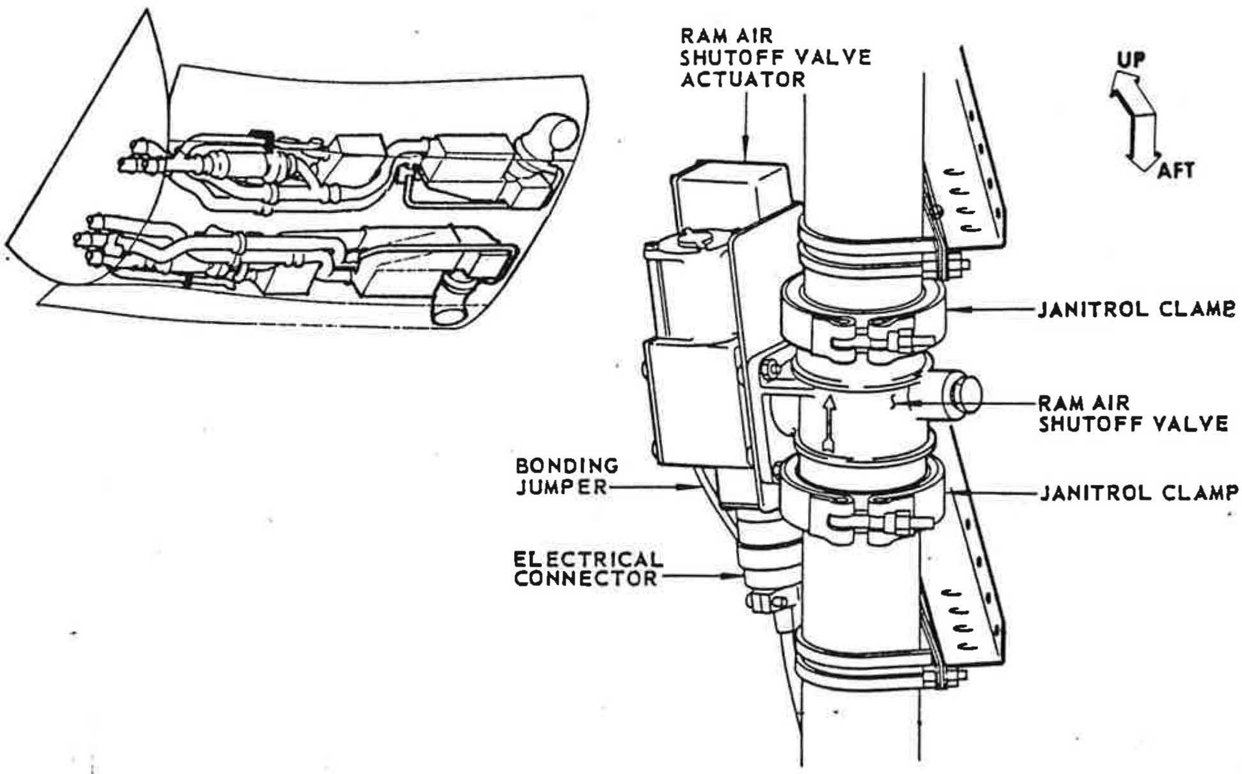
(3) Remove valve by removing two Janitrol clamps attaching valve upstream and downstream.

B. Install Ram Air Shutoff Valve

(1) Install valve by fastening two clamps attaching valve to duct upstream and downstream. (See figure 201.)

(2) Install electrical connector. Install bonding jumper.

(3) Close air conditioning equipment bay door.



Ram Air Shutoff Valve Installation
Figure 201

2. Adjustment/Test Ram Air Shutoff Valve

(1) Close cabin ram air and wing valves circuit breakers on ac bus No.4 panel (P4).

(2) Put on F/E panel ram air valve switch in OPEN position. Check that position indicators on ram air valves are in OPEN position.

(3) Put ram air valve switch in CLOSED position. Check that position indicators on ram air valves are in CLOSED position.

TURBOFAN - MAINTENANCE PRACTICES

1. Removal/Installation Turbofan

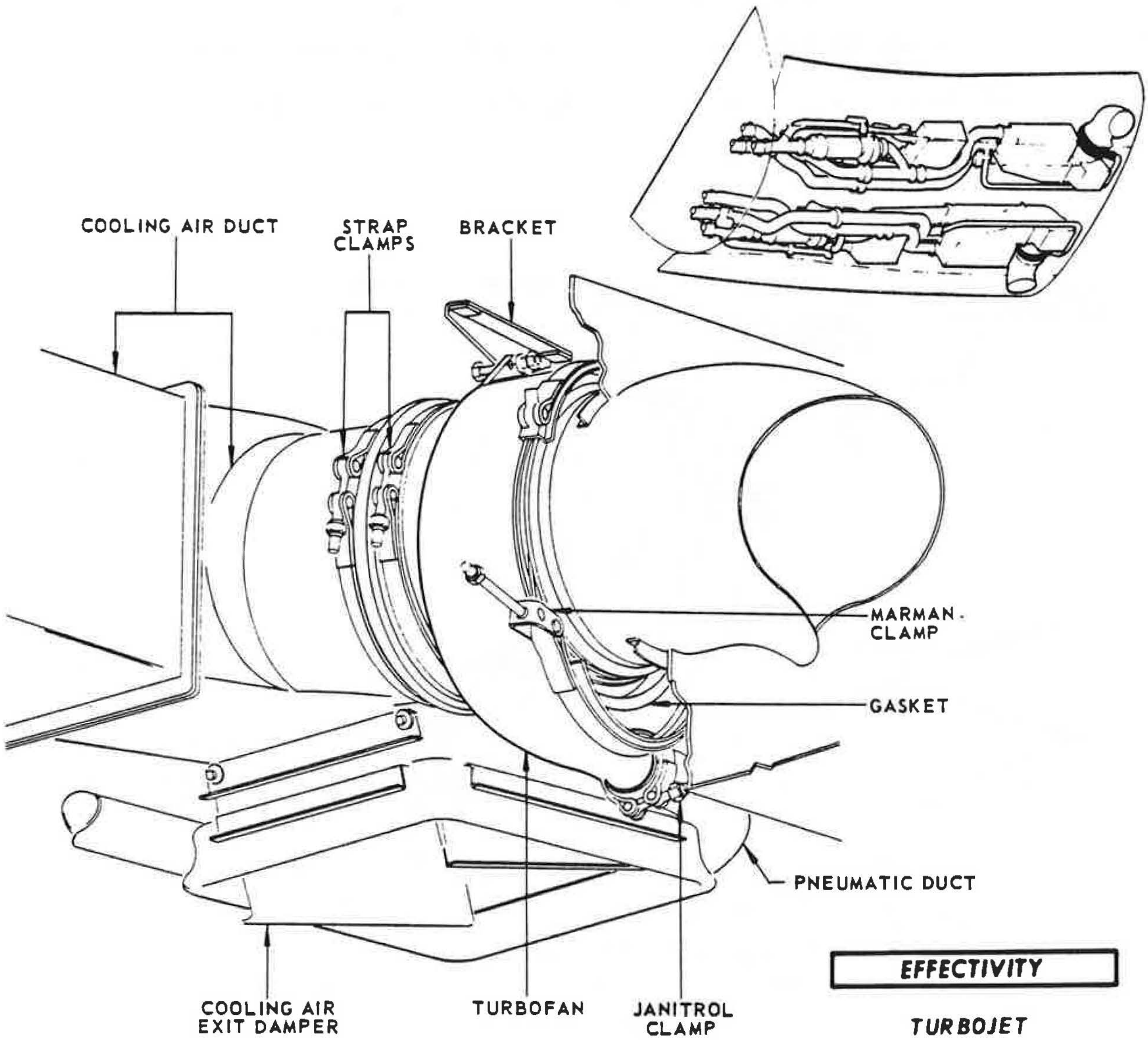
   A. Remove Turbofan

      (1) Open the air conditioning equipment bay access door.

      (2) Remove two strap clamps flanking flexible coupling between turbofan and cooling air exhaust duct. (See figure 201.)

      (3) Remove Marman clamp with gasket downstream of turbofan.

      (4) Remove clamp that joins pneumatic duct to turbofan.



EFFECTIVITY
TURBOJET

Turbofan Installation
Figure 201 (Sheet 1 of 2)

(5) Support turbofan.

(6) Unfasten bracket on top of turbofan by removing one bolt.

(7) Lower and remove turbofan.

B. Install Turbofan

(1) Set new gasket on turbofan downstream flange. (See figure 201.)

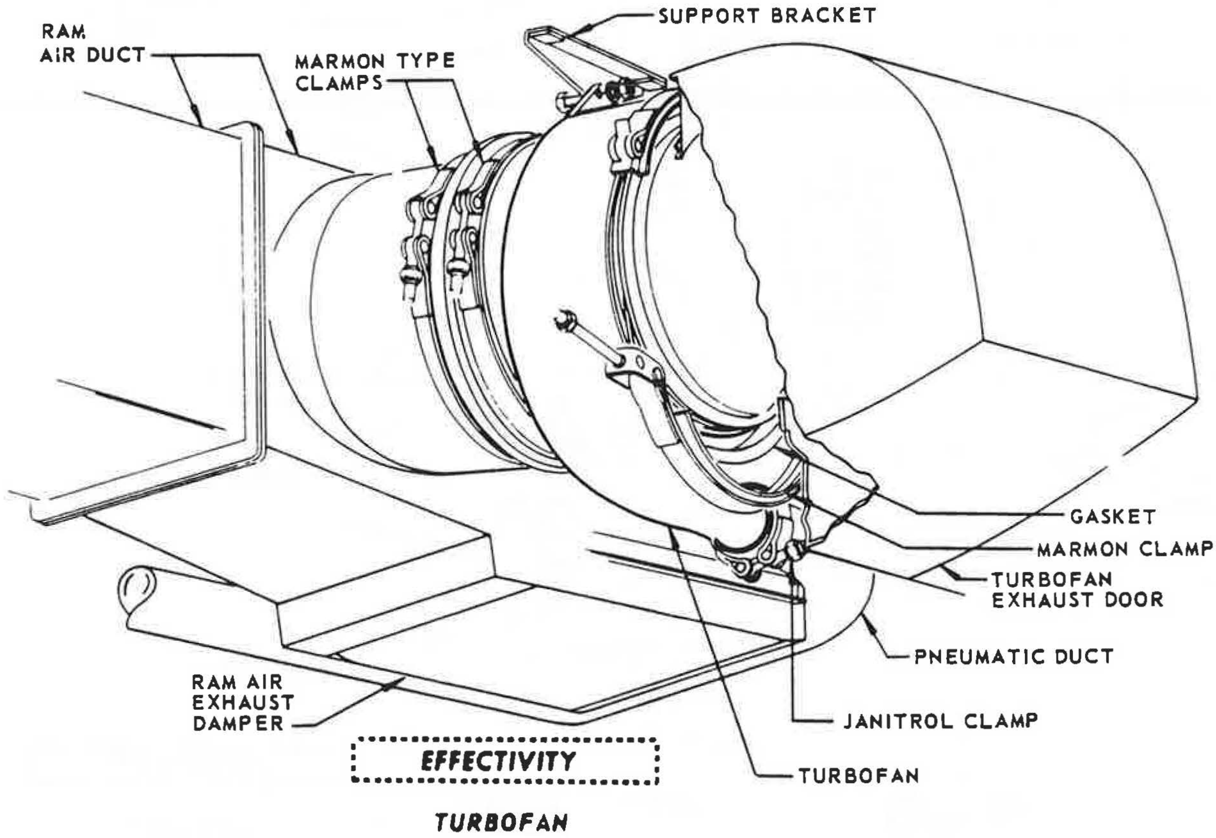
(2) Lift turbofan into position and attach bracket on top to structure by fastening one bolt.

(3) Attach to downstream flange by fastening clamp.

(4) Attach to cooling air exhaust duct by connecting two strap clamps flanking flexible coupling.

(5) Attach turbofan pneumatic duct by fastening one clamp.

(6) Close the air conditioning equipment bay access door.



TURBOFAN

Turbofan Installation
Figure 201 (Sheet 2 of 2)

TURBOFAN SHUTOFF VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Turbofan Shutoff Valve

   A. Remove Turbofan Shutoff Valve

      (1) Open air conditioning equipment bay door.

      (2) Remove electrical connector. (See figure 201.)

      (3) Remove bonding jumper.

      (4) Remove valve by removing two Janitrol clamps.

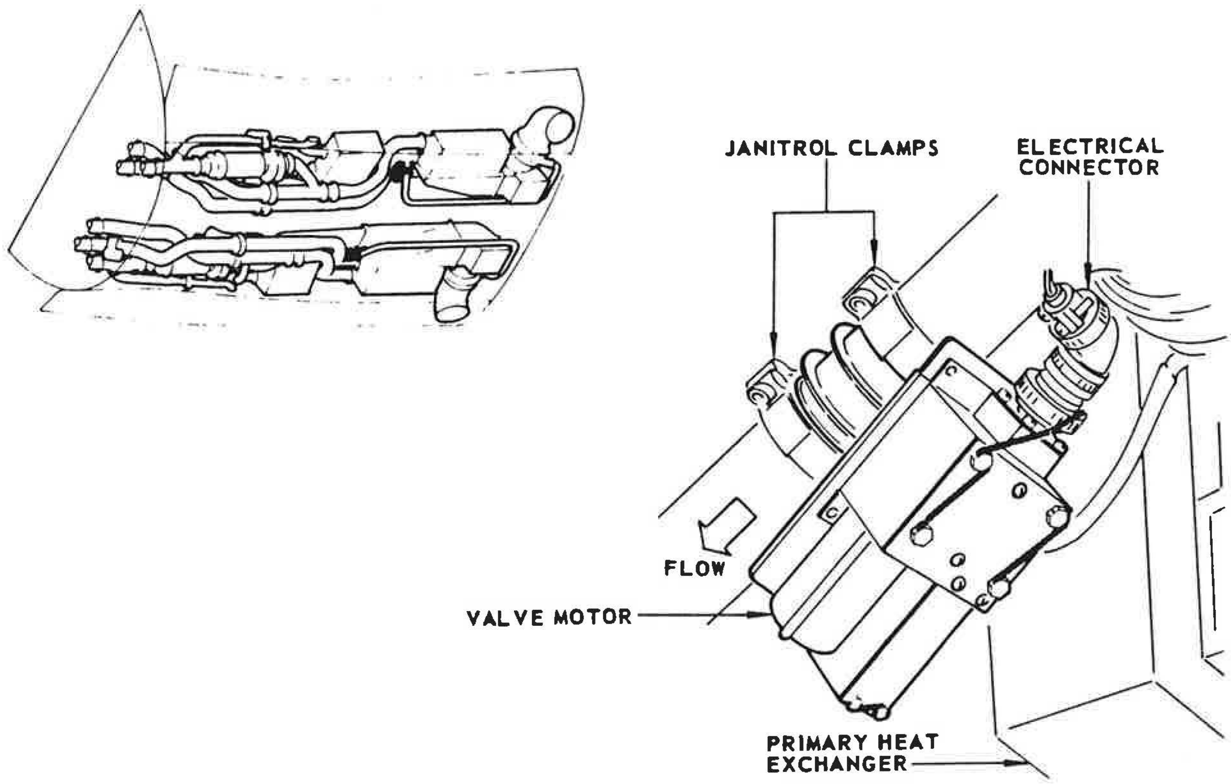
   B. Install Turbofan Shutoff Valve

      (1) Lift valve into place and attach upstream and downstream by fastening Janitrol clamps. (See figure 201.)

      (2) Install bonding jumper.

      (3) Install electrical connector.

      (4) Close air conditioning equipment bay door.



Turbofan Shutoff Valve Installation
Figure 201

AIR CONDITIONING AIR CYCLE OVERHEAT PROTECTION CIRCUITS - ADJUSTMENT/TEST

1. Adjustment/Test of Thermal Switches Circuits

A. Turbine inlet overheat protection circuit.

(1) Place air conditioning unit switch on the F/E panel in the ON position.

(2) Check that pack shutoff valve position indicator is in the OPEN position.

(3) Install jumper between terminals 1 and 2 of terminal strip T216 (for all passenger airplanes) or T217 (for all cargo airplanes).

(4) Check that pack shutoff valve position indicator has moved to the closed position.

(5) Remove jumper installed in step (3).

(6) Check that the pack shutoff valve position indicator remains in the closed position.

(7) Push RESET button on the F/E panel and check that the pack shutoff valve position indicator returns to the open position.

B. Compressor discharge overheat protection circuit. (All passenger airplanes).

(1) Pull safety and oil cooler relays circuit breaker on the P5 circuit breaker panel.

(2) Verify that the turbofan shutoff valve position indicator is in the closed position.

(3) Install a jumper between terminals 3 and 4 and terminals 4 and 5 of the terminal strip T216.

(4) Check that the turbofan shutoff valve position indicator moves to the open position and the AC UNIT OVERHEAT light on the F/E panel is ON.

(5) Remove jumper installed between terminals 3 and 4. Be sure that the jumper between terminals 4 and 5 was not removed even not temporarily.

(6) Check that the turbofan valve remains open and the AC UNIT OVERHEAT light remains ON.

(7) Remove jumper between terminals 4 and 5.

(8) Verify that the turbofan valve closes and the AC UNIT OVERHEAT light is OFF.

(9) Close circuit breaker pulled in step (1).

C. Compressor discharge overheat protection circuit. (All cargo airplanes).

(1) Install jumper between terminals 3 and 5 of terminal strip T217.

(2) Check that AC UNIT OVERHEAT light on F/E panel is ON.

(3) Remove jumper installed in step (1).

AIR CONDITIONING CONTROL AND INDICATING SYSTEM - DESCRIPTION AND OPERATION

1. General

A. The air conditioning control and indicating systems provide for controlling and monitoring main and control cabin temperatures. Two independently operated systems provide automatic or manual control. A selector in each system determines whether control is automatic or manual. A selector setting between 65°F and 85°F will provide automatic control to the temperature selected. In the manual range direct electrical control of the temperature control valves allows heating or cooling as desired. Other air conditioning controls not directly related to temperature control are; individual air distribution (gasper) fan, on airplanes AF F-BHSS and on, and SABENA OO-SJF and on; ram air control system, on turbofan airplanes; and crew auxiliary heating system on cargo airplanes.

B. Temperature regulators provided for each cabin will automatically establish and maintain the cabin temperature within 1.5°F of the selected temperature. The manual controls bypass the temperature regulators, providing faster temperature adjustments when needed.

C. The system control components, in addition to the temperature regulators and selectors, include sensing elements for cabin, duct and ambient air temperatures, and overheat controls and warning lights. (See figure 1.) The selectors, switch controls, indicators and warning lights are on the engineer's upper instrument panel. On turbofan airplanes a manual override control is accessible through an access door in the control cabin floor just aft of the electronics compartment entry grill. A switch at this location interrupts the circuit from air conditioning controls to the main cabin temperature control valve during manual override operation. (See figure 2.)

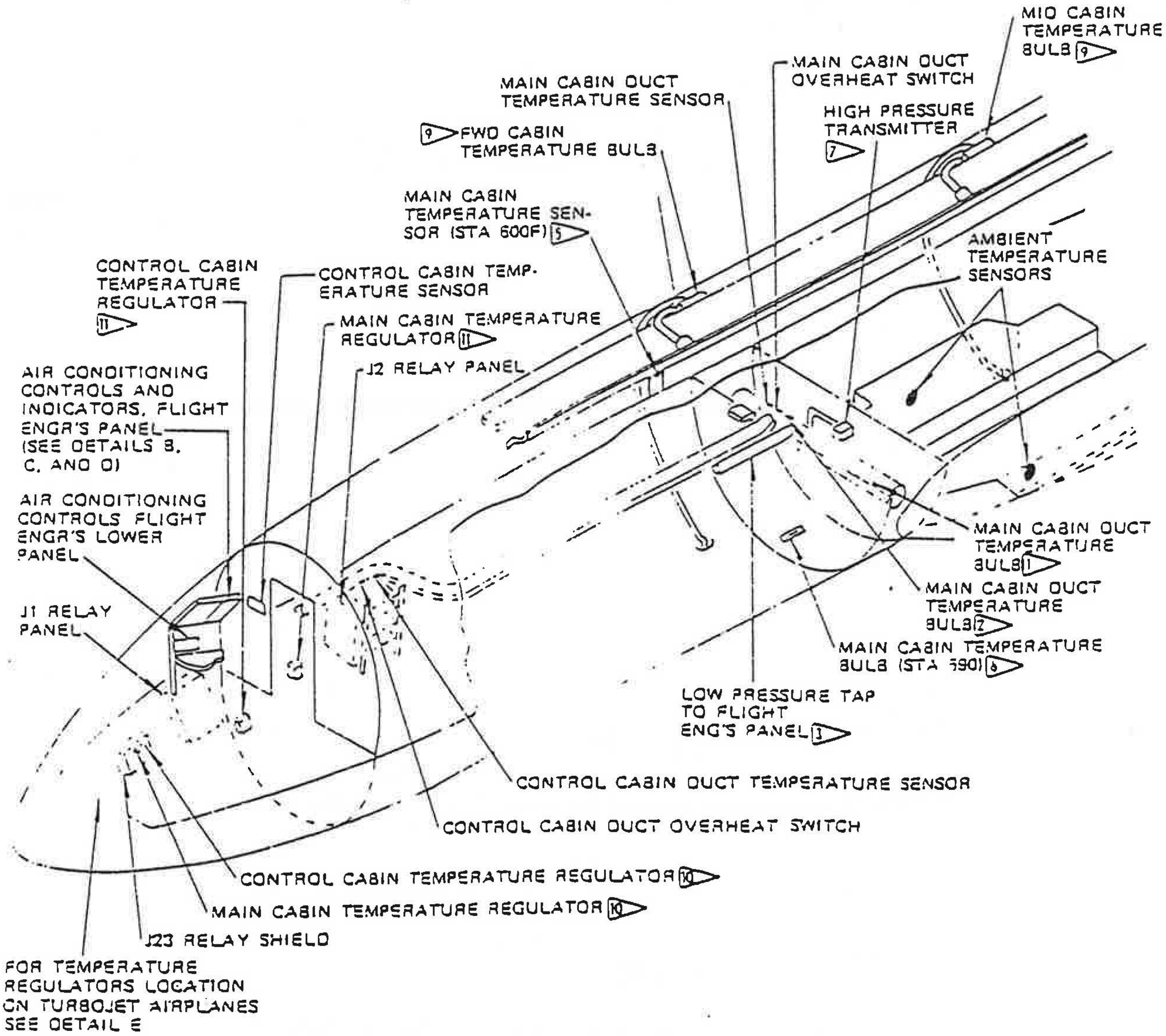
D. The main cabin outflow air temperature (cabin temperature) and inflow air (duct) temperature are indicated by a gage on the engineer's instrument panel. No gage is provided to indicate control cabin temperature.

E. The temperature control valve for the main cabin or control cabin is controlled directly by the respective temperature selector for manual control, or by the temperature regulator during automatic operation. Selections made on the temperature selectors in the "AUTOMATIC" range are transmitted to the applicable temperature regulators. Each regulator includes heating and cooling output relays and three bridge and associated amplifier circuits that are influenced by the following temperature sensing elements: (See figure 2.)

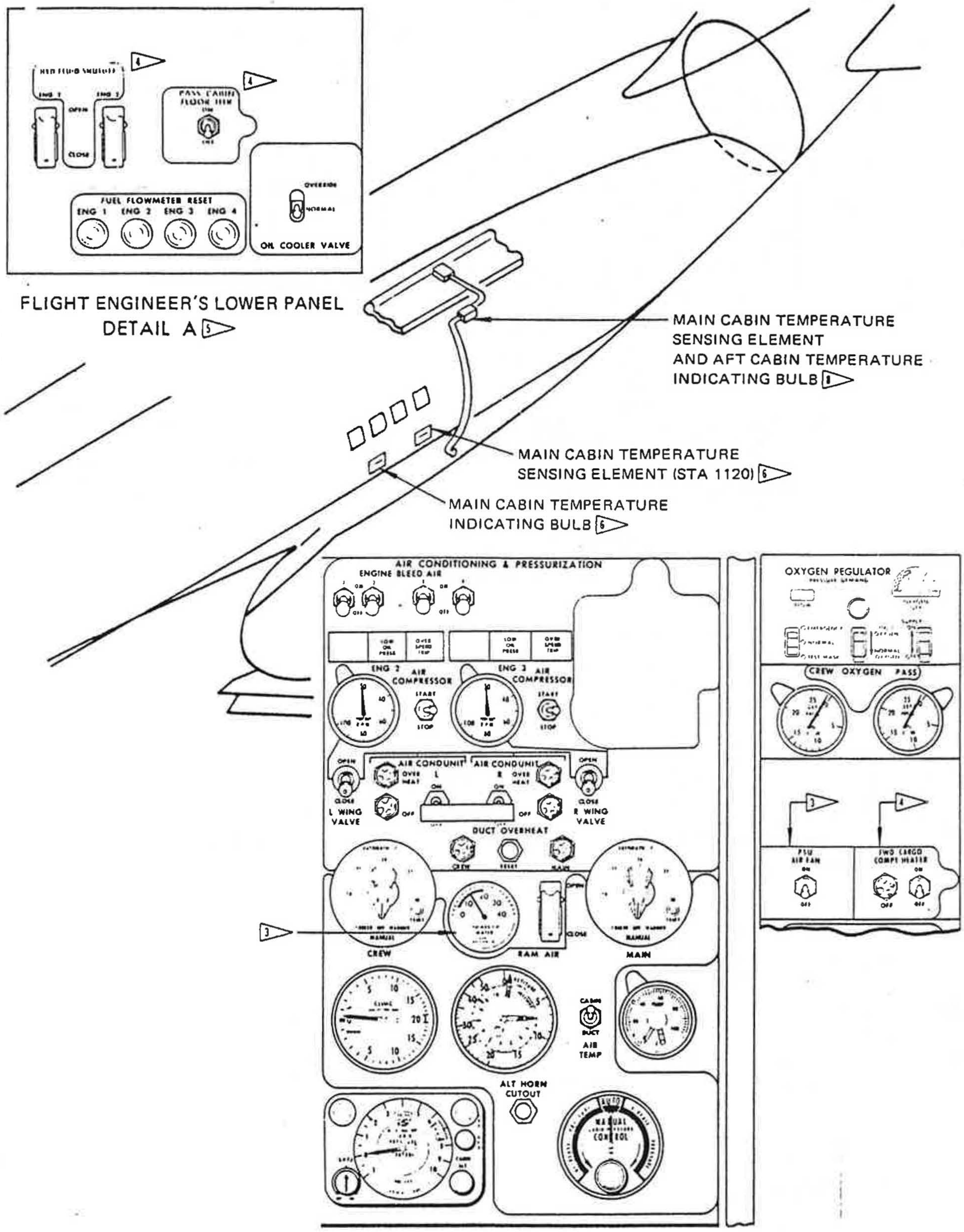
(1) A single temperature sensing element in the control cabin monitors control cabin air temperatures. Another temperature sensing element installed in the air return grill monitors the main cabin air temperature. (See figure 1.)

(2) Temperature sensing elements in control cabin and main cabin inflow ducts govern the rate of temperature change within the ducts and limit duct temperatures to a maximum of 160° (± 5°)F.

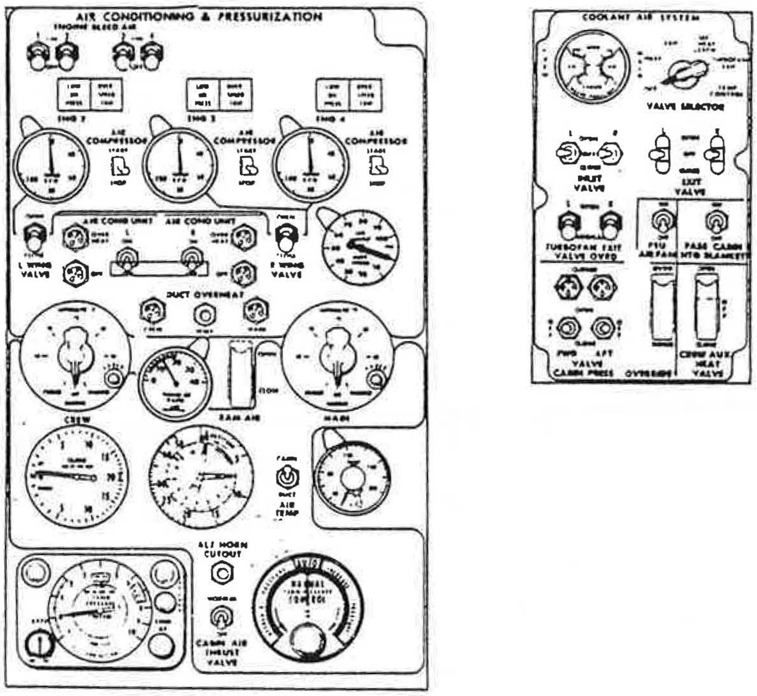
[1] OO-SJA
[2] All except OO-SJA
[3] All except OO-SJA thru OO-SJE
[4] OO-SJF and OO-SJG
[5] 707-329
[6] OO-SJH
[7] TCA : LX-N19996, LX-N20198, LX-N20199
RTCA : LX-N19997, LX-N20000
[8] TCA : LX-N19996, LX-N20198, LX-N20199
RTCA : LX-N19997, LX-20000
[9] TCA : LX-N19996, LX-N20198, LX-20199
RTCA : LX-N19997, LX-N20000
[10] OO-SJH thru OO-SJK
[11] TCA : LX-N19996, LX-N20198, LX-N20199
RTCA : LX-N19997, LX-N20000



Air Conditioning Control and Indicating System Location Diagram
Figure 1 (Sheet 1)

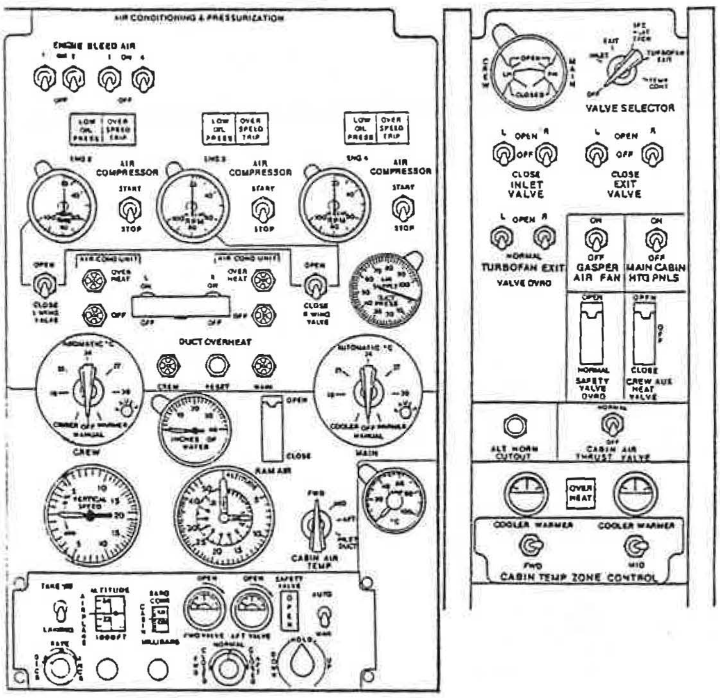


Air Conditioning Control and Indicating System Location Diagram
Figure 1 (Sheet 2)



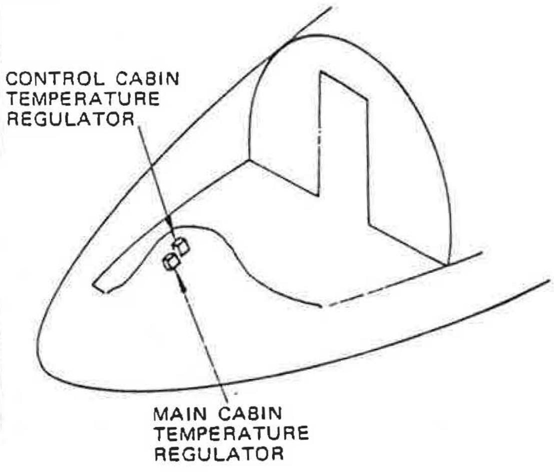
FLIGHT ENGINEER'S UPPER PANEL

DETAIL C 10



FLIGHT ENGINEER'S UPPER PANEL

DETAIL D 9



DETAIL E 5

Air Conditioning Control and Indicating System Location Diagram

Figure 1 (Sheet 3)

F. Airplanes AF F-BHSU and on, and PAA N760PA and on, are equipped with two pressure gages. A direct reading cabin low pressure air duct gage, on the flight engineer's panel, indicates the pressure in the distribution manifold in inches of water. A high pressure gage, actuated electrically by a pressure transmitter, monitors the pressure in the turbocompressor crossover duct. The high pressure gage is mounted in the flight engineer's panel. (See figure 1.)

2. Miscellaneous Control and Indicating System Components

A. Duct Overheat Control

(1) A normally open overheat switch is located in the control cabin and main cabin inflow ducts. Each switch closes at 190°F should the topping control of the respective temperature regulator fail to limit duct temperatures to 160° (± 5)F. Closing of an overheat switch energizes the respective temperature control valve to the full cool position through an overheat relay and illuminates an overheat warning light on the flight engineer's panel. Operation of a reset switch de-energizes the overheat relay affected, allowing resumption of temperature control.

B. Overspeed Protection - Air Cycle Machines

(1) Overspeed protection of the air cycle machines is provided by overheat switches, since temperature is a measure of the energy level in the machines. Refer to 21-12-0 for turbofan airplanes. Normally open compressor discharge and turbine inlet thermal switches close under overheat conditions to energize the respective compressor discharge and turbine inlet relays.

C. Reset Switch and Overheat Warning Lights

(1) A single "PUSH TO RESET" switch on the flight engineer's panel controls holding power to the energizing coils of six overheat relays on turbojet airplanes and four overheat relays on turbofan airplanes. The relays on turbojet airplanes are controlled by overheat switches in the control and main cabin ducts, and in the inlet and outlet ducts of the air cycle machines. The four relays on turbofan airplanes are controlled by overheat switches in the control and main cabin ducts and in the inlet duct of the air cycle machines.

(2) On turbojet airplanes operation of any of the overheat relays illuminates one of six overheat warning lights grouped about the reset switch. The reset switch is of the normally closed momentary open type. Operation of the reset switch interrupts power to the coil of the relay affected, causing the relay to be de-energized to restore system operation.

(3) Turbofan airplanes also have six overheat warning lights and a reset switch. The reset switch is located between the main and control cabin duct overheat lights on the flight engineer's panel. The reset switch is of the normally open momentary closed type and energises a reset relay when closed. The reset relay opens holding circuits to the turbine inlet overheat relays, the main cabin duct overheat relay, and the control cabin duct overheat relay. When the overheat condition is corrected, system operation may be restored by pushing the reset switch. At the same time the reset switch opens the air conditioning unit off light and duct overheat light circuits. The compressor discharge overheat circuit is a warning circuit only and is not affected by the reset switch.

(4) Power to the reset switch is drawn through a 5 amp "OVERHEAT CONTROL" circuit breaker on the radio and T-R circuit breaker panel (P5), on turbojet airplanes and through a AIR COND OVH'T CONT & OUTFLOW VALVE LTS circuit breaker on turbofan airplanes.

D. Air Conditioning Unit Switches

(1) Two air conditioning unit "ON-OFF" switches are ganged together on the flight engineer's panel. The switches control the left and right air conditioning pack air valves to start and stop the air cycle machines, and switch electrical power to the control and main cabin temperature selectors.

(2) Turbofan airplanes have a manual override switch to interrupt the main cabin temperature control valve electrical circuit during manual override operation. The switch is a two position "OFF-NORMAL" switch and is accessible through the manual override cover plate in the control cabin floor just aft of the lower nose compartment access door. The switch must be in the "NORMAL" position for normal operation of the air conditioning control system.

(3) Turbofan airplanes have two secondary heat exchanger damper switches. The switches are mounted on a bracket of the manual override stationary shaft and are mechanically linked to the main cabin temperature control valve. The switches close the heat exchanger dampers when the main cabin temperature control valves ACM bypass valves move to the full open position. There is one switch for each air conditioning pack.

(4) Power is drawn through 5 amp circuit breakers on a-c bus No. 4 circuit breaker panel (P4). (See figure 2.)

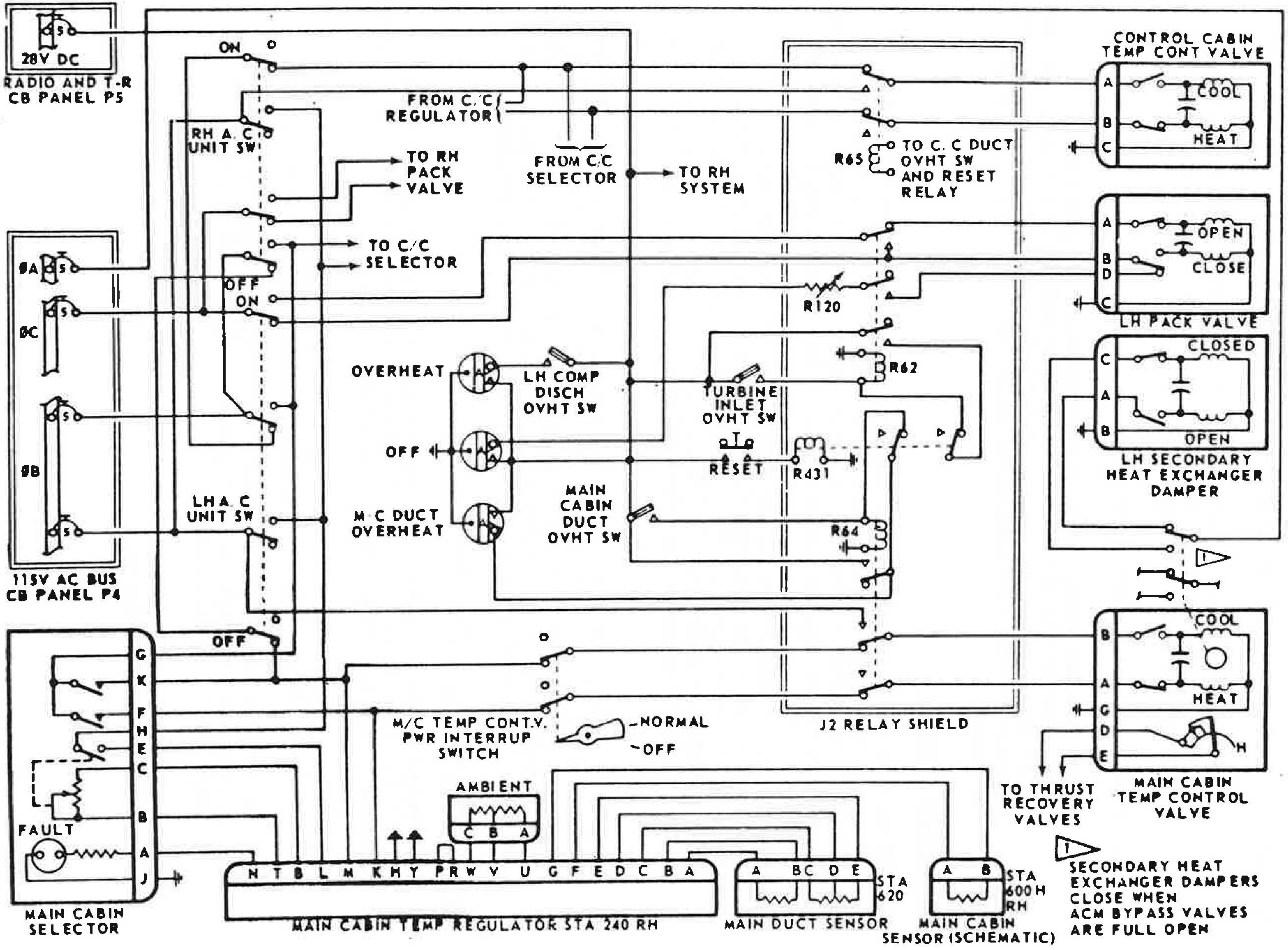
E. Ram Air Control

(1) A ram air system provides cooling air for the heat exchangers during ground operation and in flight. To obtain air flow during ground operation an air mover (turbofan) is required. It is also necessary to close off the ram air exhaust to obtain proper direction of flow without disturbing the normal flight ram air system. To obtain this ability turbofan valve and ram air exit damper circuits are wired through the landing gear safety relays. Position of the landing gear safety switch energises and de-energises the safety relay. The safety relay opens the ram air exit damper and closes the turbofan shutoff valve for flight and closes the damper and opens the valve on landing. A ram air damper and turbofan shutoff valve is provided for each air conditioning pack. (See figure 3.)

(2) Turbofan airplanes also have turbofan door, ram air inlet damper, and ram air exit damper control for modulation of the ram air system during flight. Separate switches on the flight engineer's panel are provided for modulation. The landing gear safety circuitry overrides ram air modulation to provide full ram air flow and proper direction of flow on takeoff and landing. The safety relays cause the ram air inlet damper to go full open, the turbofan exhaust door to close and the turbofan shutoff valve to close at takeoff. On landing the inlet dampers, turbofan doors and turbofan shutoff valves open and the ram air exit dampers close. For description of turbofan ram air system components see 21-12-0.

MATERIAL TO BE FURNISHED WHEN AVAILABLE

Main Cabin Air Conditioning Control Circuit
(Control Cabin Similar)
Figure 2 (Sheet 1)



Main Cabin Air Conditioning Control Circuit
(Control Cabin Similar)
Figure 2 (Sheet 2)

F. Low Pressure Duct Gage (All except OO-SJA through OO-SJE)

(1) A low pressure gage, directly connected by tubing to the main distribution duct in the air conditioning equipment bay, is located on the flight engineer's upper panel.

G. High Pressure Gage (Turbofan airplanes)

(1) A high pressure gage, actuated electrically by a pressure transmitter in the air conditioning equipment bay, is located on the flight engineer's upper panel. The pressure transmitter is connected by tubing to the turbocompressor crossover duct. See Chapter 36, Pneumatic.

3. Temperature Selectors

A. The control and main cabin temperature selectors are identical units mounted on the flight engineer's panel. A face dial is divided into AUTOMATIC and MANUAL ranges, and a rotary selector switch included in the center is moved to the desired setting. Cabin temperatures between 65 and 85°F (18 and 30°C) can be selected in the automatic range to influence the cabin bridge of the respective temperature regulator. Manual range selection provides direct operation of the respective temperature control valve. Three positions in the manual range provide OFF and momentary WARMER and COOLER selections. When the selector is turned to either momentary position and then released, it will return to the OFF position.

B. A neon FAULT light included on the face dial, when illuminated, indicates malfunctioning of the topping and anticipator bridge circuits. Faults in these circuits may not be readily apparent since the ability of the cabin bridge circuit will not be affected. The fault light is illuminated by two fault (fail safe) relays included in the temperature regulator.

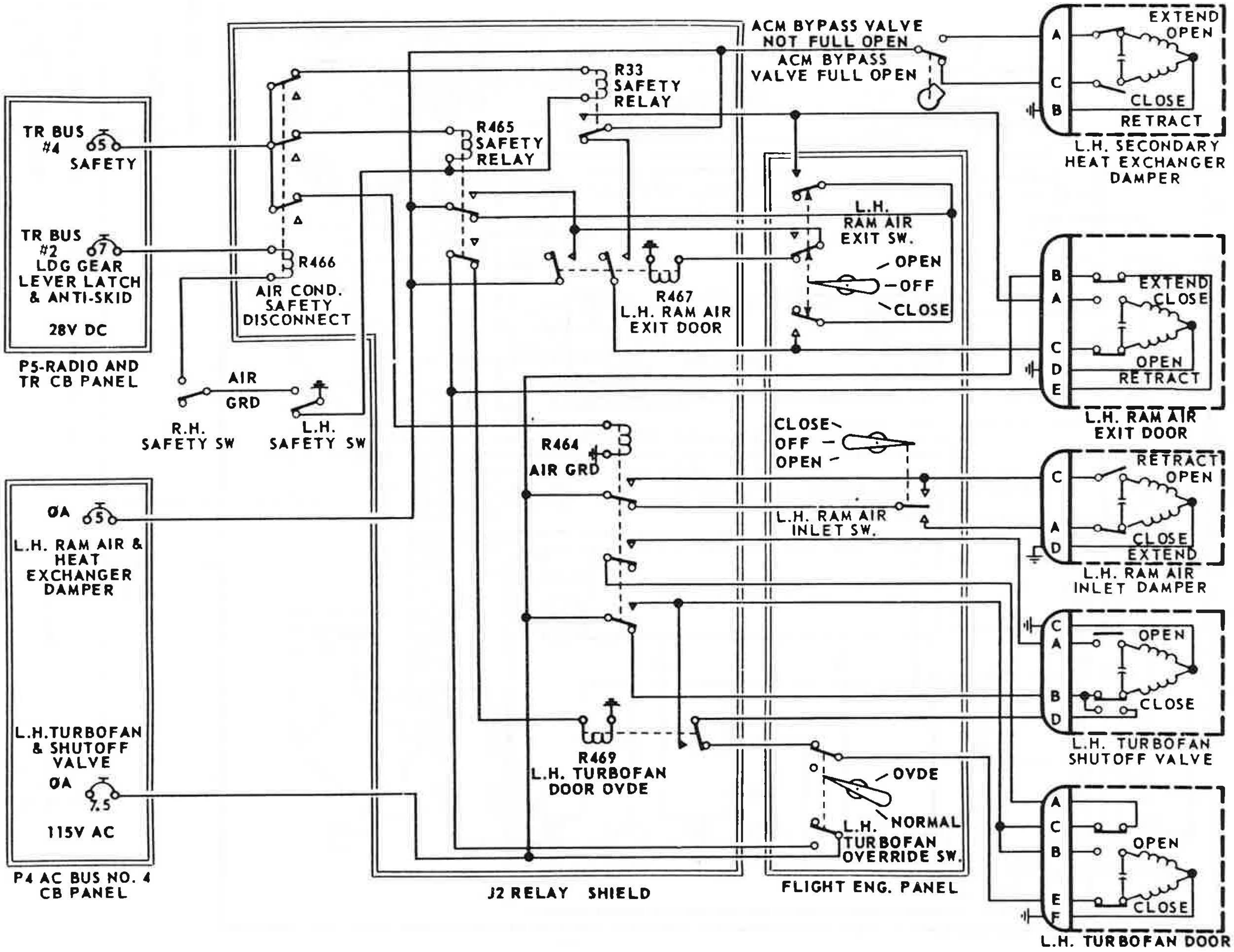
4. Temperature Regulators (See figure 4.)

A. The control cabin and main cabin temperature regulators are identical units located as shown on figure 1. Each regulator is connected to three separate bridge circuits. The bridge circuits are:

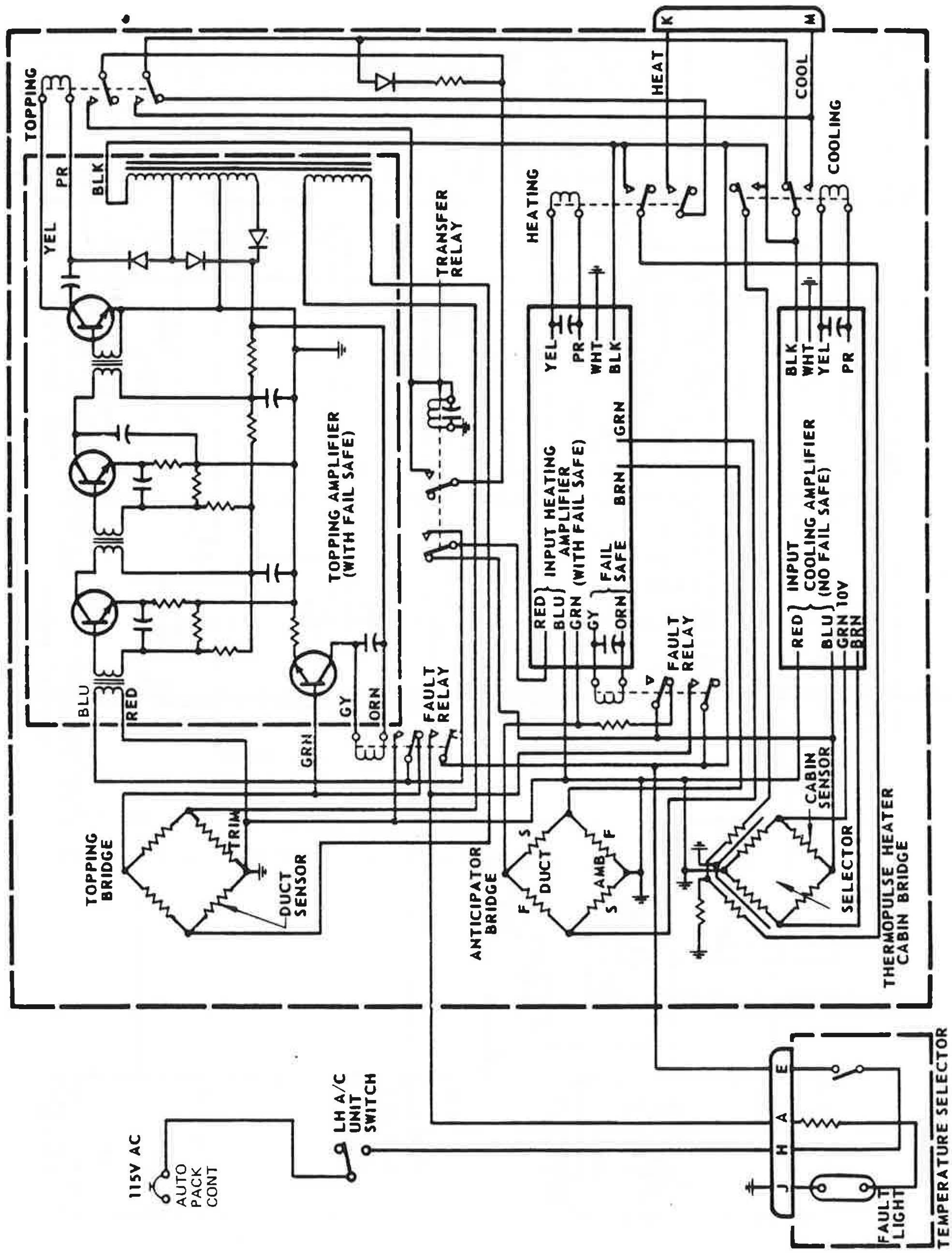
(1) Cabin bridge - influenced by the temperature selector in the automatic range, and the cabin temperature sensing elements.

(2) Anticipator bridge - influenced by an ambient temperature sensing element and the fast and slow elements included in the duct temperature sensing element.

(3) Topping bridge - influenced by a duct temperature sensing element to limit duct temperature to 160 (± 5)°F (70 [± 3]°C).



Left Hand Ram Air Control Schematic Circuit Diagram
Figure 3



Cabin Temperature Regulator Circuit
Figure -

B. The regulator includes two fault (fail safe) relays which illuminate a neon fault light on the temperature selector face dia. should a short circuit or open circuit occur in the topping or anticipator bridge circuits. A resulting bridge signal of excessive strength will actuate a fault relay. Also included are heating and cooling output relays, and a transfer relay that is energized whenever the duct temperature sensing element has imposed topping control of the air conditioning system.

C. Separate heating, cooling and topping transistorized amplifiers amplify the signals of the bridge circuits to energize the heating and cooling output relays as required.

D. Included with the cabin bridge circuit are two thermopulse heaters. The heaters are located within the regulator body, each adjacent to a bridge circuit resistance which changes value in proportion to heat acquired from the thermopulse heater. Thermopulse heater current is drawn separately from the regulator heating and cooling output relays when either is energized by cabin demands. Transfers of heat from a thermopulse heater to the adjacent bridge resistance provides pulsating cancellation of the bridge circuit input signals to the respective heating or cooling amplifier, in turn resulting in cycling of the heating or cooling output relay in use. Cycling of the output relays controls temperature overshoot and slows the rate of temperature change produced within the cabin.

5. <u>Temperature Sensing Devices</u>

A. Control Cabin Temperature Sensing Element

(1) The control cabin temperature sensing element changes resistance in proportion to control cabin air temperatures. Resistance changes influence the cabin bridge of the control cabin temperature regulator. Resistance of the element at 70°F is 312 (± 0.6) ohms.

(2) The sensing element is mounted in a case behind a protective grille on the rear bulkhead of the control cabin, 5 inches to the right of the entry door frame. The case is vented overboard to ensure movement of control cabin air across the sensing element. In some airplanes the vent air is ducted with the electronic equipment bay cooling air. On others the vent air is ducted directly overboard through a venturi line, left of the nose wheel well.

B. Control Cabin Duct Temperature Sensing Element

(1) The control cabin duct temperature sensing element embodies two separate elements that change resistance in proportion to duct air temperatures. Resistance changes influence the topping and anticipator bridges of the control cabin temperature regulator to limit duct temperatures and control the rate of temperature change produced within the control cabin.

(2) The topping bridge element has a resistance of 104 (± 0.2) ohms at 70°F. The anticipator bridge element is divided into fast and slow elements each having a resistance of 104 (± 0.2) ohms at 70°F. Response time lag in the slow element is caused by a brass core. Since the output signals of the fast and slow elements are applied to opposing sides of the bridge, the bridge responds to differential current flow during changes in temperature.

(3) The sensing element is located in the control cabin air distribution duct at sta. 370 in the lower nose compartment, right side.

C. Control Cabin Duct Overheat Switch

(1) The control cabin duct overheat switch is a normally open type thermal switch that closes to energize the control cabin duct overheat relay should duct temperatures attain 190 (± 5)°F, and illuminate an overheat warning light.

(2) The overheat switch is located in the control cabin air distribution duct sta. 260 - 384, in the lower nose compartment, right side.

D. Main Cabin Temperature Sensing Element

(1) The main cabin temperature sensing element changes circuit resistance in proportion to main cabin temperature experienced. A resistance change influences the cabin bridge of the main cabin temperature regulator. The resistance of the element is 312 ohms at 70°F.

(2) On OO-SJA through OO-SJG the element is installed in the right air return grille at approximately body station 600F. On OO-SJH the element is installed in the left air return grille at approximately body station 1110.

(3) On OO-SJJ and on, the element is installed in a box mounted to the structure behind the hatrack at station 1150. The box is connected to an air source and pickup in the hatrack bullnose for the passenger configuration, and to a ceiling supported air source pickup for the cargo configuration.

E. Main Cabin Duct Temperature Sensing Element

(1) The main cabin duct temperature sensing element embodies two separate elements that change resistance in proportion to duct air temperatures. Resistance changes influence the topping and anticipator bridges of the main cabin temperature regulator to limit duct temperatures and to control the rate of temperature change produced within the main cabin.

(2) The topping bridge element has a resistance of 104 (± 0.2) ohms at 70°F. The anticipator bridge element is divided into fast and slow elements, each having a resistance of 104 (± 0.2) ohms at 70°F. Response time lag in the slow element is caused by a brass core. Since the output signals of the fast and slow elements are applied to opposing sides of the bridge, the bridge responds to differential current flow during changes in temperature.

(3) The sensing element is located in the right branch of the conditioning air distribution manifold in the air conditioning distribution bay.

F. Main Cabin Duct Overheat Switch

(1) The main cabin duct overheat switch is a normally open type thermal switch that closes to energize the main cabin duct overheat relay should duct temperature attain 190 (± 5)° F, and illuminate an overheat warning light.

(2) The overheat switch is located in the right branch of the conditioned air distribution manifold in the air conditioning distribution bay.

G. Ambient Air Temperature Sensing Elements

(1) An ambient air temperature sensor, exposed to ram air in the left ram air intake, influences the anticipator bridge of the main cabin temperature regulator. A second sensor, in the right ram air intake, influences the anticipator bridge of the control cabin temperature regulator. The element housing encloses a fast and a slow element, each having a resistance of 104 (± 0.2) ohms at 70°F. Response time lag in the slow element is caused by a brass core. Since the output signals are applied to opposing sides of the bridge, the bridge responds to differential current flow during temperature changes.

(2) The ambient air temperature sensing elements are installed in the ram air ducts. (See figure 1.)

6. <u>Temperature Indicating System</u> (See figure 5.)

A. Main Cabin Duct Temperature Indicating Sensor

(1) The main cabin duct temperature indicating sensor transmits duct temperatures to a remote reading gage on the flight engineer's panel through a two-position selector switch on airplanes AF F-BHSA thru F-BLCF and SABENA OO-SJA thru OO-SJK, or a four-position rotary switch on all other airplanes.

(2) On airplanes AF F-BHSA thru F-BHSD and SABENA OO-SJA, the main cabin duct sensor is located in the left branch of the conditioned air distribution manifold in the air conditioning distribution bay. On all other airplanes, the duct sensor is located in the right branch of the same duct.

B. Main Cabin Temperature Indicating Bulb

(1) The main cabin temperature indicating bulb transmits cabin outflow air temeratures to a remote reading gage on the flight engineer's panel through a selector switch. Cabin outflow air temperatures are representative of temperatures existing within the cabin.

(2) On 707-329 airplanes, the bulb is located in the air return grille in the main cabin. (See figure 1.)

(3) On 707-329C airplanes, there are three different configurations of bulb installation. (See figure 1.)

(a) On OO-SJH, the bulb is located in the air return grille in the main cabin.

(b) On OO-SJJ and OO-SJK, the bulb is installed in a box mounted to structure behind the hatrack at station 1150.

(c) On all airplanes except those listed in (a) and (b), three bulbs are installed in boxes mounted to structure behind the hatrack. One is at station 1150, the two others are at station 600 and 790. In the installations, the boxes are connected to an air pickup in the hatrack bullnose for passenger configuration and to a ceiling support air source pickup for the cargo configuration.

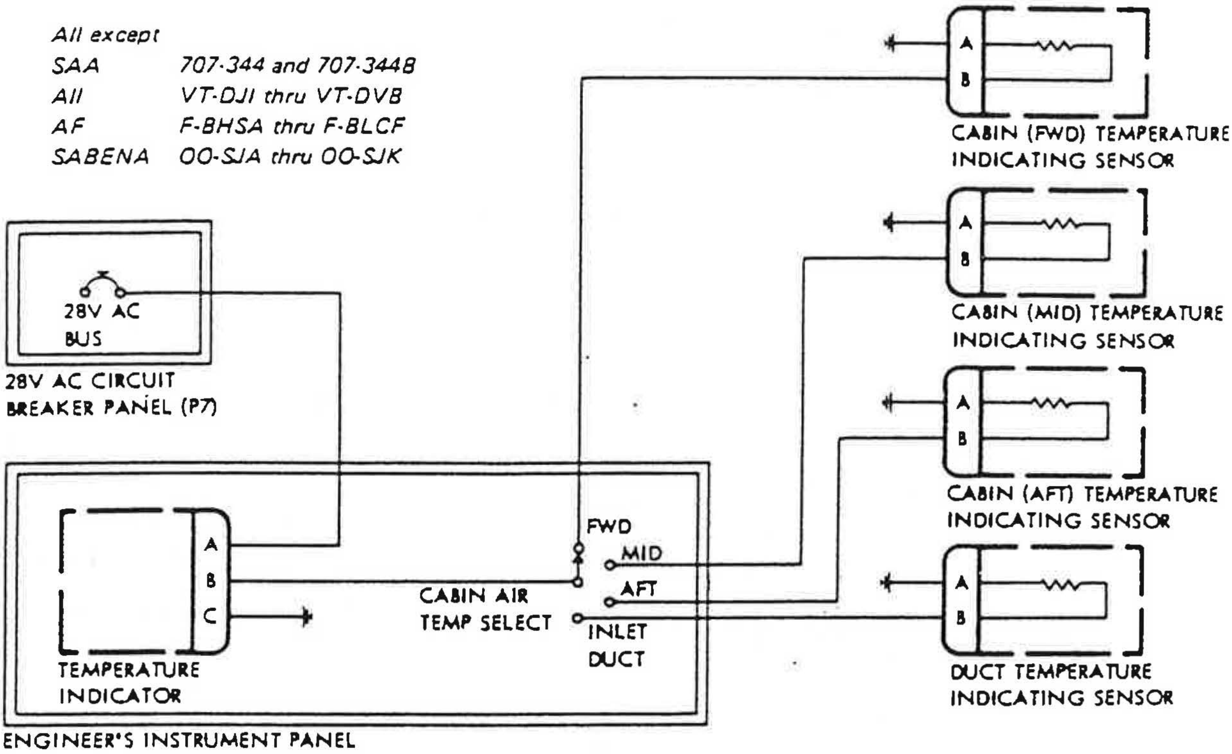
C. Main Cabin Temperature Gage and Selector

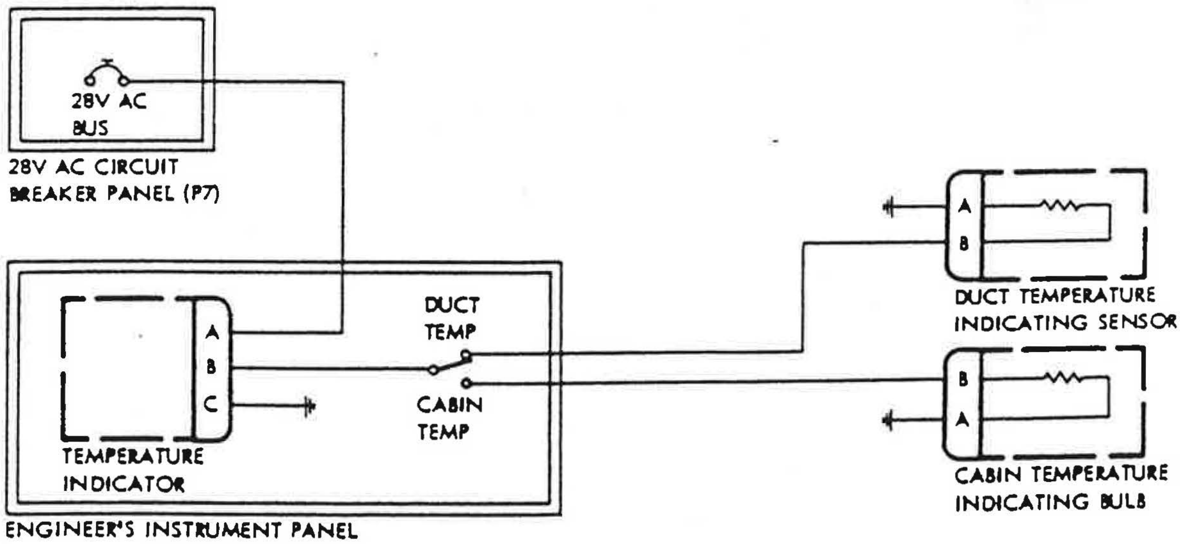
(1) The main cabin temperature gage and selector indicates temperatures existing within the main cabin and the main cabin duct. A two position switch on some airplanes and a four-position rotary switch on other airplanes selects the indication required. (See figure 5 for switch effectivity.) Power is drawn from a 5 amp circuit breaker on the 28 volt ac bus, on circuit breaker panel P7.

(2) The gage and selector are mounted on the flight engineer's panel.

All except

SAA	*707-344 and 707-344B*
AII	*VT-DJI thru VT-DVB*
AF	*F-BHSA thru F-BLCF*
SABENA	*OO-SJA thru OO-SJK*



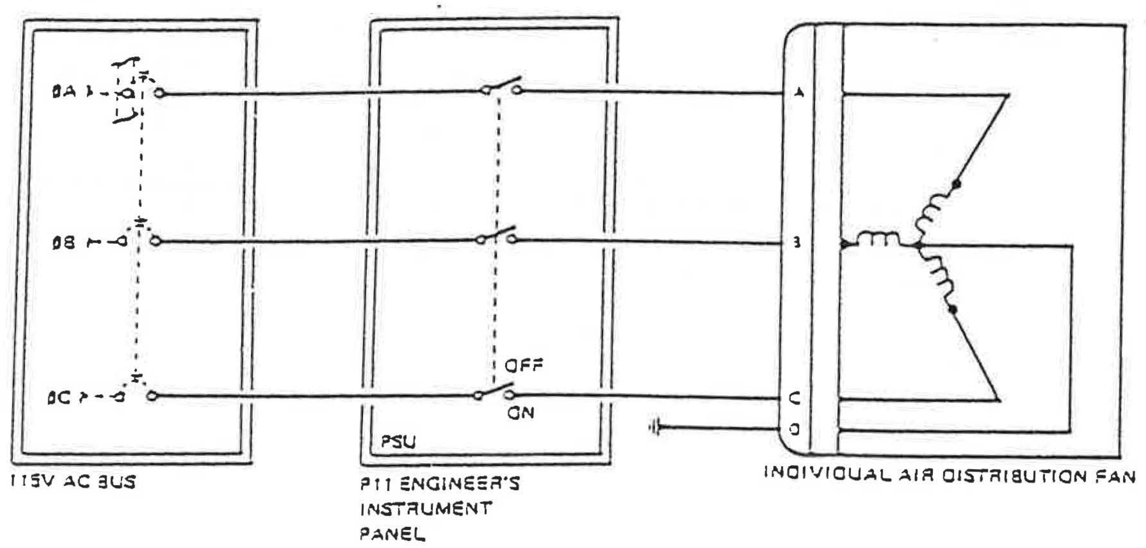


AII	*VT-DJI thru VT-DVB*
AF	*F-BHSA thru F-BLCF*
SABENA	*OO-SJA thru OO-SJK*
SAA	*707-344 and 707-344B*

Temperature Indicating Circuit
Figure 5

7. <u>Individual Air Distribution Fan Switch</u> (Airplanes AII VT-DNY and on, SABENA OO-SJF and on, and AF F-BHSS and on.)

A. The individual air distribution fan switch (PSU) is located on the flight engineer's upper panel. It is a two position, ON-OFF switch, which controls the individual air distribution fan motor for augmenting air flow to the individual air system. The fan may be used at any time whether air conditioning is turned on or off. (See figure 6.)



EFFECTIVITY

TCA : LX-N19996, LX-N20198,
LX-N20199

RTCA : LX-N19997, LX-N20000

Individual Air Distribution Fan Circuit
Figure 6

AIR CONDITIONING CONTROL AND INDICATING SYSTEM - TROUBLE SHOOTING

1. General

   A. Trouble shooting of the main and control cabin temperature controls may be accomplished by observing the response of the temperature control valve assemblies to selections made on the respective temperature selectors. Pressurized operation of the air conditioning system is not required.

2. Prepare for Trouble Shooting Temperature Controls

   A. Provide external electrical power to airplane.

   B. Close all air conditioning circuit breakers on ac bus No. 4 circuit breaker panel (P4).

   C. Close all air conditioning circuit breakers on radio and T-R circuit breaker panel (P5).

   D. Close air temperature indicator circuit breaker on 28-volt circuit breaker panel (P7).

   E. Check that main cabin temperature control valve manual override is disengaged.

   F. Check that control cabin manual air shutoff valve is open.

   G. Check that selector knobs on temperature selectors are secure.

3. Main Cabin Temperature Controls Trouble Chart

Position air conditioning unit switches to "ON." Move main cabin temperature selector to 10°F above or below present cabin temperature.

MAIN CABIN DUCT OVERHEAT LIGHT ILLUMINATES.

Press reset switch. If light illuminates when reset switch is released, check continuity of main cabin duct overheat switch. IF -

CONTINUITY - Replace defective overheat switch.

NO CONTINUITY - Replace defective main cabin duct overheat relay, R64.

FAULT LIGHT ON TEMPERATURE SELECTOR ILLUMINATES.

Check circuits from main cabin temperature regulator through main cabin duct temperature sensor and through ambient air temperature sensing element in left ram air intake for continuity. IF -

CONTINUITY - Replace main cabin temperature regulator.

NO CONTINUITY - Repair wiring or replace defective temperature sensor.

MAIN CABIN TEMPERATURE CONTROL VALVE ASSEMBLY FAILS TO RESPOND PROPERLY.

Move temperature selector to manual "WARMER" and "COOLER" while observing main cabin temperature control valve assembly.
IF -

CONTINUED ON FOLLOWING PAGE

MAIN CABIN TEMPERATURE CONTROL VALVE ASSEMBLY RESPONDS PROPERLY TO SELECTIONS IN MANUAL RANGE OF TEMPERATURE SELECTOR - Check circuit from main cabin temperature regulator through main cabin temperature sensor for continuity and check that resistance of sensor is approximately 312 ohms.
IF -

CONTINUITY AND RESISTANCE OK - Replace main cabin temperature regulator.	CONTINUITY AND RESISTANCE NOT OK - Repair wiring or replace defective sensor.

CONTINUED FROM
PRECEDING PAGE

MAIN CABIN TEMPERATURE CONTROL VALVE ASSEMBLY FAILS TO RESPOND PROPERLY TO SELECTIONS IN MANUAL RANGE OF TEMPERATURE SELECTOR - Check for power to pin "A" of main cabin temperature control valve assembly motor while holding temperature selector in manual "WARMER." IF -

POWER - Remove motor and supply power. IF -

MOTOR OPERATES - Locate and replace sticking valve

MOTOR DOES NOT OPERATE - Replace motor.

NO POWER - Check circuit from pin "A" of motor to pin "F" of main cabin temperature selector for continuity. IF -

CONTINUITY - Check circuits from main cabin temperature selector to ac bus No. 4 circuit breaker panel (P4) for continuity. IF -

NO CONTINUITY - Repair wiring or replace defective air conditioning unit switches.

CONTINUITY - Replace main cabin temperature selector.

NO CONTINUITY - Repair wiring or replace faulty LH duct overheat relay, R64.

END

AIR CONDITIONING CONTROL AND INDICATING SYSTEM - MAINTENANCE PRACTICES

1. Adjustment/Test Air Conditioning Control and Indicating System

A. Test Manual Temperature Control

(1) Close air conditioning pack control circuit breakers on a-c bus no. 4 circuit breaker panel (P4).

(2) Operate air conditioning control switches to "ON."

(3) Holding control cabin and main cabin temperature selectors to "WARMER" then to "COOLER" shall cause the respective temperature control valves to move to the full heat and full cold positions. The valve position indicators may be observed to determine valve position.

B. Test Automatic Temperature Control

NOTE: Cabin temperature should be first established at a temperature not greater than 85°F (30°C) for the following test:

(1) Close air conditioning pack control circuit breakers on a-c bus no. 4 circuit breaker panel (P4).

(2) If ambient temperature is 65°F (18°C) or above, test operation as follows:

(a) Select existing cabin temperature as accurately as possible on the main cabin temperature selector and close the left air conditioning control switch. The main cabin temperature control valves shall remain stationary. If the valves do operate, they shall stop when the selector is repositioned at some point within ± 4°F (± 2°C) of the selected temperature.

(b) The main cabin temperature control valves shall move to full heat when the respective selector is placed 5°F (3°C) above the existing cabin temperature.

(c) The main cabin temperature control valves shall move to full cold when the main cabin temperature selector is placed 5°F (3°C) below existing cabin temperature.

(3) If cabin temperature is below 65°F (18°C) test operation as follows:

(a) Select a temperature above existing cabin temperature on the main cabin selector. The main cabin temperature control valve shall move to full hot.

(b) Apply heat from a heat lamp to the main cabin temperature sensor. The respective regulator shall pass through a period of balance (no pulsing) and then drive the temperature control valve toward cold.

(4) Close right air conditioning control switch. Repeat steps 2 or 3 above with respect to the control cabin temperature control equipment.

C. Test Duct Overheat Switch Circuit Operation (Main and Control Cabins)

(1) Close the overheat control circuit breaker on radio and T-R circuit breaker panel (P5) and select "WARMER" in the manual range until the temperature control valve reaches full hot.

(2) Momentarily short terminals 1 and 2 of the respective overheat switch terminal strip.

(a) The main cabin temperature control valve shall move to full cold when the main cabin duct overheat switch terminals are shorted and the main cabin duct overheat switch warning light shall illuminate.

(b) Press the overheat reset switch. The main cabin duct overheat warning light shall go out.

(c) The control cabin temperature control valve shall move to full cold when the control cabin duct overheat switch terminals are momentarily shorted and the control cabin duct overheat warning light shall illuminate.

(d) Press the overheat reset switch. The control cabin duct overheat warning light shall go out.

D. Test System Operation

(1) Connect ground service cart (Boeing 502-11B or equivalent) to the pneumatic ground service air connection and supply air. Connect 115/200 volt 3 phase external power and energize the T-R buses.

(2) Close cabin doors and windows.

NOTE: Deleted

(3) Operate cabin altitude selector to 1000 feet below field level.

(4) Close following circuit breakers, located on panels P4 and P5.

(a) A/C manual override

(b) A/C hot air turbofan, and exhaust air valves

(c) Left A/C pack control

(d) Right A/C pack control

(e) Safety and oil cooler relays

(f) A/C overheat control

(5) Check control cabin air conditioning system operation as follows:

(a) Place the left A/C switch to "ON." The ram air exit dampers shall be closed and the turbofan valves shall be open. The left turbofan shall operate.

NOTE: The A/C control switch gang bar should be temporarily removed to perform the following checks.

(b) Hold the control cabin temperature selector knob to manual "WARMER". Warmer air shall be delivered at the control cabin outlets. Hold the selector to permit the duct overheat sensors to reach cut-out temperature. The control cabin duct overheat lamps shall light if overheat temperatures are attainable and the control cabin outlets shall then discharge cool air. Release the selector knob and press the overheat reset switch. The overheat lamp shall go out and normal operation shall be restored.

NOTE: This test will not be possible unless duct air temperature can be raised to approximately 200°F (95°C). Time allowance should be made for duct temperature lag.

(c) Hold the control cabin temperature selector knob to manual "COOLER". Cool air shall be delivered at the control cabin outlets.

(d) Place the selector knob to a temperature at least 5°F (3°C) above and below ambient cabin temperature in the automatic range, and note that a steady flow of air is delivered from the outlets at a temperature related to the selector setting. The temperature of the delivered air should remain constant and not cause discomfort.

(e) No overheat warning lamps shall light under automatic control.

(6) Check main cabin air conditioning system operation as follows:

(a) Operate right air conditioning control switch to "ON". The right turbofan shall operate.

(b) Operate main cabin temperature selector knob as in (5) (b), (c), and (d) above. Similar results shall be observed in the main cabin.

(c) No overheat warning lamps shall light under automatic control.

TEMPERATURE REGULATOR - REMOVAL/INSTALLATION

1. Remove Regulator (See figure 401.)

   A. Open air conditioning control circuit breakers on panel P4.

   B. Where necessary, remove bolts holding J23 relay shield cover in place and remove relay shield cover.

   C. Disconnect ground wire and electrical connector on regulator.

   D. Remove mounting screws and remove regulator.

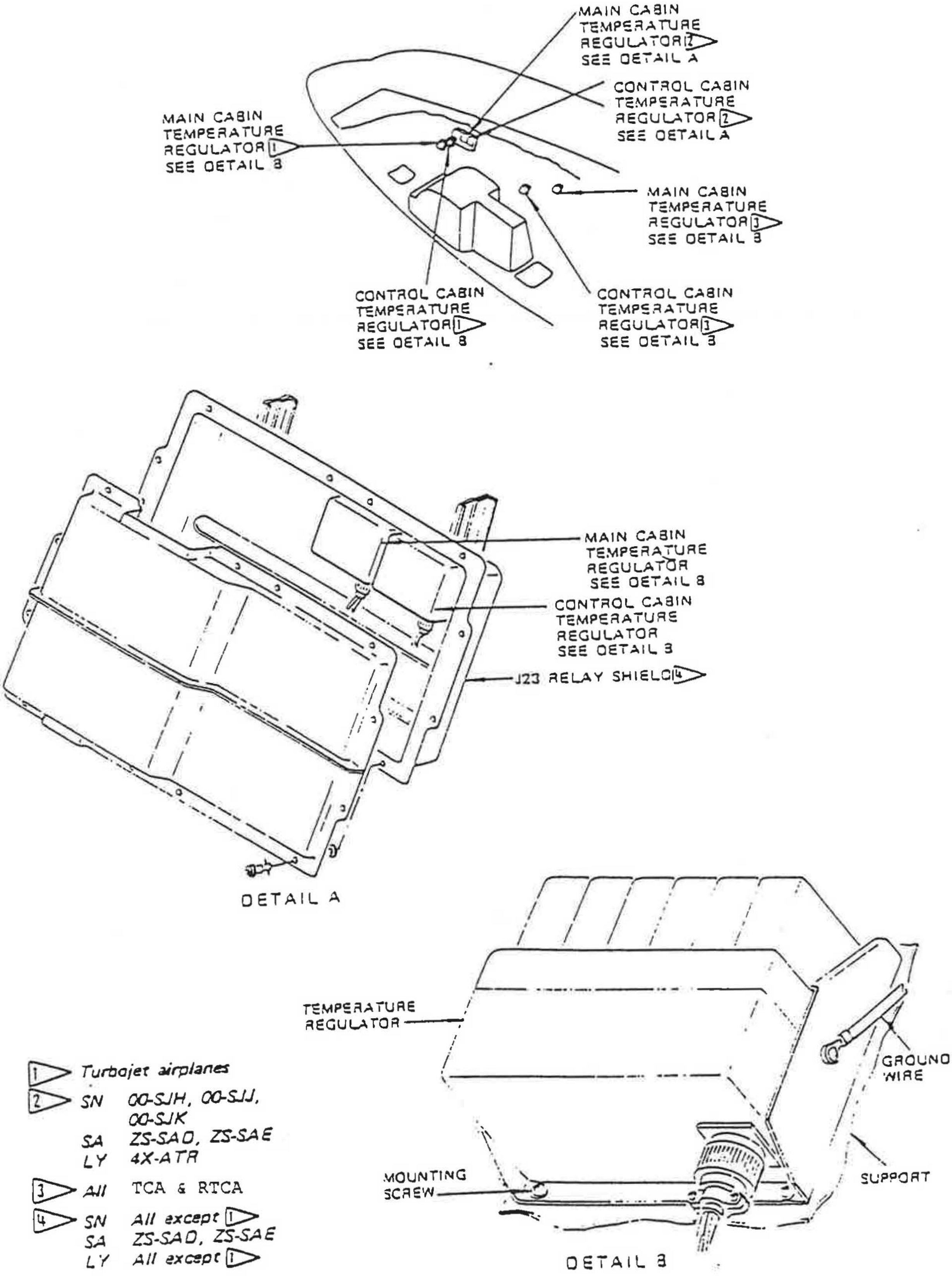
2. Install Regulator (See figure 401.)

   A. Position regulator and install mounting screws.

   B. Connect electrical connector and ground wire.

   C. Where necessary, position J23 relay shield cover and attach with bolts.

   D. Close circuit breakers.



Main and Control Cabin Temperature Regulators Installation
Figure 401

TEMPERATURE SENSING DEVICES - MAINTENANCE PRACTICES

1. Removal/Installation Control Cabin Temperature Sensing Element

    A. The control cabin temperature sensing element is mounted on the rear bulkhead of the control cabin. (See figure 201.)

    B. Remove Sensing Element

        (1) Open air conditioning control circuit breakers on circuit breaker panel P4.

        (2) Remove protective grille cover plate.

        (3) Disconnect electrical connector on sensing element.

        (4) Remove attaching screws and remove sensing element.

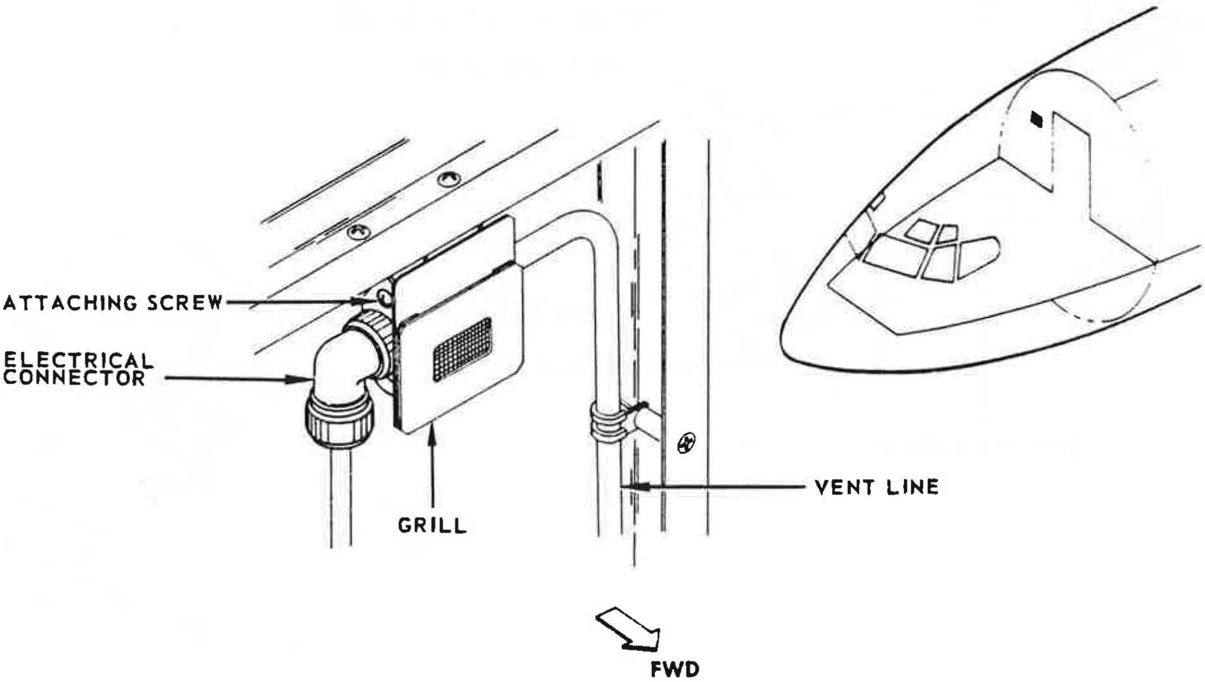
    C. Install Sensing Element

        (1) Position sensing element and install attaching screws.

        (2) Connect electrical connector.

        (3) Install protective grille cover plate.

        (4) Close air conditioning control circuit breakers on circuit breaker panel P4.



Control Cabin Temperature Sensing Element Installation
Figure 201

2. Removal/Installation Control Cabin Duct Temperature Sensing Element and Duct Overheat Switch

A. The control cabin duct temperature sensing element and overheat switch are located in the control cabin air distribution duct, sta. 360 to 384, in the right side of the lower nose compartment. Removal and installation are similar. (See figure 202.)

B. Remove Sensing Element/Overheat Switch

(1) Open air conditioning circuit breakers on circuit breaker panel P4/open overheat control circuit breaker on circuit breaker panel P5.

(2) Disconnect electrical connector on sensing element.

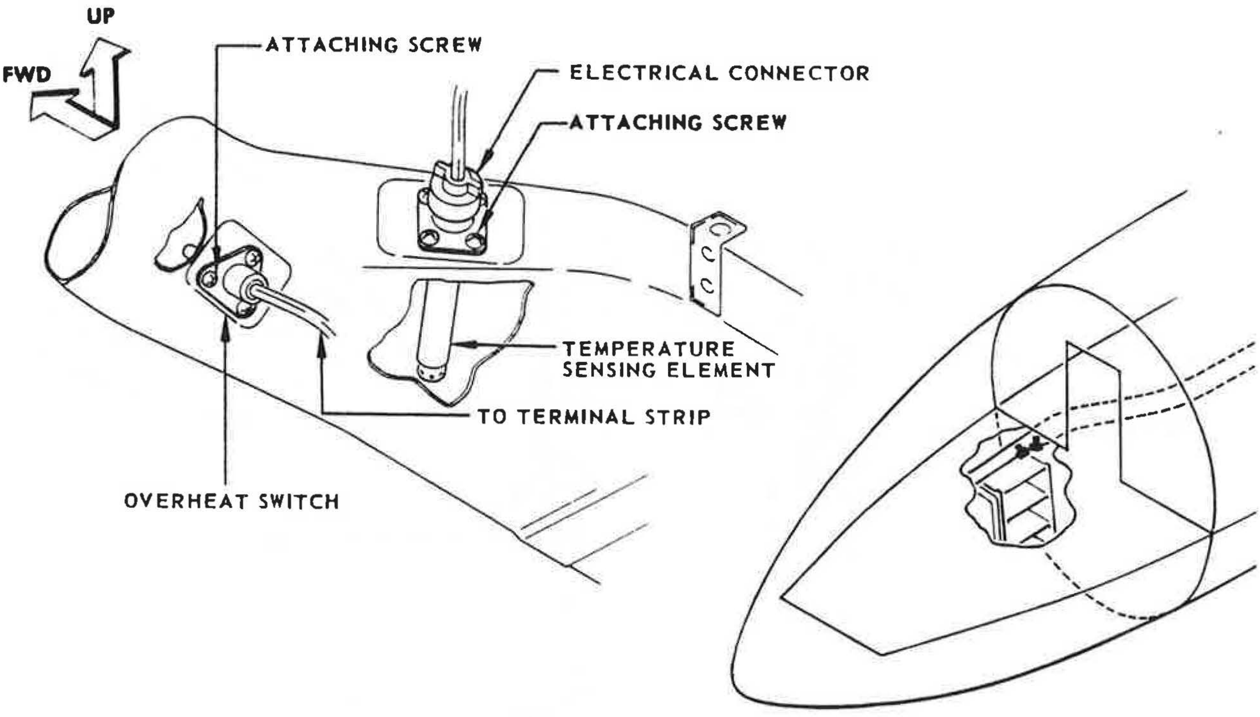
(3) Remove attaching screws and remove element.

C. Install Sensing Element/Overheat Switch

(1) Position sensing element and install attaching screws.

(2) Connect electrical connector.

(3) Close air conditioning circuit breakers on circuit breaker panel P4/close overheat control circuit breaker on circuit breaker panel P5.



Control Cabin Duct Temperature Sensing Element and Overheat Switch Installation
Figure 202

3. Removal/Installation Main Cabin Temperature Sensing Element (OO-SJA thru OO-SJH)

A. On turbojet airplanes, the main cabin temperature sensing element is installed in the right air return grille at approximately station 600 F. (See figure 203.) On OO-SJH, the element is installed in the left air return grille at approximately sta. 1100.

B. Remove Main Cabin Temperature Sensing Element

(1) Operate left and right air conditioning control switches to "OFF."

(2) Open following circuit breakers:

(a) On a-c bos No. 4 circuit breaker panel (P4): "AUTO PACK CONTROL," "MANUAL PACK CONTROL."

(b) On radio and T-R circuit breaker panel (P5): "AIR COND OVH'T CONTROL."

(3) Remove grille cover plate attaching screws.

(4) Pull down grille cover plate with element attached.

(5) Disconnect electrical connector.

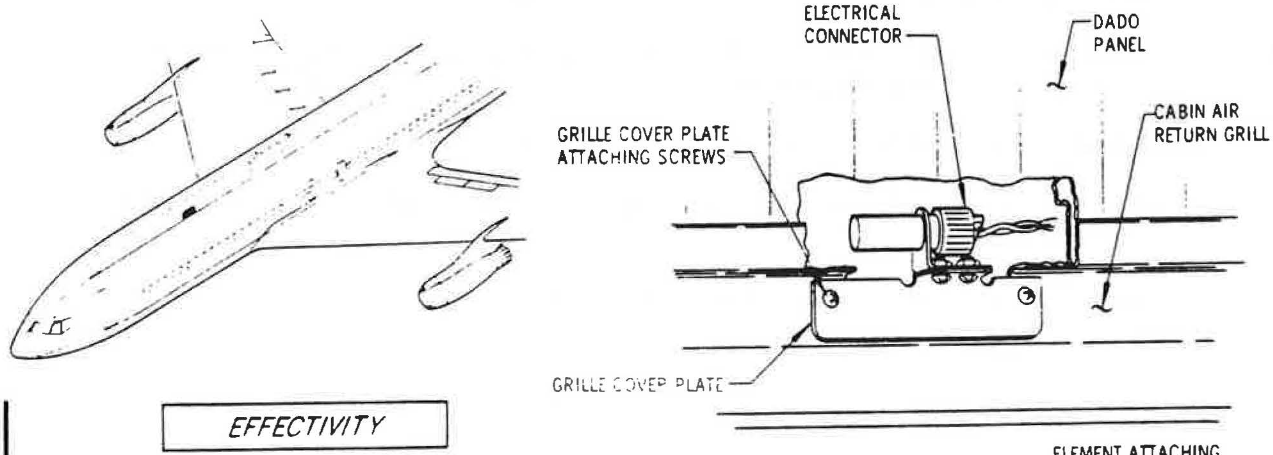
(6) Remove element attaching screws and separate element from cover plate.

C. Install Main Cabin Temperature Sensing Element

(1) Attach element to grille cover plate with element attaching screws.

(2) Connect electrical connector.

(3) Position grille cover plate and install attaching screws.



EFFECTIVITY
OO-SJA THRU OO-SJH

Main Cabin Temperature Sensing Element Installation
Figure 203

(4) Close the following circuit breakers:

(a) On a-c bus No. 4 circuit breaker panel (P4): "AUTO PACK CONTROL," "MANUAL PACK CONTROL."

(b) On radio and T-R circuit breaker panel (P5): "AIR COND OVH'T CONTROL."

4. Removal/Installation Main Cabin Temperature Sensing Element (SABENA OO-SJJ and on, IIA EI-ANV and on)

A. General

(1) The main cabin temperature sensing element is installed in a box mounted to the structure behind the hatrack at station 1150. The box is connected to an air source and pickup in the hatrack bullnose for the passenger configuration, and to the ceiling supported air source pickup for the cargo configuration.

B. Remove Main Cabin Temperature Sensing Element (See figure 204.)

(1) Operate left and right air conditioning control switches to "OFF."

(2) Open following circuit breakers:

(a) On a-c bus No. 4 circuit breaker panel (P4): "AUTO PACK CONTROL," "MANUAL PACK CONTROL."

(b) On radio and T-R circuit breaker panel (P5): "AIR COND. OVH'T CONTROL."

(3) Remove closure panel to gain access to sensing box.

(4) Remove the four bolts holding the temperature sensing box.

(5) Disconnect flex hose to air inlet pickup line.

(6) Disconnect electrical connector from sensing element.

(7) Remove two bolts from flange of sensing element and remove sensing element from sensor box.

C. Install Main Cabin Temperature Sensing Element

(1) Insert sensing element in sensor box and fasten sensing element with two bolts.

(2) Connect electrical connector to sensing element.

(3) Connect flex hose to air inlet pickup line.

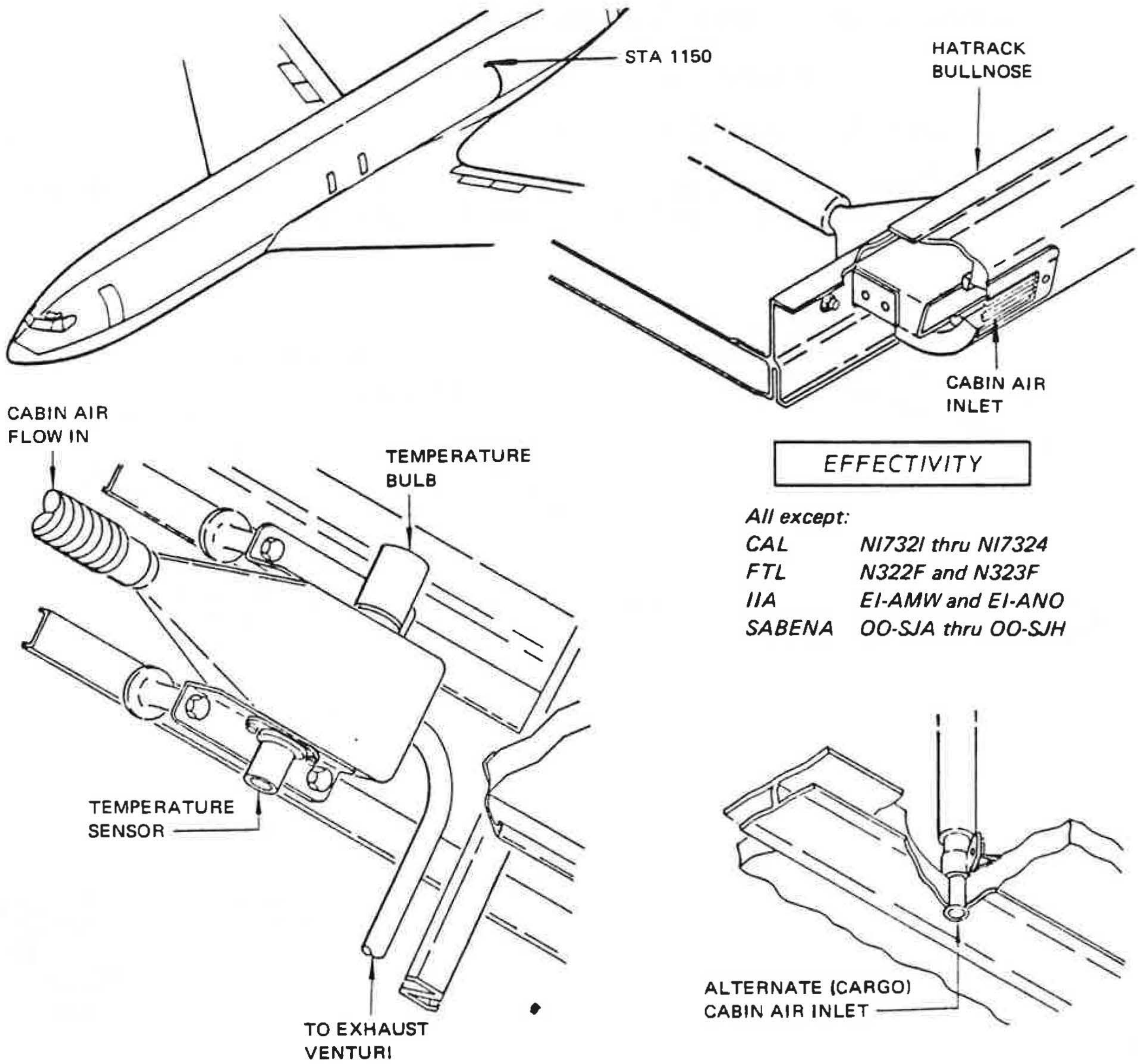
(4) Position sensing box and fasten in place with four bolts.

(5) Install closure panel.

(6) Close the following circuit breakers:

(a) On ac bus No. 4 circuit breaker panel (P4): AUTO PACK CONTROL, MANUAL PACK CONTROL.

(b) On radio and T-R circuit breaker panel (P5): AIR COND OVH'T CONTROL.



EFFECTIVITY

All except:

CAL	N17321 thru N17324
FTL	N322F and N323F
IIA	EI-AMW and EI-ANO
SABENA	OO-SJA thru OO-SJH

Main Cabin Temperature Sensing Element Installation
Figure 204

7. Removal/Installation Main Cabin Duct Temperature Sensing Element and Duct Overheat Switch

A. The main cabin duct temperature sensing element and overheat switch are located in the right branch of the conditioned air distribution manifold in the air conditioning distribution bay. Removal and installation are similar. (See figure 205.)

B. Remove Sensing Element/Overheat Switch

(1) Open air conditioning circuit breakers on circuit breaker panel P4/Open overheat control circuit breaker on circuit breaker panel P5.

(2) Disconnect electrical connector on sensing element.

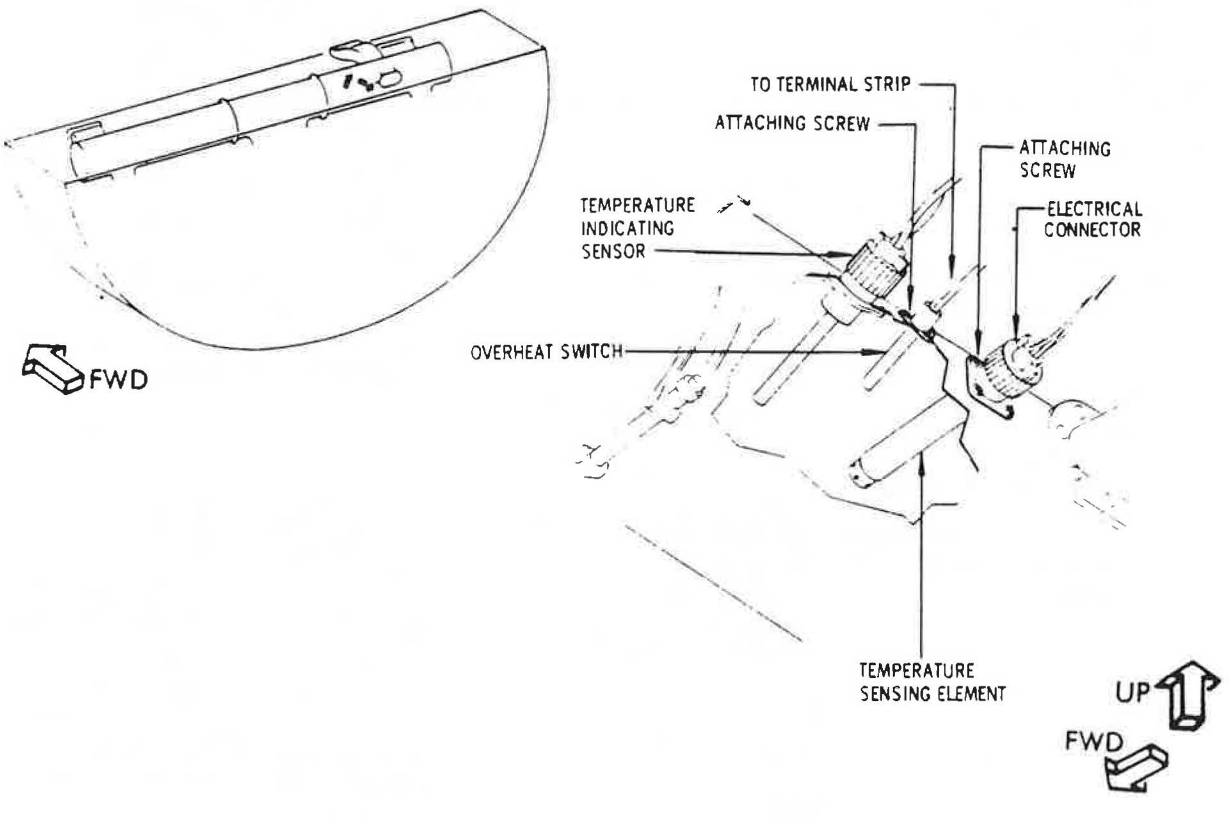
(3) Remove mounting screws and remove element.

C. Install Sensing Element/Overheat Switch

(1) Position sensing element and install mounting screws.

(2) Connect electrical connector.

(3) Close circuit breakers on circuit breaker panel P4/Close overheat control circuit breaker on circuit breaker panel P5.



Main Cabin Duct Temperature Sensing
Element and Overheat Switch Installation
Figure 205

6. Removal/Installation Ambient Air Temperature Sensing Elements

A. The ambient air temperature sensing elements are installed in the left and right ram air ducts, adjacent to the forward end of each secondary heat exchanger. Access is gained through the air conditioning equipment bay doors. (See figure 206.)

B. Remove Sensing Element

(1) Open air conditioning circuit breaker on circuit breaker panel P4.

(2) Disconnect electrical connector on sensing element.

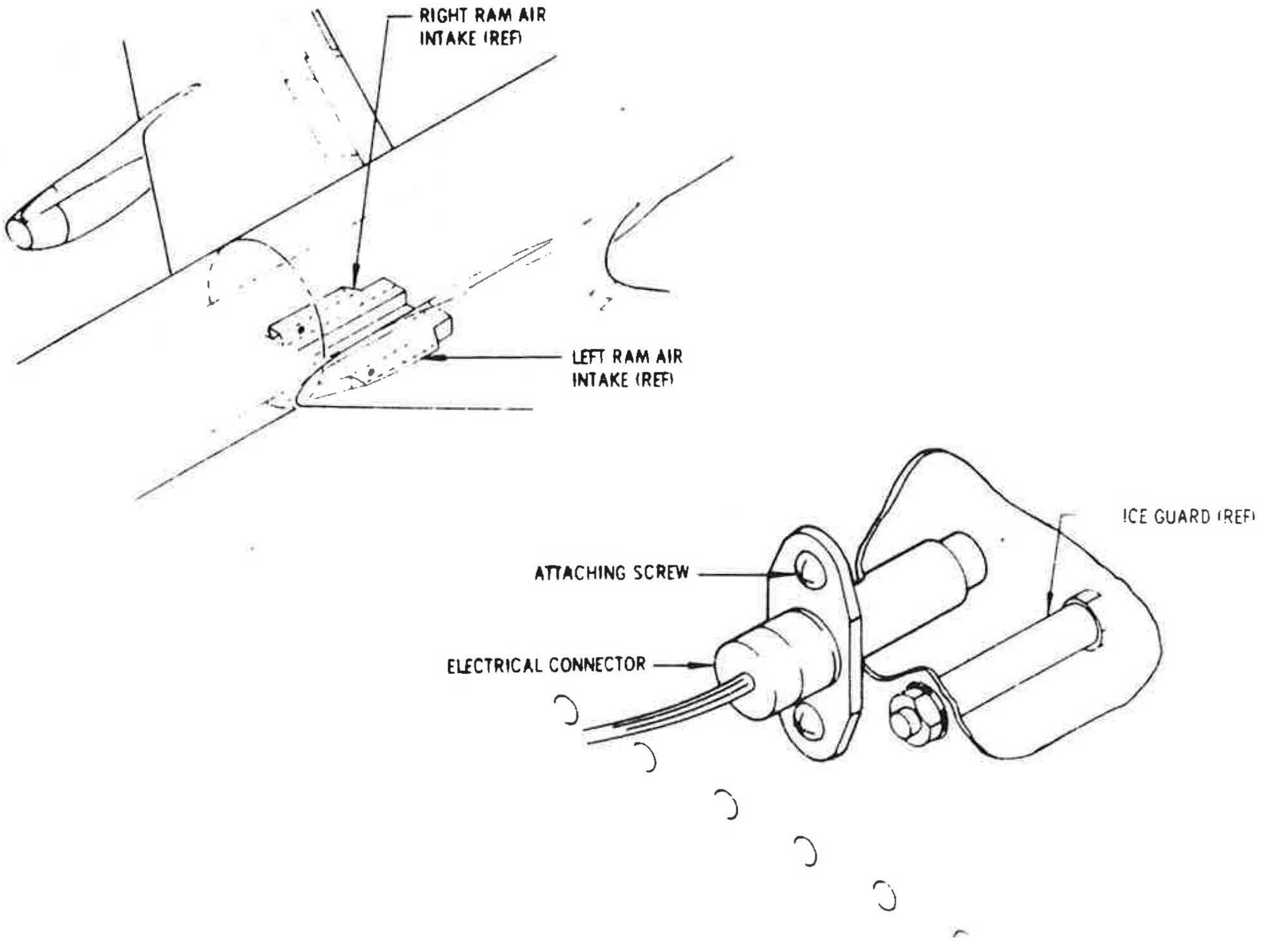
(3) Remove mounting screws and remove element.

C. Install Sensing Element

(1) Position sensing element and install mounting screws.

(2) Connect electrical connector.

(3) Close air conditioning circuit breakers on circuit breaker panel P4.



Ambient Air Temperature Sensing Element Installation
Figure 206

TEMPERATURE INDICATING SYSTEM - MAINTENANCE PRACTICES

1. Removal/Installation Main Cabin Duct Temperature Indicating Bulb

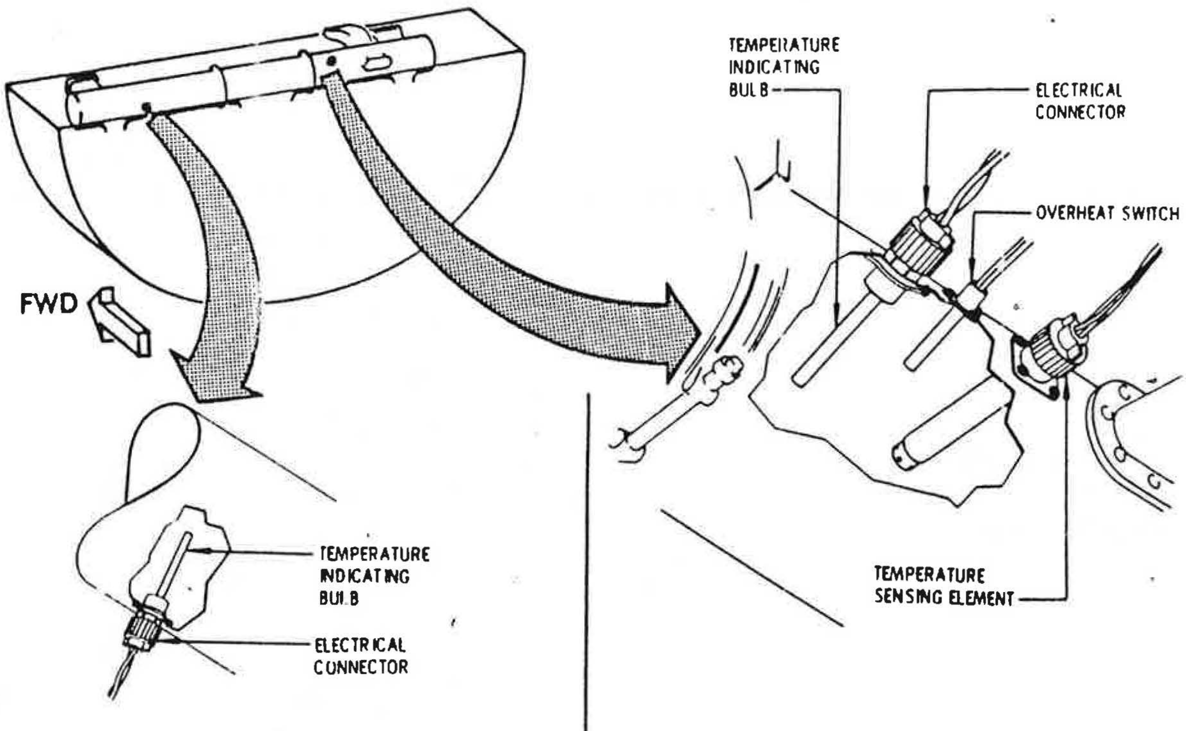
   A. The main cabin duct temperature indicating bulb is located in the conditioned air distribution manifold in the air conditioning distribution bay. When installing new bulb remove the AN900-10 gasket from temperature bulb and replace with BAC P11K10 "O" ring. Refer to Boeing 707 Illustrated Parts Catalogue.

   B. Remove Temperature Indicating Bulb

      (1) Open temperature indicator circuit breaker on 28 volt a-c circuit breaker panel (P7).

      (2) Disconnect electrical connector on temperature indicating bulb. (See figure 201.)

      (3) Unscrew indicating bulb from duct and remove bulb.



EFFECTIVITY	
AF	F-BHSA THRU F-BHSD
BOAC	G-APFB ONLY
SABENA	OO-SJA AND OO-SJB
DLH	D-ABOB

EFFECTIVITY	
AF	F-BHSE AND ON
BOAC	G-APEC AND ON
SABENA	OO-SJC AND ON
DLH	D-ABOC AND ON

Main Cabin Duct Temperature Indicating Bulb Installation
Figure 201

C. Install Temperature Indicating Bulb

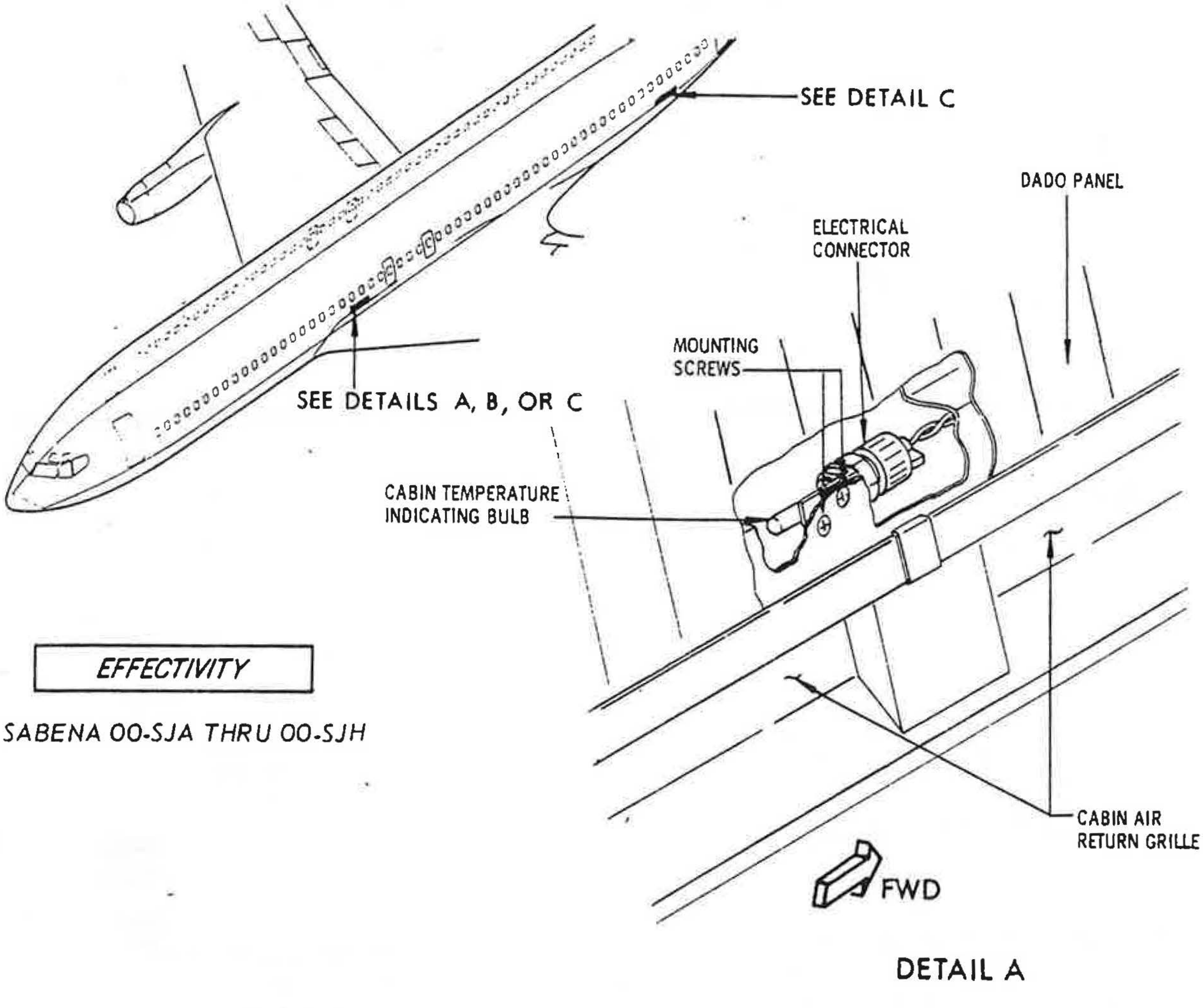
(1) Screw bulb into pad on air distribution manifold.

(2) Connect electrical connector.

(3) Close circuit breaker opened in step 1.B. (1).

2. Removal/Installation Main Cabin Temperature Indicating Bulb (SABENA OO-SJA thru OO-SJH)

A. The main cabin temperature indicating bulb is installed in the air return grille. Refer to 21-5-0, figure 1, for bulb location. (See figure 202.)



EFFECTIVITY

SABENA OO-SJA THRU OO-SJH

Main Cabin Temperature Indicating Bulb Installation
Figure 202 (Sheet 1 of 2)

B. Remove Temperature Indicating Bulb

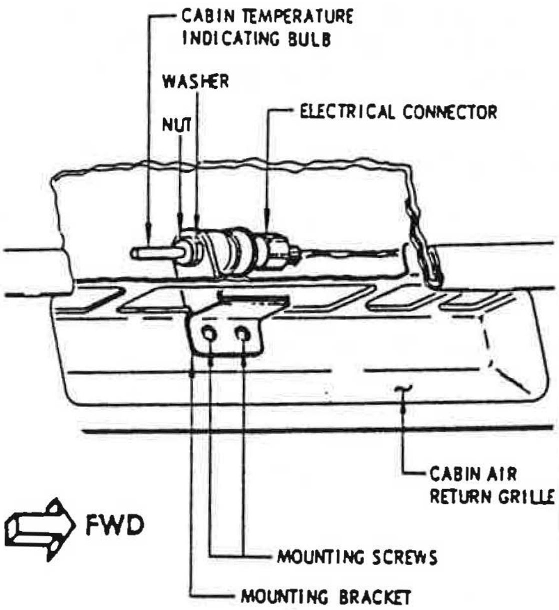
(1) Open temperature indicator circuit breaker on 28 volt a-c circuit breaker panel (P7).

(2) On airplanes AF F-BHSA thru F-BHSQ, SABENA OO-SJA thru OO-SJE, BOAC G-APFB thru G-APFP and DLH D-ABOB thru D-ABOG, remove dado panel. Refer to Sidewall Lining and Insulation, Chapter 25.

(3) Remove mounting screws and pull bulb and mounting bracket clear of cabin air return grille.

(4) Disconnect electrical connector from bulb.

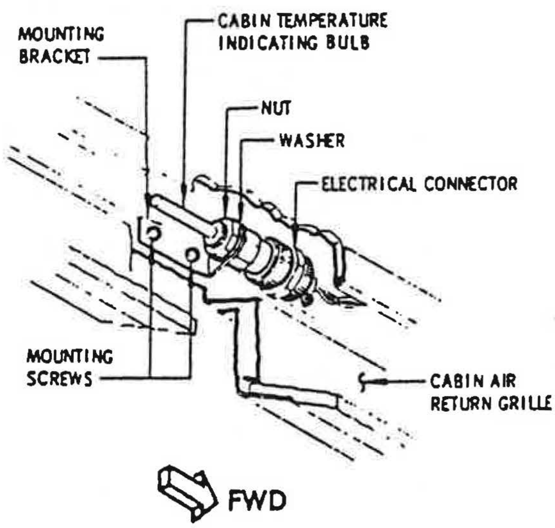
(5) Remove nut and washer attaching bulb to mounting bracket and separate bulb from bracket.



EFFECTIVITY

AF	F-BHSR THRU F-BHSZ
SABENA	OO-SJF AND OO-SJG
BOAC	G-ARRA THRU G-ARRC
DLH	D-ABOV

DETAIL B



EFFECTIVITY

AF	F-BLCA THRU F-BLCC
SABENA	OO-SJH
BOAC	G-ASZF AND G-ASZG
DLH	D-ABOT, D-ABUA, AND D-ABUE

DETAIL C

Main Cabin Temperature Indicating Bulb Installation
Figure 202 (Sheet 2 of 2)

C. Install Temperature Indicating Bulb

(1) Position sensor in mounting bracket and install washer and nut which holds bulb in bracket.

(2) Connect electrical connector to bulb.

(3) Position mounting bracket and install mounting screws.

(4) Install dado panel if removed in step 2.B.(2). Refer to Sidewall Lining and Insulation, Chapter 25.

(5) Close circuit breaker opened in step 2.B.(1).

3. Removal/Installation Main Cabin Temperature Indicating Bulb

A. General

(1) The main cabin temperature indicating bulbs are installed in boxes mounted to the structure behind the hatrack. The boxes are connected to an air source and pickup in the hatrack bullnose for the passenger configuration, and to the ceiling supported air source pickup for the cargo configuration.

B. Remove Main Cabin Temperature Sensing Element (See figure 203.)

(1) Operate left and right air conditioning control switches to "OFF."

(2) Open temperature indicator circuit breaker on panel P7.

(3) Remove closure panel to gain access to sensing box.

(4) Remove the four bolts holding the temperature sensing box.

(5) Disconnect flex hose to air inlet pickup line.

(6) Disconnect electrical connector from bulb.

(7) Unscrew bulb from boss and remove bulb from sensor box.

C. Install Main Cabin Temperature Indicating Bulb

(1) Thread bulb into sensor box.

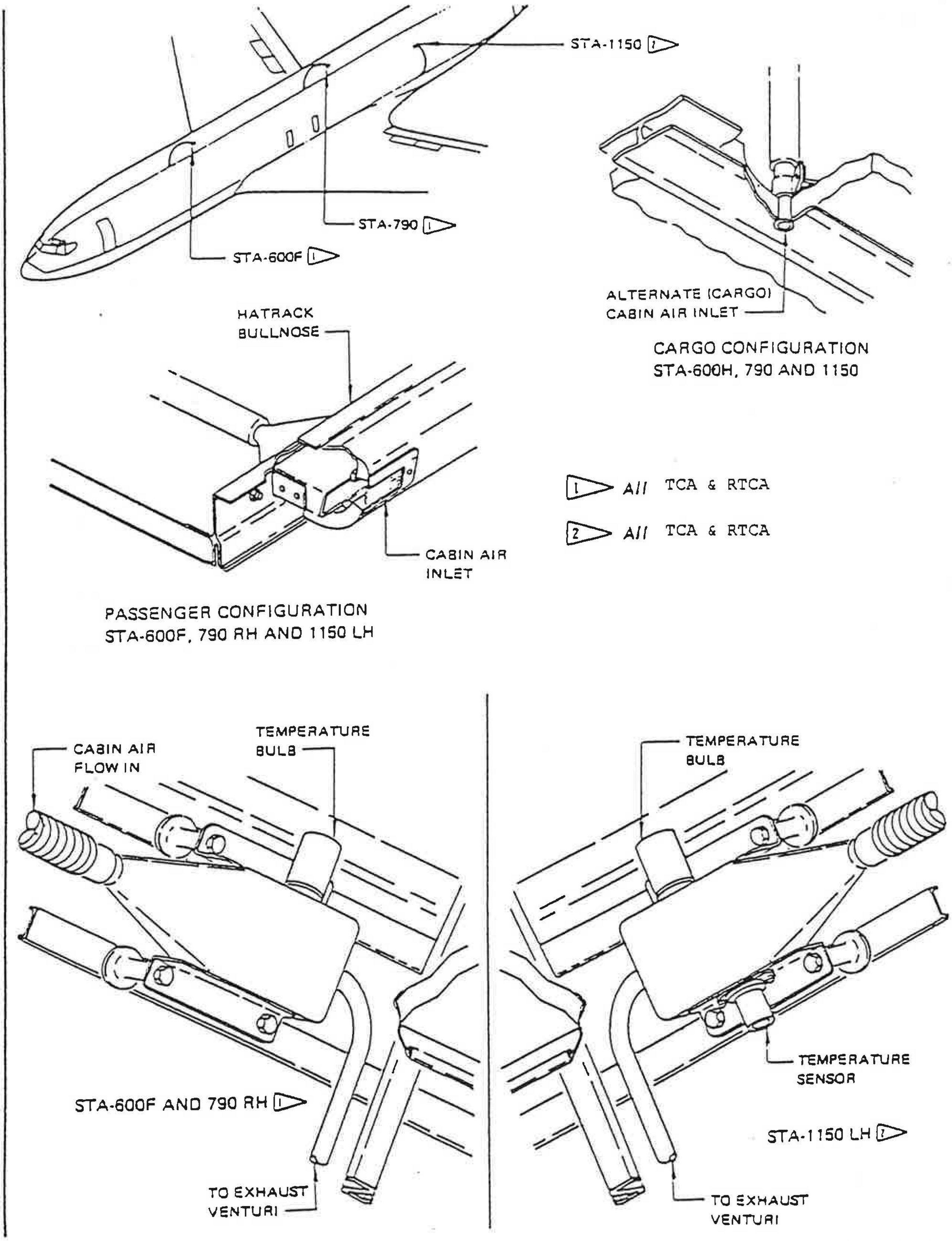
(2) Connect electrical connector to bulb.

(3) Connect flex hose to air inlet pickup line.

(4) Position sensing box and fasten in place with four bolts.

(5) Install closure panel.

(6) Close temperature indicator on circuit breaker panel P7.



Main Cabin Temperature Bulb Installation
Figure 203

AIR DISTRIBUTION SYSTEM - DESCRIPTION AND OPERATION

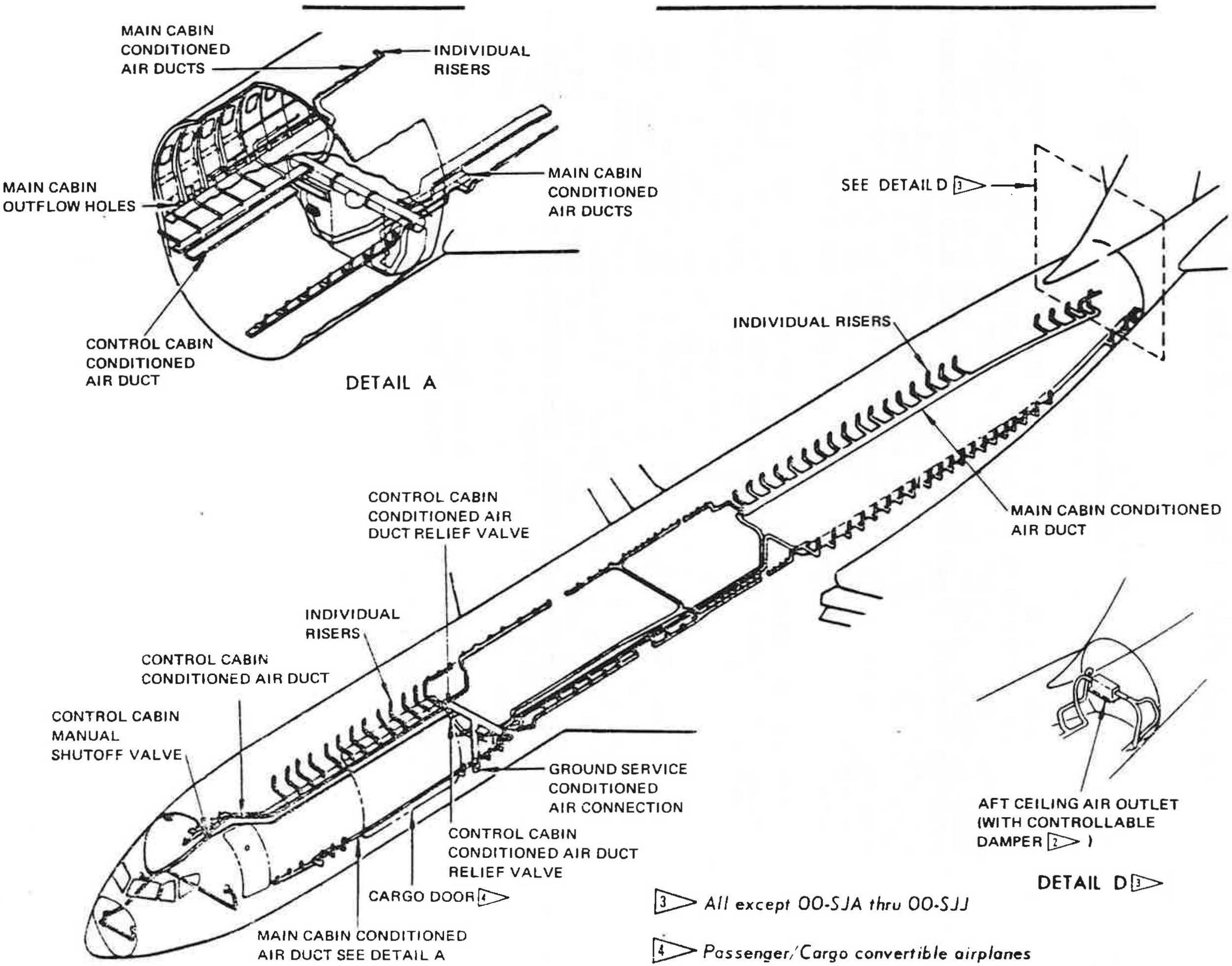
1. General

   A. The air distribution system consists of two separate duct systems for directing conditioned air, and semiconditioned or cool air to the main and control cabins. (See figures 1 and 2.)

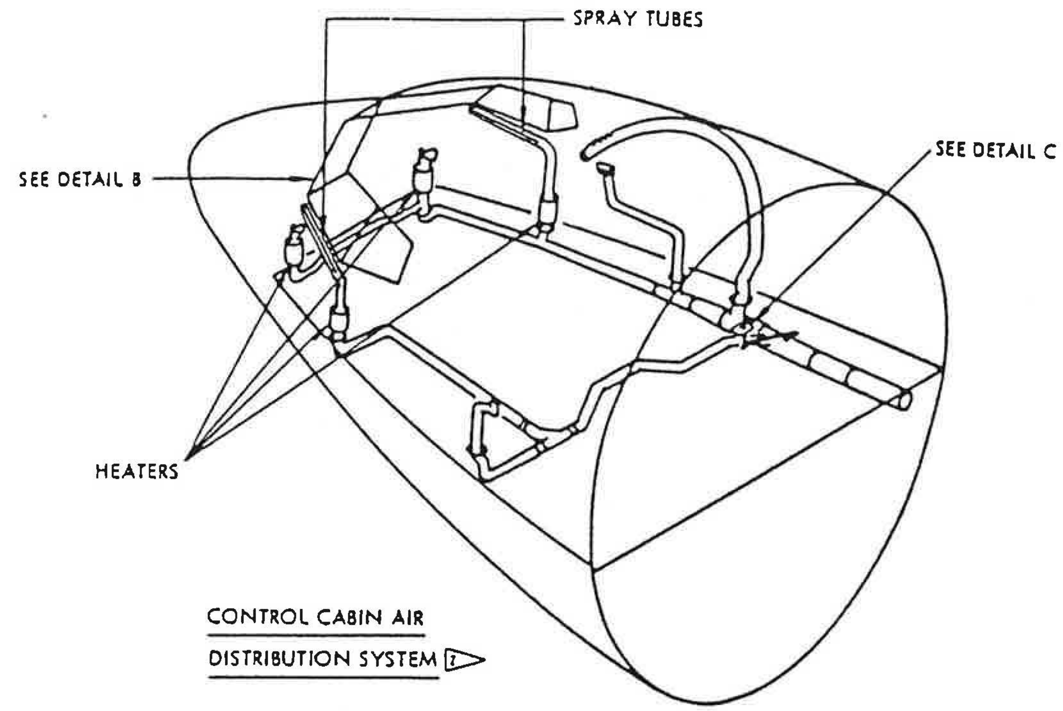
   B. The conditioned air system (figure 1) is in turn subdivided to supply the main and control cabins separately. A flow controller in the control cabin duct assures the proper division of flow to both cabins. A relief valve is also included in the same duct to prevent duct damage from excessive pressure. A manual shutoff valve in the duct permits shutting off airflow to the control cabin. Conditioned air is also used for cooling the pilot's and copilot's instrument panels on turbofan airplanes. On some airplanes electric heaters are installed at the pilot and copilot foot outlets and on spray tubes along the pilot and copilot window sill. Refer to 21-42-0, Control Cabin Heating System.

   C. Distribution of conditioned air to the main cabin is through a free-flowing duct system leading fore and aft beneath the floor. Individual riser ducts branch off below each window panel to provide flow throughout the cabin. Orifice restrictors in each riser balance the flow. The air is directed from the risers through the cabin sidewall between the insulation and interior lining either through air distribution bags or through plastic ducts. The air enters the cabin through the cove light grille and on some airplanes also through an air grille, equipped with controllable damper, located in the aft ceiling area. Air then is exhausted from the cabin through air exit grilles into outflow holes in the sidewall just above the floor. (See figure 1.) The exhausted air then passes around the cargo compartment interior lining and out the outflow valves. Refer to Pressurization Control and Indicating System.

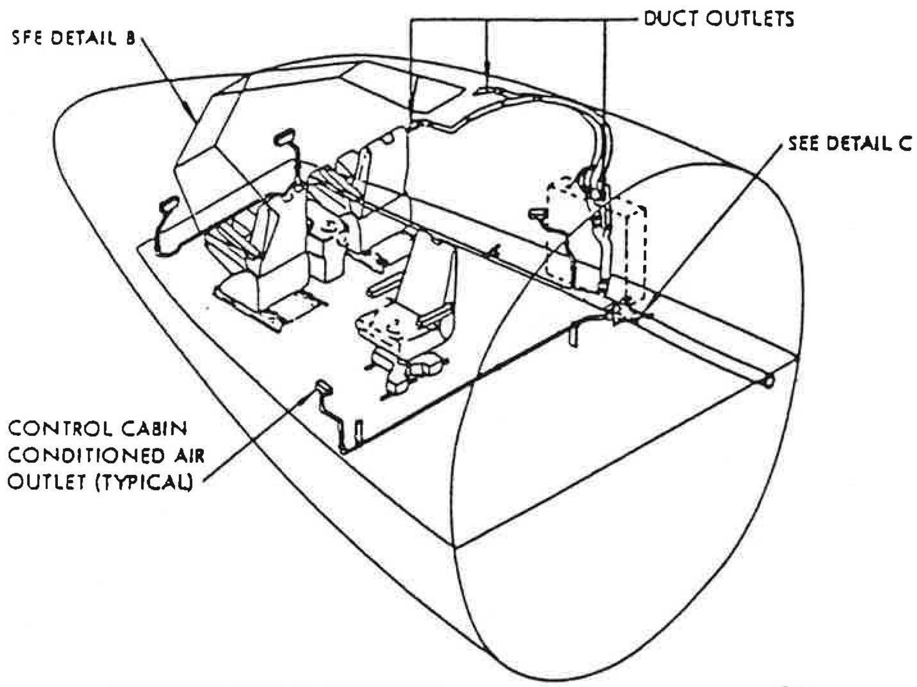
   D. Cargo airplanes do not have riser ducts from the conditioned air system in the cargo door area. Instead heating blankets are provided to maintain warmth in the door area.



Conditioned Air Distribution System
Figure 1 (Sheet 1)



CONTROL CABIN AIR
DISTRIBUTION SYSTEM 2

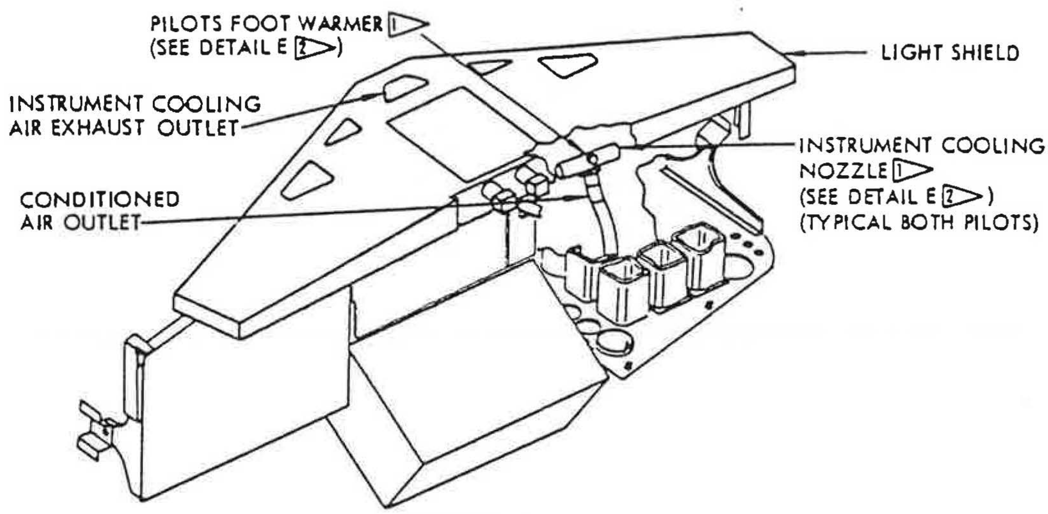


CONTROL CABIN CONDITIONED
AIR DISTRIBUTION SYSTEM 1

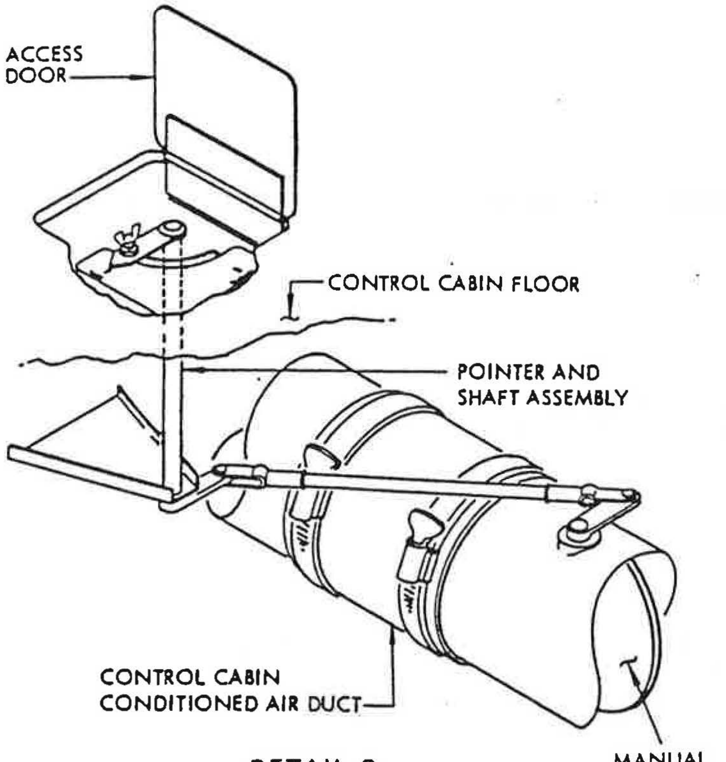
1 SABENA OO-SJA thru OO-SJK
AR LV-ISA thru LV-ISD

2 All TCA & RTCA

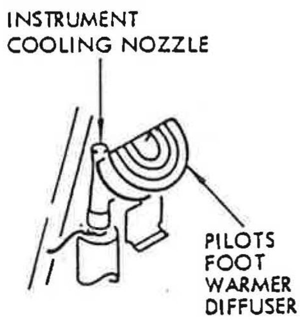
Conditioned Air Distribution System
Figure 1 (Sheet 2)



DETAIL B



DETAIL C



DETAIL E 2

Conditioned Air Distribution System
Figure 1 (Sheet 3)

E. Semiconditioned or cool air flows through individual air system ducts located behind the cove lights to individually controlled outlets in passenger service units above each row of seats. (See figure 2.) Individual outlets are also located in the lounge, lavatory and galley areas and at each crew station in the control cabin. A pressure regulator in the duct ensures adequate flow based on system demand, with relief valves to protect against excessive pressure.

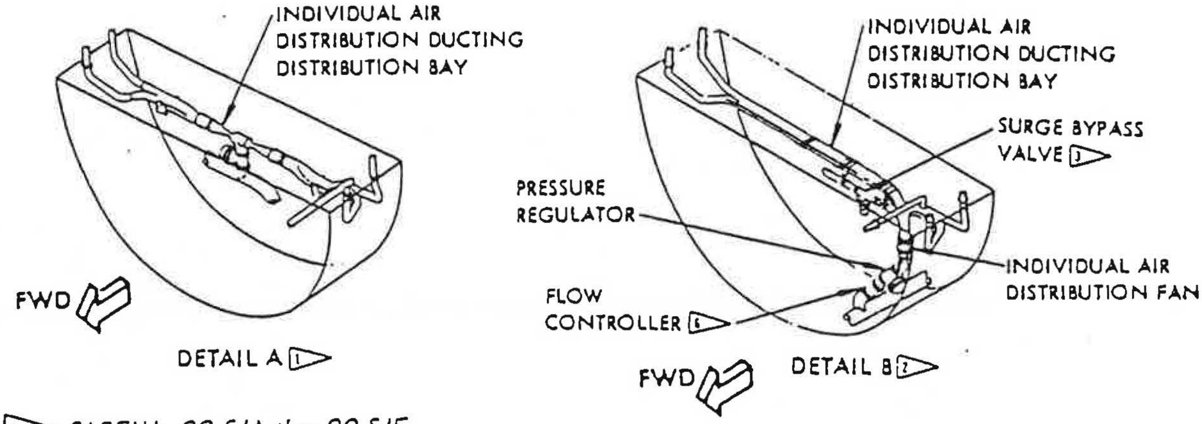
F. Some airplanes are equipped with an individual air distribution fan to provide adequate system airflow on the ground with or without operation of the air conditioning packs. The fan may also be used in flight to augment airflow. On some airplanes, a flow controller is installed in the fan inlet ducting just upstream of the individual air pressure regulator to limit the fan windmilling speed when the fan is turned off. (See figure 2 for fan and flow controller effectivity.)

2. Pressure Regulator

A. The individual air outlet pressure regulator is a pneumatically-actuated, differential pressure controlled butterfly valve that maintains a constant flow of semiconditioned air to the outlets. The pressure regulator is located in the air conditioning distribution bay.

3. Ground Conditioned Air Valve and Duct

A. The ground conditioned air valve is a swing check valve, located just above the ground connection, to prevent reverse flow. The ground conditioned air duct is an extension of the main mixing duct. It has an exterior connection for receiving air from an external source for air conditioning on the ground. A drain is provided beside the air valve to prevent the accumulation of water.



1 *SABENA OO-SJA thru OO-SJE*
BOAC G-APFB thru G-APFP and G-ARRA

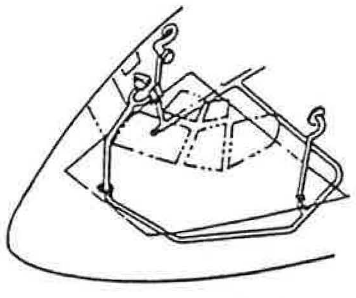
2 *All* TCA & RTCA

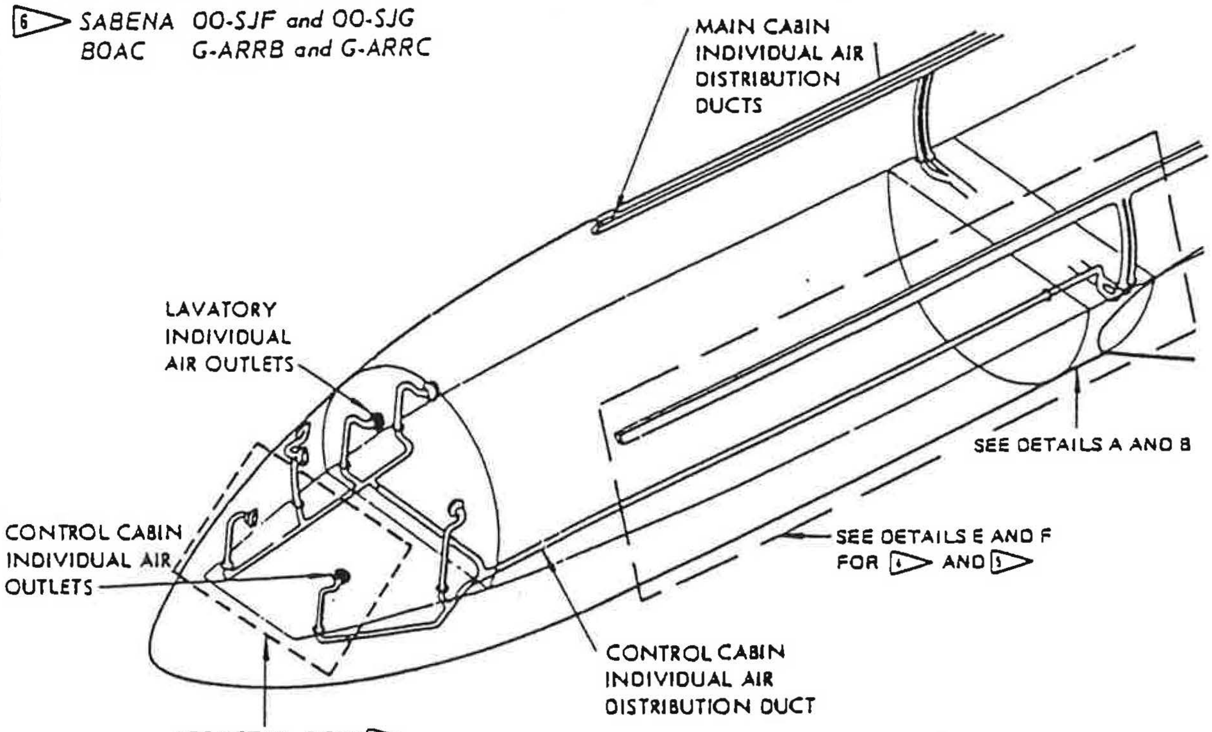
3 *All except:*
SABENA OO-SJA thru OO-SJK
BOAC G-ASZF, GASZG, and 707-436 airplanes

4 *SABENA OO-SJH, OO-SJJ, and OO-SJK*
BOAC G-ASZF and G-ASZG

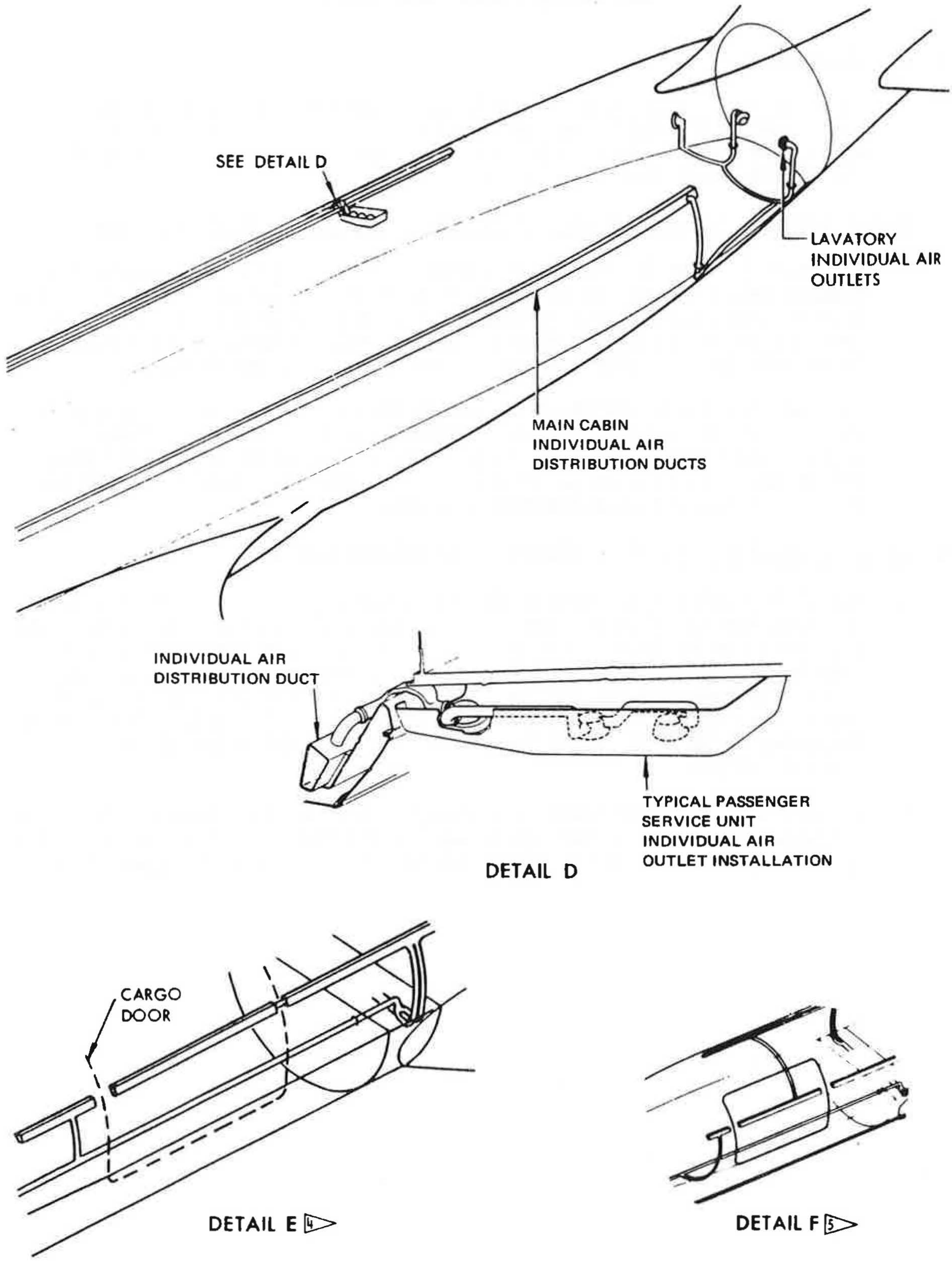
5 *All Passenger/Cargo convertible airplanes*

6 *SABENA OO-SJF and OO-SJG*
BOAC G-ARRB and G-ARRC





Individual Air Distribution System
Figure 2 (Sheet 1)



Individual Air Distribution System
Figure 2 (Sheet 2)

4. Flow Controller

A. The flow controller is a pneumatically actuated, differential pressure controlled butterfly valve that maintains a constant flow of conditioned air to the control cabin outlets. The flow controller is located in the air conditioning distribution bay.

5. Relief Valves - Individual Air and Control Cabin Distribution Systems

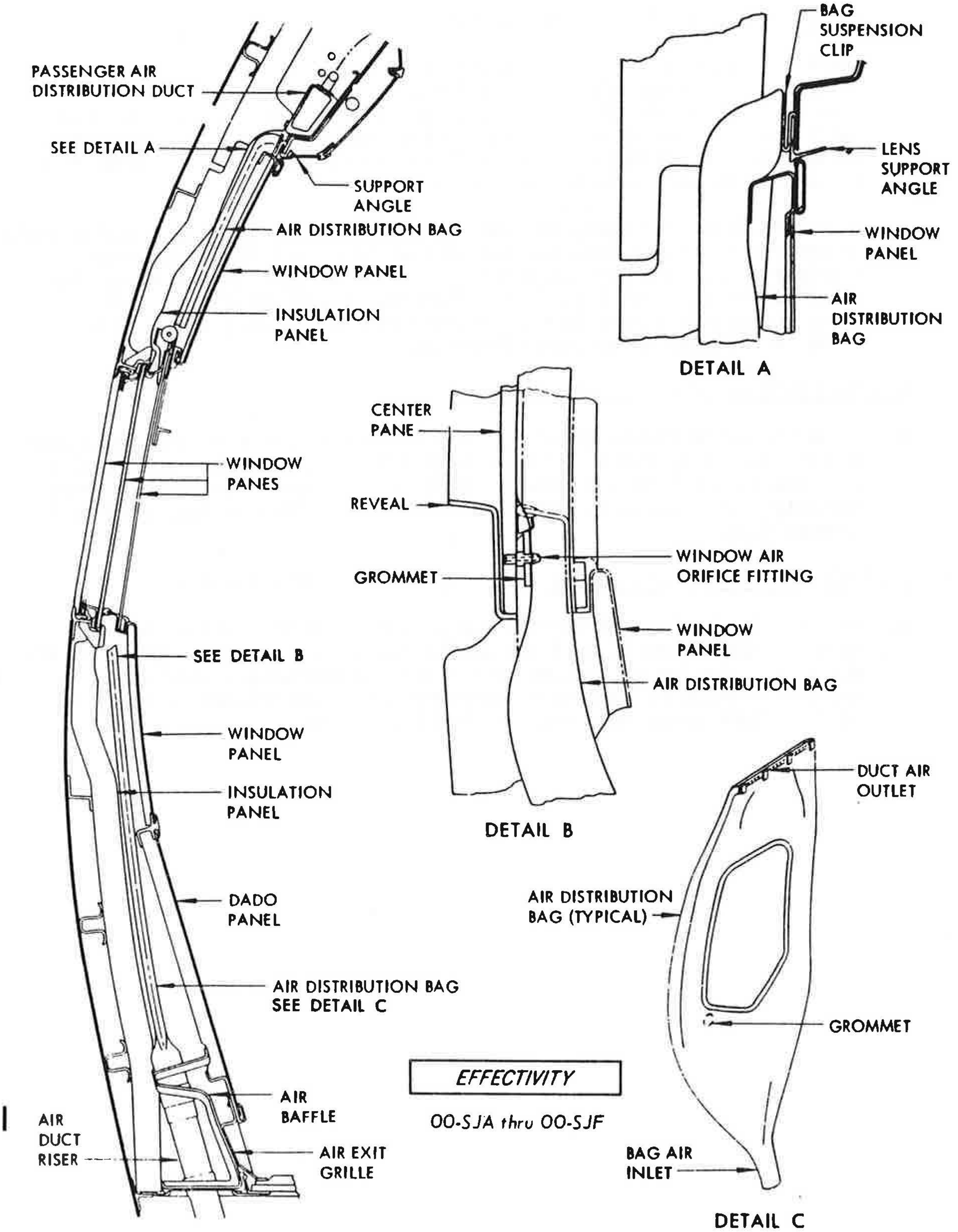
A. The control cabin distribution system relief valve is a spring-loaded flapper valve located in the distribution duct at station 600E above the forward cargo compartment ceiling panel. The valve relieves the initial pressure surge before the flow controller takes effect or when airflow is stopped by the control cabin emergency manual control valve.

B. The individual air distribution system relief valves are spring-loaded flapper valves installed in the individual air distribution ducts to relieve the initial pressure surge until the pressure regulator takes effect and when individual outlets are closed. The valves are located in the air conditioning distribution bay.

6. Air Distribution Bags (See figure 3 for effectivity.)

A. Air distribution bags between the cabin insulation and interior lining are used for the distribution of conditioned air to the main cabin. The bags are made of thin, pliable plastic sheet. Each bag has one or two legs attached to the riser outlets and secured by plastic tape. Air enters the bags through the legs and leaves through openings along the upper edge, which is reinforced by a heavier plastic strip. The bags are suspended on the cove light lens support angle, above the windows, by means of clips.

B. A small amount of air leaks from each bag into a space between the outer and middle window pane through a hole in the bag. The hole is reinforced by a sponge plastic washer (grommet) cemented to the bag. (See figure 3.)



Air Distribution Bag Location
Figure 3

7. Hot Wall Ducts (See figure 4 for effectivity.)

A. Plastic ducts route conditioned air from the riser ducts, between the cabin insulation and the interior lining, and out the cove outlets. (See figure 4.) The ducts attach to the risers and outlets with tape. Where there is one riser in a window bay, the duct branches and goes up either side of the window. Where there are two risers, a separate duct routes air up each side of the window.

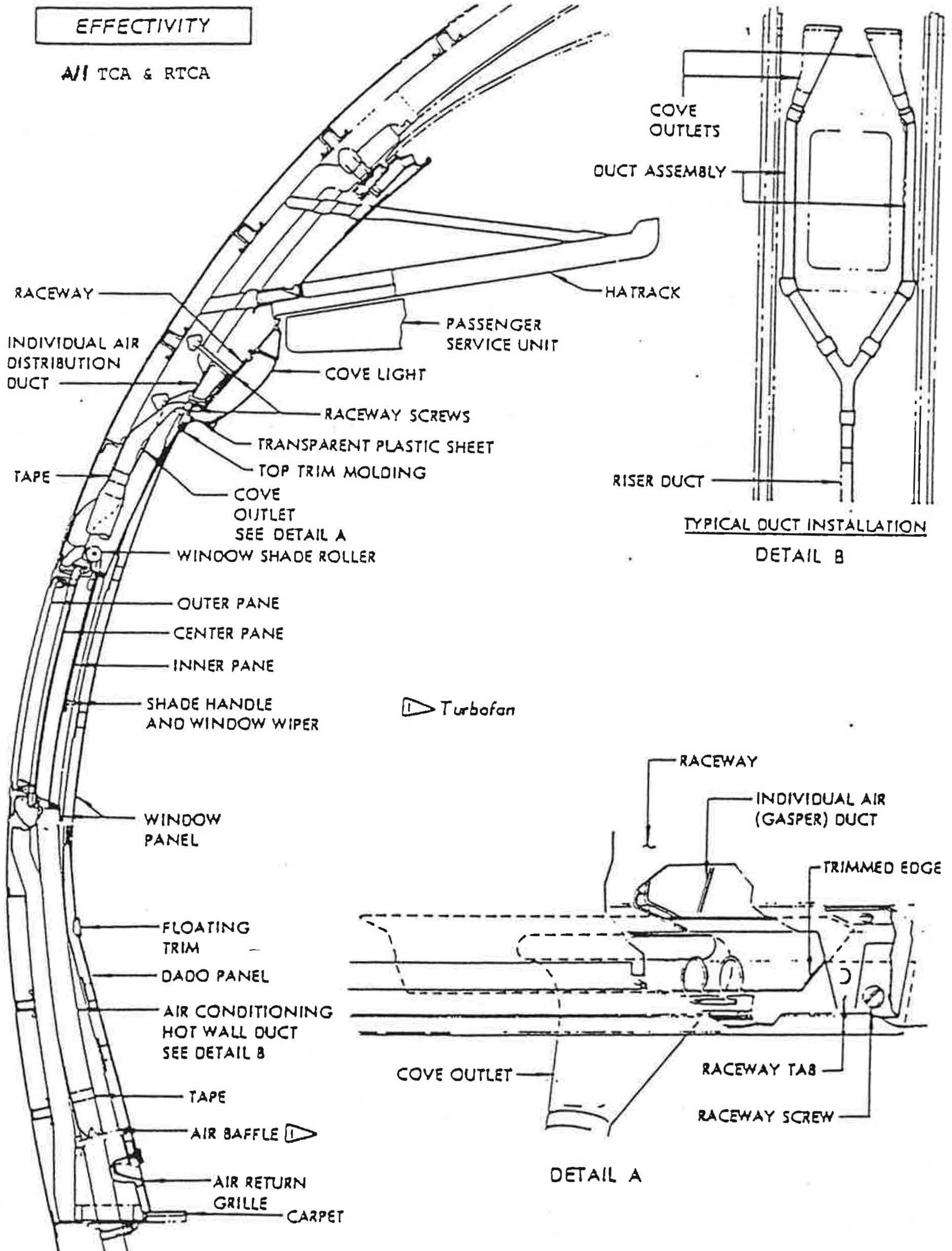
B. Cargo airplanes are equipped with two aluminum turbulence generating ducts as part of the smoke detector system when operating in the all-cargo configuration. One duct is located at station 1370 right side and the other at station 1397 left side. Each turbulence generating duct exhausts through a hole in the interior lining, about 3 feet off the floor, to prevent smoke stratification.

8. Control Cabin Air Manual Shutoff Valve

A. A control cabin manual shutoff apparatus is located under an access door in the right rear floor of the control cabin. (See figure 1, detail A.) A combination handle and pointer positions the valve through a linkage assembly. The handle is locked by a thumbscrew that unlocks when it is screwed down.

9. Individual Air Distribution Fan (See figure 2 for effectivity.)

A. The individual air distribution fan is a motor-driven axial flow fan used to augment the flow of air in the individual cool air system in the airplane. The fan is located in the air conditioning distribution bay above the individual pressure regulator and is controlled by a switch on the flight engineer's panel marked PSU AIR FAN.



Hot Wall Duct Installation
Figure 4

10. Surge Bypass Valve (See figure 2 for effectivity.)

A. On later airplanes a surge bypass valve is installed downstream of the gasper air fan. The surge bypass valve is pneumatically operated and automatically opens to bypass air into the air conditioning mixing chamber when the difference in pressure caused by the gasper air fan reaches 10 inches of water. Opening of the valve eliminates fan buffeting, resulting when too many individual air outlets are closed.

11. Control Cabin Electric Heaters (See figure 1 for effectivity.)

A. Control cabin 500-watt electric heaters are installed at the pilot and copilot foot outlets. 300-watt electric heating elements are installed in the supply ducts leading to the spray tubes, along the window sills.

B. Each heater is connected phase-to-phase for high heat and phase-to-ground for low heat by means of individual manually-controlled switches. A relay energized through the landing gear safety switch interrupts power to the switches and renders the heaters inoperative when the airplane is on the ground. The switches are located at the pilot and copilot sidewalls adjacent to the ash-tray.

PRESSURE REGULATOR - MAINTENANCE PRACTICES

1. Removal/Installation Pressure Regulator

A. Remove Pressure Regulator

(1) Remove aft bulkhead of forward cargo compartment.

(2) Disconnect downstream pressure sensing line at regulator. (See figure 201.)

(3) Disconnect and remove v-band clamps connecting the regulator and ducting and remove gaskets.

B. Install Pressure Regulator

(1) Check and remove foreign objects from ducts.

(2) Position the pressure regulator and new gaskets for installation. (See figure 201.)

(3) Connect the ducts to pressure regulator with V-band clamps. Torque to 70 to 80 pound-inches.

(4) Connect downstream pressure sensing line.

(5) Install aft bulkhead of forward cargo compartment.

2. Adjustment/Test Pressure Regulator

A. Test Pressure Regulator

(1) Disconnect downstream pressure sensing line.

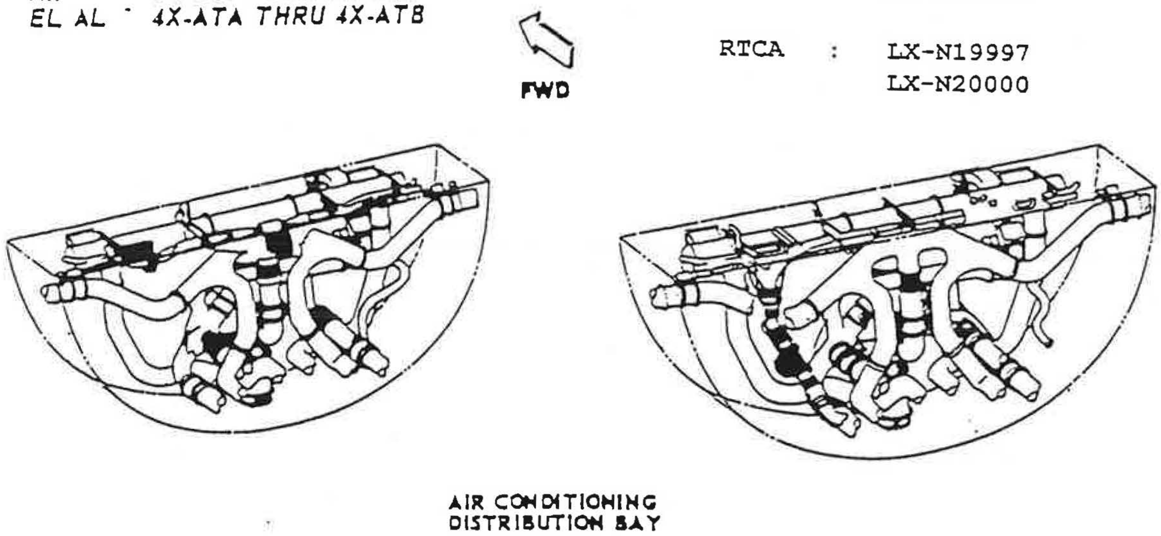
(2) Apply pressure of 12.4 inches of water at downstream pressure sensing line connection. Valve shall remain full open as indicated by valve position indicator.

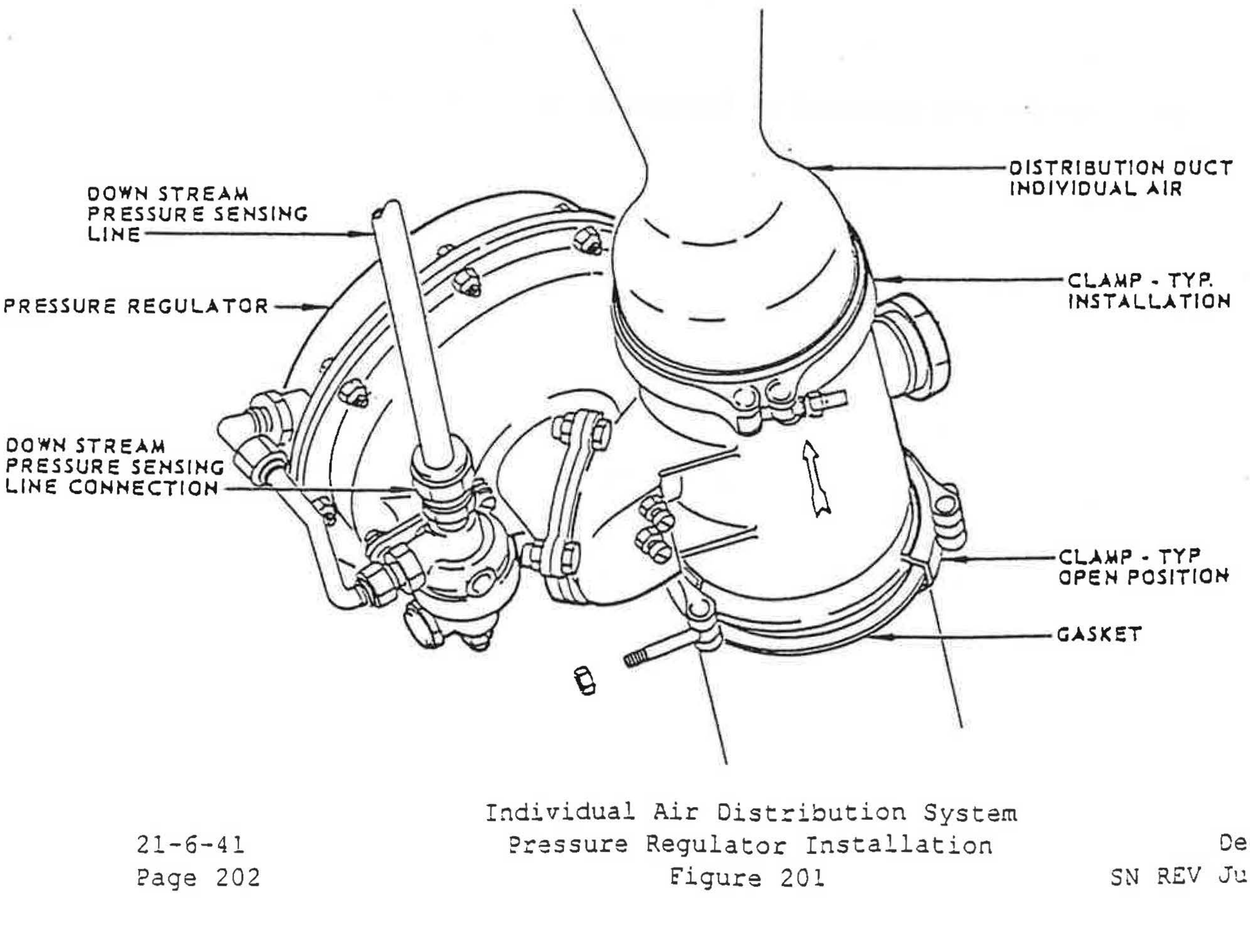
(3) Increase pressure to 15.6 inches of water. Valve shall move to the closed position.

(4) Re-connect downstream pressure sensing line.

EFFECTIVITY	
PAA	N714PA THRU N759PA
AF	F-BHSA THRU F-BHSR
SABENA	OO-SJA THRU OO-SJE
BOAC	G-APFB THRU G-ARRA
AII	VT-DJI THRU VT-DMN
EL AL	4X-ATA THRU 4X-ATB

EFFECTIVITY		
TCA	:	LX-N19996
		LX-N20198
		LX-N20199
RTCA	:	LX-N19997
		LX-N20000





Individual Air Distribution System
Pressure Regulator Installation
Figure 201

C. Remove Individual Air Distribution Duct Relief Valve

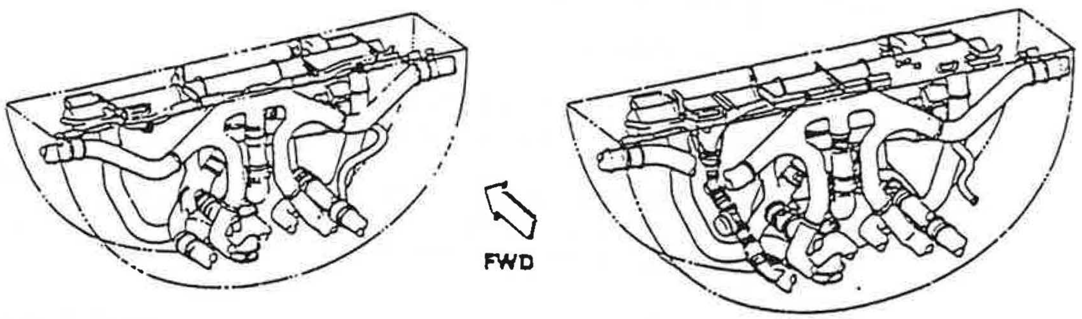
(1) Remove aft bulkhead of forward cargo compartment.

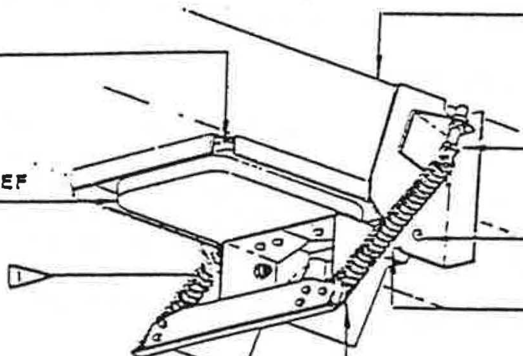
(2) Remove valve hold down spring. (See figure 202.)

<u>NOTE</u>: The spring adjustment bolt should not be disturbed. Adjustment is set at 23.8 pounds spring tension.

(3) Remove relief valve cover pivot bolts, nuts, and flanged bushings.

(4) Remove relief valve cover and gasket.





1 TCA : LX-N19996, LX-N20198, LX-20199
RTCA : LX-N19997, LX-N20000

Individual Air Distribution System Relief Valve Installation
Figure 202

D. Install Individual Air Distribution Duct Relief Valve

(1) Equipment and Materials

(a) Dow Corning A4014 Primer, or equivalent

(b) Dow Corning Catalyst XY-27, or equivalent

(c) Dow Corning Adhesive A4000, or equivalent

(2) Install new gasket rough side up by the following method:

(a) Clean surface to bare metal.

(b) Prime gasket and metal faying surfaces with Dow Corning A4014 Primer, or equivalent, and allow to dry 30 minutes.

(c) Mix 4.5 parts of Dow Corning catalyst XY-27, or equivalent, with 100 parts (by weight) of Dow Corning adhesive A4000, or equivalent, in an open container. Pot life is 2 to 4 hours at 70°F.

(d) Apply thin coat of adhesive to gasket and metal faying surfaces and allow to dry for one to one and one-half hours at 70°F.

(e) Press gasket firmly in place and ensure complete contact.

(3) Position relief valve cover and install flanged bushings, pivot bolts and nuts. (See figure 202.)

(4) Install relief valve cover hold down spring.

(5) Install aft bulkhead of forward cargo compartment.

2. <u>Adjustment/Test Relief Valves</u>

A. Adjust Control Cabin Conditioned Air Duct Relief Valve

(1) With valve in closed position, adjust spring tension to 23.4 pounds using a spring balance. This is equivalent to a total closing torque of 35.75 pound-inches of the pivot bolt.

B. Adjust Individual Air Distribution Duct Relief Valve

(1) With valve in closed position, adjust spring tension to 23.8 pounds using a spring balance. This is equivalent to a closing torque of 38 pound-inches at the pivot bolt.

GROUND CONDITIONED AIR VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Ground Conditioned Air Valve

A. Remove Ground Conditioned Air Valve

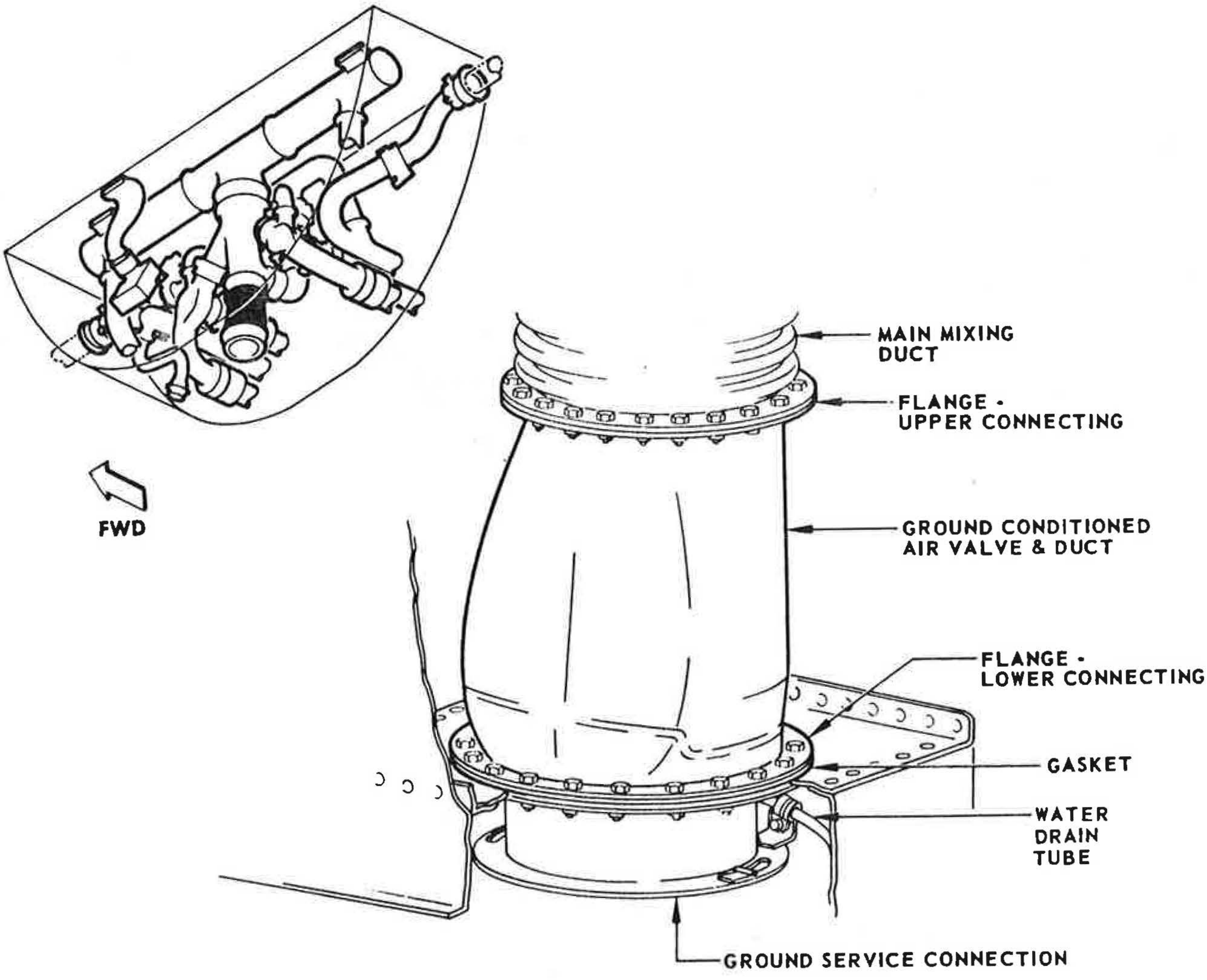
(1) Remove aft bulkhead of forward cargo compartment.

(2) Remove bolts at lower connecting flange. (See figure 201.)

NOTE: The ground service connection will drop down when the bolts are removed.

(3) Remove bolts and washers at upper connecting flange.

(4) Remove air valve assembly and gasket.



Ground Conditioned Air Valve and Duct Installation
Figure 201

B. Install Ground Conditioned Air Valve

(1) Position new gasket and air valve **assembly**. (See figure 201.)

NOTE: Adjust check valve to insure proper seating. The portion of the valve under the hinge is spring loaded to unseat, except when cabin is pressurized.

(2) Install bolts and washers at lower connecting flange.

NOTE: The ground service connection must be positioned properly before the bolts can be installed.

(3) Install bolts and washers at upper connecting flange.

(4) Install aft bulkhead of forward cargo compartment.

END

FLOW CONTROLLERS - MAINTENANCE PRACTICES

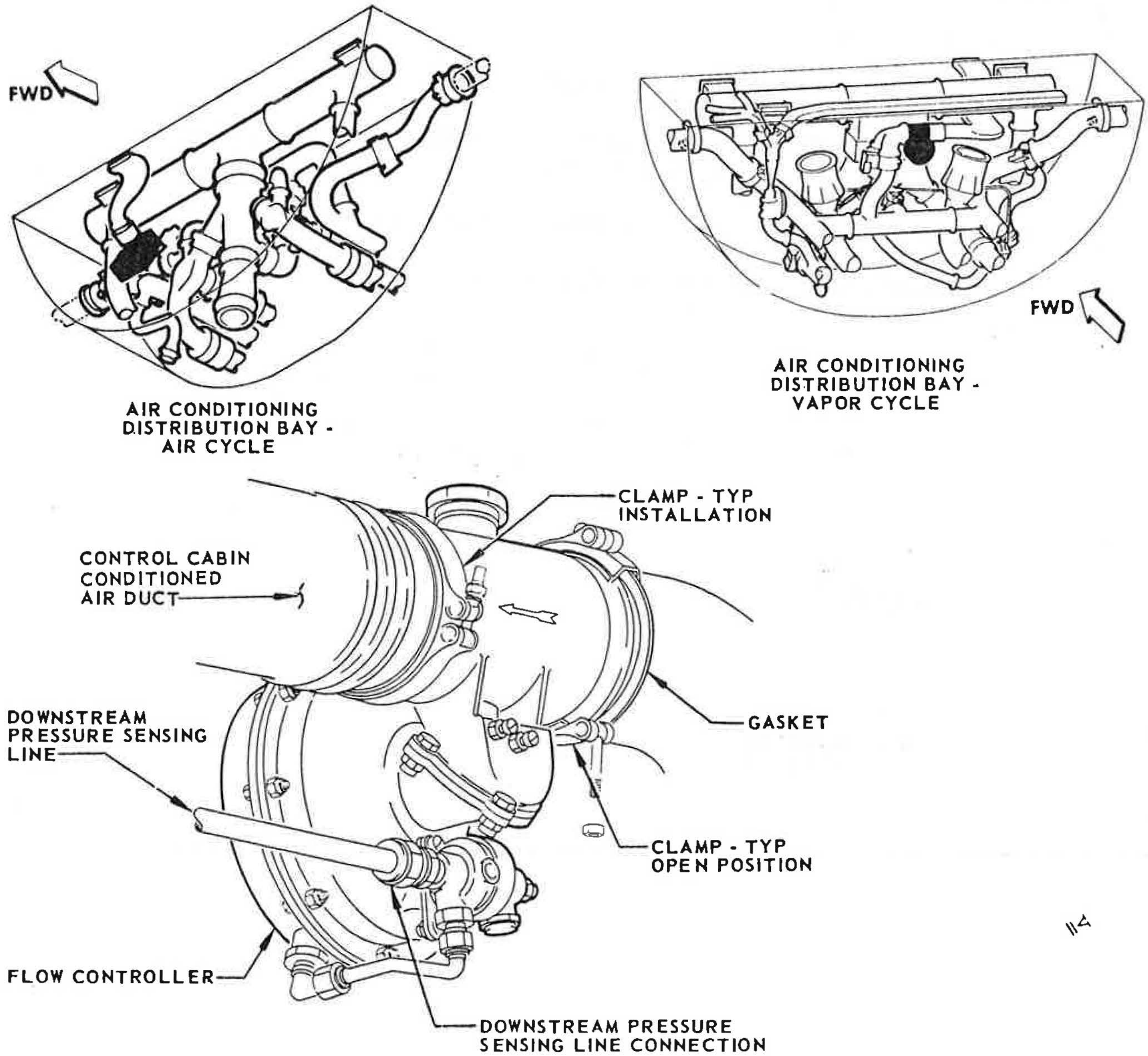
1. Removal/Installation Flow Controller

   A. Remove Flow Controller

      (1) Remove aft bulkhead of forward cargo compartment.

      (2) Disconnect downstream pressure sensing line at flow controller. (See figure 201.)

      (3) Disconnect and remove V-band clamps connecting flow controller to duct and remove gasket.



Control Cabin Air Distribution System
Flow Controller Installation
Figure 201

B. Install Flow Controller

(1) Check for and remove foreign objects in ducts.

(2) Position flow controller and new gaskets for installation. (See figure 201.)

(3) Connect ducts to flow controller with V-band clamps. Torque to 70 to 80 pound-inches.

(4) Connect downstream pressure sensing line.

(5) Install aft bulkhead of forward cargo compartment.

2. Adjustment/Test Flow Controller

A. Test Flow Controller

(1) Disconnect downstream pressure sensing line.

(2) Apply air pressure of 6 in. water. Valve shall remain open as indicated by valve position indicator.

(3) Increase air pressure to 9 in. water. Valve shall close.

(4) Connect downstream pressure sensing line.

END

RELIEF VALVES - MAINTENANCE PRACTICES

1. Removal/Installation Relief Valves

   A. Remove Control Cabin Conditioned Air Duct Relief Valve

      (1) Remove forward cargo compartment overhead panel. (See Chapter 25, Forward Cargo Compartment Equipment.)

      (2) Remove relief valve cover hold down springs on each side of valve. (See figure 201.)

         NOTE: The spring adjustment bolt should not be disturbed. Adjustment is set at 23.4 pounds spring tension.

      (3) Remove relief valve cover pivot bolts, nuts, flanged bushings, and washers.

      (4) Remove relief valve cover and gasket.

   B. Install Control Cabin Conditioned Air Duct Relief Valve

      (1) Equipment and Materials

         (a) Dow Corning A4014 Primer, or equivalent

         (b) Dow Corning Catalyst XY27, or equivalent

         (c) Dow Corning Adhesive A4000, or equivalent

      (2) Install new gasket with rough side up by the following method:

         (a) Clean metal surface to bare metal.

         (b) Prime gasket and metal faying surfaces with Dow Corning A4014 Primer or equivalent, and allow to dry 30 minutes.

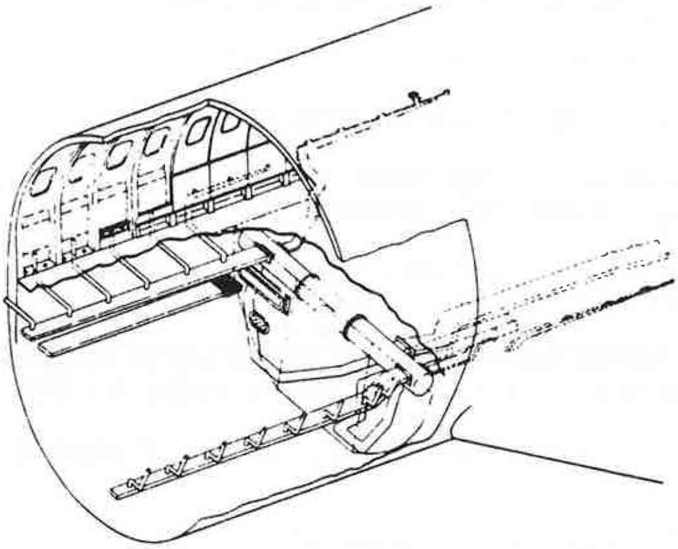
         (c) Mix 4.5 parts of Dow Corning catalyst XY-27, or equivalent, with 100 parts (by weight) of Dow Corning adhesive A4000 or equivalent, in an open container. Pot life of this mixture is 2 to 4 hours at 70°F.

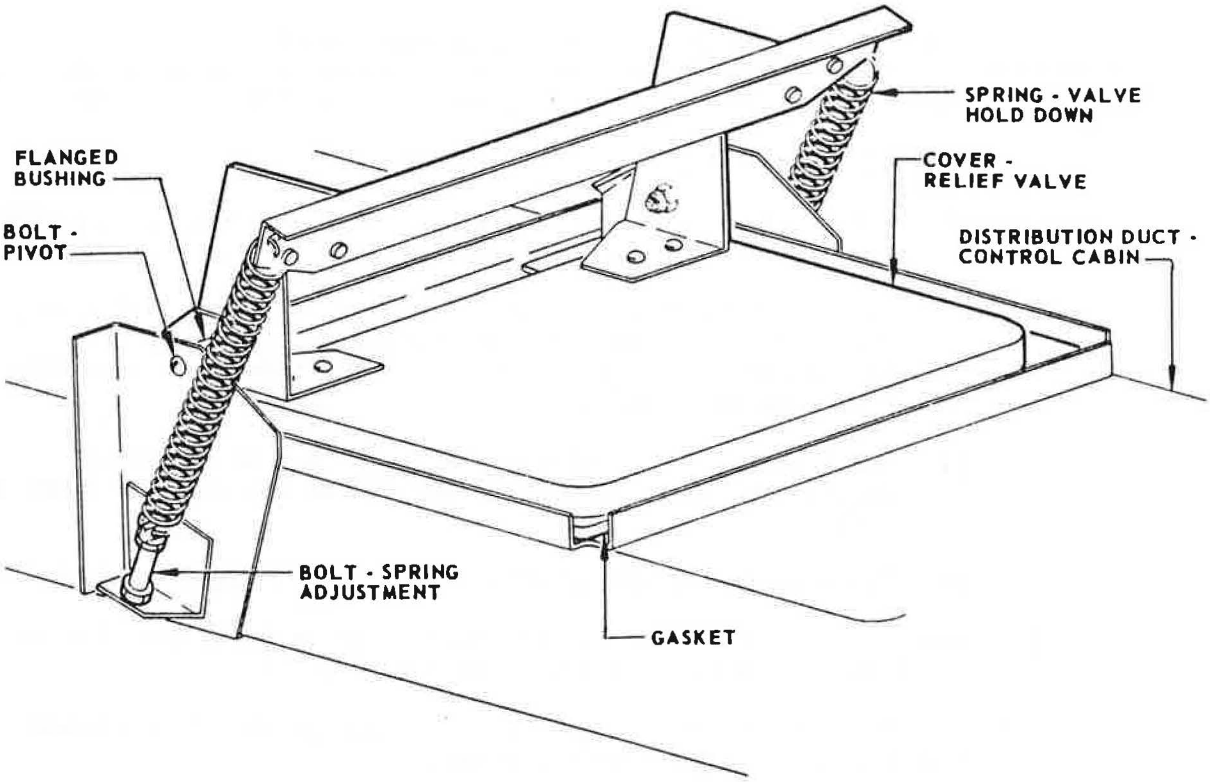
         (d) Apply thin coat of adhesive to gasket and metal faying surface and allow to dry for one to one and one-half hours at 70°F.

         (e) Press gasket firmly in place and ensure complete contact.

      (3) Position relief valve cover and install pivot bolts with flanged bushings, washers, and nuts. (See figure 201.)

      (4) Install forward cargo compartment overhead panel. (See Chapter 25, Forward Cargo Compartment Equipment.)





Control Cabin Conditioned Air Duct Relief Valve Installation
Figure 201

C. Remove Individual Air Distribution Duct Relief Valve

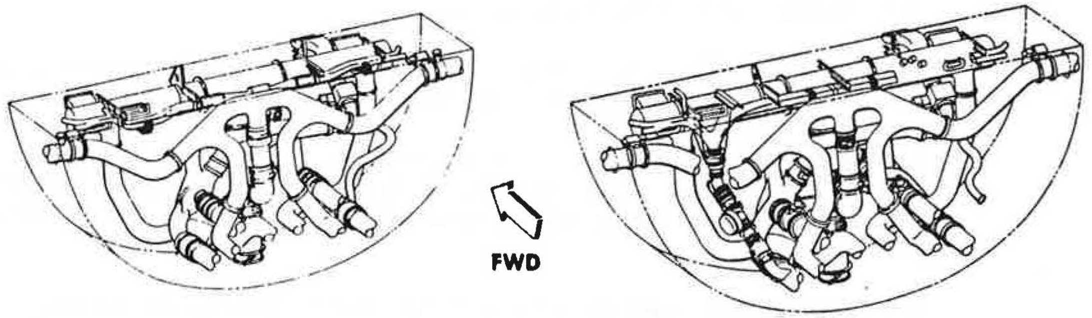
(1) Remove aft bulkhead of forward cargo compartment.

(2) Remove valve hold down spring. (See figure 202.)

NOTE: The spring adjustment bolt should not be disturbed. Adjustment is set at 23.8 pounds spring tension.

(3) Remove relief valve cover pivot bolts, nuts, and flanged bushings.

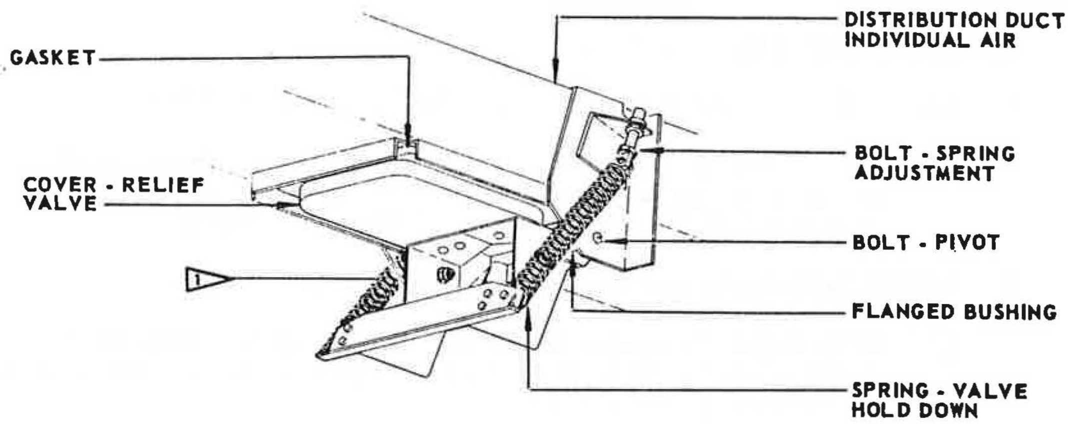
(4) Remove relief valve cover and gasket.



EFFECTIVITY	
PAA	N714PA THRU N759PA
AF	F-BHSA THRU F-BHSR
SABENA	OO-SJA THRU OO-SJE
BOAC	G-APFB THRU G-ARRA
AII	VT-DJI THRU VT-DMN
EL AL	4X-ATA THRU 4X-ATB

AIR CONDITIONING DISTRIBUTION BAY

EFFECTIVITY	
PAA	N760PA AND ON
AF	F-BHSS AND ON
SABENA	OO-SJF AND ON
BOAC	G-ARRB AND ON
AII	VT-DNY AND ON
EL AL	4X-ATC AND ON
CEA	ALL AIRPLANES



1 PAA N760PA AND ON, AF F-BHSS AND ON, SABENA OO-SJF AND ON, BOAC G-ARRB AND ON, AII VT-DNY AND ON, EL AL 4X-ATC AND ON, AND ALL CEA AIRPLANES

Individual Air Distribution System Relief Valve Installation
Figure 202

D. Install Individual Air Distribution Duct Relief Valve

(1) Equipment and Materials

(a) Dow Corning A4014 Primer, or equivalent

(b) Dow Corning Catalyst XY-27, or equivalent

(c) Dow Corning Adhesive A4000, or equivalent

(2) Install new gasket rough side up by the following method:

(a) Clean surface to bare metal.

(b) Prime gasket and metal faying surfaces with Dow Corning A4014 Primer, or equivalent, and allow to dry 30 minutes.

(c) Mix 4.5 parts of Dow Corning catalyst XY-27, or equivalent, with 100 parts (by weight) of Dow Corning adhesive A4000, or equivalent, in an open container. Pot life is 2 to 4 hours at 70°F.

(d) Apply thin coat of adhesive to gasket and metal faying surfaces and allow to dry for one to one and one-half hours at 70°F.

(e) Press gasket firmly in place and ensure complete contact.

(3) Position relief valve cover and install flanged bushings, pivot bolts and nuts. (See figure 202.)

(4) Install relief valve cover hold down spring.

(5) Install aft bulkhead of forward cargo compartment.

2. <u>Adjustment/Test Relief Valves</u>

A. Adjust Control Cabin Conditioned Air Duct Relief Valve

(1) With valve in closed position, adjust spring tension to 23.4 pounds using a spring balance. This is equivalent to a total closing torque of 35.75 pound-inches of the pivot bolt.

B. Adjust Individual Air Distribution Duct Relief Valve

(1) With valve in closed position, adjust spring tension to 23.8 pounds using a spring balance. This is equivalent to a closing torque of 38 pound-inches at the pivot bolt.

HOT WALL DUCTS - MAINTENANCE PRACTICES

1. Removal/Installation Hot Wall Ducts (See figure 201).

   A. Equipment and Materials

      (1) Tape, Minnesota Mining & Mfg. Co., No. 474 Vinyl Plastic Tape.

   B. Remove Hot Wall Ducts

      (1) Remove partitions and cabin equipment as necessary. See Chapter 25, "Passenger Cabin Partitions," "Passenger Seats," and "Passenger Cabin Equipment."

      (2) Remove air return grills, dado panels, window panels, transparent plastic sheets, and cove light covers. See Chapter 25, "Passenger Cabin Equipment."

      (3) Remove tape securing hot wall duct to riser duct and separate ducts.

      (4) Loosen raceway screws.

      (5) Rotate cove outlet and duct assembly inboard until cove outlet slips free from raceway.

      NOTE: Continue to loosen raceway screws as necessary to free cove outlet.

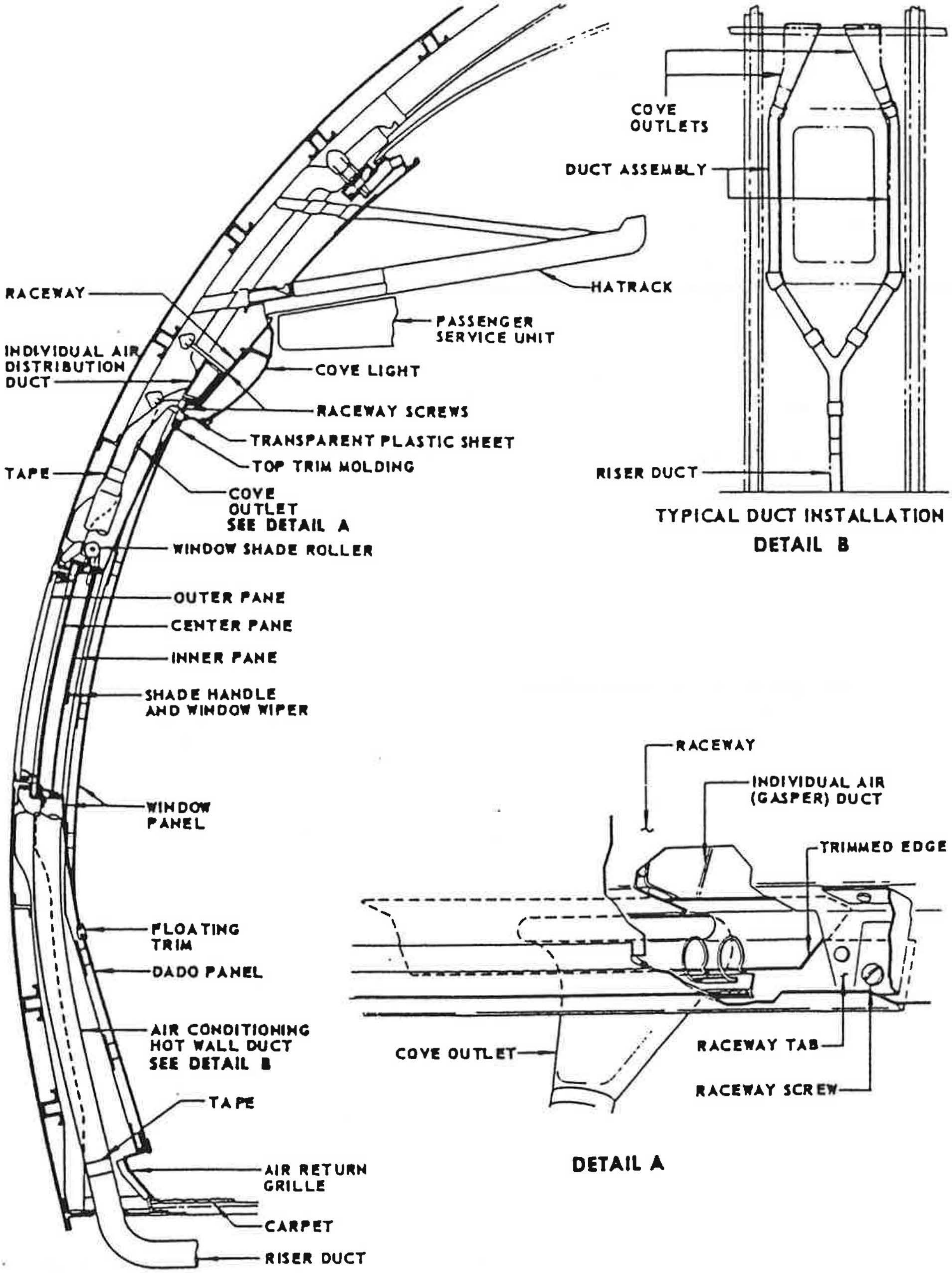
      (6) Retighten raceway screws.

      (7) Cover riser duct outlet to prevent foreign material entering distribution system.

   C. Install Hot Wall Ducts

      (1) Install cove outlets.

         (a) Loosen raceway screws.



Hot Wall Duct Installation
Figure 201

(b) Trim cove outlet ends to fit between raceway tabs. Allowable clearance is 0.01 inch.

(c) Position cove outlet on raceway.

NOTE: Continue to loosen raceway screws until cove outlet slips into position.

(d) Tape corners of cove outlet to raceway.

NOTE: At locations where there is no individual air distribution duct, apply tape along entire top flange of cove outlet.

(e) Tighten raceway screws.

(2) Slip hot wall duct over riser and slide duct down as far as possible. Do not tape.

NOTE: A transition duct is used to connect the riser duct and the hot wall duct where the riser duct is oval shaped or has a smaller diameter. Tape transition ducts in the normal manner.

(3) Slip hot wall duct up on riser far enough to allow top of duct to slide over end of cove outlet.

(4) Tape hotwall duct to cove outlet.

NOTE: All taped ducts must overlap a minimum of one inch. Tape must be applied with a minimum of two wraps.

(5) Slip hotwall duct up on riser as far as possible to force duct tight against the insulation blanket in the window area.

NOTE: Check that hot wall duct, when pushed outboard by sidewall panel, will have maximum possible clearance with window shade roller and brackets. Check that duct will not be collapsed or wrinkled at any location. Check that wire reinforced ducts will not be kinked on window shade roller brackets except between station 880 and 900 where duct may be reduced to area available between sidewall, intercostal, and gear flag bar.

(6) Hold duct in position and tape as noted in step (4).

(7) Install air return grills, dado panels, window panels, transparent plastic sheets, and cove light covers. See Chapter 25, "Passenger Cabin Equipment."

(8) Install partitions and cabin equipment as necessary. See Chapter 25, "Passenger Cabin Partitions," "Passenger Seats," and "Passenger Cabin Equipment."

INDIVIDUAL AIR DISTRIBUTION FAN - MAINTENANCE PRACTICES

TCA : LX-N19996
LX-N20198
LX-N20199

RTCA : LX-N19997
LX-N20000

1. Removal/Installation Individual Air Distribution Fan

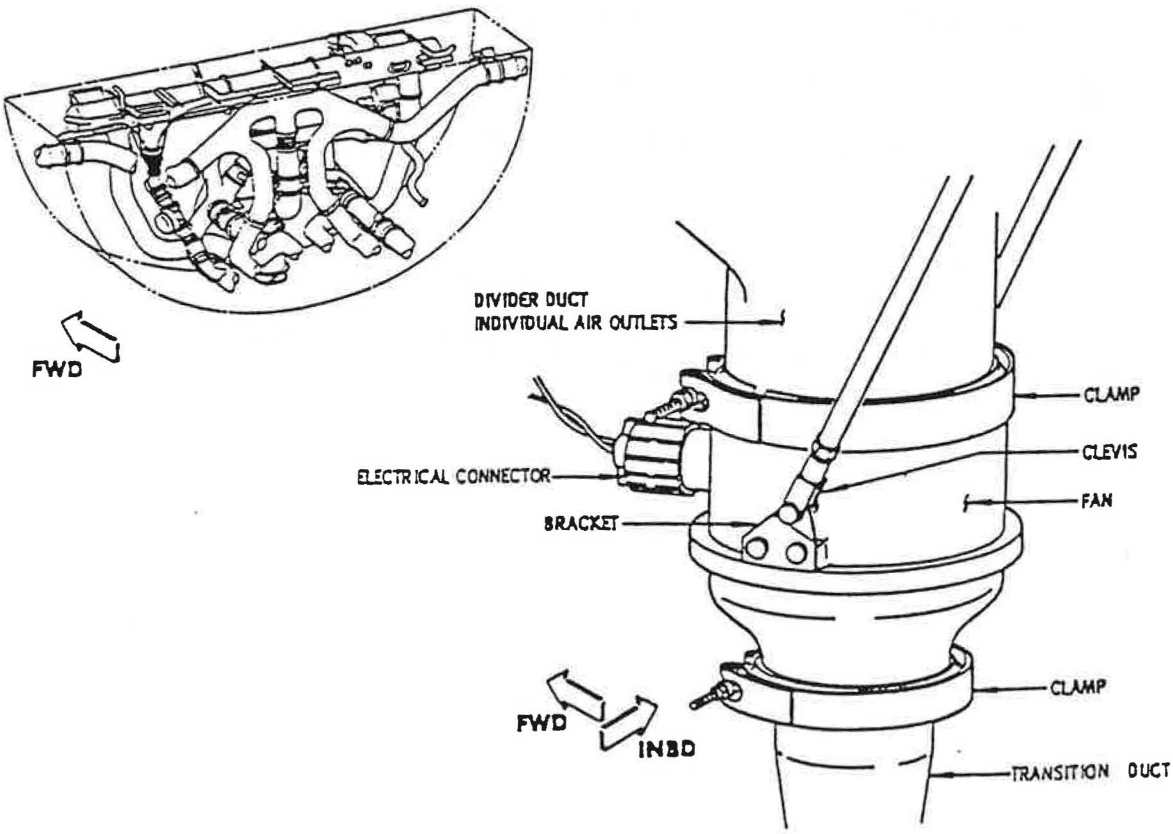
   A. Remove Individual Air Distribution Fan

      (1) Disconnect electrical connector. (See figure 201.)

      (2) Disconnect clevis at fan bracket.

      (3) Disconnect and remove V-band clamps connecting the fan and ducting.

      (4) Remove fan.



Individual Air Distribution Fan Installation
Figure 201

B. Install Individual Air Distribution Fan

(1) Position individual air distribution fan for installation. (See figure 201.)

(2) Connect the ducts to air distribution fan with V-band clamps.

(3) Connect clevis to fan bracket.

(4) Connect electrical connector.

2. <u>Adjustment/Test Individual Air Fan Installation</u>

A. Close Circuit Breakers as Follows:

(1) Oil cooler override switch, safety and turbocompressor flow control.

(2) Left-hand air conditioning.

(3) Right-hand air conditioning.

(4) Pack valves.

(5) Individual air distribution fan.

B. Turn "ON" left-hand and right-hand air conditioning switches.

<u>NOTE</u>: Fan operation may also be checked with air conditioning switches off.

C. Turn "ON" Passenger Service Unit (PSU) air fan switch.

D. With individual air outlet open airflow should commence.

E. Turn "OFF" air conditioning switches and PSU airfan switch.

SURGE BYPASS VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Surge Bypass Valve

   A. Remove Surge Bypass Valve

      (1) Remove aft bulkhead of forward cargo compartment. (See figure 201.)

      (2) Disconnect pressure sensing line at surge bypass valve.

      (3) Disconnect and remove V-band connecting surge bypass valve to duct.

      (4) Remove surge bypass valve.

   B. Install Surge Bypass Valve

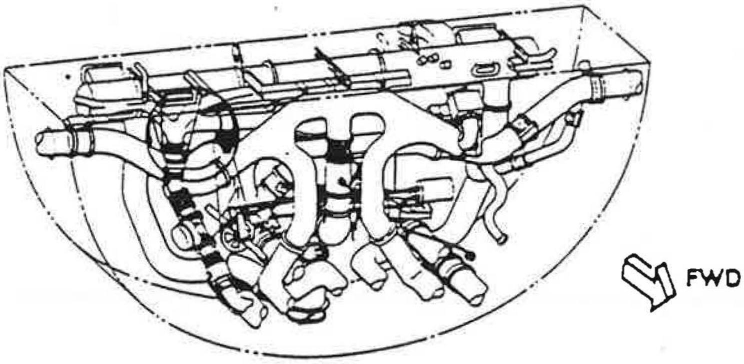
      (1) Check for and remove foreign objects in ducts.

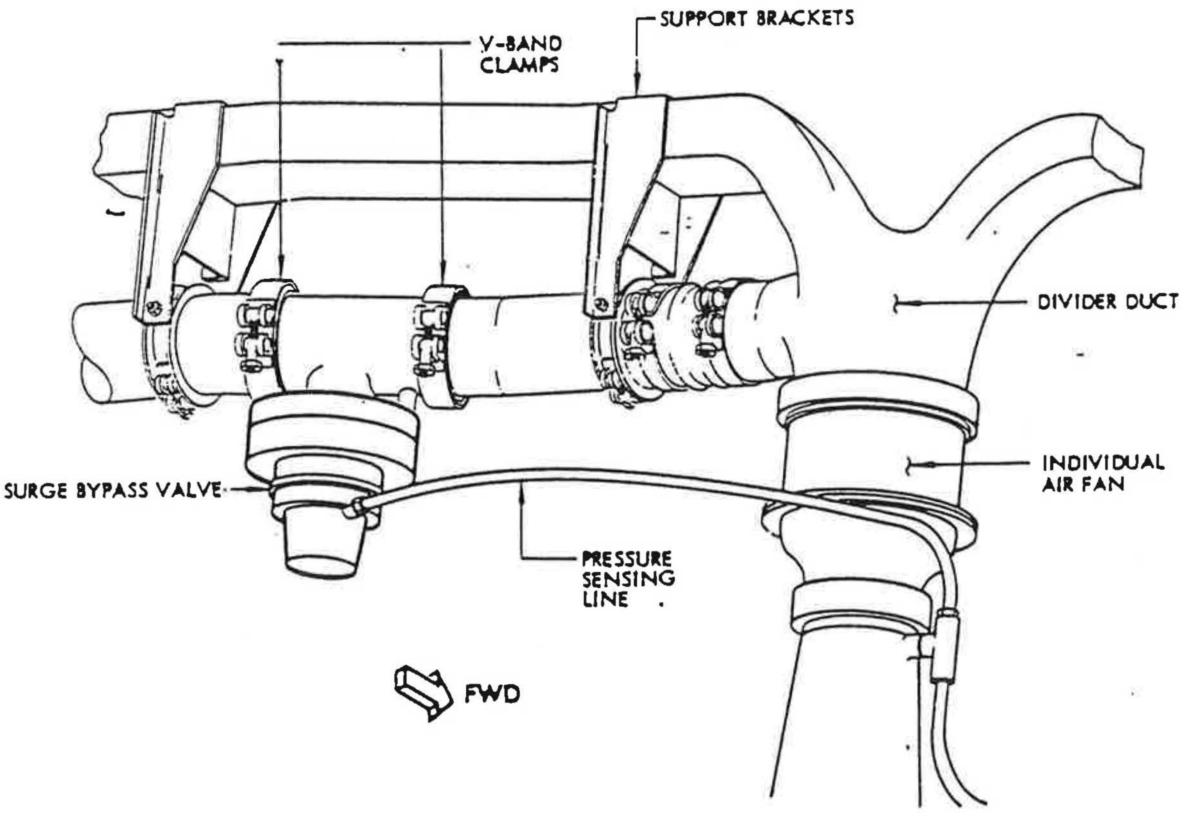
      (2) Position surge bypass valve for installation. (See figure 201.)

      (3) Connect ducts to surge bypass valve with V-band.

      (4) Connect pressure sensing line at surge bypass valve.

      (5) Install aft bulkhead of forward cargo compartment.





Surge Bypass Valve
Figure 201

C. Test of Manual Air Shutoff Valve

(1) In control cabin, open manual air shutoff access door, position pointer in closed position and lock.

(2) In lower nose compartment, check valve arm : should point forward.

(3) In control cabin, move pointer to open position and lock.

(4) Close manual air shutoff access door.

INDIVIDUAL (GASPER) AIR DUCTS - APPROVED REPAIRS

1. General

   A. Ruptures at corners of the air distribution header duct and at stress concentrations where brackets and goosenecks are attached can be quickly repaired by method 1. A complete separation of the distribution duct should be repaired as described in method 2. These repairs can be made to all types of plastic material currently used for air distribution ducts.

2. Equipment and Materials

   A. Cleaning solvent BMS 3-2

   B. Adhesive tape, Minnesota Mining & Mfg CO., No. 474 Vinyl Plastic Tape, 1 inch wide

   C. Fiberglass cloth tape, style 128 or 181, United Merchants' Industrial Fabrics, or equivalent.

      (1) 1-1/2 inches wide for method 1.

      (2) 3 inches wide for method 2.

   D. Adhesive BMS 5-19, class B-1/2 or BMS 5-31, Minnisota Mining and Mfg. Co.

3. Repair Individual (Gasper) Air Ducts - Method 1

   A. Remove cove light section within area of duct failure.

   B. Remove insulation from ducting as required to facilitate the repair.

   C. Drill ends of cracks to prevent further crack propagation.

   D. Clean repair area with solvent.

   E. Apply a liberal coat of adhesive to the ruptured area to a minimum of one inch beyond end of rupture.

   F. Attach one end of 1-1/2 inches wide fiberglass tape to duct with adhesive tape. Wrap the ruptured area maintaining 1/4 inch minimum overlap on each lap of fiberglass tape. Fiberglass should extend a minimum of one inch beyond each end of the rupture. (See figure 801.)

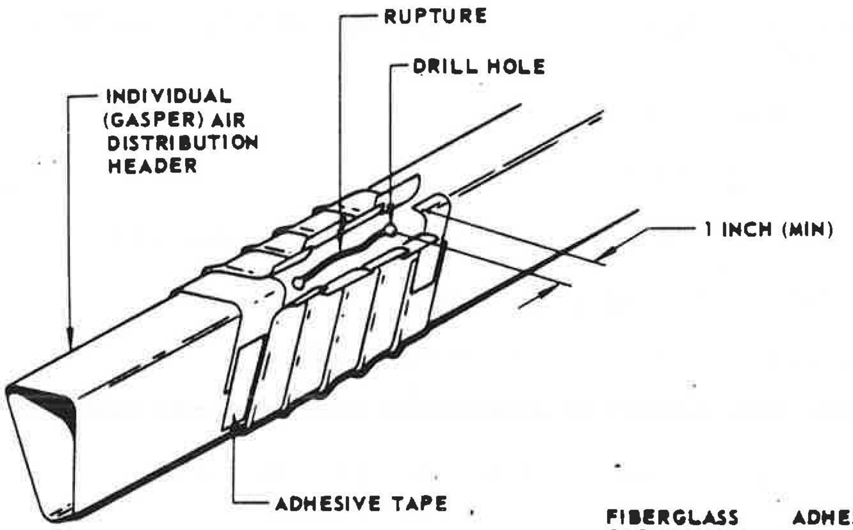
G. Wrap fiberglass so that adhesive is forced to impregnate the fabric.

H. Attach end of fiberglass tape to duct with adhesive tape.

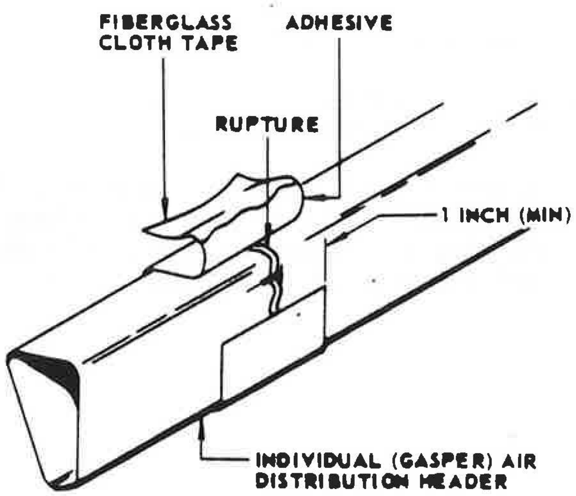
I. Cure the adhesive at a temperature between 120° to 140°F to complete repair as quickly as possible.

NOTE: Applied adhesive, BMS 5-19 Class B-1/2, is considered ready for handling after it has become tack-free and hard enough to resist being deformed by finger pressure. This ordinarily requires approximately 16 hours at 75°F. Cure of adhesive can be reduced to 2 hours by local application of hot air at 135°F.

CAUTION: DO NOT EXCEED 160°F OR DAMAGE TO THE DUCT MAY RESULT.



METHOD 1



METHOD 2

Individual (Gasper) Air Duct Repairs
Figure 801

4. Repair Individual (Gasper) Air Ducts - Method 2

A. Remove cove light section with area of duct failure.

B. Remove insulation from ducting as required to facilitate the repair.

C. Smooth sharp edges of duct separation with a file.

D. Clean repair area with solvent.

E. Coat 3 inch wide fiberglass cloth tape on one side only with a liberal coat of adhesive 0.015 to 0.010 inch thick.

F. Wrap one layer of coated fiberglass cloth tape (with adhesive down) over joint with 1 inch minimum lap on each duct. Overlap tape ends 1-2 inches at the tape joints. Pull out wrinkles in the fiberglass tape and smooth out any voids between the fiberglass and the ducts.

NOTE: Gap between duct sections should not exceed 1/4 inch.

G. Cure the adhesive at a temperature between 120° to 140°F to complete repair as quickly as possible.

NOTE: Applied adhesive BMS 5-19 Class B-1/2 is considered ready for handling after it has become tack free and hard enough to resist being deformed by finger pressure. This ordinarily requires approximately 16 hours at 75°F. Cure of adhesive can be reduced to 2 hours by local application of circulating warm air of 135°F.

CAUTION: DO NOT EXCEED 160°F OR DAMAGE TO THE DUCT MAY RESULT.

SURGE BYPASS VALVE - MAINTENANCE PRACTICES

EFFECTIVITY

All except OO-SJA thru OO-SJK

1. Removal/Installation Surge Bypass Valve

A. Remove Surge Bypass Valve

(1) Remove aft bulkhead of forward cargo compartment. (See figure 201.)

(2) Disconnect pressure sensing line at surge bypass valve.

(3) Disconnect and remove V-band connecting surge bypass valve to duct.

(4) Remove surge bypass valve.

B. Install Surge Bypass Valve

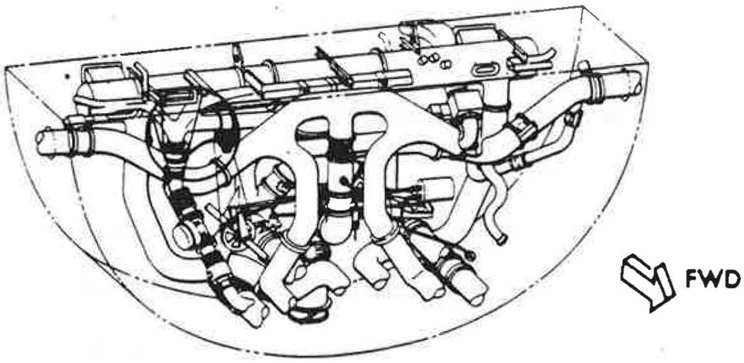
(1) Check for and remove foreign objects in ducts.

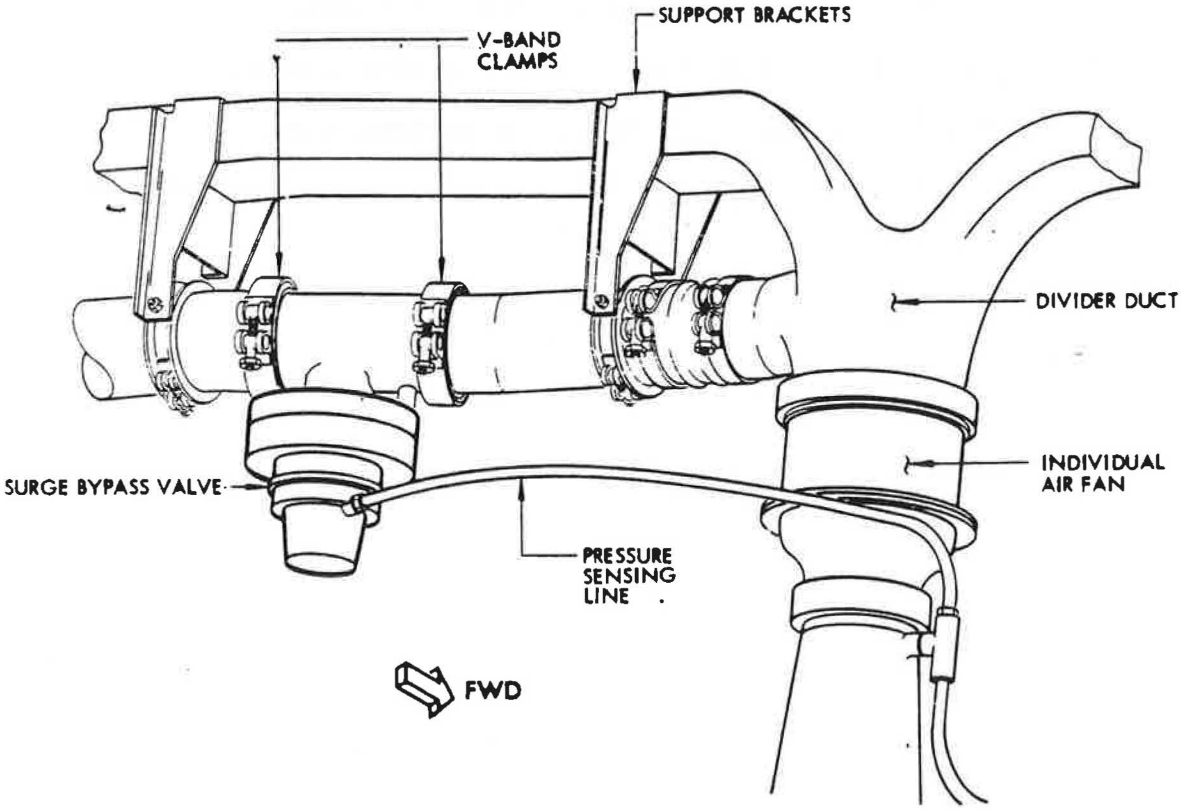
(2) Position surge bypass valve for installation. (See figure 201.)

(3) Connect ducts to surge bypass valve with V-band.

(4) Connect pressure sensing line at surge bypass valve.

(5) Install aft bulkhead of forward cargo compartment.





Surge Bypass Valve
Figure 201

AIR CONDITIONING-AIR CYCLE - DESCRIPTION AND OPERATION

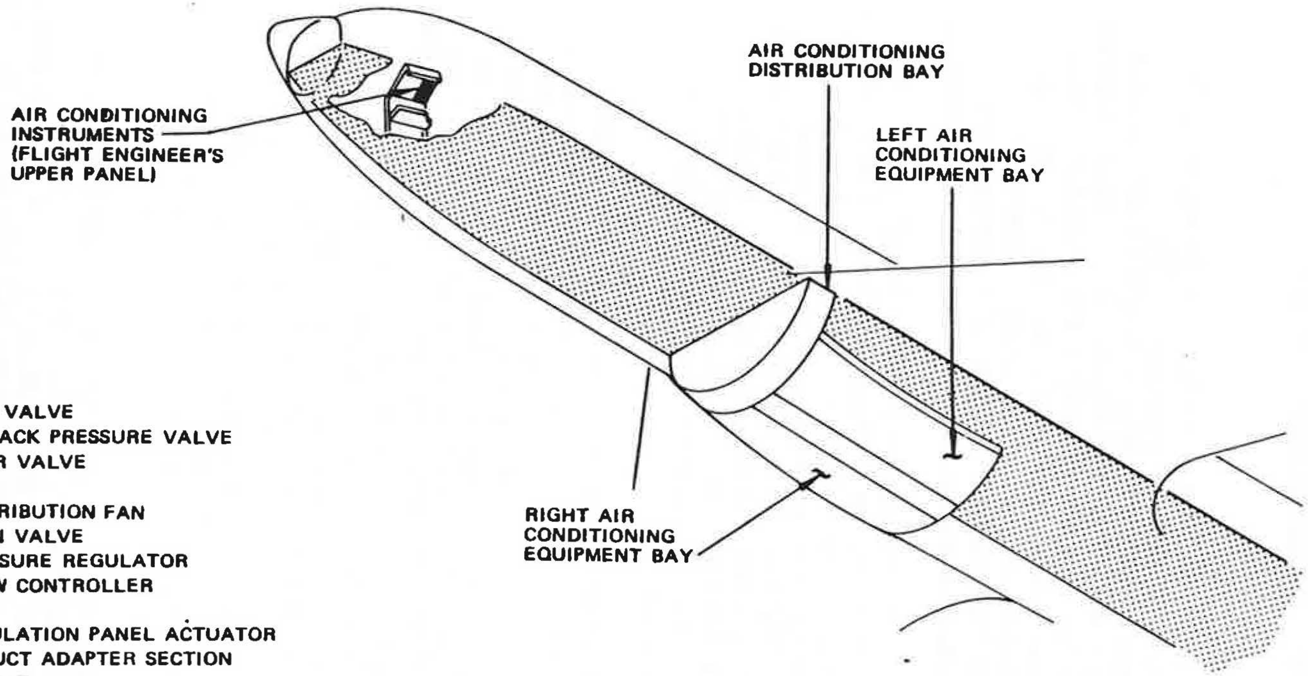
1. General

   A. The air conditioning system utilizes an air cycle refrigeration system for cooling some of the hot compressed air supplied by the turbocompressors of the pneumatic system. This hot air is either used directly, pre-cooled in the primary heat exchanger, or is routed through the air cycle machine and secondary heat exchanger for additional cooling. The pre-cooled and fully cooled air is mixed with hot air in varying proportions as necessary to maintain a selected cabin temperature. Mixing is accomplished in the temperature control valve assemblies in response to signals received from the air conditioning control system.

   B. The air cycle system includes two cooling packs located below the wing center section and a ram air duct system running parallel to wing to body junction. (See figure 1.) Each pack contains a primary and a secondary air-to-air heat exchanger, an air cycle machine, a water separator with an anti-icing thermostat and control valve, and a turbofan with shutoff valve. The ram air duct system consists of entry and exit dampers, a damper for governing air flow through the secondary heat exchanger, actuators for positioning the dampers, and the turbofan mentioned as a part of the air conditioning pack.

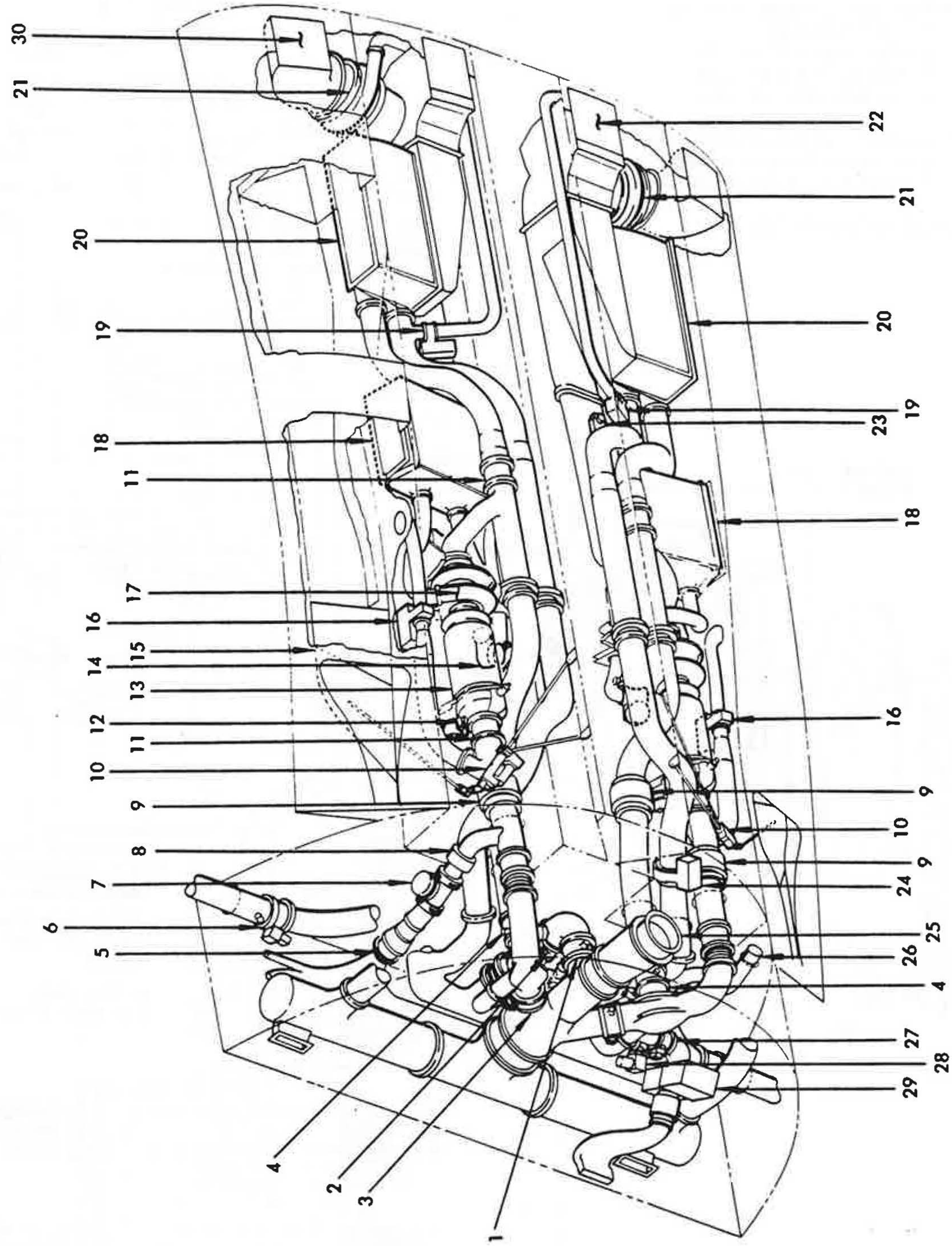
   C. Ram air provides cooling for primary and secondary heat exchangers during flight. The ram air duct system provides enough cooling air for maximum required air conditioning cooling. Since maximum requirements are seldom encountered during normal flight a damper has been located at the ram air inlet. Doors are also located at each turbofan and ram air outlet. Motor operated actuators, controlled from switches on the flight engineer's panel, position the inlet damper and the outlet doors. Required airflow through the secondary heat exchanger also depends on the cooling requirements of the airplane and may not be required at all part of the time. A secondary heat exchanger damper limits ram air flow through the secondary heat exchanger according to the position of the main cabin temperature control valve. Forced circulation of ambient ground air, induced by a turbofan, provides cooling for the heat exchangers during ground operation. A ram air shutoff valve may be opened to admit ambient air to the cabins for ventilation during nonpressurized flight.

   D. The air that is routed through the air cycle packs for cooling, flows through the primary heat exchanger where it becomes cooled or semiconditioned air. (See figure 2.) This semiconditioned air is mixed with hot air in stages (2) and (3) or if in stage (4) some or all of the air is routed into the compressor side of the air cycle machine. (See figure 3.) Here the high energy air flows into the secondary heat exchanger where some heat is extracted with little pressure drop. Next the air flows into the turbine side of the air cycle machine, expands and cools to the lowest temperature in the cycle as it drives the turbine wheel. The cold air then flows through the water separator where excess moisture is removed.



1 MAIN CABIN HOT AIR VALVE
2 TURBOCOMPRESSOR BACK PRESSURE VALVE
3 MAIN CABIN COLD AIR VALVE
4 ACM BYPASS VALVE
5 INDIVIDUAL AIR DISTRIBUTION FAN
6 LEFT WING ISOLATION VALVE
7 INDIVIDUAL AIR PRESSURE REGULATOR
8 INDIVIDUAL AIR FLOW CONTROLLER
9 CHECK VALVE
10 RAM AIR INLET MODULATION PANEL ACTUATOR
11 AIR CONDITIONING DUCT ADAPTER SECTION
12 ANTI-ICING THERMOSTAT
13 WATER SEPARATOR
14 ANTI-ICING CONTROL VALVE
15 RAM AIR INLET MODULATION PANEL
16 RAM AIR SHUTOFF VALVE
17 AIR CYCLE MACHINE
18 SECONDARY HEAT EXCHANGER
19 TURBOFAN SHUTOFF VALVE
20 PRIMARY HEAT EXCHANGER
21 TURBOFAN
22 RAM AIR EXIT DAMPER
23 SECONDARY HEAT EXCHANGER DAMPER ACTUATOR
24 AIR CONDITIONING PACK SHUTOFF VALVE (RIGHT)
25 CONDITIONED AIR GROUND SERVICE CONNECTION
26 PNEUMATIC SYSTEM GROUND SERVICE CONNECTION
27 CONTROL CABIN HOT AIR VALVE
28 CONTROL CABIN COLD AIR VALVE
29 FLOW CONTROLLER
30 TURBOFAN EXIT DOOR

Air Cycle Air Conditioning System Equipment Location
Figure 1 (Sheet 1)

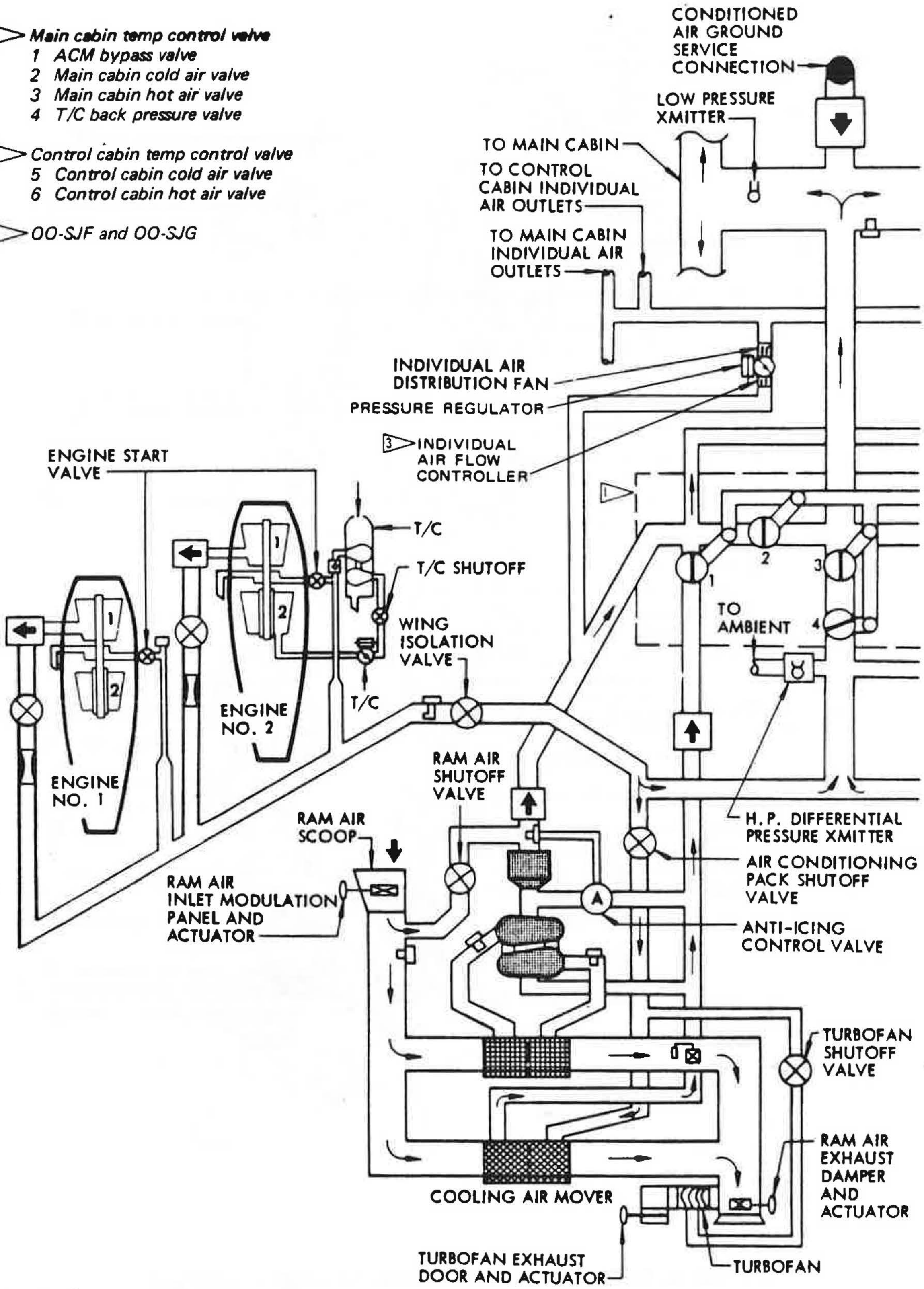


Air Cycle Air Conditioning System Equipment Location
Figure 1 (Sheet 2)

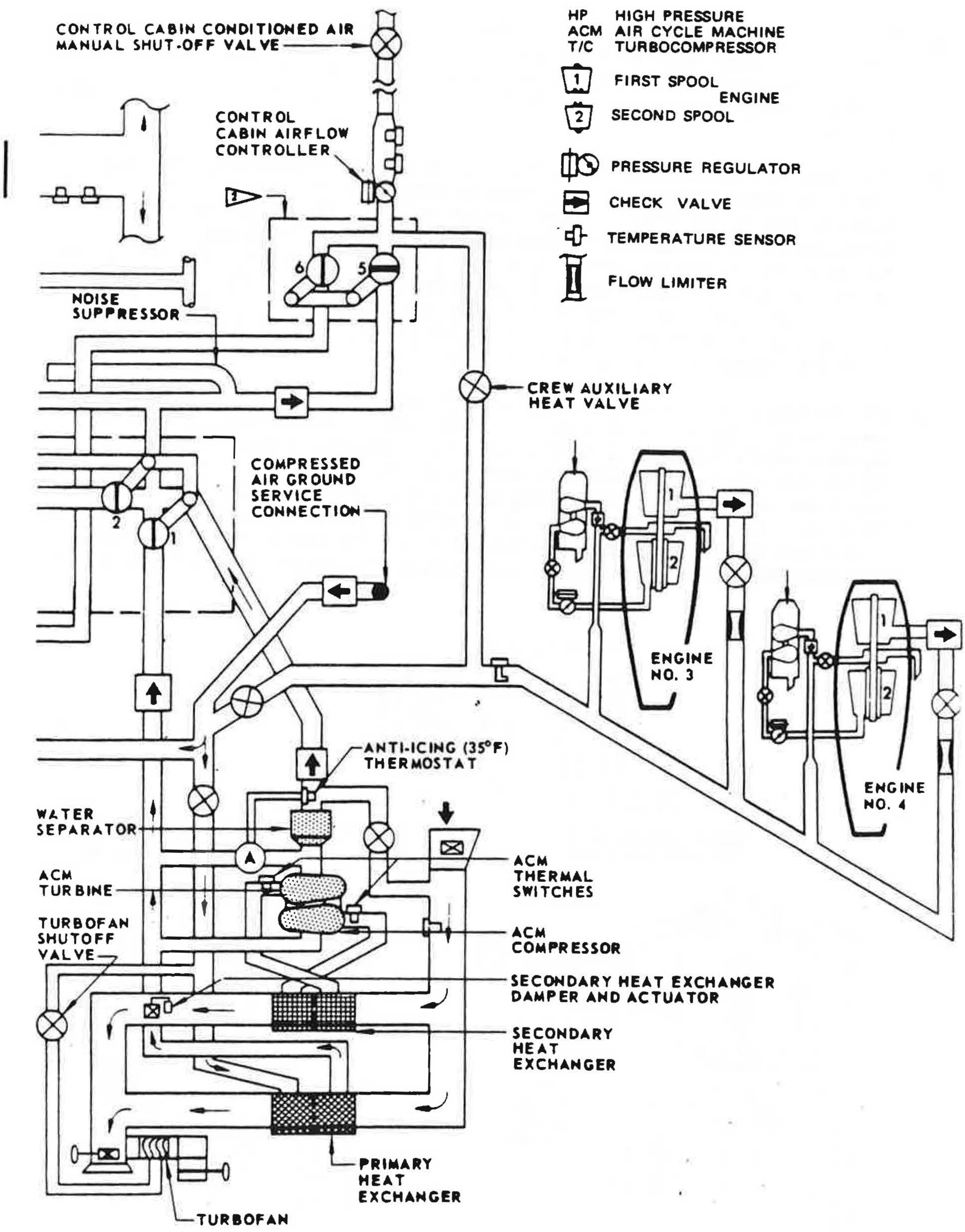
1 Main cabin temp control valve
1 ACM bypass valve
2 Main cabin cold air valve
3 Main cabin hot air valve
4 T/C back pressure valve

2 Control cabin temp control valve
5 Control cabin cold air valve
6 Control cabin hot air valve

3 OO-SJF and OO-SJG



Air Cycle Air Conditioning System Schematic
Figure 2 (Sheet 1 of 2)

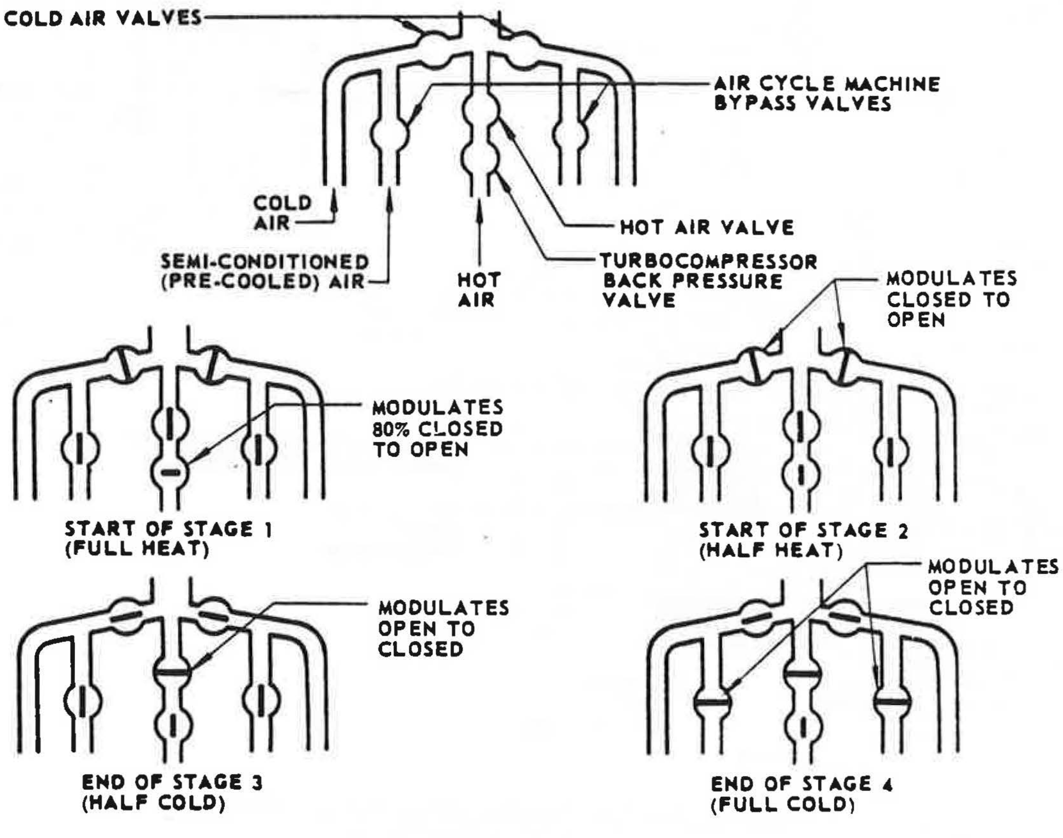


Air Cycle Air Conditioning System Schematic
Figure 2 (Sheet 2)

E. The anti-icing thermostat senses the temperature of the cold air as it leaves the water separator. When the air temperature reaches 35°F the anti-icing control valve opens and semiconditioned air is mixed with the cold air as it leaves the air cycle machine to prevent icing in the water separator.

F. The main cabin temperature control valve assembly includes a hot air valve, a turbocompressor (T/C) back pressure valve, two cold air valves and two air cycle machine (ACM) bypass valves. These six valves are operated by an actuator by means of bellcranks and pushrods. The actuator is driven by an electric motor on the actuator. The valves are modulated through four stages to provide varying proportions of hot, pre-cooled (semi-conditioned) and cold air to the main cabin. (See figure 3.) Each stage represents approximately 25% of time of valve position change from full heat to full cold.

G. At the beginning of stages (1) and (2), hot air only is directed to the main cabin. At start of stage (1) the back pressure valve closes off approximately 80% of the duct area. This creates a back pressure which the turbocompressor must work against. As a result the air being supplied to the air conditioning system at start of stage (1) is hotter then when the back pressure valve is open at start of stage (2). Between the start of stage (2) and the end of stage (3) air in the main cabin distribution duct gradually becomes cooler by the movement of two valves.



Valve Positions By Stages
Figure 3

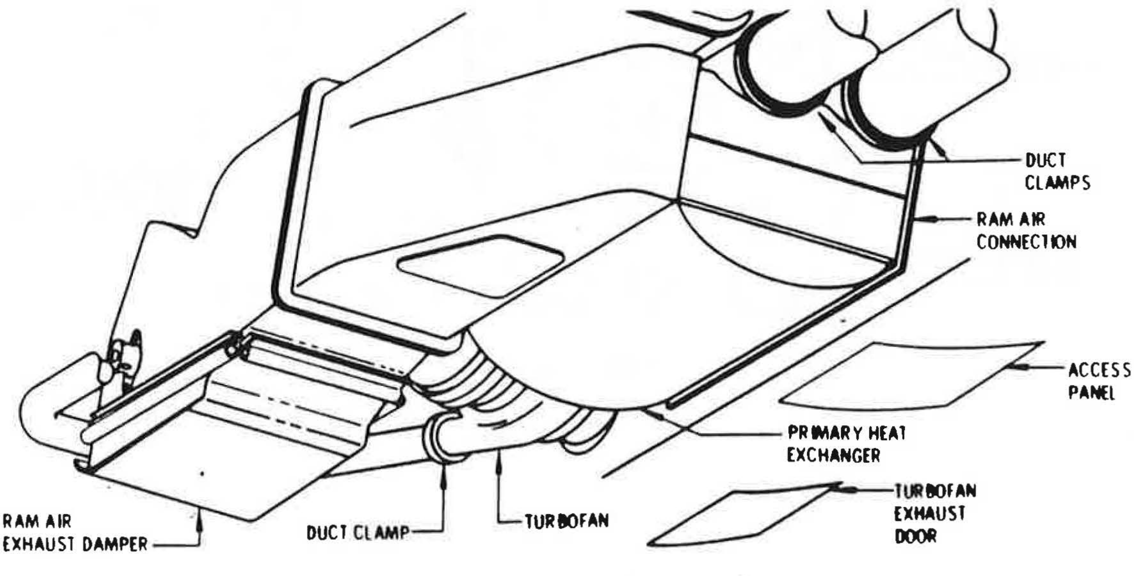
First the cold air valves modulate from closed to open and second the hot air valve moves from open to closed. At the end of stage three the air in the main cabin distribution duct is supplied by a mixture of cold and semi-conditioned air. During step (4) the air cycle machine bypass valve closes and at the end of the cycle only air which has had the full cooling treatment enters the mixing chamber for cabin conditioning.

H. The control cabin temperature control valve assembly is a two valve assembly that mixes hot and semi-conditioned or cold air to maintain selected control cabin temperatures.

I. A control cabin auxiliary heat valve allows hot pneumatic air to be ducted directly to the control cabin when normal ventilating air is shut off. The crew auxiliary heat valve is controlled by a switch on the flight engineer's upper instrument panel.

2. Primary Heat Exchangers

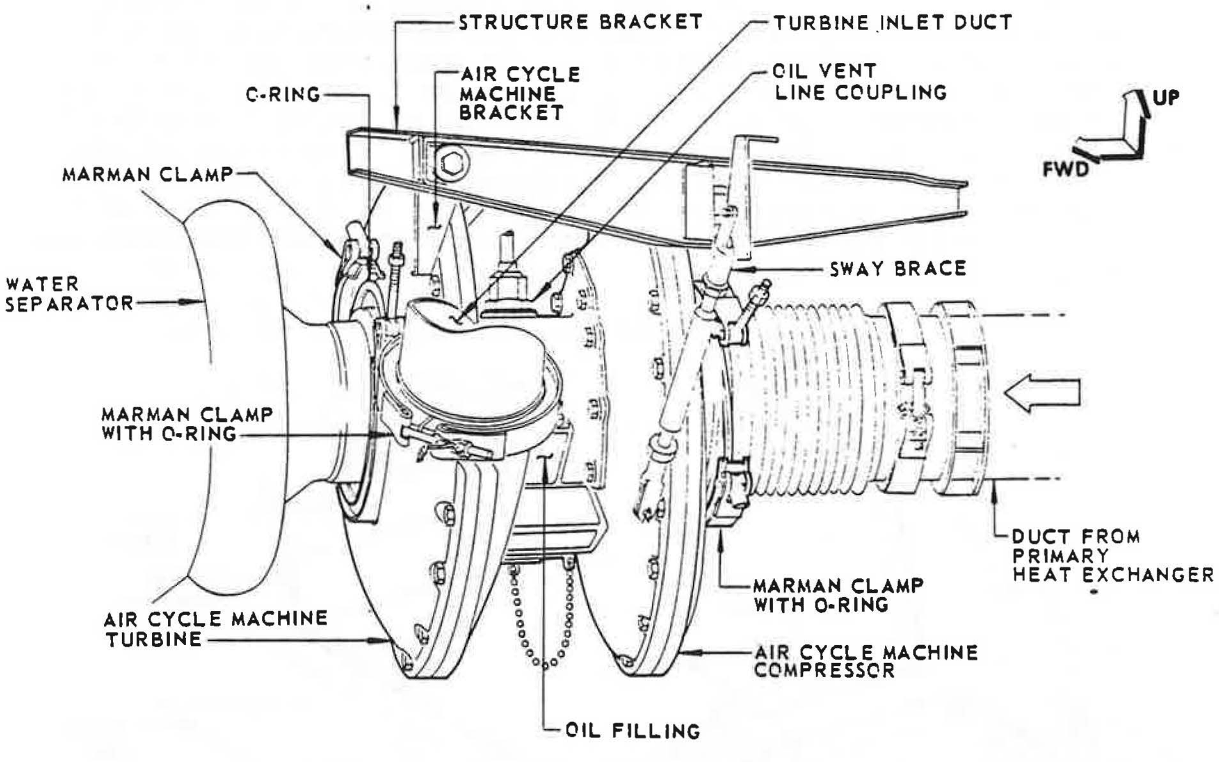
A. The primary heat exchanger (figure 4) is a rectangular unit through which hot air from the pneumatic system flows in a bank of parallel tubes, cooled by ambient air directed across the tubes. The hot air enters at top inboard front of exchanger, fills a plenum chamber along the top inboard side, follows a tube bank down, outboard and up to an outflow plenum chamber from which the cooled air is discharged into the duct leading to the air cycle machine or to the temperature control valve. The ambient air makes only one pass across the thin walled tubes. Ram pressure provides airflow during flight. The arm air exhaust damper is open at this time. For ground cooling a turbofan induces air through the same ram air ducting but air is exhausted out the turbofan exhaust and the ram air exhaust damper is closed. The ram air exhaust damper actuator motor receives power to open the door on takeoff and close during landing as a result of a relay in the landing gear safety (squat) switch circuit. The exchanger is in the air conditioning equipment bay to the rear. There is one primary heat exchanger in each pack.



Primary Heat Exchanger
Figure 4

3. Air Cycle Machines

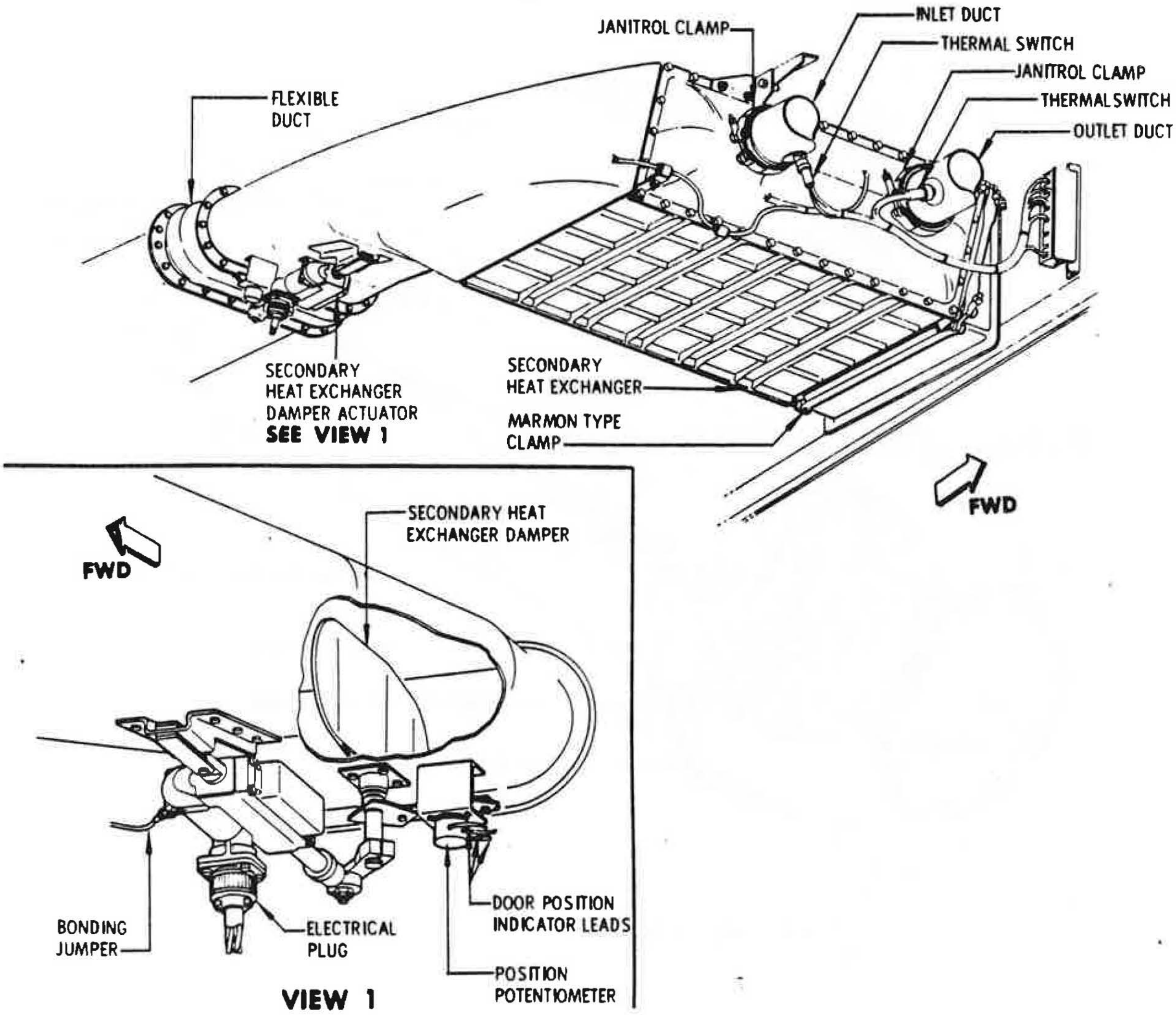
A. The air cycle machine (figure 5) is a cooling unit consisting of an expansion turbine on a common shaft with a compressor. Pressurized air expands through the turbine, driving the compressor. The compressor compresses air coming from the primary heat exchanger. This air is then directed through a secondary heat exchanger in which the heat of compression is absorbed. The air leaves the secondary heat exchanger restored to approximately the temperature it had when entering the compressor. The air then enters the air cycle machine turbine, expands and cools to the lowest temperature in the cycle. An overheat switch in the compressor discharge duct activates the air conditioning unit overheat light on the flight engineer's panel. An overheat in the turbine inlet duct protects the machine from overspeeding. The air cycle machine is in the center part of the air conditioning equipment bay between secondary heat exchanger and water separator. There is one air cycle machine in each pack.



Air Cycle Machine
Figure 5

4. Secondary Heat Exchangers

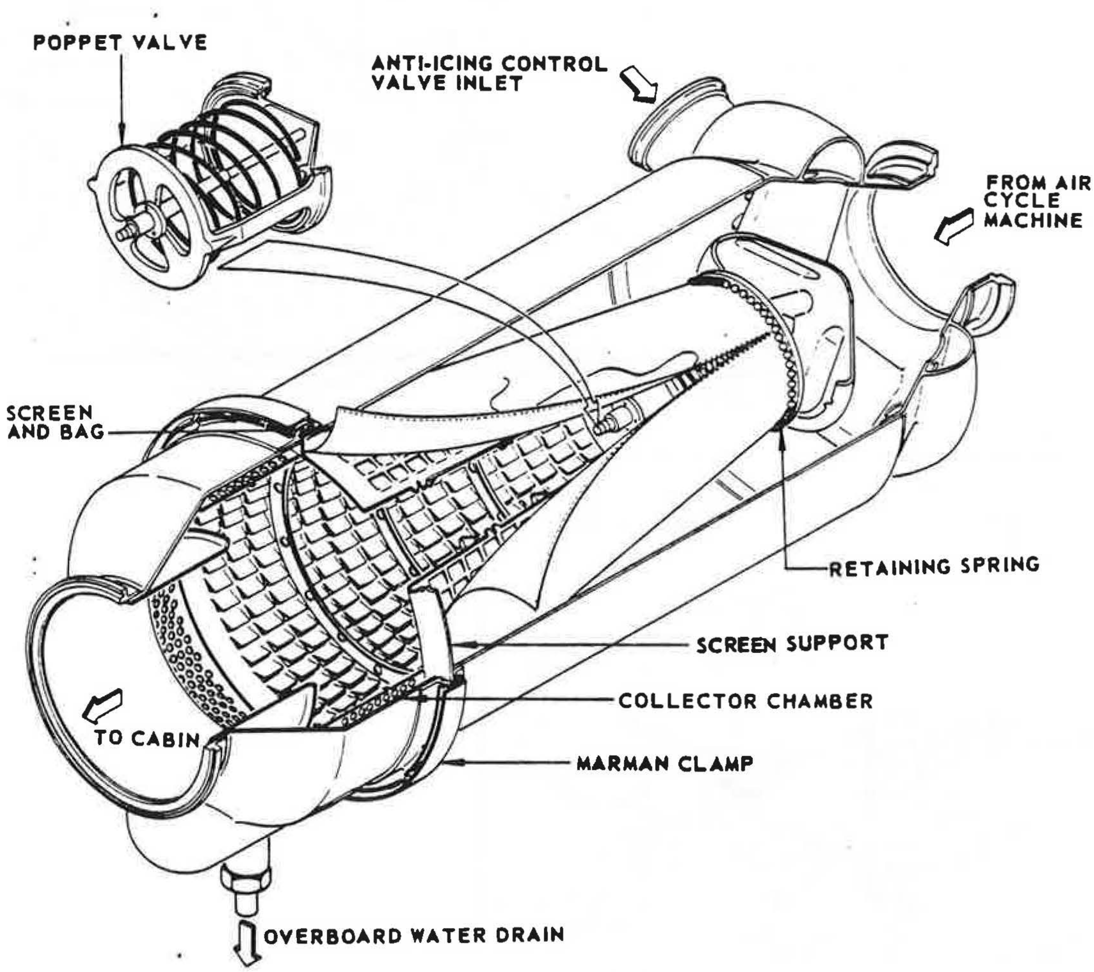
A. The secondary heat exchanger (figure 6) is a rectangular unit in which the air exhausted from the air cycle machine compressor flows through a bank of parallel tubes, cooled by ambient air directed across the tubes. The air enters at the front of the exchanger, follows one tube bank to the rear and returns through a second tube bank to the front, where the cooled air is discharged into a duct leading to the air cycle machine turbine. The secondary heat exchanger is in the ram air duct system. Ambient airflow is induced by ram effect in flight and by a turbofan on the ground. A motor operated actuator, controlled by the main cabin temperature control valve, cuts off cooling air supply through the heat exchanger when the air cycle machine is not operating. The exchanger is in the air conditioning equipment bay forward of the primary heat exchanger. The secondary heat exchanger damper and actuator are downstream of the exchanger in the ram air ducting. There is one secondary heat exchanger in each air conditioning pack.



Secondary Heat Exchanger
Figure 6

5. Water Separators

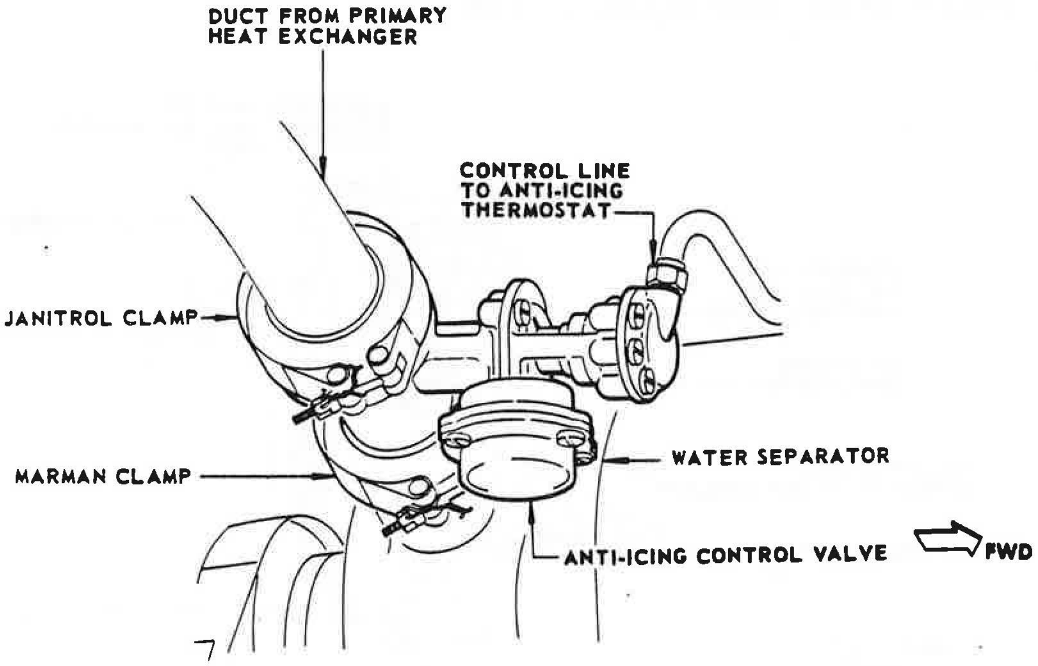
A. The water separator (figure 7) is a cylindrical chamber with a cone-shaped screen covered with a cloth bag for removing excess moisture from the air stream. Turbine air and bypass air metered by the anti-icing control valve enters the chamber and is spun by numerous turning vanes. The centrifugal force throws the water droplets to the separator wall. The droplets gather in a collector ring and drain overboard. A poppet valve at the upstream end allows air flow to bypass the bag if the latter becomes frozen or clogged. The separator is in the air conditioning equipment bay, forward of the air cycle machine. There is one water separator in each air conditioning pack.



Water Separator
Figure 7

6. Anti-Icing Control Valve

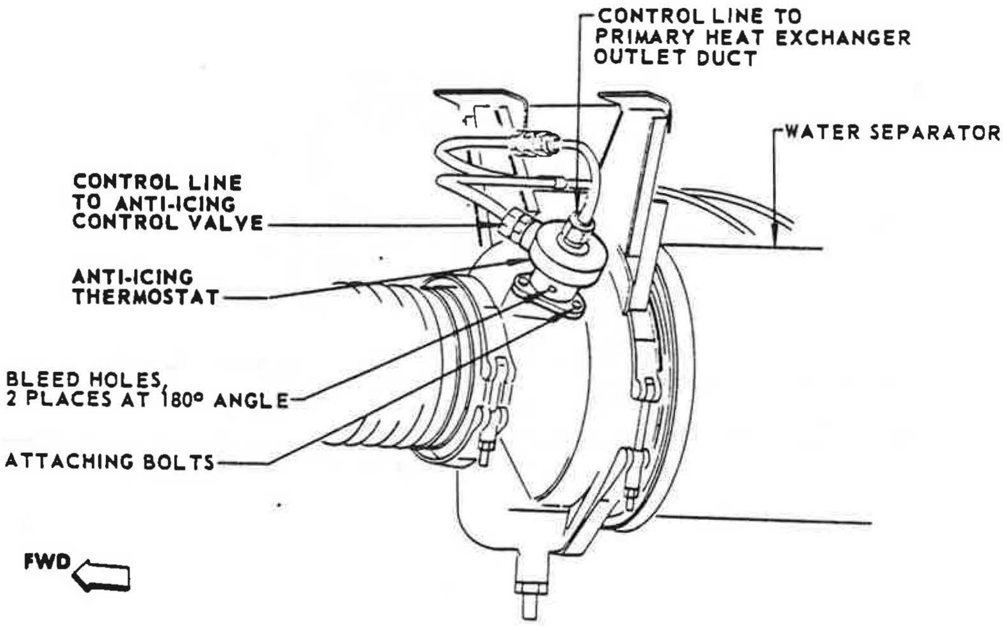
A. The anti-icing control valve (figure 8) is a pneumatically operated butterfly valve which opens to admit warm air into the water separator to prevent icing when the air flow temperature drops below 35°F. The valve is normally spring-loaded closed until pressure from the anti-icing control thermostat opens the valve. The valve is located in the air cycle machine bypass duct in each air conditioning equipment bay.



Anti-Icing Control Valve
Figure 8

7. Anti-Icing Thermostat

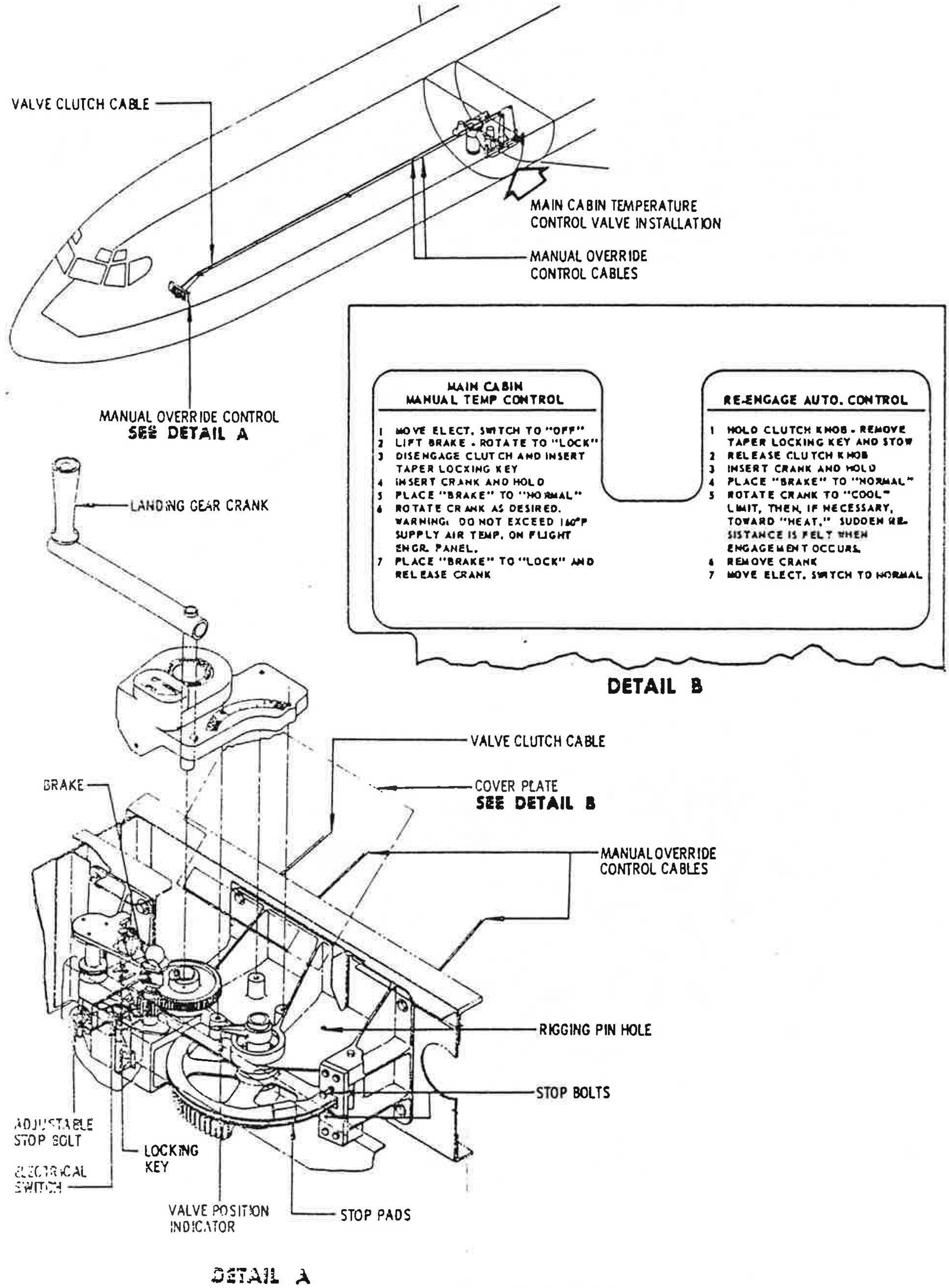
A. The anti-icing thermostat (figure 9) consists of a bi-metal temperature sensing unit, a pneumatic control valve and a pneumatic servo valve mounted at the downstream end of the water separator for sensing air temperature. As long as this is above 35°F, the thermostat control and servo valves are held open, permitting air to flow from primary heat exchanger outlet duct through the thermostat valve ports. When the temperature drops below 35°F, the bi-metal unit contracts, which closes both valves in the thermostat. This raises pressure in the line to the anti-icing control valve and the valve opens to admit warm air to the separator. The thermostat is in the air conditioning equipment bay just forward of the water separator in each pack.



Anti-Icing Thermostat
Figure 9

8. Main Cabin Temperature Control Manual Override

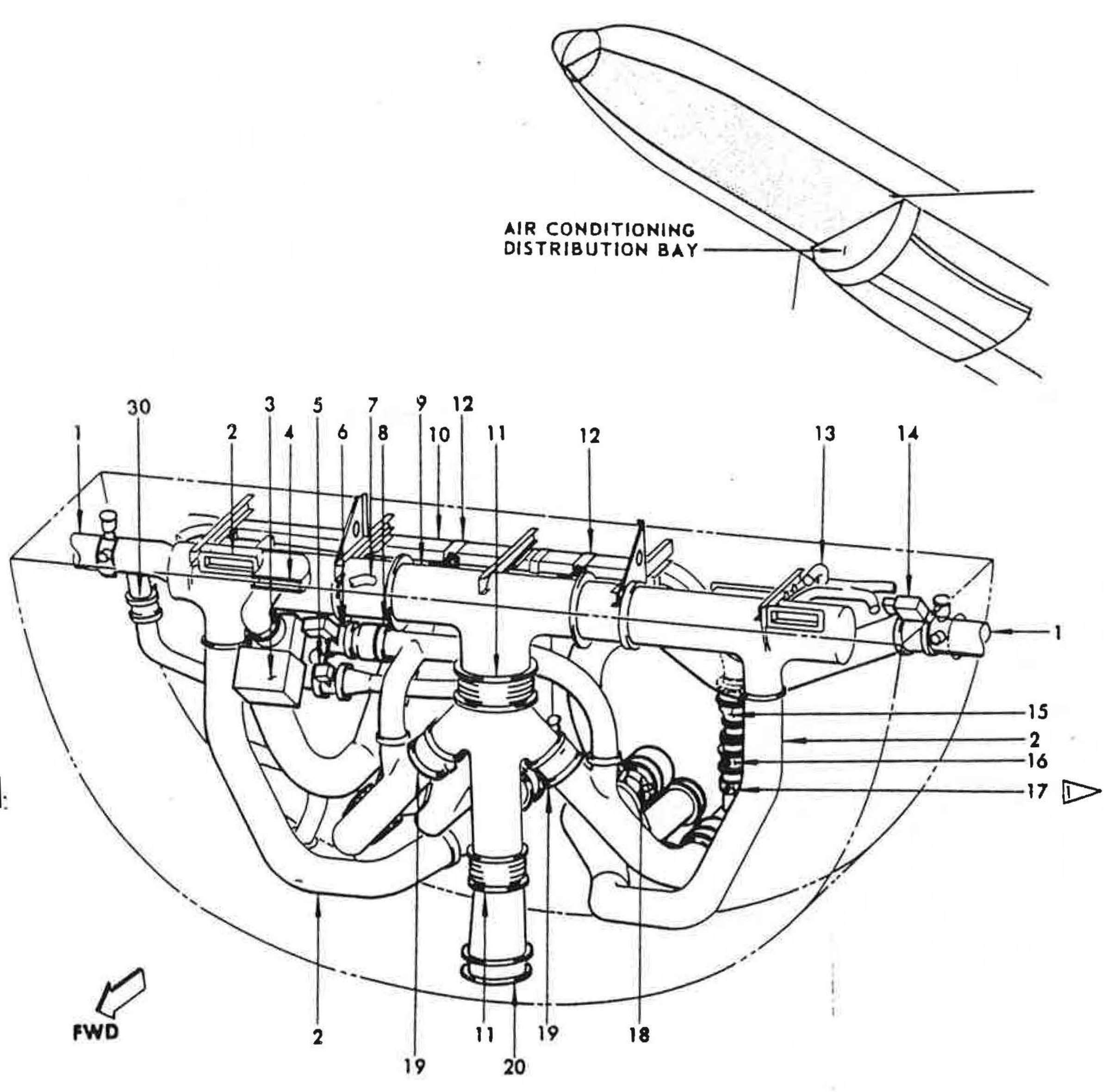
A. The main cabin temperature control valve installation includes a manual override feature. (See figure 10.) The landing gear crank can be used to manually position the valve. An access door just aft of the lower nose compartment door covers a gear and pulley arrangement in which the crank is inserted. A cable system from the control cabin to the control valve makes it possible to disconnect the motor operated actuator and manually position the valve. Operating instructions are printed on the lower surface of the access door.



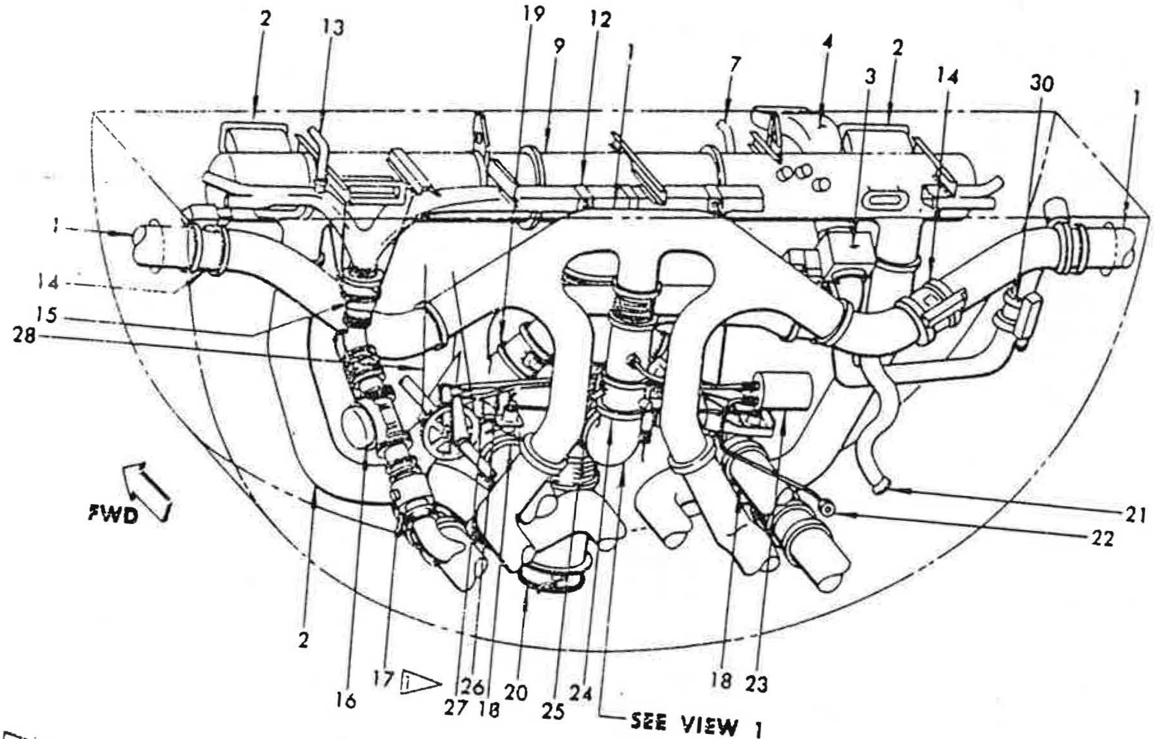
Main Cabin Temperature Control Manual Override
Figure 10

9. Main Cabin Temperature Control Valve Assembly

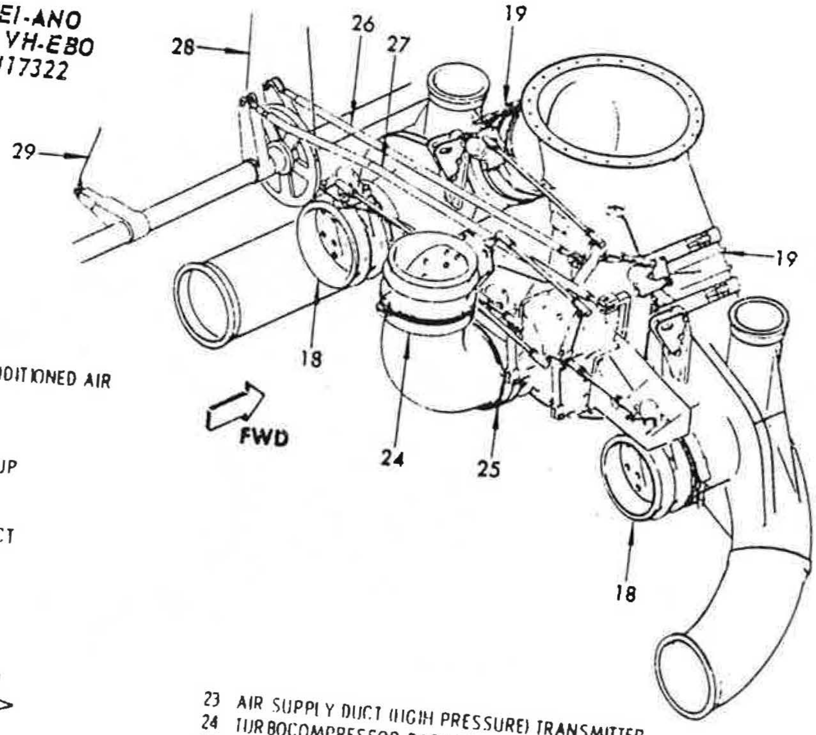
A. The main cabin temperature control valve assembly (figure 11) is an electrically controlled, six valve assembly, that mixes hot, semi-conditioned, and conditioned air to maintain selected main cabin temperatures. Two air cycle machine bypass valves in the semi-conditioned air ducts, two cold air valves in the conditioned air duct and a hot air valve and turbocompressor back pressure valve in the hot air duct make up the valve assembly. The six valves are driven by one 115-volt a-c motor through cranks and pushrods. The motor can be stopped or reversed at any position in the operating cycle. The actuation signal is received from the temperature regulator.



Air Cycle Air Conditioning Distribution Bay
Figure 11 (Sheet 1 of 2)



[1] IIA EI-AMW AND EI-ANO
QANTAS VH-EBN AND VH-EBO
CAL N17321 AND N17322

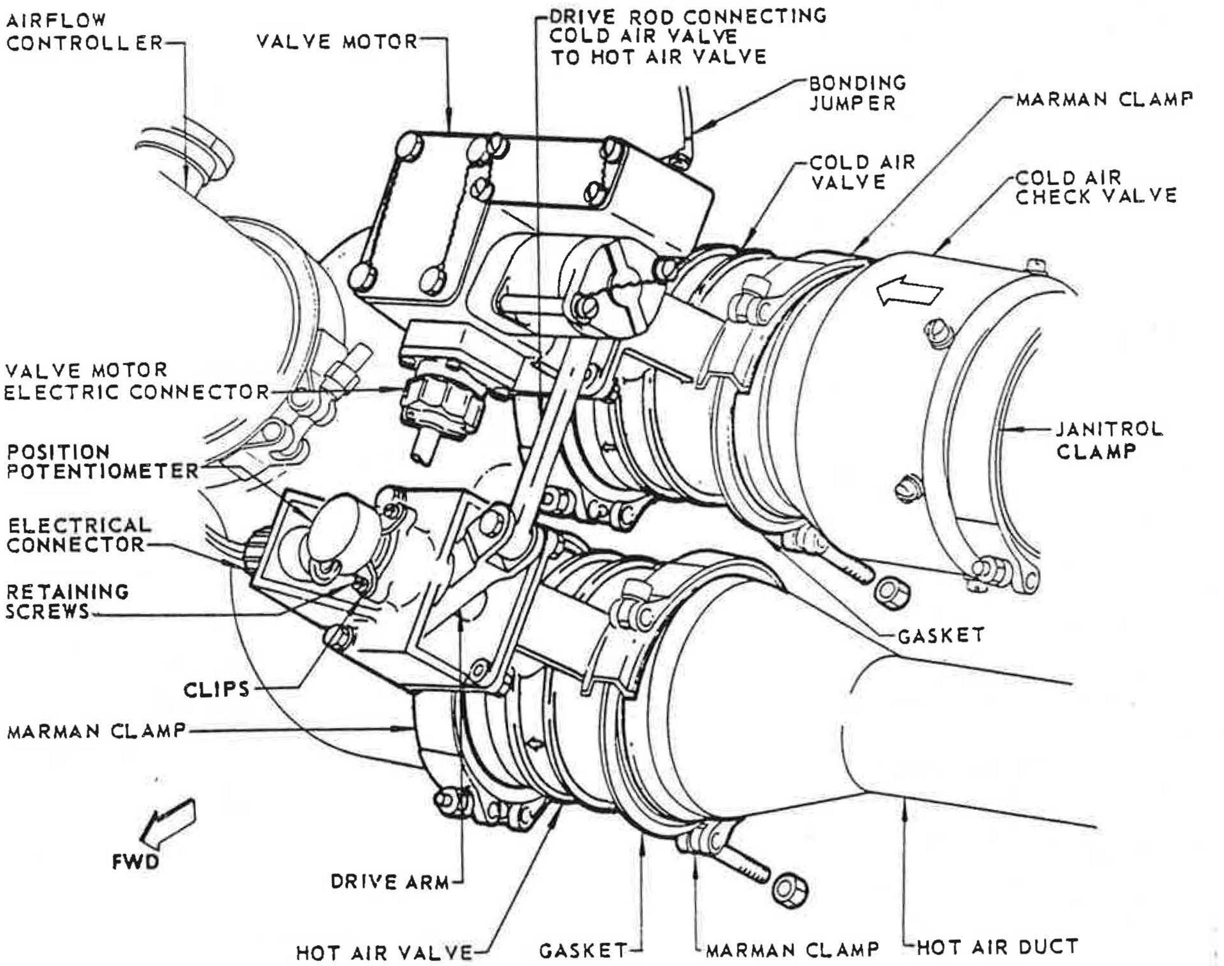


1 PNEUMATIC DUCT
2 MAIN CABIN DISTRIBUTION DUCT
3 FLOW CONTROLLER - CONTROL CABIN CONDITIONED AIR
4 CONTROL CABIN DISTRIBUTION DUCT
5 CONTROL CABIN HOT AIR VALVE
6 CONTROL CABIN COLD AIR VALVE
7 MIXING CHAMBER (LOW PRESSURE) PICK-UP
8 CHECK VALVE
9 MIXING CHAMBER
10 INDIVIDUAL AIR DISTRIBUTION SYSTEM DUCT
11 FLEXIBLE COUPLING
12 INDIVIDUAL AIR PRESSURE RELIEF VALVE
13 CONTROL CABIN INDIVIDUAL AIR DUCT
14 WING ISOLATION VALVE
15 INDIVIDUAL AIR DISTRIBUTION (PSU) FAN
16 INDIVIDUAL AIR (PSU) PRESSURE REGULATOR
17 INDIVIDUAL AIR (PSU) FLOW CONTROLLER [1]
18 ACM BYPASS VALVE
19 MAIN CABIN COLD AIR VALVE
20 CONDITIONED AIR GROUND SERVICE CONNECTION
21 PNEUMATIC SYSTEM GROUND SERVICE CONNECTION
22 AMBIENT PRESSURE PICK-UP (AIR SUPPLY DUCT PRESSURE TRANSMITTER)
23 AIR SUPPLY DUCT (HIGH PRESSURE) TRANSMITTER
24 TURBOCOMPRESSOR BACK PRESSURE VALVE
25 MAIN CABIN HOT AIR VALVE
26 MANUAL CONTROL ROD - MAIN CABIN TEMPERATURE CONTROL VALVE
27 VALVE CLUTCH ROD - MANUAL OVERRIDE
28 MANUAL OVERRIDE CONTROL CABLE
29 MANUAL OVERRIDE CLUTCH CABLE
30 CREW AUXILIARY HEAT VALVE

Air Cycle Air Conditioning Distribution Bay
Figure 11 (Sheet 2)

10. Control Cabin Temperature Control Valve Assembly

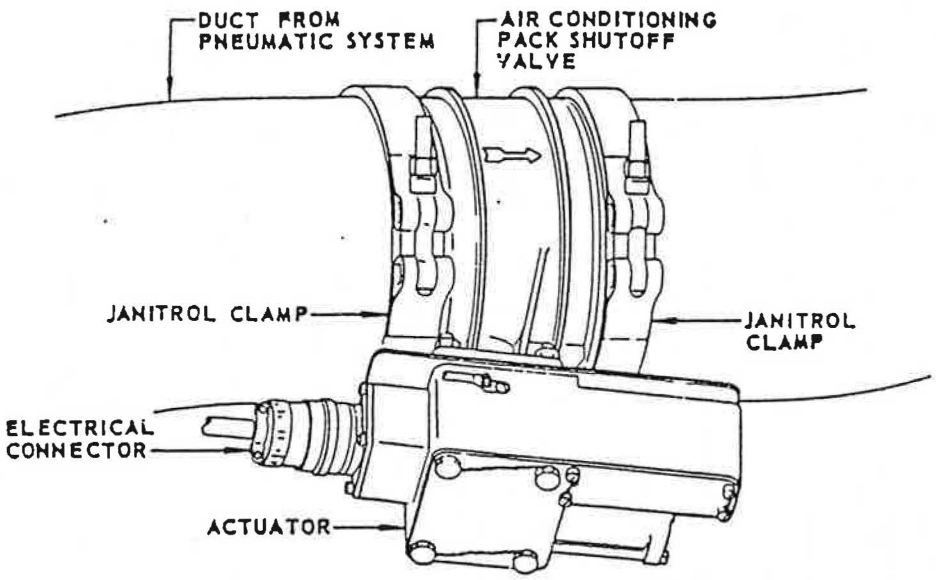
A. The control cabin temperature control valve assembly (figure 12) is an electrically controlled two-valve assembly that mixes hot and conditioned air to maintain selected control cabin temperature. The control cabin hot air valve and the control cabin cold air valve are interconnected and driven by a single 115-volt a-c motor that can be stopped or reversed at any position in the operating cycle. The actuation signal is received from the temperature regulator. A position potentiometer on the hot air valve senses control cabin valve position and is electrically connected to a position indicator on the flight engineer's upper auxiliary panel.



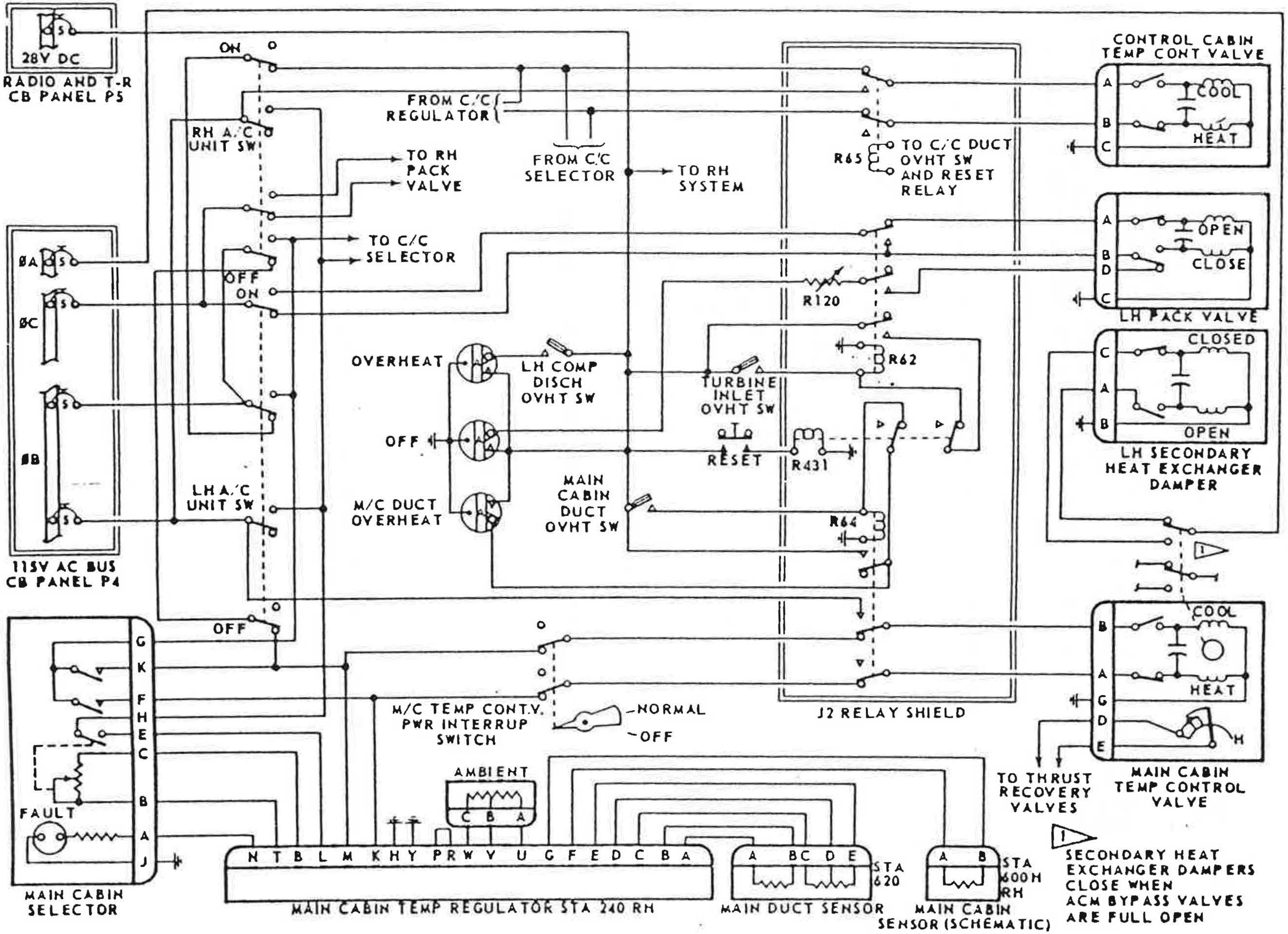
Control Cabin Temperature Control Valve
Figure 12

11. Air Conditioning Pack Shutoff Valves

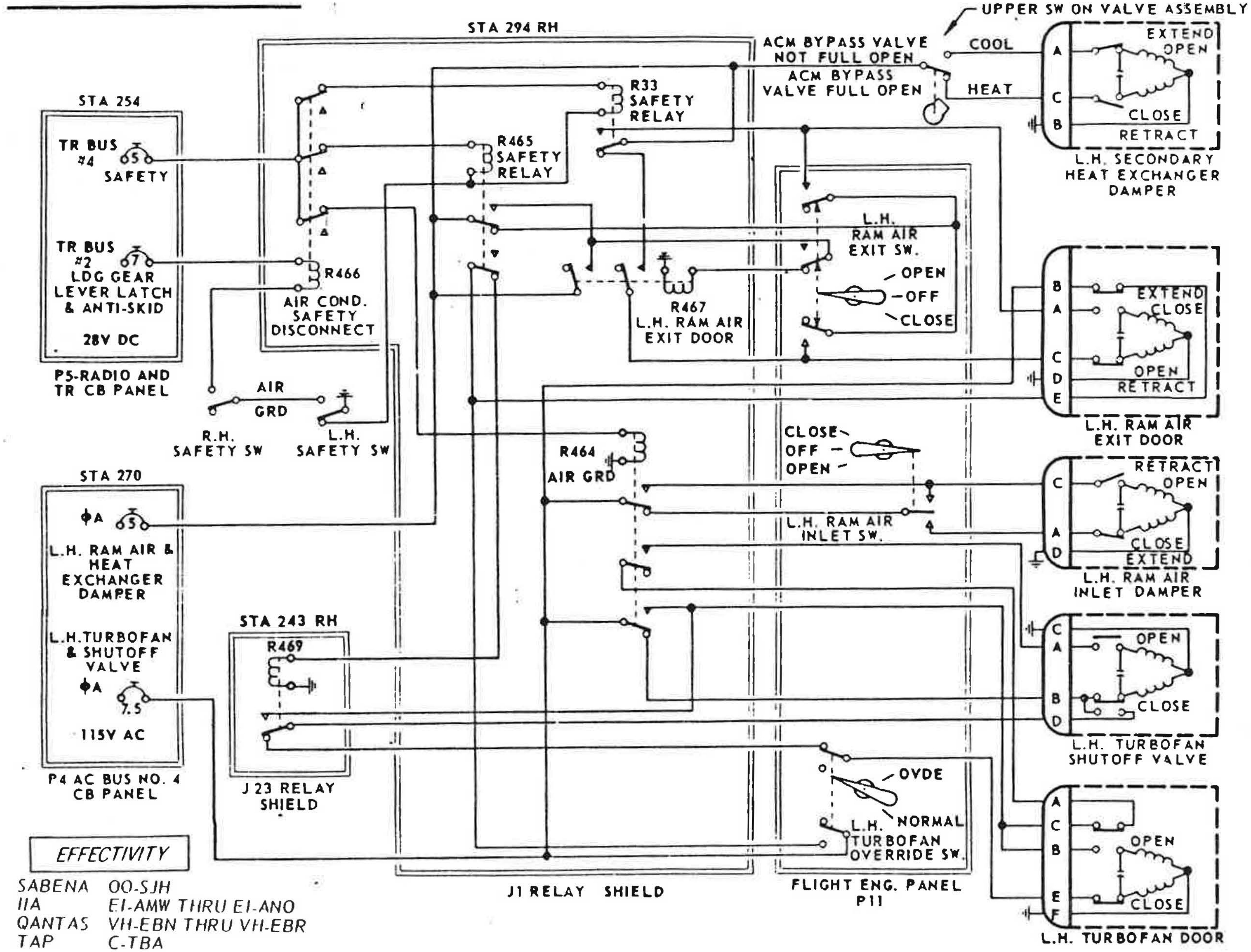
A. Left and right air conditioning pack shutoff valves (figure 13) are identical six inch diameter motor-driven butterfly valves, operating on 115-volts ac, located in the ducts branching from the pneumatic crossover duct to the packs. The valves are operated by the air conditioning unit switches. (see figure 14.)



Air Conditioning Pack Shutoff Valve
Figure 13



Left Hand Air Conditioning Schematic Circuit Diagram
Figure 14

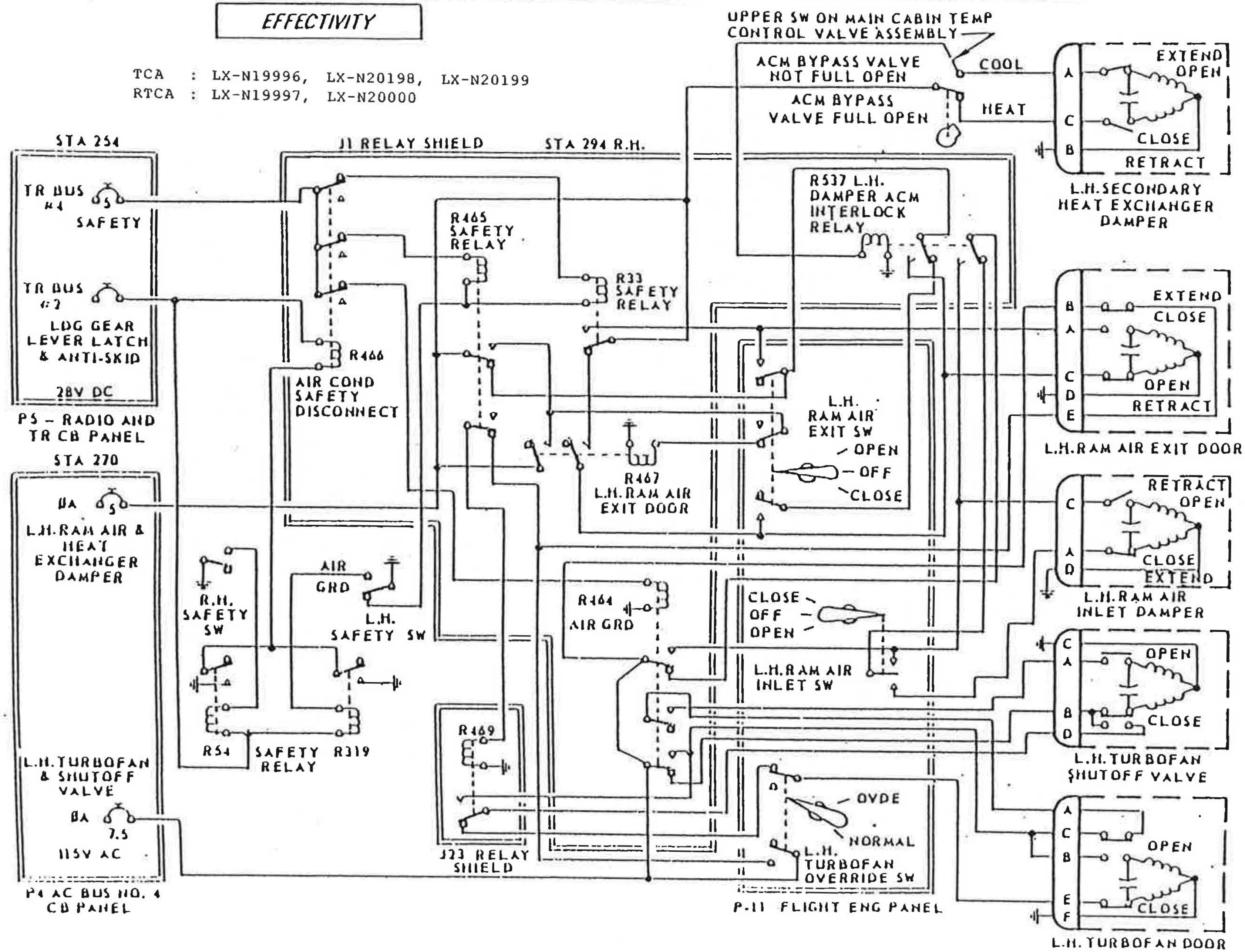


Left-Hand Ram Air Control Circuit Diagram
Figure 14A

EFFECTIVITY	
SABENA	OO-SJH
IIA	EI-AMW THRU EI-ANO
QANTAS	VH-EBN THRU VH-EBR
TAP	C-TBA

EFFECTIVITY

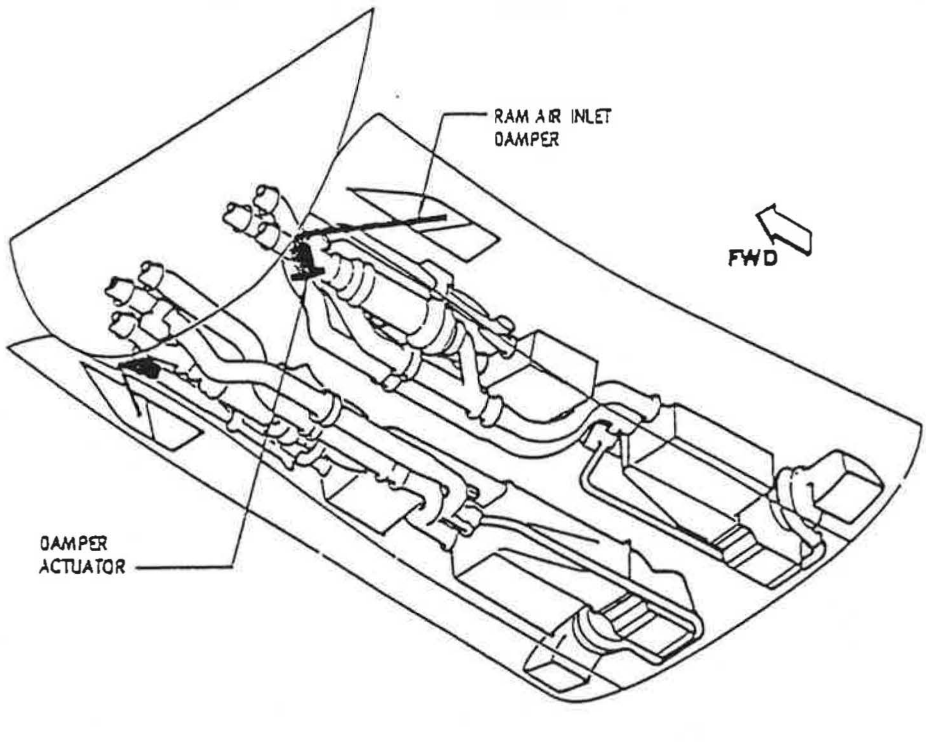
TCA : LX-N19996, LX-N20198, LX-N20199
RTCA : LX-N19997, LX-N20000



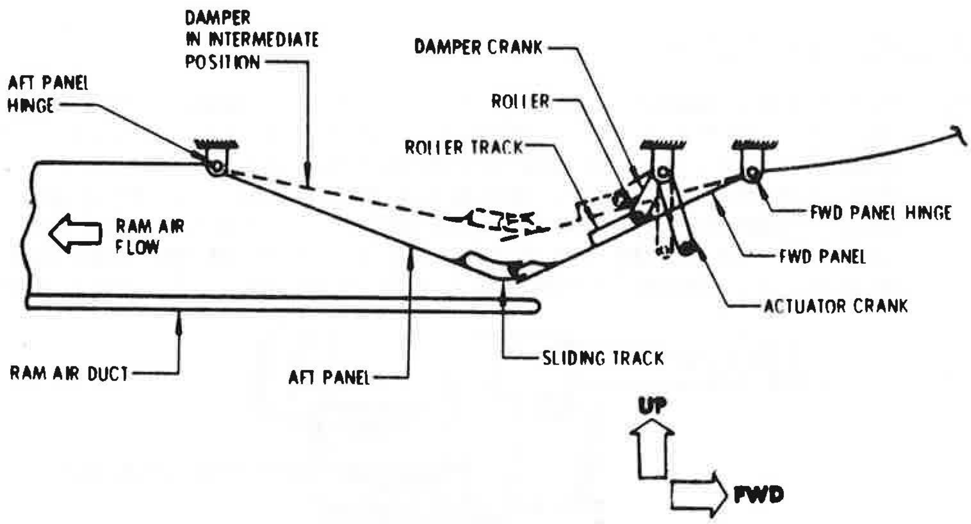
Left Hand Ram Air Control Circuit Diagram
Figure 14B

12. Ram Air Inlet Damper

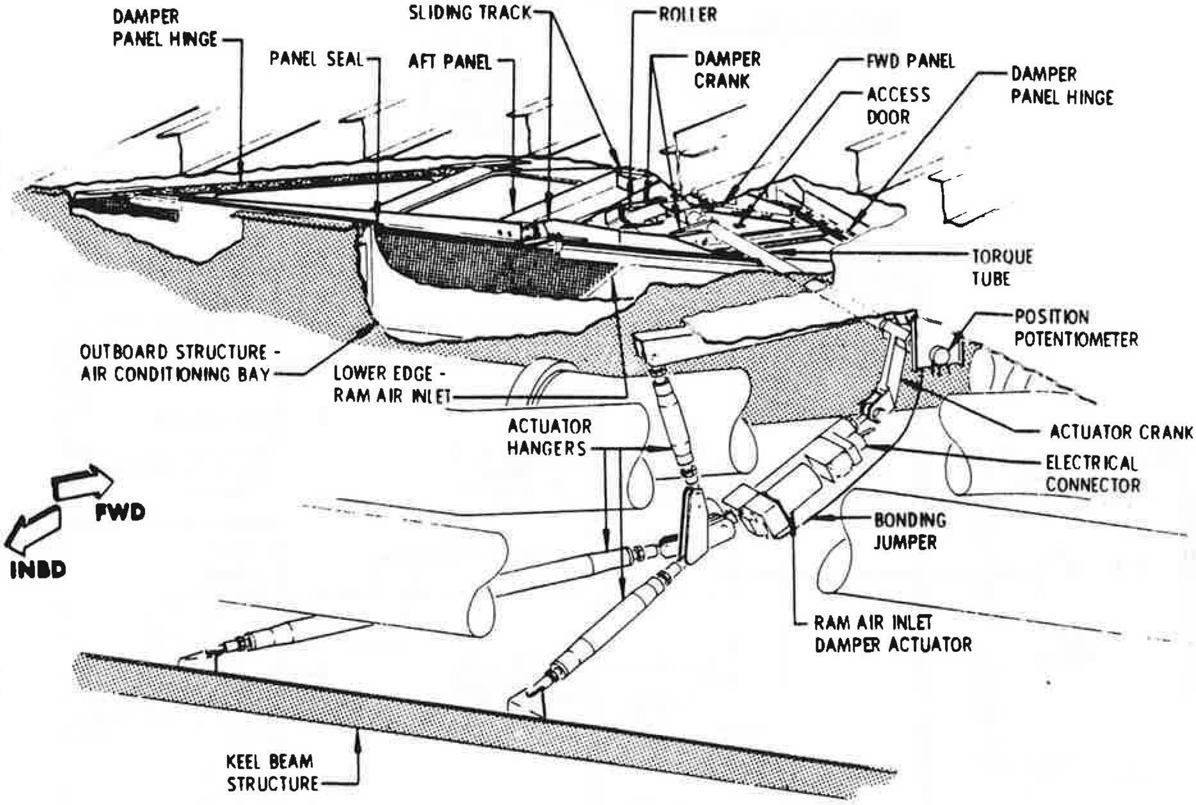
A. The ram air inlet damper provides a method for changing the area of the opening to the ram air duct system in flight. Closing the inlets according to the air conditioning system cooling requirements reduces airflow through the ram air ducts and improves airplane performance. Two panels, hinged at opposite ends, are connected at their unhinged ends by a sliding track arrangement. A 115-volt, a-c motor operated linear actuator connects to a crank at one end of a torque tube. At the other end of the torque tube two other cranks are attached. Each of these cranks has a roller fastened at the end away from the tube. The rollers fit inside channel tracks on the forward panel and when the actuator is extended and retracted the forward panel closes and opens. The aft panel follows as a result of the sliding track arrangement between the panels. The motor is controlled by a three position switch labeled "INLET VALVE" on the flight engineer's upper auxiliary panel. When the forward panel moves, the aft panel follows as a result of the sliding track arrangement, and a change to the inlet opening is obtained. A position potentiometer at the inboard end of the torque tube transmits a position signal to an indicator on the flight engineer's auxiliary panel. The inlet damper panels are attached to the upper surface of the ram air inlet duct. The actuator is held in place by hangers and is located below the air conditioning packs at the forward end of the air conditioning bay. There is one ram air inlet damper and actuator for each air conditioning pack. See figure 14A for schematic control circuit.



Ram Air Inlet Damper and Actuator
Figure 15 (Sheet 1 of 2)



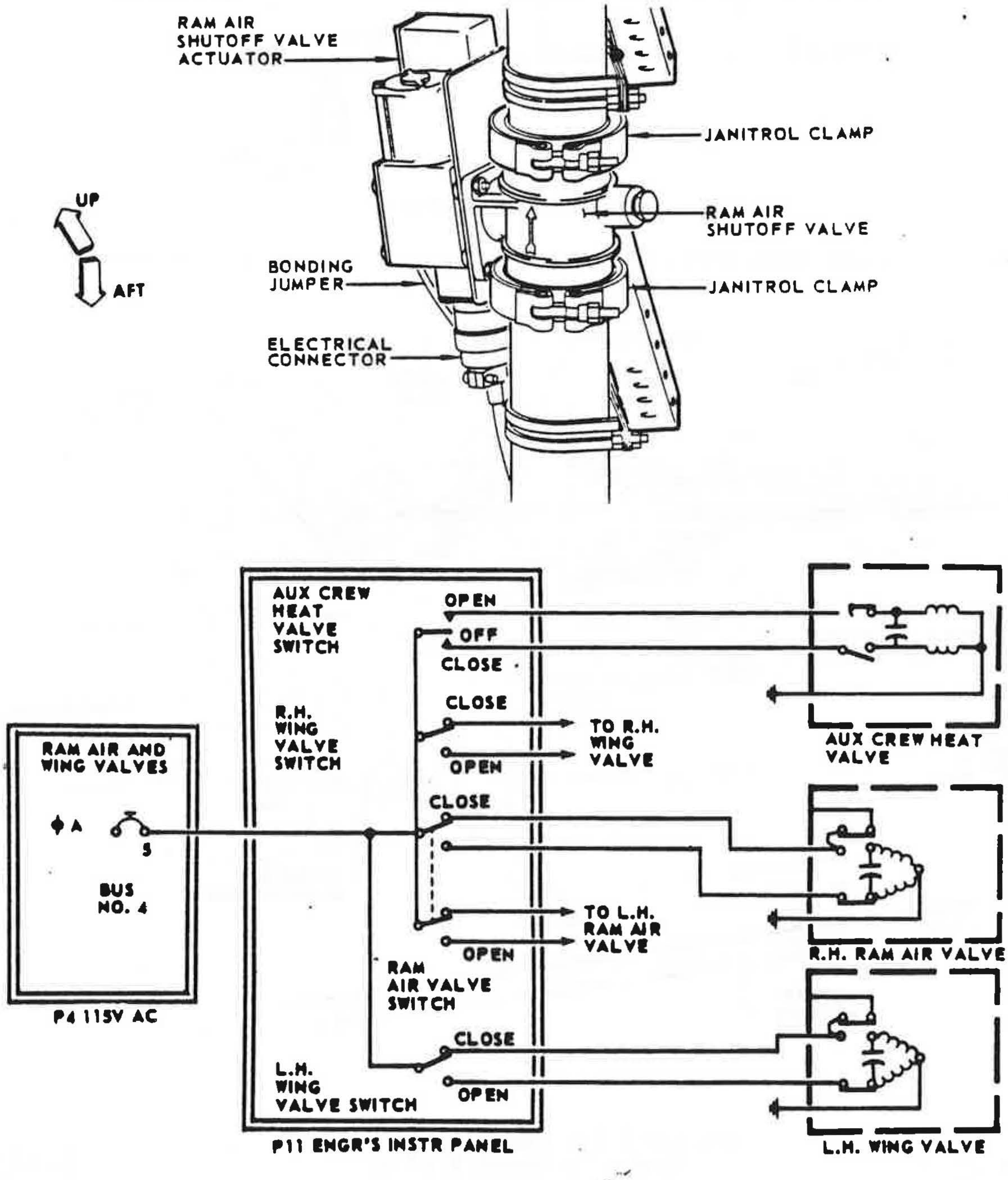
SCHEMATIC
RAM AIR INLET MODULATION PANEL



Ram Air Inlet Damper and Actuator
Figure 15 (Sheet 2 of 2)

13. Ram Air Shutoff Valve

A. The ram air shutoff valve (figure 16) is a motor-driven two and one half inch diameter butterfly valve operating on 115 volts ac that may be opened to let ventilation air into the main and control cabins directly from the ram air scoop, bypassing the air conditioning pack. The main cabin temperature control valve must first be in place in the cooler range. The valve is in the air conditioning equipment bay outboard of the water separator. There is one ram air shutoff valve for each pack.

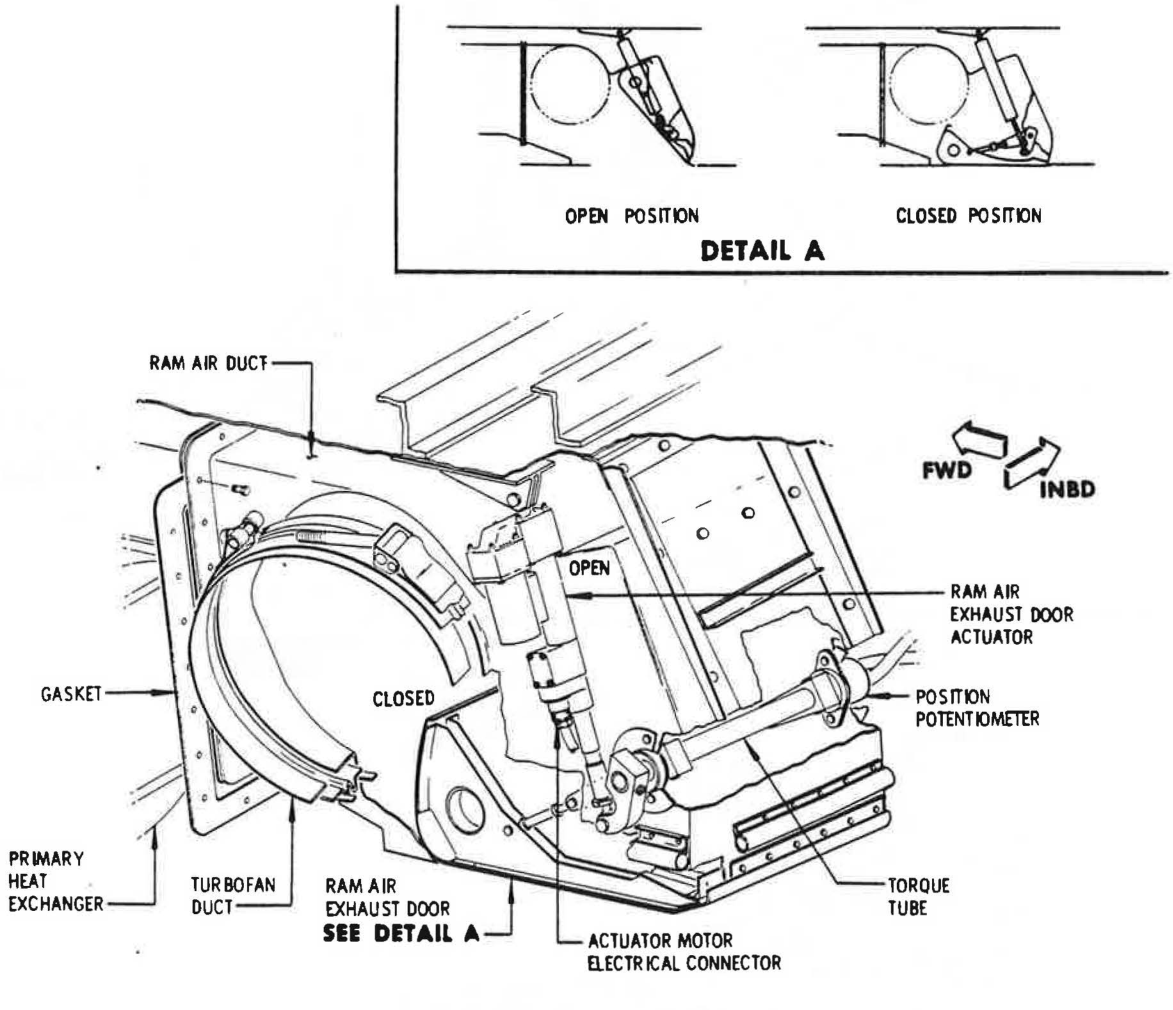


Ram Air Shutoff Valve
Figure 16

14. Ram Air Exhaust Door and Actuator

A. The ram air exhaust door (figure 17) closes for ground air conditioning operation and opens during flight. On take-off, a motor driven actuator pulls the door inside the ram air exhaust duct to the full open position. During flight the door may be positioned as desired between full open and full closed. The ram air exhaust door is located in the aft part of the ram air duct in the air conditioning equipment bay. There is one ram air exhaust door for each pack.

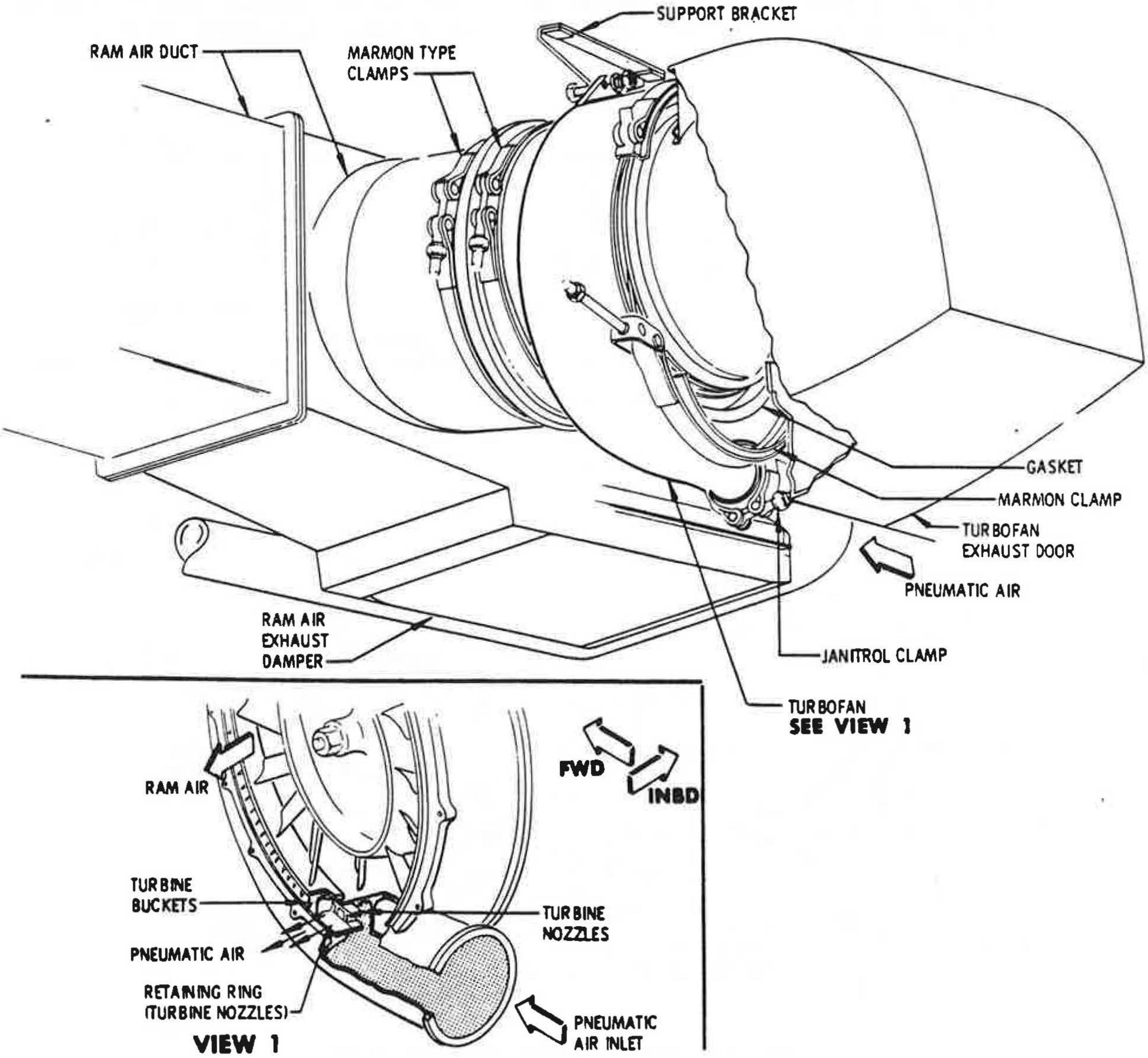
B. The ram air exhaust door actuator is a linear actuator operated by a 115-volt a-c motor. The motor is wired into the landing gear safety (squat) switch circuit so that on the ground the actuator moves the ram exhaust door to the full closed position and on take-off the door moves to the full open position. An "EXIT VALVE" switch located on the flight engineer's upper panel is also wired into the exhaust door actuator circuit which allows moving the door to intermediate positions during flight. A potentiometer on the end of the torque tube transmits a position signal to an indicator on the flight engineer's upper panel.



Ram Air Exhaust Door and Actuator
Figure 17

15. Turbofan

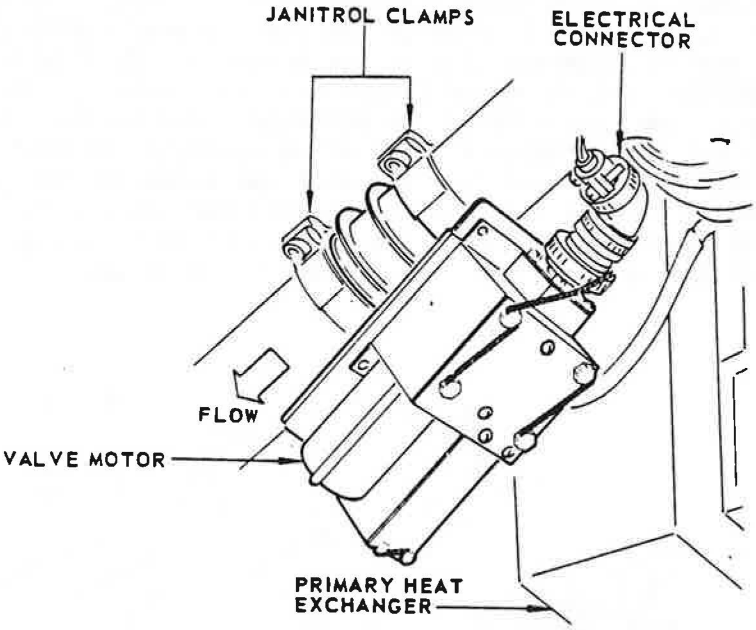
A. The turbofan (figure 18) is a turbine powered fan located in the ram air duct system to move cool air past the heat exchangers during ground air conditioning operation. Air from the pneumatic system is directed against turbine buckets located on the outer periphery of a fan. The force of the air on the turbine turns the fan, which in blowing air from the duct, maintains flow of ambient air past the heat exchangers. A turbofan shut-off valve in the pneumatic duct to the turbine is wired through the landing gear safety (squat) switches to automatically open when the airplane lands and close when it takes off. A turbofan exhaust door actuator is also wired to close the door on take-off and open it on landing. The turbofan for each pack is located in the air conditioning equipment bay, outboard and to the rear of the primary heat exchanger.



Turbofan
Figure 18

16. Turbofan Shutoff Valve

A. The turbofan shutoff valve (figure 19) is a motor-driven butterfly valve that controls the supply of air to operate the turbofan. The valve operates on 115-volt a-c power. The shutoff valve is automatically closed on takeoff when the landing gear safety (squat) switch relay is de-energized. When the relay is energized, as it is on landing, the valve automatically opens if the turbofan exhaust door actuator is in the open position. Obtaining power to the open side of the shutoff valve through the exhaust door actuator prevents operation of the turbofan unless the turbofan exhaust door is open. The turbofan shutoff valve is located in the equipment bay immediately forward of the primary heat exchanger.

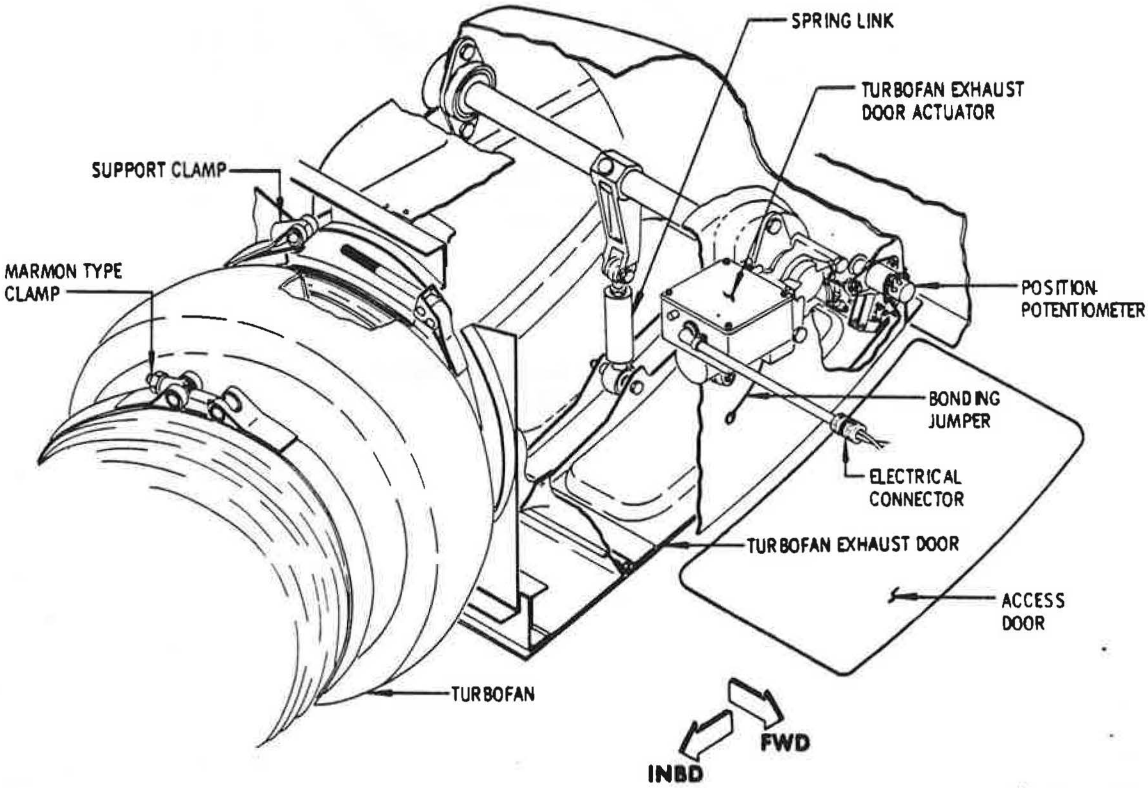


Turbofan Shutoff Valve
Figure 19

17. Turbofan Exhaust Door and Actuator

A. The turbofan exhaust door opens during ground operation of the air conditioning system to provide an exit for the turbofan exhaust air. The door automatically closes on takeoff to prevent motoring of the turbofan during flight. A manual override switch located on the flight engineers upper panel will open the door in flight should the ram air exit door fail to open. The turbofan exhaust door opens inward and is located on the lower fuselage outboard of the turbofan. A potentiometer attached to structure and linked to the forward outboard corner of the door signals the position indicator on the flight engineers panel. Door position is either open or closed.

B. The turbofan exhaust door actuator, (figure 20), is an electro-mechanical rotory actuator whose motor operates from 115-volt, single phase alternating current. A relay in the landing gear safety (squat) switch circuit controls current flow to the actuator. In flight a "TURBO FAN EXIT OVERRIDE" switch on the flight engineers panel provides current directly to the open side of the actuator. The turbofan exhaust door actuator and the turbofan shutoff valve circuitry prevent opening the shutoff valve unless the door actuator has moved to the open position and prevents closing the door until after the shutoff valve has closed. Access to the turbofan exhaust door actuator is by way of the panel on the lower fuselage just forward of the exhaust door.



Turbofan Exhaust Door and Actuator
Figure 20

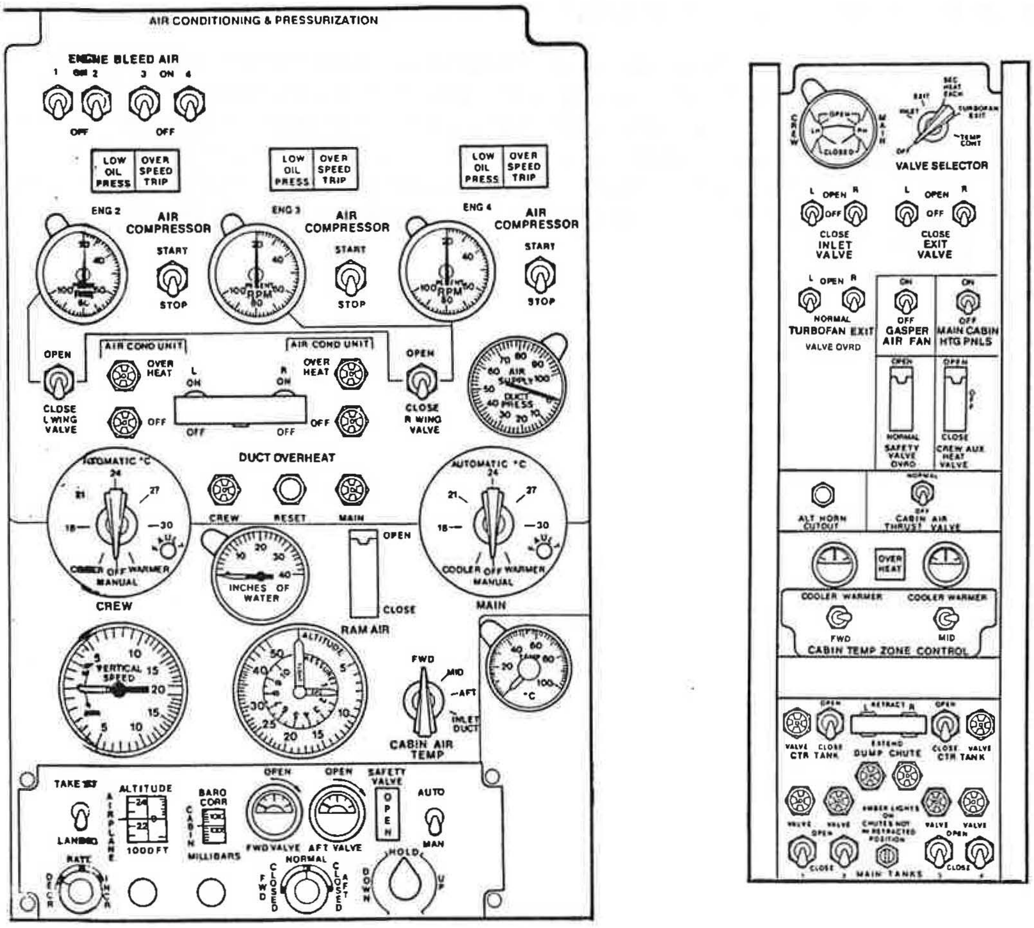
18. Miscellaneous Air Conditioning System Components

A. Air Conditioning Unit Switches

(1) Left and right air conditioning unit switches are on-off switches for operating the packs. Both switches are on the flight engineer's upper instrument panel. The switches operate the air conditioning pack shutoff valves. When the air conditioning unit switches are in the OFF position simultaneously, the crew and main cabin temperature control valves are driven to the full cold position.

B. Ram Air Duct System Switches

(1) The ram air duct system switches are located on the flight engineers upper auxiliary panel. These switches permit regulation of ram air flow past the heat exchangers and provide for a cooling air exit should the ram air exit stick in the closed position during flight. The switches labeled INLET VALVE control the right and left ram air inlet damper actuators. The EXIT VALVE switches



Flight Engineer's Upper Instrument Panel
Figure 21

control the right and left ram air exit damper actuators. These are three-position switches and provide electrical power to move the actuators when the switch is held in the "OPEN" or "CLOSED" position. When moved to "OFF" the actuator stays in the position selected.

(2) The "TURBOFAN EXIT VALVE OVERRIDE" switches can be used to open the turbofan exhaust doors in flight should the ram air exit dampers fail to open. These are two-position switches labeled "NORMAL" and "OPEN." Unless moved to "OPEN," the turbofan exit door will be open on the ground and closed in flight.

C. Individual Air Distribution (Gasper) Air Fan Switch

(1) The individual air distribution for switch labeled "GASPER AIR FAN" turns on a fan in the individual air distribution system. The switch is a two-position, "ON - OFF" switch and is located on the flight engineers upper auxiliary panel.

D. Valve Position Selector and Indicator

(1) A valve position indicator is located on the flight engineer's upper auxiliary panel. By turning the selector knob, the position of the left or right air inlet, air exit, secondary heat exchanger, and turbofan exit doors may be monitored from the control cabin. Position of main and control cabin temperature control valves may also be monitored with the selector moved to the "TEMP CONT VALVE" position.

E. Deleted.

F. Passenger Cabin Heating Blanket Switch

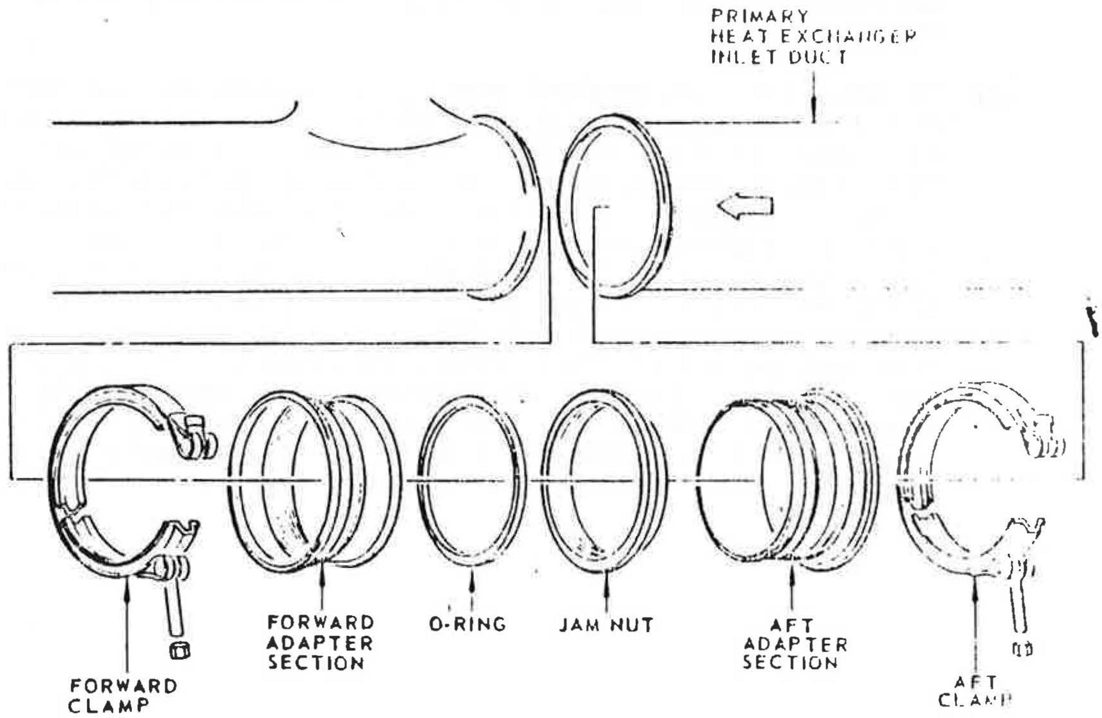
(1) An electric blanket covering the main cargo door is controlled from the flight engineer's upper panel by the passenger cabin heating blanket switch. (See "Passenger Cabin Equipment," Chapter 25.)

G. Air Conditioning Low Pressure Gage

(1) Conditioned air available from the air conditioning system is monitored from the control cabin by the low pressure gage. Air pressure is picked up from the main cabin distribution duct and routed to the low pressure gage on the flight engineer's upper panel. During normal operation gage should read in the green range. Pressure is indicated in inches of water.

H. Duct Adapter Sections

(1) An air conditioning duct adapter section (figure 22) is installed in the primary heat exchanger duct and one just forward of the water separator to adjust for manufacturing tolerances. The adapter consists of two threaded sections, one internal and one external, that are adjusted to the required length and locked in position with a jam nut and sealed with an O-ring.



Air Conditioning Duct Adapter Section
Figure 22

I. Thermal Switches

(1) Six thermal switches, two for each air cycle machine, one for the main cabin air conditioning duct, and one for the control cabin air conditioning duct, operate on 28-volt d-c power from a circuit breaker on the P5 circuit breaker panel.

(2) Each air cycle machine has a compressor discharge overheat sensing thermoswitch which closes at 335 (± 5)°F and a turbine inlet overheat sensing thermoswitch which closes at 270 (± 5)°F. Should an attempt be made to route excess air through the air cycle machine the compressor discharge air may become too hot. At 335°F the compressor discharge thermoswitch will close and the air conditioning unit overheat light will illuminate. When air past the turbine inlet overheat thermoswitch exceeds 270°F the thermoswitch closes completing a circuit through the turbine inlet overheat relay. As a result a circuit is completed to close the pack valve. The air conditioning off light on the flight engineer's panel will illuminate when the pack valve closes. In addition to providing a circuit to the pack valve the turbine inlet overheat relay, when energized, completes a holding circuit to prevent opening the pack valve before the reset switch is pushed. When the reset switch is closed the pack valves will not open until the air has cooled sufficiently for the turbine inlet overheat sensor to open.

(3) The main cabin duct overheat sensing thermoswitch and the control cabin duct overheat sensing thermoswitch prevent the respective ducts from becoming too hot. The main cabin duct sensor and the control cabin duct sensor are set to close at 190 (± 5)°F. When the main cabin duct sensor closes, the main cabin duct overheat relay is energized completing a circuit to the main cabin temperature control valve and driving it to the full cold position. At the same time a holding circuit is completed through the overheat reset relay which prevents moving the valve toward the warm position without first pushing the reset switch. The control cabin sensor provides the same function to the control cabin temperature control valve. A main cabin duct overheat light and a control cabin duct overheat light on the flight engineer's panel illuminate when a duct overheat condition exists.

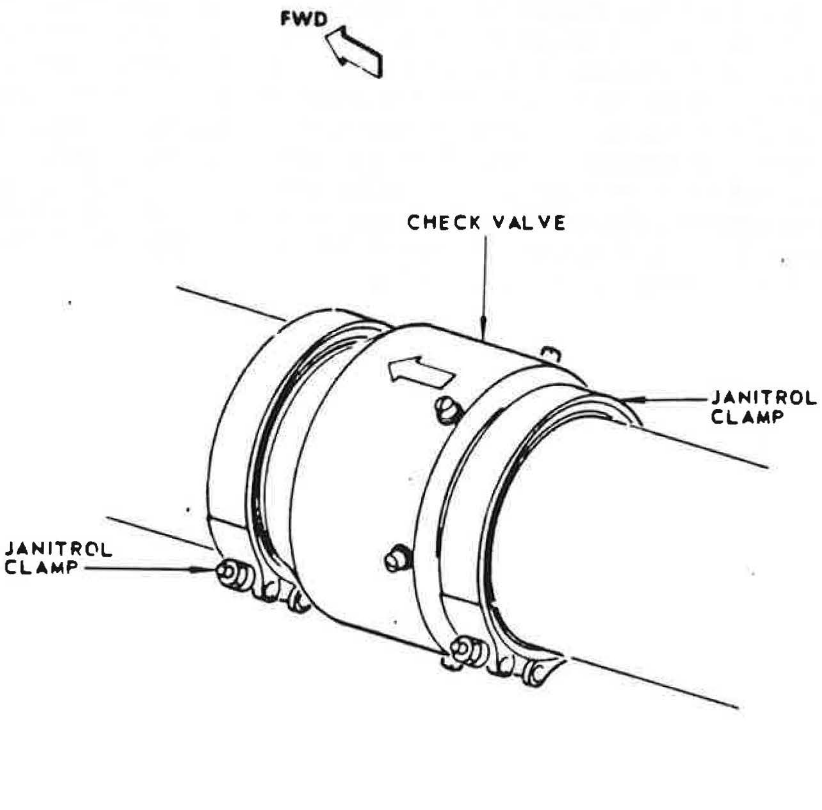
J. Check Valves

(1) The main cabin cold air and semiconditioned air check valves are six inch diameter double hinged flapper valves. They are located in the cold air and the semiconditioned air ducts in the air conditioning distribution bay. (See figure 23.)

(2) The control cabin cold air check valve is a four inch diameter hinged valve located just upstream of the control cabin cold air valve in the air conditioning distribution bay.

K. Duct System Noise Suppressor

(1) An "L" shaped stainless steel duct is welded to the control cabin cold air crossover duct to act as a noise suppressor. The long side of the noise suppressor runs parallel to the crossover duct and is completely blocked off at the free end. The noise suppressor reduces the noise in the control cabin caused by turbulent air flow in the duct systems.



Typical Check Valve
Figure 23

19. Crew Auxiliary Heat Valve

A. The crew auxiliary heat valve is a motor-operated butterfly valve which permits the flow of hot pneumatic air directly to the control cabin. For additional information on crew auxiliary heat valve, refer to 21-42-0, Control Cabin Heating System - Description and Operation.

20. Operation

A. The main cabin temperature control valve operates either electrically or manually. In either case the manual override control moving parts, cables, cranks, and pulleys, are being moved when the temperature control valve changes position. A switch at the manual override control interrupts current to the valve actuator during manual operation and a clutch mechanically disconnects it from the valve. At this time mechanical stops on the manual override control bracket prevent moving the control pulley far enough to cause overtravel of the main cabin temperature control valve. Unless the valve and override control are properly adjusted these stops could prevent normal movement of the valve during electrical operation, possibly causing damage to the valve or manual override components. The secondary heat exchanger damper actuators move the damper either open or closed according to main cabin temperature control valve position. To relate damper position to valve position two switches, actuated by cams on the manual override pulley and control crank assembly, direct power to either the open or closed side of the actuators. Each of the three systems, manual override, main cabin temperature control valve, and secondary heat exchanger damper, not only require proper adjustment within each system but require proper adjustment as a group to assure untroubled operation. For procedure on changing to manual operation from the normal electrical operation see figure 10.

Figure 24 Deleted

AIR CONDITIONING SYSTEM - AIR CYCLE - TROUBLE SHOOTING

1. General

   A. The following trouble shooting charts are based on testing the air conditioning system without air flow.

   B. Prepare for trouble shooting without air flow: provide external electrical power to airplane. Close all air conditioning circuit breakers. Check control knobs for insecurity. Open both wing isolation valves.

      NOTE: Check control cabin control valve linkage adjustment: Run cold air valve to full open position (until limit switch stops it.) Adjust linkage so that hot air valve is fully closed.

2. Air Conditioning System - Air Cycle - Trouble Chart

Prepare for trouble shooting without airflow

INEFFECTUAL TEMPERATURE CONTROL IN CONTROL CABIN

Check linkage adjustment in control cabin temperature control valve. (See note.) IF -

Check control cabin air shutoff valve as shown in AIR DISTRIBUTION "Adjustment/Test"

If fault light on temperature selector dial is illuminated, see control system trouble chart.

Check control cabin temperature sensor as shown in control system trouble chart.

NOT OK - Adjust

OK - Check temperature selector as shown in control system trouble chart. IF -

NOT OK - Proceed with control sytem trouble chart.

OK - Check control cabin temperature control valve action by holding control cabin temperature selector to manual "COOLER" for four minutes, then to "WARMER" position. IF -

CONTROL CABIN TEMPERATURE CONTROL VALVE FAILS TO MOVE IN EXPECTED DIRECTION - Check power at motor plugs. IF -

CONTROL CABIN TEMPERATURE CONTROL VALVE DOES MOVE IN EXPECTED DIRECTION (As seen on position indicators) - Check automatic temperature control by selecting temperature above or below cabin temperatures. IF -

VALVE DOES NOT MOVE IN EXPECTED DIRECTION - Check power to control cabin temperature control valve. IF -

VALVE MOVES IN EXPECTED DIRECTION - Check control cabin flow controller as in Air Distribution "Adjustment/Test". IF -

POWER AVAILABLE Disconnect actuator from valve. Apply electrical power. IF -

POWER NOT AVAILABLE - Check continuity to control cabin temperature selector. IF -

FLOW CONTROLLER OK - Proceed with Air Distribution Adjustment/Test for duct relief valve and duct integrity.

ACTUATOR RUNS - Replace control cabin temperature control valve.

ACTUATOR DOES NOT RUN - Replace actuator (and motor).

OK - See control system trouble chart for checking power to temperature regulator, if necessary, power source, regulator.

NOT OK - Repair wiring.

Prepare for trouble shooting without airflow.

INEFFECTUAL TEMPERATURE CONTROL IN MAIN CABIN

Check power to main cabin temperature control valve motor plug while holding both selectors to manual "COOLER" for four minutes, then to manual "WARMER". IF -

See control system trouble chart for checking main cabin temperature sensors with wiring.

POWER AVAILABLE AND MOTOR DOES NOT RUN - Remove actuator with motor. Apply electrical power to motor. IF -

NO POWER - Check continuity to selector, then to regulator. IF -

POWER AVAILABLE, MOTOR RUNS, CONTROL VALVE DOES MOVE IN EXPECTED DIRECTION (As seen on position indicators) Check automatic temperatures above or below cabin temperatures. IF -

VALVE DOES NOT MOVE IN EXPECTED DIRECTION - Check main cabin temperature selector as shown in control system trouble chart.

MOTOR DOES NOT RUN - Replace actuator (and motor).

OK - Replace gang valve.

NOT OK - Repair wiring.

OK - See control system trouble chart for checking selector, regulator, power sources.

Prepare for trouble shooting without air flow

INSUFFICIENT COOLING IN EITHER OR BOTH CABINS

Check control cabin control valve linkage adjustment; control cabin air shutoff valve; selector dial fault light; both cabin temperature sensors - as for trouble "INEFFECTUAL TEMPERATURE CONTROL".

Detach turbofan clamps, spin fan, (left and right). If turbofan defective - Replace it.

Hold both selectors to manual "COOLER" for four minutes. Observe control cabin temperature control valve position indicators. IF -

Remove water separator, spin air cycle machine turbine, (left and right). If air cycle machine defective - replace it.

CONTROL CABIN COLD AIR VALVE OPEN, HOT AIR VALVE CLOSED - Observe main cabin temperature control valve position indicators. IF -

CONTROL CABIN COLD AIR VALVE NOT OPEN, OR HOT AIR VALVE NOT CLOSED - Check power to control cabin temperature control valve motor. IF -

NO POWER - Check continuity from valve to temperature regulator. IF -

OK - Disconnect actuator from valve and apply power. IF -

NOT OK - Repair wiring.

OK - Check control system.

MAIN CABIN HOT AIR VALVE CLOSED, TURBO-COMPRESSOR BACK PRESSURE VALVE OPEN, COLD AIR VALVES OPEN - Check control system.

TURBOCOMPRESSOR BACK PRESSURE VALVE NOT OPEN OR HOT AIR VALVE NOT CLOSED OR ONE COLD AIR VALVE NOT OPEN - Check power to main cabin temperature control valve. IF -

ACTUATOR RUNS - Replace control cabin temperature control valve.

ACTUATOR DOES NOT RUN - Replace actuator (and motor).

OK - Disconnect actuator from valve. Apply power. IF -

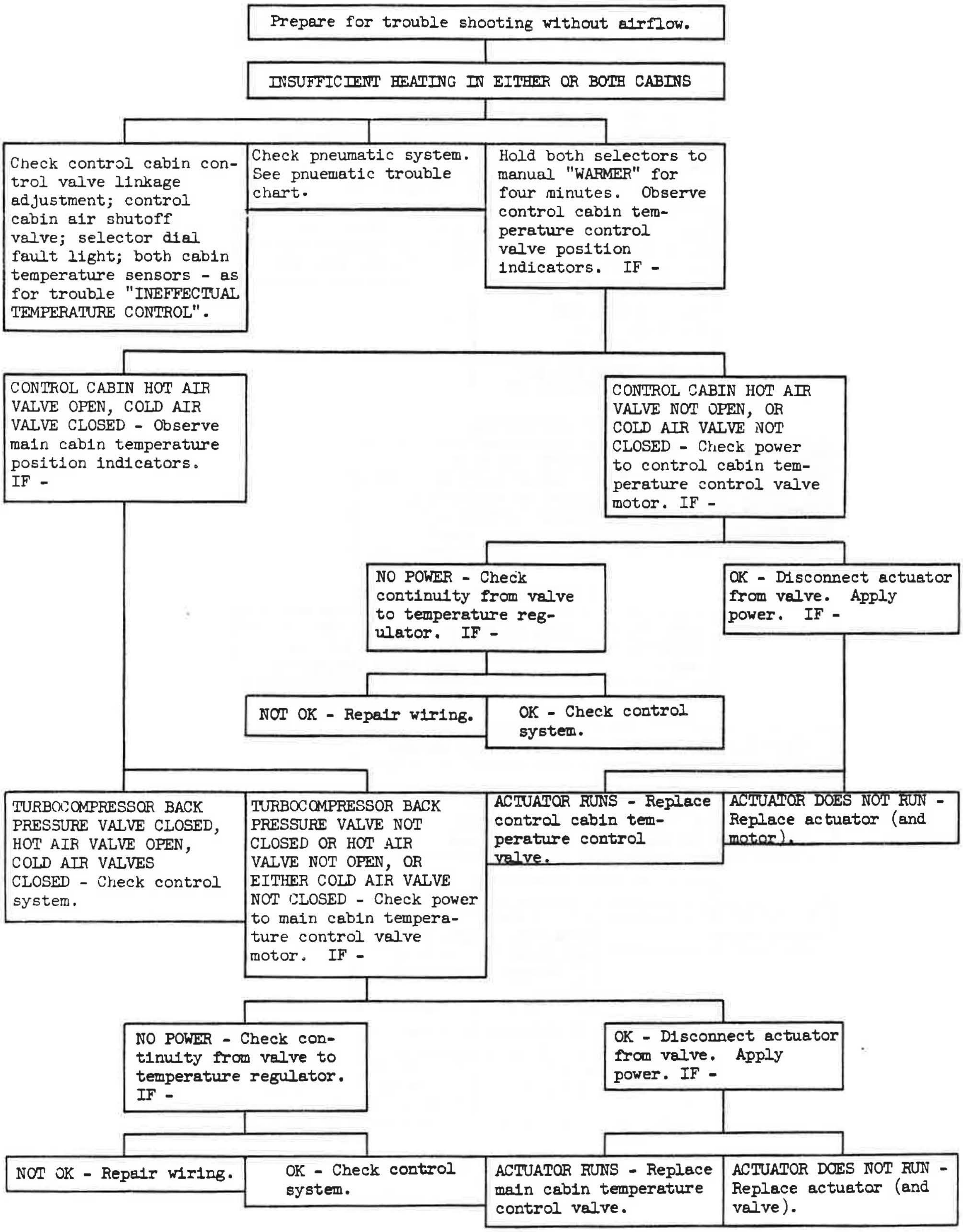
NO POWER - Check continuity from valve to temperature regulator. IF -

ACTUATOR RUNS - Replace main cabin temperature control valve.

ACTUATOR DOES NOT RUN - Replace actuator.

NOT OK - Repair wiring.

OK - Check control system.


Prepare for trouble shooting without airflow.
INSUFFICIENT HEATING IN EITHER OR BOTH CABINS
Check control cabin control valve linkage adjustment; control cabin air shutoff valve; selector dial fault light; both cabin temperature sensors - as for trouble "INEFFECTUAL TEMPERATURE CONTROL".
Check pneumatic system. See pnuematic trouble chart.
Hold both selectors to manual "WARMER" for four minutes. Observe control cabin temperature control valve position indicators. IF -
CONTROL CABIN HOT AIR VALVE OPEN, COLD AIR VALVE CLOSED - Observe main cabin temperature position indicators. IF -
CONTROL CABIN HOT AIR VALVE NOT OPEN, OR COLD AIR VALVE NOT CLOSED - Check power to control cabin temperature control valve motor. IF -
NO POWER - Check continuity from valve to temperature regulator. IF -
OK - Disconnect actuator from valve. Apply power. IF -
NOT OK - Repair wiring.
OK - Check control system.
TURBOCOMPRESSOR BACK PRESSURE VALVE CLOSED, HOT AIR VALVE OPEN, COLD AIR VALVES CLOSED - Check control system.
TURBOCOMPRESSOR BACK PRESSURE VALVE NOT CLOSED OR HOT AIR VALVE NOT OPEN, OR EITHER COLD AIR VALVE NOT CLOSED - Check power to main cabin temperature control valve motor. IF -
ACTUATOR RUNS - Replace control cabin temperature control valve.
ACTUATOR DOES NOT RUN - Replace actuator (and motor).
NO POWER - Check continuity from valve to temperature regulator. IF -
OK - Disconnect actuator from valve. Apply power. IF -
NOT OK - Repair wiring.
OK - Check control system.
ACTUATOR RUNS - Replace main cabin temperature control valve.
ACTUATOR DOES NOT RUN - Replace actuator (and valve).

EXCESSIVE FOG OR MOISTURE IN MAIN CABIN

This condition may not be reproduceable on the ground. On the basis of the flight report, check separator screen and bag for obstruction or defects. IF -

OK - Check poppet valve by hooking a piece of stiff wire through the drilled hole in end of valve shaft, and pulling. IF -

CAUTION

DO NOT PRESS AGAINST ANTI-ICING THERMOSTAT

NOT OK - Remove obstructions or replace screen with bag if necessary

VALVE OPERATES FREELY WITH LESS THAN 35 POUND ON SHAFT, OR IF VALVE CANNOT BE MOVED - Replace poppet valve.

POPPET VALVE OK - Check anti-icing control valve by applying 10 inches mercury air pressure to control valve sensing port. IF -

ANTI-ICING CONTROL VALVE DOES NOT OPEN - Replace valve.

ANTI-ICING CONTROL VALVE DOES OPEN - Replace anti-icing thermostat

EXCESSIVE NOISE FROM AIR CONDITIONING SYSTEM

Check left and right water separator poppet valve for depressions or other signs of clatter on valve body or valve seat. IF -

DEFECTS FOUND - Replace poppet valve.

OK - Remove water separator. Spin air cycle machine turbine (left and right side). IF -

AIR CYCLE MACHINE DEFECTIVE - Replace it.

OK - Check for foreign matter in distribution ducts or ports.

END

AIR CONDITIONING SYSTEM - MAINTENANCE PRACTICES

EFFECTIVITY
TURBOFAN

1. Adjustment/Test Main Cabin Temperature Control Valve and Manual Override

A. General

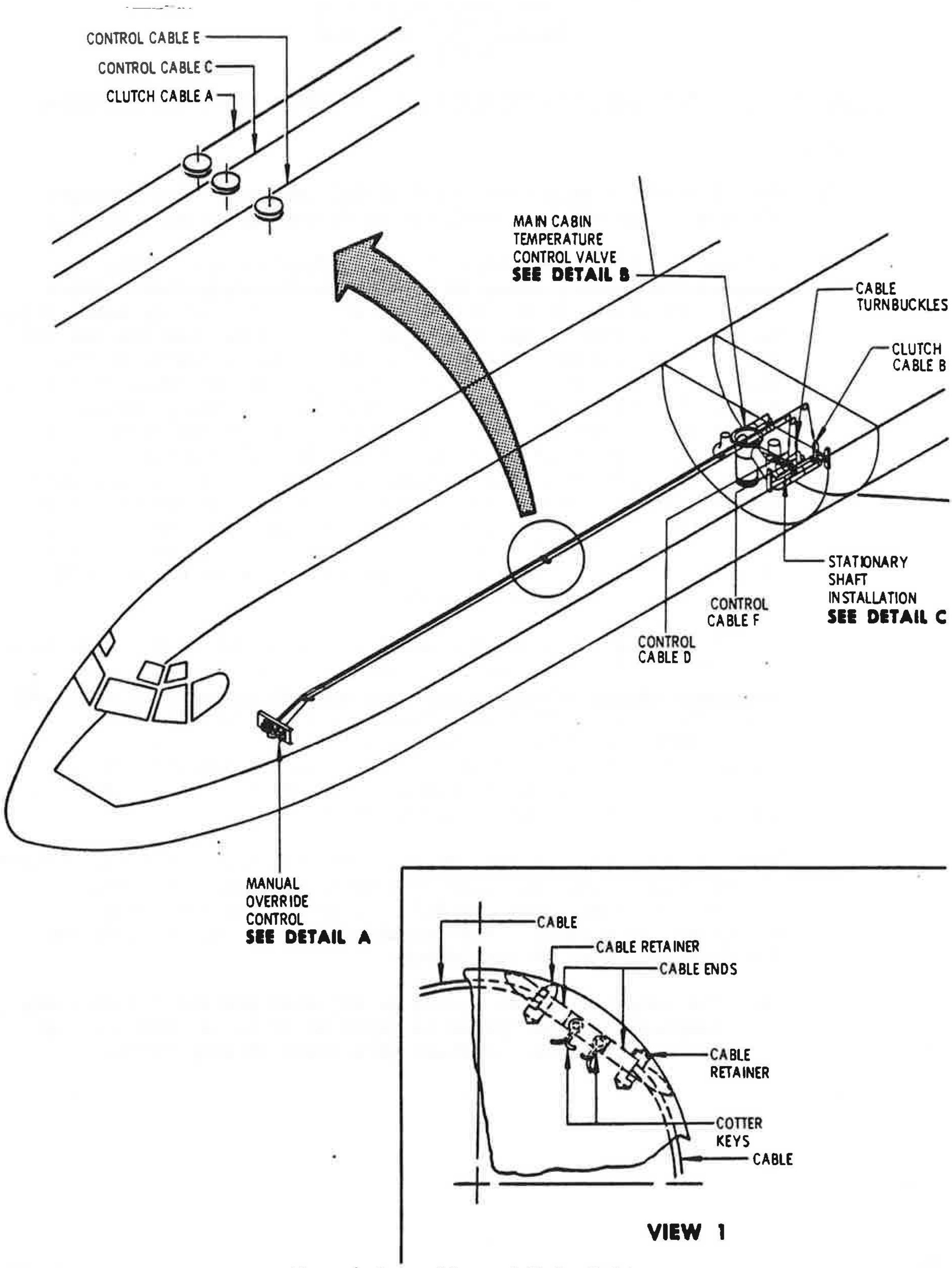
(1) Manual override adjustment is included here since its improper adjustment can affect normal air conditioning system operation.

(2) A cable and push rod system extending from the main cabin temperature control valve in the air conditioning distribution bay to the manual override control beneath the control cabin floor makes it possible to manually operate the valve from the control cabin. During normal operation an electrical actuator on the valve positions the valve. Limit switches in the actuator prevent moving the valve butterfly beyond its limit. During manual operation this protection is obtained by mechanical stops on the manual override control pulley. Since the cable system moves during both electrical and mechanical operation it is mandatory that the two systems be compatible. If the cable system reaches its mechanical stops before the limit switch stops the actuator, the motor will continue in its effort to drive the valve and may be damaged or may damage some component in the manual override system which it is driving against.

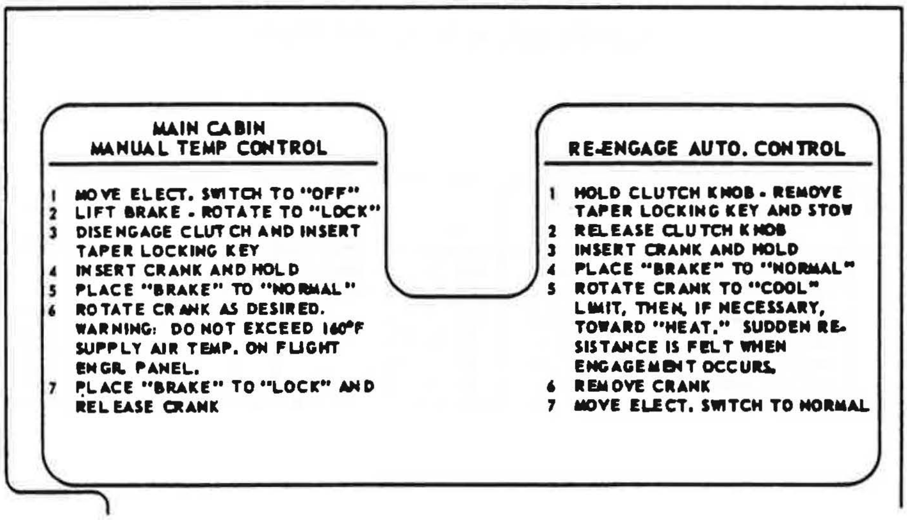
(3) Another system necessarily related to the control valve functions as a result of manual override movement. The secondary heat exchanger damper actuators move the dampers either open or closed according to main cabin temperature control valve position. To relate damper position to valve position two switches, one for the damper on each air conditioning pack, are actuated by cams on the manual override pulley and crank assembly to direct power to the open or closed side of the actuators.

(4) Each of the three systems, manual override, main cabin temperature control valve, and secondary heat exchanger damper not only require proper adjustment within the system but also proper adjustment as a group. When working on either of these systems the following must be considered.

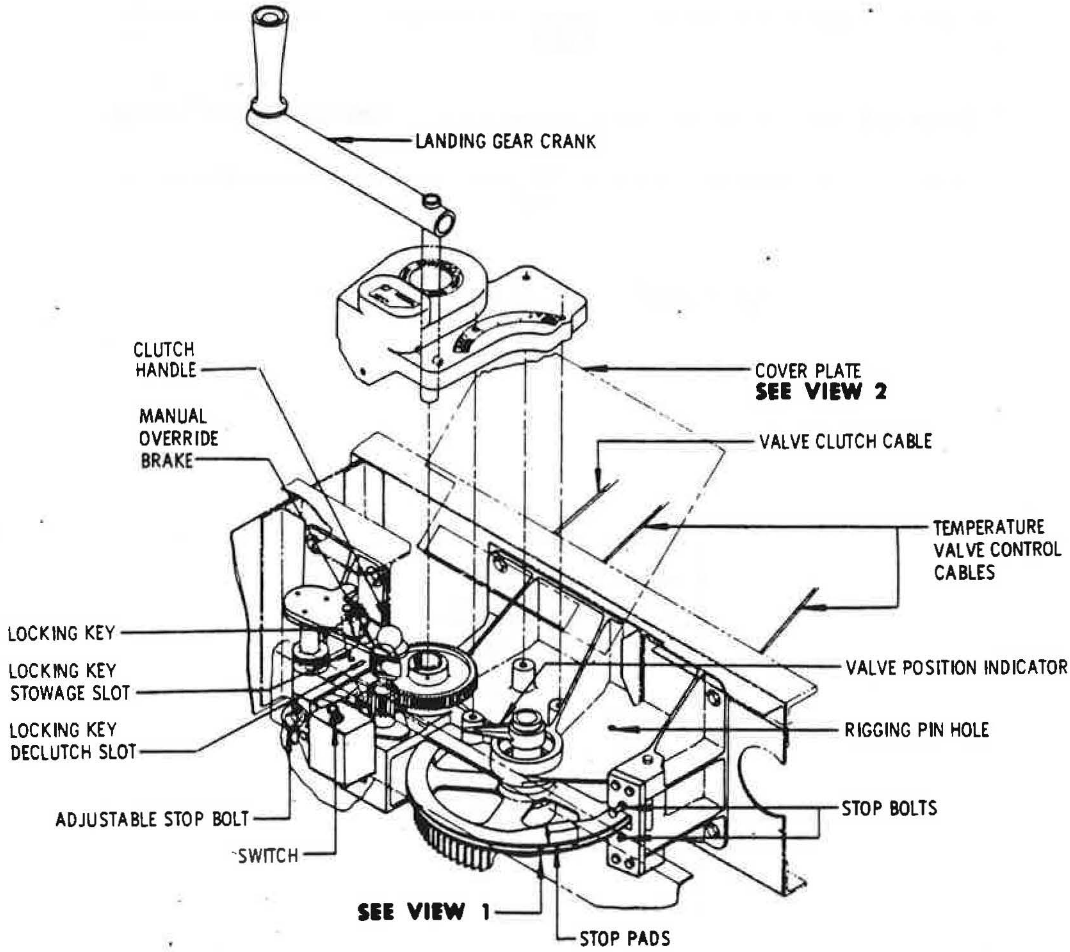
(a) The manual override should be adjusted and checked when any component of the system is replaced if it is necessary to disconnect cables or alter adjustment of stop bolts.



Manual Override and Main Cabin
Temperature Control Valve Adjustment
Figure 201 (Sheet 1 of 5)



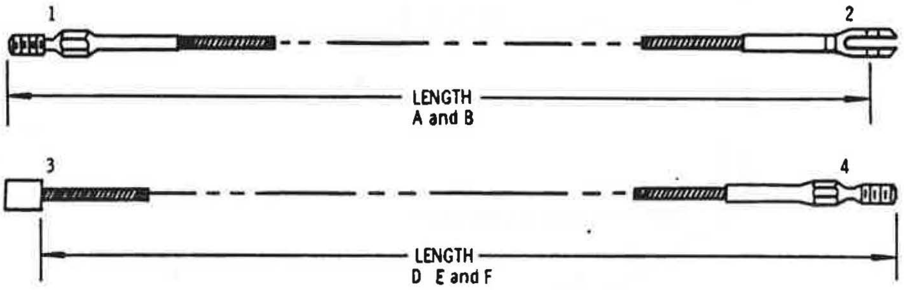
VIEW 2



DETAIL A

Manual Override and Main Cabin
Temperature Control Valve Adjustment
Figure 201 (Sheet 2 of 5)

CABLE REF	DRAWING NO.	NO. REQ.	LENGTH IN.	CABLE SIZE	FITTINGS			
					1	2	3	4
A	NAS303-28-4605	1	460.63	3/32 7 X 7	AN669L3RH	AN667-3		
B	NAS303-25-191	1	19.13	3/32 7 X 7	AN669L3LH	AN667-3		
C	BAC-C13G-468-583	1	458.3	1/8 7 X 19			BAC-T14 -4	AN669L4RH
D	BAC-C13G-469-182	1	18.2	1/8 7 X 19			BAC-T14 -4	AN669L4LH
E	BAC-C13G-468-577	1	457.7	1/8 7 X 19			BAC-T14 -4	AN669L4RH
F	BAC-C13G-469-182	1	18.2	1/8 7 X 19			BAC-T14 -4	AN669L4LH

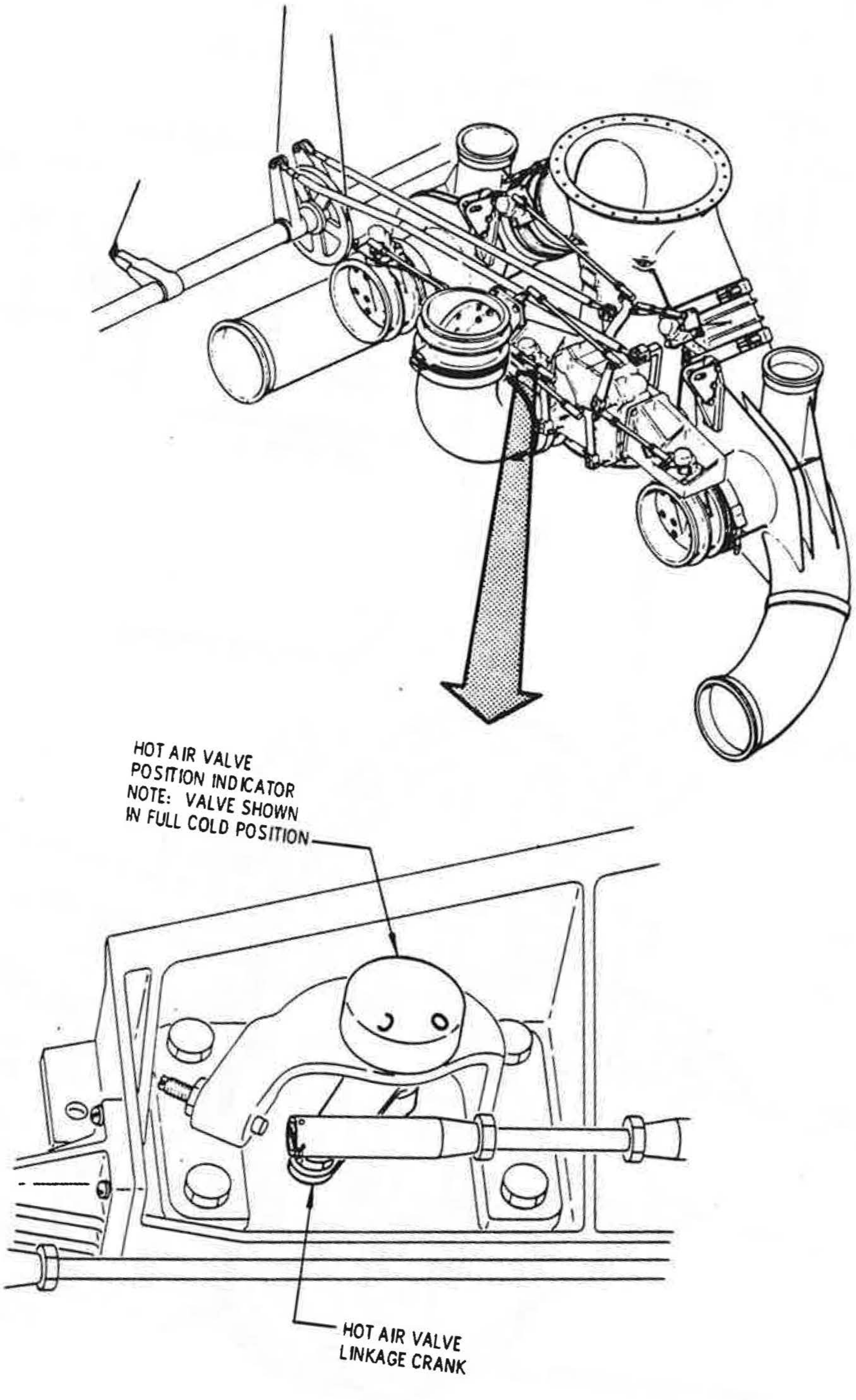


MANUAL OVERRIDE CABLE DESCRIPTION

TEMPERATURE	RIGGING LOAD 5 POUNDS
100 F	101.4
90 F	92.4
80 F	83.7
70 F	75.0
60 F	66.3
50 F	57.6
40 F	49.0
30 F	40.4
20 F	32.7
10 F	23.1
0 F	14.4

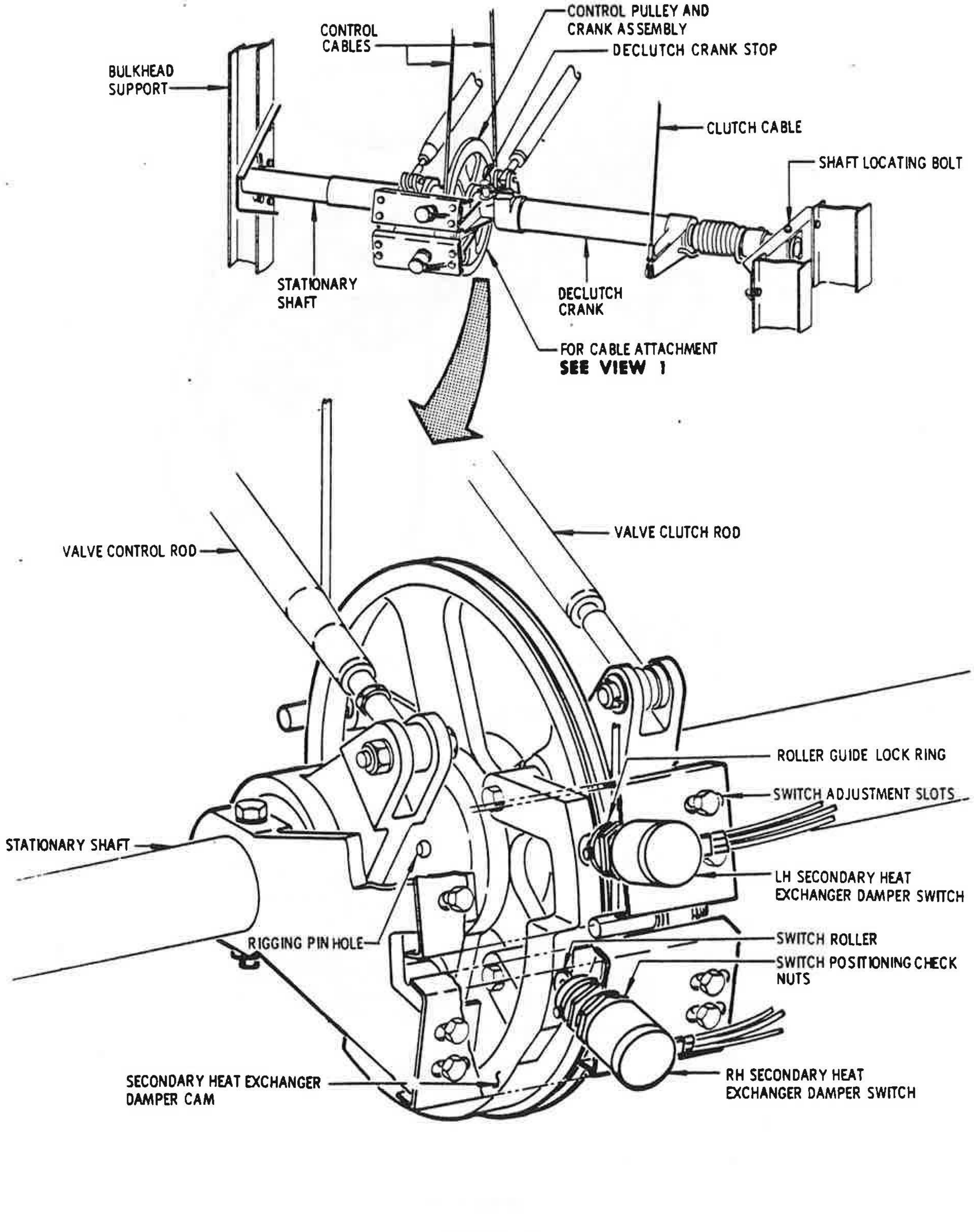
MANUAL OVERRIDE CONTROL CABLE TENSION

Manual Override and Main Cabin
Temperature Control Valve Adjustment
Figure 201 (Sheet 3 of 5)



DETAIL B

Manual Override and Main Cabin
Temperature Control Valve Adjustment
Figure 201 (Sheet 4 of 5)



DETAIL C

Manual Override and Main Cabin
Temperature Control Valve Adjustment
Figure 201 (Sheet 5 of 5)

(b) When maintenance requires disconnecting the manual override from the valve but does not alter the manual override otherwise it is only necessary to adjust control and clutch rods.

(c) A properly adjusted control valve clutch is required before the manual override control can be adjusted.

(d) Installation of secondary heat exchanger damper switches must be accomplished when the main cabin temperature control valve is in the proper related position.

B. Equipment and Materials

(1) Spring scale, 20 pound capacity

(2) Rigging pin, MS20392-4-85 or equivalent

(3) Rigging pin, MS20392-3-67 or equivalent

(4) Tensiometer, 0 to 110 pound capacity

C. Prepare to Adjust Manual Override

(1) Remove aft bulkhead of forward cargo compartment.

(2) Disconnect control and clutch rods from main cabin temperature control valve at manual override control and clutch cranks.

(3) Gain access to manual override controls through access door under navigators station in control cabin floor.

D. Adjust Control Valve Clutch (See figure 201.)

(1) Move clutch handle to the full normal position.

(2) Adjust clutch cable tension. Cable should be adjusted at turnbuckle so a force of 5-1/2 (± 1/2) pounds applied at the crank clutch rod hole and perpendicular to the crank arm will just move crank from its stop.

(3) Lockwire turnbuckle.

(4) Engage and disengage clutch from control cabin to determine that pulleys rotate freely.

(5) With spring scale attached to clutch handle knob exert forward force until the clutch handle moves from its stop. Force required should be 11-1/2 (± 2-1/2) pounds.

(6) Check that clutch handle returns to full normal position if released from the disengaged position.

(7) With clutch handle in the fully normal position adjust valve clutch rod so attaching bolt slips freely through rod end and crank. Install bolt, tighten check nuts, and lockwire.

(8) Move clutch handle to fully disengaged position.

NOTE: A sudden increase in resistance to movement will mark fully disengaged position.

(9) With clutch handle in fully disengaged position screw the clutch stop bolt until it contacts the crank. Back bolt off two turns, tighten check nut, and lockwire bolt and nut.

(10) Check that when locking key is in clutch disengaged slots clutch is disengaged and that the stop bolt on the clutch handle retains the key in the stowage slots when clutch is in the normal position.

E. Adjust Control Valve Manual Override Control

NOTE: Control valve clutch should be rigged prior to adjusting override control.

(1) Check that brake knob is in the "NORMAL" position.

(2) Turn the control pulley until the MS20392-4-85 rigging pin may be inserted through bracket and pulley and insert pin.

(3) Rotate pulley and crank assembly on stationary shaft until rigging pin holes line up and insert MS20392-3-67 rigging pin.

(4) Connect control cables to control pulley and to pulley and crank assembly. Connect cables and tighten to tabulated values. (See figure 201.) Balance load on turnbuckles so MS20392-3-67 rigging pin remains free in the rigging pin holes.

(5) Remove rigging pins and cycle system to assure freedom of pulley and cable movement.

(6) Measure force required to move the control crank in both directions. Force must be measured perpendicular to the control crank at the control rod hole. Maximum force allowable is 8 pounds either direction.

(7) Insert MS20392-3-67 rigging pin in stationary shaft.

(8) Electrically operate the main cabin temperature control valve to the full cold position.

NOTE: Full cold position is when the hot air valve is closed. Valve position may be observed by noting the position of the hot air valve linkage crank with respect to the markings on the crank housing. (See detail B, figure 201.)

(9) Adjust control rod length until the mounting bolts fit freely in their holes. Install mounting bolts, check nuts, and lockwire.

(10) Remove rigging pin from stationary shaft.

(11) Electrically operate valve between full cooling and full heating to assure that system is operating freely.

CAUTION: ASSURE THAT STOP PADS ON CONTROL PULLEY DO NOT CONTACT STOP BOLTS DURING ELECTRICAL OPERATION.

(12) Return system to full cool position.

(13) Adjust upper stop bolt to provide clearance of 1.12 (± 0.03) inches between head of bolt and pulley stop pad. Tighten check nut and lockwire check nut and bolt.

(14) Check position of indicator with position decal on manual override cover. If indicator does not align with cold mark on decal remove indicator lock ring and indicator and reinstall by indexing to the nearest aligning serration.

(15) Electrically move main cabin temperature control valve to the full hot position.

(16) Position lower stop bolt to obtain clearance of 1.12 (± 0.03) inches between head of bolt and stop pad on pulley. Tighten check nut and lockwire check nut and stop bolt.

(17) Check manual operation of the control valve. (See manual override operating instructions, figure 201.)

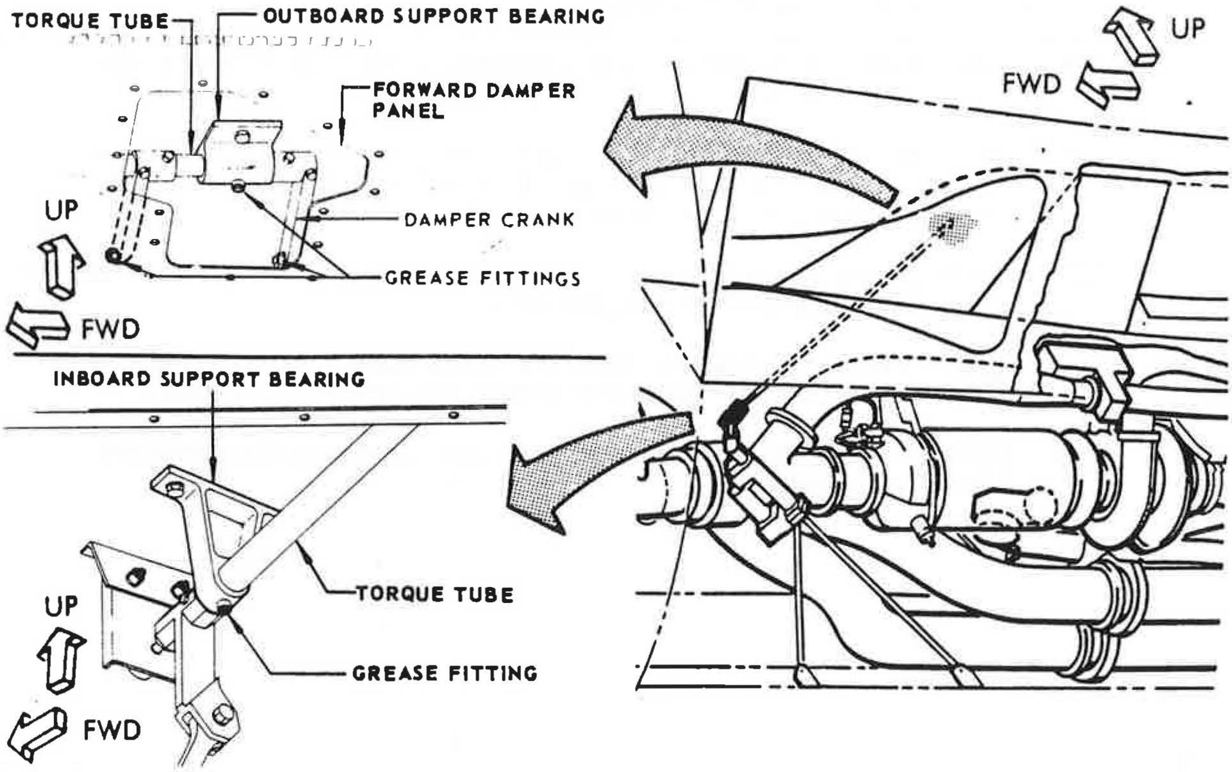
NOTE: Force required to turn the crank during manual override operation of the valve should not exceed 20 pounds.

(18) Return system to automatic control per operating instructions. (See figure 201.)

2. Unit Servicing Ram Air Inlet Damper

A. Lubricate Ram Air Inlet Damper Torque Tube Support Bearings (See figure 202.)

INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1	Torque tube outboard support bearing and damper cranks.	a. Remove access panel in forward damper panel. b. Apply grease, MIL-G-23827, to flush fitting. c. Install access panel in forward damper panel.
2	Torque tube inboard support bearing	a. Open air conditioning equipment bay access door. b. Apply grease, MIL-G-23827, to flush fittings. c. Close air conditioning equipment bay access door.



Ram Air Inlet Damper System Lubrication
Figure 202

3. Air Conditioning System Operational Check - Air Cycle

A. General

(1) The following procedure presumes testing of the air conditioning system without simultaneous pressurization of the airplane.

B. Prepare to Test Air Conditioning System

(1) Check that the cabin air conditioning ram air plugs are removed prior to testing.

(2) Provide external electrical power to airplane.

(3) Check that the following circuit breakers are closed:

On A-C Bus No. 1 circuit breaker panel (P1): OUTBOARD WING ANTI-ICE VALVES.

On A-C Bus No. 2 circuit breaker panel (P2): INBOARD WING ANTI-ICE VALVES.

On A-C Bus No. 4 circuit breaker panel (P4): AIR CONDITIONING AUTO PACK CONTROL, MANUAL PACK CONTROL, PACK VALVES, CABIN RAM AIR AND WING VALVES, LEFT and RIGHT TURBOFAN DOORS AND SHUTOFF VALVES, LEFT and RIGHT RAM AIR AND HEAT EXCHANGER DAMPERS.

On Radio and T-R circuit breaker panel (P5): SAFETY AND OIL COOLER RELAYS, TURBOCOMPRESSOR VALVE AND LIGHTS, AIR FLOW INDICATOR AND THRUST VALVE, AIR CONDITIONING OVERHEAT CONTROL, HORN AND ALTIMETER WARNING CUTOUT, A/C VALVE AND DAMPER POSITION INDICATOR.

On Essential 28 volt circuit breaker panel (P6): START AND IGNITION PRESS SELECTOR.

On 28 volt A-C circuit breaker panel (P7): ANTI-ICING DUCT, CABIN AND RAM AIR TEMPERATURE INDICATORS.

(4) Check that the ram air inlet damper and turbofan exhaust door are in the open position and that ram air exhaust damper is in the closed position. (These are their normal positions when the aircraft is on the ground.)

(5) Check that position of the ram air inlet damper, turbofan exhaust door, and ram air exhaust damper matches position shown by the valve and damper position indicator on the flight engineer's panel.

(6) Close ram air shutoff valve. (Check position indicator on valve. Normally closed.)

(7) Close all doors, windows and hatches.

(8) Open left and right wing isolation valves, left and right pack shutoff valves by operating valve switches to "OPEN."

C. Test Manual Temperature Controls

(1) Hold main cabin manual temperature selector to "WARMER" for four minutes.

(2) Check that the valve and damper position indicator shows the main cabin temperature control valve to be full open.

(3) Move valve selector to "SEC HEAT EXCH" and check that position indicator reads full closed.

(4) Hold main cabin manual temperature selector to "COOLER" for four minutes.

(5) Check that the valve and damper position indicator shows the main cabin temperature control valve to be full open.

(6) Move valve selector to "SEC HEAT EXCH" and check that position indicator reads full open.

(7) Repeat steps (1) and (2), and steps (4) and (5) for the control cabin manual control.

D. Test Automatic Temperature Controllers if Ambient Temperature is 75°F (24°C) or Below

<u>CAUTION</u>: CHECK THAT THE TURBOCOMPRESSIR RAM AIR PLUGS ARE REMOVED PRIOR TO ENGINE START.

(1) Run a minimum of two turbocompressors with associated engines (No. 2 and 4 would assure minimum nuisance from jet blast).

(2) Operate left air conditioning unit switch to "ON." Leave right air conditioning unit switch "OFF."

NOTE: Remove gang bar on switches.

(3) Turn main cabin temperature selector to 10°F (5°C) above initial cabin temperature, or to 70°F (21°C) if initial cabin temperature is below 60°F (16°C). Wait four minutes. Check that the main cabin temperature control valve indicator on the flight engineer's panel moves toward "OPEN."

(4) If cabin temperature reached 70°F (21°C) or higher, turn main cabin selector to 65°F (18°C). Check that the main cabin temperature control valve indicator on flight engineer's panel moves toward "CLOSED."

(5) Repeat (3) and (4) with left air conditioning unit switch "OFF," right air conditioning unit switch "ON."

(6) Repeat steps (2) to (5) for crew cabin automatic temperature controller.

NOTE: At end of check replace gang bar on switches.

E. Test Automatic Temperature Controllers if Ambient Temperature is Above 75°F (24°C).

(1) Run engines No. 2 and 4 at maximum 90% RPM or connect ground cart capable of supplying 120 pounds per minute at 40 psig.

(2) Turn left air conditioning unit switch to "ON." Leave right air conditioning unit switch "OFF."

NOTE: Remove gang bar on switches.

(3) Turn main cabin temperature selector to 10°F (5°C) below initial cabin temperature, or to 80°F (27°C) if initial cabin temperature is above 90°F (32°C). Wait four minutes. Check that the main cabin temperature control valve position indicator on the flight engineer's panel moves toward "CLOSED." Operate air temperature switch to "DUCT" and check gage for change in inlet duct temperature also.

(4) If cabin temperature reached 80°F (27°C) or less, turn main cabin selector to 85°F (30°C). Check that the main cabin temperature control valve position indicator on flight engineer's panel moves toward "OPEN."

(5) Repeat (3) and (4) with left air conditioning unit switch "OFF," right air conditioning unit switch "ON."

(6) Repeat steps (2) to (5) for control cabin automatic temperature controller.

F. Test Anti-Icing Control Valve (Water Separator)

(1) Run engines No. 2 and 4 at maximum 90% RPM or connect a ground cart capable of supplying 120 pounds per minute at 40 psig.

(2) Turn both air conditioning unit switches to "ON."

(3) Turn both temperature selectors to "COOLER." If control valve position indicator does not move (after control unit has been warmed up), detach control line to anti-icing thermostat and apply 10 inches mercury (4.9 psig) air pressure to control valve sensing port. Check that valve opens.

G. Test Air Conditioning Ducts for Leakage (optional)

(1) Drain water separators and plug drain holes.

(2) Detach sensing lines from anti-icing thermostats to primary heat exchanger outlet ducts and plug holes.

(3) Close both turbofan shutoff valves:

(a) Open "WATER DRAIN MAST HEATER" circuit breaker on panel (P1).

(b) Open the "SAFETY & OIL COOLER RELAYS" circuit breaker on panel (P5).

CAUTION: FAILURE TO OPEN WATER DRAIN MAST HEATER CIRCUIT BREAKER PRIOR TO OPENING SAFETY AND OIL COOLER RELAYS CIRCUIT BREAKER CAN CAUSE OVERHEAT DAMAGE TO HEATER.

(4) Connect ground cart capable of supplying 120 pounds per minute at 40 psig to pneumatic ground air service connection.

(5) Turn cabin pressure control to right and hold until 2 psi pressure differential is reached.

(6) Determine by feel that there are no concentrated leakage points in the air conditioning ducts.

WARNING: DO NOT APPROACH TURBOFAN OUTLETS LEFT AND RIGHT SIDE, BETWEEN WING LOWER SURFACE AND AIR CONDITIONING ACCESS DOOR, JUST FORWARD OF STA. 820.

PRIMARY HEAT EXCHANGER - MAINTENANCE PRACTICES

EFFECTIVITY

TURBOFAN

1. Removal/Installation Primary Heat Exchanger

A. Remove Primary Heat Exchanger

(1) Open air conditioning equipment bay door.

(2) Disconnect wire bundle clamps from primary heat exchanger inlet and outlet ducts.

(3) Disconnect electrical connector from turbofan shutoff valve.

(4) Remove clamp on the upstream side of the turbofan shutoff valve.

(5) Remove heat exchanger inlet and outlet ducts by removing clamps adjacent to heat exchanger and those at next forward joints.

(6) Support heat exchanger.

(7) Remove fairing access panel by removing 25 bolts. Reach into opening, remove bolts fastening heat exchanger to structure. (See figure 201.)

(8) Remove ram air exhaust duct access panel by removing 16 bolts. Reach into opening, remove bolts connecting heat exchanger to exhaust duct. (See figure 201.)

(9) Remove turbofan. (See 21-2-191.)

(10) Remove bolt from turbofan pneumatic duct hanger and remove pneumatic duct and shut off valve.

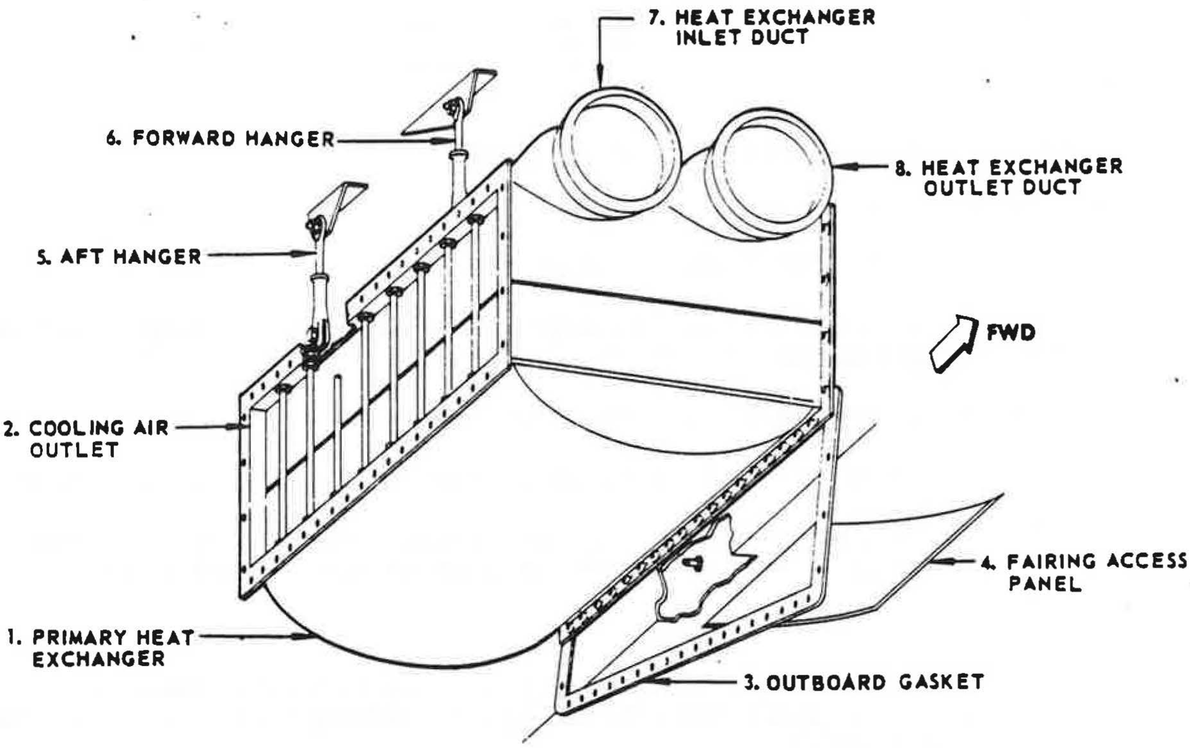
(11) Support cooling air exhaust duct.

(12) Remove ram air exit damper.

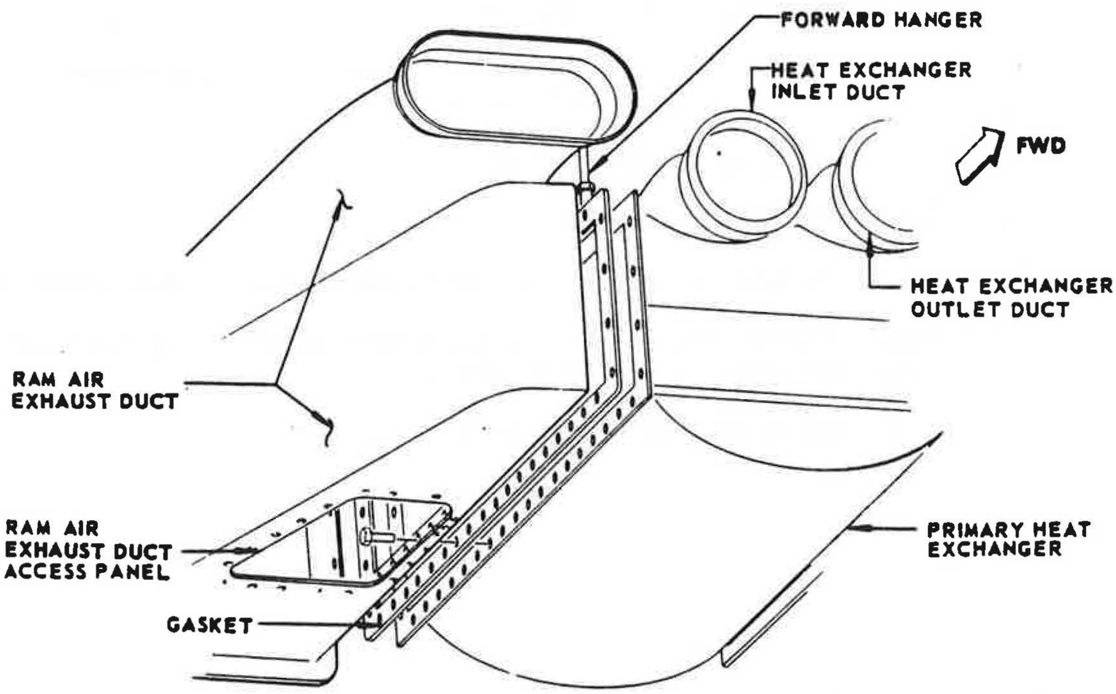
(13) Remove forward part of cooling air exhaust duct. (See figure 202.)

(14) Remove forward and aft hanger above heat exchanger by removing one bolt from each. (See figure 201.)

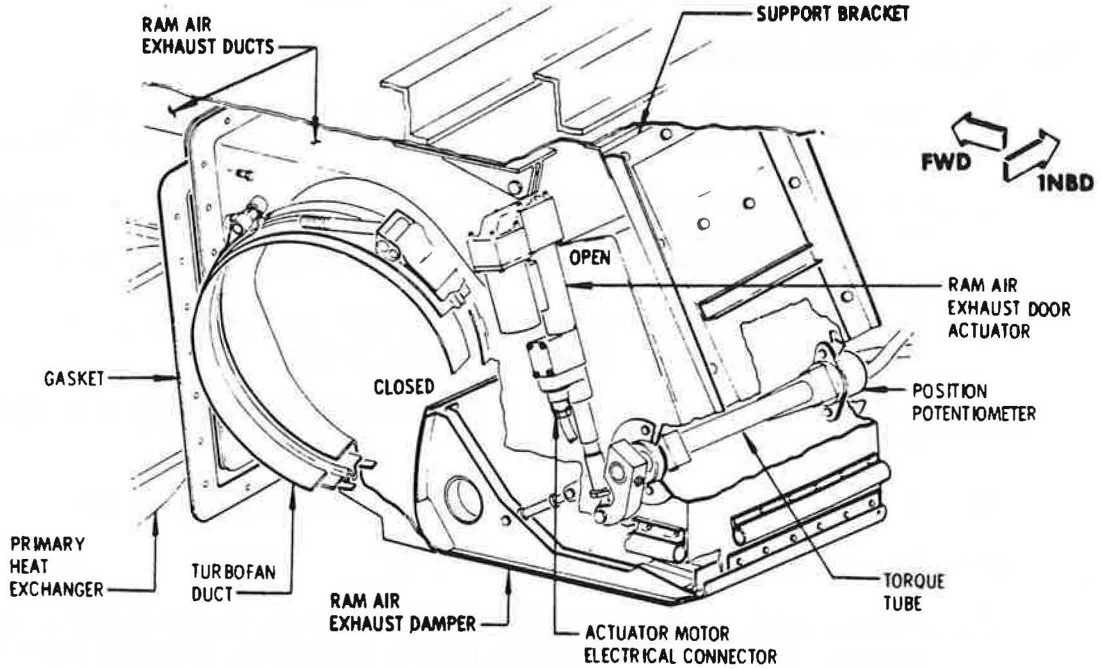
(15) Lower and remove heat exchanger.



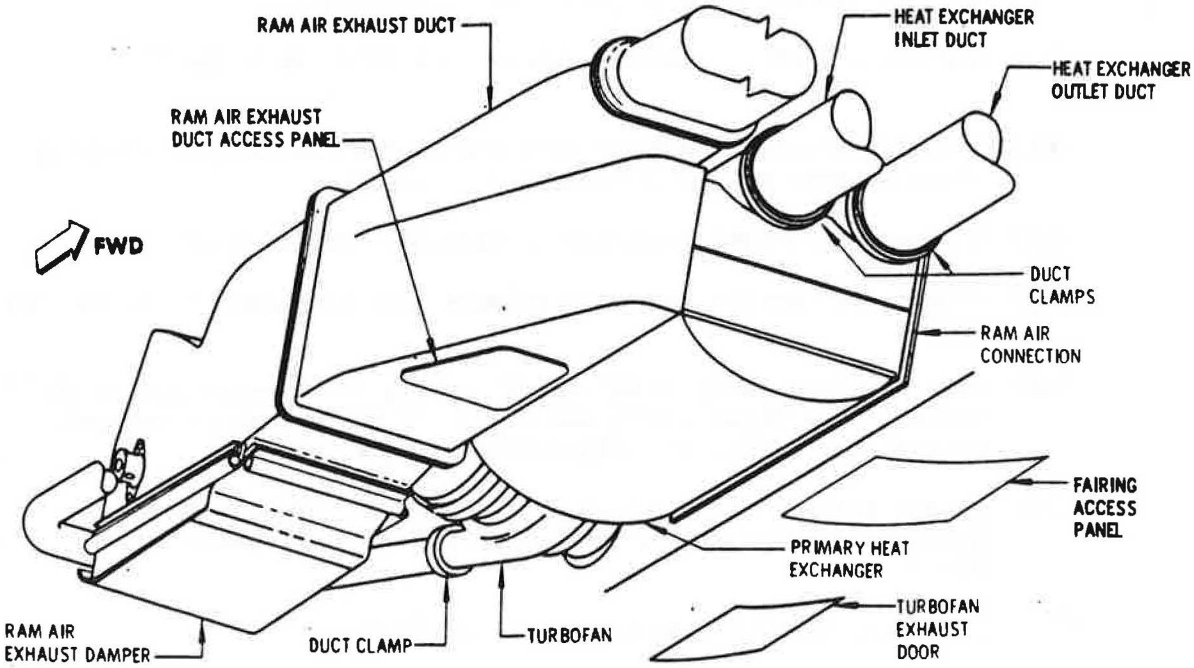
Installation of Supports and Outboard Gasket
Figure 201



Installation of Cooling Air Exhaust Duct and Inboard Gasket
Figure 202



Installation of Ram Air Exit Damper and Actuator
Figure 203



Primary Heat Exchanger Installation
Figure 204

B. Install Primary Heat Exchanger

(1) Cement outboard gasket in place on structure surface with synthetic rubber cement MIL-C-4003, Grade I or equal. (See figure 201.)

(2) Lift exchanger into place, attach exchanger to structure with a bolt at either end of the exchanger to help support it. Do not tighten bolts. Bolt holes are reached through fairing access panel.

(3) Fasten forward and aft hanger by installing one bolt in each. (See figure 201.) Adjust hangers if necessary.

(4) Install the rest of the bolts that attach the exchanger to the structure (44 bolts, total), but do not tighten.

(5) Install heat exchanger inlet duct by fastening two clamps.

(6) Tighten 44 bolts referred to in (4).

(7) Install heat exchanger outlet duct by fastening two clamps. If clamps. If necessary, adjust length of adapter section forward of outlet duct. (See figure 202.)

(8) Cement new inboard gasket in place with MIL-C-4003 Grade I or equal, lift ram air exhaust duct into place and fasten to exchanger with 44 bolts. Bolts are reached through opening in back of duct and through access panel. (See figure 202.)

(9) Install ram air exit damper. (See 21-12-181.)

(10) Install turbofan. Install flange nuts referred to in (8).

(11) Install turbofan pneumatic duct and shutoff valve by installing a clamp on each end and attaching duct hanger.

(12) Connect electrical connector to turbofan shutoff valve.

(13) Attach wire bundle clamps to primary heat exchanger inlet and outlet ducts.

(14) Fasten access panel in bottom of cooling air exhaust duct with 16 bolts. (See figures 202, and 204.) If old gasket is damaged, replace and cement with MIL-C-4003 or equal.

(15) Fasten fairing access panel with 25 bolts. If old gasket is damaged, replace and cement with MIL-C-4003 or equal. (See figure 204.)

(16) Close air conditioning equipment bay door.

SECONDARY HEAT EXCHANGER DAMPER ASSEMBLY - MAINTENANCE PRACTICES

EFFECTIVITY

TURBOFAN

1. Removal/Installation Secondary Heat Exchanger Damper

   A. Remove Secondary Heat Exchanger Damper

      (1) Pull the following circuit breakers:

         (a) A/C VALVE AND DAMPER POS INDICATOR circuit breaker on the radio and 28V DC TR busses circuit breaker panel (P5).

         (b) RAM AIR AND HEAT EXCHANGER DAMPER circuit breaker on the AC Bus No. 4 circuit breaker panel (P4).

      (2) Open air conditioning equipment bay door.

      (3) Remove electrical wires from wire bundle clamp on primary heat exchanger inlet duct.

      (4) Disconnect electrical connector of the damper actuator and cut the position potentiometer wires at splice closest to potentiometer.

      (5) Disconnect actuator bonding jumper. (See figure 201.)

      (6) Remove primary heat exchanger inlet and outlet ducts by removing clamps adjacent to heat exchanger and those at next forward joints. Also remove clamp between the inlet duct and the turbofan shutoff valve.

      (7) Disconnect flexible duct from aft end of cooling air exhaust duct.

      (8) Unbolt cooling air exhaust duct from the secondary heat exchanger.

      (9) Lower and remove exhaust duct, damper assembly, actuator, and position potentiometer in one unit.

      (10) If it is necessary to remove damper actuator and position potentiometer from duct and damper assembly, refer to paragraphs 2.A. and 3.A.

B. Install Secondary Heat Exchanger Damper

(1) Check that the following circuit breakers are open:

(a) A/C VALVE AND DAMPER POS INDICATOR circuit breaker on the radio and 28V DC TR busses circuit breaker panel (P5).

(b) RAM AIR AND HEAT EXCHANGER DAMPER circuit breaker on the AC Bus No. 4 circuit breaker panel (P4).

(2) Position cooling air exhaust duct and bolt to secondary heat exchanger.

(3) Install damper actuator. Refer to paragraph 2.B.

(4) Connect flexible duct to aft end of cooling air exhaust duct.

(5) Install primary heat exchanger inlet and outlet ducts. Connect turbofan shutoff valve to inlet duct by fastening one clamp.

(6) Connect actuator bonding jumper.

(7) Install wiring in wire bundle clamp on primary heat exchanger inlet duct.

(8) Attach electrical connector to actuator.

(9) Install position potentiometer and splice wiring to electrical wiring of airplane. Refer to paragraph 3.B.

(10) Close air conditioning equipment bay door.

2. <u>Removal/Installation Damper Actuator</u>

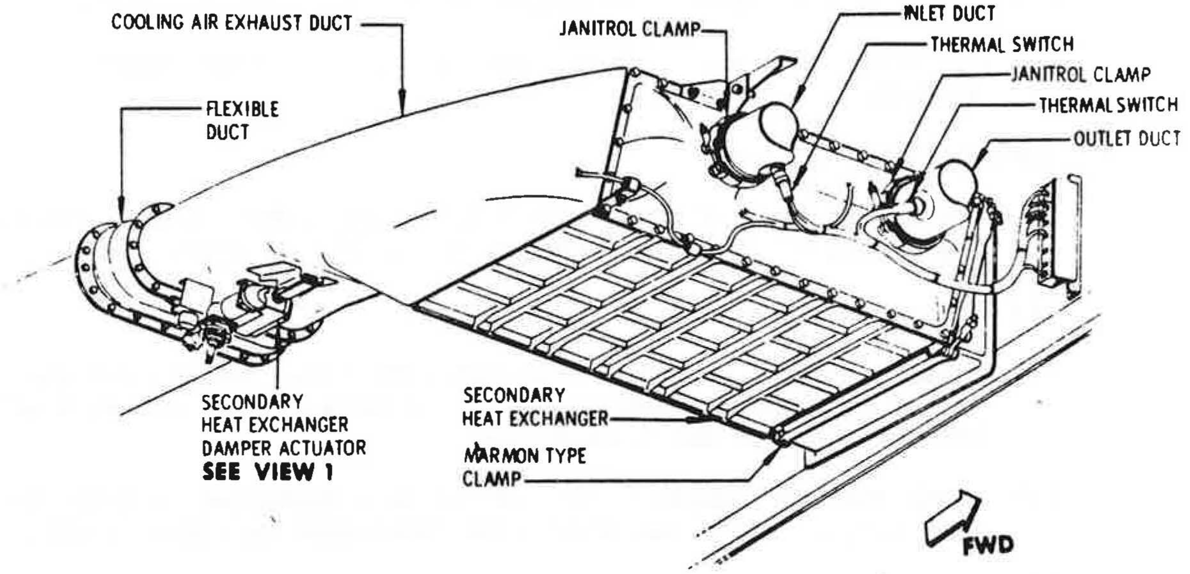
A. Remove Damper Actuator

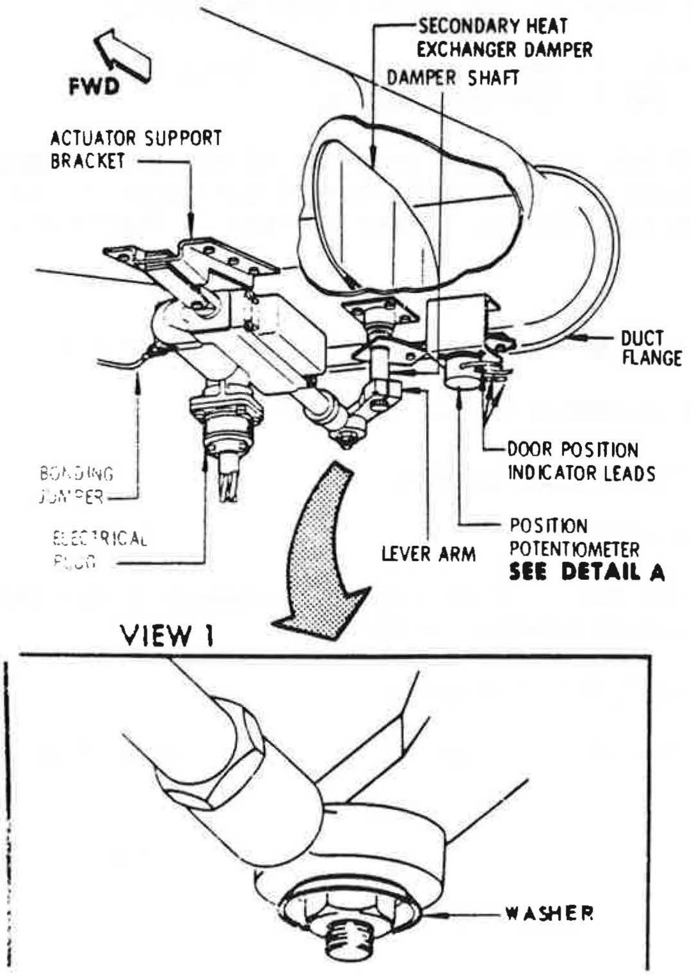
(1) Pull the RAM AIR AND HEAT EXCHANGER DAMPER circuit breaker on the AC Bus No. 4 circuit breaker panel (P4).

(2) Open air conditioning equipment bay door.

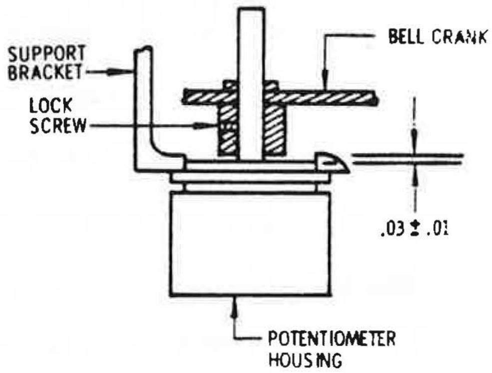
(3) Disconnect electrical plug from the damper actuator.

(4) Disconnect actuator bonding jumper.





VIEW 1



DETAIL A

Secondary Heat Exchanger
Figure 201

(5) Disconnect actuator from damper lever arm. See figure 201.

(6) Disconnect actuator from support bracket and remove actuator from airplane.

B. Install Damper Actuator

(1) Check that the RAM AIR AND HEAT EXCHANGER DAMPER circuit breaker on the AC Bus No. 4 circuit breaker panel (P4) is open.

(2) Remove flexible duct aft of damper.

(3) Attach actuator to support bracket with bolt, washer, nut and cotter pin. After installation, a minimum gap of .005 must exist between actuator and bracket lug.

(4) Check that the damper lever arm has been installed so that its index mark aligns within one tooth with index mark on damper shaft.

(5) Install electrical bonding jumper.

(6) Connect electrical connector to actuator plug.

(7) Electrically operate actuator to the fully extended position.

(8) Attach rod end of actuator to damper lever arm. Install with turned edge of washer down to prevent binding.

(9) Loosen actuator rod jam nut and adjust bearing rod end until damper is in fully open position, i.e. the flat face of the damper is at 90° to the plane of the duct flange. Refer to view 1, figure 201.

(10) Replace flexible duct.

(11) Adjust position potentiometer, if necessary, per paragraph 4.B.

(12) Close air conditioning equipment bay access door.

3. <u>Removal/Installation Damper Position Potentiometer</u>

A. Remove Damper Position Potentiometer

(1) Pull A/C VALVE AND DAMPER POS INDICATOR circuit breaker on the radio and 28V DC TR busses circuit breaker panel P5.

(2) Open air conditioning equipment bay doors.

(3) Cut position potentiometer wires at splice closest to potentiometer.

(4) Electrically operate the secondary heat exchanger damper to the full closed position.

(5) Loosen set screw in shoulder of potentiometer bell crank.

(6) Remove screws, washers, and tabs which lock potentiometer in the set position.

(7) Remove potentiometer.

B. Install Damper Position Potentiometer

(1) Check that the A/C VALVE AND DAMPER POS POTENTIOMETER circuit breaker on the radio and 28V DC TR busses circuit breaker panel (P5) is open.

(2) Check that the secondary heat exchanger damper is in the closed position.

(3) Loosen set screw in shoulder of potentiometer bell crank.

(4) Splice potentiometer wiring to airplane wiring.

(5) Close A/C VALVE AND DAMPER POS INDICATOR circuit breaker and immediately rotate potentiometer housing with respect to potentiometer shaft until indicator on flight engineer's panel reads approximately position of damper.

(6) Insert potentiometer in bell crank and with clearance shown in figure 201, detail A, tighten lock screw in bell crank shoulder.

(7) Install set screws, washers and tabs which hold the potentiometer housing in place but do not tighten.

(8) Adjust position potentiometer per paragraph 4.

(9) Tighten set screws.

(10) Close air conditioning equipment bay doors.

4. <u>Adjustment/Test Damper Position Potentiometer</u>

A. Special Equipment

(1) Jewelers screwdriver or equivalent small, very thin bladed screwdriver.

B. Adjust Damper Position Potentiometer

(1) Connect external electrical power and energize the following circuit breaker panels:

(a) 115V AC BUS NO. 4 (P4)

(b) RADIO AND 28V DC TR BUSSES (P5)

(2) Check that the following circuit breakers are closed:

(a) A/C VALVE AND DAMPER POS INDICATOR

(b) L.H. or R.H. RAM AIR AND HEAT EXCHANGER DAMPER

(3) Check that the secondary heat exchanger damper is in the closed position.

(4) Move the valve selector switch to position required to read position of damper.

(5) Loosen screws in potentiometer retaining clamps and rotate the potentiometer housing relative to its shaft until the indicator reads "CLOSED" then tighten the screws.

(6) Electrically operate the damper to the fully open position.

(a) If indicator does not read "OPEN," note deviation, loosen potentiometer clamp screws, and rotate the potentiometer housing relative to its shaft until one-half the deviation is corrected. Retighten clamp screws.

(b) Move damper to the closed position.

(c) Gain access to the valve and damper position indicator control unit located in the J23 relay shield and remove the trim pot cover plate. See figure 202.

(d) With a jewelers screwdriver, adjust the trim pot corresponding to the damper being adjusted (i.e. left or right) until the indicator reads "CLOSED."

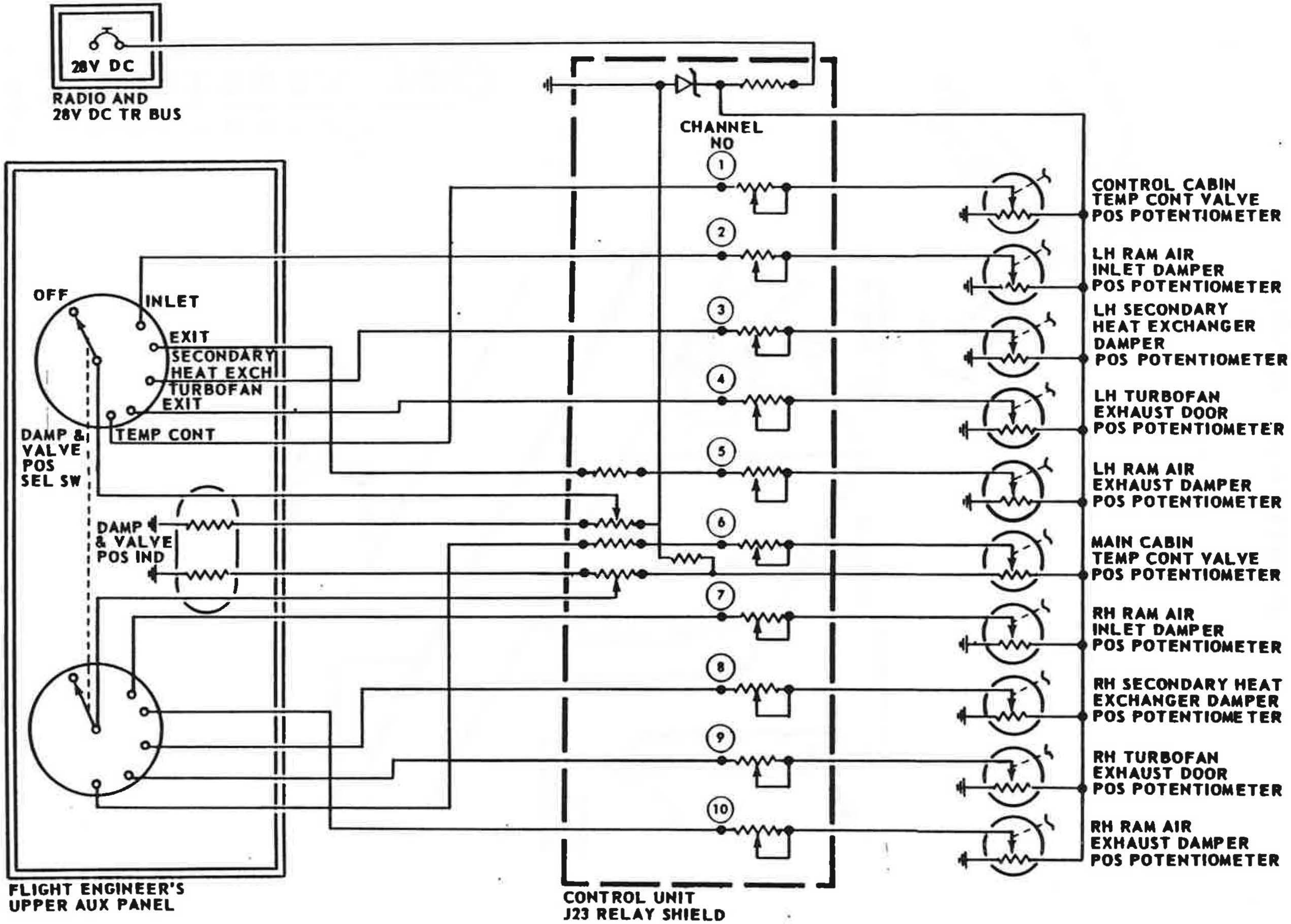
CAUTION: DO NOT MOVE UNNUMBERED SCREWS. THESE ARE FOR FACTORY ADJUSTMENTS AND IF MOVED MAY RUIN THE TRIM UNIT.

(e) Move the damper to the full open position. Indicator should read correctly. If not the adjustment procedure, steps (3) through (6), should be repeated until both extremes of damper travel correspond to indicator reading.

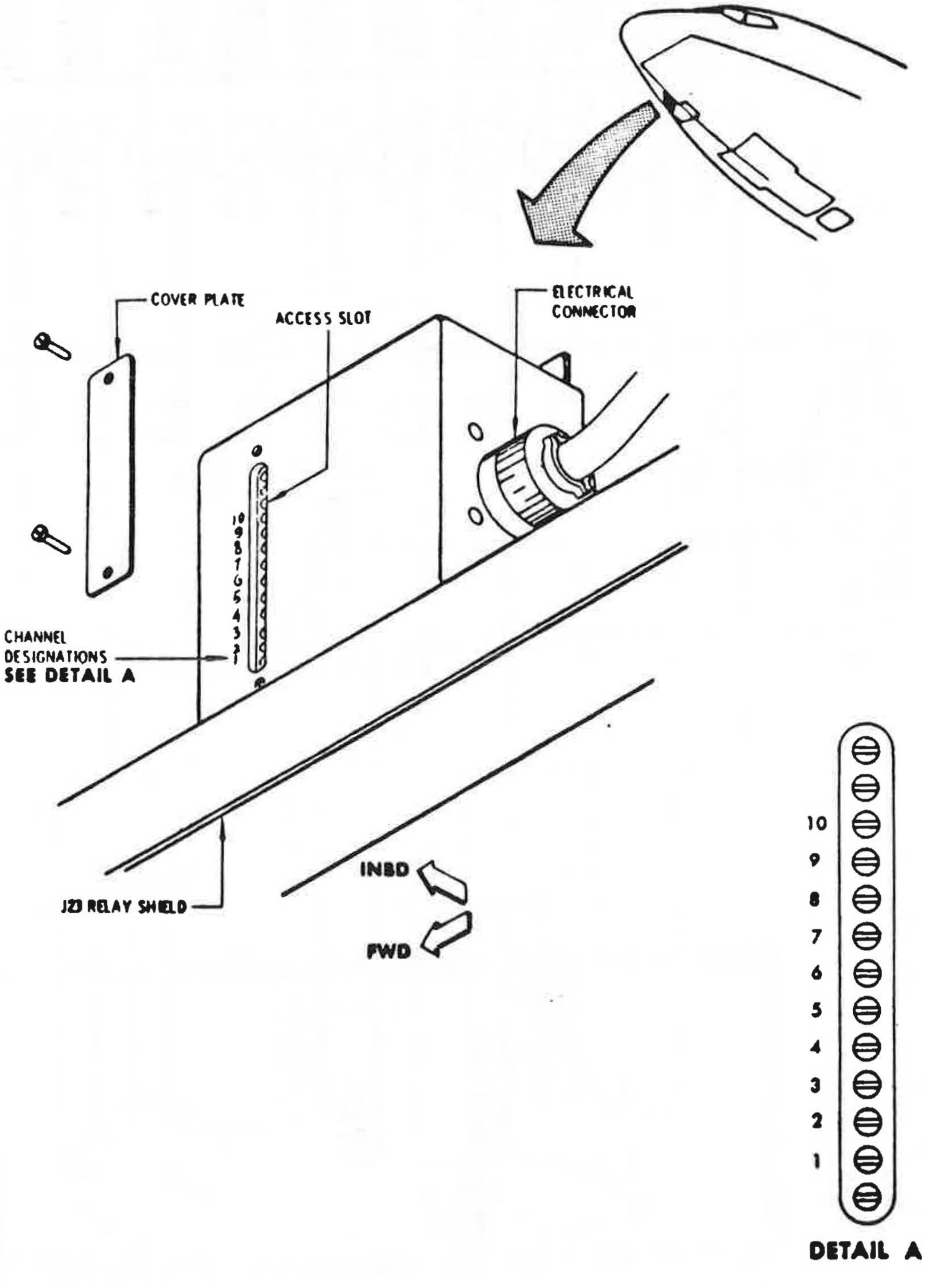
(f) Replace trim pot cover plate.

(7) Return airplane electrical system to normal ground configuration.

(8) Disconnect electrical power from airplane.



Valve and Damper Position Indicator Control Unit
Figure 202 (Sheet 1 of 2)



Valve and Damper Position Indicator Control Unit
Figure 202 (Sheet 2 of 2)

MAIN CABIN TEMPERATURE CONTROL VALVE AND MANUAL OVERRIDE - MAINTENANCE PRACTICES

EFFECTIVITY

TURBOFAN

1. General

   A. The main cabin temperature control valve, the manual override stationary shaft, the manual override control, and the secondary heat exchanger damper switches may be removed or installed individually. The interrelationship between these installations during operation however, make it necessary to treat them as a system during adjustment or testing.

2. Removal/Installation Main Cabin Temperature Control Valve Manual Override

   A. Remove Manual Override Control (See figure 201.)

      (1) Remove forward cargo compartment aft bulkhead.

      (2) Relax tension on control cables and clutch cable at the turnbuckles then disconnect control cables from control pulley and clutch cable from declutch arm.

      NOTE: Turnbuckles are located in air distribution bay.

      (3) Pull cables through holes in floor beam and stow.

      (4) Remove eight bolts which secure control assembly to floor beam then remove control assembly.

      (5) Remove four bolts attaching declutch bracket assembly to structure and remove declutch assembly.

   B. Remove Manual Override Stationary Shaft Installation (See figure 202.)

      (1) Remove forward cargo compartment aft bulkhead.

      (2) Relieve tension on control cables and disconnect cables from pulley.

      (3) Relieve tension on clutch cable and disconnect cable from declutch crank.

      (4) Disconnect valve clutch and control rods at stationary shaft.

(5) Remove secondary heat exchanger damper switches from their support brackets and stow.

NOTE: A roller guide lock ring locks the roller in position to bear correctly on the pulley cam. This ring must be pulled before the lower positioning nut can be removed during secondary heat exchanger damper switch removal.

(6) Remove locating bolt which secures stationary shaft to aft support channel.

(7) Remove bolts which attach forward stationary shaft bracket to the bulkhead support.

(8) Slide forward support bracket aft on stationary shaft until enough clearance is obtained to slide stationary shaft from hole in rear support then remove stationary shaft assembly.

C. Install Manual Override Control

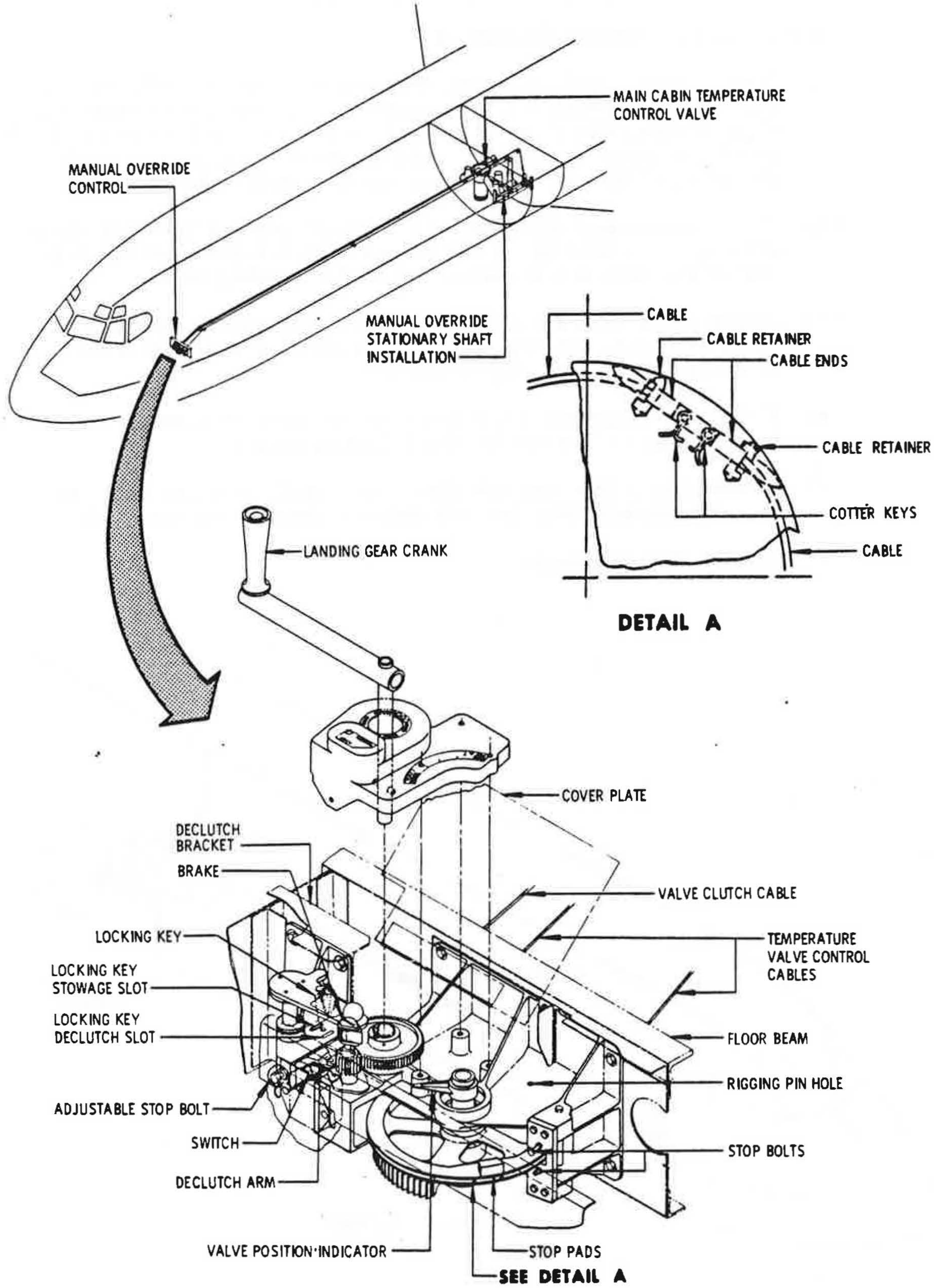
(1) Bolt declutch bracket and control assembly to structure under the control cabin floor below navigators station. (See figure 201.)

NOTE: The declutch bracket should be installed first.

(2) Thread clutch cable through the control cabin floor beam and attach cable terminal fork to declutch arm. (See detail A, figure 201.)

(3) Thread control cables through control cabin floor beam and control bracket and secure to control pulley.

(4) Adjust control valve clutch and manual override control. Refer to Adjustment/Test Manual Override, 21-12-0, paragraphs 1.C. and 1.D.



Manual Override Control Installation
Figure 201

D. Install Manual Override Stationary Shaft

(1) Insert forward end of manual override stationary shaft assembly through the forward support bracket sufficiently to temporarily allow bolting the forward bracket to the bulkhead support. At the same time leave enough end space so the aft end of the shaft may be inserted through the hole in the aft support bracket.

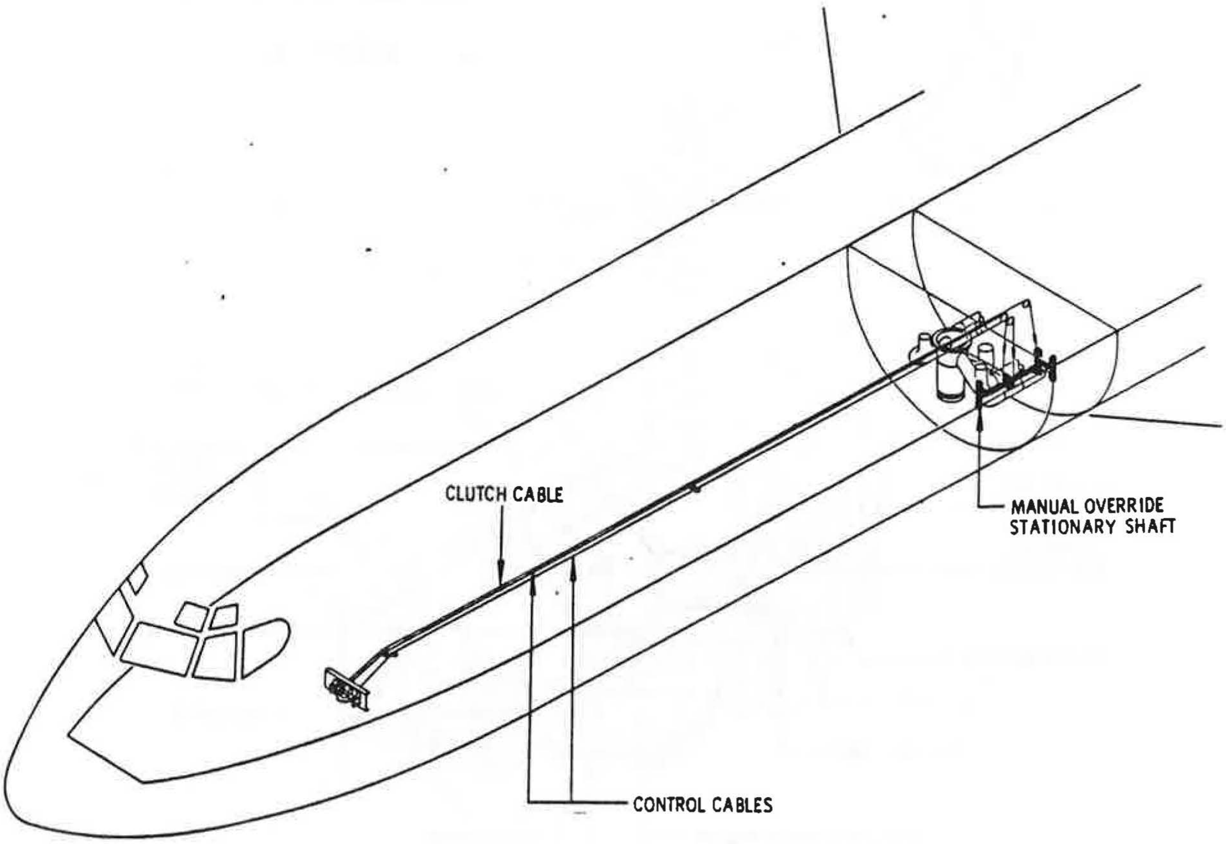
(2) Insert stationary shaft into aft support bracket hole and slide aft until the control pulley aligns with the overhead turning pulley and mark end distance for shaft locating hole.

(3) Remove bolts from forward support bracket, remove stationary shaft assembly, leaving forward bracket on shaft, and drill locating hole. (See figure 202.)

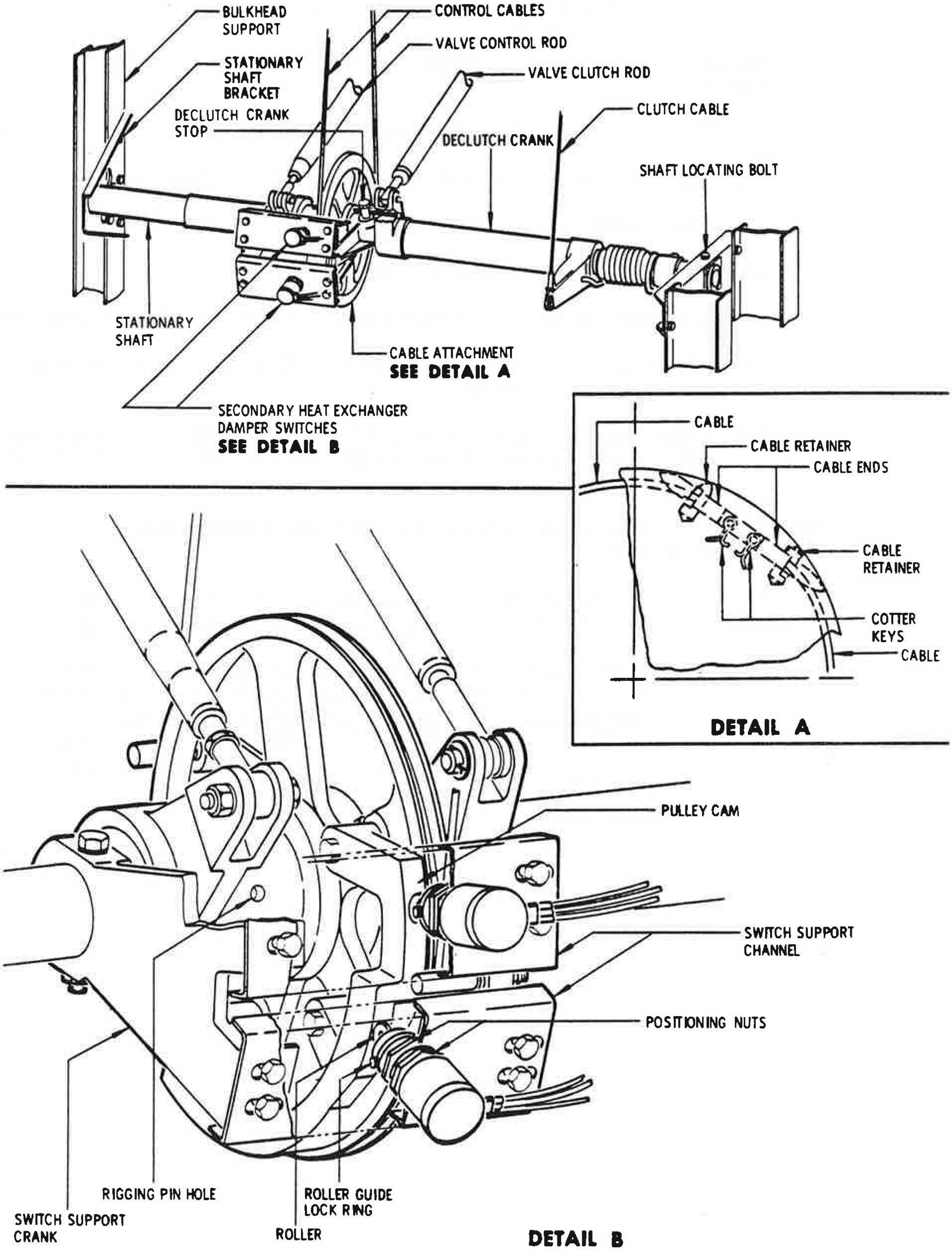
(4) Slide stationary shaft aft end into aft support bracket and fasten forward support bracket to the bulkhead support.

(5) Adjust shaft, fore and aft direction, until location bolt may be inserted through both the aft support channel and the shaft.

(6) Install locating bolt.



Manual Override Stationary Shaft Installation
Figure 202 (Sheet 1 of 2)



Manual Override Stationary Shaft Installation
Figure 202 (Sheet 2 of 2)

(7) Install secondary heat exchanger switches in their support brackets.

(a) Remove roller guide lock ring from switch.

(b) Remove lower jam nut and insert switch in bracket.

(c) Screw lower jam nut on switch.

(d) Install roller guide lock ring.

(e) Move main cabin temperature control valve to full hot position.

(f) Adjust switch by moving jam nuts until roller just contacts cam then tighten nuts.

(g) Center switch roller on cam, if necessary, by loosening bolts holding switch channel to support cranks and moving it either fore or aft.

(8) Connect clutch cable to declutch crank and control cables to control pulley.

(9) Adjust control valve clutch and manual override control. Refer to Adjustment/Test Manual Override, 21-12-0, paragraphs 1.D. and 1.C.

CAUTION: DO NOT CONNECT THE CONTROL ROD OR CLUTCH ROD TO THE MAIN CABIN TEMPERATURE CONTROL VALVE UNTIL THE MANUAL CONTROL AND CLUTCH HAVE BEEN PROPERLY ADJUSTED. ELECTRICAL OPERATION OF THE CONTROL VALVE WITHOUT A PROPERLY ADJUSTED MANUAL OVERRIDE COULD DAMAGE THE ACTUATOR.

3. Removal/Installation Main Cabin Temperature Control Valve

A. General

(1) Weight of main cabin temperature control valve requires at least two men for safe handling.

B. Remove Main Cabin Temperature Control Valve (See figure 203.)

(1) Remove forward cargo compartment aft bulkhead.

(2) Remove right side bulkhead support.

(3) Remove electrical connector from valve actuator.

(4) Remove electrical connector from valve position potentiometer.

(5) Disconnect manual override control rod from the control arm of the valve actuator gear box.

(6) Disconnect manual override clutch rod from the clutch arm of the valve actuator gear box.

(7) Remove flexible coupling from between valve and ground service conditioned air duct by removing bolts in upper and lower flanges.

(8) Support temperature control valve.

(9) Remove bolts connecting valve to sway braces.

(10) Disconnect all bonding jumpers to temperature control valve.

(11) Disconnect tube leading to pneumatic supply pressure transmitter from the tee duct just upstream of the turbocompressor back pressure valve.

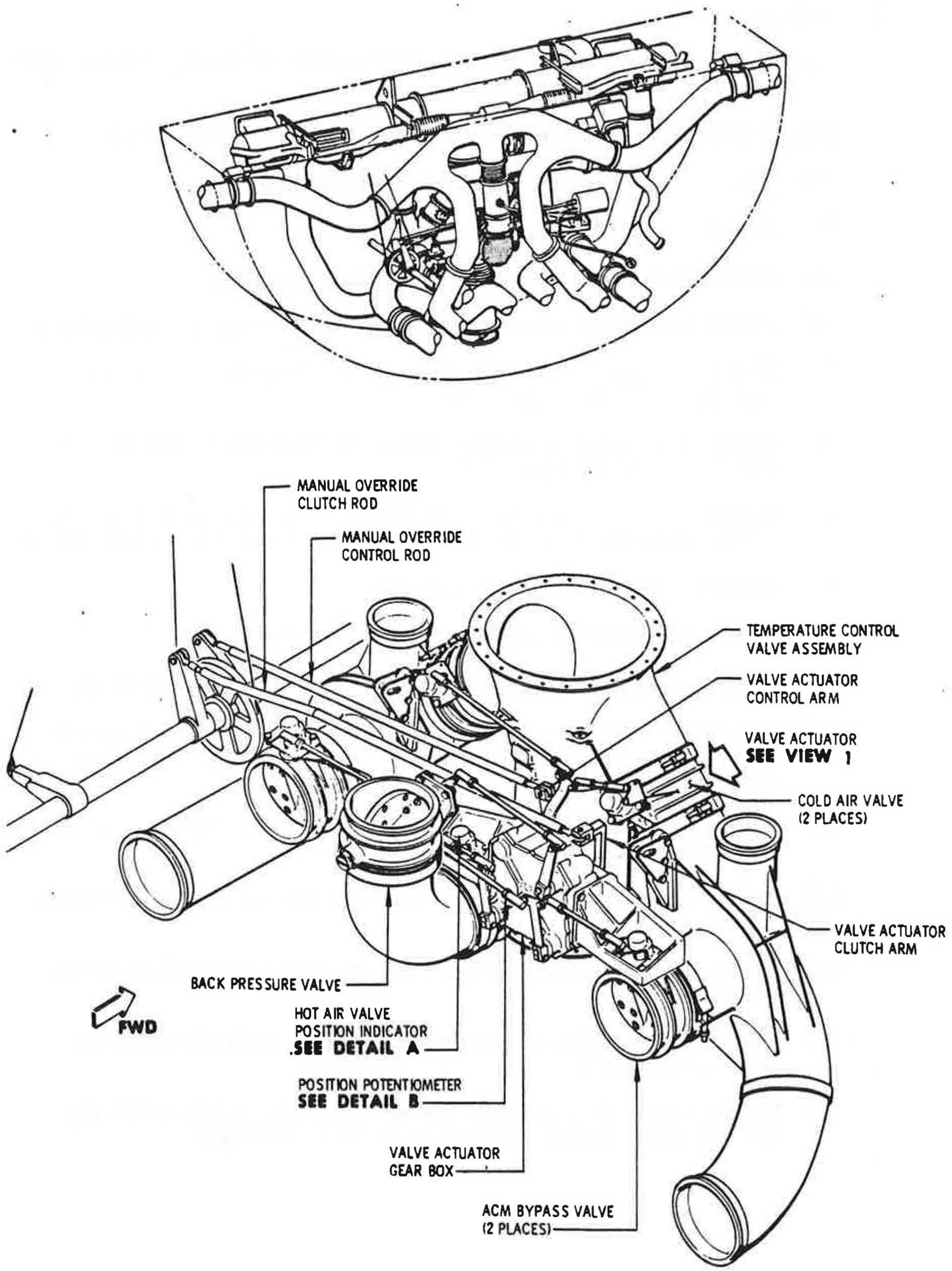
(12) Remove clamp which connects the control cabin hot air duct to the tee duct. (See detail A, figure 201.)

(13) Remove clamp from between tee duct and pneumatic duct universal joint.

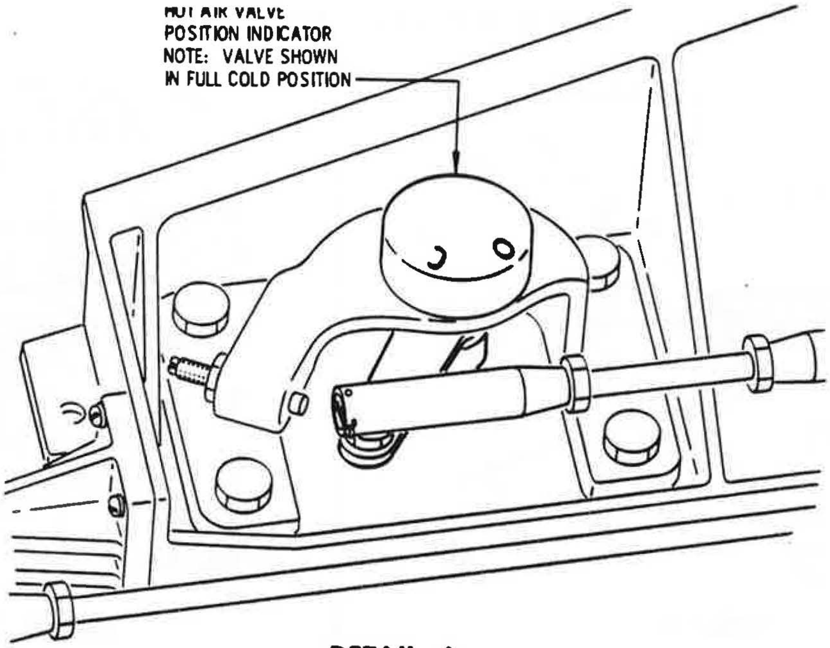
(14) Remove clamps connecting the cold air duct universal joint to valve (2 places).

(15) Remove clamps which connect control cabin cold air ducts to valve (2 places).

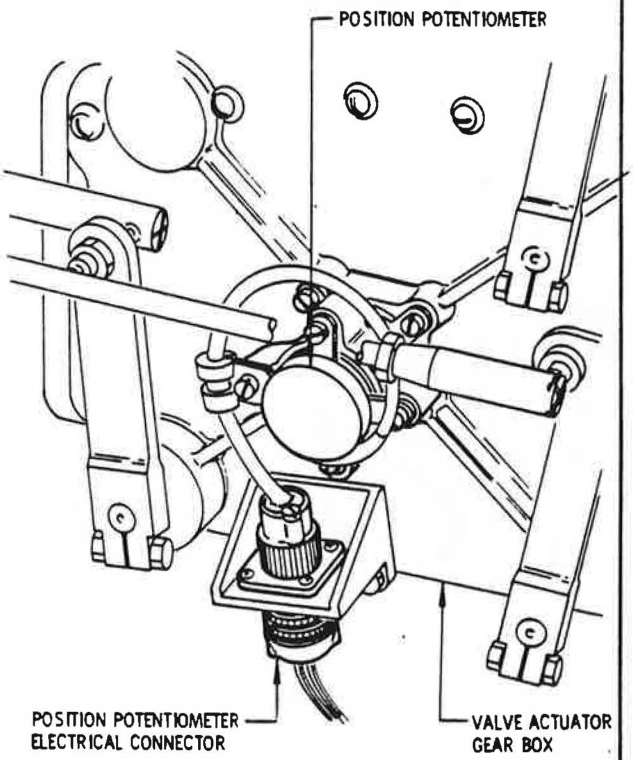
(16) Remove clamps from between the semiconditioned air ducts and the universal joints leading to valve (2 places).



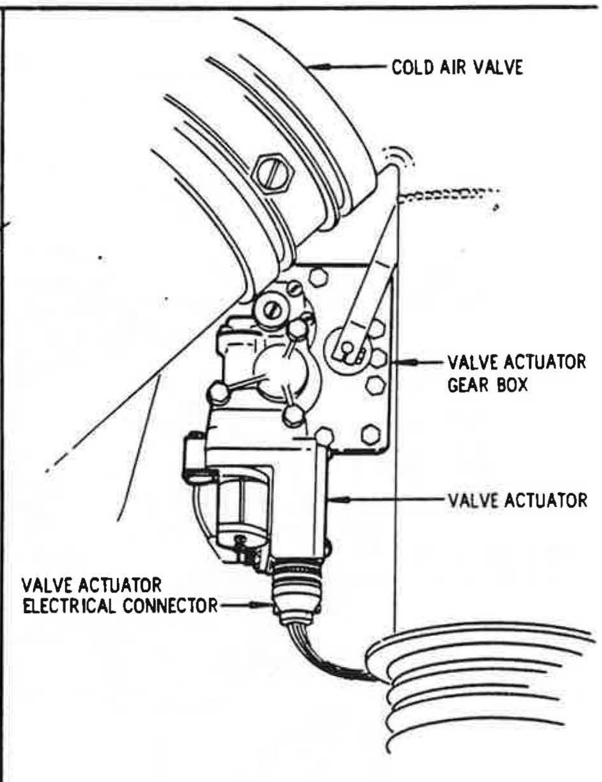
Main Cabin Temperature Control Valve Assembly Installation
Figure 203 (Sheet 1 of 3)



DETAIL A

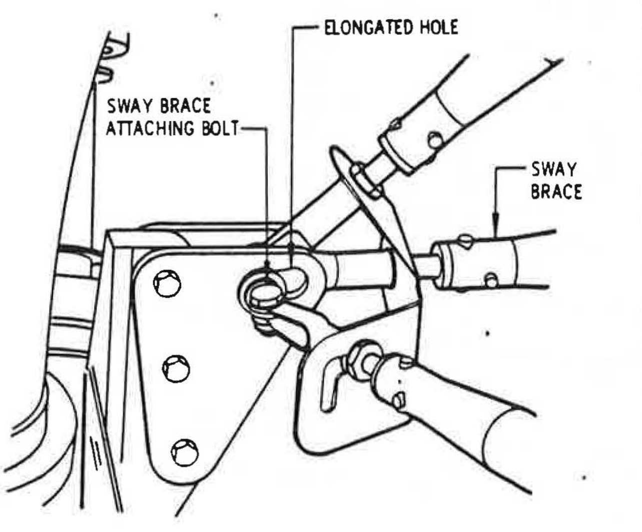


DETAIL B

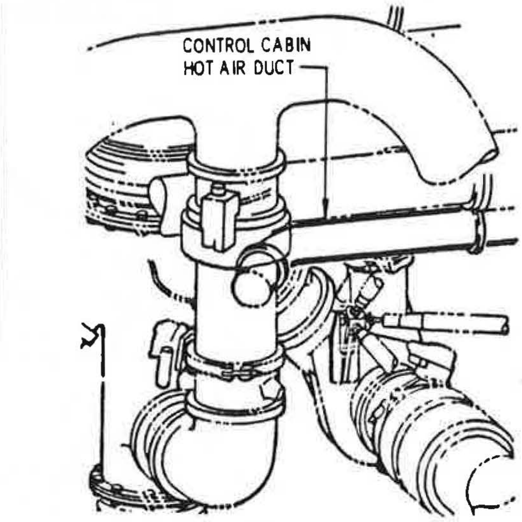


VIEW 1

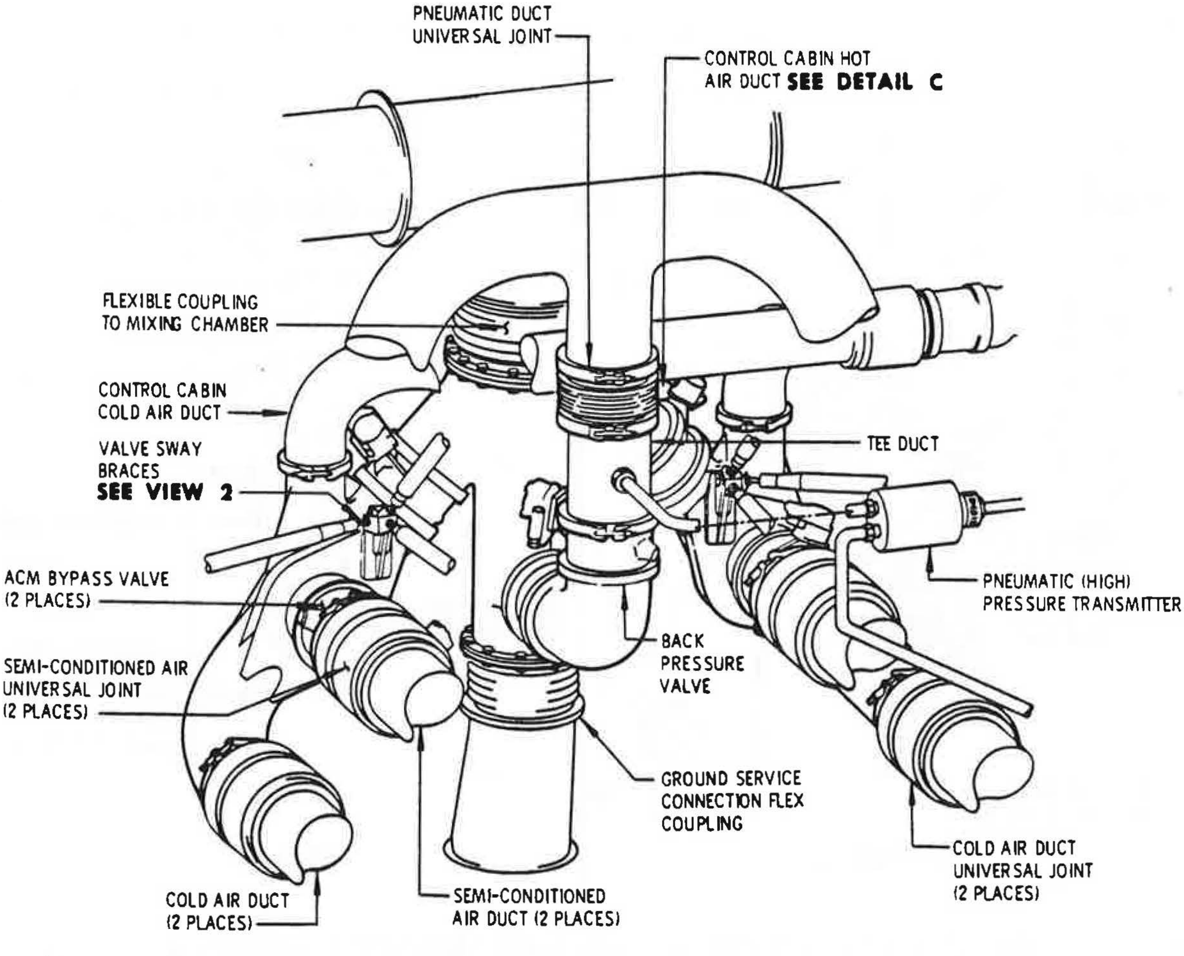
Main Cabin Temperature Control Valve Assembly Installation
Figure 203 (Sheet 2 of 3)



VIEW 2



DETAIL C



Main Cabin Temperature Control Valve Assembly Installation
Figure 203 (Sheet 3 of 3)

(17) Remove bolts which connect valve to flexible coupling to mixing chamber.

(18) Remove main cabin temperature control valve.

(19) Remove clamps holding universal joints to valve and carefully remove the joints.

(20) Remove clamp from between tee duct and turbocompressor valve and remove tee duct.

NOTE: Universal joints removed in step (19) and tee duct removed in step (20) will be needed for new valve installation.

C. Prepare to Install Main Cabin Temperature Control Valve

(1) Install tee duct to turbocompressor back pressure valve with clamp. Leave clamp loose for later adjustment.

NOTE: Tee duct connects to control cabin hot air duct as well as to the pneumatic pressure transmitter and must be installed accordingly.

(2) Install universal joints on air cycle machine (ACM) bypass valves with clamps.

D. Install Main Cabin Temperature Control Valve

(1) Lift valve into place and support it.

(2) Install clamps connecting semiconditioned air duct to universal joints on valve.

(3) Install clamps connecting valve to universal joints of cold air ducts (2 places).

(4) Attach sway braces by fastening holes on each side in forward positions of elongated holes. Adjust bolt position if necessary by screwing sway brace rod ends in or out.

(5) Remove valve support.

(6) Position tee duct and install clamp connecting the control cabin hot air duct to the tee duct. (See detail 4, figure 201.)

(7) Install the tube from the pneumatic pressure transmitter to the tee duct.

(8) Tighten the clamp between the back pressure valve and the tee duct.

(9) Install clamp joining tee duct to pneumatic duct universal joint.

(10) Install clamps joining control cabin cold air ducts to valve. If difficulty is encountered loosen first clamp downstream of the main cabin temperature control valve and realign.

(11) Using new gasket, bolt lower flange of mixing chamber flex duct to outlet of main cabin temperature control valve.

(12) Install flexible coupling between ground service conditioned air duct and control valve by bolting one flange to the duct and the other to the valve.

(13) Install electrical connector to valve actuator.

(14) Install electrical connector to valve position potentiometer.

(15) Adjust position potentiometer. (Refer to Adjustment/Test Main Cabin Temperature Control Valve Position Potentiometers.)

(16) Adjust manual override control rod and clutch rod and connect to valve.

(a) Check that manual override clutch handle is in the full normal position.

(b) Operate main cabin temperature control valve to the full cold position.

(c) Insert MS20392-3-67 rigging pin in manual override stationary shaft. (See figure 202.)

(d) Adjust control and clutch rod lengths until the mounting bolts fit freely in their holes.

(e) Install mounting bolts and check nuts then lockwire.

(f) Remove rigging pin installed in step (c).

(17) Check operation of valve.

(a) Close air conditioning pack control circuit breakers on a-c bus No. 4 circuit breaker panel (P4).

(b) Move air conditioning control switches to "ON."

(c) Holding the main cabin temperature selector to "Warmer" then to "Cooler" shall cause the valve to move to the full hot and full cold position. The valve position indicator may be observed to determine valve position.

(18) Install right side bulkhead support.

(19) Install forward cargo compartment aft bulkhead.

4. Removal/Installation Main Cabin Temperature Control Valve Position Potentiometer

A. Remove Main Cabin Temperature Control Valve Position Potentiometer

(1) Pull A/C VALVE AND DAMPER POS INDICATOR circuit breaker on radio and 28V DC TR busses circuit breaker panel P5.

(2) Remove aft bulkhead of forward cargo compartment.

(3) Disconnect electrical connector from potentiometer plug. (See detail B, figure 203.)

(4) Remove screws holding electrical plug to bracket.

(5) Remove screws, washers, and tabs which lock potentiometer in set position.

(6) Remove potentiometer and spring.

B. Install Main Cabin Temperature Control Valve Position Potentiometer.

(1) Check that A/C VALVE AND DAMPER POS INDICATOR circuit breaker on the radio and 28V DC TR busses circuit breaker panel (P5) is open.

(2) Electrically operate the main cabin temperature control valve to the full cold position.

(3) Install the potentiometer stop, then the spring so it engages in the valve shaft and the potentiometer, with the potentiometer stop pin adjacent to but not touching the stop. Secure with washers, tabs, and screws and attach wire clamp. Do not tighten screws. See detail B, figure 203.

(4) Attach electrical plug to bracket with four screws.

(5) Connect potentiometer wiring to airplane wiring by attaching electrical connector to plug.

(6) Close A/C VALVE AND DAMPER POS INDICATOR circuit breaker and immediately rotate potentiometer housing with respect to potentiometer shaft until indicator on flight engineer's panel reads approximately "CLOSED" (which corresponds to the full cold position of the valve).

(7) Adjust position potentiometer per paragraph 5.B.

(8) Tighten set screws.

(9) Install aft bulkhead of forward cargo compartment.

5. Adjustment/Test Main Cabin Temperature Control Valve Position Potentiometer

A. Special Equipment

(1) Jewelers screwdriver or equivalent small, very thin bladed screwdriver.

B. Adjust Main Cabin Temperature Control Valve Position Potentiometer

(1) Connect external electrical power and energize the following circuit breaker panels:

(a) "115V AC BUS NO. 4" (P4)

(b) "RADIO AND 28V DC TR BUSSES" (P5)

(2) Check that the A/C VALVE AND DAMPER POS IND circuit breaker is closed.

(3) Electrically drive the control valve to the full cold position.

(4) Turn the valve position selector switch on the flight engineer's upper panel to the setting required to read position of main cabin temperature control valve.

(5) Loosen screws in potentiometer retaining clamps and rotate the potentiometer housing relative to its shaft until the indicator reads "CLOSED" then tighten screws.

NOTE: The full cold position of the control valve corresponds to "CLOSED" on the indicator dial, and full hot corresponds to "OPEN."

(6) Electrically operate the control valve to the full hot position and check reading of indicator.

(a) If indicator does not read "OPEN," note deviation, loosen potentiometer clamp screws, and rotate the potentiometer housing relative to its shaft until one-half the deviation is corrected, then retighten clamp screws.

(b) Electrically operate the control valve to the full cold position.

(c) Gain access to the valve and damper position indicator control unit located in the J23 relay shield and remove the trim pot cover plate. (See figure 204.)

(d) Adjust the trim pot correcponding to the main cabin temperature control valve position potentiometer with a jewelers screwdriver until the indicator reads "CLOSED."

CAUTION: DO NOT MOVE UNNUMBERED SCREWS. THESE ARE FOR FACTORY ADJUSTMENT AND IF MOVED MAY RUIN THE TRIM UNIT.

(e) Electrically operate the valve to the full hot position. Indicator should read correctly (i.e. "OPEN"). If not the adjustment procedure, steps (3) through (6) should be repeated until both extremes of valve travel correspond to indicator reading.

(f) Replace trim pot cover plate.

(7) Return airplane electrical system to normal ground configuration.

(8) Disconnect electrical power from airplane.

6. Removal/Installation Main Cabin Temperature Control Valve Actuator

A. Remove Main Cabin Temperature Valve Actuator. (see fig. 203)

(1) Remove forward cargo compartment aft bulkhead.

(2) Electrically operate valve to full cold position.

(3) Remove connector plug from actuator and disconnect bonding jumper on actuator.

(4) Remove nuts, washers, bolts and remove actuator from clutch and gear assembly.

B. Install Main Cabin Temperature Valve Actuator (see figure 203)

(1) Manually operate main cabin temperature control valve to the full cold position.

(2) Install connector plug on actuator and run actuator to full cold position.

(3) Position actuator on clutch and gear assembly and install bolts, washers and nuts. Attach jumper to lug of actuator.

NOTE : To align serrations on actuator shaft and on gear of clutch and gear assembly, turn maximum one tooth, to valve full hot position, on gear of clutch and gear assembly.

(4) Check operation of valve as described in paragraph 3D (17)

(5) Install forward cargo compartment after bulkhead.

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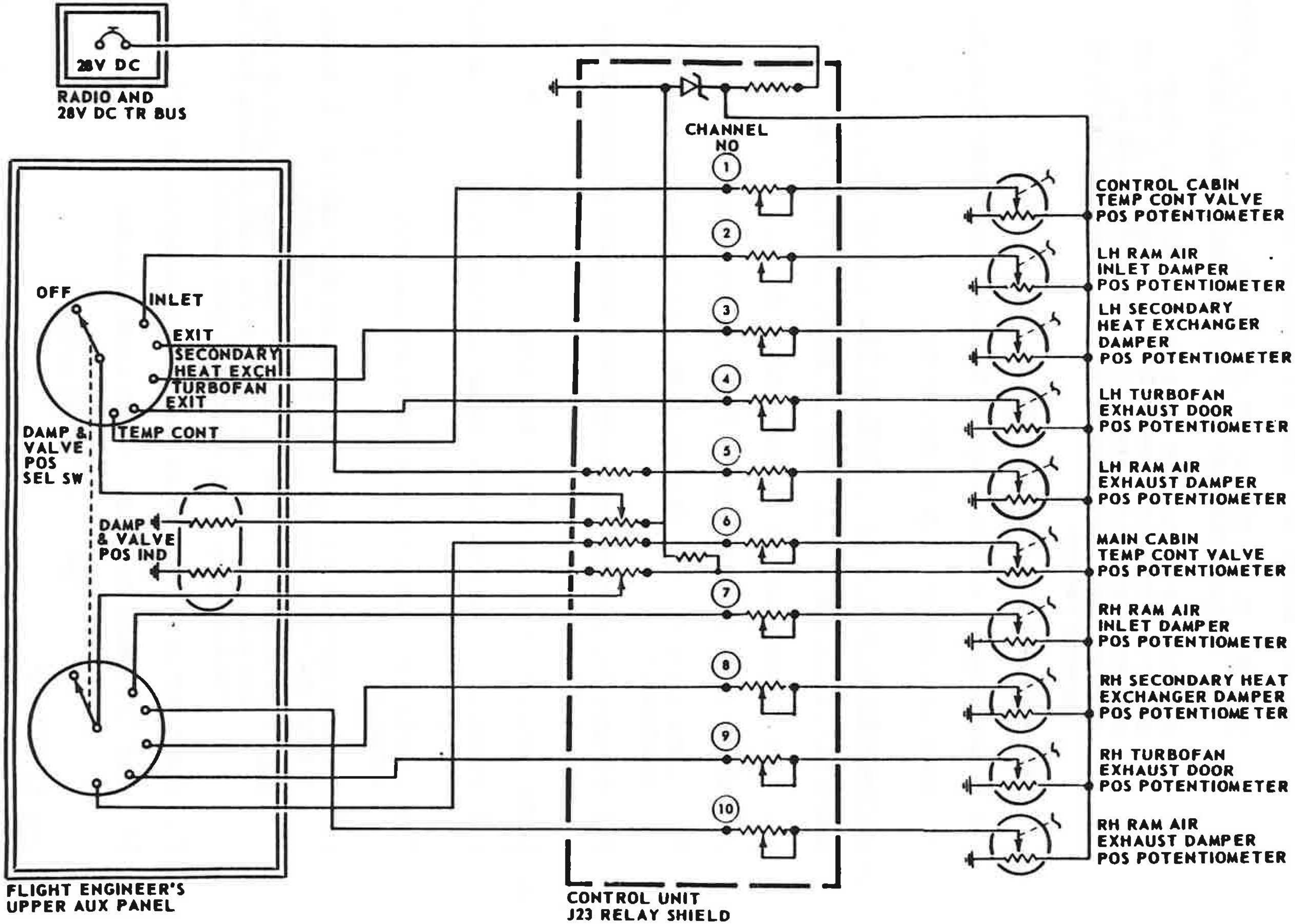
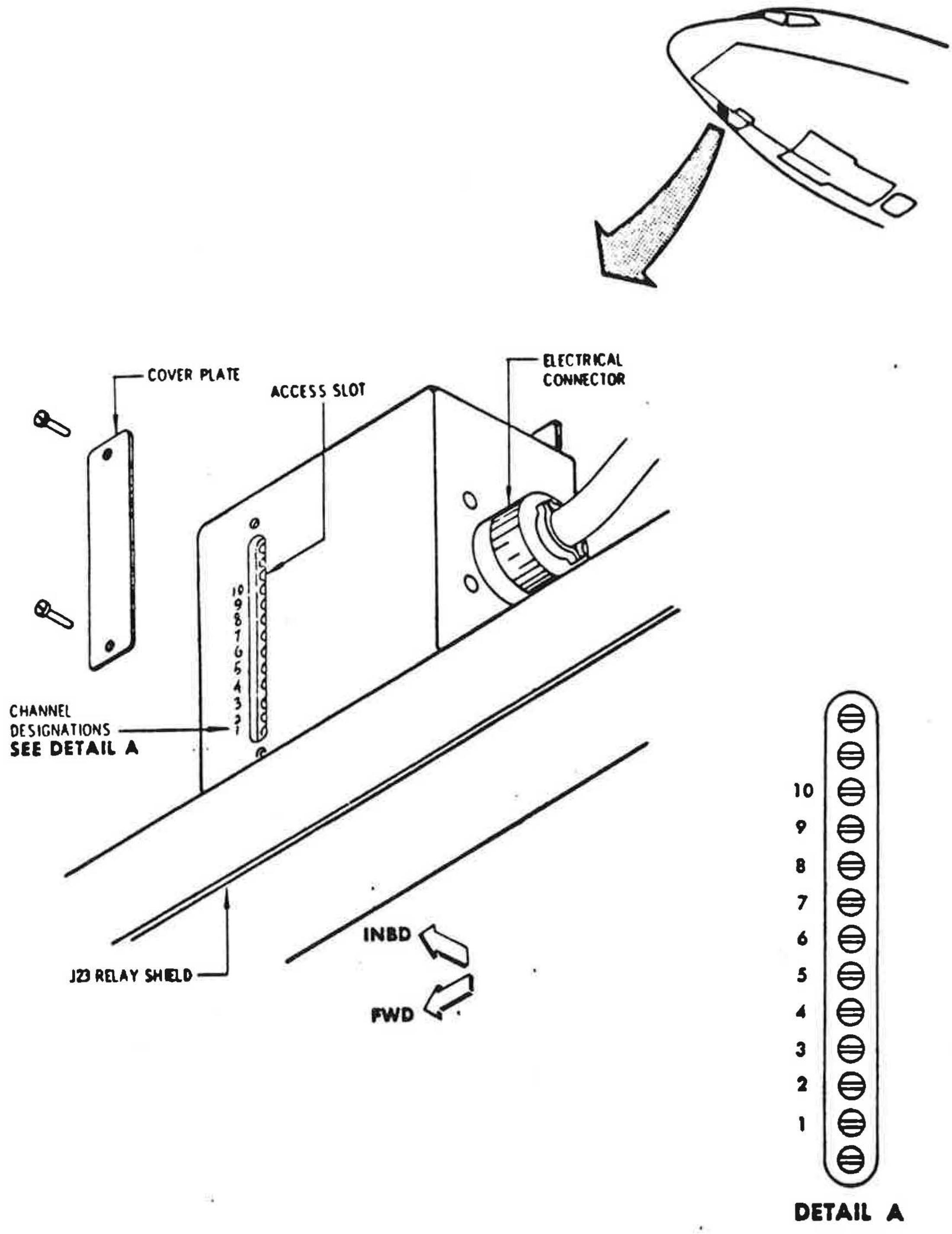


Valve and Damper Position Indicator Control Unit
Figure 204 (Sheet 1 of 2)



Valve and Damper Position Indicator Control Unit
Figure 204 (Sheet 2 of 2)

CONTROL CABIN TEMPERATURE CONTROL VALVE - MAINTENANCE PRACTICES

EFFECTIVITY

TURBOFAN

1. Removal/Installation Control Cabin Temperature Control Valve Assembly

A. Remove Control Cabin Temperature Control Valve

(1) Remove forward cargo compartment aft bulkhead.

(2) Remove electrical connector to motor. (See figure 201.)

(3) Remove electrical connector to position potentiometer.

(4) Remove right side bulkhead support.

(5) Disconnect bonding jumpters at temperature control valve.

(6) Support temperature control valve.

(7) Disconnect four marman clamps, upstream and downstream of hot air and cold air valves. Remove four gaskets.

(8) Remove valve assembly with motor and position potentiometer.

B. Separate Component Valves

(1) Separate hot air valve from cold air valve by removing pin at end of hot air valve drive arm.

C. Install Control Cabin Temperature Control Valve

(1) Set one new gasket on each end of cold air valve, lift valve into place and support it. (See figure 201.)

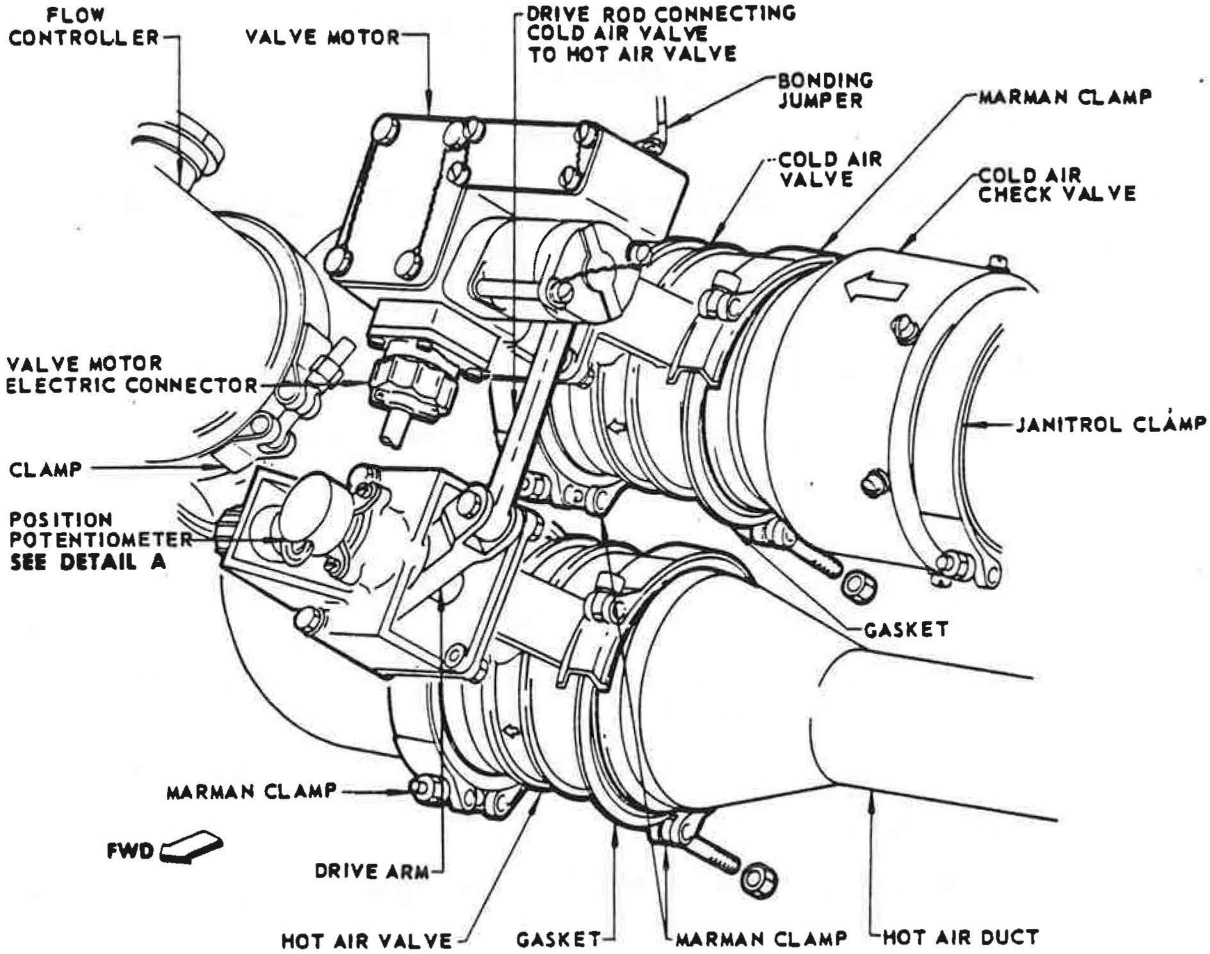
(2) Attach Marman clamps upstream and downstream of cold air valve and fasten loosely so valve can be rotated by hand.

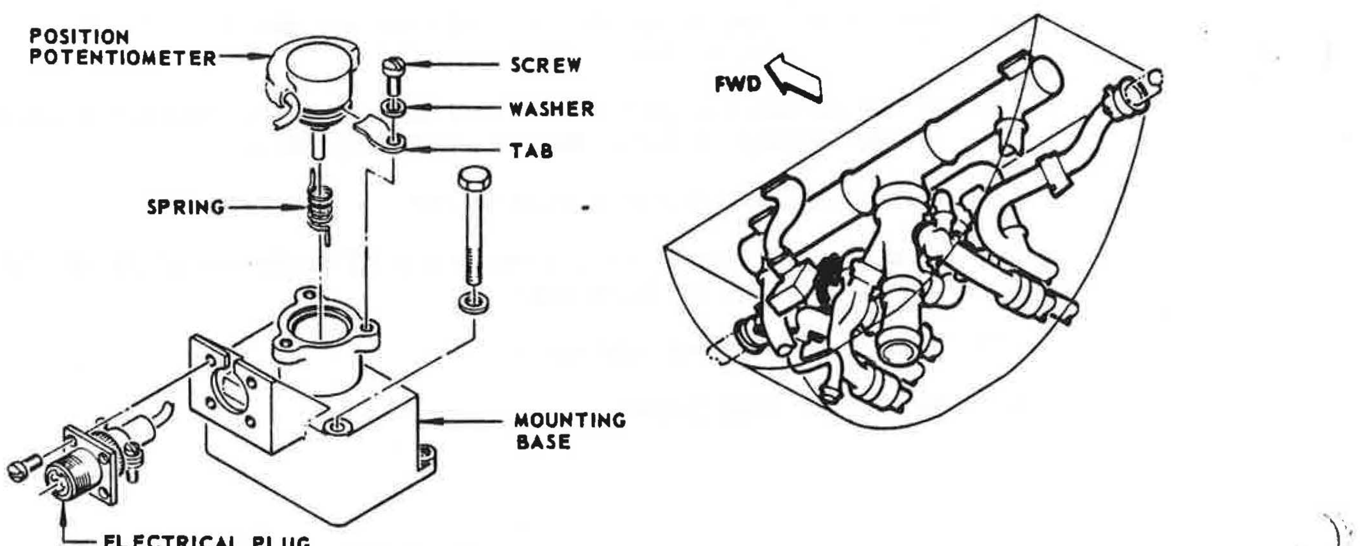
(3) Install hot air valve in same manner.

(4) Rotate valves until hot air valve end of drive rod slips easily into forked end of drive arm.

(5) Tighten four Marman clamps.

(6) Connect bonding jumper.





DETAIL A

Control Cabin Temperature Control Valve Installation
Figure 201

(7) Install electrical connector to motor.

(8) Install electrical connector to position potentiometer.

(9) Remove supports.

(10) Adjust linkage between valves as under 2. "Adjustment."

(11) Test valve according to "Adjustment/Test Air Conditioning System."

(12) Install right side bulkhead support.

(13) Install forward cargo compartment aft bulkhead.

2. Adjustment/Test Control Cabin Temperature Control Valve

A. Adjust Linkage Between Actuator and Hot Air Valve

(1) Operate cold air valve to full open position until stopped by limit switch.

(2) Adjust linkage so hot air valve is fully closed. If pin through drive rod and fork does not slip in easily, loosen rod jam nut, turn rod until pin fits, tighten jam nut.

3. Removal/Installation Control Cabin Temperature Control Valve Position Potentiometer

A. Remove Control Cabin Temperature Control Valve Position Potentiometer.

(1) Pull A/C VALVE AND DAMPER POS INDICATOR circuit breaker on radio and 28V DC TR busses circuit breaker panel P5.

(2) Remove aft bulkhead of forward cargo compartment.

(3) Disconnect potentiometer electrical plug.

(4) Remove 4 screws holding electrical plug to mounting base and remove wire from slot.

(5) Remove screws, washers, and tabs which lock potentiometer in set position.

(6) Remove potentiometer and spring. (See figure 201, detail A.)

B. Install Control Cabin Temperature Control Valve Position Potentiometer.

(1) Check that A/C VALVE AND DAMPER POS INDICATOR circuit breaker on the radio and 28V DC TR busses circuit breaker panel (P5) is open.

(2) Electrically operate control cabin temperature control valve to the full cold position.

(3) Install spring and position potentiometer. See figure 201, detail A.

(4) Secure potentiometer with washers, tabs, and screws, but do not tighten.

(5) Attach electrical plug to mounting base with 4 screws.

(6) Connect potentiometer wiring to airplane wiring by attaching electrical connector to plug.

(7) Close A/C VALVE AND DAMPER POS INDICATOR circuit breaker and immediately rotate potentiometer housing with respect to potentiometer shaft until indicator on flight engineer's panel reads approximately "CLOSED" (which corresponds to the full cold position of the valve).

(8) Adjust position potentiometer per paragraph 4B.

(9) Tighten set screws.

(10) Install aft bulkhead of forward cargo compartment.

4. Adjustment/Test Control Cabin Temperature Control Valve Position Potentiometer

A. Special Equipment

(1) Jewelers screwdriver or equivalent small, very thin bladed screwdriver.

B. Adjust Control Cabin Temperature Control Valve Position Potentiometer

(1) Connect external electrical power and energize the following circuit breaker panels:

(a) 115V AC BUS NO. 4 (P4)

(b) RADIO AND 28V DC TR BUSSES (P5)

(2) Check that the A/C VALVE AND DAMPER POS IND circuit breaker is closed.

(3) Electrically drive the control valve to the full cold position.

(4) Turn the valve position selector switch on the flight engineer's upper panel to the setting required to read position of control cabin temperature control valve.

(5) Loosen screws in potentiometer retaining clamps and rotate the potentiometer housing relative to its shaft until the indicator reads "CLOSED" then tighten screws.

<u>NOTE</u>: The full cold position of the control valve corresponds to "CLOSED" on the indicator dial, and full hot corresponds to "OPEN."

(6) Electrically operate the control valve to the full hot position and check reading of indicator.

(a) If indicator does not read "OPEN," note deviation, loosen potentiometer clamp screws, and rotate the potentiometer housing relative to its shaft until one-half the deviation is corrected, then retighten clamps screws.

(b) Electrically operate the control valve to the full cold position.

(c) Gain access to the valve and damper position indicator control unit located in the J23 relay shield and remove the trim pot cover plate. (See figure 202.)

(d) Adjust the trim pot corresponding to the control cabin temperature control valve position potentiometer with a jewelers screwdriver until the indicator reads "CLOSED."

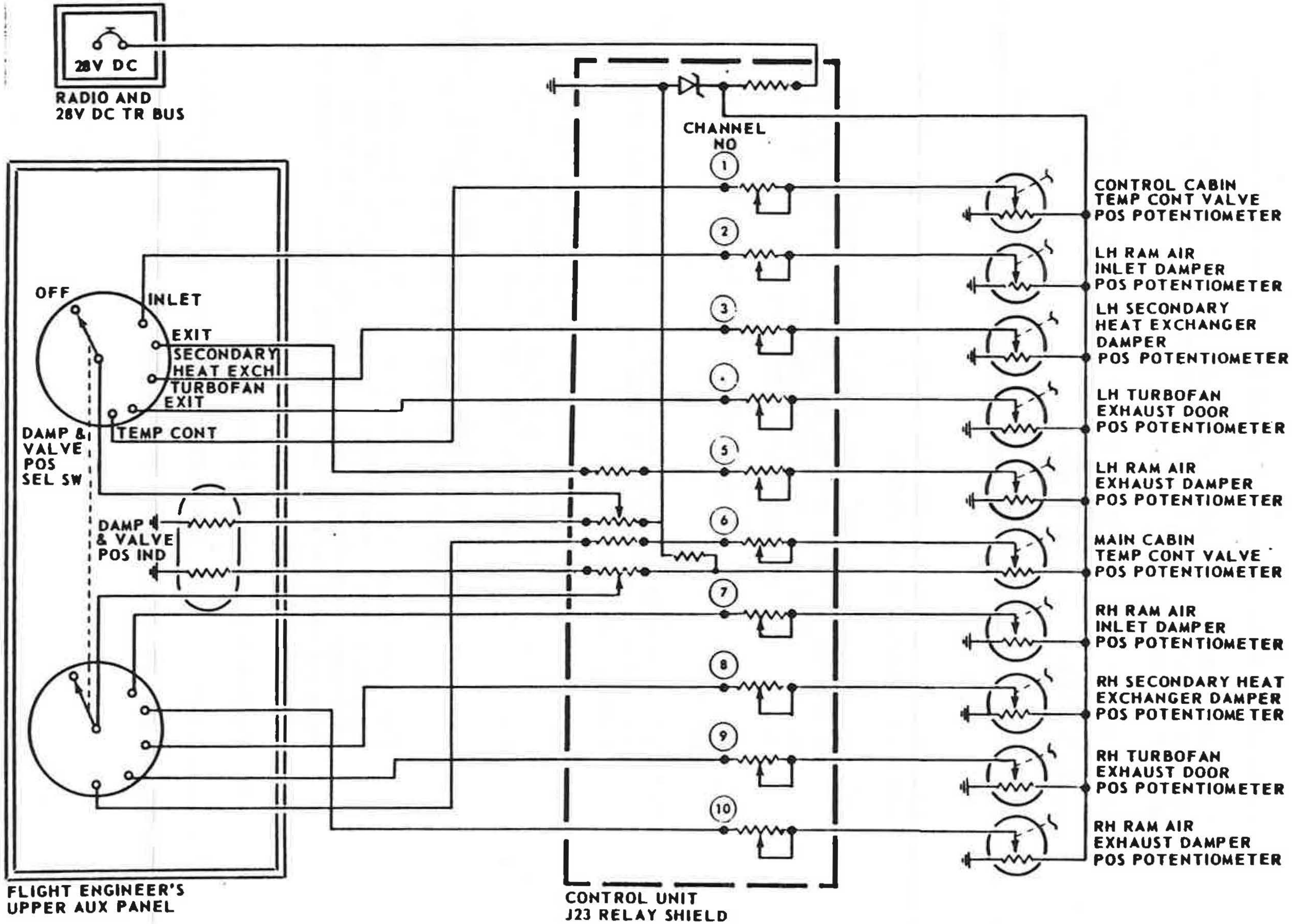
<u>CAUTION</u>: DO NOT MOVE UNNUMBERED SCREWS. THESE ARE FOR FACTORY ADJUSTMENT AND IF MOVED MAY RUIN THE TRIM UNIT.

(e) Electrically operate the valve to the full hot position. Indicator should read correctly (i.e. "OPEN"). If not the adjustment procedure, steps (3) through (6), should be repeated until both extremes of valve travel correspond to indicator reading.

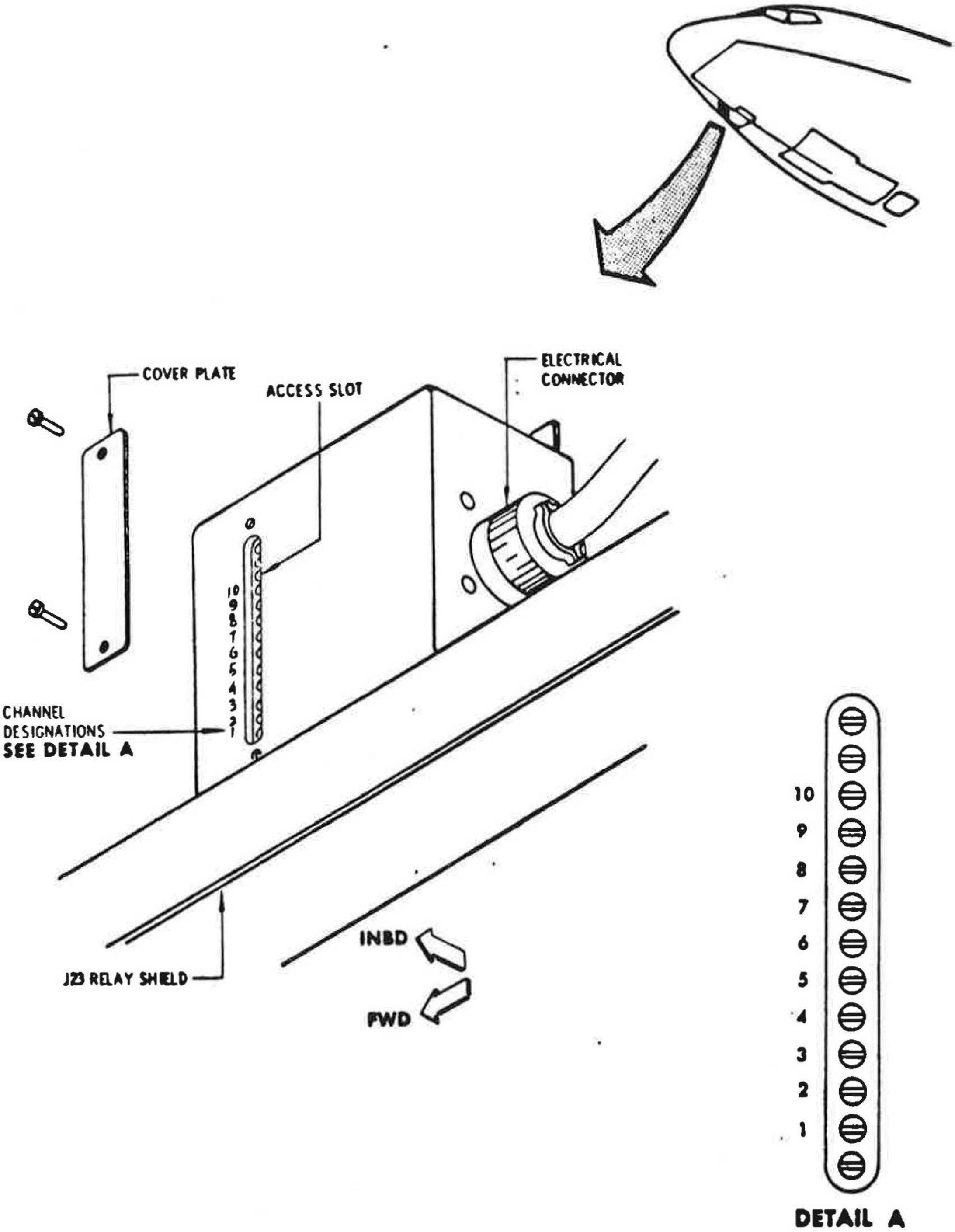
(f) Replace trim pot cover plate.

(7) Return airplane electrical system to normal ground configuration.

(8) Disconnect electrical power from airplane.



Valve and Damper Position Indicator Control Unit
Figure 202 (Sheet 1 of 2)



Valve and Damper Position Indicator Control Unit
Figure 202 (Sheet 2 of 2)

RAM AIR EXHAUST DAMPER ASSEMBLY - MAINTENANCE PRACTICES

EFFECTIVITY

TURBOFAN

1. General

A. The ram air exhaust damper actuator and the damper position potentiometer may be removed and installed as separate units. To remove the exhaust damper as a single unit it is necessary to remove the potentiometer from its torque shaft, disconnect the actuator, and remove the turbofan.

B. Since the ram air exhaust damper actuator is wired through the safety switch on the torsion link of the main landing gear the exhaust damper is normally in the closed position when the airplane is on the ground. To electrically operate the exhaust damper to the open position when the airplane is on the ground it is necessary to simulate flight conditions. On method of doing this is as follows:

(1) Connect external electrical power to the airplane and energize the following circuit breaker panels:

(a) 115V AC BUS NO. 4 (P4)

(b) RADIO AND 28V DC T-R BUSSES (P5)

(2) Pull the two water drain mast heater circuit breakers on the 28V SERVICE LIGHTS AND 115V AC BUS NO. 1 (P1) circuit breaker panel.

CAUTION: WATER DRAIN MAST HEATER CIRCUIT BREAKERS MUST BE OPEN WHILE SIMULATING FLIGHT CONDITIONS TO PREVENT OVERHEATING THE MAST HEATERS.

(3) Turn the ram air exhaust switch, on the flight engineer's panel, to the "OPEN" position.

(4) Operate the ram air exhaust damper actuator by means of the two main gear oleo safety switches located on the main gear shock struts. (See figure 201.)

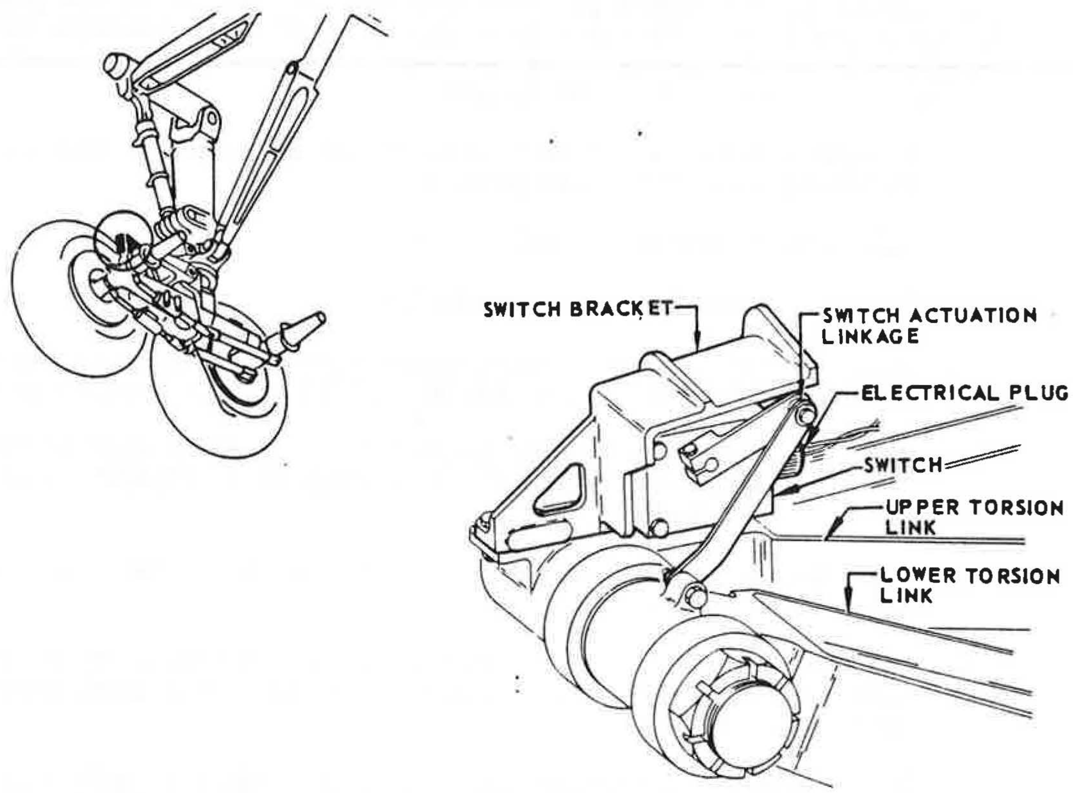
(a) Disconnect actuation linkage, of the left hand safety switch, from upper torsion link of the landing gear, by removing one bolt.

(b) Move left hand safety switch to the flight position.

(c) Disconnect actuation linkage, of the right hand safety switch, from upper torsion link of landing gear.

(d) Open ram air exhaust damper by moving right hand safety switch to the flight position.

(e) Close ram air exhaust damper by moving right hand safety switch to the ground position.



Main Gear Oleo Safety Switch Installation
Figure 201

2. Removal/Installation Ram Air Exhaust Damper Actuator

A. Remove Ram Air Exhaust Damper Actuator

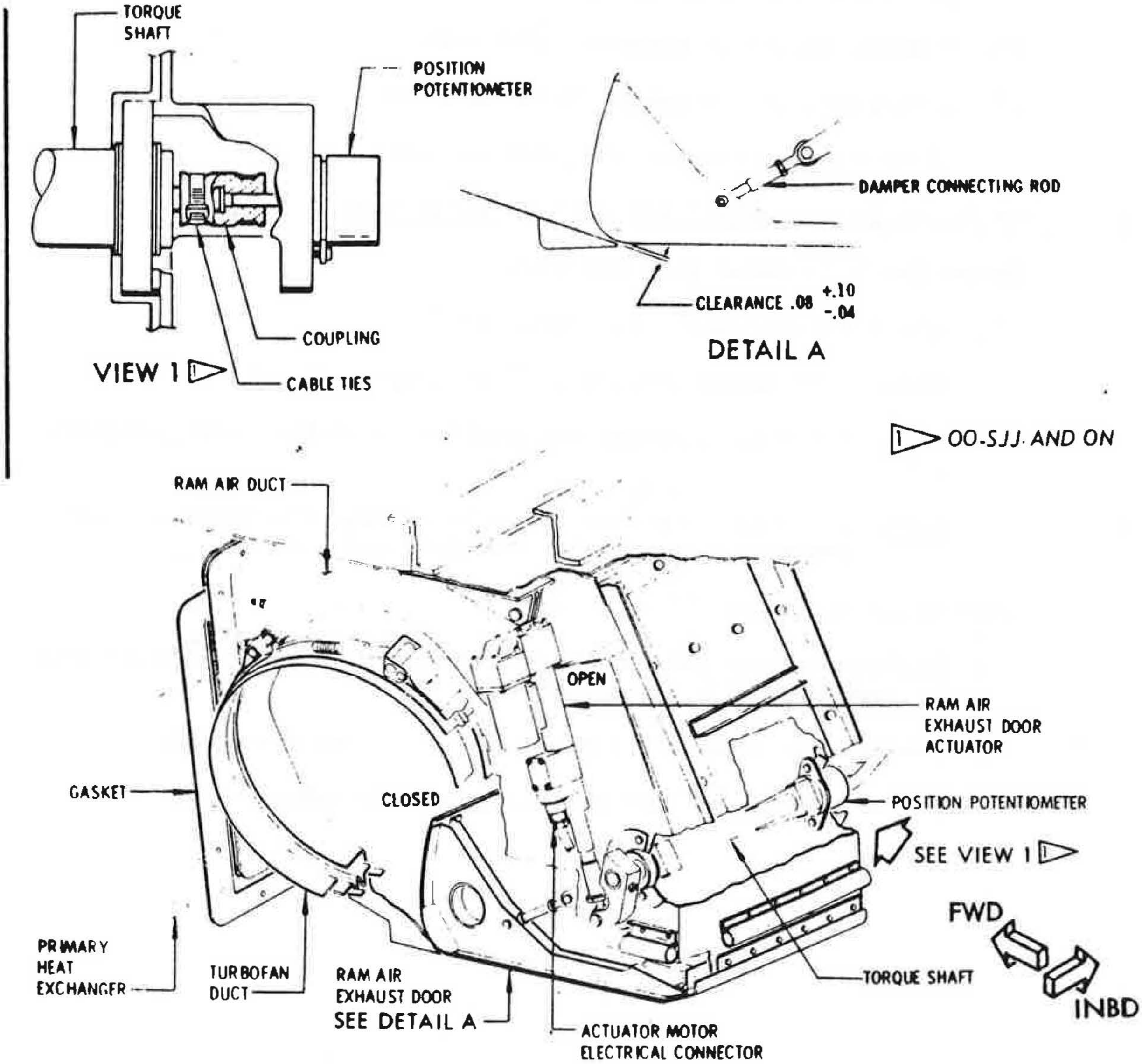
(1) Open air conditioning equipment bay door.

(2) Disconnect electrical connector from exhaust damper actuator. (See figure 202.)

(3) Disconnect bonding jumper.

(4) Disconnect actuator from damper crank.

(5) Disconnect actuator from support bracket.



Ram Air Exhaust Door Actuator
Figure 202

B. Install Ram Air Exhaust Damper Actuator

(1) Attach exhaust damper actuator to support bracket.

(2) Attach bonding jumper.

(3) Connect electrical connector to actuator and lockwire.

(4) Electrically operate the actuator to the fully extended position.

(5) Move ram air exhaust damper to the closed position.

(6) Manually adjust length of actuator jackscrew to align hole in jackscrew with holes in the end of the damper crank.

(7) Tighten jam nut on actuator jackscrew.

(8) Attach actuator jackscrew to damper crank.

(9) Close air conditioning equipment bay door.

3. <u>Removal/Installation Ram Air Exhaust Duct and Damper</u>

A. Remove Ram Air Exhaust Duct and Damper

(1) Open air conditioning equipment bay door.

(2) Remove exit damper actuator. (See paragraph 2.A.)

(3) Remove position potentiometer from torque shaft. (See paragraph 4.A.)

NOTE: It is not necessary to cut wires from potentiometer unless removing potentiometer from airplane.

(4) Remove turbofan. (See 21-2-191.)

(5) Disconnect joint between aft and forward cooling air exhaust duct by removing bolts. Remove gasket.

(6) Remove bolts from duct support bracket. (See figure 202.)

(7) Remove aft part of duct containing ram air exhaust damper.

B. Install Ram Air Exhaust Duct and Damper

(1) Lift aft part of exhaust duct and damper into place, install gasket and bolt to the forward ram air duct.

(2) Attach ram air exhaust duct to support bracket.

(3) Attach position potentiometer to torque shaft. (See paragraph 4.B.)

(4) Install exhaust damper actuator. (See paragraph 2.B.)

(5) Adjust damper per paragraph 5.A.

(6) Install turbofan.

(7) Close air conditioning equipment bay door.

4. Removal/Installation Ram Air Exhaust Damper Position Potentiometer

A. Remove Ram Air Exhaust Damper Position Potentiometer

(1) Pull A/C VALVE AND DAMPER POS INDICATOR circuit breaker on radio and 28V DC T-R busses circuit breaker panel P5.

(2) Open air conditioning equipment bay door.

(3) Disconnect position potentiometers wires by cutting wires at splice closest to potentiometer.

(4) Move the ram air exhaust damper to the closed position.

(5) Release coupling.

(a) On airplanes OO-SJA thru OO-SJH, loosen set screws nearest potentiometer in coupling between shaft of potentiometer and damper torque tube.

(b) On airplanes OO-SJJ and on, cut cable tie on each end of coupling and remove.

(6) Remove screws, washers and clamps which lock potentiometer in position.

(7) Remove potentiometer from coupling.

B. Install Ram Air Exhaust Damper Position Potentiometer

(1) Check that A/C VALVE AND DAMPER POS INDICATOR circuit breaker on radio and 28V DC T-R busses circuit breaker panel (P5) is open.

(2) Move the ram air exhaust damper to closed.

(3) Splice potentiometer wiring to airplane wiring.

(4) Close A/C VALVE AND DAMPER POS INDICATOR circuit breaker and immediately rotate potentiometer shaft until indicator on flight engineer's panel reads approximately position of damper.

(5) Insert potentiometer shaft in coupling.

CAUTION: POTENTIOMETER SHAFT MUST NOT BUTT AGAINST DAMPER TORQUE SHAFT OR A DAMAGED POTENTIOMETER MAY RESULT FROM VIBRATION.

(6) Secure coupling.

(a) On airplanes 00-SJA thru 00-SJH, tighten lock screws in shaft coupling.

(b) On airplanes 00-SJJ and on, install cable ties on each end of coupling and tighten to just visible deform the coupling. Trim off tail of cable tie as close to coupling as possible. (See figure 202.)

(c) Install clamps, washers, and screws which hold potentiometer housing in place but do not tighten.

(7) Adjust potentiometer per paragraph 6.B.

(8) Tighten screws.

(9) Close air conditioning equipment bay doors.

5. Adjustment/Test Ram Air Exhaust Damper

A. Adjust Ram Air Exhaust Damper

(1) Remove turbofan. (See 21-2-191.)

(2) Disconnect actuator from damper crank.

(3) Rotate damper from full closed to full open position. If damper contacts the sides of the duct in any position adjust damper.

(a) Loosen bolts attaching damper hinge to the duct.

(b) Shift the damper to clear the duct walls.

(c) Tighten the bolts in (a).

(4) With door in closed position adjust damper connecting rods until damper closes within tolerances shown in figure 202, detail A.

(5) Connect actuator to damper crank.

6. Adjustment/Test Ram Air Exhaust Damper Position Potentiometer

A. Special Equipment

(1) Jewelers screwdriver or equivalent small, very thin bladed screwdriver.

B. Adjust Ram Air Exhaust Damper Position Potentiometer.

(1) Connect external electrical power and energize the following circuit breaker panels:

(a) 115V AC BUS NO. 4 (P4)

(b) RADIO AND 28V DC T-R BUSSES (P5)

(2) Check that the following circuit breakers are closed:

(a) A/C VALVE AND DAMPER POS IND

(b) LH RAM AIR AND HEAT EXCHANGER DAMPER

(c) RH RAM AIR AND HEAT EXCHANGER DAMPER

(3) Check that exhaust damper is in the closed position.

(4) Move the valve selector switch on the flight engineer's upper instrument panel to the setting required to read position of exit damper door.

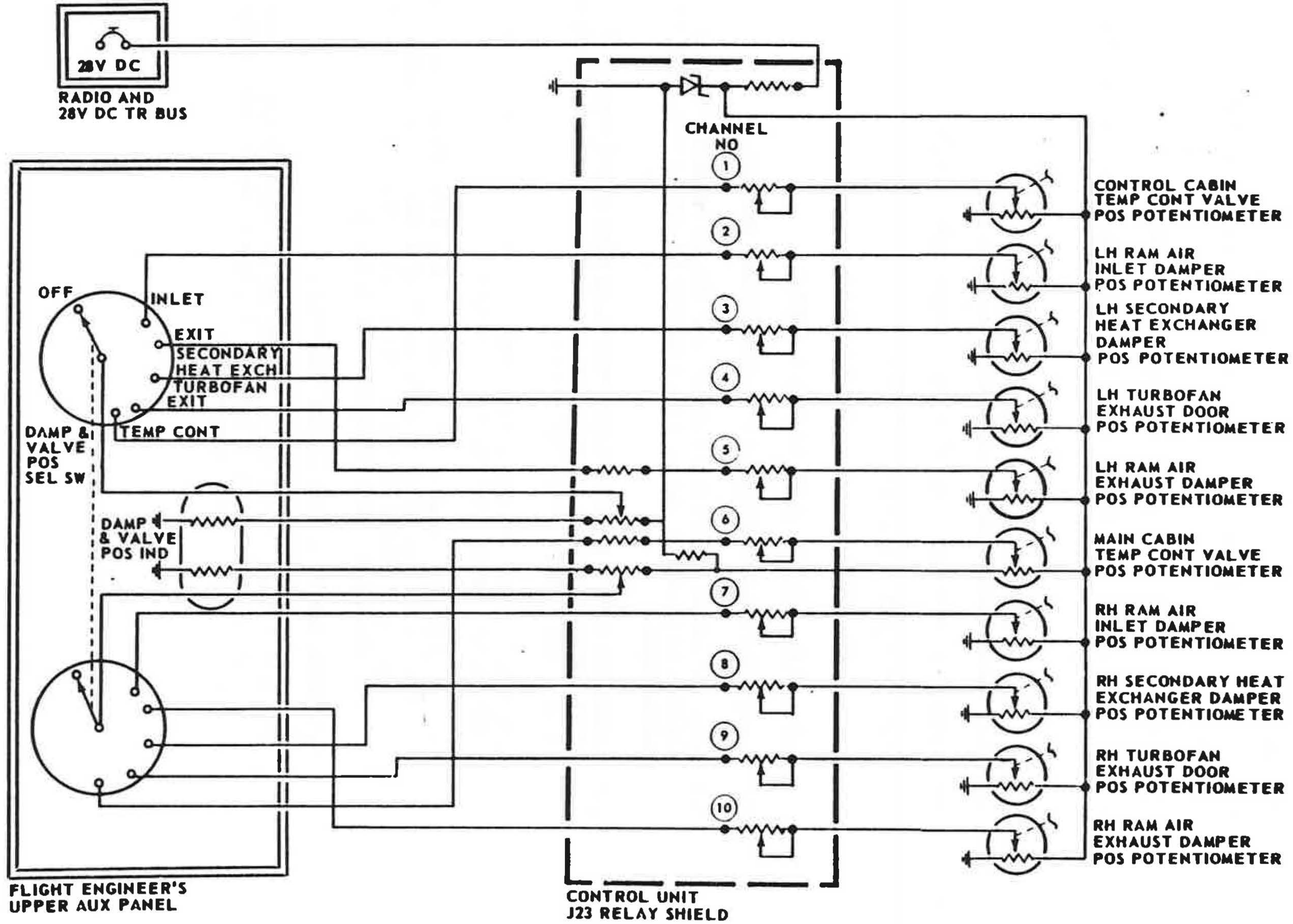
(5) Loosen screws in potentiometer retaining clamps and rotate the potentiometer housing relative to its shaft until the indicator reads closed thentighten the screws.

(6) Electrically operate the ram air exit damper to the fully open position and check reading of indicator.

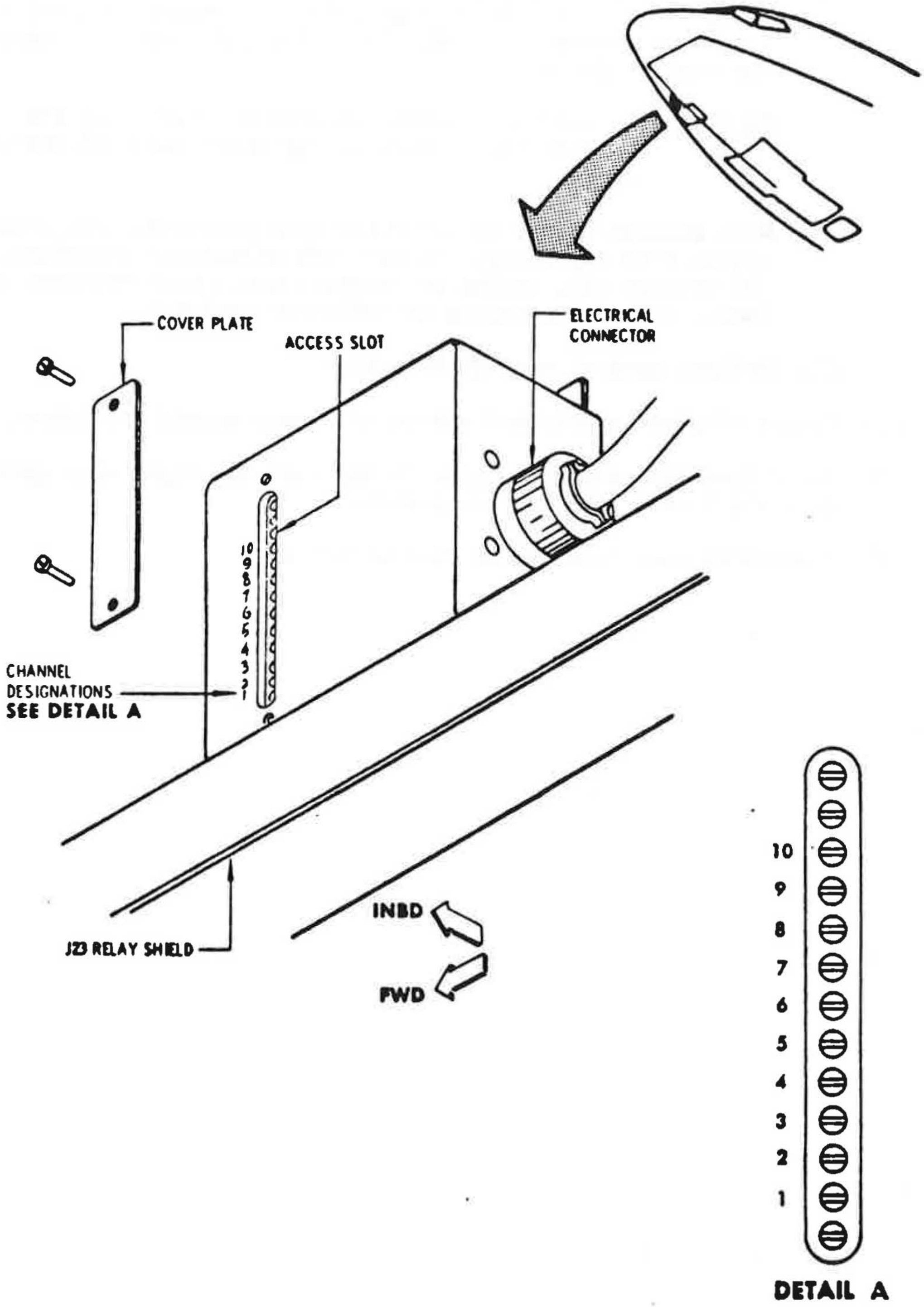
(a) If indicator does not read fully open, note deviation, loosen potentiometer clamp screws, and rotate the potentiometer housing relative to its shaft until one-half the deviation is corrected, then retighten clamp screws.

(b) Move damper to the closed position.

(c) Gain access to the valve and damper position indicator control unit located in the J23 relay shield and remove the control unit cover plate. (See figure 203.)



Valve and Damper Position Indicator Control Unit
Figure 203 (Sheet 1 of 2)



Valve and Damper Position Indicator Control Unit
Figure 203 (Sheet 2 of 2)

(d) Adjust the trim pot corresponding to the potentiometer being adjusted (either left or right, ram air exhaust damper) with a jeweler's screwdriver until the indicator reads the position of the exhaust damper.

CAUTION: DO NOT MOVE UNNUMBERED SCREWS. THESE ARE FOR FACTORY ADJUSTMENTS AND IF MOVED MAY RUIN THE CONTROL UNIT.

(e) Move exhaust damper to the fully open position. Indicator should read correctly. If not, the adjustment procedure, steps (3) through (6), should be repeated until both extremes of damper travel correspond to indicator reading.

(f) Replace control unit cover plate.

(7) Return airplane electrical system to normal ground configuration.

(8) Check that the actuation links on the left and right main gear oleo safety switches have been reconnected.

(9) Disconnect electrical power from airplane.

TURBOFAN EXHAUST DOOR ASSEMBLY - MAINTENANCE PRACTICES

EFFECTIVITY
TURBOFAN

1. General

A. Turbofan exhaust door actuators are wired through the safety switches on the main landing gear torsion links. The turbofan exhaust doors are normally open when the airplane is on the ground and in order to electrically operate them to the closed position, it is necessary to simulate flight conditions. One method of doing this is as follows:

(1) Connect external electrical power to the airplane and energize the following circuit breaker panels:

(a) 115V AC BUS NO. 4 (P4)

(b) RADIO AND 28 V DC T-R BUSSES (P5)

(2) Pull the two water drain mast heater circuit breakers on the 28V SERVICE LIGHTS AND 115V AC BUS NO. 1 (P1) circuit breaker panel.

CAUTION: WATER DRAIN MAST HEATER CIRCUIT BREAKERS MUST BE OPEN WHILE SIMULATING FLIGHT CONDITIONS TO PREVENT BURNING THE MAST HEATERS OUT.

(3) Turn the turbofan exhaust door switch, on the flight engineer's panel, to the "CLOSED" position.

(4) Operate the turbofan exhaust door actuator by means of the two main gear oleo safety switches located on the main gear shock struts:

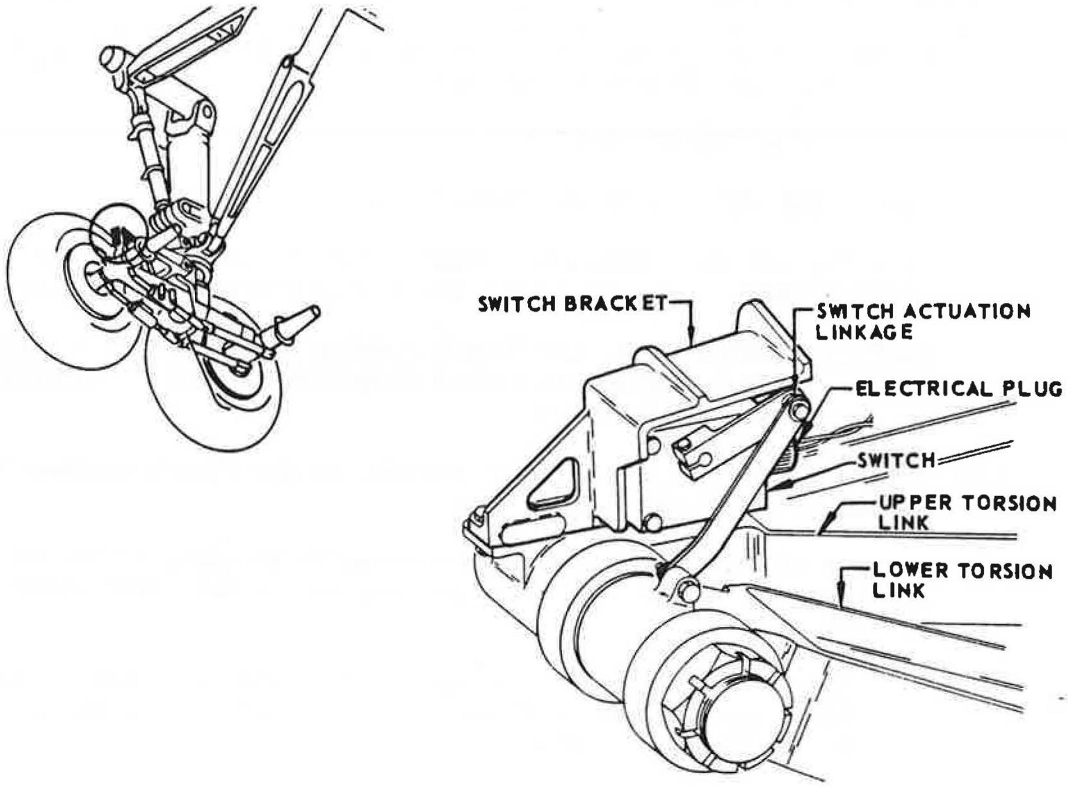
(a) Disconnect actuation linkage, of the left hand safety switch, from upper torsion link of the landing gear, by removing one bolt. See figure 201.

(b) Move left hand safety switch to the flight position.

(c) Disconnect actuation linkage, of the right hand safety switch, from upper torsion link of landing gear.

(d) Close turbofan exhaust damper by moving right hand safety switch to the flight position.

(e) Open turbofan exhaust damper by moving right hand safety switch to the ground position.



Main Gear Oleo Safety Switch Installation
Figure 201

2. **Removal/Installation Turbofan Exhaust Door Actuator**

A. **Remove Turbofan Exhaust Door Actuator.**

(1) Remove access door forward of turbofan door.

(2) Reach through opening and disconnect electrical connector of door actuator.

(3) Disconnect bonding jumper.

(4) Remove actuator mounting bolts.

(5) Remove actuator.

B. Install Turbofan Exhaust Door Actuator

(1) Connect electrical connector to door actuator.

(2) Install bonding jumper.

(3) Electrically operate actuator to limit of travel in the direction corresponding to the door full open position.

(4) Hold turbofan door fully open.

(5) Align index marks on torque shaft spline to straddle index mark on actuator spline. Insert actuator spline in torque tube spline.

(6) Align mounting holes in actuator with mounting holes in duct, and install mounting bolts.

(7) With the turbofan door fully open check that the clearance between the edge of the door and the torque tube is 0.20(± 0.10).

(8) If clearance between door and torque tube is not 0.20 (± 0.10), adjust clearance with the following actuator adjustment screws:

(a) For left turbofan exhaust door actuator move the clockwise limit switch adjustment screw. (See figure 202.)

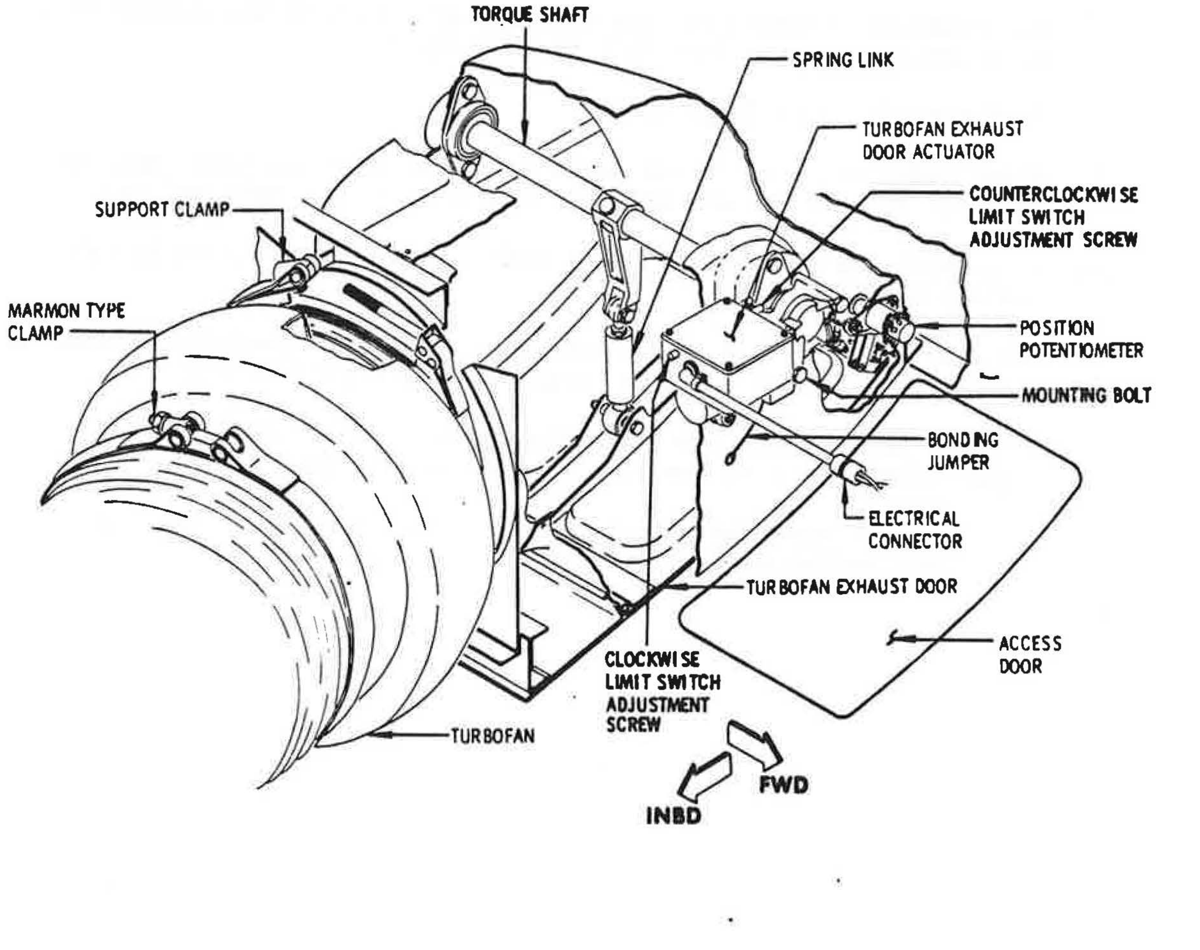
(b) For right turbofan exhaust door actuator move the counterclockwise limit switch adjustment screw. (Refer to figure 202.)

NOTE: 1. Adjust actuator limit switch only if required to maintain clearance called out in step (7).

2. If mounting holes in actuator and duct cannot be aligned, interference exists between damper and torque shaft which must be eliminated by adjusting actuator limit switch before actuator can be mounted.

(9) Return airplane electrical system to normal ground condition.

(10) Replace access panel immediately forward of turbofan damper.



Turbofan Exhaust Door and Actuator
Figure 202

3. Removal/Installation Turbofan Exhaust Door Position Potentiometer

A. Remove Turbofan Exhaust Door Position Potentiometer

(1) Pull A/C VALVE AND DAMPER POS INDICATOR circuit breaker on radio and 28V DC TR busses circuit breaker panel P5.

(2) Remove access door forward of turbofan door.

(3) Cut position potentiometer wires at splice closest to potentiometer.

(4) Check that the turbofan exhaust door is in the open position.

(5) Loosen lock screw in position indicator shaft.

(6) Remove screws, washers, and tabs which lock potentiometer in the set position.

(7) Remove potentiometer.

B. Install Turbofan Exhaust Door Position Potentiometer

(1) Check that A/C VALVE AND DAMPER POS INDICATOR circuit breaker on the radio and 28V DC TR busses circuit breaker panel (P5) is open.

(2) Check that the turbofan exhaust door is open.

(3) Splice potentiometer wiring to airplane wiring.

(4) Close A/C VALVE DAMPER POS INDICATOR circuit breaker and immediately rotate potentiometer housing with respect to potentiometer shaft until indicator on flight engineer's panel reads approximately position of damper.

(5) Loosen lock screw in position indicator shaft.

(6) Insert potentiometer shaft in position indicator shaft and tighten lock screw.

(7) Install tabs, set screws and washers which hold the potentiometer housing in place but do not tighten.

(8) Adjust position potentiometer per paragraph 4.

(9) Tighten set screws.

(10) Install access door forward of turbofan damper.

4. Adjustment/Test Turbofan Exhaust Door Position Potentiometer

A. Special Equipment

(1) Jewelers screwdriver or equivalent small, very thin bladed screwdriver.

B. Adjust Turbofan Exhaust Door Position Potentiometer

(1) Connect external electrical power and energize the following circuit breaker panels:

(a) 115V AC BUS NO. 4 (P4)

(b) RADIO AND 28V DC T-R BUSSES (P5)

(2) Check that the following circuit breakers are closed:

(a) A/C VALVE AND DAMPER POS IND

(b) LH TURBOFAN DOOR AND SHUTOFF VALVE

(c) RH TURBOFAN DOOR AND SHUTOFF VALVE

(3) Electrically operate the turbofan exhaust door to the closed position.

NOTE: Normally the turbofan exhaust damper is open during ground operation. To operate the doors and dampers from the flight engineer's control switches will require simulating an airplane flight configuration. Refer to paragraph 1.

(4) Turn the damper and valve position selector switch on the flight engineer's upper panel to the setting required to read position of turbofan exhaust door.

(5) Loosen screws in potentiometer retaining clamp and rotate the potentiometer housing relative to its shaft until the indicator reads closed then tighten the screws.

(6) Electrically operate the turbofan exhaust damper to the fully open position and check the reading of the indicator.

(a) If the indicator does not read fully open, note deviation, loosen potentiometer clamp screws, and rotate the potentiometer housing relative to its shaft until one-half the deviation is corrected, then retighten clamp screws.

(b) Move door to the closed position.

(c) Gain access to the valve and damper position indicator control unit located in the J23 relay shield and remove the control unit cover plate. (See figure 203.)

(d) Adjust the trim pot corresponding to the potentiometer being adjusted (either left or right, turbofan exhaust door) with a jewelers screwdriver until the indicator reads the position of the exhaust door.

CAUTION: DO NOT MOVE UNNUMBERED SCREWS. THESE ARE FOR FACTORY ADJUSTMENTS AND IF MOVED MAY RUIN THE CONTROL UNIT.

(e) Move exhaust door to the fully open position. Indicator should read correctly. If not the adjustment procedure, steps (3) through (6), should be repeated until both extremes of damper travel correspond to indicator reading.

(f) Replace control unit cover plate.

(7) Return airplane electrical system to normal ground configuration.

(8) Check that actuation linkage for left and right main gear safety switches is reconnected.

(9) Disconnect electrical power from airplane.

C. Test Turbofan Exhaust Door

(1) Normally the turbofan exhaust door is open during ground operation. For this test simulation of the flight configuration is required. Pull the safety relays circuit breaker on the P5 CB panel.

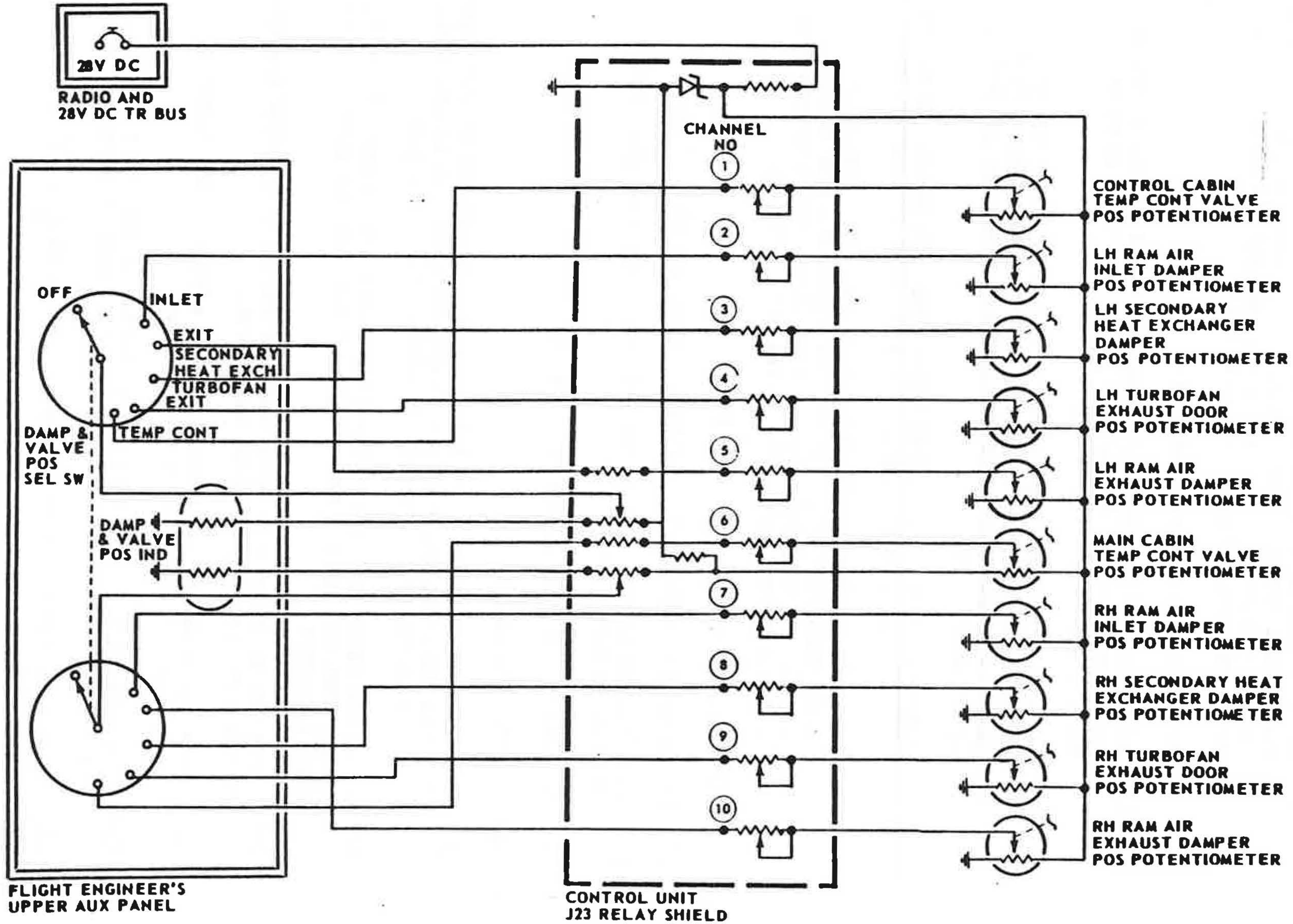
(2) Using the valve position indicator and selector on the F/E panel, verify that the ram air exit damper is open and the turbofan exit door is closed.

(3) Place the turbofan exit valve override switch in the OPEN position. Verify that the turbofan exit door opens.

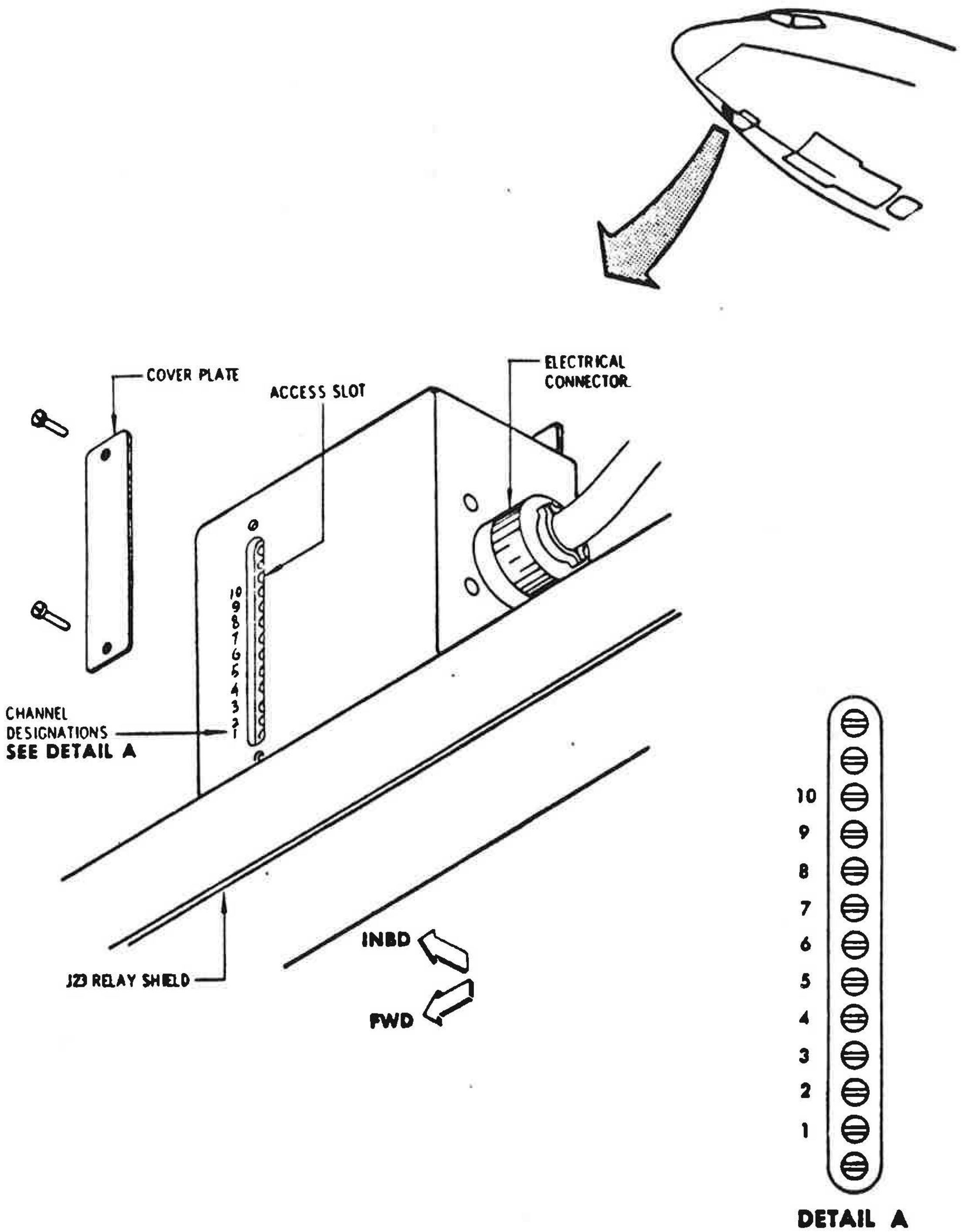
(4) Place the turbofan exit valve override switch in the NORMAL position. Verify that the turbofan exit door closes.

(5) By holding the ram air exit damper switch in the CLOSE position, close the ram air exit damper. Verify that the turbofan exit door opens.

(6) Close safety relays circuit breaker pulled in step (1).



Valve and Damper Position Indicator Control Unit
Figure 203 (Sheet 1 of 2)



Valve and Damper Position Indicator Control Unit
Figure 203 (Sheet 2 of 2)

RAM AIR INLET DAMPER ASSEMBLY - MAINTENANCE PRACTICES

1. General

   A. Ram air inlet damper actuators are wired through the safety switches on the main landing gear torsion links. The inlet dampers are normally open when the airplane is on the ground and in order to electrically operate them to the closed position, it is necessary to simulate flight conditions. One method of doing this is as follows:

      (1) Connect external electrical power to the airplane and energize the following circuit breaker panels:

         (a) 115V AC BUS NO. 4 (P4)

         (b) RADIO AND 28V DC T-R BUSSES (P5)

      (2) Check that the following circuit breakers are closed:

         (a) AIR COND VALVES & DAMPER POSITION IND

         (b) LH TURBO FAN DOOR AND SHUTOFF VALVE

         (c) LH RAM AIR AND HEAT EXCHANGER DAMPER

         (d) RH TURBO FAN DOOR AND SHUTOFF VALVE

         (e) RH RAM AIR AND HEAT EXCHANGER DAMPER

      (3) Pull the two water drain mast heater circuit breakers on the 28V SERVICE LIGHTS AND 115V AC BUS NO. 1 (P1) circuit breaker panel.

         CAUTION: WATER DRAIN MAST HEATER CIRCUIT BREAKERS MUST BE OPEN WHILE SIMULATING FLIGHT CONDITIONS TO PREVENT BURNING THE MAST HEATERS OUT.

      (4) Turn the ram air INLET VALVE switch, on the flight engineer's panel, to the CLOSE position.

      (5) Operate the ram air inlet damper actuator by means of the two main gear oleo safety switches located on the main landing gear shock struts:

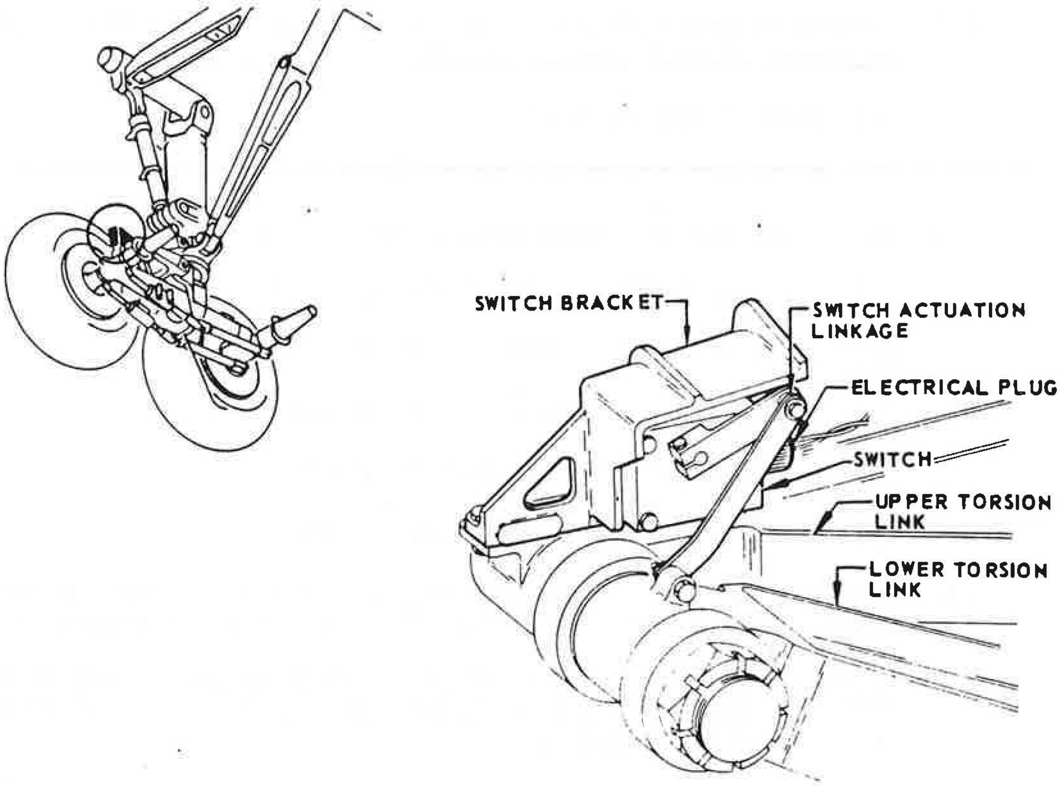
         (a) Disconnect actuation linkage, of the left hand safety switch, from upper torsion link of the landing gear, by removing one bolt. See figure 201.

         (b) Move left hand safety switch to the flight position.

(c) Disconnect actuation linkage, of the right hand safety switch, from upper torsion link of landing gear.

(d) Close ram air inlet damper by moving right hand safety switch to the flight position.

(e) Open ram air inlet damper by moving right hand safety switch to the ground position.



Main Gear Oleo Safety Switch Installation
Figure 201

2. Removal/Installation Ram Air Inlet Damper Actuator

A. Remove Ram Air Inlet Damper Actuator

(1) Open air conditioning equipment bay access door.

(2) Remove electrical connector from damper actuator (See figure 202.)

(3) Disconnect bonding jumper from position potentiometer support bracket.

(4) Remove bolt attaching actuator rod to actuator crank.

(5) Remove bolt holding actuator to support fitting.

B. Install Ram Air Inlet Damper Actuator

(1) Attach actuator to support fitting with bolt, nut and two washers.

(2) Place ram air inlet panels in the fully open position and temporarily restrain them.

(3) Connect electrical connector to damper actuator.

(4) Connect bonding jumper to position potentiometer support bracket.

(5) Electrically operate the actuator to the fully retracted position.

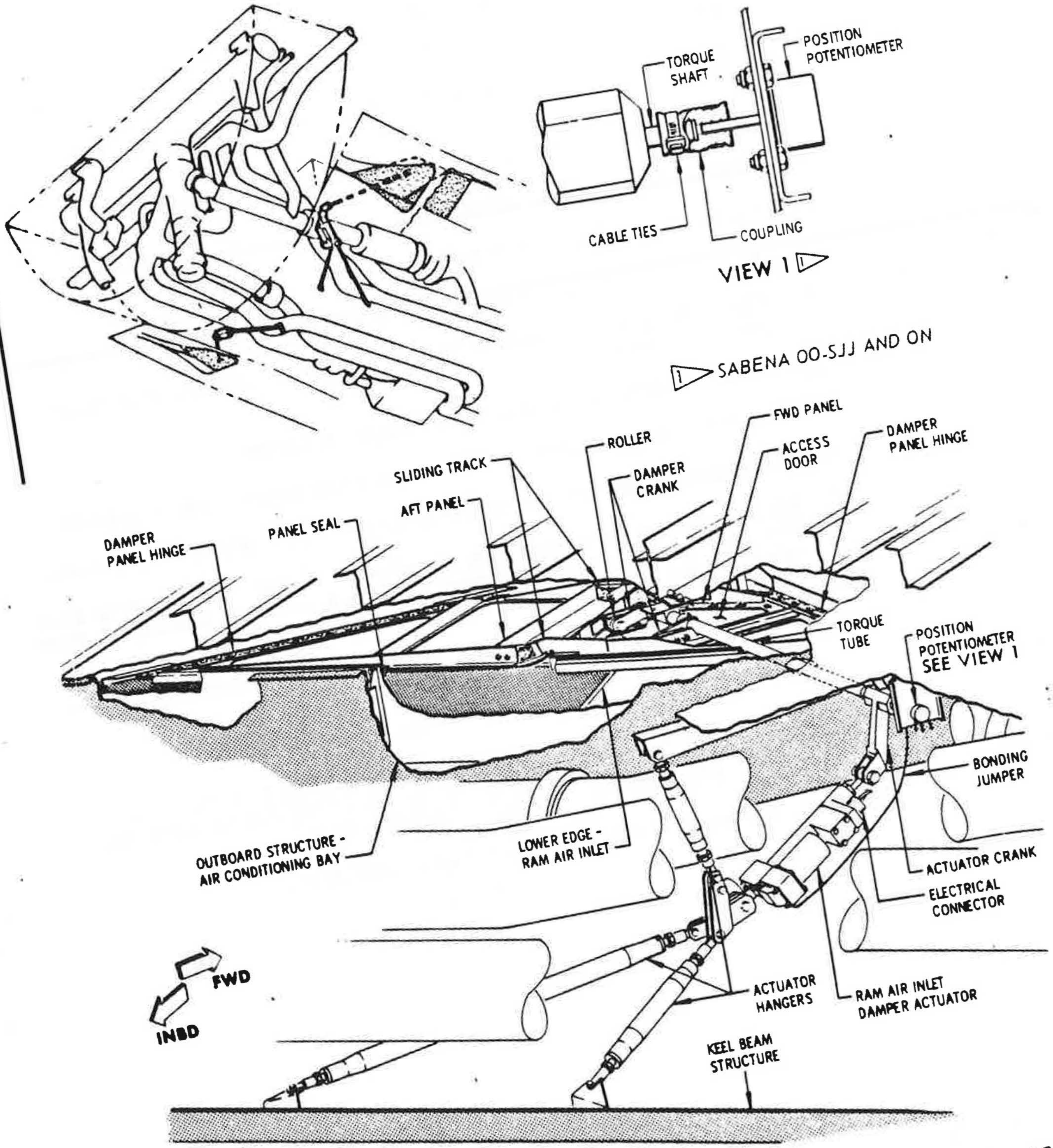
(6) Adjust bearing on movable end of actuator so that the mounting bolt fits freely through the actuator crank and actuator bearing, tighten actuator jam nut against lockwasher.

(7) Install mounting bolt, nut and two washers that attach actuator to actuator crank.

(8) Remove temporary restrainment of modulation panels.

CAUTION: FAILURE TO REMOVE TEMPORARY RESTRAINMENT OF INLET PANELS WILL RESULT IN DAMAGE TO THE STRUCTURE AND/OR ACTUATOR IF THE ACTUATOR IS OPERATED ELECTRICALLY.

(9) Close air conditioning equipment bay access door.



Ram Air Inlet Damper and Actuator
Figure 202

3. Removal/Installation Ram Air Inlet Damper Position Potentiometer

A. Remove Ram Air Inlet Damper Position Potentiometer

(1) Open AIR COND VALVES & DAMPER POSITION IND circuit breaker on panel P5.

(2) Open air conditioning equipment bay access door.

(3) Cut wires at splice closest to potentiometer.

(4) Loosen wire bundle clamp on position potentiometer support bracket and remove potentiometer wires from clamp.

(5) Check that ram air inlet damper is in the open position.

(6) Release coupling.

(a) On airplanes SABENA OO-SJA thru OO-SJH, IIA EI-AMW and EI-ANO, and AII VT-DJI thru VT-DSI, loosen set screws nearest potentiometer in coupling between shaft of potentiometer and the actuator crank.

(b) On airplanes not listed in step (a), cut cable tie on each end of coupling and remove.

(7) Remove screws, washers and clamps which lock potentiometer in position.

(8) Remove potentiometer from coupling.

B. Install Ram Air Inlet Damper Position Potentiometer

(1) Check that AIR COND VALVES & DAMPER POSITION IND circuit breaker on panel P5 is open.

(2) Check that ram air inlet damper is in the open position.

(3) Insert potentiometer wires in wire bundle clamp and splice potentiometer wiring to airplane wiring.

(4) Close AIR COND VALVES & DAMPER POSITION IND circuit breaker and immediately rotate potentiometer housing with respect to potentiometer shaft until indicator on flight engineer's panel reads approximately the position of damper.

(6) Insert potentiometer shaft in coupling.

CAUTION: POTENTIOMETER SHAFT MUST NOT BUTT AGAINST SHAFT FROM ACTUATOR CRANK OR A DAMAGED POTENTIOMETER MAY RESULT FROM VIBRATION.

(6) Secure coupling

(a) On airplanes IIA EI-AMW and EI-ANO, AII VT-DJI thru VT-DSI, SABENA OO-SJA thru OO-SJH, tighten lock screws in shaft couplings.

(b) On all airplanes except those listed in step (a), install cable on each end of coupling and tighten to just visibly deform the coupling. Trim off tail of cable tie as close to coupling as possible. (See figure 201.)

(c) Install clamps, washers, and screws which hold potentiometer housing in place, but do not tighten.

(7) Adjust position potentiometer per paragraph 4.B.

(8) Tighten set screws.

(9) Close air conditioning equipment bay access door.

4. Adjustment/Test Ram Air Inlet Damper Position Potentiometer

A. Special Equipment

(1) Jewelers screwdriver or equivalent small, very thin bladed screwdriver.

B. Adjust Ram Air Inlet Damper Position Potentiometer

(1) Connect external electrical power and energize the following circuit breaker panels:

(a) 115V AC BUS NO. 4 (P4)

(b) RADIO AND 28V DC T-R BUSSES (P5)

(2) Check that following circuit breakers are closed:

(a) AIR COND VALVES & DAMPER POSITION IND

(b) LH TURBO FAN DOOR AND SHUTOFF VALVE

(c) RH TURBO FAN DOOR AND SHUTOFF VALVE

(3) Electrically operate the ram air inlet damper to the closed position.

NOTE: Normally the ram air inlet damper is open during ground operation. To operate the damper from the flight engineer's control switches will require simulating flight conditions. See paragraph 1.A.

(4) Turn the damper and valve position selector switch on the flight engineer's upper panel to the setting required to read position of ram air inlet damper.

(5) Loosen screws in potentiometer retaining clamp and rotate the potentiometer housing relative to its shaft until the indicator reads closed then tighten the screws.

(6) Electrically operate the inlet damper to the fully open position and check the reading of the indicator.

(a) If the indicator does not read fully open, note deviation, loosen potentiometer clamp screws, and rotate the potentiometer housing relative to its shaft until one-half the deviation is corrected, then retighten clamp screws.

(b) Move damper to the closed position.

(c) Gain access to the valve and damper position indicator control unit located in the J23 relay shield and remove the control unit cover plate. (See figure 203.)

(d) Adjust the trim pot corresponding to the potentiometer being adjusted (either left or right, ram air inlet damper) with a jewelers screwdriver until the indicator reads the position of the inlet damper.

CAUTION: DO NOT MOVE UNNUMBERED SCREWS. THESE ARE FOR FACTORY ADJUSTMENTS AND IF MOVED MAY RUIN THE CONTROL UNIT.

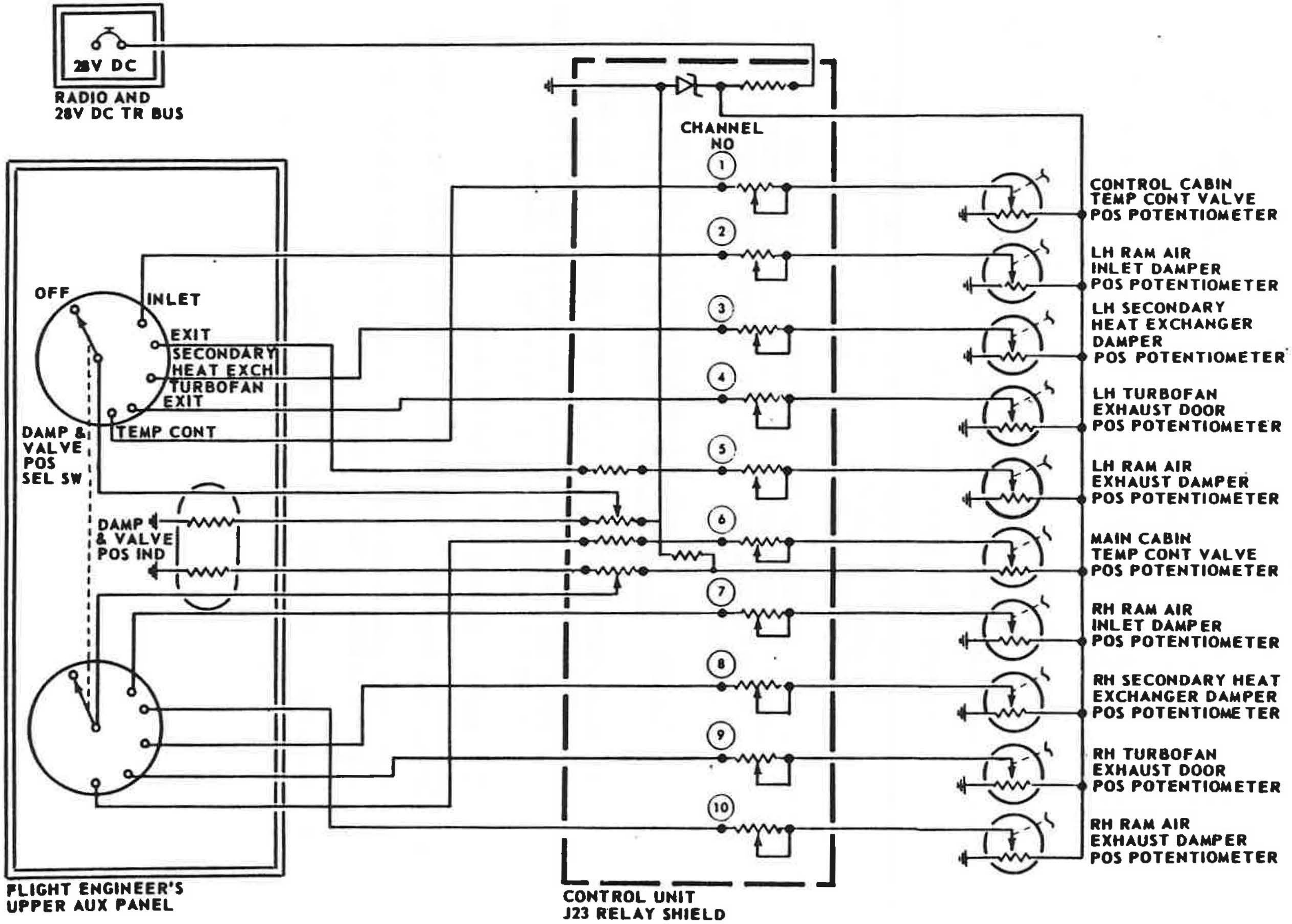
(e) Move inlet damper to the fully open position. Indicator should read correctly. If not the adjustment procedure, steps (3) through (6), should be repeated until both extremes of damper travel correspond to indicator reading.

(f) Replace control unit cover plate.

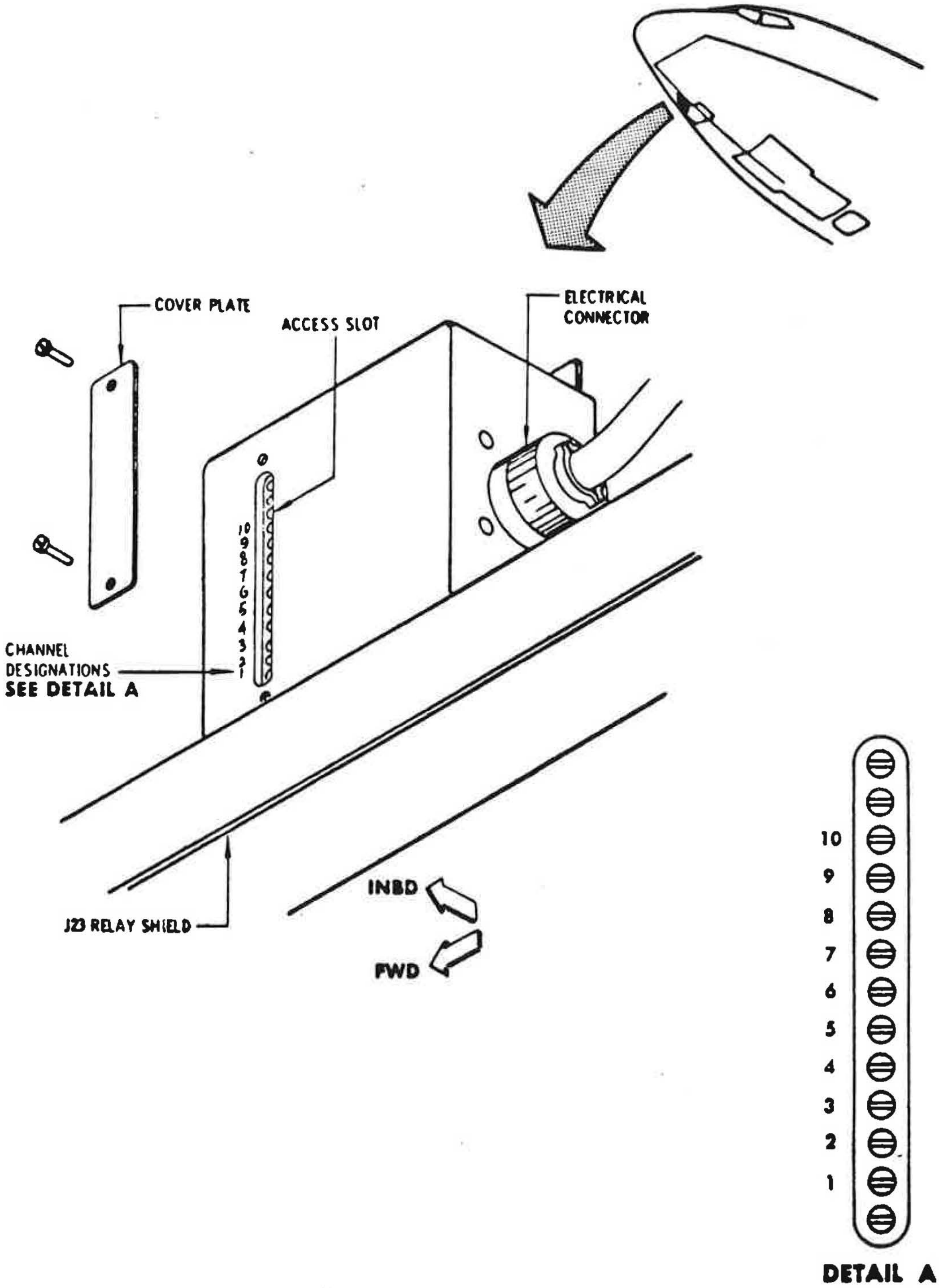
(7) Return airplane electrical system to normal ground configuration.

(8) Check that ground actuation linkage on left and right main gear safety switches is reconnected.

(9) Disconnect electrical power from airplane.



Valve and Damper Position Indicator Control Unit
Figure 203 (Sheet 1 of 2)



Valve and Damper Position Indicator Control Unit
Figure 203 (Sheet 2 of 2)

PRESSURIZATION CONTROL AND INDICATING SYSTEM - DESCRIPTION AND OPERATION

1. General

A. The pressurization control and indicating system is electropneumatically operated. An electropneumatic type relay is used to transfer from electrical to pneumatic signals at the outflow valve. Metering the exhaust of ventilating air through the electropneumatically controlled outflow valves provides the following pressurization characteristics:

(1) Constant low altitude cabin pressure can be maintained during airplane high altitude flight.

(2) Cabin pressure rate of change is controlled.

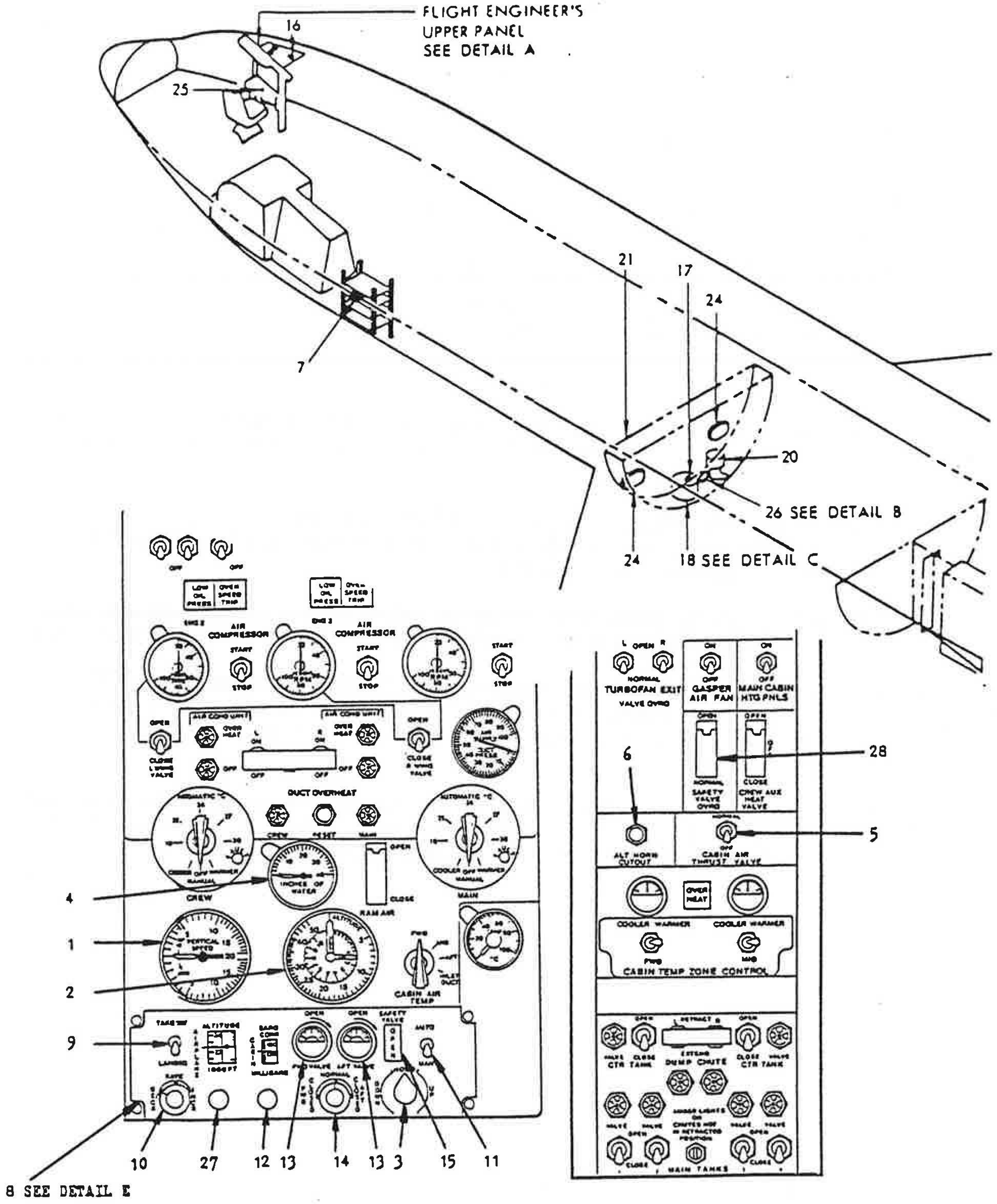
(3) Positive pressure relief at 9.42 (± 0.15) psi pressure differential is provided to protect the airplane in the event of a pressure control system failure.

(4) A negative (vacuum) pressure relief mechanism lets air in when outside pressure exceeds cabin pressure and limits differential to ten inches water pressure.

(5) A barometric correction selector helps select proper landing field altitude so the pressure differential at landing may approach zero.

(6) A cabin altitude limit control will maintain a maximum 13,000 (± 2000) feet cabin altitude if other control components fail, and as long as the pneumatic system provides sufficient air for pressurization.

B. The pressurization control system consists of a cabin pressure selector, an electronic control, two outflow valves, a safety valve, two vacuum pumps, and three thrust recovery valves. (See figure 1.)

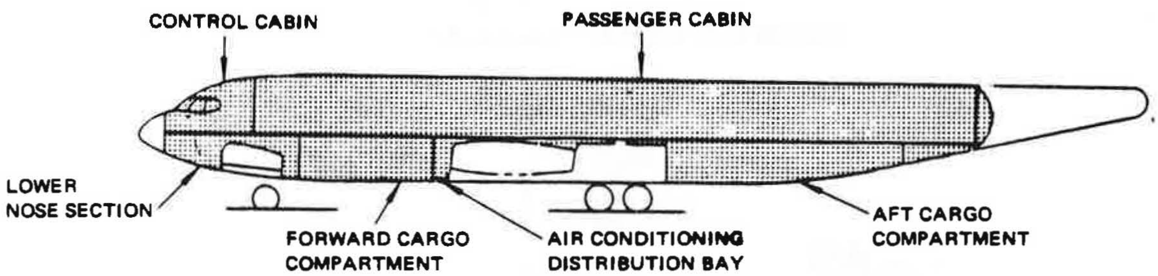


FLIGHT ENGINEER'S INSTRUMENT PANEL

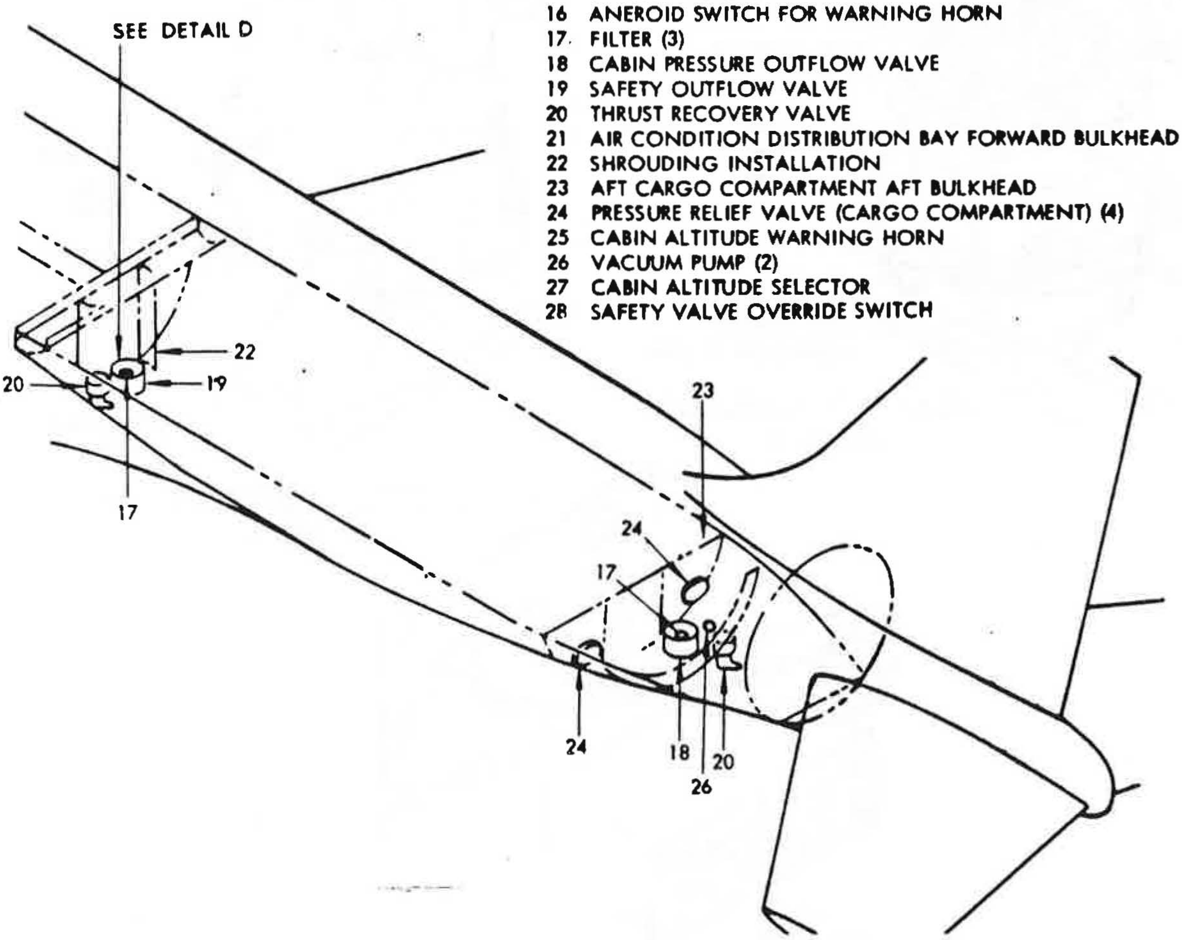
DETAIL A

Pressurization Control and Indicating System Location Diagram

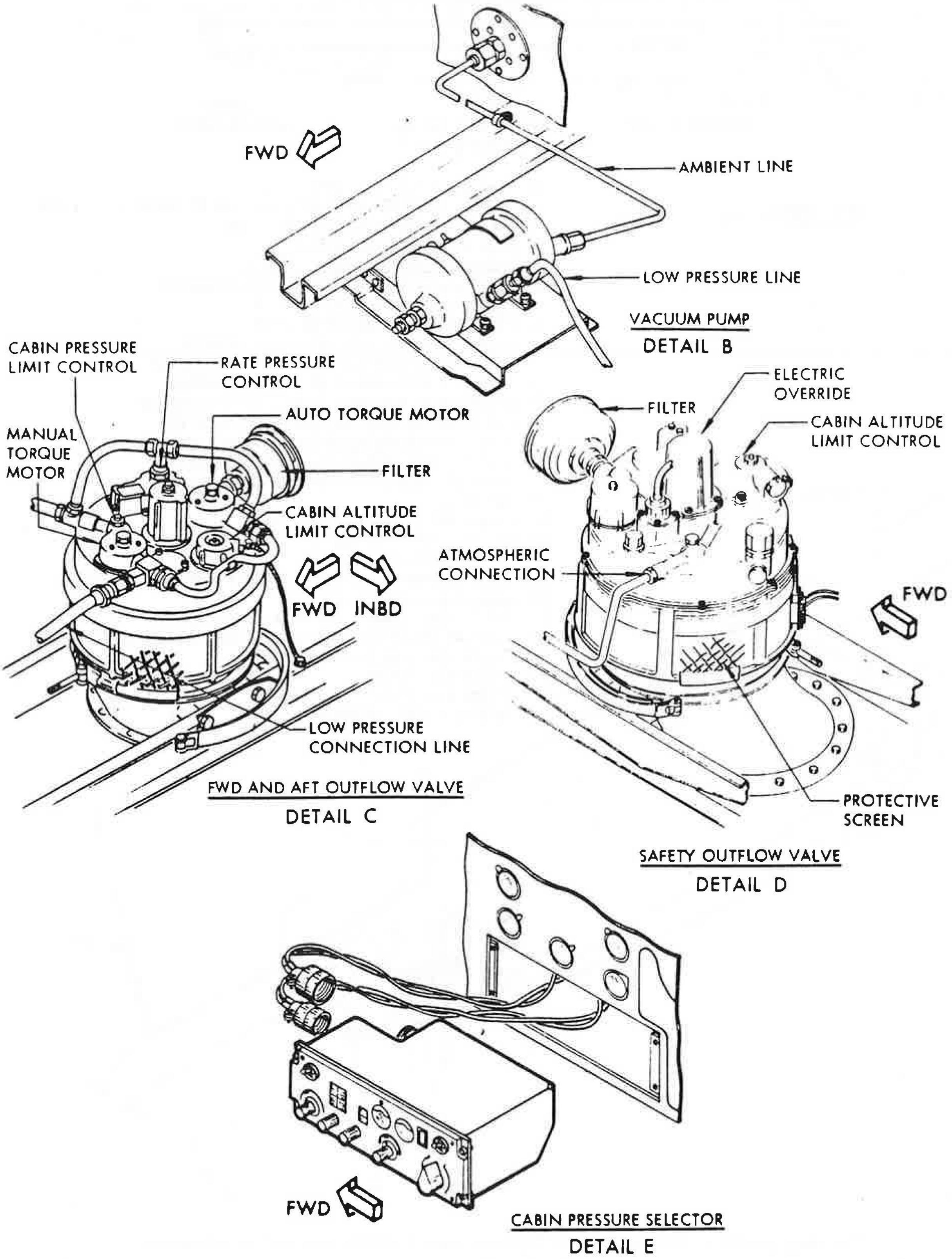
Figure 1 (Sheet 1)



1 VERTICAL SPEED INDICATOR GAGE
2 CABIN ALTIMETER AND DIFFERENTIAL PRESSURE INDICATOR
3 MANUAL RATE CONTROL SELECTOR
4 LOW PRESSURE DUCT GAGE
5 THRUST RECOVERY VALVE SWITCH
6 ALTITUDE WARNING HORN CUTOUT SWITCH
7 ELECTRONIC CONTROL UNIT
8 CABIN PRESSURE SELECTOR UNIT
9 TAKE OFF AND LANDING MODE SWITCH
10 RATE OF CHANGE CABIN ALTITUDE SELECTOR
11 MANUAL-AUTOMATIC SELECTOR CONTROL
12 BAROMETRIC PRESSURE CORRECTION SELECTOR
13 OUTFLOW VALVE POSITION INDICATOR (2)
14 OUTFLOW VALVE POSITION CONTROL
15 SAFETY VALVE POSITION INDICATOR LIGHT
16 ANEROID SWITCH FOR WARNING HORN
17 FILTER (3)
18 CABIN PRESSURE OUTFLOW VALVE
19 SAFETY OUTFLOW VALVE
20 THRUST RECOVERY VALVE
21 AIR CONDITION DISTRIBUTION BAY FORWARD BULKHEAD
22 SHROUDING INSTALLATION
23 AFT CARGO COMPARTMENT AFT BULKHEAD
24 PRESSURE RELIEF VALVE (CARGO COMPARTMENT) (4)
25 CABIN ALTITUDE WARNING HORN
26 VACUUM PUMP (2)
27 CABIN ALTITUDE SELECTOR
28 SAFETY VALVE OVERRIDE SWITCH



Pressurization Control and Indicating System Location Diagram
Figure 1 (Sheet 2)



Pressurization Control and Indicating System Location Diagram
Figure 1 (Sheet 3)

C. The indicating system consists of a cabin differential pressure indicator, altimeter and rate of climb indicator, an altitude warning horn and the visual displays of the cabin pressure selector.

D. The pressurized compartments include the main and control cabins, both cargo compartments, and the lower nose section. Decompression panels, mounted in rubber extrusions, are provided in bulkheads between pressurized sections to provide local structural protection should the airplane become depressurized at altitude.

2. Cabin Pressure Selector

A. The cabin pressure selector is mounted on the flight engineer's panel and is used to select the desired cabin pressure schedule. The cabin pressure level is adjustable from a minus 1000 feet to a plus 14,000 feet, pressure altitude. The rate-of-change of cabin pressure can be adjusted from 50 to 2000 feet per minute.

B. Additional controls are integrated into the selector for barometric correction, take-off and landing mode operation, relative valve position control, and manual system operation. Position indicators for continuous monitoring of outflow valves positions and a safety valve open position warning light, are also provided. (See figure 1.)

C. The selector contains a manual control which is a semiautomatic electropneumatic device that senseds the pressure differential between a bellows and the cabin pressure. When the MANUAL mode is selected on the AUTO-MANUAL switch, the existing cabin pressure is trapped in the bellows and positioning of the needle valve determines the rate of cabin pressure change. Rotation of the manual control knob in the UP or DOWN direction provides rate control. When the knob is in the HOLD position, the rate control is zero.

D. The selector provides command signals to the control portion of the system. Four selections can be made: cabin altitude, mode switch, barometric pressure correction and cabin rate. These selections in conjunction with the landing gear safety switch provide three modes of control.

(1) Minimum differential pressure control. When the aircraft is on the ground, the landing gear safety switch is automatically in the ground position. With the mode switch in the land position, the cabin altitude command is derived from an open valve reference signal. The differential pressure reference signal is the ground differential pressure reference signal, but since the system is seeking to control to a lower differential pressure than the ground differential pressure reference, the ground differential reference signal has no effect and the outflow valves will be fully open.

(2) Ground differential pressure control. With the mode switch in the TAKEOFF position and the landing gear safety switch is in the ground position, the cabin altitude command is provided with a ground differential pressure reference signal. Under these conditions, the cabin altitude will descend under rate control to the ground differential pressure reference and hold. The ground differential pressure reference is equivalent to approximately 250 feet below the takeoff airport ambient altitude. Returning the mode switch to the LANDING position will fully open the outflow valves on rate control.

(3) Cabin flight altitude control. With the landing gear safety switch in the airborne position, the differential pressure reference signal is derived from the flight differential pressure reference and the cabin altitude command signal is derived from the cabin altitude selection. The control system then seeks to control the cabin altitude to the selected cabin altitude. This, then, is the normal flight control mode. The mode selector switch has no effect on the system when the landing gear safety switch is in the airborne position.

3. <u>Electronic Control Unit</u>

A. The electronic control unit, mounted in the electronics rack located in the lower nose section (figure 1), contains all the control elements and circuits required for absolute pressure, differential pressure, and rate-of-change pressure control. Built-in test circuitry is included for fault isolation to either the selector, control, or outflow valve in all normal control modes.

B. The cabin air pressure controller incorporates capacitive type pressure sensors for the absolute and cabin-to-ambient pressure sensing elements. These output signals are converted and amplified to usable valve position control signals through solid state electronic components.

C. The controller receives three command inputs from the selector: cabin altitude command, cabin rate command, and mode selection switch signal. It also receives a command signal from the landing gear safety switch. It includes the differential references and the required solid state switches. The cabin altitude command determines the isobaric control altitude for the cabin. The cabin rate command determines the rate limit at which the system controls the cabin pressure rate of change. The differential pressure reference signal determines the point at which the differential pressure control takes over and suppresses the isobaric control. The controller senses the cabin altitude and cabin-to-ambient differential pressure to control the electropneumatic relay position signal which drives the electropneumatic relay which positions the outflow safety valves.

D. Isobaric altitude control is obtained by comparing the cabin altitude command signal to the sensed altitude signal, thus creating a cabin altitude error signal. This error signal positions the electropneumatic relay which controls valve reference pressure which positions the outflow valves. Cabin rate is generated from the sensed cabin altitude signal and negatively summed with the cabin error signal to provide rate compensation for the isobaric control loop. Rate compensation is necessary to stabilize the control loop.

E. Cabin rate is obtained through a process of rate limiting. The cabin rate signal generated from the sensed cabin altitude is fed into a deadband circuit. The width of the deadband circuit is variable and is determined by the cabin rate command signal. When the sensed cabin rate exceeds the deadband width, that portion of the signal exceeding the deadband width is negatively summed with the cabin altitude error signal. The resulting signal suppresses the electropneumatic relay position signal, thereby controlling valve rate which controls cabin rate. The altitude error signal is limited to ± 50 feet. This provides linear rate control to within 50 feet of the selected cabin altitude and restricts the flareout to isobaric control to within the 50 feet.

F. Differential pressure is obtained by comparing the differential pressure reference signal with the sensed cabin-to-ambient differential pressure. If the sensed differential pressure is less than the differential pressure reference, no signal is passed. If the sensed differential is greater than the differential pressure reference, a differential pressure error signal is passed. This differential pressure error signal is passed through the hard limit differential pressure control which switches out the cabin rate limiting function during differential control. Thus, the rate control circuit rates the cabin pressure up and down as demanded, but cannot rate the cabin up above the hard limit differential pressure. When the hard limit differential pressure is reached, the cabin pressure is controlled at the fixed hard limit differential pressure. However, when the aircraft descends after differential pressure control, cabin transition occurs under rate control.

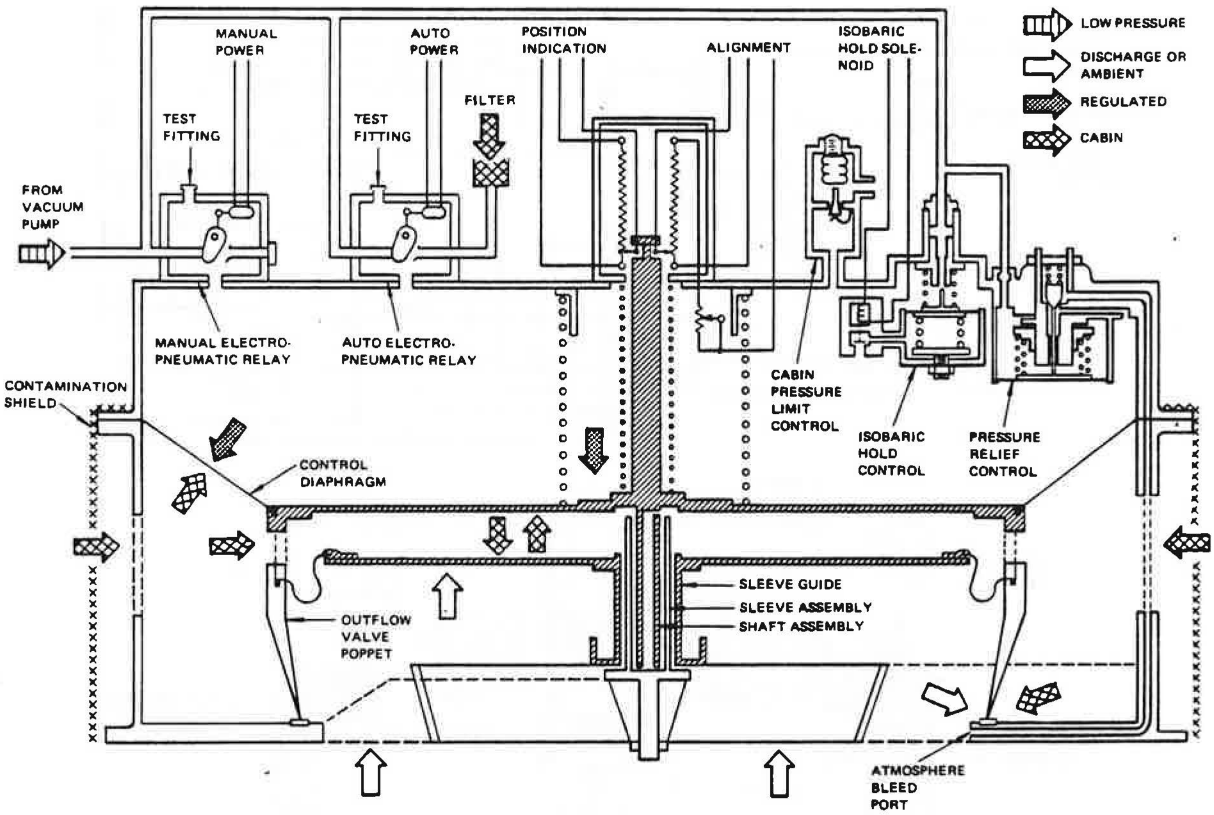
G. A 10 (± 2) second delay circuit is incorporated into the command signal generation circuits. This delay circuit prevents command signals from being transmitted to the automatic control driver amplifiers from the command signal generation circuits until the rate control loop is stabilized. This delay circuit is employed whenever the system is energized with ac power.

H. Deleted

4. Outflow Valves

A. Two outflow valves, are located near the bottom centerline of the airplane, one just aft of the forward cargo compartment and one to the rear of the bulkhead of the aft cargo compartment. (See figures 1 and 2.) The outflow valves contain control elements for valve position control during automatic system operation, valve position control for manual system operation, automatic maximum differential pressure, vacuum relief, cabin altitude limit, and pressurization rate control. Position potentiometers are included for valve position indication and relative valve position control.

B. Each of the two outflow valves is controlled by an electropneumatic relay which is integral to the valve and by an associated vacuum pump. In automatic control, the control signal drives the two identical autocontrol torque motors of the electropneumatic relays (one for each outflow valve) which, with the vacuum pumps, control the outflow valve head chamber pressures which position the outflow valve poppets to maintain the selected cabin pressure schedule. Since both electropneumatic relays are driven by a common control output signal, the outflow valve poppet position signals are amplified and fed back to the relay control amplifiers to assure equal valve position or a specific relative position relationship between outflow valves. If a relative position error of the outflow valve poppets occurs, both electropneumatic relays will be oppositely driven in a direction to reduce the valve poppet position error to zero.

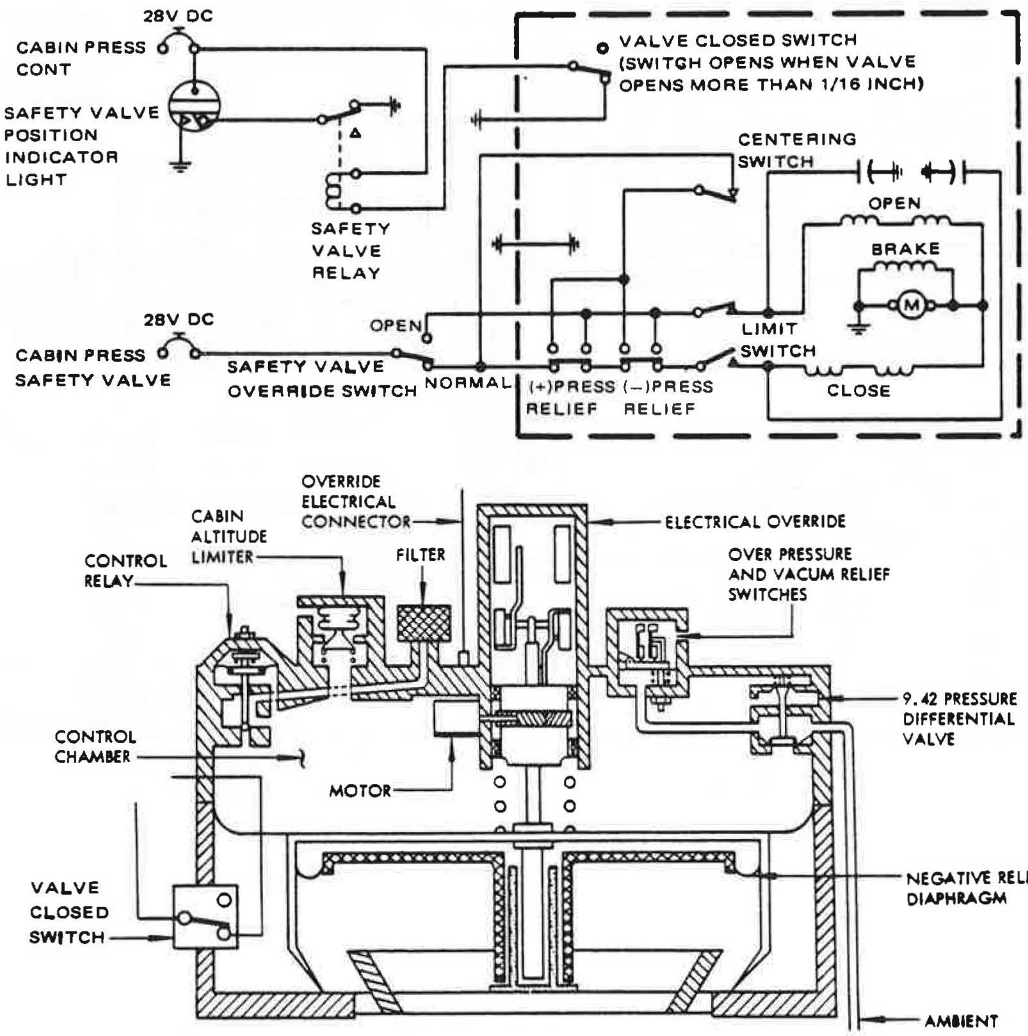


Outflow Valve Schematic
Figure 2

5. Safety Outflow Valve

A. The safety outflow valve design is similar to the outflow valve with the exception that electropneumatic relays and position potentiometers are eliminated and a valve closed switch and an electric override motor are added. The valve closed switch controls a circuit to illuminate the SAFETY VALVE OPEN light any time the safety valve opens more than 1/16 inch. The electric override motor is controlled by a SAFETY VALVE OVERRIDE switch on the flight engineer's instrument panel and positive and negative pressure relief switches in the valve. Under normal conditions, the valve is closed; however if pressure relief (either positive or negative) is required, the valve is automatically driven open. The valve may be manually driven open by positioning the SAFETY VALVE OVERRIDE switch to the OPEN position. (See figure 3.)

B. The safety outflow valve is located near the bottom centerline of the airplane in the forward section of the aft cargo compartment. (See figure 1.)



Safety Outflow Valve Schematic
Figure 3

6. Vacuum Pumps

A. The vacuum pumps are provided to permit full open outflow valve operation while on the ground as well as to obtain a faster valve response characteristic at the lower differential pressures. The vacuum pumps operate on 115 volt ac 400 cycle, single phase power. A pressure switch will shut the pumps off whenever the vacuum-to-cabin pressure is high enough to guarantee adequate system dynamic performance. (See figure 4.)

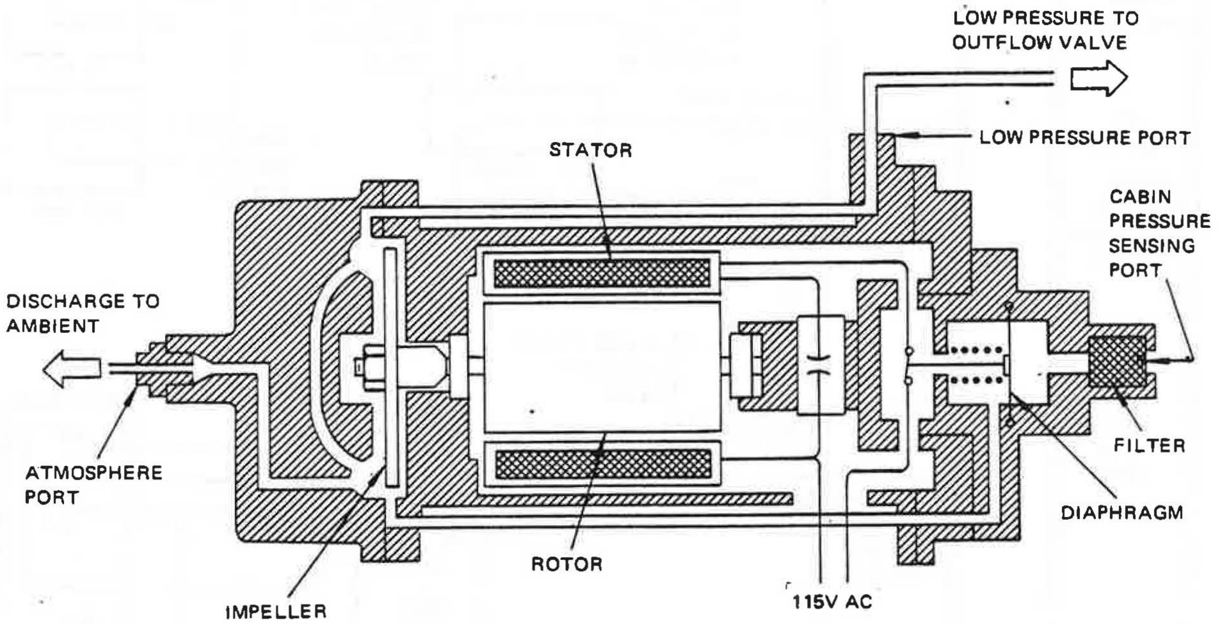
B. The vacuum pumps are located near the bottom centerline of the airplane, one just aft of the forward cargo compartment and one to the rear of the bulkhead of the aft cargo compartment. (See figure 1.)

7. Filters

A. Three filters, one attached to each of the two outflow valves, and one to the outflow safety valve remove particulate matter from ventilating air before the air is delivered to the control lines. The filter cartridges are in rubber containers.

8. Pressure Equalization Valves

A. Two pressure equalization valves are located in each cargo compartment. Each valve consists of two 3 inch flapper type valves. The valves open to relieve pressure either way if the pressure difference exceeds 4 inches of water either way.



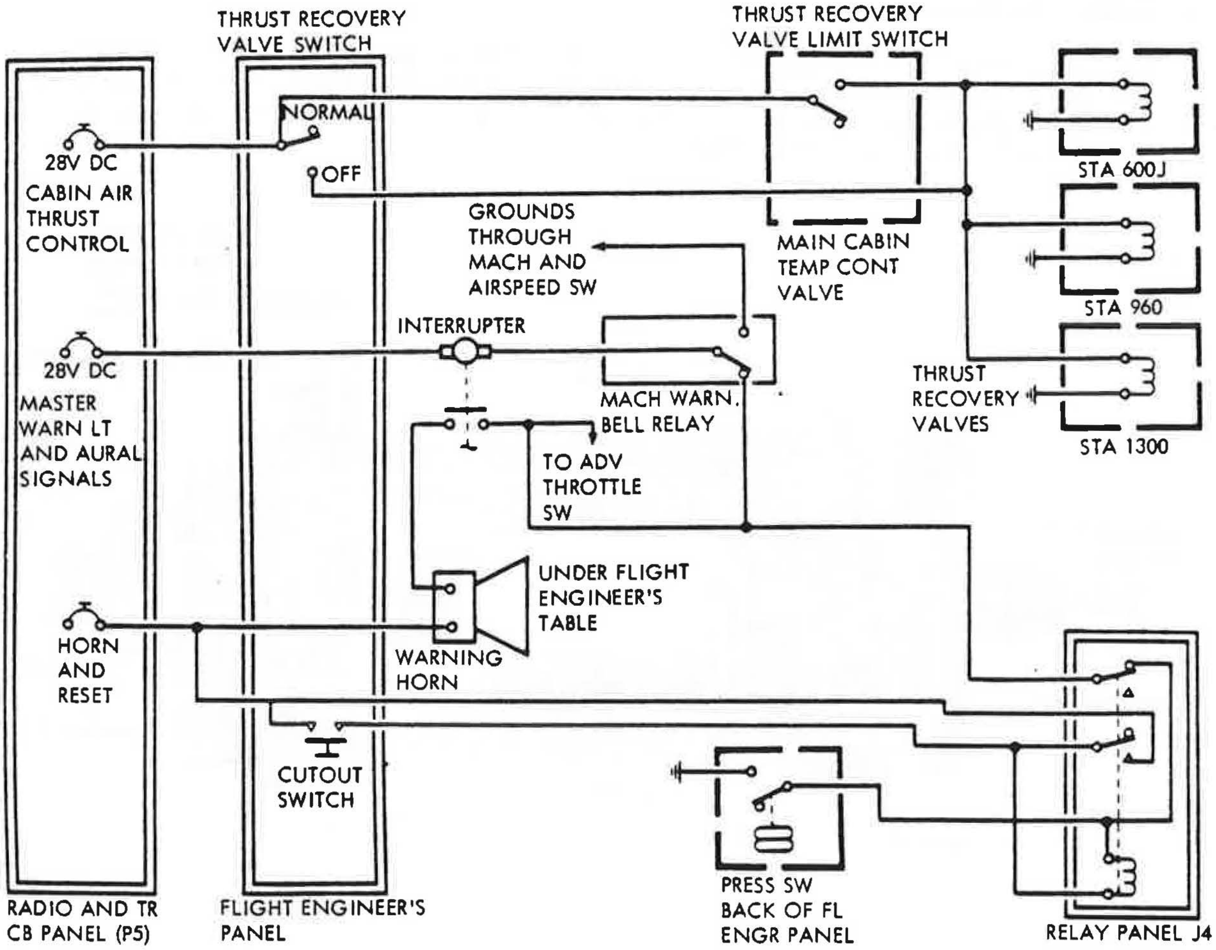
Vacuum Pump Schematic
Figure 4

9. Thrust Recovery Valve Switch

A. All three thrust recovery valves are operated by a single switch on the engineer's instrument panel. (See figure 5.) The control circuit wiring is protected by a circuit breaker on the radio and T-R circuit breaker panel (P5).

10. Thrust Recovery Valve Limit Switch

A. A thrust recovery valve limit switch automatically closes the thrust recovery valves with air conditioning approaching the "full cold" position, because pressure must be preserved during the cold phase of the system cycle. The limit switch is on the main cabin temperature control valve motor.



Pressurization Control and Indicating System Circuits
Figure 5

11. Cabin Altitude Warning Horn and Switch

A. A cabin altitude warning horn emits an intermittent sound signal when cabin altitude exceeds 10,000 feet. The horn is actuated by an aneroid switch. (See figure 5.) The warning horn serves additional purposes, not connected with the pressurization system. The signal can be stopped by an electric cutout switch. The horn is under the flight engineer's table, the aneroid switch on the upper shelf behind flight engineer's panel.

B. A cabin altitude warning horn cutout switch is used to stop the warning signal. The circuit is protected by a circuit breaker on the radio and T-R circuit breaker panel (P5). The cutout switch is on the flight engineer's upper instrument panel.

12. Altimeter (See figure 1.)

A. An altimeter is installed on the flight engineer's upper panel. The indicator registers absolute cabin pressure in feet of cabin altitude.

13. Differential Pressure Indicator (See figure 1.)

A. The differential pressure indicator registers the difference in pressure between cabin and ambient. The indicator senses ambient through the auxiliary static system. The differential pressure indicator is located on the flight engineer's upper panel.

14. Rate-of-Climb Indicator

A. A rate-of-climb indicator registers rate-of-change of cabin absolute pressure in terms of feet altitude per minute. The rate-of-climb indicator is used to monitor rate selection, since the rate-of-change selector is not calibrated. The indicator is on the flight engineer's upper instrument panel.

15. Thrust Recovery Valves

A. Three thrust recovery valves discharge cabin air to ambient in an aft direction when cabin pressure is 0.5 psi or more above ambient. Part of the energy drawn from the engines for pressurization and air conditioning is thereby recovered. The valves are butterfly type units.

B. The rate of flow through the thrust recovery valves increases with pressure differential and is approximately 25 pounds per minute per valve at 8.6 psi differential.

C. The valves are pneumatically operated and electrically controlled by a single switch. In addition, a limit switch automatically closes the valves with air conditioning approaching FULL COLD. (See figure 5.)

D. The thrust recovery valves are located near the cabin pressure outflow and safety outflow valves.

16. Blowout Panels

A. Blowout panels are located in forward and aft cargo compartments. Under normal conditions the panels are held in place by a flexible seal around the outside of the panel. If a pressure differential of a sufficient amount is experienced in either cargo compartment, the panels will blow out allowing the pressure differential to equalize.

17. Operation

A. The operating principle of the electronic-pneumatic type system is an electronic control loop coupled to a pneumatically-actuated outflow valve. An electropneumatic relay is used to transfer from electrical to pneumatic signals at the outflow valve. (See figure 6.)

B. Cabin absolute pressure control is obtained by continuous comparison and algebraic summation of the output from the cabin pressure transducer, with the preset reference voltage level selected by the crew on the selector in the cockpit. When the desired control point is reached, the output is zero. Barometric pressure correction is obtained by applying a corrective voltage to the cabin pressure reference voltage.

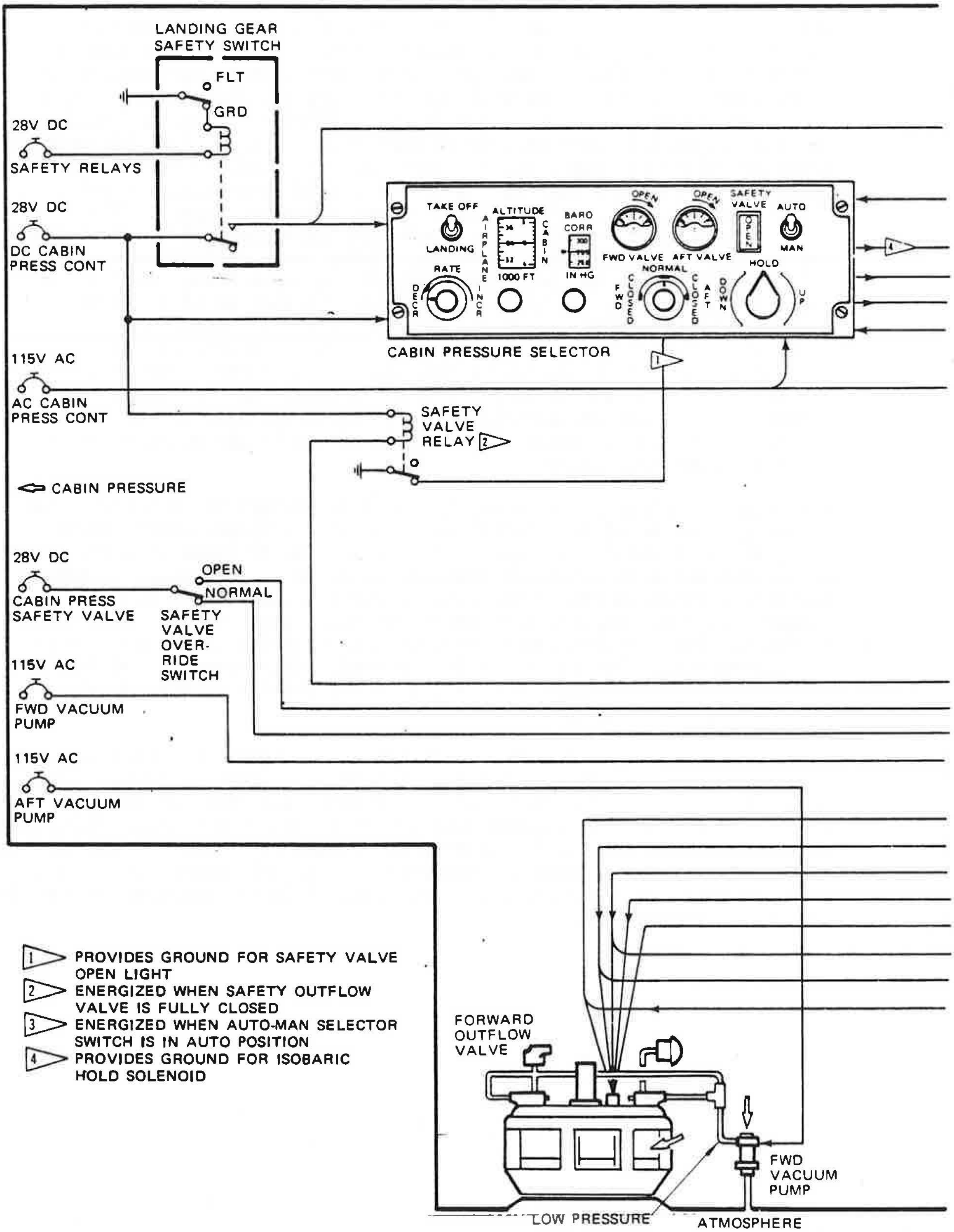
C. Cabin rate-of-change control is obtained by electronically differentiating the cabin pressure transducer output. The resulting signal is passed through an adjustable deadband and then algebraically summed with the absolute control command signal. The deadband width is adjusted by the crew on the selector. Should the cabin rate exceed the set value, the rate control output overrides the absolute pressure output to maintain the cabin rate-of-change to the set value. If the rate-of-change is less than the set value, the rate control output is zero. The rate-of-change control signal is the predominate command signal, with a system reaction toward limiting cabin rates-of-change to the selected value when transient inputs are applied to the system.

D. Ground differential and normal differential pressure control are obtained in the same manner as the absolute pressure control. These output signals are algebraically summed with the absolute pressure and rate signals to obtain the desired pressure schedule.

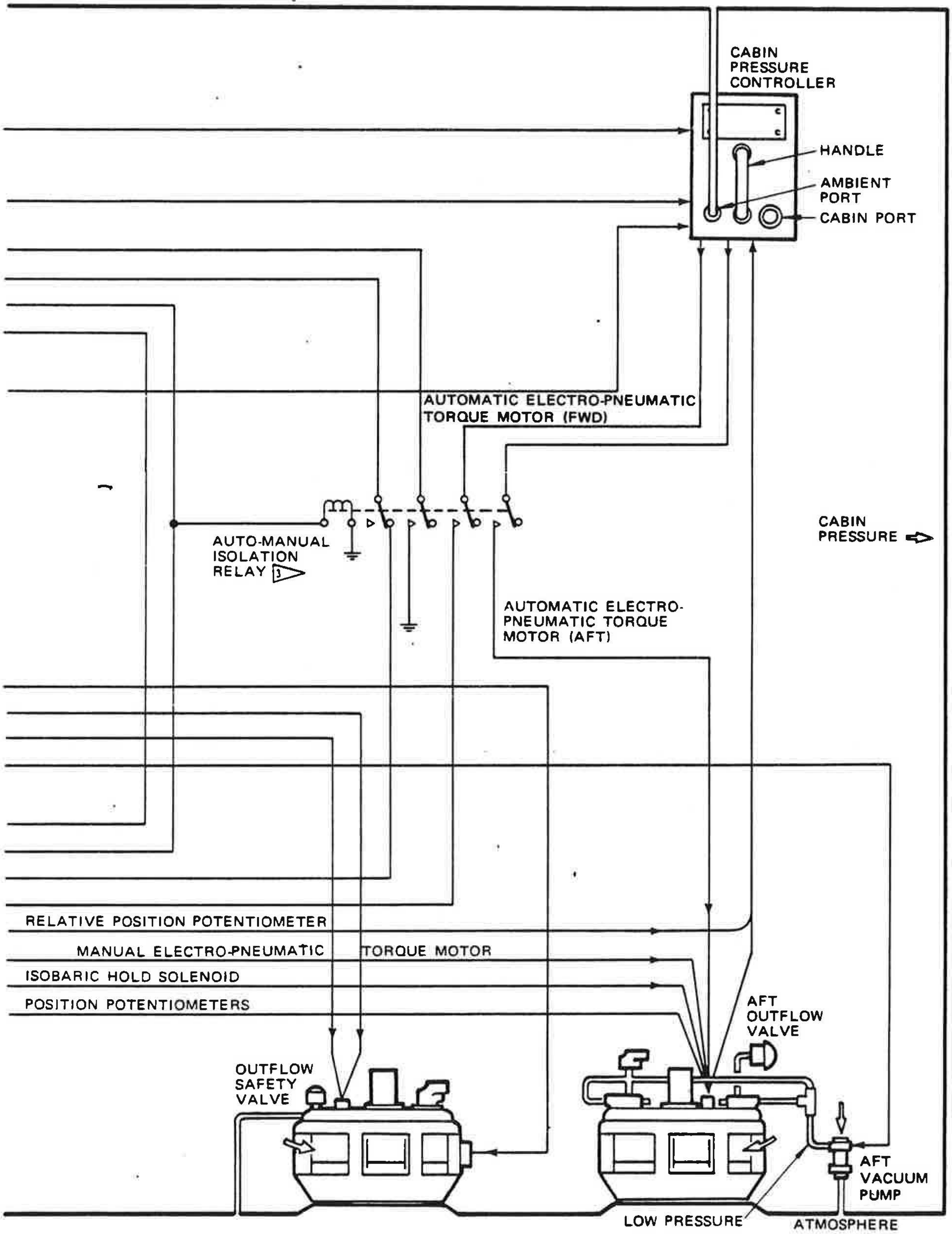
E. In automatic operation, four selections can be made by the flight engineer; cabin altitude, mode switch, barometric pressure correction, and cabin rate. In addition to these selections there is a valve balance control. The normal position of this control synchronizes the movement of the two outflow valves. Either outflow valve may be partially or completely closed with this control while the other valve takes over the complete pressure control function. With the airplane on the ground and the mode switch in the LANDING position, the cabin altitude command is derived from an open valve signal. The differential pressure reference signal has no effect and the outflow valves will be fully open. With the mode switch in the TAKEOFF position, the cabin altitude command is provided with a closed reference signal. The cabin altitude will descent under rate control to approximately 250 feet below the takeoff airport ambient altitude. Under these conditions a solenoid valve within the controller closes the static sense line. This valve remains closed until the landing gear safety switch opens it as the airplane breaks ground. Thus the cabin altitude is maintained below field elevation during ground roll and rotation and not affected by increased static pressure during takeoff. Once airborne the mode switch has no effect, the static line solenoid is open, and the controller receives the flight deferential pressure reference signal. The control system then seeks to control the cabin altitude to the selected cabin altitude under rate control.

F. When manual control is selected, 115 volt ac current is shut off to the automatic portion of the controller and separate torque motors within the outflow valves are employed. If both ac and dc power is lost, or if ac is lost while on automatic control, or if dc is lost while on manual control, a solenoid within the outflow valves moves to its normally closed position, trapping a reference pressure which controls the valve position. This trapped reference pressure maintains cabin altitude as it existed until electric power is restored. When power is initially lost there will be a momentary rise in cabin pressure before cabin altitude is stabilized.

G. An auto-manual isolation relay is installed to ensure that no interaction can exist between automatic and manual control. (See figure 6.) The isolation relay is energized when the AUTO-MAN selector switch is in the AUTO position and de-energized when switch is in MAN position. Energized, the relay connects circuits required for automatic control of the outflow valves and interrupts circuits necessary for manual control of the valves. When the relay is de-energized, manual control is connected and automatic control is interrupted.



Cabin Pressure Control System Schematic
Figure 6 (Sheet 1)



Cabin Pressure Control System Schematic
Figure 6 (Sheet 2)

PRESSURIZATION CONTROL AND INDICATING SYSTEM - TROUBLE SHOOTING

EFFECTIVITY

TCA : LX-N19996
LX-N20198
LX-N20199

RTCA : LX-N19997
LX-N20000

1. General

A. Trouble shooting the pressurization system requires that an adjustment/test procedure be performed to verify that a trouble exists and to narrow the trouble down to a specific system function. Refer to Pressurization Control and Indicating System - Adjustment/Test. Trouble shooting is broken down to correspond to the applicable adjustment/test and is intended to permit isolating the cause of troubles without operating the airplane engines or pressurizing the cabin.

B. Some procedures require that electrical connectors be disconnected during the trouble shooting procedure in order to install test equipment or to perform continuity tests. Ensure that the system is de-energized prior to disconnecting electrical connectors and that the system is again energized after connecting test equipment.

2. Equipment and Materials

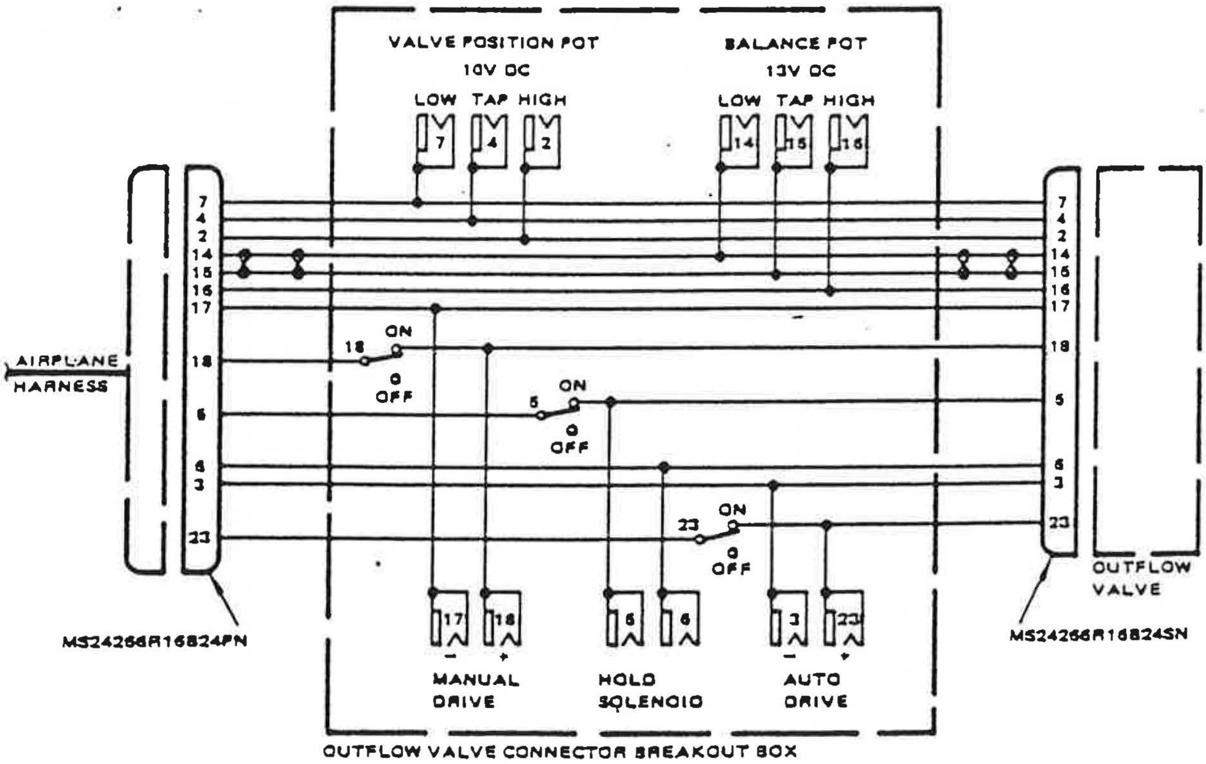
A. Voltohmmeter, Simpson Model 26 Series 4M or equivalent

B. Connector Breakout Boxes (See figures 101 thru 103.)

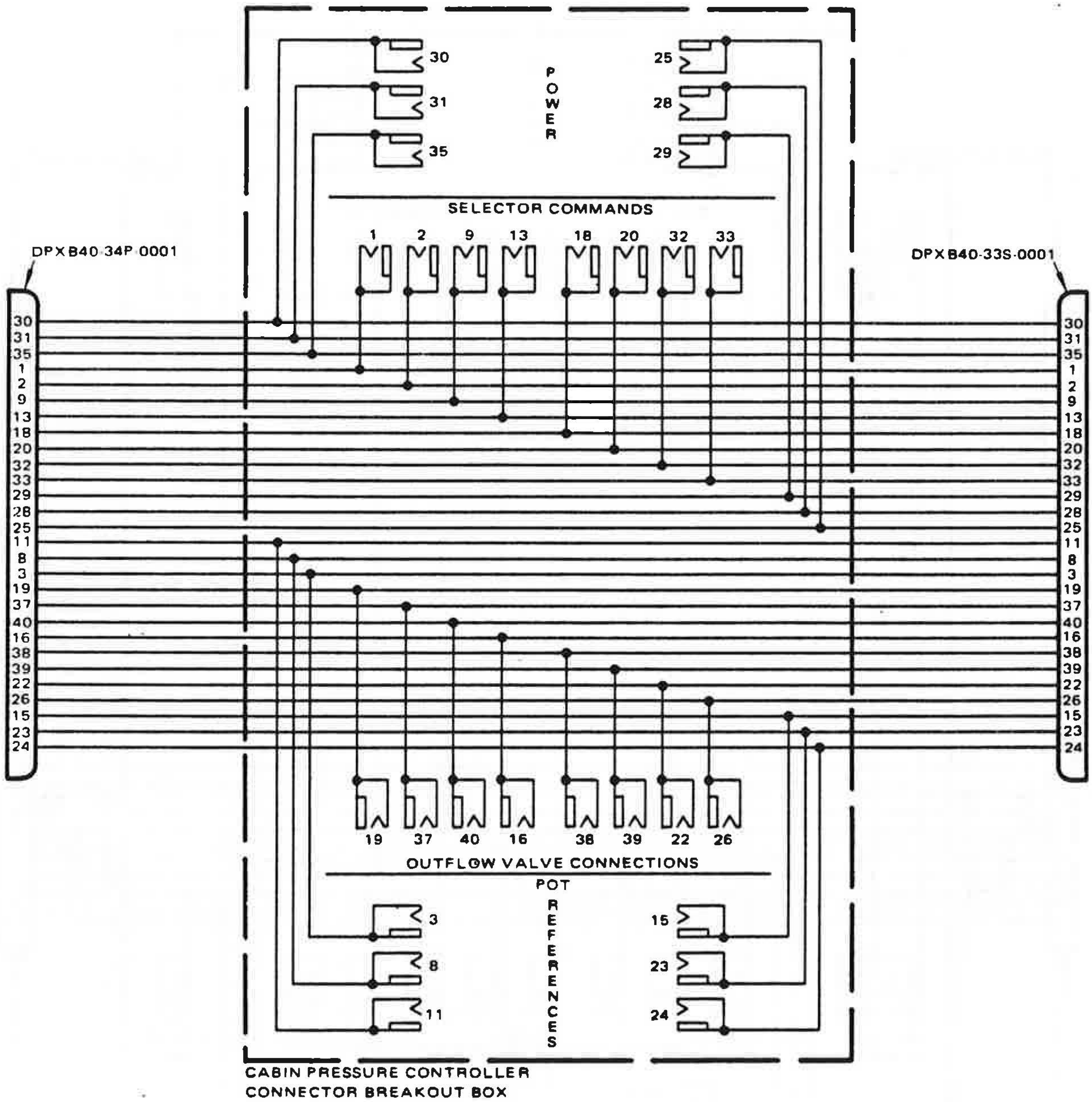
(1) Some trouble shooting procedures require the use of a connector breakout box to be installed between system components and airplane wiring. Connector breakout boxes should be fabricated for the cabin pressure selector, cabin pressure controller, and outflow valves. The boxes provide test jacks to measure required electrical values.

(2) To fabricate a connector breakout box, use a standard size electrical box and electrical leads (20 gauge minimum) approximately 36 inches long on each side of the box. Use standard electrical quick-disconnect connectors of the Canna-clip type for the cabin pressure selector and outflow valve connector breakout boxes. Use ITT Cannon Electric electrical connectors for the cabin pressure controller connector breakout box. Switches used for the outflow valve connector breakout box must be rated at 115 volts ac, 15 amp (minimum).

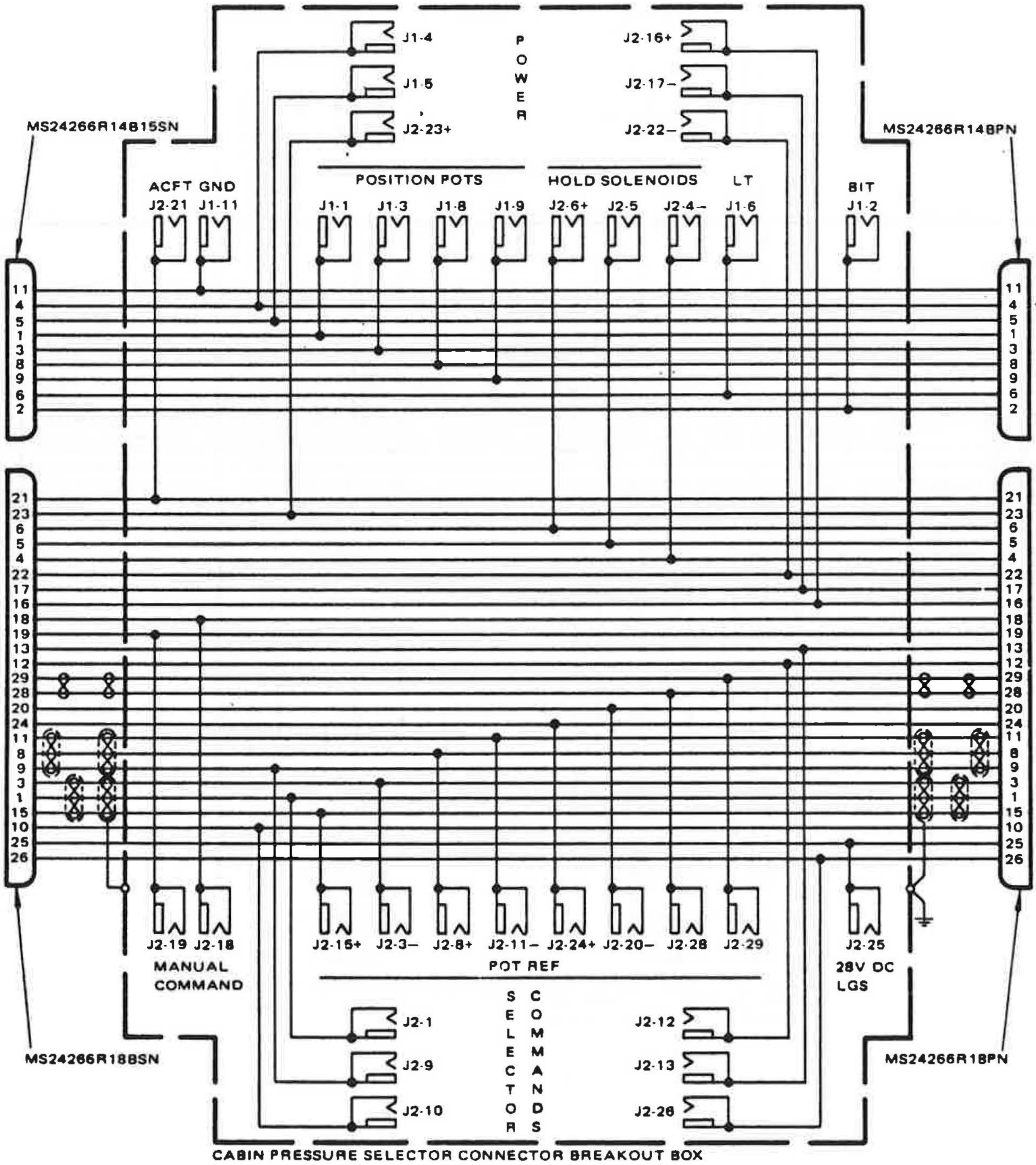
(3) Schematics for the outflow valve, cabin pressure, controller, and cabin pressure selector connector breakout boxes are shown in figures 101 through 103 respectively. Electrical leads must be twisted and shielded as shown. Internal connections, wiring, and connectors must be continuity and resistance tested prior to using the breakout boxes.



Outflow Valve Connector Breakout Box
Figure 101



Cabin Pressure Controller Connector Breakout Box
Figure 102



Cabin Pressure Selector Connector Breakout Box
Figure 103

3. Trouble Shooting Charts

A. Manual Control

NOTE: Install selector and controller connector breakout boxes prior to performing trouble shooting procedure. An outflow valve connector breakout box may have to be installed at either or both the forward or aft valve location to complete the trouble shooting.

Test Manual Control Operation. Refer to Pressurization Control and Indicating System - Adjustment/Test. IF-

OUTFLOW VALVES DO NOT RESPOND PROPERLY TO MANUAL CONTROL

Push SAFETY VALVE press-to-test light on cabin pressure selector. IF-

LIGHT DOES NOT COME ON, check for 28 (± 4) volts dc across jacks J2-16(+) and J2-17(-) on selector breakout box. IF-

LIGHT COMES ON, check for 28 (± 4) volts dc across jacks J2-13(+) and J2-17(-) on selector breakout box. IF-

VOLTAGE DOES NOT CHECK, repair wiring between circuit breaker and selector.

VOLTAGE CHECKS, replace light bulbs. IF-

LIGHT DOES NOT COME ON WHEN PRESSED, replace cabin pressure selector.

VOLTAGE DOES NOT CHECK, replace cabin pressure selector.

VOLTAGE CHECKS, check for 28 (± 4) volts dc across jacks 13(+) and 35(-) on controller breakout box. IF-

Continued on Page 106

Continued from
Page 105

VOLTAGE DOES NOT CHECK, repair wiring between selector and controller.

VOLTAGE CHECKS, continue trouble shooting per the following applicable trouble shooting procedures.

With manual rate control selector in HOLD position, check outflow valve position. IF-

OUTFLOW VALVES ARE NOT CLOSED.

Check that voltage across jacks 40 and 37 and jacks 39 and 38 on controller breakout box is zero (± 0.2) volt. IF-

VOLTAGE DOES NOT CHECK, replace cabin pressure controller.

VOLTAGE CHECKS, check that voltage across jacks J2-19 and J2-18 on selector breakout box does not exceed 2 volts dc. IF-

VOLTAGE DOES NOT CHECK, replace cabin pressure selector.

VOLTAGE CHECKS, install outflow valve breakout box at valve location(s) and check that voltage across jacks 18(+) and 17(-) does not exceed 2 volts dc. IF-

VOLTAGE DOES NOT CHECK, repair wiring between selector and outflow valve.

VOLTAGE CHECKS, place jack 18 ON-OFF switch on outflow valve breakout box in OFF position and check that resistance between jacks 18 and 17 is 10.5 (± 1) ohms. IF-

Continued on
Page 107

Continued from
Page 106

RESISTANCE DOES NOT CHECK, replace outflow valve.

Rotate manual rate control selector to UP position. IF-

OUTFLOW VALVE(S) FAIL TO OPEN OR OPEN SLOWLY (GREATER THAN 20 SECONDS).

Check that voltage across jacks J2-19 and J2-18 on selector breakout box is not less than 5 volts dc. IF-

VOLTAGE DOES NOT CHECK, replace cabin pressure selector.

VOLTAGE CHECKS, install outflow valve breakout box at valve location(s) and check that voltage across jacks 18(+) and 17(-) is not less than 5 volts dc. IF-

VOLTAGE DOES NOT CHECK, repair wiring between selector and outflow valve.

VOLTAGE CHECKS, place jack 18 ON-OFF switch on outflow valve breakout box in OFF position and check that resistance between jacks 18 and 17 is 10.5 (± 1) ohms. IF-

RESISTANCE DOES NOT CHECK, replace outflow valve.

Rotate manual rate control selector to DOWN position. IF-

OUTFLOW VALVE(S) FAIL TO CLOSE OR CLOSE SLOWLY (GREATER THAN 14 SECONDS).

Continued on
Page 108

Continued from
Page 107

Check that voltage across jacks J2-19 and J2-18 on selector breakout box is zero (± 0.2) volt. IF-

VOLTAGE DOES NOT CHECK, replace cabin pressure selector.

VOLTAGE CHECKS, install outflow valve breakout box at valve location(s) and check that voltage across jacks 18(+) and 17(-) is zero (± 0.2) volts. IF-

VOLTAGE DOES NOT CHECK, repair wiring between selector and outflow valve.

VOLTAGE CHECKS, place jack 18 ON-OFF switch on outflow valve breakout box in OFF position and check that resistance between jacks 18 and 17 is 10.5 (± 1) ohms. IF-

RESISTANCE DOES NOT CHECK, replace outflow valve.

Return manual rate control selector to HOLD from DOWN position. IF-

OUTFLOW VALVES FAIL TO REMAIN CLOSED.

Check that voltage across jacks J2-19 and J2-18 on selector breakout box is zero (± 0.2) volt. IF-

VOLTAGE DOES NOT CHECK, replace cabin pressure selector.

With manual rate control selector in HOLD position, toggle TAKEOFF-LANDING mode switch. IF-

OUTFLOW VALVE(S) DO NOT REMAIN CLOSED

Check that voltage across jacks 40 and 37 and jacks 39 and 38 on controller breakout box is zero (± 0.2) volt. IF-

VOLTAGE DOES NOT CHECK, replace cabin pressure controller.

With manual rate control selector in UP position, open DC CABIN PRESS CONT circuit breaker (P5). (See NOTE.) IF-

OUTFLOW VALVE(S) DO NOT REMAIN OPEN FOR 10 SECONDS, replace outflow valve(s).

NOTE: FWD and AFT VALVE position indicators are rendered inoperative when DC CABIN PRESS CONT circuit breaker (P5) is opened.

B. Automatic Control (Minimum Differential Pressure Control)

NOTE: Install selector and controller connector breakout boxes prior to performing trouble shooting procedure. An outflow valve connector breakout box may have to be installed at either or both the forward or aft valve location to complete the trouble shooting.

With system controls at initial settings for automatic control operation test (refer to Pressurization Control and Indicating System - Adjustment/Test), place AUTO-MAN selector switch in AUTO position. IF-

OUTFLOW VALVE(S) FAIL TO OPEN OR OPEN SLOWLY (GREATER THAN 14 SECONDS)

Continued on Page 110

Continued from
Page 109

Check for 28 (± 4) volts dc across jacks J2-25 and J2-21 on selector breakout box. IF-

VOLTAGE DOES NOT CHECK, repair wiring between circuit breaker and selector.

VOLTAGE CHECKS, check for 28 (± 4) volts dc across jacks J2-12 and J2-21 on selector breakout box. IF-

VOLTAGE DOES NOT CHECK, replace cabin pressure selector.

VOLTAGE CHECKS, check that voltage across jacks 33 and 35 on controller breakout box is 28 (± 4) volts. IF-

VOLTAGE DOES NOT CHECK, repair wiring between selector and controller.

VOLTAGE CHECKS, check that voltage across jacks 40 and 37 (forward valve) and/or jacks 39 and 38 (aft valve) on controller breakout box is not less than 5 volts dc. IF-

VOLTAGE DOES NOT CHECK, check that there is no voltage across jacks J2-13 and J2-21 on selector breakout box. IF-

VOLTAGE PRESENT, replace cabin pressure selector

NO VOLTAGE, replace cabin pressure controller

VOLTAGE CHECKS, install outflow valve breakout box at valve location(s) and check that voltage across jacks 23(+) and 3(-) is not less than 5 volts dc. IF-

VOLTAGE DOES NOT CHECK, repair wiring between controller and outflow valve.

VOLTAGE CHECKS, open AC CABIN PRESS CONT (P1) and DC CABIN PRESS CONT (P5) circuit breakers, disconnect airplane connector from controller breakout box, and check that resistance between connector pins 40 and 37 (forward valve) and/or pins 39 and 38 (aft valve) is 12 (± 1) ohms and 13 (± 1) ohms respectively. IF-

Continued on
Page 111

Continued from
Page 110

RESISTANCE DOES NOT CHECK, place jack 23 ON-OFF switch on outflow valve breakout box in OFF position and check that resistance between jacks 23(+) and 3(-) is 10.5 (± 1) ohm. IF-

RESISTANCE CHECKS, repair wiring between controller and outflow valve.

RESISTANCE DOES NOT CHECK, replace outflow valve.

With outflow valve, open, place TAKEOFF-LANDING mode switch in TAKEOFF position. IF-

OUTFLOW VALVE(S) FAIL TO CLOSE OR CLOSE SLOWLY (GREATER THAN 14 SECONDS).

Check for 28 (± 4) volts dc across jacks J2-10 and J2-21 on selector breakout box. IF-

VOLTAGE DOES NOT CHECK, replace cabin pressure selector.

VOLTAGE CHECKS, check for 28 (± 4) volts dc across jacks 32 and 35 on controller breakout box. IF-

VOLTAGE DOES NOT CHECK, repair wiring between selector and controller.

VOLTAGE CHECKS, check that voltage across jacks 40 and 37 (forward valve) and/or jacks 39 and 38 (aft valve) on controller breakout box is not more than 1 volt dc. IF-

VOLTAGE DOES NOT CHECK, replace cabin pressure controller.

VOLTAGE CHECKS, install outflow valve breakout box at valve location(s) and check that voltage across jacks 23(+) and 3(-) is not more than 1 volt dc. IF-

Continued on
Page 112

VOLTAGE DOES NOT CHECK, repair wiring between controller and outflow valve.

Continued from
Page 111

VOLTAGE CHECKS, place jack 23 ON-OFF switch on outflow valve breakout box in OFF position and check that resistance between jacks 23(+) and 3(-) is 10.5 (± 1) ohms. IF-

RESISTANCE DOES NOT CHECK, replace outflow valve.

With outflow valves closed, rotate manual rate control selector in UP direction. IF-

OUTFLOW VALVE(S) DO NOT REMAIN CLOSED.

Check that voltage across jacks J2-19 and J2-18 on selector breakout box is zero (± 0.2) volt. IF-

VOLTAGE DOES NOT CHECK, replace cabin pressure selector.

With outflow valves closed, place TAKEOFF-LANDING mode switch in LANDING position. IF-

OUTFLOW VALVE(S) FAIL TO OPEN, check for 28 (± 4) volts dc across jacks J2-25 and J2-21 on selector breakout box. IF-

VOLTAGE DOES NOT CHECK, repair wiring between circuit breaker and selector.

VOLTAGE CHECKS, check for 28 (± 4) volts dc across jacks J2-12 and J2-21 on selector breakout box. IF-

Continued on
Page 113

Continued from
Page 112

VOLTAGE DOES NOT CHECK, replace cabin pressure selector.

VOLTAGE CHECKS, check that voltage across jacks 33 and 35 on controller breakout box is 28 (± 4) volts dc. IF-

VOLTAGE DOES NOT CHECK, repair wiring between controller and selector.

VOLTAGE CHECKS, check that voltage across jacks 40 and 37 (forward valve) and/or jacks 39 and 38 (aft valve) on controller breakout box is not less than 5 volts dc. IF-

VOLTAGE DOES NOT CHECK, check that there is no voltage across jacks J2-13 and J2-21 on selector breakout box. IF-

VOLTAGE PRESENT, replace cabin pressure selector.

NO VOLTAGE, replace cabin pressure controller.

VOLTAGE CHECKS, install outflow valve breakout box at valve location(s) and check that voltage across jacks 23(+) and 3(-) is not less than 5 volts dc. IF-

VOLTAGE DOES NOT CHECK, repair wiring between controller and outflow valve.

VOLTAGE CHECKS, open AC CABIN PRESS CONT (P1) and DC CABIN PRESS CONT (P5) circuit breakers, disconnect airplane connector from controller breakout box, and check that resistance between connector pins 40 and 37 (forward valve) and/or pins 39 and 38 (aft valve) is 12 (± 1) ohms and 13 (± 1) ohms respectively. IF-

Continued on
Page 114

Continued from
Page 113

RESISTANCE DOES NOT CHECK, place jack 23 ON-OFF switch on outflow valve breakout box in OFF position and check that resistance between taps 23(+) and 3(-) is 10.5 (± 1) ohms. IF-

RESISTANCE CHECK, repair wiring between controllers and outflow valve.	RESISTANCE DOES NOT CHECK, replace outflow valve.

C. Automatic Control (Isobaric Hold Solenoid)

With outflow valves open, open AC CABIN PRESS CONT circuit breaker (P1). IF-

OUTFLOW VALVE(S) DO NOT REMAIN OPEN DURING 10 SECOND WAIT, replace outflow valve(s).

D. Automatic Control (Auto Delay)

With outflow valves open and AC CABIN PRESS CONT circuit breaker (P1) open, place TAKE-OFF-LANDING mode switch in TAKEOFF position and close AC CABIN PRESS CONT circuit breaker (P1). IF-

OUTFLOW VALVES CLOSE PRIOR TO AN APPROXIMATE 15 SECOND DELAY, replace cabin pressure controller.

E. Automatic Control (Simulated Flight Operation)

With CABIN ALTITUDE selector set at field elevation, adjust BARO CORR selector until outflow valves are 1/4 to 3/4 open. IF-

BARO CORR TAPE DISPLAY DOES NOT MATCH KNOWN FIELD BAROMETRIC PRESSURE WITHIN 0.25 INCH OF MERCURY

Replace cabin pressure controller. IF-

TAPE DISPLAY STILL DOES NOT MATCH WITHIN 0.25 INCH OF MERCURY, replace cabin pressure selector.

NOTE: Install selector and controller connector breakout boxes prior to performing trouble shooting procedure. An outflow valve connector breakout box may have to be installed at either or both the forward or aft valve location to complete the trouble shooting procedure.

Adjust CABIN ALTITUDE selector to field elevation and BARO CORR selector to field barometric pressure. IF-

BOTH OUTFLOW VALVES DO NOT OPEN TO APPROXIMATELY SAME POSITION (1/4 TO 3/4 OPEN) WITHIN A BARO CORR SELECTOR SETTING OF FIELD PRESSURE ± 0.25 INCH OF MERCURY

Place outflow valve position control in FWD CLOSED position. IF-

FORWARD OUTFLOW VALVE FAILS TO CLOSE, check that voltage across jacks J2-29 and J2-20 on selector breakout box is approximately 10 volts dc and that voltage across jacks J2-28 and J2-20 does not exceed 1 volt dc. IF-

Continued on Page 116

FORWARD OUTFLOW VALVE CLOSES, place outflow valve position control in CLOSED AFT position. IF-

Continued on Page 117

Continued from
Page 115

VOLTAGE DOES NOT CHECK, replace cabin pressure selector.

VOLTAGE CHECKS, check that voltage across jacks 20 and 23 on controller breakout box is approximately 10 volts dc and that voltage across jacks 18 and 23 does not exceed 1 volt dc. IF-

VOLTAGE DOES NOT CHECK, repair wiring between selector and controller.

VOLTAGE CHECKS, place outflow valve position control in NORMAL position. IF-

BOTH OUTFLOW VALVES MODULATE OPEN UNEQUALLY, record voltage across jacks 40 and 37 and jacks 39 and 38 on controller breakout box, place outflow valve position control in FWD CLOSED position, and check that voltage across jacks 40 and 37 is approximately 1 volt dc less than recorded value and that voltage across 39 and 38 is approximately 1 volt dc more than recorded value. IF-

FORWARD OUTFLOW VALVE OPENS BUT AFT OUTFLOW VALVE FAILS TO OPEN, adjust BARO CORR selector until aft valve is 1/4 to 3/4 open, record voltage across jacks 40 and 37 and jacks 39 and 38 on controller breakout box, place outflow valve position control in FWD CLOSED position, and check that voltage across jacks 40 and 37 is approximately 1 volt dc less than recorded value and that voltage across 39 and 38 is approximately 1 volt dc more than recorded value. IF-

VOLTAGE DOES NOT CHECK, replace cabin pressure controller.

VOLTAGE DOES NOT CHECK, replace cabin pressure controller.

Continued on
Page 118

Continued from
Page 115

FORWARD OUTFLOW VALVE FAILS TO OPEN AND/OR AFT OUTFLOW VALVE FAILS TO CLOSE, check that voltage across jacks J2-28 and J2-20 on selector breakout box is approximately 10 volts dc and that voltage across jacks J2-29 and J2-20 does not exceed 1 volt dc. IF-

VOLTAGE DOES NOT CHECK, replace cabin pressure selector.

VOLTAGE CHECKS, check that voltage across jacks 18 and 23 on controller breakout box is approximately 10 volts dc and that voltage across jacks 20 and 23 does not exceed 1 volt dc. IF-

VOLTAGE DOES NOT CHECK, repair wiring between selector and controller.

VOLTAGE CHECKS, place outflow valve position control in NORMAL position. IF-

BOTH OUTFLOW VALVES MODULATE OPEN UNEQUALLY, record voltage across jacks 39 and 38 and jacks 40 and 37 on controller breakout box, place outflow valve position control in CLOSED AFT position, and check that voltage across jacks 39 and 38 is approximately 1 volt dc less than recorded value and that voltage across 40 and 37 is approximately 1 volt dc more than recorded value. IF-

VOLTAGE DOES NOT CHECK, replace cabin pressure controller.

AFT OUTFLOW VALVE OPENS BUT FORWARD OUTFLOW VALVE FAILS TO OPEN, adjust BARO CORR selector until forward valve is 1/4 to 3/4 open, record voltage across jacks 39 and 38 and jacks 40 and 37 on controller breakout box, place outflow valve position control in CLOSED AFT position, and check that voltage across jacks 39 and 38 is approximately 1 volt dc less than recorded value and that voltage across 40 and 37 is approximately 1 volt dc more than recorded value. IF-

VOLTAGE DOES NOT CHECK, replace cabin pressure controller.

Continued on
Page 118

Continued from
Page 116 and 117

VOLTAGE CHECKS, install outflow valve breakout box at valve locations and check that voltages across jacks 16 and 14, jacks 16 and 15, and jacks 15 and 14 on outflow valve breakout box agree with values listed in figure 104 for each outflow valve with valves positioned as indicated. (See NOTE.) IF-

VOLTAGES DO NOT CHECK, disconnect controller breakout box connector from controller and outflow valve breakout box connector from outflow valves; connect jumper wires across jacks 16 and 22, jacks 19 and 22, jacks 26 and 22, jacks 40 and 37, and jacks 39 and 28 on controller breakout box; and check for continuity across jacks 15 and 14, jacks 16 and 14, and jacks 23 and 3 on outflow valve breakout boxes. IF-

VOLTAGES CHECK, replace outflow valve(s).

NOTE: Use outflow valve position control to place outflow valves in open and closed positions. If control will not close an outflow valve, open applicable (FWD or AFT) VACUUM PUMP circuit breakers (P1) to close valve.

CONTINUITY DOES NOT CHECK, repair wiring between controller and outflow valve(s).

CONTINUITY CHECKS, replace outflow valve(s).

OUTFLOW VALVE POSITION	VOLTS ACROSS PINS 16 & 14	VOLTS ACROSS PINS 16 & 15	VOLTS ACROSS PINS 15 & 14
Closed	14	11 to 14	0 to 3
Open	14	0 to 3	11 to 14

Outflow Valve Relative Position Potentiometer Data
Figure 104

NOTE: Install selector and controller connector breakout boxes prior to performing trouble shooting procedure. An outflow valve connector breakout box may have to be installed at either or both the forward or aft valve location to complete the trouble shooting procedure.

Adjust CABIN ALTITUDE selector to field altitude and BARO CORR selector to 28.0 IN. HG. IF-

OUTFLOW VALVES DO NOT OPEN

Adjust BARO CORR selector to field pressure and record voltage across jacks J2-1 and J2-21. Return selector to 28.0 IN. HG and record voltage across jacks J2-1 and J2-21. IF-

VOLTAGE AT 28.0 IN. HG IS EQUAL TO OR GREATER THAN THAT AT FIELD PRESSURE, replace cabin pressure selector.

VOLTAGE AT 28.0 IN. HG IS LESS THAN THAT AT FIELD PRESSURE, check that voltage across jacks 40 and 37 (forward valve) and jacks 39 and 38 (aft valve) on controller breakout box is not less than 5 volts dc. IF-

VOLTAGE DOES NOT CHECK, replace cabin pressure controller.

VOLTAGE CHECKS, install outflow valve breakout box at valve location(s) and check that voltage across jacks 23(+) and 3(-) is not less than 5 volts dc. IF-

VOLTAGE DOES NOT CHECK, repair wiring between controller and outflow valve.

VOLTAGE CHECKS, place jack 23(+) ON-OFF switch on outflow valve breakout box in OFF position and check that resistance between jacks 23(+) and 3(-) is 10.5 (± 1) ohms. IF-

RESISTANCE DOES NOT CHECK, replace outflow valve.

NOTE: Install selector and controller connector breakout boxes prior to performing trouble shooting procedure. An outflow valve connector breakout box may have to be installed at either or both the forward or aft valve location to complete the trouble shooting procedure.

Adjust CABIN ALTITUDE selector to field altitude and BARO CORR selector to 31.0 IN. HG. IF-

OUTFLOW VALVES DO NOT CLOSE

Adjust BARO CORR selector to field pressure and record voltage across jacks J2-1 and J2-21. Return selector to 31.0 IN. HG and record voltage across jacks J2-1 and J2-21. IF-

VOLTAGE AT 31.0 IN. HG IS EQUAL TO OR LESS THAN THAT AT FIELD PRESSURE, replace cabin pressure selector.

VOLTAGE AT 31.0 IN. HG IS GREATER THAN THAT AT FIELD PRESSURE, check that voltage across jacks 40 and 37 (forward valve) and jacks 39 and 38 (aft valve) on controller breakout box is not greater than 1 volt dc. IF-

VOLTAGE DOES NOT CHECK, replace cabin pressure controller.

VOLTAGE CHECKS, install outflow valve breakout box at valve location(s) and check that voltage across jacks 23(+) and 3(-) is not greater than 1 volt dc. IF-

VOLTAGE DOES NOT CHECK, repair wiring between controller and outflow valve.

VOLTAGE CHECKS, place jack 23(+) ON-OFF switch on outflow valve breakout box in OFF position and check that resistance between jacks 23(+) and 3(-) is 10.5 (± 1) ohms. IF-

RESISTANCE DOES NOT CHECK, replace outflow valve.

F. Outflow Valve Position Indication

NOTE: Install selector connector breakout box prior to performing trouble shooting procedure. An outflow valve connector breakout box may have to be installed at the forward and aft valve locations to complete the trouble shooting.

Test Outflow Valve Position Indication Operation. Refer to Pressurization Control and Indicating System - Adjustment/Test. IF-

OUTFLOW VALVE POSITION DOES NOT AGREE WITH POSITION INDICATOR ON CABIN PRESSURE SELECTOR, open SAFETY RELAYS circuit breaker (P5) (See CAUTION); adjust CABIN ALTITUDE selector to field elevation and BARO CORR selector until outflow valves are one-fourth to three-fourths open; close outflow valve by placing outflow valve position control in applicable CLOSED position; connect a jumper wire on selector breakout box across jacks J1-3 and J1-8 to check the forward valve indicator, or across jacks J1-1 and J1-8 for the aft valve indicator; and check that indicator deflects to the full open position. IF-

- INDICATOR DOES NOT DEFLECT FULL OPEN, replace cabin pressure selector.
- INDICATOR DEFLECTS FULL OPEN, remove jumper wires, install outflow valve breakout box at valve locations, and check that voltages across jacks 2 and 4, jacks 2 and 7, and jacks 4 and 7 on outflow valve breakout box agree with values listed in figure 105 for each outflow valve with valves positioned as indicated. (Use outflow valve position control to place outflow valves in open and closed positions.) IF-

Continued on Page 122

CAUTION: ATTITUDE WARNING AC (P5), WATER DRAIN MAST HEATER AC (P1), AND CREW AIR HEATER (P3) CIRCUIT BREAKERS MUST BE OPEN BEFORE OPENING SAFETY RELAYS CIRCUIT BREAKER TO PREVENT DAMAGE TO HEATING ELEMENTS.

Continued from
Page 121

VOLTAGES DO NOT CHECK, disconnect selector breakout box connector from selector and outflow valve breakout box connector from outflow valves; connect jumper wires across jacks J1-1 and J1-3, jacks J1-3 and J1-8, and jacks J1-8 and J1-9 on selector breakout box and check for continuity across jacks 2 and 4 and jacks 4 and 7 on outflow valve breakout boxes. IF-

VOLTAGES CHECK, replace cabin pressure selector.

CONTINUITY DOES NOT CHECK, repair wiring between selector and outflow valves.

CONTINUITY CHECKS, replace applicable outflow valve(s).

OUTFLOW VALVE POSITION	VOLTS ACROSS PINS 2 and 4	VOLTS ACROSS PINS 2 and 7	VOLTS ACROSS PINS 4 and 7
Closed	11 to 14	14	0 to 3
Open	0 to 3	14	11 to 14

Outflow Valve Position Transmitter Potentiometer Data
Figure 105

PRESSURIZATION CONTROL AND INDICATING SYSTEM - ADJUSTMENT/TEST

EFFECTIVITY

TCA : LX-N19996
LX-N20198
LX-N20199

RTCA : LX-N19997
LX-N20000

1. General

A. The cabin pressure control system is divided into seven tests: one leakage test, five operational tests and one cabin altitude warning system. All seven tests must be performed to establish functional integrity of the system, but any of the tests may be used alone as required to check a particular portion of the system.

B. The leakage test is intended to determine if the ambient sense lines to the outflow valves and safety valve are within leakage limits.

(1) Testing procedure for the forward outflow valve and safety valve is identical to the aft outflow valve test.

(2) Leakage tolerances for the outflow valves differ from the safety valve leakage tolerance.

C. Operational tests are intended to ensure correct functioning of the cabin pressure control system components, and circuit continuity to the components and indicating devices. The tests consist of tests for the safety valve, ground differential pressure solenoid, manual control operation, automatic control operation, and outflow valve position indication.

(1) Operational test of the safety valve includes testing the safety valve open light circuitry.

(2) The automatic control operation test includes the minimum differential pressure control test, isobaric hold solenoid test, auto delay test and simulated flight operational test.

D. The cabin altitude warning system test is intended to ensure correct functioning of the warning horn and continuity of the control circuits.

2. Cabin Pressure Control System Test

A. Vacuum Pump Discharge and Ambient Sense Lines Leakage Test

(1) Equipment and Materials

(a) Ground power 115/200 volt 400 cps, 3-phase, not less than 10 KW capacity

(b) Vacuum source with capability of 1 pound per minute at 20 inches of mercury

(c) Manometers with range capability 0 to 30 inches of mercury

(d) Flowmeter with range capability 0 to 0.10 pound per minute

(e) Lines, fittings and air shutoff valves as required

(2) Prepare Vacuum Pump Discharge and Ambient Sense Lines for Leakage Test

(a) Check that following circuit breakers are closed:

1) DC CABIN PRESS CONT (P5)

2) EXT PWR (J9)

(b) Open the following circuit breakers:

1) FWD VACUUM PUMP (P1)

2) AFT VACUUM PUMP (P1)

(c) Attach a leak-proof vacuum line to the aft vacuum pump discharge port (aft outflow valve sense port) from outside the airplane at the port through the skin.

NOTE: The forward vacuum pump discharge port (forward outflow valve sense port) is located on the aft side of the station 600K bulkhead in the right air conditioning bay.

The safety valve sense port is located on the forward side of the station 960 bulkhead.

(d) Install a tee connection in the end of the attached vacuum line. Connect a mercury differential manometer to one leg of the tee fitting and the flowmeter to the other leg of the tee fitting. Connect the flowmeter to regulated vacuum source.

(3) Test Vacuum Pump Discharge and Ambient Sense Lines

(a) Apply external power.

(b) Place AUTO-MAN switch in MAN position.

(c) Place manual rate control selector in DOWN position.

(d) Adjust vacuum to 8.0 inches of mercury differential.

(e) Check that leakage flow rate does not exceed 0.240 standard cubic feet per minute.

(4) Restore Airplane to Normal

(a) Disconnect and remove test equipment, tee fittings, and connecting lines.

(b) Close the following circuit breakers.

1) FWD VACUUM PUMP (P1)

2) AFT VACUUM PUMP (P1)

(c) Place AUTO-MAN switch in AUTO position.

(d) Place manual rate control selector in HOLD position.

(e) Determine if there is any further need for electrical power on the airplane; if not, remove external power.

B. Safety Valve Operation and Open Light Test

(1) Prepare to Test Safety Valve

(a) Connect ground power.

(b) Check that following circuit breakers are closed:

1) DC CABIN PRESS CONT (P5)

2) CABIN PRESS SAFETY VALVE (P6)

3) EXT PWR (J9)

(2) Test safety valve operation.

(a) Check that SAFETY VALVE open light is off.

(b) Press to test SAFETY VALVE open light.

(c) Hold SAFETY VALVE switch in the OPEN position until safety valve light comes on and immediately open CABIN PRESS SAFETY VALVE circuit breaker.

(d) Check that the safety valve poppet is approximately 1/8 inch off valve seat.

(e) Close cabin pressure safety valve circuit breaker and return SAFETY VALVE switch to NORMAL position.

(f) Check that SAFETY VALVE open light is off.

(g) Place SAFETY VALVE switch in OPEN position.

(h) Check that valve drives fully open in 35.0 seconds maximum and remains open and the SAFETY VALVE open light comes on.

(i) Place SAFETY VALVE switch in NORMAL position.

(j) Check that valve drives close in 35.0 seconds or less and remains closed and SAFETY VALVE open light goes off.

(3) Determine if there is any further need for electrical power on the airplane; if not, remove external power.

C. Controller Ground Differential Pressure Solenoid Test

(1) Equipment and Materials

(a) Vacuum source with capability of 1 pound per minute at 20 inches mercury

(b) Manometer with range capability 0 to 30 inches of mercury

(c) Air shutoff valve, lines, and fittings as required

(2) Prepare to Test Controller Ground Differential Pressure Solenoid

(a) Connect vacuum source to an auxiliary static system port at station 514.

(b) Temporarily seal the unused auxiliary static system ports.

(c) Connect external power.

(d) Check that following circuit breakers are closed:

1) FWD VACUUM PUMP (P1)

2) AFT VACUUM PUMP (P1)

3) AC CABIN PRESS CONT (P1)

4) DC CABIN PRESS CONT (P5)

5) SAFETY RELAYS (P5)

6) EXT PWR (J9)

(e) Place AUTO-MAN switch in AUTO position.

(f) Place TAKEOFF-LANDING mode switch in TAKEOFF position.

(g) Set CABIN ALTITUDE selector at field elevation.

(h) Set BARO CORR selector at field pressure.

(i) Place outflow valve position (balance) control in NORMAL position.

(j) Place RATE selector in maximum INCR position.

(3) Test Controller Ground Differential Pressure Solenoid

(a) Check that both outflow valves are closed.

(b) Check that both valve position indicator pointers are in the full closed position.

(c) Slowly apply a vacuum of 0.19 inch of mercury at static system port and check that outflow valves remain closed.

(d) Slowly increase vacuum to 0.30 inch of mercury and check that outflow valves go full open within 20 seconds after 0.30 inch of mercury vacuum is applied.

(4) Restore Airplane to Normal

(a) Remove temporary seals from unused auxiliary static system ports.

(b) Remove vacuum source from auxiliary static system port.

(c) Determine if there is any further need for electrical power on airplane; if not, remove external electrical power.

D. Manual Control Operation Test

(1) Prepare to Test Manual Control Operation

(a) Apply external power.

(b) Check that following circuit breakers are closed:

1) FWD VACUUM PUMP (P1)

2) AFT VACUUM PUMP (P1)

3) AC CABIN PRESS CONT (P1)

4) DC CABIN PRESS CONT (P5)

5) SAFETY RELAYS (P5)

6) EXT PWR (J9)

(c) Place AUTO-MAN switch in MAN position.

(d) Place manual rate control selector in HOLD position.

(e) Place RATE selector in maximum INCR position.

(f) Set CABIN ALTITUDE selector at field elevation.

(g) Set BARO CORR selector at field pressure.

(h) Place TAKEOFF-LANDING mode switch in TAKEOFF position.

(2) Test Manual Control Operation

(a) Rotate manual rate control selector to maximum UP position and check that outflow valves move to full open position within 20 seconds after initial valve movement.

(b) Set CABIN ALTITUDE selector at -1000 feet cabin altitude.

(c) Open DC CABIN PRESS CONT circuit breaker (P5) and check that outflow valves remain open for 10 seconds.

NOTE: FWD and AFT VALVE position indicators are rendered inoperative when DC CABIN PRESS CONT circuit breaker (P5) is opened.

(d) Close DC CABIN PRESS CONT circuit breaker (P5) and allow sufficient time for outflow valves to open (if closed).

(e) Check that outflow valves are open.

(f) Return CABIN ALTITUDE selector to field elevation.

(g) Rotate manual rate control selector to maximum DOWN position and check that outflow valves move to full closed position within 14 seconds after initial valve movement.

(h) Return manual rate control selector to HOLD position.

(i) Check that outflow valves remain closed.

(j) Place TAKEOFF-LANDING mode switch in LANDING position.

(k) Check that outflow valves remain closed.

(l) Place AUTO-MAN switch in AUTO position and check that outflow valves open within 12 seconds.

(m) Rotate manual rate control selector to maximum DOWN position.

(n) Check that outflow valves remain open.

(o) Return manual rate control selector to HOLD position.

(p) Place TAKEOFF-LANDING mode switch in TAKEOFF position and check that outflow valves close within 15 seconds.

(q) Rotate manual rate control selector to maximum UP position.

(r) Check that outflow valves remain closed.

(s) Return manual rate control selector to HOLD position.

(3) Determine if there is any further need for electrical power on the airplane; if not, remove external power.

E. Automatic Control Operation Test

(1) Prepare to Test Automatic Control Operation

(a) Apply external power.

(b) Check that following circuit breakers are closed:

1) FWD VACUUM PUMP (P1)

2) AFT VACUUM PUMP (P1)

3) AC CABIN PRESS CONT (P1)

4) DC CABIN PRESS CONT (P5)

5) SAFETY RELAYS (P5)

6) EXT PWR (J9)

(2) Test Automatic Control Operation

(a) Test minimum differential pressure control.

1) Place AUTO-MAN switch in MAN position.

2) Place manual rate control selector in DOWN position.

3) Place TAKEOFF-LANDING mode switch in LANDING position.

4) Set CABIN ALTITUDE selector at field elevation.

5) Set BARO CORR selector at field pressure.

6) Place outflow valve position (balance) control in NORMAL position.

7) Place RATE selector in maximum INCR position.

8) Check that outflow valves are closed.

9) Place AUTO-MAN switch in AUTO position.

10) Check that outflow valves move to full open.

11) Place TAKEOFF-LANDING mode switch in TAKEOFF position.

12) Check that outflow valves go full closed.

13) Place TAKEOFF-LANDING mode switch in LANDING position.

14) Check that outflow valves return to full open.

(b) Test isobaric hold solenoid.

1) Open AC CABIN PRESS CONT circuit breaker (P1). Wait 10 seconds and check that outflow valves remain open during interval, then open FWD and AFT VACUUM PUMP circuit breakers (P1).

2) Check that outflow valves close indicating vacuum pumps have stopped operating.

3) Close FWD and AFT VACUUM PUMP circuit breakers (P1). Check that vacuum pumps operate and the outflow valves open slowly.

(c) Test auto delay

1) Place TAKEOFF-LANDING mode switch in TAKEOFF position.

2) Close AC CABIN PRESS circuit breaker (P1).

3) After approximately 15 seconds delay, check that outflow valves start to close.

(d) Test simulated flight operation

1) Open the following circuit breakers:

a) ATTITUDE WARNING AC (P5)

b) WATER DRAIN MAST HEATER AC (P1)

c) CREW AIR HEATER (P3)

d) SAFETY RELAYS (P5)

CAUTION: ATTITUDE WARNING AC, WATER DRAIN MAST HEATER AC, AND CREW AIR HEATER CIRCUIT BREAKERS MUST BE OPEN BEFORE OPENING SAFETY RELAYS CIRCUIT BREAKER TO PREVENT DAMAGE TO HEATING ELEMENTS.

2) Check that AUTO-MAN switch is in AUTO position, BARO CORR selector at field pressure, outflow valve position (balance) control in NORMAL position, and RATE selector in maximum INCR position.

3) Set CABIN ALTITUDE selector at 300 feet above field elevation.

4) Check that outflow valves are open.

5) With TAKEOFF-LANDING mode switch in TAKEOFF position, check that valves are open.

6) Place TAKEOFF-LANDING mode switch in LANDING position.

7) Check that valves remain open.

8) Adjust CABIN ALTITUDE selector to 300 feet below field elevation.

9) Check that outflow valves close.

10) Adjust BARO CORR selector to 28 inches of mercury.

11) Check that outflow valves open.

12) Adjust CABIN ALTITUDE and BARO CORR selectors to field elevation and pressure respectively.

13) Adjust BARO CORR selector until outflow valves are one-fourth to three-fourths open.

14) Check that BARO CORR selection matches known barometric pressure within 0.25 inch of mercury.

15) Place outflow valve position (balance) control in FWD CLOSED position.

16) Check that the aft outflow valve remains open and forward outflow valve closes.

17) Place outflow valve position (balance) control in CLOSED AFT position.

18) Check that the forward outflow valve opens and the aft outflow valve closes.

(3) Restore Airplane to Normal

(a) Close SAFETY RELAYS circuit breaker (P5).

(b) Close ATTITUDE WARNING AC (P5), WATER DRAIN MAST HEATER AC (P1), and CREW AIR HEATER (P3) circuit breakers.

(c) Determine if there is any further need for electrical power on the airplane; if not, remove external power.

F. Outflow Valve Position Indication Test

(1) Test Outflow Valve Position Indication

(a) Apply external power.

(b) Check that the following circuit breakers are closed:

1) FWD VACUUM PUMP (P1)

2) AFT VACUUM PUMP (P1)

3) AC CABIN PRESS CONT (P1)

4) DC CABIN PRESS CONT (P5)

5) EXT PWR (J9)

(c) Check that AUTO-MAN switch is in AUTO position.

(d) Place TAKEOFF-LANDING mode switch in TAKEOFF position to close forward and aft outflow valves.

(e) Check that FWD and AFT VALVE position indicators agree with forward and aft outflow valve positions.

(f) Place TAKEOFF-LANDING mode switch in LANDING position to open forward and aft outflow valves.

(g) Check that FWD and AFT VALVE position indicators agree with forward and aft outflow valve positions.

(2) Determine if there is any further need for electrical power on the airplane; if not, remove external power.

3. Cabin Altitude Warning System Test

A. General

(1) Testing the cabin altitude warning system is accomplished during flight.

(2) Testing the altitude warning system requires decreasing cabin pressure below a comfortable level and should not be attempted with passengers aboard.

B. Flight Test Cabin Altitude Warning System

(1) At an airplane altitude above 11,250 feet, increase the cabin altitude by either automatic or manual control, to an altitude that activates the warning horn while observing the cabin altitude on the altimeter and differential pressure indicator.

(2) Check that horn blows at 10,000 (± 1250) feet.

(3) Press cabin altitude warning horn cutout switch.

(4) Check that warning horn becomes silent.

NOTE: Do not raise cabin altitude higher than required to perform test. Passenger service unit oxygen masks drop at approximately 14,000 feet cabin altitude.

C. Ground Test of Cabin Altitude Warning System

(1) Disconnect electrical plug of altitude warning switch.

(2) Install a jumper between pins A and B of airplane plug. Horn should blow.

(3) Press cabin altitude warning horn cutout switch. Horn should become silent.

(4) Remove jumper and reinstall electrical plug on altitude warning switch.

CABIN PRESSURE SELECTOR - REMOVAL/INSTALLATION

1. Remove Cabin Pressure Selector (See figure 401.)

   A. Open flight engineer's upper instrument panel.

   B. Remove electrical connections from two terminals.

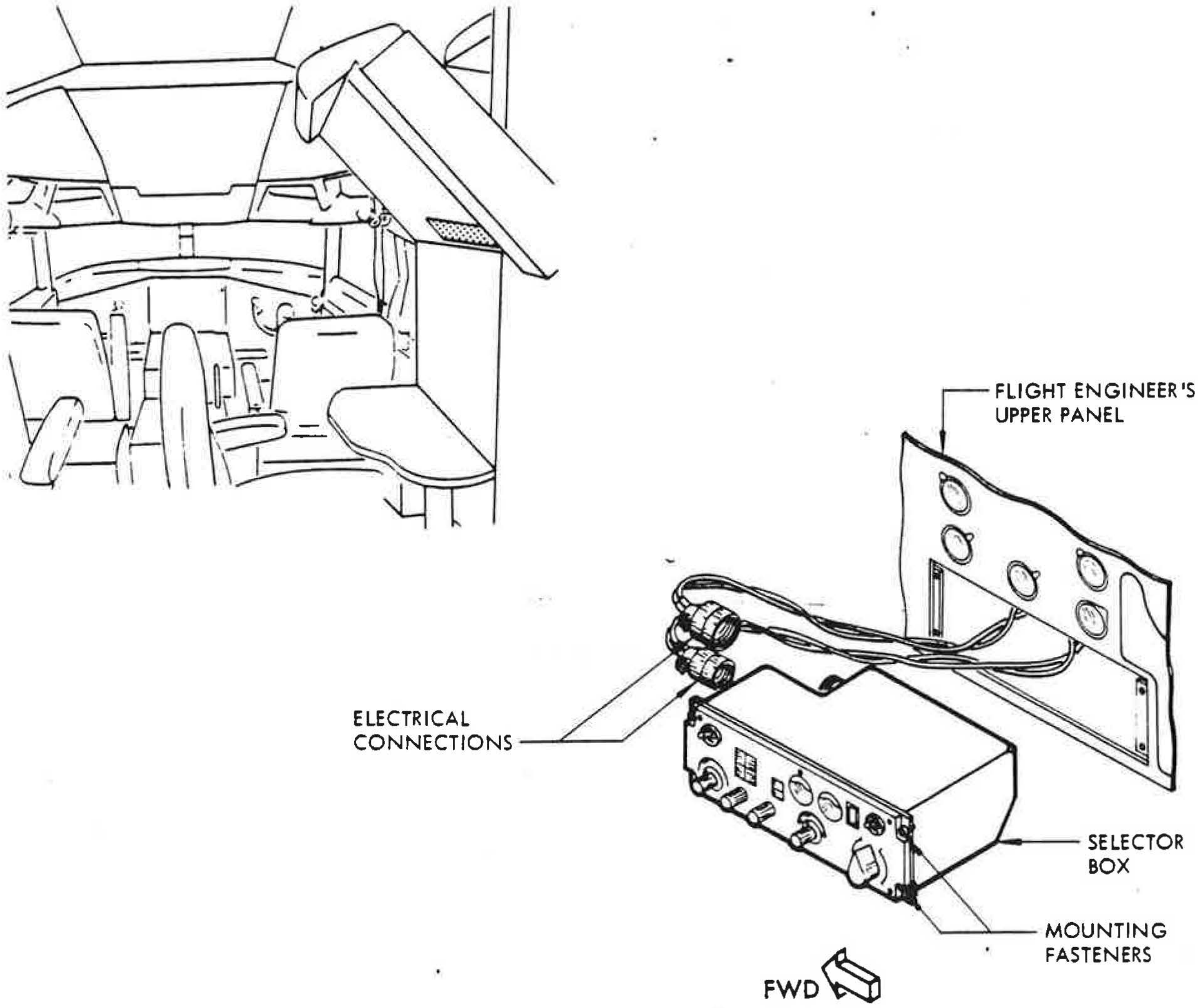
   C. Disconnect mounting fasteners and remove selector.

2. Install Cabin Pressure Selector

   A. Set selector into place and attach mounting fasteners.

   B. Attach electrical connections to two terminals.

   C. Close flight engineer's upper instrument panel.



Cabin Pressure Selector Installation
Figure 401

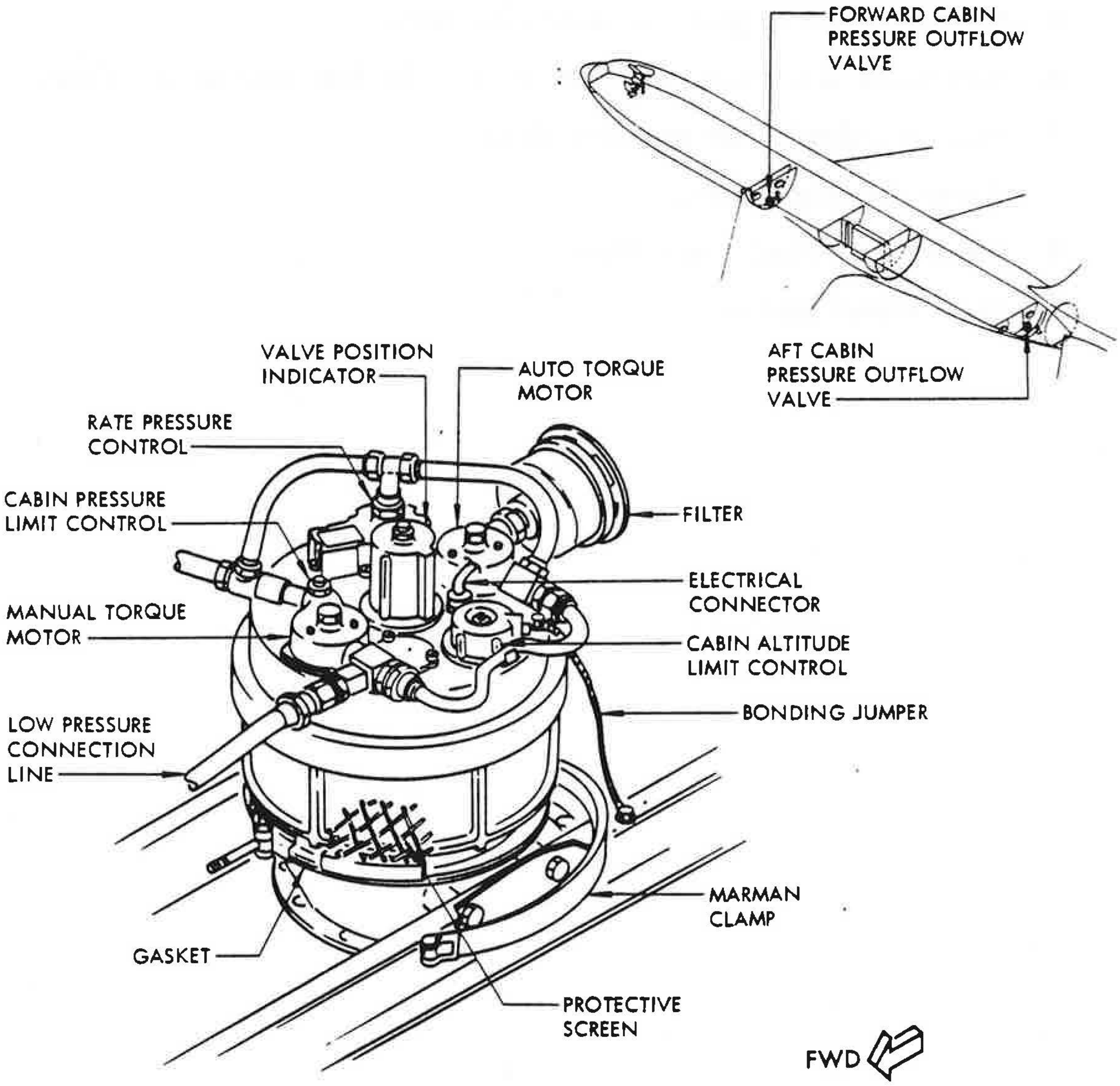
CABIN PRESSURE OUTFLOW VALVES - REMOVAL/INSTALLATION

1. Remove Cabin Pressure Outflow Valve (See figure 401.)

   A. Gain access to valve.

      (1) For forward outflow valve, remove aft bulkhead in forward cargo compartment.

      (2) For aft outflow valve, remove aft bulkhead in aft cargo compartment.



Typical Cabin Pressure Outflow Valve Installation
Figure 401

B. Disconnect low pressure connection line. Cap and tag line end.

C. Disconnect bonding jumper.

D. Disconnect electrical connection.

E. Detach Marman clamp around lower part of valve body.

F. Remove valve and gasket.

2. Install Cabin Pressure Outflow Valve

A. Set new gasket in place on valve body seat.

B. Move valve into place and attach to seat by fastening Marman clamp.

C. Uncap and connect low pressure line.

D. Connect bonding jumper.

E. Connect electrical connection.

F. Close access panels.

SAFETY OUTFLOW VALVE - REMOVAL/INSTALLATION

1. Remove Safety Outflow Valves (See figure 401.)

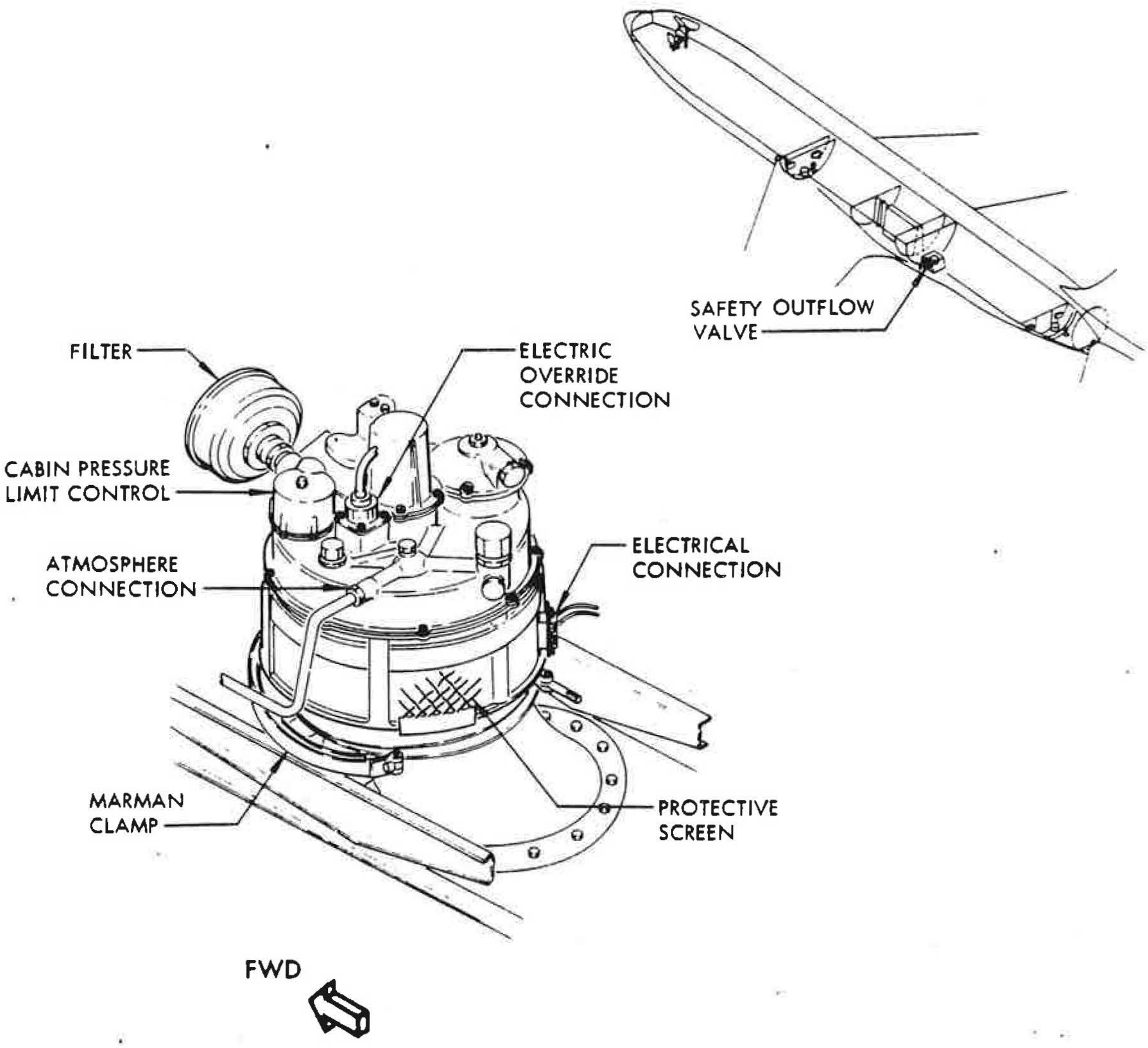
   A. Gain access to safety valve by removing shrouding installation in forward section of aft cargo compartment.

   B. Disconnect atmosphere connection line. Cap and tie line end.

   C. Disconnect electrical connections.

   D. Detach Marman clamp around louver part of valve body seat.

   E. Remove valve and gasket.



Safety Outflow Valve Installation
Figure 401

2. Install Safety Outflow Valve

A. Set new gasket in place on valve body seat.

B. Move valve into place and attach to seat by fastening Marman clamp.

C. Uncap and connect atmosphere connection line.

D. Connect electrical connection.

E. Install shrouding in forward section of aft cargo compartment.

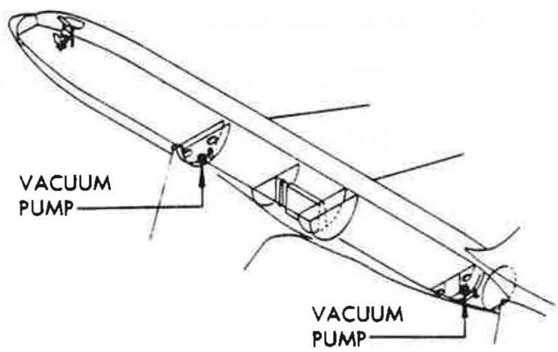
VACUUM PUMP INSTALLATION - REMOVAL/INSTALLATION

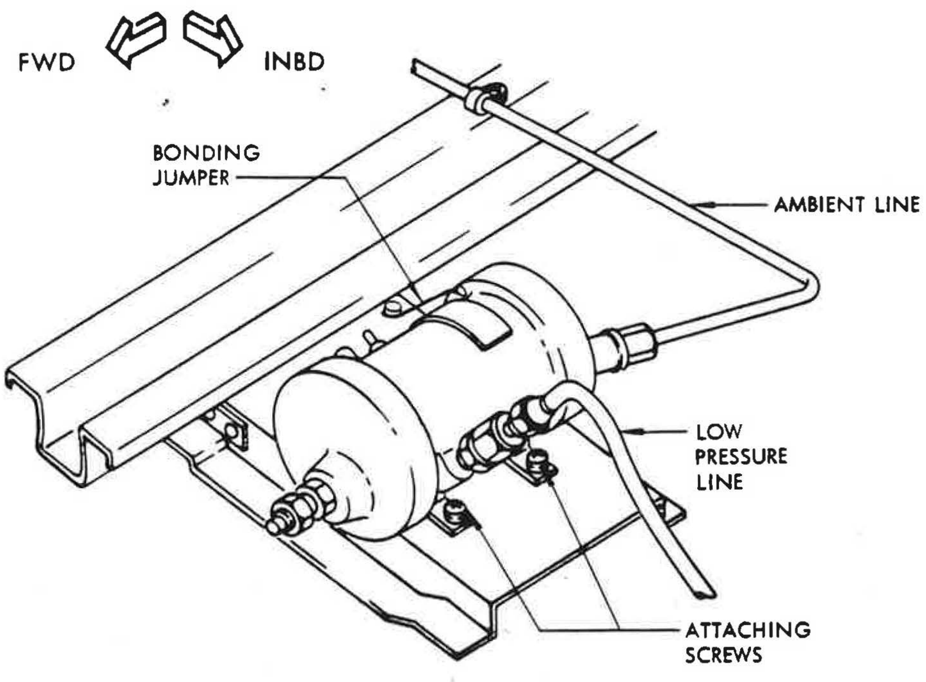
1. Remove Vacuum Pump (See figure 401.)

   A. Gain access to pump.

      (1) For forward vacuum pump, remove aft bulkhead in forward cargo compartment.

      (2) For aft vacuum pump, remove aft bulkhead in aft cargo compartment.





Vacuum Pump Installation
Figure 401

B. Disconnect low pressure line. Cap and tag line.

C. Disconnect ambient line. Cap and tag line.

D. Disconnect bonding jumper.

E. Remove mounting screws and remove vacuum pump.

2. Install Vacuum Pump

A. Set vacuum pump in place and install mounting screws.

B. Uncap and connect ambient line.

C. Uncap and connect low pressure line.

D. Connect bonding jumper.

E. Close access panel.

HEATING - DESCRIPTION AND OPERATION

1. General

   A. Heating includes those systems or equipment which are installed to provide heat for the airplane.

   B. The systems supplying heated air into the passenger cabin, the control cabin and the cargo compartment consist of the following:

      (1) Main cabin heating systems

      (2) Control cabin heating system

      (3) Cargo compartment heating system

MAIN CABIN HEATING SYSTEMS - DESCRIPTION AND OPERATION

1. General

   A. Main cabin heating systems include all methods or equipment used in the main cabin which are specifically installed for providing heat.

   B. Electric heating blankets supplement the air conditioning distribution system and are provided to prevent certain cold spots from forming in the main cabin which the air conditioning distribution system cannot keep warm enough during long periods of cold soak. These cold spots form where ducts, which provide distribution of conditioned air, are missing.

   C. The main cabin heating systems consist of the escape hatch heating blankets, main cargo door heating blankets, floor heating blankets, or floor heating panels. (See figure 1.) These electric heating blankets or panels, operate from single phase 115 volt ac power and are controlled from the main (PASS) cabin blanket switch located on the flight engineer's panel. (See figure 2.)

2. Escape Hatch Heating Blankets

   A. General

      (1) There are three escape hatches located on each side of all Passenger/Cargo Convertible Airplanes. Two of these escape hatches are located in the airplane midsection over the wing area. The third escape hatch is located in the aftsection of the airplane. Standard Passenger Airplanes contain only the midsection escape hatches.

   B. Midsection Escape Hatches

      (1) At the midsection escape hatches on all airplanes having heating blankets, the sidewall panels which contain the escape hatch also contain two heating blankets. One heating blanket is in the escape hatch, the other heating blanket is in the lower part of the sidewall panel between the escape hatch bottom and the cabin floor. See figure 1 for effectivity.

(a) In the escape hatch the heating blanket is inboard of the skin insulation and extends downward from the upper three quarters of the window panel to the dado panel trim. The heating blanket is bonded to the window panel and consists of electric wires imbedded in a fiberglass blanket. The heat of the blanket is thermostatically controlled at temperatures ranging from 75 to 100°F (24 to 38°C). The connector to the electrical blanket lead is in the upper corner of the escape hatch.

(b) In the sidewall panel between the escape hatch bottom and the cabin floor, the heating blanket consists of electric wires imbedded in a fiberglass blanket which is inserted into the dado retainers behind the dado panel. The heat of the blanket is thermostatically controlled at temperatures ranging from 75 to 100°F (24 to 38°C). The electrical lead to the blanket is in the lower corner of the blanket and is accessible upon removal of the dado panel.

C. Aftsection Escape Hatches

(1) At the aftsection escape hatch on Passenger/Cargo Convertible Airplanes having heating blankets, the escape hatch comes completely to the floor and contains only one heating blanket. See figure 1 for effectivity.

(a) In the aftsection escape hatch, the heating blanket is installed inboard of the skin insulation next to the dado panel and extends upward from the bottom of the escape hatch to the approximately midpoint of the window panel. The heating blanket consists of electric wires imbedded in a fiberglass blanket and is held in place by shock mount fastener recesses, and inclusion between the window and dado panel and the skin insulation. The heat of the blanket is thermostatically controlled at temperatures ranging from 75 to 100°F (24 to 38°C). The lead connection for the blanket is located in the upper corner of the emergency escape hatch.

3. <u>Main Cargo Door Heating Blankets</u>

A. General

(1) The main cargo door is on the upper left side of the forward fuselage. Electric blankets contained within the cargo door are of two configurations. Cargo doors with five window panels have a three heating blanket configuration. Cargo doors with seven window panels have a two heating blanket configuration.

B. Three Heating Blanket Configuration

(1) Three electric heating blankets are contained within the main cargo door inboard of the skin insulation. See figure 1 for effectivity. One is at the bottom of the door immediately behind the dado panel. The other two are located at each end of the first or bottom blanket and extend upward from the door bottom following the skin contour to an approximate window panel midpoint. The heating blankets consist of electric wires imbedded in fiberglass blankets and are retained in position by inclusion between the dado panel and the skin insulation. No additional fasteners are required. The heating blankets are thermostatically controlled at temperatures ranging from 75 to 100°F (24 to 38°C). The blanket lead connectors are fastened through a conduit into a main cargo door terminal box located in the upper portion of the cargo door.

C. Two Heating Blanket Configuration

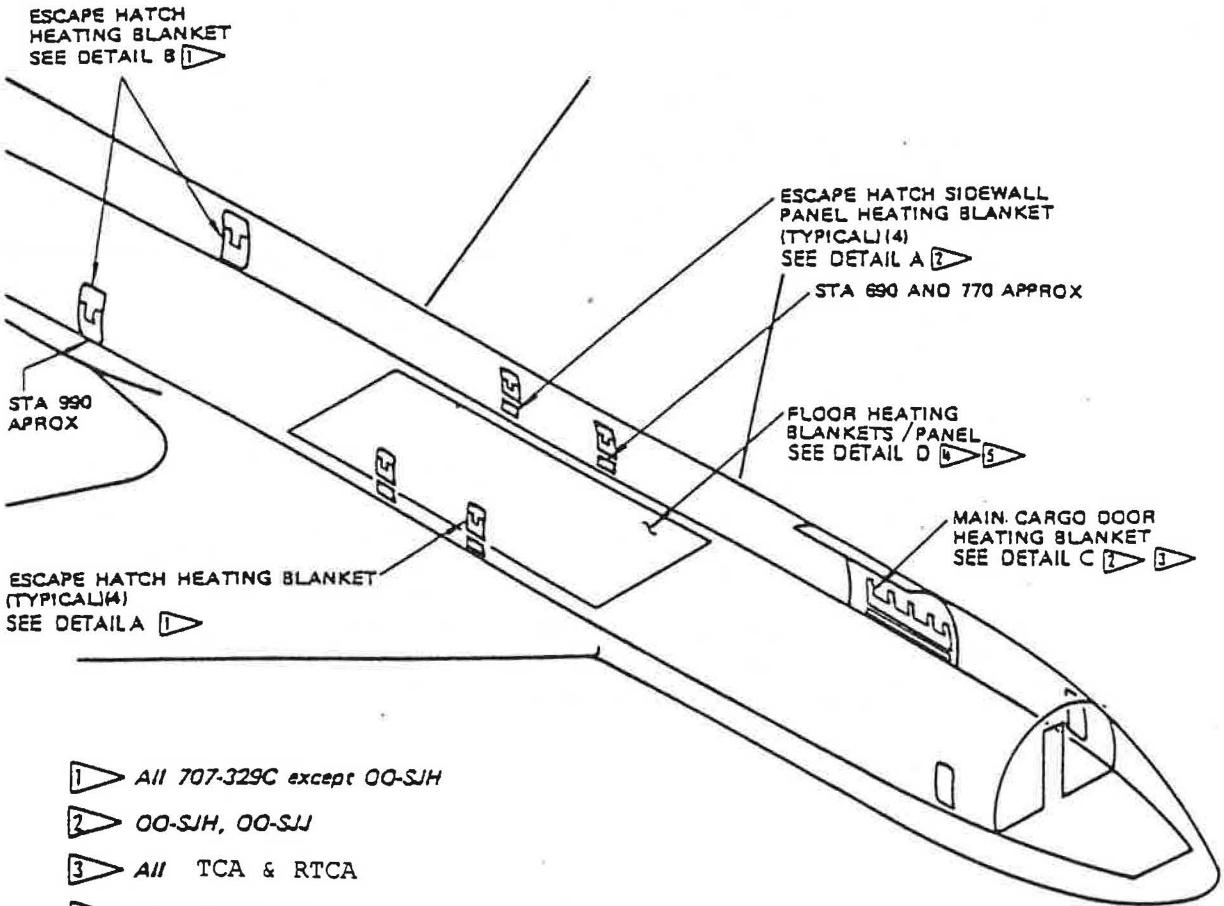
(1) Two electric heating blankets are contained within the main cargo door inboard of the skin insulation. See figure 1 for effectivity. One is at the bottom of the door immediately behind the dado panel. The other extends from slightly above this level, immediately behind the window panel to the top of the window panel. The heating blankets consist of-electric wires imbedded in fiberglass blankets and are retained in position by inclusion between the dado panel and the skin insulation. No additional fasteners are required. The heating blankets are thermostatically controlled at temperatures ranging from 75 to 100°F (24 to 38°C). The blanket lead connectors are fastened through a conduit into a main cargo door terminal box located in the upper portion of the cargo door.

4. Floor Heating Blankets

A. Floor heating blankets are located over the wing center section. See figure 1 for effectivity. They consist of electric wires imbedded in rubberized fabric and are installed in a strip between the seat tracks, underneath the rugs. The heat of these blankes is not thermostatically controlled because of the low wattage dissipated by the heater element. Terminal strip connectors for electrical leads to the blankets are beneath the floor panels at approximate body stations 620, 820 and 960. Short sections of floor panels at these locations must be removed to gain access to the heating blanket terminal strips.

5. Floor Heating Panels

A. On certain airplanes, the floor heating blankets are replaced by floor heating panels. See figure 1 for effectivity. Fabrication of these floor panels includes a built in heater element between the upper face and core. The heater element dissipates 7 watts of electrical power per square foot of floor panel area at 115 volts ac with a floor panel thickness of approximately 0.40 inches. Because of the low wattage, the heater element is not thermostatically controlled. Terminal strips for electrical leads to the floor heating panels are located at approximate body stations 600K, 810 and 960. Conduits are installed as required, to provide protection for electrical wires being routed from each terminal strip to a box which provides mounting for an electrical connector. The box is installed under each panel between two body structure members. The purpose of the box is to provide an easy plug disconnect for the two heating panel lead wires for floor panel replacement or testing.



1 All 707-329C except OO-SJH

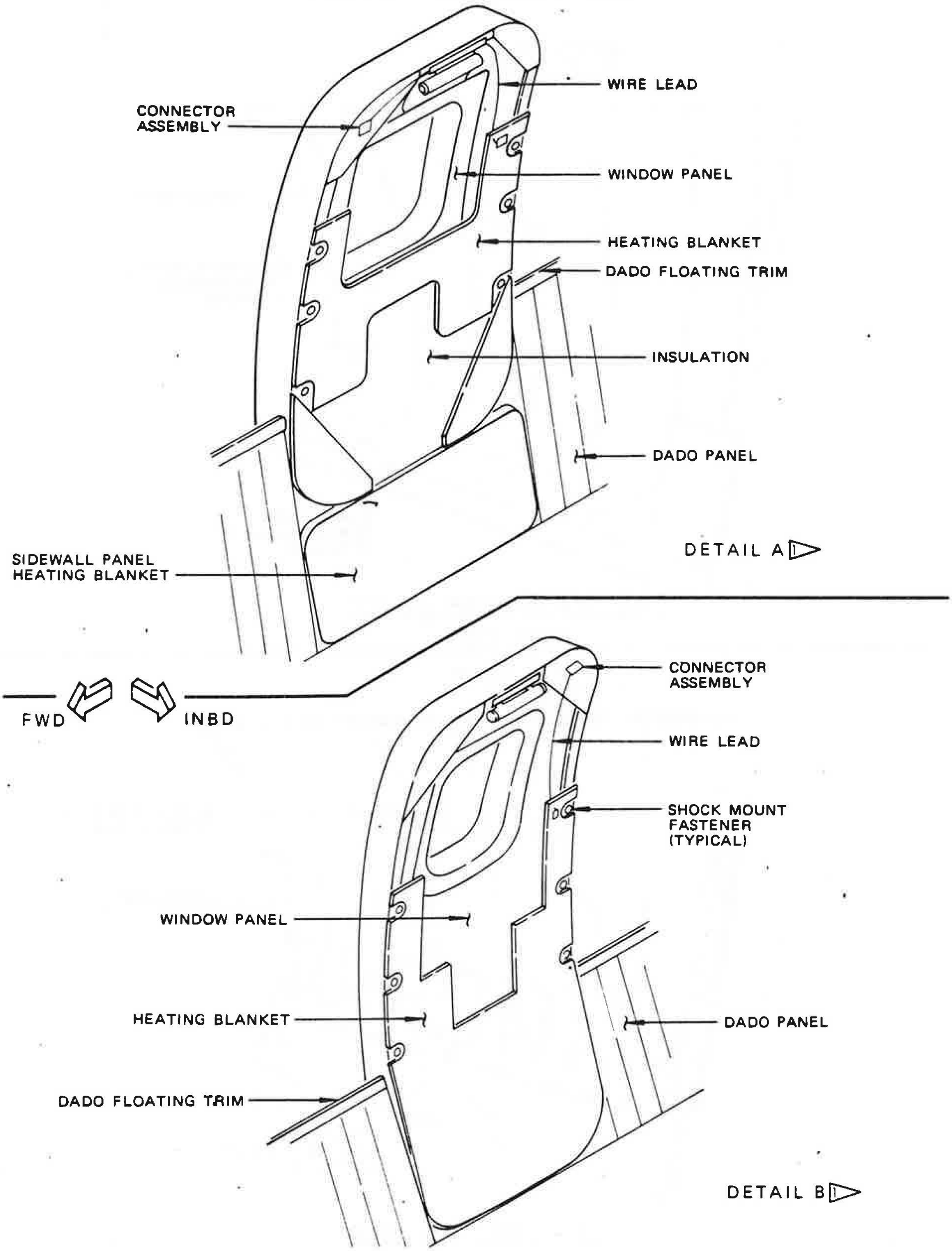
2 OO-SJH, OO-SJJ

3 All TCA & RTCA

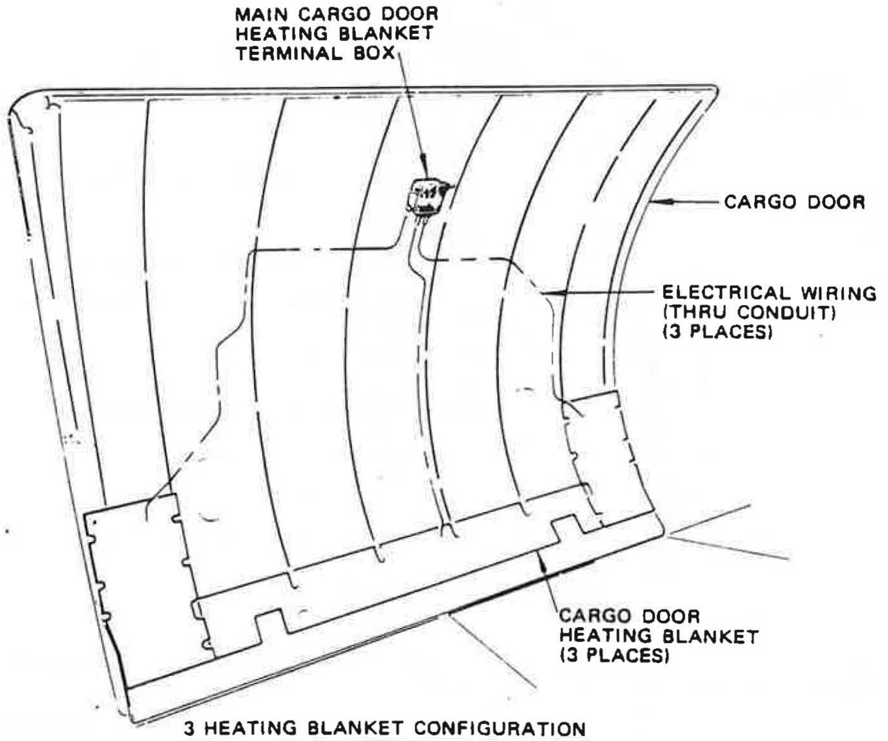
4 All 707-329 except OO-SJA thru OO-SJE

5 All 707-329C except LX-N19996

Main Cabin Heating Blankets
Figure 1 (Sheet 1)

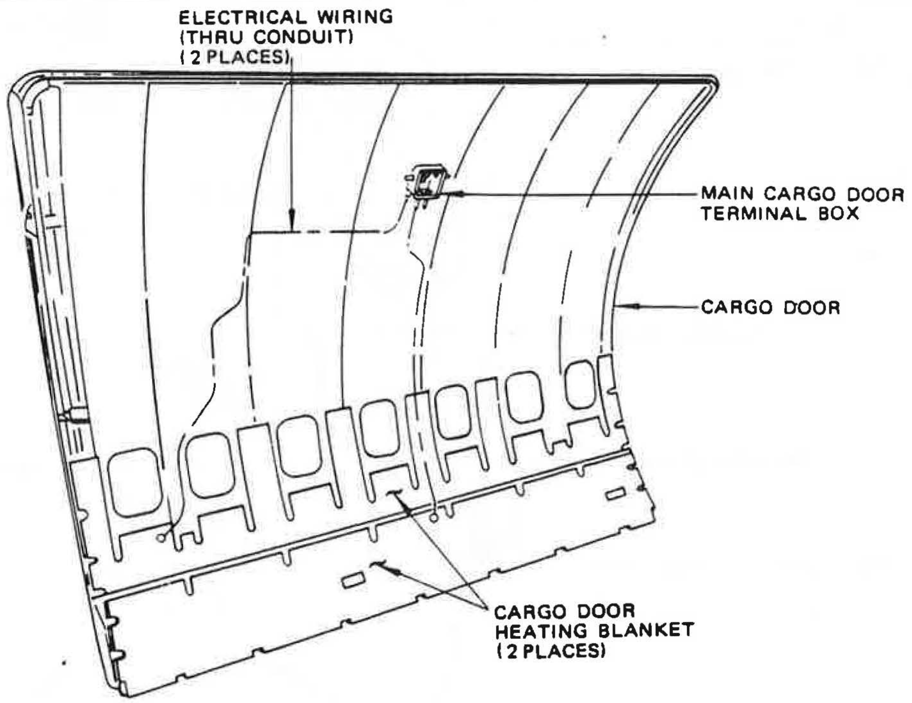


Main Cabin Heating Blankets
Figure 1 (Sheet 2)



3 HEATING BLANKET CONFIGURATION

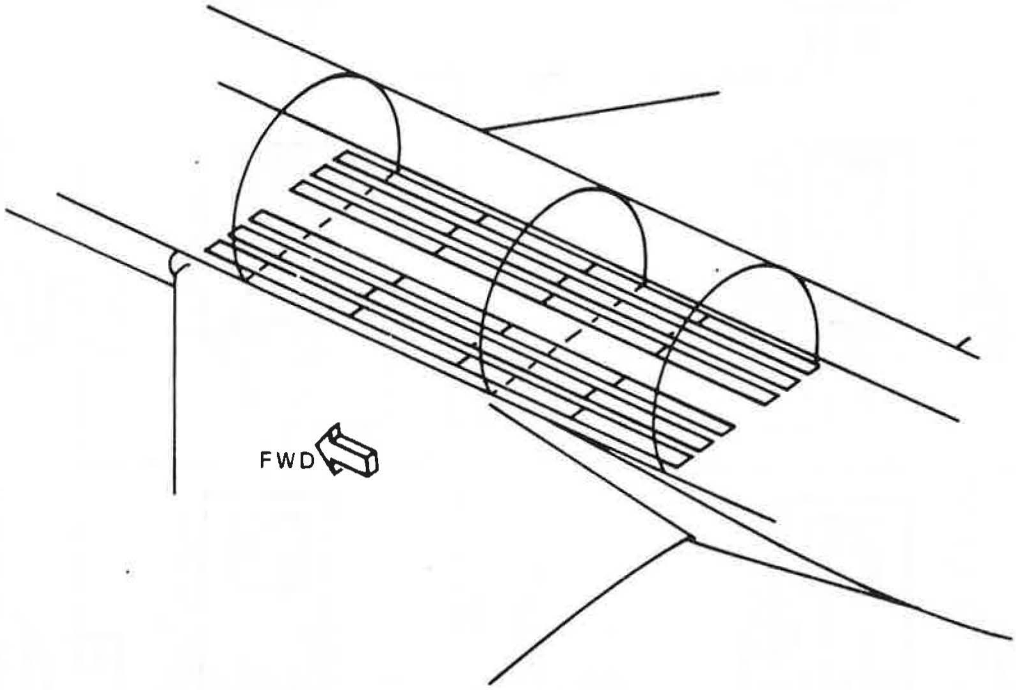
DETAIL C [2]



2 HEATING BLANKET CONFIGURATION

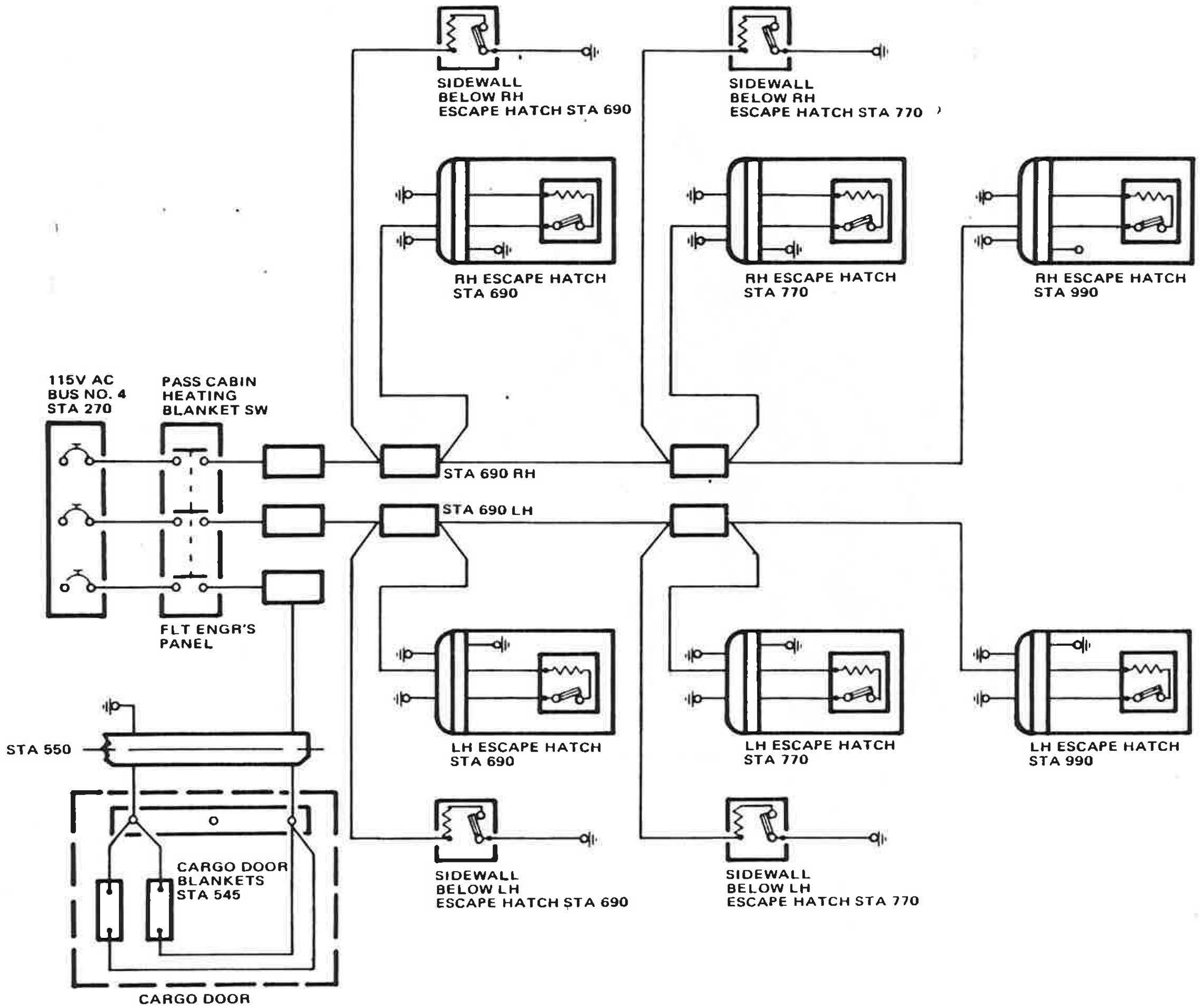
DETAIL C [3]

Main Cabin Heating Blankets
Figure 1 (Sheet 3)

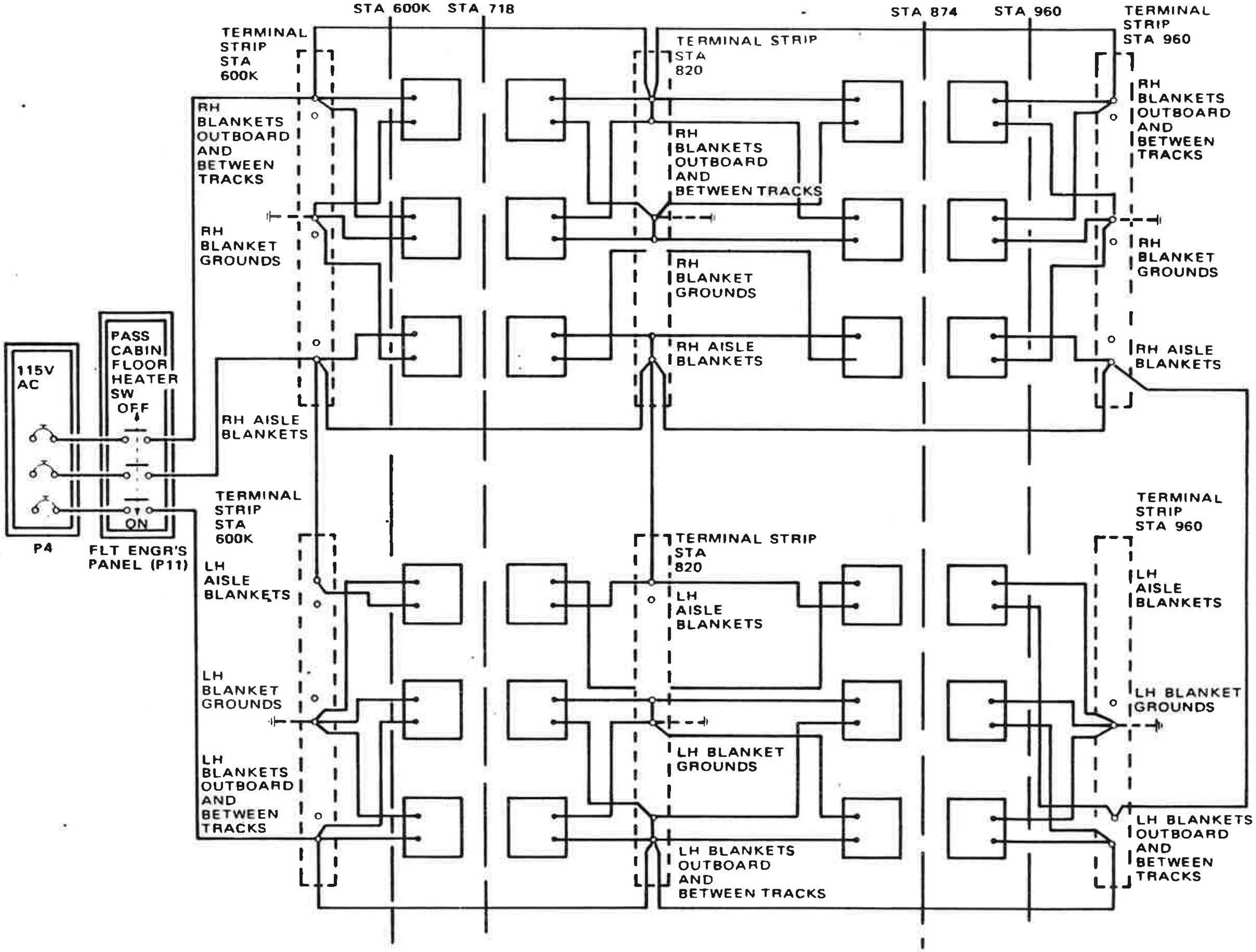


DETAIL D [4]

Main Cabin Heating Blankets
Figure 1 (Sheet 4)



Escape Hatch and Cargo Door Heating Blankets - Schematic
Figure 2



Floor Heating Blankets - Schematic
Figure 3

ESCAPE HATCH HEATING BLANKETS - REMOVAL/INSTALLATION

EFFECTIVITY	
TCA :	LX-N19996
	LX-N20198
	LX-N20199
RTCA :	LX-N19997
	LX-N20000

1. Equipment and Materials

   A. Interior Trim Remover Assembly, F70033 or equivalent, for removing snap-on trim without marring or tearing vinyl covering.

   B. Wood Block (3/4 x 1 x 5 inches), to install snap-on trim.

   C. Cement, BMS 5-30

   D. Solvent, Methyl Ethyl Ketone

2. Remove Escape Hatch Heating Blankets (See figure 401.)

   A. Open escape hatch heater circuit breaker on 115 volt ac bus No. 4 circuit breaker panel (P4).

   B. Remove escape hatch from sidewall. Refer to 52-6-0, Emergency Exit Hatch.

   C. Remove hatch window panel.

      (1) Release snap-on dado panel floating trim along bottom of window panel.

      (2) Remove two studs securing molding around hatch lifting handle, and remove molding.

      (3) Remove two flat head screws located underneath lifting handle molding.

      (4) Remove mullion trim from retainer assemblies along each edge of hatch.

(5) Remove five screws securing each retainer strip, and remove mullion retainers.

(6) Carefully release velcro tape bonding window panel to heating blanket.

(7) Lift window panel free of dado panel floating trim, and remove panel with remaining attachments.

D. Remove dado panel floating trim.

NOTE: To remove dado panel floating trim, it will be necessary to unbolt ground strap bonded to trim from airframe ground strap.

E. Remove escape hatch dado panel (Sta 990 hatch).

(1) Remove seven screws securing panel above air grille stiffener at bottom of hatch.

(2) Remove four fastening screws along forward and aft edges of hatch, and remove dado panel, air grille stiffener, and hatch seal along bottom of hatch.

NOTE: To remove air grille stiffener, it will be necessary to unbolt ground strap attached to trim from airframe ground strap.

F. Detach heating blanket wire leads from connector assembly in upper RH corner (Sta 690 and 990 hatches) or upper LH corner (Sta 770 hatch) of escape hatch. (Mark wires and connections for reinstallation.)

G. Remove heating blanket from hatch.

3. Install Escape Hatch Heating Blankets (See figure 401.)

A. Set heating blanket in place and attach wire leads to connector assembly in upper corner of hatch.

NOTE: Escape hatch should be reoved from sidewall, resting in horizontal position.

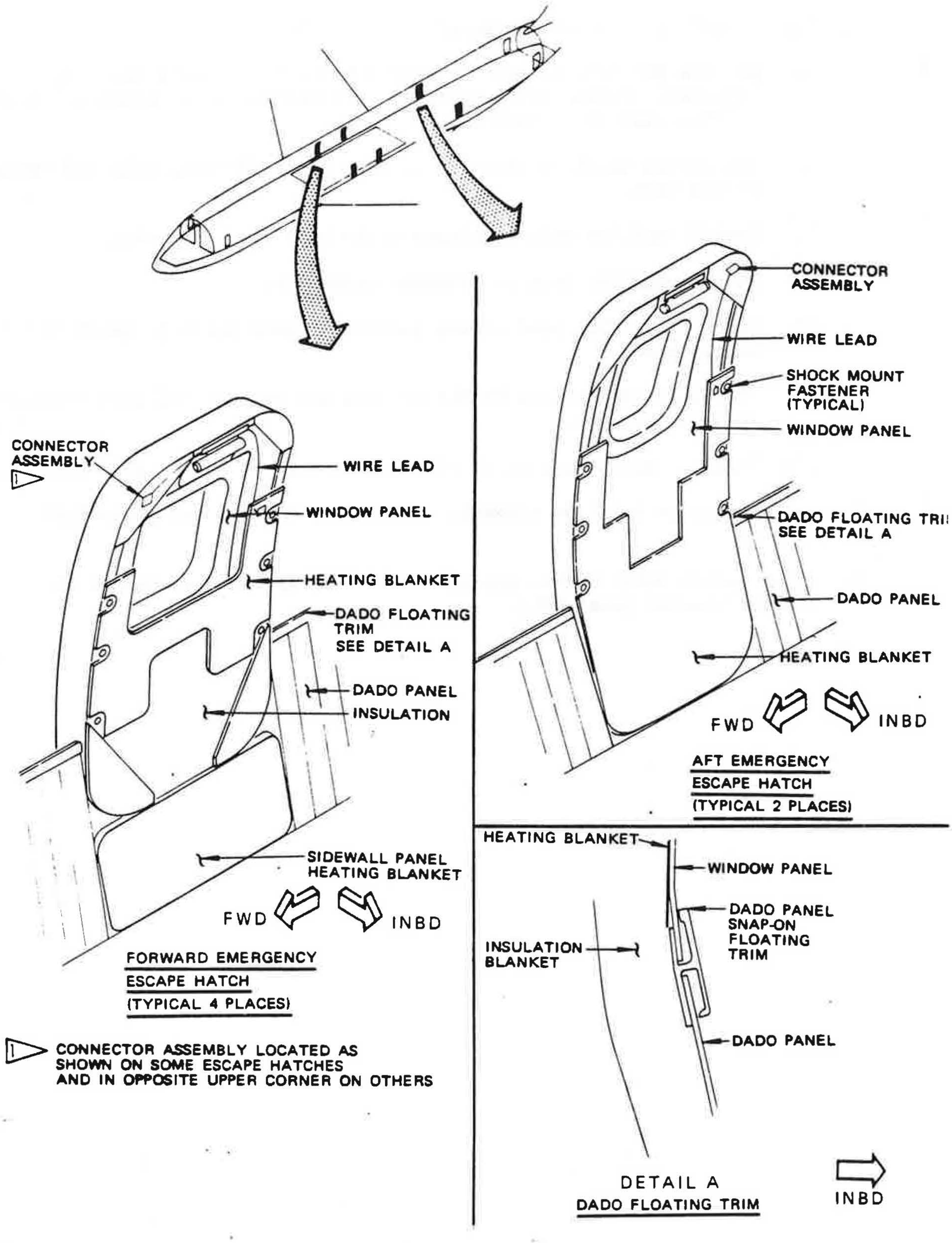
B. Install escape hatch dado panel (Sta 990 hatch).

(1) Set dado panel, air grille stiffener, and seal assembly in position on hatch.

(2) Install seven screws above air grille stiffener securing bottom of dado panel. Reinstall ground strap.

(3) Install four screws along fore and aft edges of hatch.

C. Set dado panel floating trim in position along top of dado panel. Reinstall ground strap.



Escape Hatch Heating Blankets
Figure 401

D. Install escape hatch window panel.

(1) Replace BMS 5-30 cement on heating blanket or window panel as required. Clean faying surfaces with methyl ethyl ketone and brush on thin coat of adhesive.

(2) Set window panel in position in dado panel floating trim and secure velcro tape.

(3) Install mullion trim retainers along both edges of hatch.

(4) Install mullion trim on retainer assemblies.

(5) Install two flat head screws securing window panel in hatch lifting handle area.

(6) Install hatch lifting handle molding and install two stud fasteners securing molding.

(7) Engage snap-on dado panel floating trim along bottom of window panel.

E. Install escape hatch in sidewall. (Refer to 52-6-0, Emergency Exit Hatch.)

F. Close escape hatch heater circuit breaker on 115 volt ac bus No. 1 circuit breaker panel (P1).

ESCAPE HATCH HEATING BLANKETS - ADJUSTMENT/TEST

EFFECTIVITY

TCA : LX-N19996
LX-N20198
LX-N20199

RTCA : LX-N19997
LX-N20000

1. Equipment and Materials

A. Utility 400 cps Multimeter or equivalent

2. Test Escape Hatch Heating Blankets

A. Supply 115/200 volts ac, 400 cps electrical ground power to airplane.

B. Open main (PASS) cabin heater switch (S582), on flight engineer's panel (P11).

C. Ensure that thermostat on heating blanket is cooled sufficiently to close heating blanket circuit. (Thermostat has range of 75° to 100°F.)

D. Connect ohmmeter to lead wires of heating blanket. Check that resistance measures 410 to 500 ohms for heating blankets at Sta 690 and Sta 770, and 109 to 134 ohms for heating blankets at Sta 990.

E. With Emergency Escape Hatch Heater circuit breaker closed on 115 volts ac bus No. 4 circuit breaker panel (P4), close switch (S582) and feel that blankets commence heating when power is applied.

CAUTION: DO NOT APPLY POWER FOR MORE TIME THAN NECESSARY TO VERIFY BLANKETS ARE OPERATIONAL BECAUSE OF THE POSSIBILITY OF GROUND OVERHEAT.

ESCAPE HATCH SIDEWALL PANEL HEATING BLANKETS - REMOVAL/INSTALLATION

EFFECTIVITY

TCA : LX-N19996
LX-N20198
LX-N20199

RTCA : LX-N19997
LX-N20000

1. Remove Escape Hatch Sidewall Panel Heating Blankets, Midsection

   A. Open escape hatch heater circuit breaker on 115 volt ac bus No. 4 circuit breaker panel (P4).

   B. Remove dado panel. Refer to 25-10-21, Sidewall Lining and Installation.

   C. Detach heating blanket wire leads from feeder wire. (Mark wires for reinstallation.)

   D. Remove heating blanket.

2. Install Escape Hatch Sidewall Panel Heating Blankets, Midsection

   A. Set heating blanket in place and attach wire leads to feeder wire.

   B. Install dado panel. Refer to 25-10-21, Sidewall Lining and Installation.

   C. Close escape hatch heater circuit breaker on 115 volt ac bus No. 4 circuit breaker panel (P4).

MAIN CARGO DOOR HEATING BLANKET - REMOVAL/INSTALLATION

EFFECTIVITY

TCA : LX-N19996
LX-N20198
LX-N20199

RTCA : LX-N19997
LX-N20000

1. Remove Main Cargo Door Heating Blanket

   A. Open MAIN CARGO DOOR HEATER circuit breaker on 115 volt ac bus No. 4 circuit breaker panel P4.

   B. Disconnect and mark electrical wires in main cargo door heating blanket terminal box.

   C. Remove main cargo door lining. Refer to 52-11-171, Main Cargo Door Lining.

   D. Attach a 14-foot cord to all wires at terminal box.

   E. Remove main cargo door heating blanket, pulling wires and cord through conduit.

   NOTE: Cord is to be used as lead when installing new heating blanket.

2. Install Main Cargo Door Heating Blanket

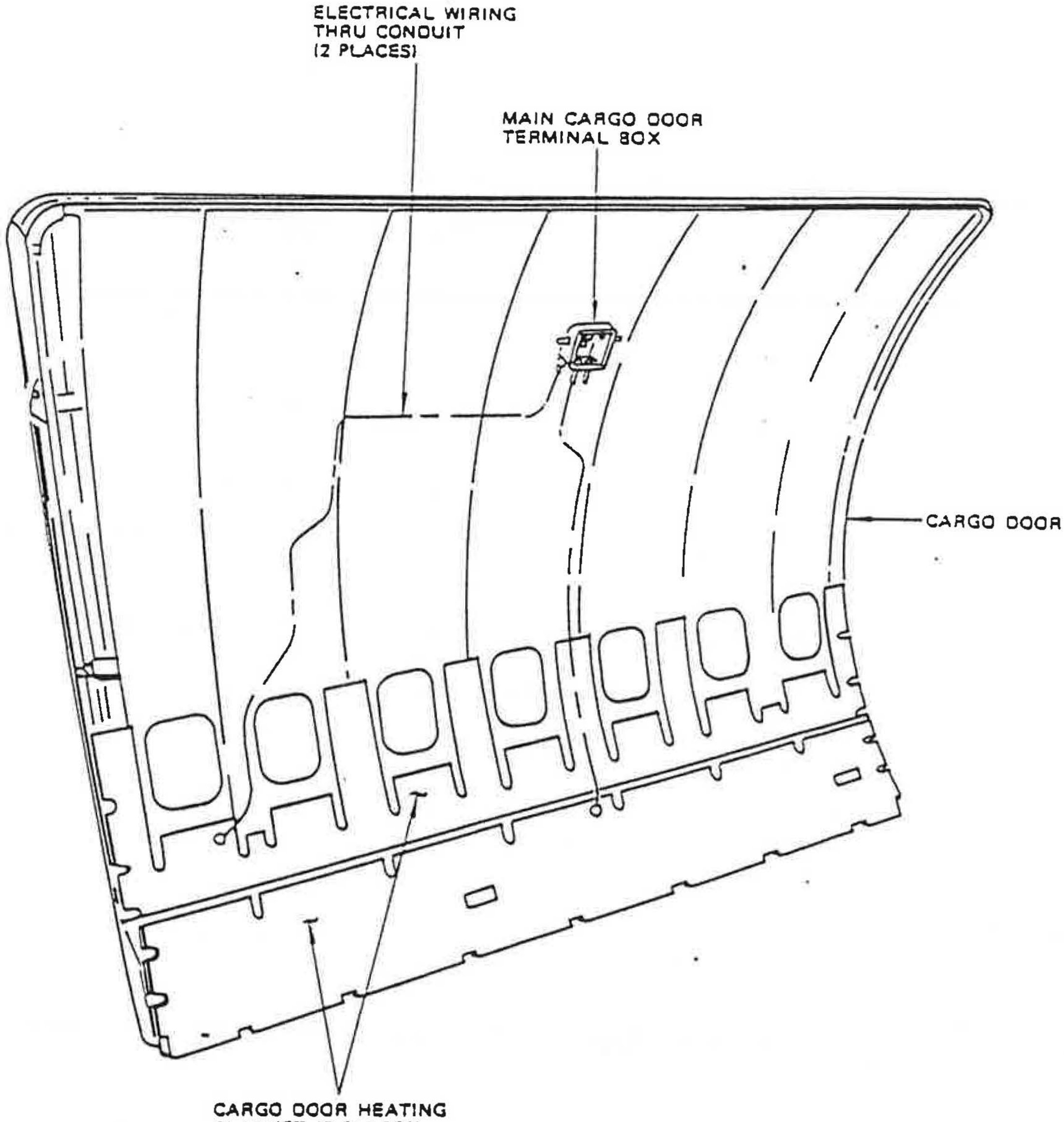
   A. Attach lead cord to main cargo door heating blanket wires.

   B. Place heating blankets in position and pull wires through conduit with lead cord. (See figure 401.)

   C. Disconnect cord and connect wires to terminals.

   D. Test heating blankets. Refer to Main Cargo Door Heating Blankets - Adjustment/Test.

   E. Install main cargo door lining. Refer to 52-11-171, Main Cargo Door Lining.



Main Cargo Door Heating Blanket Installation
Figure 401

MAIN CARGO DOOR HEATING BLANKETS - ADJUSTMENT/TEST

EFFECTIVITY

TCA : LX-N19996
LX-N20198
LX-N20199

RTCA : LX-N19997
LX-N20000

1. Equipment and Materials

   A. Electrical Ground Power Supply, 115/200 volts ac, 400 cps, 3 phase

   B. Utility 400 cps Multimeter or equivalent

2. Test Main Cargo Door Heating Blankets

   A. Open main (PASS) cabin heating blanket switch, S582, on flight engineer's panel P11.

   B. Measure resistance between terminals 1 and 3 of terminal strip T342 on cargo door at BS542. Check that resistance measures 12 to 19 ohms.

   C. With MAIN CARGO DOOR HEATER circuit breaker closed on 115 volts ac bus No. 4 circuit breaker panel P4, close S582 and feel that blankets commence heating when power is applied.

   CAUTION: DO NOT APPLY POWER FOR MORE TIME THAN NECESSARY TO VERIFY BLANKETS ARE OPERATIONAL BECAUSE OF THE POSSIBILITY OF GROUND OVERHEAT.

FLOOR HEATING PANELS - REMOVAL/INSTALLATION

EFFECTIVITY

All 707-329C except LX-N19996

1. General

   A. The electrical leads from the floor heating panels must be disconnected from the electrical connector in a box installed under the heating panel. Access to the box can only be gained after the fasteners securing the panel have been removed and the panel itself partially removed. See CAUTION decal on upper face of the floor heating panel.

2. Remove Floor Heating Panels

   A. Refer to Chapter 53, Passenger Cabin Floor.

3. Install Floor Heating Panels

   A. Refer to Chapter 53, Passenger Cabin Floor.

FLOOR HEATING PANELS - ADJUSTMENT/TEST

EFFECTIVITY

All 707-329C except TCA LX-N19996

1. Test Floor Heating Panels

   A. Close the three FLOOR HEATING BLANKET circuit breakers on the ac bus No. 4 circuit breaker panel (P4).

   B. Close the Main Cabin Heating Panel switch and verify that floor panels commence heating when power is applied.

      CAUTION: DO NOT APPLY POWER FOR LONGER TIME THAN NECESSARY TO VERIFY THAT BLANKETS ARE OPERATIONAL.

CONTROL CABIN HEATING SYSTEM - DESCRIPTION AND OPERATION

1. General

   A. Heating of the control cabin does not exist as a specific heating system. Whether heating or cooling is required is determined by the air conditioning control and indicating systems, 21-5-0, which either lowers or raises the temperature of the cabin by mixing air from the air conditioning packs with hot air bypassing the packs. Refer to 21-12-0.

   B. Maintaining a desirable temperature in the control cabin is accomplished through the control cabin air distribution system. Conditioned air enters the control cabin from several outlets located to give proper air circulation throughout the cabin. Refer to Air Distribution System, 21-6-0.

   C. On Passenger/Cargo Convertible Airplanes, a crew auxiliary heat valve allows hot pneumatic air to be ducted directly to the control cabin when normal ventilating air is shut off. See figure 1.

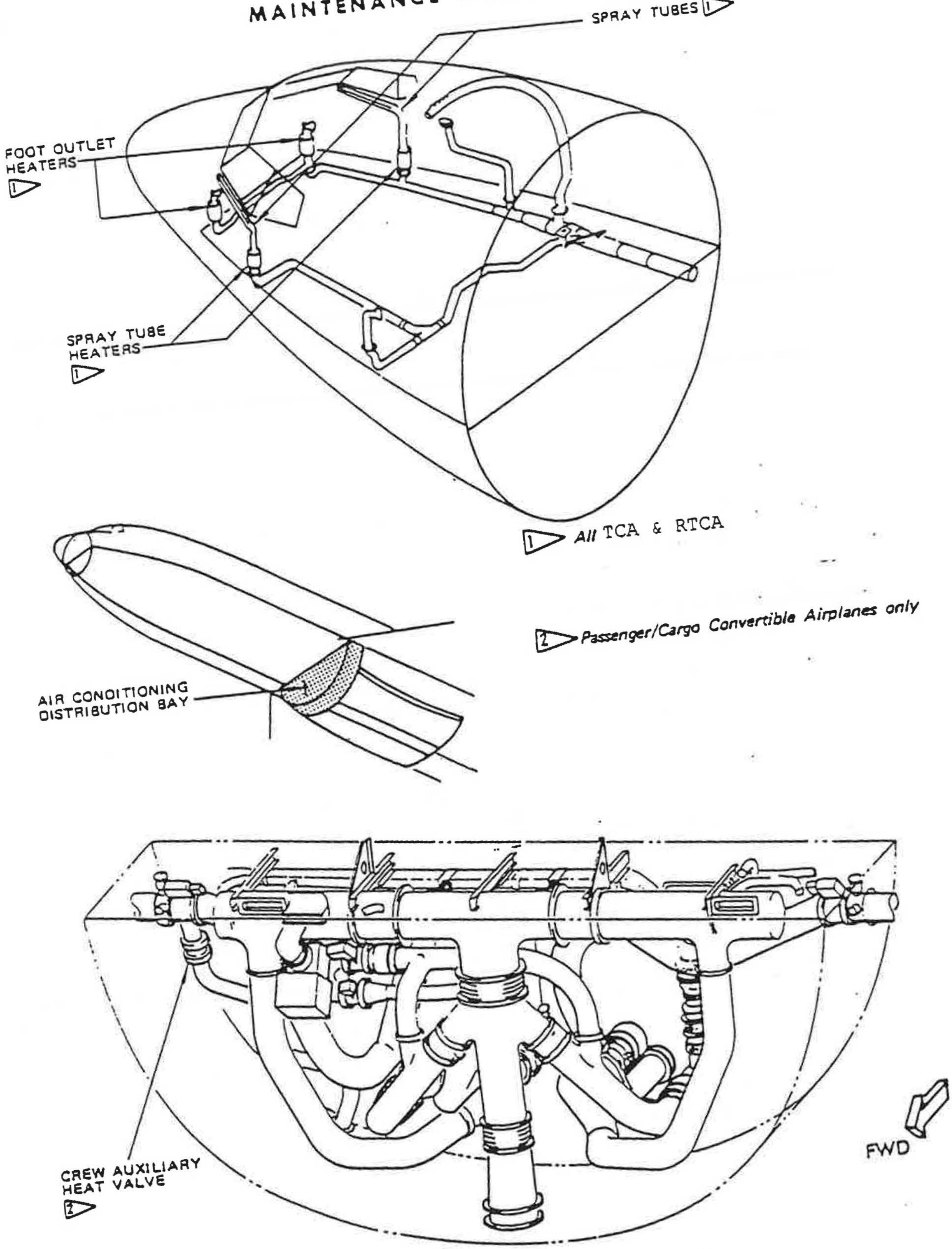
   D. On some airplanes, electric heaters are installed at the pilot and copilot foot outlets and on spray tubes along the pilot and copilot window sills. See figure 1 for effectivity.

2. Crew Auxiliary Heat Valve

   A. The crew auxiliary heat valve is a motor-operated butterfly valve which permits the flow of hot pneumatic air directly to the control cabin, regardless of the position of the wing isolation valves. The purpose of the valve is to ensure a supply of hot air for heating the cockpit when normal ventilating air is shut off.

   B. Pneumatic air from turbocompressors No. 3 and No. 4 bypasses the air conditioning system, through the crew auxiliary heat valve, to the downstream side of the control cabin temperature control valve. The crew auxiliary heat valve is located in the right side of the air conditioning distribution bay. (See figure 1.)

   C. A 115 volt single phase ac motor, with limit switches, actuates the auxiliary heat valve. The valve actuator is controlled from the flight engineer's panel by a three position switch, spring-loaded to the OFF position. (See figure 2.)

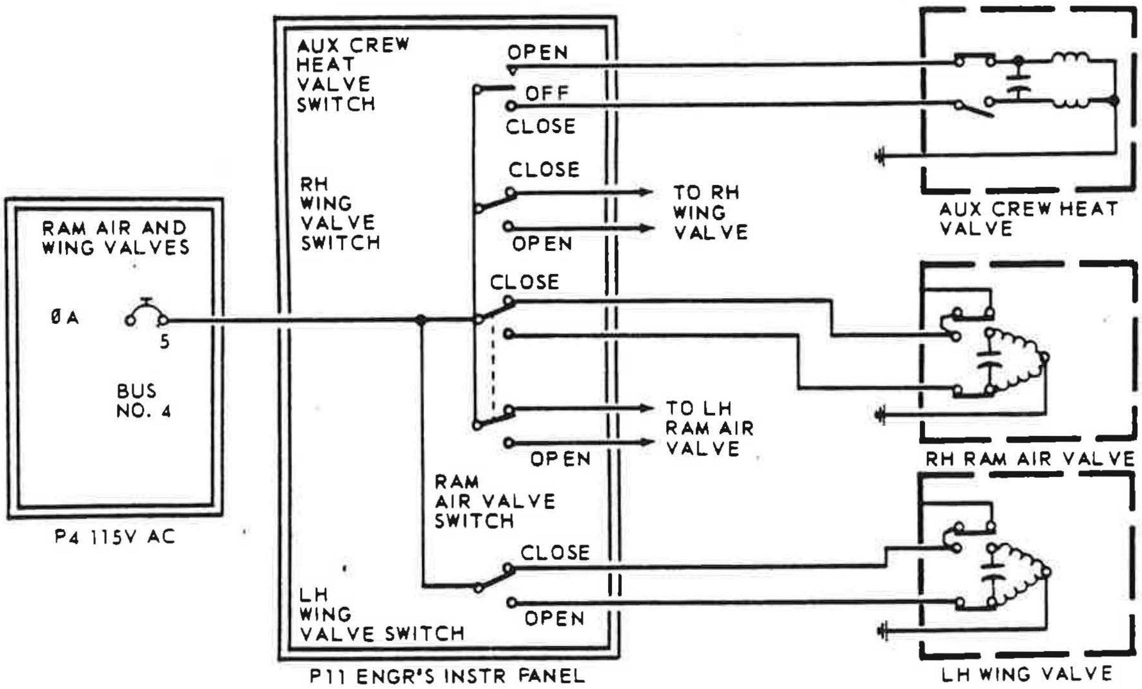


Control Cabin Heating Equipment Location
Figure 1

3. Control Cabin Electric Heaters (See figure 1 for effectivity.)

A. Control cabin 500-watt electric heaters are installed at the pilot and copilot foot outlets. 300-watt electric heating elements are installed in the supply ducts leading to the spray tubes, along the window sills.

B. Each heater is connected phase-to-phase for high heat and phase-to-ground for low heat by means of individual manually-controlled switches. A relay energized through the landing gear safety switch interrupts power to the switches and renders the heaters inoperative when the airplane is on the ground. The switches are located at the pilot and copilot sidewalls adjacent to the ash tray.



Crew Auxiliary Heat Valve Circuit
Figure 2

SHOULDER HEATER - REMOVAL/INSTALLATION

EFFECTIVITY

TCA : LX-N19996
LX-N20198
LX-N20199

RTCA : LX-N19997
LX-N20000

1. Equipment and Materials

   A. Cleaning solvent per BMS 3-2

   B. Two-inch vinyl plastic tape (pressure sensitive adhesive)

   C. Electrical bonding meter

2. Remove Shoulder Heater

   A. Open crew air heater circuit breaker on circuit breaker panel P1.

   B. Remove access door from sidewall lining.

   C. Disconnect bonding jumper from ground clamp atop shoulder heater.

   D. Disconnect lead wires beneath shoulder heater.

   E. Remove clamp from bottom of shoulder heater.

   F. Remove tape from duct joint atop shoulder heater.

   G. Move shoulder heater downward releasing upper end of heater from transition duct.

   H. Tip shoulder heater to clear top transition duct and move heater upward, pulling flexible duct attached to bottom of heater upward through hole in floor.

   I. Remove ground clamp from shoulder heater.

   J. Remove flexible duct from shoulder heater and remove shoulder heater.

3. Install Shoulder Heater

A. Install ground clamp onto shoulder heater.

NOTE: Smooth sharp edges of duct ends with a file.

B. Install flexible duct on beaded end of shoulder heater allowing for at least 1/2 inch overlap at duct walls and push downward through hole in floor to permit straight end of heater to be aligned with upper transition duct.

C. Telescope straight end of shoulder heater into upper transition duct allowing for a least one-half inch overlap of duct walls.

D. Install clamp at bottom of shoulder heater.

E. Connect bonding jumper to ground clamp. Spot clean attaching surfaces.

F. Using bonding meter, check that resistance between straight end of shoulder heater and airplane body is no greater than 2.5 milliohm.

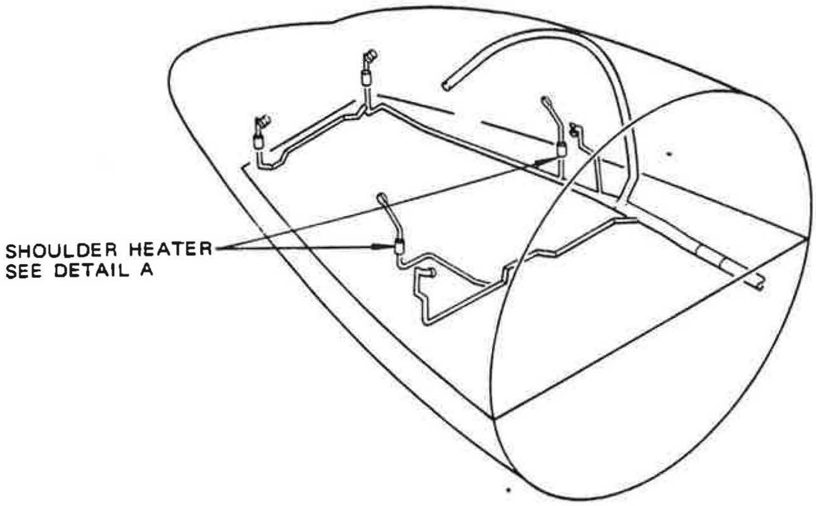
G. Clean area to be taped atop shoulder heater using cleaning solvent per BMS 3-2.

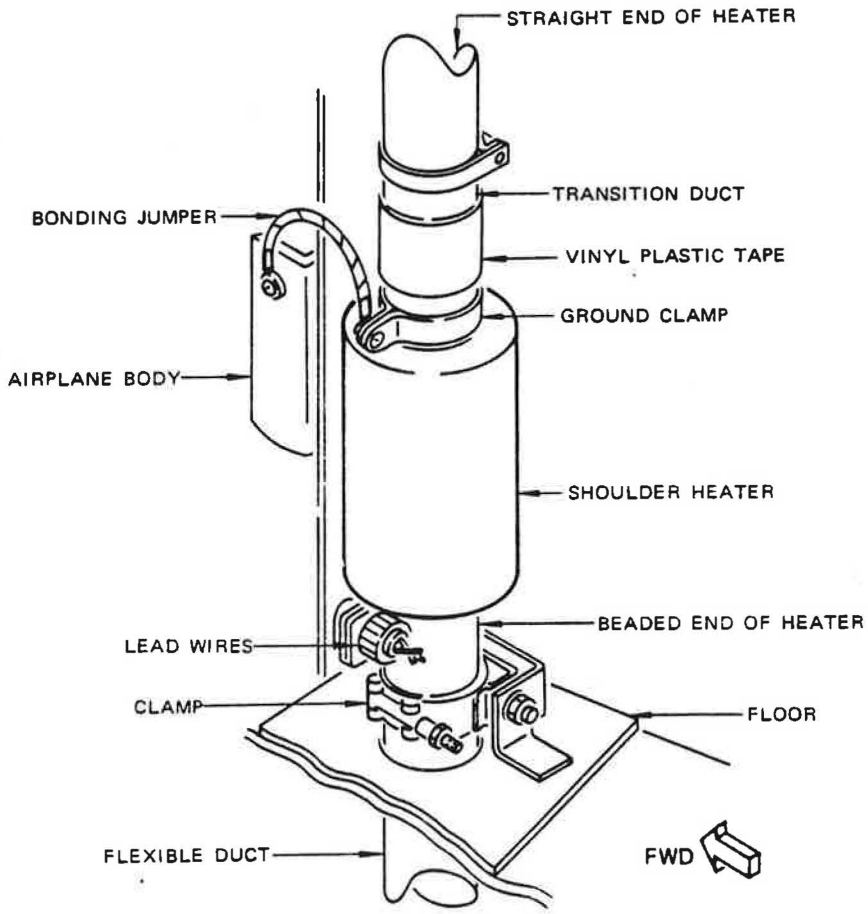
H. Apply two laps of two inch vinyl plastic tape to center of top joint, pulling taut and smoothing while applying.

I. Connect lead wires beneath shoulder heater.

J. Install access door into sidewall lining.

K. Close crew air heater circuit breaker.





DETAIL A

Shoulder Heaters
Figure 401

FOOT WARMER - REMOVAL/INSTALLATION

EFFECTIVITY

TCA : LX-N19996
LX-N20198
LX-N20199

RTCA : LX-N19997
LX-N20000

1. Equipment and Materials

   A. Cleaning solvent per BMS 3-2

   B. Permacel Cold Weather Vinyl Tape No. 295 or equivalent

   C. Electrical bonding meter

2. Remove Foot Heater

   A. Open crew air heater circuit breaker on circuit breaker panel P1.

   B. Remove screws, nuts, and washers fastening air diffuser to header and to bracket and remove diffuser. Remove gaskets.

   C. Disconnect bonding jumper from ground clamp atop foot heater. Remove clamp.

   D. Disconnect lead wires beneath foot heater.

   E. Remove tape from duct joint beneath foot heater.

F. Move foot heater and header upward, releasing them from the lower air transition duct.

G. Remove tape from header joint and remove header from heater.

H. Remove ground clamp from foot heater.

3. Install Foot Heater

A. Install ground clamp atop foot heater.

NOTE: Smooth sharp edges of duct ends with a file.

B. Telescope heater into header to a minimum overlap of 1/2 inch.

C. Clean area to be taped atop foot heater using cleaning solvent.

D. Apply two laps of plastic tape to center of joint, pulling taut and smoothing while applying.

E. Telescope lower end of heater into lower transition duct to a minimum overlap of 1/2 inch. Install gasket between header and bracket.

F. Connect bonding jumper to ground clamp. Spot clean attaching surfaces.

G. Using bonding meter, check that resistance between upper end of foot heater and airplane body is not greater than 2.5 milliohms.

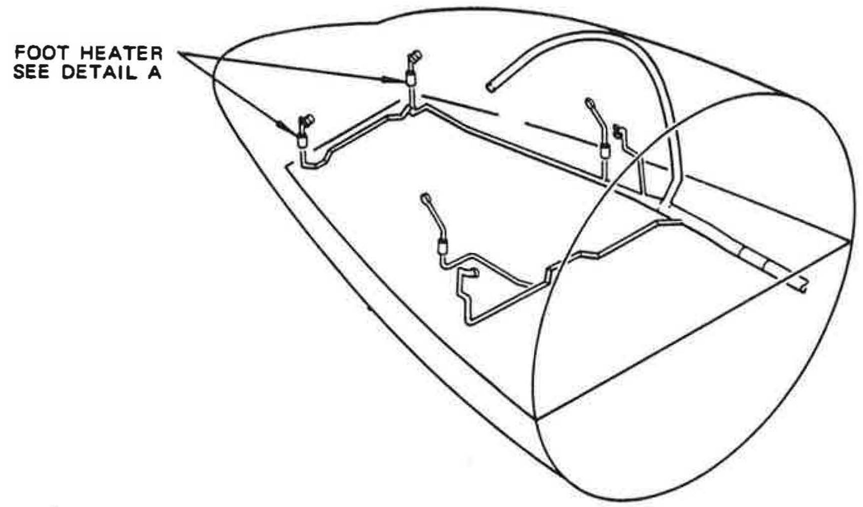
H. Clean area to be taped below heater using cleaning solvent.

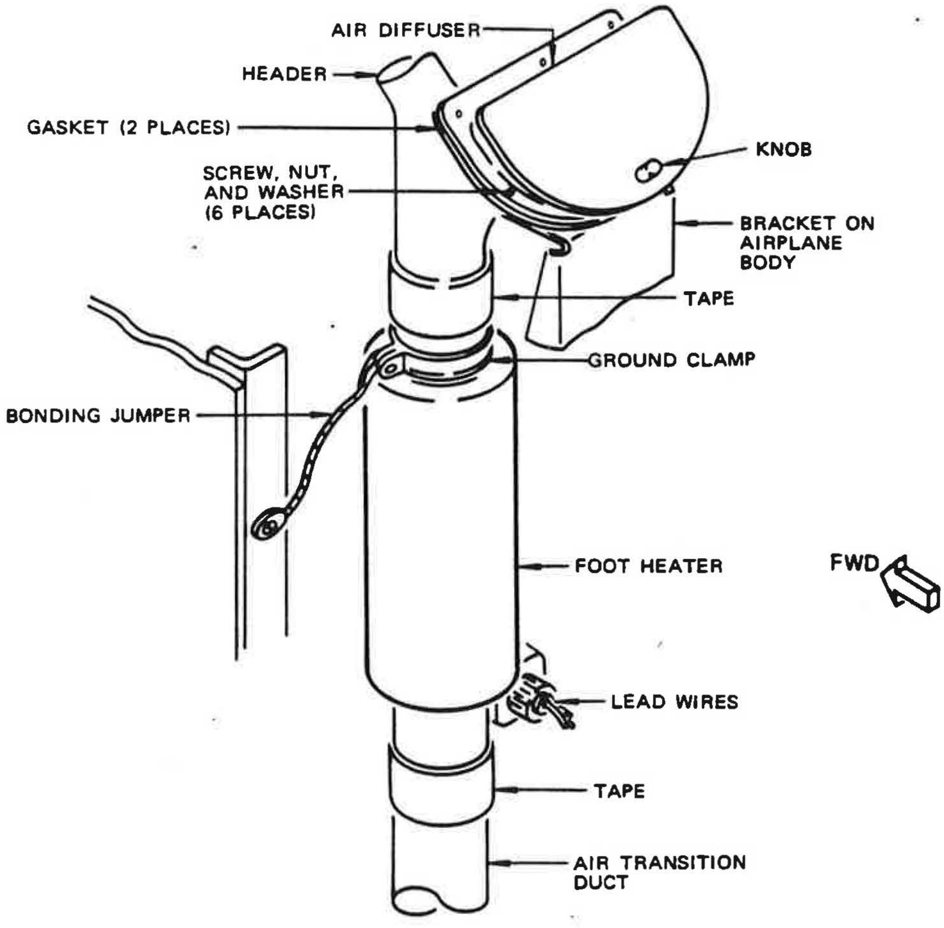
I. Apply two laps of plastic tape to center of joint, pulling taut and smoothing while applying.

J. Install gasket and diffuser stop bracket and header. Attach with screws, nuts, and washers.

K. Pull diffuser knob to OPEN position.

L. Close crew air heater circuit breaker.





DETAIL A

Foot Heater Installation
Figure 401

CREW AUXILIARY HEAT VALVE - REMOVAL/INSTALLATION

EFFECTIVITY

Passenger/Cargo Convertible Airplanes

1. Remove Crew Auxiliary Heat Valve

   A. Open the RAM AIR & WING VALVES circuit breaker on panel P4.

   B. Remove forward cargo compartment aft bulkhead.

   C. Disconnect electrical connector from valve. (See figure 401.)

   D. Disconnect bonding jumper.

   E. Remove two clamps securing valve to duct and remove valve.

2. Install Crew Auxiliary Heat Valve

   A. Check that RAM AIR & WING VALVES circuit breaker on panel P4 is open.

   B. Place crew auxiliary heat valve in position and secure with two clamps.

   C. Connect bonding jumper.

   D. Connect electrical connector.

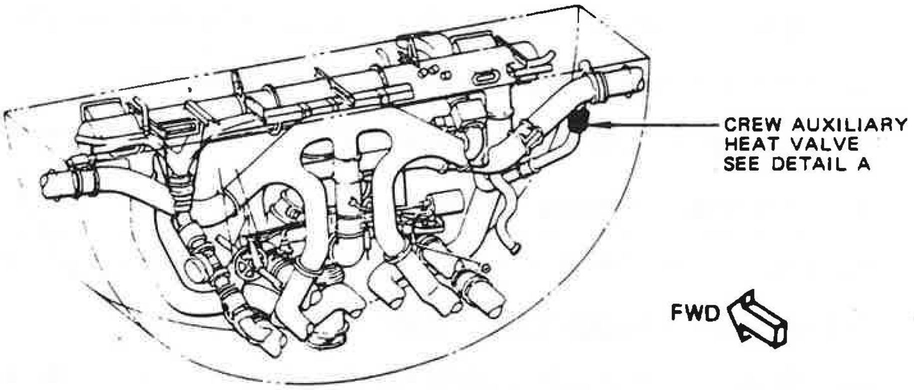
   E. Close RAM AIR & WING VALVES circuit breaker on panel P4.

   F. Provide electrical power.

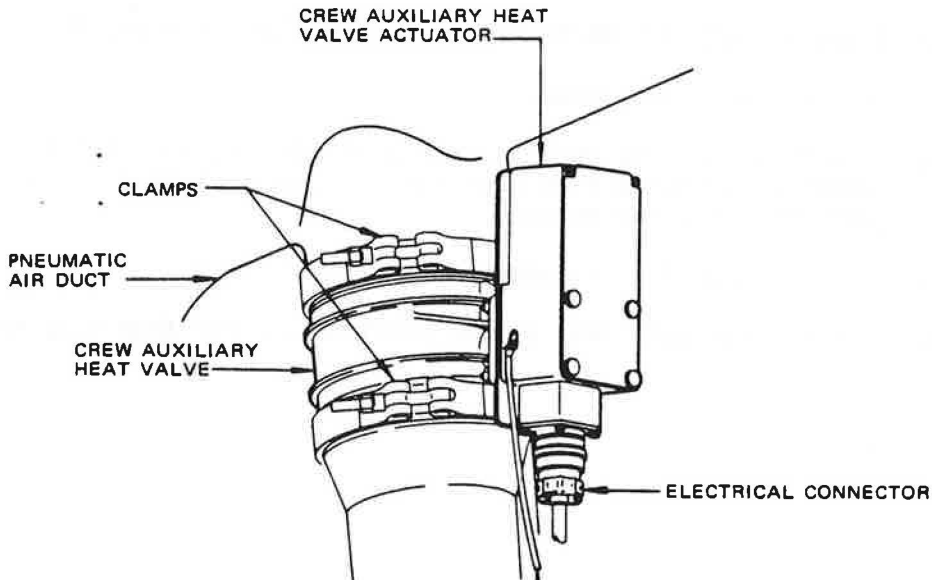
   G. Hold CREW AUX HEAT VALVE switch on flight engineer's upper panel in CLOSE position and check that crew auxiliary heat valve moves to closed position. Release switch.

   H. Install forward cargo compartment aft bulkhead.

   I. If no longer required, remove electrical power from airplane.



AIR CONDITIONING
DISTRIBUTION BAY



DETAIL A

Crew Auxiliary Heat Valve
Figure 401

EQUIPMENT COOLING SYSTEM - DESCRIPTION AND OPERATION

EFFECTIVITY

TCA : LX-N19996
LX-N20198
LX-N20199

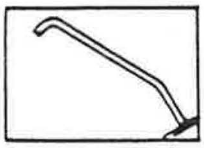
RTCA : LX-N19997
LX-N20000

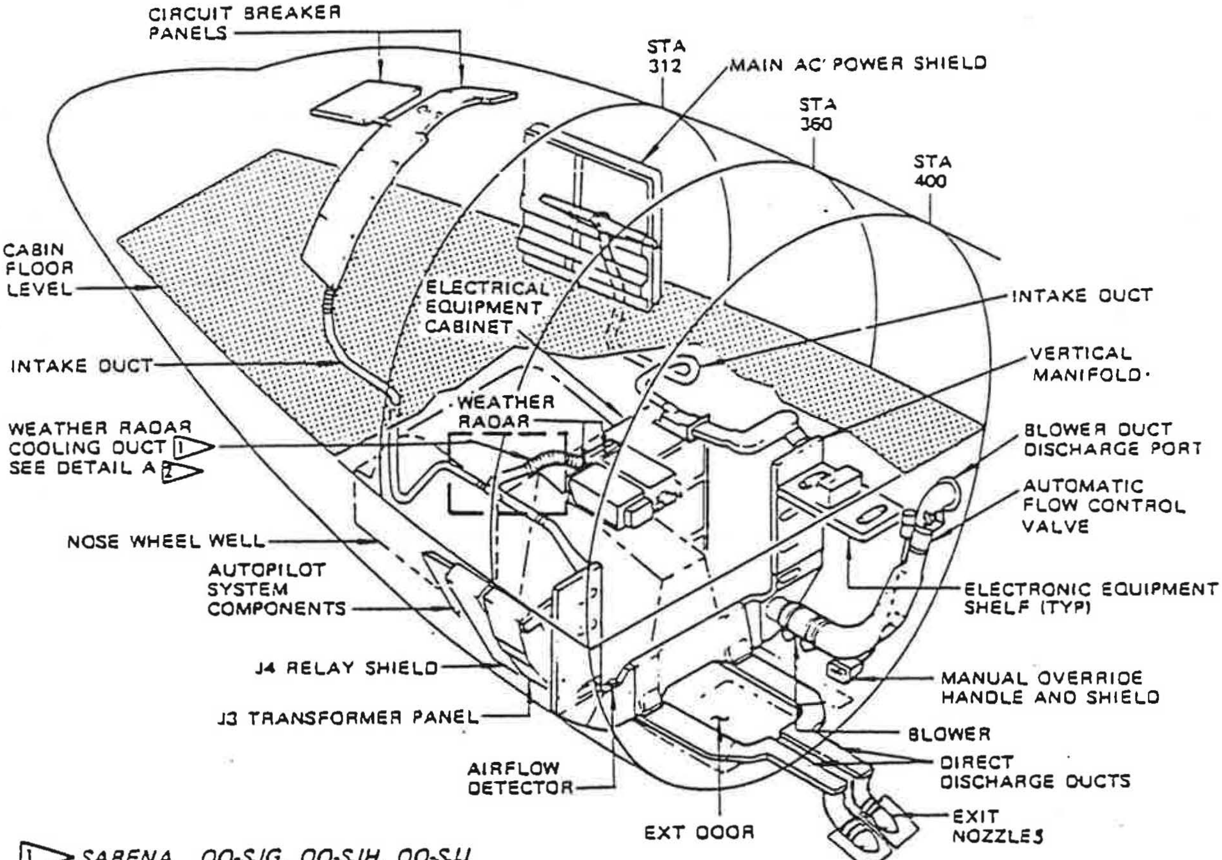
1. General

A. The equipment cooling system is a controlled ventilation system which provides airflow across electronic and electrical equipment to prevent excessive heating of the units and to provide smoke evacuation. Cabin air is drawn through the equipment and into a system of ducts and manifolds. The air takes up heat from the equipment as it flows through it. The warm air is then either discharged overboard or is mixed with other cabin air and recirculated. An airflow detector system warning gives warning to the flight engineer if not enough air is flowing to cool the equipment.

B. Each electronic equipment shelf is hollow to form a manifold for the pieces of equipment which rest on it. The upper surface of each shelf has openings under each equipment case. Each opening has an orifice adjustment cover to vary the size of the opening and thus to regulate the amount of air which flows through it. The space between each equipment case and the upper surface of the shelf is sealed.

C. All intake ducts and manifolds lead into a vertical manifold. (See figure 1.) The vertical manifold is a large, flat, U-shaped structure which is near station 360. It forms part of the support for the electronic equipment shelves. A blower duct is connected to the vertical manifold at the lower right-hand corner of its aft side. The blower duct runs from the vertical manifold to a blower duct discharge port. A blower and an automatic flow control valve are installed in the blower duct.


DETAIL A 2



1 *SABENA OO-SJG, OO-SJH, OO-SJJ*
SAA ZS-DYL
EL AL 4X-ATR
TAP CS-TBA
OA SX-DBA, SX-DBB

2 *SABENA OO-SJK*
SAA ZS-EKV
EL AL 4X-ATS
TAP CS-TBB
OA SX-DBB

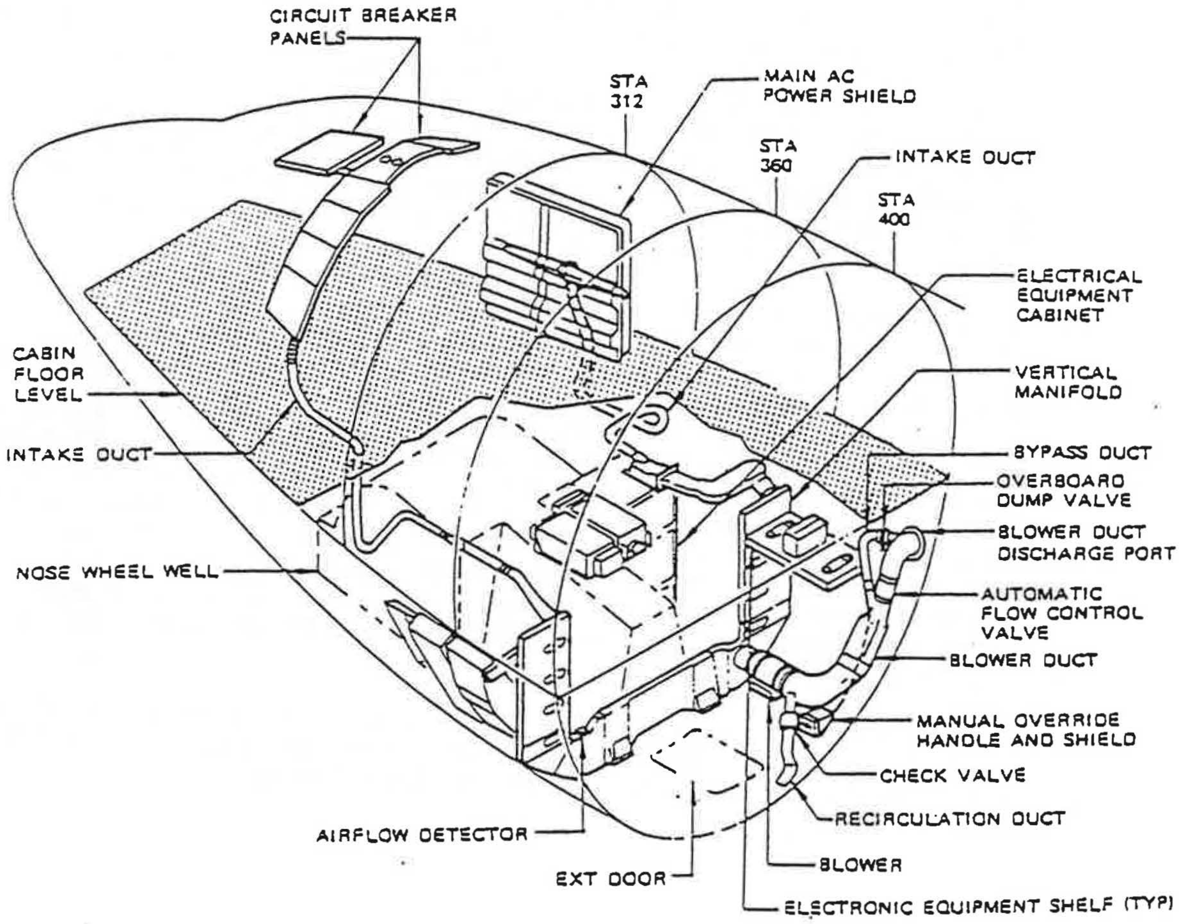
EFFECTIVITY

(Direct discharge duct airplanes)

SABENA OO-SJG, OO-SJH and OO-SJJ

Equipment Cooling System Location Diagram
Figure 1 (Sheet 1)

SAB. REV 17 SEP 1969



EFFECTIVITY

(Recirculation duct airplanes)

TCA : LX-N19996, LX-N20198, LX-20199
RTCA : LX-N19997, LX-N20000

Equipment Cooling System Location Diagram
Figure 1 (Sheet 2)

D. There are two equipment cooling systems. These are the direct discharge and recirculation systems. (See figure 1 for effectivity.) On the direct discharge systems two direct discharge ducts run from the vertical manifold to two exit nozzles. On airplanes with this system, the blower normally runs only when the airplane is on the ground or flying at a low altitude. The warm air flows overboard through the blower duct discharge port when the airplane is on the ground. When the outside air pressure drops as the airplane gains altitude, the low pressure outside the airplane draws warm air from the vertical manifold, through the direct discharge ducts and overboard through the exit nozzles. The lowering pressure outside the airplane also makes the automatic flow control valve go shut. The blower is turned off by a microswitch which opens when the automatic flow control valve shuts.

E. On the recirculation system a recirculation duct branches from the blower duct. The blower normally runs whenever the airplane's electrical system is energized. The blower draws the cooling air through the system and discharges it overboard through the blower duct discharge port when the airplane is on the ground or flying at a low altitude. When the airplane is flying at higher altitudes, the automatic flow control valve shuts and the warm air then flows through the recirculation duct and into the space under the forward cargo compartment floor. The warm air mixes with other cabin air and is recirculated or flows overboard through the air conditioning outflow valve. Recirculation duct airplanes have an overboard dump valve which is normally shut, but which can be opened to bypass the automatic flow control valve if the blower should fail when the airplane is in flight.

F. The manifolds and ducts are made of fiberglass, sheet metal, metal tubing, and flexible ducts. The main parts of the system are connected with duct clamps to facilitate their removal and installation.

2. Blower

A. The blower is an axial-flow type, with its electric motor mounted in the centerline of the cylindrical housing. It has a capacity of 835 cfm of hot air (165°F) against a static pressure of eight and one half inches of water. Operation of the blower, on direct discharge duct airplanes is controlled by the automatic flow control valve. (See figure 1 for effectivity.) The motor operates on 115 volt three-phase power. The blower normally runs whenever the airplane's electrical system is energized on recirculation duct airplanes. (See figure 1 for effectivity.)

B. The blower is connected in the blower duct by short flexible ducts and duct clamps and it is secured to a box support.

C. A blower operation indicator is on the flight engineer's panel on direct discharge duct airplanes. (See figure 1 for effectivity.) It is a blue light which shows BLOWER ON when energized by a microswitch in the automatic flow control valve.

3. Automatic Flow Control Valve

A. The automatic flow control valve is operated by flow through the valve and over the butterfly which acts as an airfoil. The butterfly rotates through 68 degrees from full open to closed position. The varying amounts of flow through valve are caused by the difference between cabin and ambient pressure. The valve is clamped in the blower duct near the blower duct discharge port.

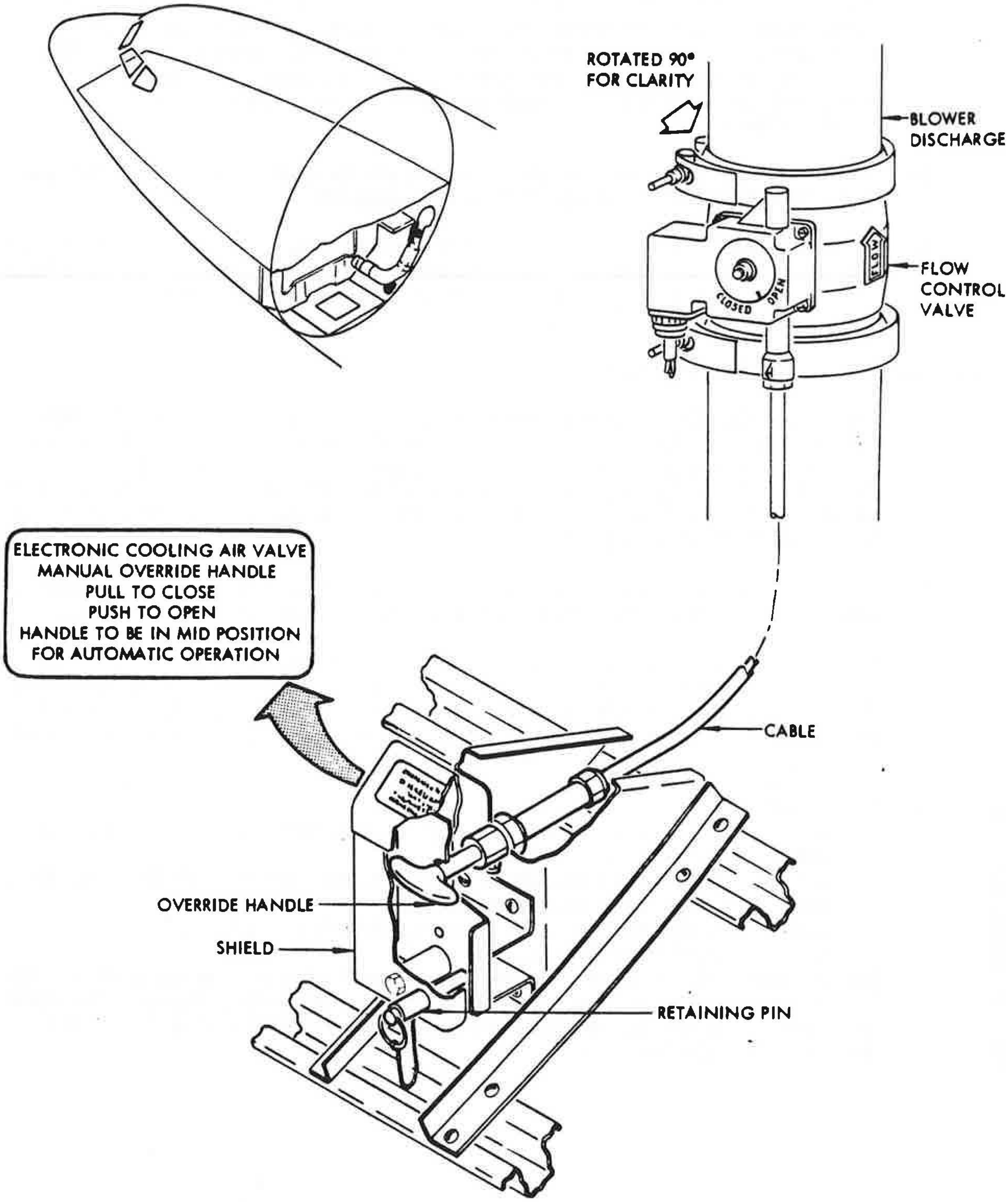
B. The valve position is indicated by a green light on the flight engineer's panel which shows VALVE OPEN when the valve is in any open position.

C. A manual override handle is provided for emergency opening or closing of the blower duct in event of failure of the automatic flow control valve. The valve handle, which is normally in the automatic position, is near the floor below the radio rack. The handle is shielded so as not to be moved except as required. (See figure 2.)

D. On all except:

AF	F-BHSA thru F-BHSV, F-BHSX thru F-BHSZ, F-BLCA and F-BLCB
SABENA	OO-SJA thru OO-SJH
AII	VT-DJI thru VT-DJK, VT-DMN, VT-DNY, VT-DNZ, VT-DPM and VT-DSI
SAA	ZS-CKC thru ZS-CKE and ZS-DYL
ELAL	4X-ATA thru 4X-ATC, 4X-ABA, 4X-ABB and 4X-ATR
AA	N755A thru N7561A,

the automatic flow control valve is equipped with a damping device. The device is provided to dampen movement of the butterfly plate. The device is attached to the butterfly plate shaft and consists of a flat vane immersed in silicone oil.



Automatic Flow Control Valve
Figure 2

4. Overboard Dump Valve (Recirculation Duct Airplanes - See figure 3 for Effectivity)

   A. The overboard dump valve is installed in the bypass duct. (See figure 1.) The valve is motor-operated. It takes 115 volt ac power from circuit breaker panel P2. (See figure 3.) The valve can be opened or closed by operating a switch which is on the flight engineer's panel.

5. Airflow Detector System

   A. General

      (1) The airflow detector system consists of an airflow detector, warning light, and the detector system circuitry. (See figure 3.)

      (2) Electrical power for the control and operation of this system is taken from the essential 28 volt dc bus on circuit breaker panel (P6). Power to the warning light press-to-test circuit is supplied from the 28 volt dc bus on circuit breaker panel (P5).

   B. Airflow Detector

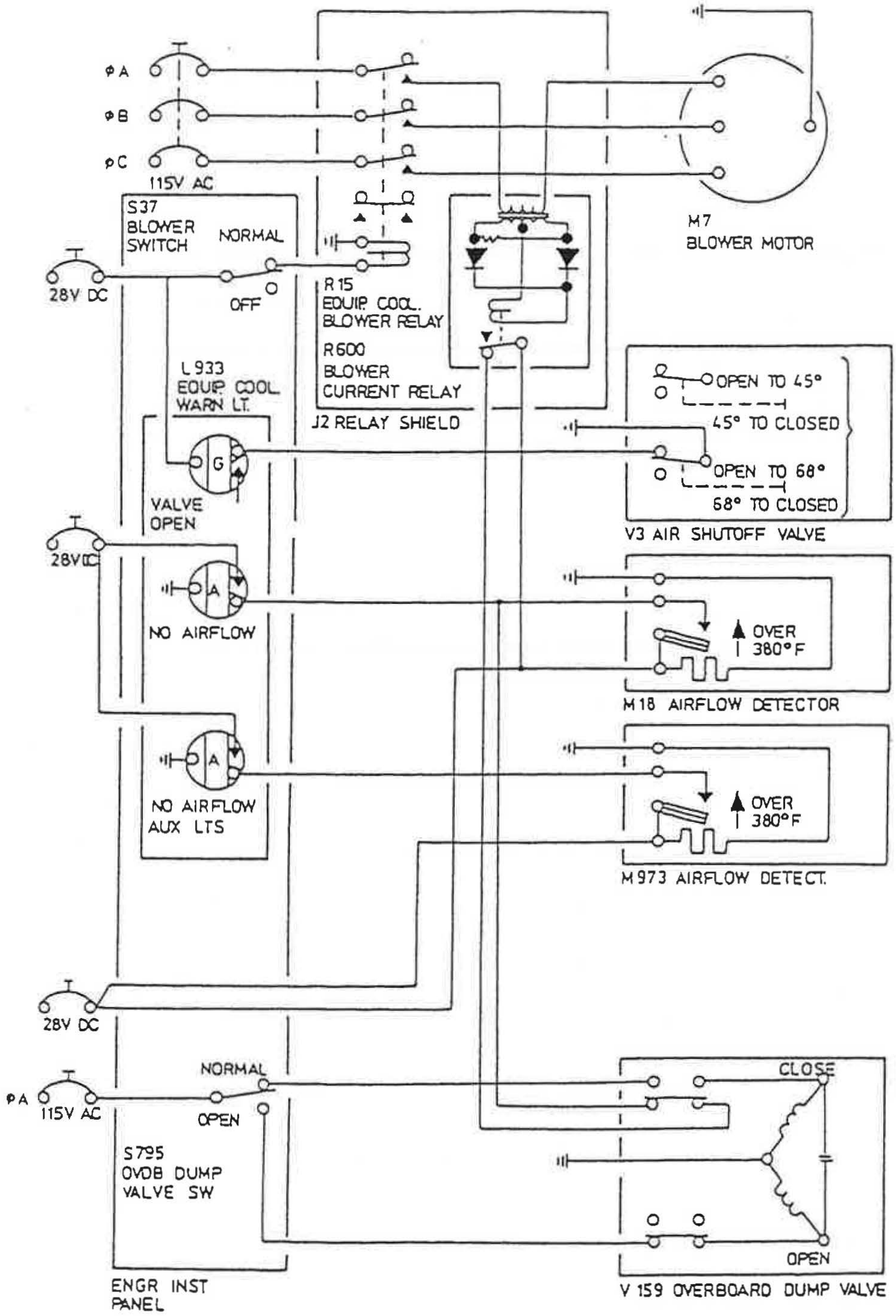
      (1) The airflow detector consists of a temperature sensitive switch, combined with a small electric heater. The airflow detector is installed in the vertical manifold. (See figure 1.)

   C. No-Airflow Warning Light

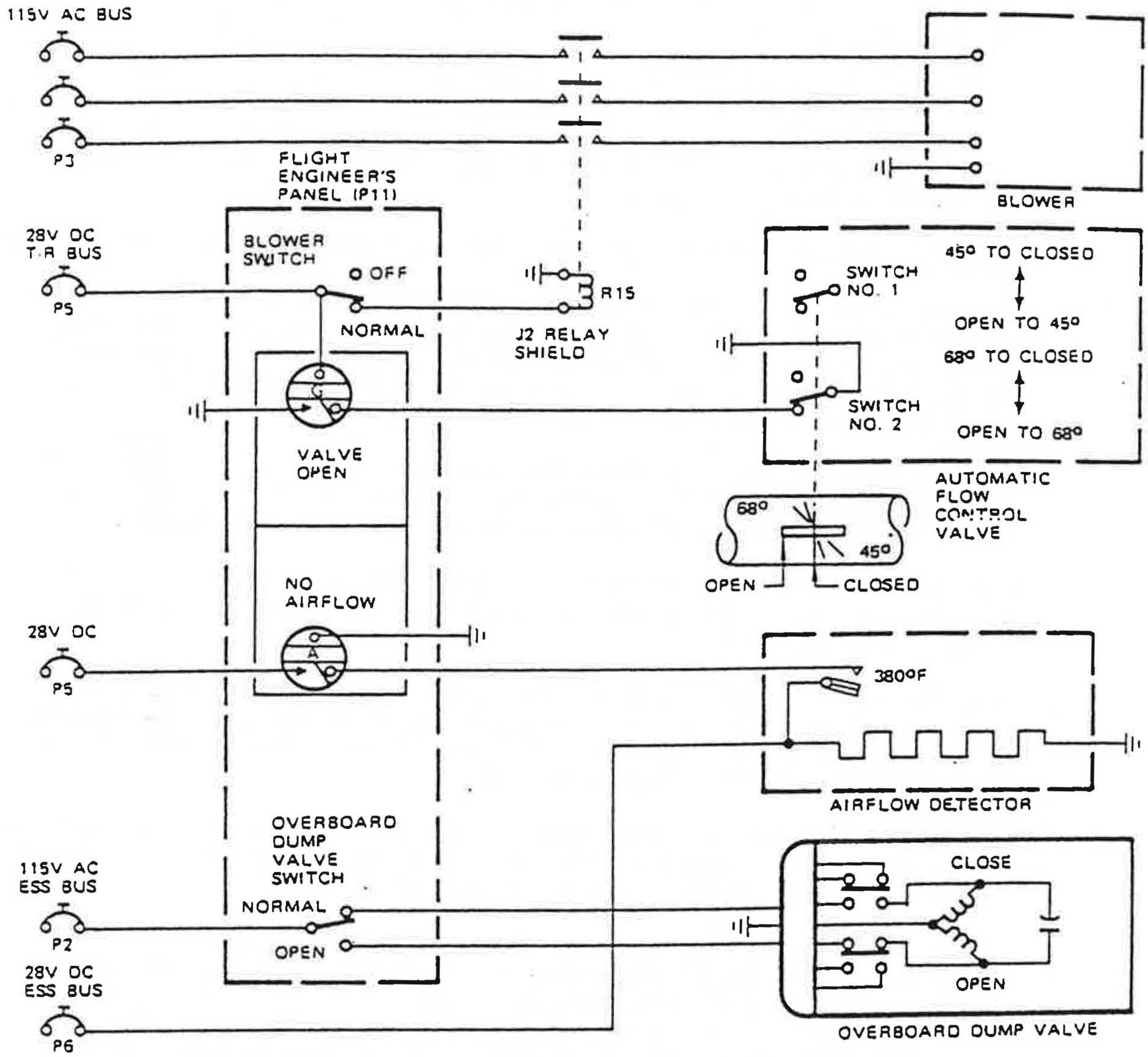
      (1) The no-airflow amber warning light is on the flight engineer's panel. The detector switch will actuate and the light will illuminate within 10 minutes after loss of sufficient airflow. The light will remain illuminated up to 5 minutes after sufficient airflow is resumed.

6. Operation (Direct Discharge Duct Airplanes - See figure 1 for effectivity.)

   A. The operation of the equipment cooling system is controlled automatically by the flow control valve and in case of emergency by a manual override handle below the inboard side of the radio rack. The handle should only be used in an emergency.



Equipment Cooling System Circuit
Figure 3 (Sheet 1)



EFFECTIVITY

(Recirculation duct airplanes)

EFFECTIVITY TCA LX-N20198 LX-N20199

B. The three equipment cooling system lights indicate to the flight engineer how the system is operating. When the NO AIRFLOW warning light comes on, it is an indication that the airflow in the system is insufficient. In this case the flight engineer can position the override handle to open position causing the blower to operate. The BLOWER ON light will remain on until the cabin pressure differential increases to 0.9 to 2.0 psi. The VALVE OPEN light will remain on until the cabin pressure differential increases to 1.8 to 2.8 psi.

WARNING: DO NOT OPERATE OVERRIDE HANDLE WHEN THE AIRPLANE IS PRESSURIZED.

C. When the cabin pressure differential increases to 0.9 to 2.0 psi, relay R15 is energized through the flow control valve. Relay R15 supplies power to the blower and BLOWER ON indicating light. When the valve is in the open position, power is supplied to the VALVE OPEN indicating light through switch 2 on the flow control valve.

D. When the cabin pressure differential exceeds 0.9 to 2.0 psi, relay R15 is de-energized by switch 1 on the flow control valve. The blower and BLOWER ON indicating light are both de-energized at this time.

E. When the cabin pressure differential increases to 1.8 to 2.8 psi, the flow control valve closes and the VALVE OPEN indicating light is de-energized by switch 2.

F. When the cabin pressure differential drops below 1.8 to 2.8 psi, the flow control valve starts to open and switch 2 is energized to turn on the VALVE OPEN indicating light. No power is supplied to relay R15 due to switch 1 in the flow control valve.

G. When the cabin pressure differential drops below 0.9 to 2.0 psi, switch 1 in the flow control valve closes which energizes relay R15. The blower and BLOWER ON indicating light are turned on.

H. The airflow detector is energized whenever power is supplied to the airplane. During normal operation the airflow through the equipment cooling system is sufficient to remove heat from the detector heater, preventing the temperature sensitive switch from actuating. When the airflow through the system is not sufficient to remove heat from the heater, the temperature around the detector rises, actuating the switch. This illuminates the no-airflow warning light on the flight engineer's instrument panel which will remain on until airflow through the system is sufficient to remove heat from the heater, allowing the switch to open. The light will illuminate approximately 10 minutes after loss of airflow and may remain on up to approximately 5 minutes after the resumption of normal airflow.

7. Operation (Recirculation Duct Airplanes - See figure 3 for effectivity).

   A. The equipment cooling system blower normally runs whenever electrical power is furnished to the airplane. The blower draws air from the cabin and through the electrical and electronic equipment, the ducts and the vertical manifold. The air takes up heat from the equipment as it flows through it.

   B. The warm air flows through the blower duct and flows overboard through the blower duct discharge port when the airplane is on the ground.

   C. As the airplane gains altitude, the increasing pressure difference between the cabin air and the air outside the airplane causes the automatic flow control valve to shut. The warm air which the blower discharges must then flow through the recirculation duct and into the space which is under the forward cargo compartment floor. (See sheet 2 of figure 1). The warm air is mixed with other cabin air and is recirculated or flows overboard through the air conditioning outflow valve.

   D. The NO AIRFLOW warning light which is on the flight engineer's panel comes on when not enough air is being drawn through the equipment cooling system or, on aircraft LX-N19997 and LX-N20000, when the blower fails. The flight engineer may increase the airflow, when the airplane is in flight, by opening the overboard dump valve. The overboard dump valve may also be opened to evacuate smoke which may be generated in the electronic compartment.

   E. The recirculation duct has a check valve to keep air from being drawn out of the space which is under the forward cargo compartment floor when the overboard dump valve is open.

EQUIPMENT COOLING SYSTEM - TROUBLE SHOOTING

EFFECTIVITY

All except:	
AII	707-437
SAA	707-344
PAA	N714PA thru N730PA; N757PA thru N764PA
AF	707-328
SABENA	OO-SJA thru OO-SJF
BOAC	707-436
EL AL	707-458

1. General

A. In trouble shooting the equipment cooling system, two cooling problems may exist. One concerns the equipment in the racks and sizing of the orifice openings. The other will result from faulty components in the air moving portion of the system.

B. Orifice openings are sized to provide the proper airflow for all equipment installed in the airplane at delivery. Refer to 21-58-12, Equipment Cooling Orifice Covers - Adjustment/Test. If orifices are not set accordingly, or if additional orifices are added to provide cooling for equipment installed after delivery, it may upset the cooling balance and allow overheating of some electrical/electronic equipment.

CAUTION: DO NOT ADD EQUIPMENT OR CHANGE ADJUSTMENT OF COOLING ORIFICES WITHOUT OBTAINING ENGINEERING APPROVAL. IF ORIFICES ARE CHANGED OR IF NEW ORIFICES ARE ADDED EQUIPMENT IN THE RACKS MAY OVERHEAT.

(1) Furthermore, it should be noted that cooling of equipment utilizes control cabin exhaust air. This air, drawn through the equipment, may contain impurities such as tars and nicotine which may settle on the equipment. If equipment is not cleaned for a considerable period of time these deposits could adversely affect their cooling.

C. The equipment cooling system consists of a blower, automatic flow control valve, ducting and interrelated electrical wiring. Airplanes may have either of three different types of control and indicating systems. The following may be used to determine which system is used in the airplane.

(1) On airplanes with direct discharge equipment cooling system, the BLOWER ON light indicates blower operation and the VALVE OPEN light indicates automatic flow control valve position. Operation of the blower is controlled by the flow control valve switches through the equipment cooling blower relay.

(2) On some airplanes with recirculation equipment cooling system, the blower operation is controlled by a position switch through the equipment cooling blower relay. The automatic flow control valve only varies the airflow in the system and does not control blower operation. The VALVE OPEN light and indicator indicates valve position.

(3) On other recirculation cooling system airplanes, the indicating and control systems are the same as with airplanes having recirculated airflow, except that any failure of the blower causes the NO AIRFLOW light to come on immediately. A relay is provided in one of the blower three-phase lines which actuates a switch if the blower is not operating.

D. Failure of air movement in the equipment cooling system is indicated when the NO AIRFLOW warning light on the flight engineer's panel comes on. On airplanes with direct discharge system and on some with recirculation system the NO AIRFLOW light is actuated by the temperature sensitive switch, a heated unit in the airflow detector system. It actuates the warning light to ON every time there is not enough airflow or on failure of air movement in the system. On all other airplanes with the recirculation system, the NO AIRFLOW warning light is a dual purpose light which may either be actuated by the temperature sensitive switch or by blower failure.

E. Few components of the equipment cooling system could cause failure of air movement in the system. The following trouble shooting charts are provided to isolate faulty components for each of the three different types of control and indicating system. If after using the trouble shooting charts the problem is not corrected, the trouble may either be in the electrical wiring or connectors. Refer to wiring diagram.

NOTE: Prior to using trouble shooting charts, check press-to-test LIGHTS.

2. Trouble Shooting Charts

EFFECTIVITY

(Direct discharge duct airplanes)

SABENA OO-SJG, OO-SJH and OO-SJJ

Power supplied to airplane	
Circuit Breakers	Closed
BLOWER ON light	OFF
VALVE OPEN light	OFF
Blower	Not Operating

Check that position of automatic flow control valve is between full open and 45 degrees from full open. IF -

VALVE BETWEEN OPEN AND 45 DEGREES FROM OPEN - Replace automatic flow control valve switching assembly

VALVE NOT BETWEEN OPEN AND 45 DEGREES FROM OPEN - Replace automatic flow control valve

Power supplied to airplane	
Circuit breakers	Closed
BLOWER ON light	ON
VALVE OPEN light	ON
Blower	Not Operating

Check blower assembly receptacle for 115V AC between ground and terminals A, B, and C. IF -

VOLTAGE - Replace blower

NO VOLTAGE - Check continuity across equipment cooling blower relay pins L1-T1, L2-T2, and L3-T3. IF -

CONTINUITY - Repair circuit between blower receptacle pins A, B, and Cand circuit breakers

NO CONTINUITY - Replace equipment cooling blower relay

Power supplied to airplane	
Circuit Breakers	Closed
BLOWER ON light	OFF
VALVE OPEN light	ON
Blower	Operating

Check for CONTINUITY across NO contacts of equipment cooling blower relay. IF -

NO CONTINUITY - Replace relay

CONTINUITY - Repair wiring between NO contact of blower relay and BLOWER ON light

Power supplied to airplane	
Circuit Breakers	Closed
BLOWER ON light	ON
VALVE OPEN light	OFF
Blower	Operating or Not operating

REPAIR wiring between connector at Station 390R and Valve open light

Power supplied to airplane	
circuit breakers	CLOSED
BLOWER ON light	OFF
VALVE OPEN light	ON
Blower	Not Operating

Check that auto flow control valve position is not more than 45 degrees from open position by observing valve position indicator. IF -

VALVE MORE THAN 45 DEGREES FROM OPEN - Replace valve

VALVE LESS THAN 45 DEGREES FROM OPEN - Check for VOLTAGE at flow control valve pin B. IF -

NO VOLTAGE - Replace auto flow control valve switch assembly

VOLTAGE - Replace equipment cooling blower relay

3. Trouble Shooting Charts

EFFECTIVITY

(Recirculation duct airplanes)

TCA : LX-N19996
LX-N20198
LX-N20199

RTCA : LX-N19997
LX-N20000

Power supplied to airplane
Circuit Breakers — Closed
VALVE OPEN light — OFF
Valve is between FULL open and 68°
Blower — Operating or Not Operating
BLOWER SWITCH — NORMAL or OFF

Check VOLTAGE at pin E of switch assembly flow control valve. IF -

VOLTAGE - Replace switch assembly of valve

NO VOLTAGE - Repair wiring between flow control valve and VALVE OPEN light and to connector near BLOWER SWITCH

Power supplied to airplane	
Circuit Breakers	Closed
VALVE OPEN light	OFF
Valve is between FULL open and 68°	
Blower	Operating or Not Operating
BLOWER SWITCH	NORMAL or OFF

Check VOLTAGE at pin E of switch assembly flow control valve. IF -

VOLTAGE - Replace switch assembly of valve

NO VOLTAGE - Repair wiring between flow control valve and VALVE OPEN light and to connector near BLOWER SWITCH

Power supplied to airplane	
Circuit Breakers	Closed
BLOWER SWITCH	NORMAL
VALVE OPEN light	ON
Blower	Not Operating

Check VOLTAGE at blower receptacle terminals A, B and C to ground for 115V AC. IF -

- VOLTAGE - Replace blower
- NO VOLTAGE - Replace equipment cooling blower relay

Power supplied to airplane	
Circuit Breakers	Closed
BLOWER SWITCH	NORMAL
VALVE OPEN light	ON
Blower	Not Operating

Check VOLTAGE INPUT at equipment cooling blower relay. IF -

- VOLTAGE - Replace equipment cooling blower relay
- NO VOLTAGE - Replace BLOWER SWITCH assembly

EQUIPMENT COOLING SYSTEM - ADJUSTMENT/TEST

1. Equipment Cooling System Test

A. General

(1) The equipment cooling system test provides an operational check of equipment of the equipment cooling system. Since the control and monitoring features of some airplanes are different than others, two test procedures are provided.

B. Test Equipment Cooling System

TWA	N746TW thru N752TW, N754TW thru N759TW, N781TW thru N785TW, N795TW thru N799TW, N6720 thru N6724, N6726 thru N6729, N6763T, N6764T and N6771T
PAA	N401PA thru N410PA, N412PA, N414PA thru N418PA, N765PA thru N767PA and N790PA thru N799PA
TWA	707-331B, N760TW, N773TW thru N776TW, N778TW thru N780TW, N793TW, N8705T, N8715T, N8725T, N18701 thru N18704 and N18706 thru N18712
AF	F-BHSV, F-BHSX thru F-BHSZ and F-BLCA thru F-BLCG
SABENA	OO-SJG, OO-SJH, OO-SJJ and OO-SJK
BOAC	G-ASZF thru G-ASZG

(1) Provide electrical power.

(2) Check that the following circuit breakers are closed:

(a) CABIN AIR CONDITIONING (P7)

(b) EQUIPMENT OVERHEAT WARNING LIGHT (P6)

(c) EQUIPMENT COOLING BLOWER (P5) AND (P4)

(3) Remove shield and put override handle in VALVE CLOSED position.

(4) Check that blower stops and BLOWER ON and VALVE OPEN lights go out, and that within 10 minutes the NO AIRFLOW warning light comes on.

(5) Put override handle in VALVE OPEN position.

(6) Check that blower starts operating and that the BLOWER ON and VALVE OPEN light comes on.

(7) Check that within 5 minutes the NO AIRFLOW light goes out.

(8) Put the override handle in the AUTOMATIC position and replace shield.

(9) If no longer required, remove electrical power from airplane.

C. Test Equipment Cooling System (all except airplanes listed in paragraph 1.B)

(1) Provide electrical power.

(2) Check that the following circuit breakers are closed:

(a) OVERBOARD DUMP VALVE (P2)

(b) EQUIPMENT COOLING BLOWER (P3)

(c) EQUIPMENT COOLING BLOWER CONTROL AND PRESS-TO-TEST LIGHTS (P5)

(d) AIR WARNING (P6)

(3) Remove shield and put automatic flow control valve override handle in VALVE CLOSED position.

(4) Check that VALVE OPEN lights on flight engineer's panel goes out.

(5) Put overboard dump valve switch on flight engineer's panel in OPEN position.

(6) Feel for airflow at blower duct discharge port.

(7) Put overboard dump valve switch in NORMAL position.

(8) Feel at blower duct discharge port that airflow has stopped.

(9) Put blower switch on flight engineer's panel in OFF position.

(10) Check that NO AIRFLOW light on flight engineer's panel comes on within 10 minutes.

(11) Put blower switch in NORMAL position.

(12) Check that NO AIRFLOW light goes out within 5 minutes.

(13) Put automatic flow control valve override handle in AUTOMATIC position and replace shield.

(14) Check that VALVE OPEN light comes on.

(15) If no longer required, remove electrical power from airplane.

TAPE MACHINE	SPACE	HF-1 CONTR	HF-P1	HF-1 T-R

SHELF NO. 1

ADF-R1	SPACE	HF-2 CONTR	HF-P2	HF-2 T-R

SHELF NO. 2

MACH TRIM CONTROL UNIT	AUTOPILOT P	AUTOPILOT AMPL	SPACE

SHELF NO. 3

NAV WARN (PROVISIONS)	VHF-T1	VHF-T2	ENGINE VIB AMPL (AVM)	MKR	P/A AMPL	SPACE	VHF-R2	VHF-R1

SHELF NO. 4

LH RACK

FWD

DOPP TRACKER 1 (PROVISIONS)	SPACE	DOPPLER COMPUTER NO. 1 (PROVISIONS)	DOPPLER JUNCTION BOX	DOPPLER COMPUTER NO. 2 (PROVISIONS)	SPACE	DOPP TRACKER 2 (PROVISIONS)

SHELF NO. 1

GS-1	GS-2	VOR-R1	VOR-1 ACCESS	VOR-R2	VOR-2 ACCESS	DME-1 [4] (PROVISIONS [1])	DME-2 (PROVISIONS)

SHELF NO. 2

FLT RECORDER (PROVISIONS)	LORAN RCVR	POLAR PATH COUPLER-1	POLAR PATH COUPLER -2	ATC TRANSP (PROVISIONS)	ADF-R2

SHELF NO. 3 [2]

POLAR PATH COUPLER 1	POLAR PATH COUPLER 2	LORAN RCVR	ATC TRANSP NO. 2 (PROVISIONS)	ATC TRANSP NO. 1 (PROVISIONS)	ADF-R2

SHELF NO. 3 [3]

KIFIS CONTROL	FLIGHT COMPUTER	FLIGHT INSTR AMPL-1	FLIGHT INSTR AMPL-2	SPACE

SHELF NO. 4

FWD

RH RACK

[1] OO-SJH

[2] OO-SJH and OO-SJJ

[3] OO-SJK

[4] OO-SJJ and OO-SJK

EFFECTIVITY

OO-SJH, OO-SJJ and OO-SJK

Electronic Equipment Location
Figure 502 (Sheet 1)

TAPE MACHINE (PROVISIONS)	SPACE	HF-1 CONTR	HF-1 T-R

SHELF NO. 1

ADF-R1	SPACE	HF-2 CONTR	HF-2 T-R

SHELF NO. 2

MACH TRIM CONTROL UNIT	AUTOPILOT P	AUTOPILOT AMPL	SPACE

SHELF NO. 3

NAV WARN (PROVISIONS)	ENGINE VIB AMPL (AVM)	MKR	P/A AMPL	SPACE	VHF COMM R-T 2	VHF COMM R-T 1

SHELF NO.4

LH RACK

FWD

DOPP TRACKER 1 (PROVISIONS)	SPACE	DOPPLER COMPUTER NO. 1 (PROVISIONS)	DOPPLER JUNCTION BOX	DOPPLER COMPUTER NO. 2 (PROVISIONS)	SPACE	DOPP TRACKER 2 (PROVISIONS)

SHELF NO. 1

SPACE	VOR/ILS RECEIVER 1	VOR/ILS RECEIVER 2	DME-1	DME-2 (PROVISIONS)

SHELF NO. 2

SPACE	LORAN	ATC TRANSP NO. 2 (PROVISIONS)	ATC TRANSP NO. 1 (PROVISIONS)	ADF-R2

SHELF NO. 3

KIFIS CONTROL	COMPASS AMPL-1	COMPASS AMPL-2	FLIGHT INSTR-1 AMPL	FLIGHT INSTR-2 AMPL	FLIGHT COMPUTER

SHELF NO. 4

RH RACK

FWD

EFFECTIVITY

TCA : LX-N19996, LX-N20198, LX-20199
RTCA : LX-N19997, LX-N20000

TAPE MACHINE	SPACE	HF-1 CONTR	HF-P1	HF-1 T-R

SHELF NO. 1

ADF-R1	SPACE	HF-2 CONTR	HF-P2	HF-2 T-R

SHELF NO. 2

MACH TRIM CONTROL UNIT	AUTOPILOT P	AUTOPILOT AMPL	SPACE

SHELF NO. 3

NAV WARN (PROVI-SIONS)	VHF-T1	VHF-T2	ENGINE VIB AMPL (AVM)	MKR	P/A AMPL	SPACE	VHF-R2	VHF-R1

SHELF NO. 4

LH RACK

FWD

DOPP TRACKER 1 (PROVISIONS)	SPACE	DOPPLER COMPUTER NO. 1 (PROVISIONS)	DOPPLER JUNCTION BOX	DOPPLER COMPUTER NO. 2 (PROVISIONS)	SPACE	DOPP TRACKER 2 (PROVISIONS)

SHELF NO. 1

GS-1	GS-2	VOR-R1	VOR-1 ACCESS	VOR-R2	VOR-2 ACCESS	DME-1 4 (PROVISIONS 1)	DME-2 (PROVISIONS)

SHELF NO. 2

FLT RECORDER (PROVISIONS)	LORAN RCVR	POLAR PATH COUPLER-1	POLAR PATH COUPLER-2	ATC TRANSP (PROVISIONS)	ADF-R2

SHELF NO. 3 2

POLAR PATH COUPLER 1	POLAR PATH COUPLER 2	LORAN RCVR	ATC TRANSP NO. 2 (PROVISIONS)	ATC TRANSP NO. 1 (PROVISIONS)	ADF-R2

SHELF NO. 3 3

KIFIS CONTROL	FLIGHT COMPUTER	FLIGHT INSTR AMPL-1	FLIGHT INSTR AMPL-2	SPACE

SHELF NO. 4

FWD

RH RACK

1 *OO-SJH*

2 *OO-SJH and OO-SJJ*

3 *OO-SJK*

4 *OO-SJJ and OO-SJK*

EFFECTIVITY

OO-SJH, OO-SJJ and OO-SJK

Electronic Equipment Location
Figure 502 (Sheet 1)

TAPE MACHINE (PROVISIONS)	SPACE	HF-1 CONTR	HF-1 T-R

SHELF NO. 1

ADF-R1	SPACE	HF-2 CONTR	HF-2 T-R

SHELF NO. 2

MACH TRIM CONTROL UNIT	AUTOPILOT P	AUTOPILOT AMPL	SPACE

SHELF NO. 3

NAV WARN (PROVISIONS)	ENGINE VIB AMPL (AVM)	MKR	P/A AMPL	SPACE	VHF COMM R-T 2	VHF COMM R-T 1

SHELF NO.4

LH RACK

FWD

DOPP TRACKER 1 (PROVISIONS)	SPACE	DOPPLER COMPUTER NO. 1 (PROVISIONS)	DOPPLER JUNCTION BOX	DOPPLER COMPUTER NO. 2 (PROVISIONS)	SPACE	DOPP TRACKER 2 (PROVISIONS)

SHELF NO. 1

SPACE	VOR/ILS RECEIVER 1	VOR/ILS RECEIVER 2	DME-1	DME-2 (PROVISIONS)

SHELF NO. 2

SPACE	LORAN	ATC TRANSP NO. 2 (PROVISIONS)	ATC TRANSP NO. 1 (PROVISIONS)	ADF-R2

SHELF NO. 3

KIFIS CONTROL	COMPASS AMPL-1	COMPASS AMPL-2	FLIGHT INSTR-1 AMPL	FLIGHT INSTR-2 AMPL	FLIGHT COMPUTER

SHELF NO. 4

RH RACK

FWD

EFFECTIVITY

All except OO-SJH, OO-SJJ and OO-SJK

Electronic Equipment Location
Figure 502 (Sheet 2)

EQUIPMENT NOMENCLATURE	TRAY TYPE	ORIFICE OPENING IN INCHES		
		ORIFICE NO. 1	ORIFICE NO. 2	ORIFICE NO. 3
ADF-R1	3	0.80	CLOSED	NONE
ADF-R2 ▷2	3	0.70	CLOSED	NONE
ADF-R2 ▷3	3	0.66	CLOSED	NONE
ATC TRANSP (PROVISIONS) ▷2	3	1.17	CLOSED	NONE
ATC TRANSP NO. 1 and NO. 2 ▷3 (PROVISIONS)	3	1.10	CLOSED	NONE
AUTOPILOT AMPL	4	1.27	CLOSED	CLOSED
AUTOPILOT P	2	1.00	NONE	NONE
DME-1 ▷4 (PROVISIONS ▷1)	3	FULL OPEN	0.45	NONE
DME-2 (PROVISIONS)	3	FULL OPEN	0.45	NONE
DOPPLER COMPUTER NO. 1 and NO. 2 (PROVISIONS)	2	1.26	NONE	NONE
DOPPLER JUNCTION BOX	3	CLOSED	CLOSED	NONE
DOPP TRACKER 1 and 2 (PROVISIONS)	3	FULL OPEN	0.98	NONE
ENGINE VIB AMPL (AVM)	1	0.72	NONE	NONE
FLIGHT COMPUTER	5	0.72	CLOSED	NONE
FLIGHT INSTR AMPL-1 and -2	2	0.50	NONE	NONE
FLIGHT RECORDER (PROVISIONS) ▷2	3	0.80	CLOSED	NONE
GS-1 and GS-2	1	0.49	NONE	NONE
HF-1 CONTR	2	0.35	NONE	NONE
HF-2 CONTR	2	0.33	NONE	NONE
HF-P1	2	0.80	NONE	NONE
HF-P2	2	0.76	NONE	NONE
HF-1 T-R	4	FULL OPEN	FULL OPEN	0.19
HF-2 T-R	4	FULL OPEN	1.28	CLOSED
KIFIS CONTROL	5	0.82	CLOSED	NONE
LORAN RCVR ▷2	3	1.29	CLOSED	NONE
LORAN RCVR ▷3	3	1.23	CLOSED	NONE
MACH TRIM CONTROL UNIT	3	0.55	CLOSED	NONE
MKR	1	0.45	NONE	NONE
NAV WARN	2	CLOSED	NONE	NONE
P/A AMPL	1	0.51	NONE	NONE
POLAR PATH COUPLER-1 and -2 ▷2	3	0.68	CLOSED	NONE
POLAR PATH COUPLER-1 and -2 ▷3	3	0.65	CLOSED	NONE
TAPE MACHINE	3	1.14	CLOSED	NONE
VHF-R1 and -R2	2	0.47	NONE	NONE
VHF-T1 and -T2	2	0.46	NONE	NONE
VOR-1 and -2 ACCESS	2	0.48	NONE	NONE
VOR-R1 and -R2	2	0.47	NONE	NONE

EFFECTIVITY

OO-SJH, OO-SJJ, and OO-SJK

▷1 OO-SJH
▷2 OO-SJH and OO-SJJ
▷3 OO-SJK
▷4 OO-SJJ and OO-SJK

Equipment Cooling Orifice Cover Setting
Figure 503 (Sheet 1)

EQUIPMENT NOMENCLATURE	TRAY TYPE	ORIFICE OPENING IN INCHES		
		ORIFICE NO. 1	ORIFICE NO. 2	ORIFICE NO. 3
ADF-R1	2	0.44	NONE	NONE
ADF-R2	2	0.42	NONE	NONE
AUTOPILOT P	2	0.65	NONE	NONE
ATC TRANSP NO. 1 and NO. 2 (PROVISIONS)	3	0.73	CLOSED	NONE
AUTOPILOT AMPL	4	1.18	CLOSED	CLOSED
COMPASS AMPL-1 and -2	1	0.14	NONE	NONE
DME-1	3	0.92	CLOSED	NONE
DME-2 (PROVISIONS)	3	0.92	CLOSED	NONE
DOPPLER COMPUTER NO. 1 and NO. 2 (PROVISIONS)	2	0.92	NONE	NONE
DOPPLER JUNCTION BOX	3	CLOSED	CLOSED	NONE
DOPP TRACKER 1 and 2 (PROVISIONS)	3	1.00	CLOSED	NONE
ENGINE VIB AMPL (AVM)	1	0.20	NONE	NONE
FLIGHT INSTR AMPL-1 and -2	2	0.70	NONE	NONE
FLIGHT COMPUTER	3	0.54	CLOSED	NONE
HF-1 CONTR and -2 CONTR	2	0.28	NONE	NONE
HF-1 T-R	4	1.29	CLOSED	CLOSED
HF-2 T-R	4	1.27	CLOSED	CLOSED
KIFIS CONTROL	3	0.74	CLOSED	NONE
LORAN	3	0.63	CLOSED	NONE
MACH TRIM CONTROL UNIT	3	0.35	CLOSED	NONE
MKR	1	0.19	NONE	NONE
NAV WARN (PROVISIONS)	2	0.56	NONE	NONE
P/A AMPL	1	FULL	NONE	NONE
TAPE MACHINE (PROVISIONS)	3	0.66	CLOSED	NONE
VHF COMM R-T1 and R-T2	2	0.67	NONE	NONE
VOR/ILS RECEIVER 1 and 2	2	0.42	NONE	NONE

Equipment Cooling Orifice Cover Setting
Figure 503 (Sheet 2)

EQUIPMENT COOLING BLOWER - REMOVAL/INSTALLATION

1. Remove Blower (See figure 401.)

   A. Loosen two duct clamps on each end of blower.

   B. Pull flexible connecting ducts away from blower.

   C. Disconnect wiring connector.

   D. Remove four bolts which secure blower to its support.

   E. Remove blower.

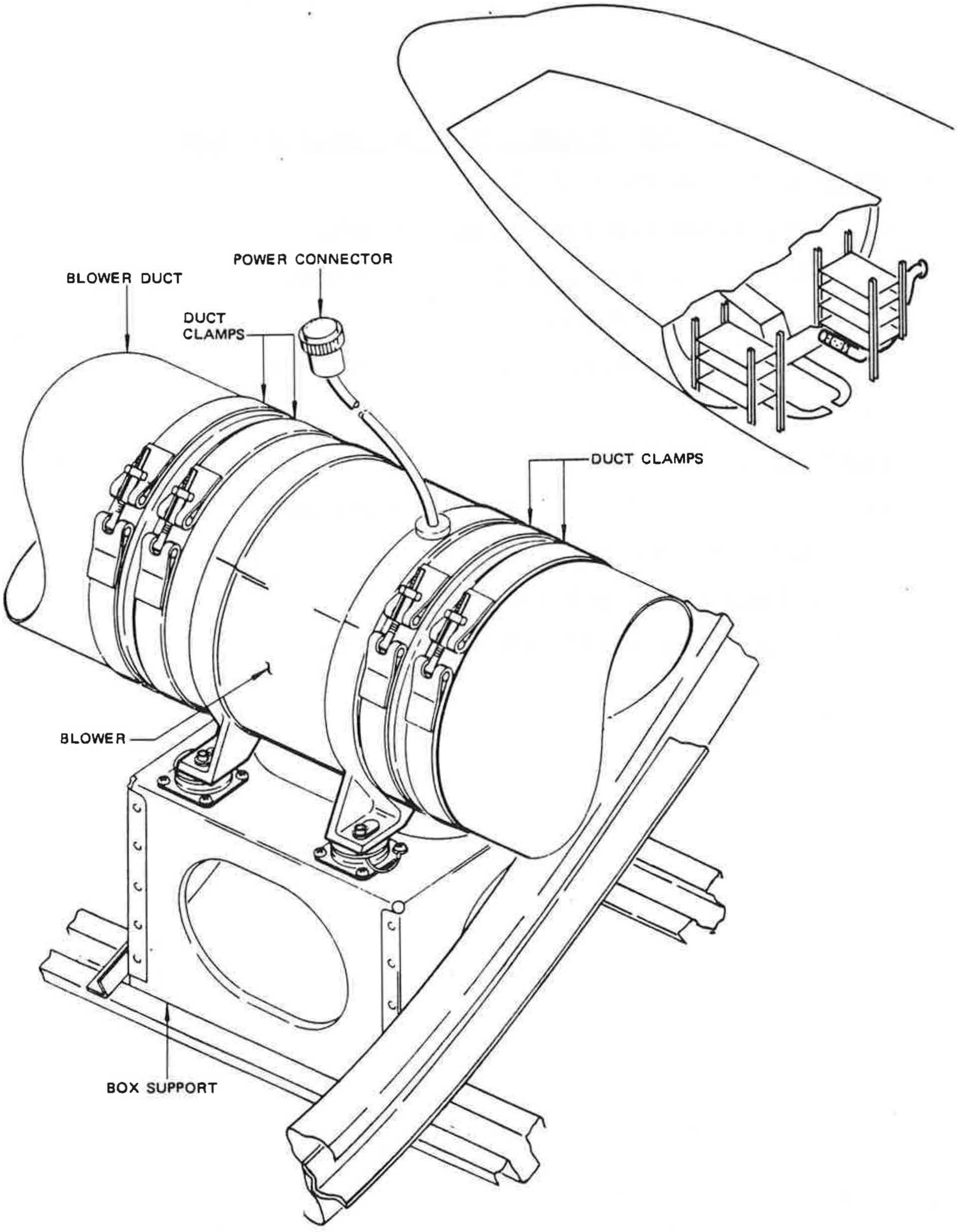
2. Install Blower

   A. Place blower on support and secure it with bolts.

   B. Connect electrical connector.

   C. Pull flexible ducts back over blower.

   D. Place all clamps back in position and tighten.



Equipment Cooling Blower Installation
Figure 401

AUTOMATIC FLOW CONTROL VALVE - REMOVAL/INSTALLATION

1. Remove Automatic Flow Control Valve (See figure 401.)

   A. Remove the upper bulkhead panel from the right side of the cargo compartment forward bulkhead.

   B. Remove lower V-clamp which secures the valve to the duct adapter.

   C. Remove blower discharge duct support bracket.

   D. Remove large duct clamp from the blower discharge duct at the blower.

   E. Remove manual override handle shield retaining pin and rotate shield forward.

   F. Loosen manual override handle stop nut, remove control handle and cable from support bracket.

   G. Remove manual override handle support bracket mounting bolts and remove support bracket from airplane.

   H. Remove blower discharge duct.

   I. Loosen manual override handle cable clamps.

   J. Disconnect valve electrical connector.

   K. Remove upper V-clamp which secures the valve to the discharge port.

   L. Remove valve along the same path blower discharge duct was removed.

2. Install Automatic Flow Control Valve (See figure 401.)

   A. Slide valve beneath the shelves into position.

   B. Position valve to discharge port with replaced new gaskets and install V-clamp.

C. Orientate override cable sheath bracket.

NOTE: Top of sheath bracket should be in up position. If down moisture may collect and cause the valve to be inoperable.

(1) If necessary break lockwire and loosen control cable coupling nut at the valve.

(2) Position manual override handle in correct position and check that sheath bracket is in the up position.

(3) Remove any twist in the cable casing. Tighten and lockwire the control cable nut.

D. Connect valve electrical connector.

E. Install manual override handle cable clamps.

F. Slide blower discharge duct into position and install support bracket loosely to permit movement of duct.

G. Install manual override handle support bracket.

H. Install manual override handle in the correct position and tighten stop nut.

I. Slide blower discharge duct into flexible duct at blower. Check position and tighten duct clamp.

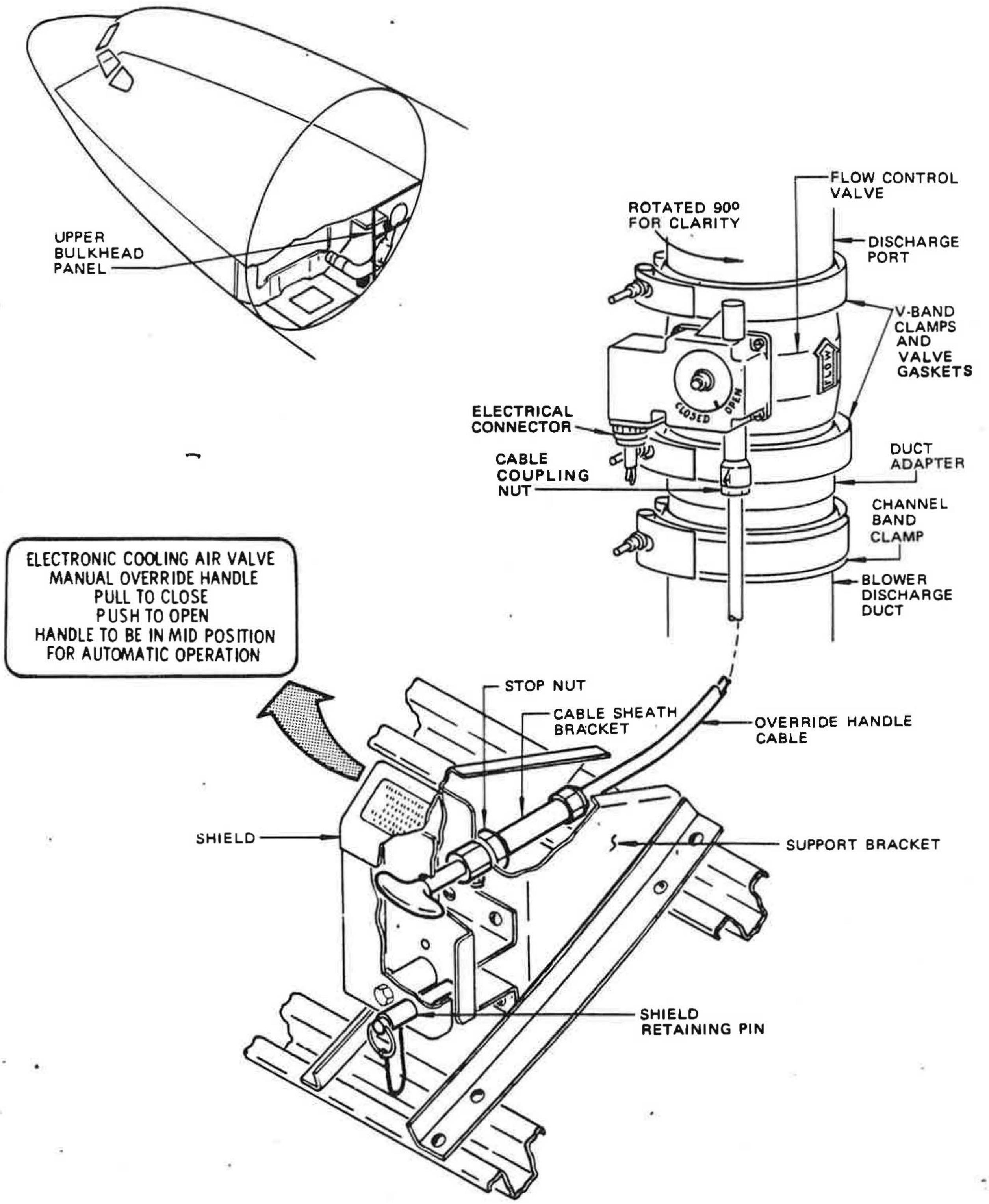
J. Position blower discharge duct with duct adapter to valve and install V-clamp.

K. Tighten blower discharge duct support bracket mounting bolts.

L. Install lockwire between upper and lower V-clamps.

M. Move manual override handle to neutral position, move handle shield down over manual override handle and insert retaining pin.

N. Install bulkhead panel.



Automatic Flow Control Valve Installation
Figure 401

OVERBOARD DUMP VALVE - REMOVAL/INSTALLATION

EFFECTIVITY

TCA : LX-N19996
LX-N20198
LX-N20199

RTCA : LX-N19997
LX-N20000

1. Remove Overboard Dump Valve (See figure 401.)

   A. Disconnect electrical connector

   B. Remove two V-band clamps.

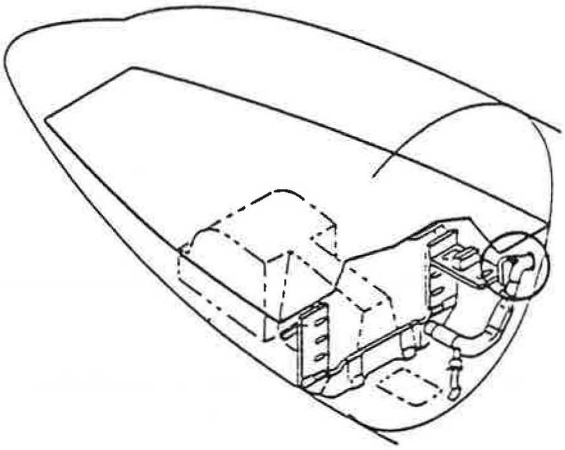
   C. Remove valve.

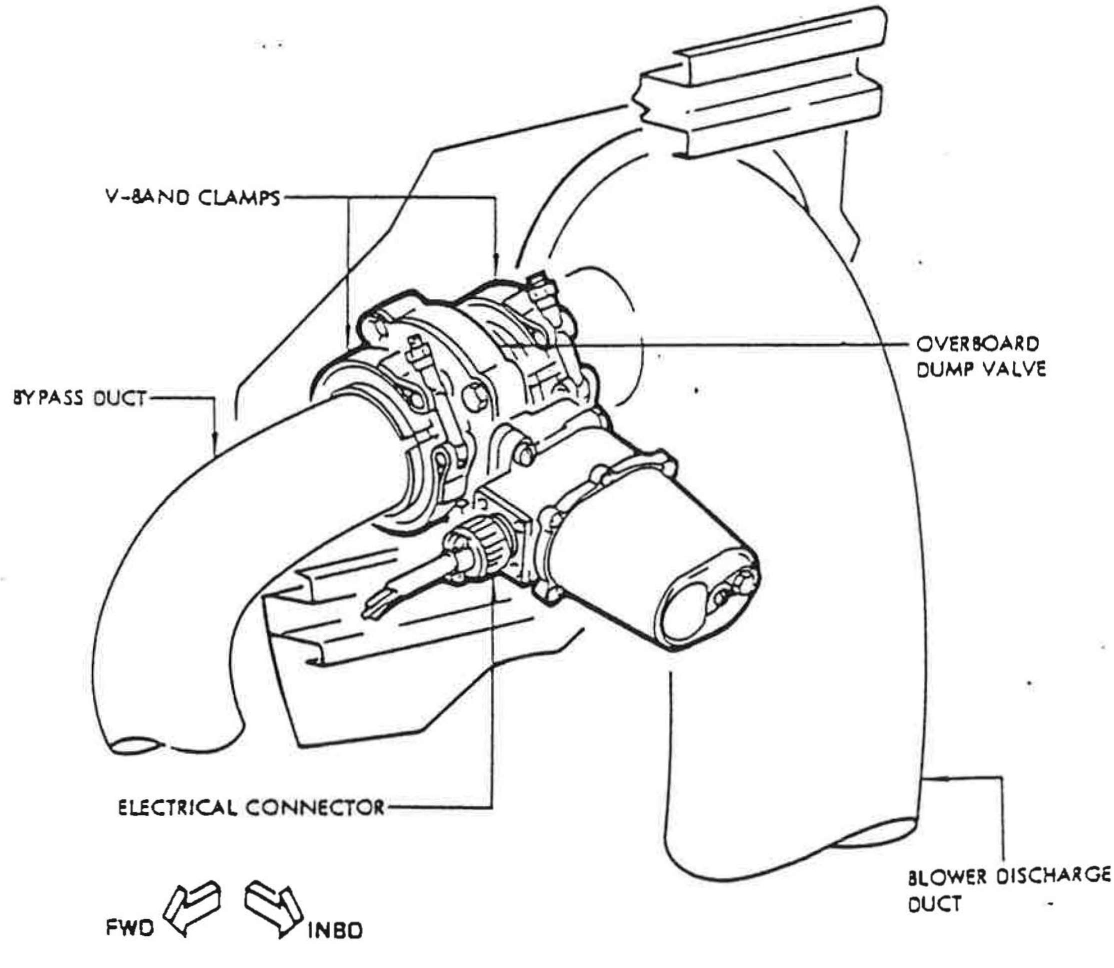
2. Install Overboard Dump Valve

   A. Hold valve in place.

   B. Install and tighten two V-band clamps.

   C. Connect electrical connector.





Overboard Dump Valve Installation
Figure 401

ZONE TEMPERATURE CONTROL SYSTEM - DESCRIPTION AND OPERATION

EFFECTIVITY

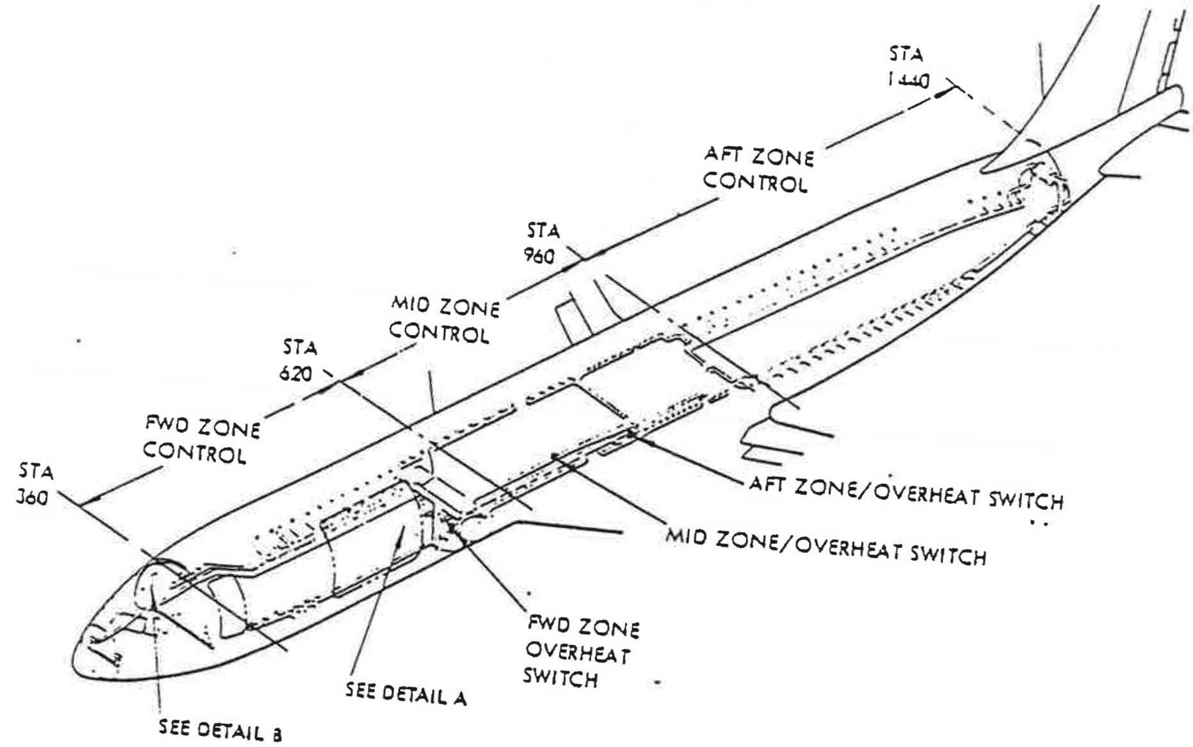
TCA : LX-N19996
LX-N20198
LX-N20199

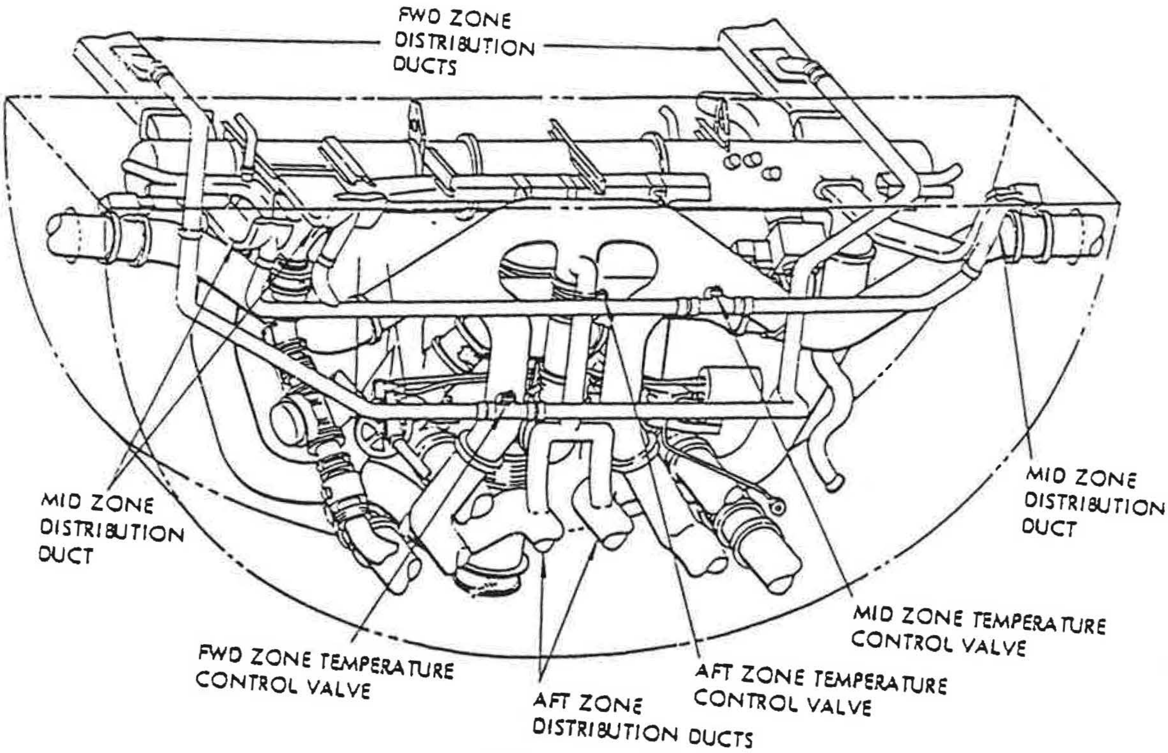
RTCA : LX-N19997
LX-N20000

1. General

A. The zone temperature control system is a manually controlled system that supplements the automatic temperature control system to compensate for the temperature variations in the main cabin resulting from uneven or abnormal passenger loading. The temperature level compensations are accomplished either by adding pneumatic duct hot air directly into the forward or mid zone distribution ducts to increase the air temperature in these zones, or by adding hot air to the aft zone to cause the main cabin temperature sensor to call for cooler air from the temperature control valve which will cool the forward and mid zones.

B. The zone temperature control system and zone temperature system indication consist of three zone temperature control valves, three 190 degree duct thermal overheat switches, an overheat indicator light, two system indicators and two control switches. (See figure 1.)



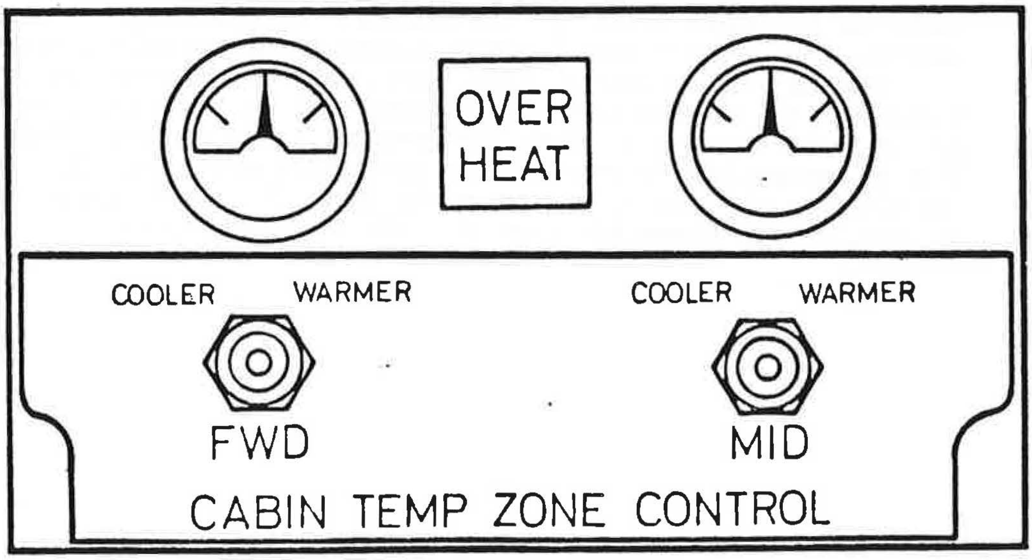


DETAIL A

Zone Temperature Control Location Diagram
Figure 1 (Sheet 1)

2. Zone Temperature Control Valves

A. The zone temperature control valves are 110v single phase ac reversible motor driven 3-inch valves, each with an external mechanical position indicator, an internal position potentiometer, internal open and closed position limit switches, and a mechanical clutch to hold the valve in any position between open and closed. The three valves are in the air distribution bay. Normal no-load operation time from limit switch to limit switch is 30 to 40 seconds using approximately 1.0 ampere. The limit switches and position potentiometer are preadjusted.



DETAIL B

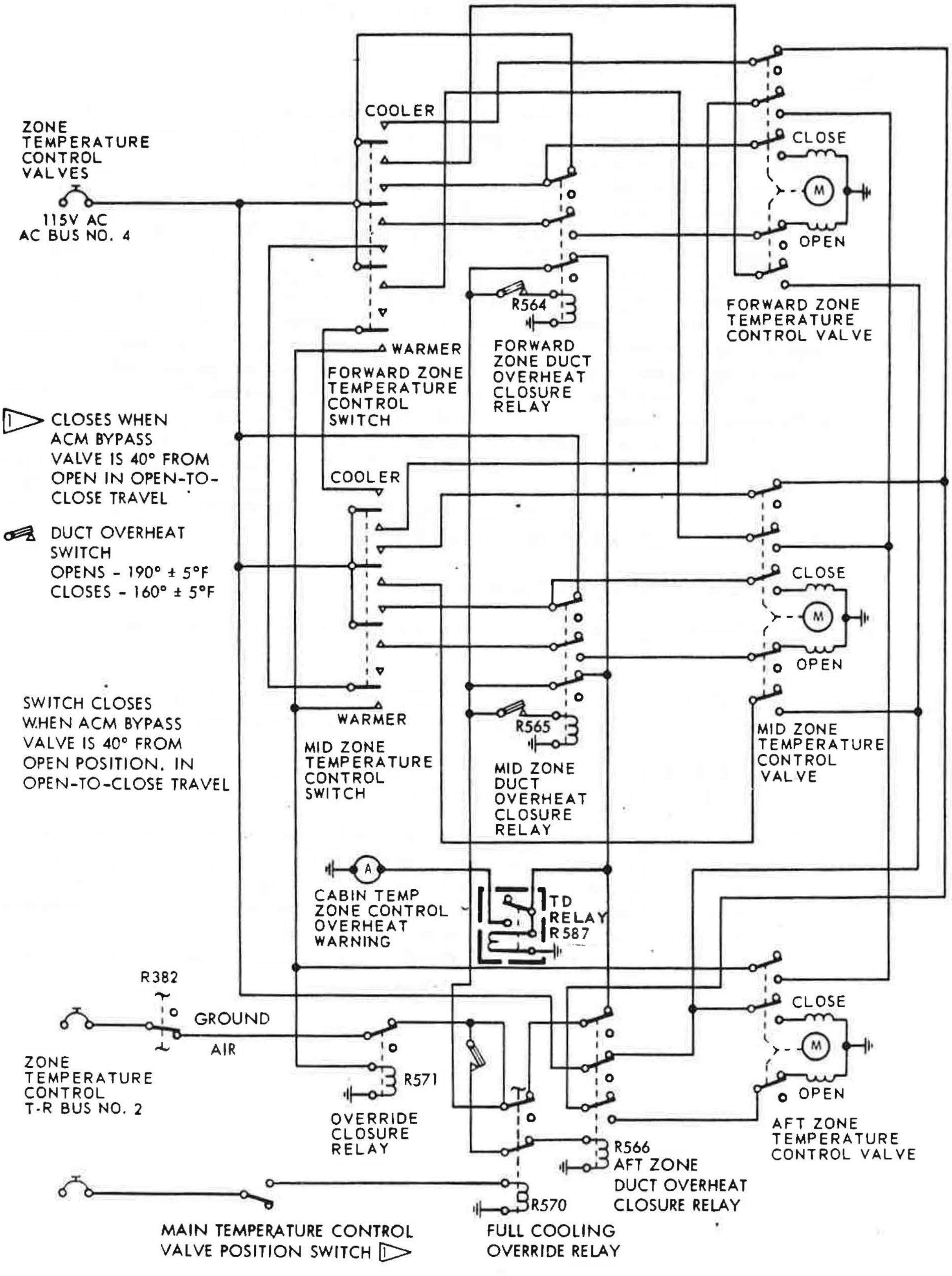
Zone Temperature Control Location Diagram
Figure 1 (Sheet 2)

3. Zone Temperature Control System

A. The zone temperature control system consists of two center-off toggle switches on the engineer's auxiliary panel, three overheat switches, an overheat indicator light and the related relays. (See figure 2.) The toggle switches, one each for the forward and mid zone temperature control, operate the zone control valves. See paragraphs 5 and 6 for system operation sequence. It will be noted that the system interlocked so that only two valves may be opened at one time by the two switches, and in each operating sequence the third or nonoperating valve must be in its closed position.

4. Zone Temperature Overheat Switch

A. A 190° (± 5°)F overheat switch is in each zone distribution duct downstream of where the hot air from the zone temperature control valves enters the distribution ducts. (See figure 1.) At overheat, 190° (± 5°)F, the switches open the circuits to the respective duct overheat closure relays to de-energize the relay, which, in turn, actuates the valve to the closed position and illuminates the zone temperature overheat light. The overheat switch will close when the air temperature in the duct cools to below 160° (± 5°)F, to energize the relay, which turns the indicator light off and restores valve motor positioning control. The forward zone overheat switch is in the left forward distribution duct at station 600G, accessible by removing the left aft section of the forward cargo compartment ceiling. The mid zone overheat switch is in the left mid zone distribution duct at station 730, buttock line 30, accessible by removing the applicable main cabin floor panel. The aft zone overheat switch is in the left aft zone distribution duct at station 830, accessible from the left wheel well area.



Zone Temperature Control System Schematic
Figure 2

5. Zone Temperature System Indication

A. The zone temperature system indication consists of two system indicators on the engineer's auxiliary panel controlled by three preadjusted position potentiometers, one in each of the zone temperature control valves. Controlled 6.8v dc from a control unit provides electrical power for the indicators. (See figure 3.) With all valves closed there is no potential across either indicator, both indicators will be neutral or vertical. If either or both forward and mid zone switches are toggled WARMER with the aft valve closed, the potentiometers will develop a positive potential across the respective indicators and the indicators will show WARMER. When the aft valve is opened, which can happen only when either or both the forward and mid valves are closed and the respective switch toggled toward COOLER, a negative potential is developed which affects the existing potential across both indicators, with both indicators moving toward the COOLER limit. The indicator for the valve which is closed will show the relative open position of the aft valve, while the other indicator will show the summation of the aft valve position with the position of the opened valve. Therefore both indicators must be observed and analyzed to determine the positions of each valve at any given set of indications.

6. Zone Temperature System Operation

A. The following is a summary of the zone temperature system zone switch operation:

(1) If all valves are closed and either or both the forward or mid zone switches are positioned to WARMER, the respective valves will open.

(2) If all valves are closed and either zone switch is positioned to COOLER the aft valve will open.

(3) If the forward zone valve and the aft zone valves are open and the mid zone switch is positioned at WARMER, both opened valves will move toward the closed position until either the forward valve or the aft valve is closed, at which time the mid valve can commence opening. Similar results are obtained if the mid valve and aft valves are open and the forward zone switch is positioned at WARMER.

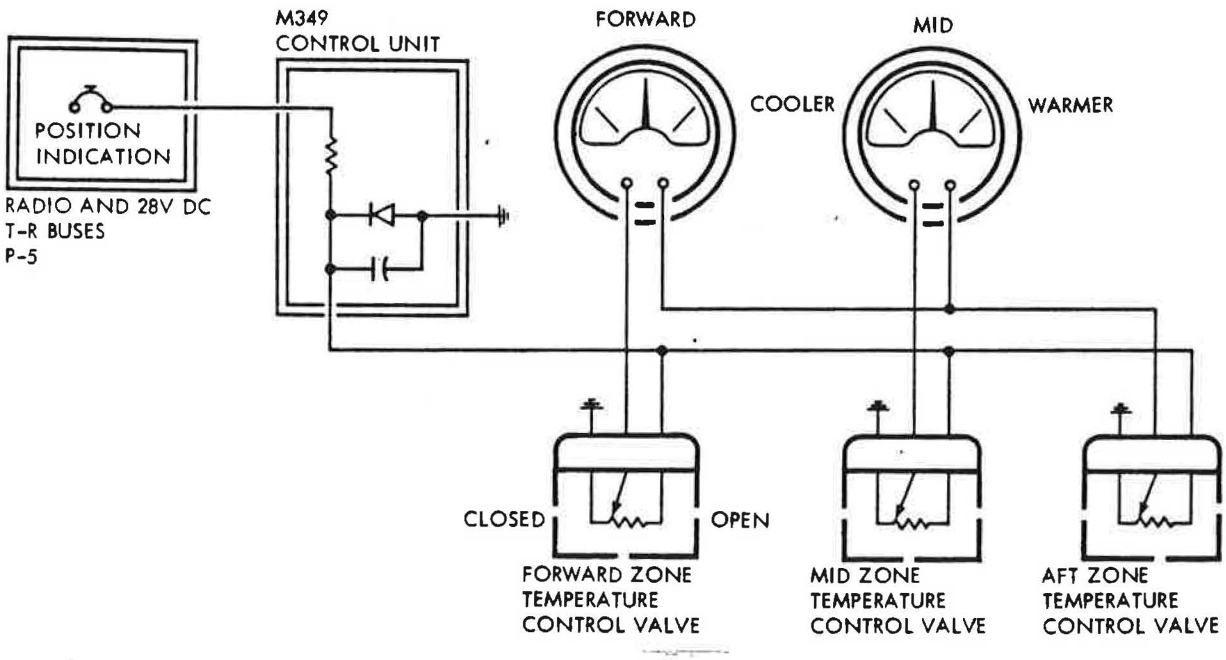
(4) If either the forward or mid zone switches are positioned at COOLER when the valve is open, that valve will move toward the closed position. If the switch is held at COOLER after the valve is closed, the aft valve will open.

(5) If the two zone switches are toggled to opposite positions simultaneously, the overrride closure relay will relax the three duct overheat relays to drive each opened valve closed. Releasing either switch will return control to the other switch.

B. All valves are driven to the closed position at touchdown and the zone control system is de-energized on the ground.

C. In flight, the aft valve is automatically energized to the closed position when the air conditioning system is in the full cool position.

D. When duct overheat is encountered, the respective zone duct overheat closure relay is de-energized to illuminate the overheat warning light and to drive the applicable zone control valve toward the closed position. On overheat switch cooling, the closure relay is energized to turn the indicator light out and to return control of the affected zone to the operator.



Zone Temperature System Indication Schematic
Figure 3

ZONE TEMPERATURE CONTROL SYSTEM - ADJUSTMENT/TEST

EFFECTIVITY

TCA : LX-N19996
LX-N20198
LX-N20199

RTCA : LX-N19997
LX-N20000

1. General

A. Testing the zone temperature control system consists of an operational test of the zone temperature control and a test of the temperature system overheat switches.

2. Equipment and Material

A. Controlled Heat Source-Temp Cal Probe Heater Attachment to Jet Cal Engine Analyzer or equivalent.

3. Test Zone Temperature Control

A. Prepare for Test

(1) Open safety relays circuit breaker.

(2) Apply external electrical power.

(3) Position main cabin temperature control valve to any position other than full cold.

(4) Close zone temperature control valves circuit breaker.

(5) Close zone temperature control circuit breaker.

B. Test Zone Temperature Control

(1) Check forward and mid zone control valves by toggling each control switch to WARMER.

NOTE: To ensure that electrical connectors for forward and mid zone temperature control valves are not reversed, a visual check for movement of the valve position indicator located on the valve must be made while the appropriate switch is toggled on the flight engineer's panel.

(a) Check that valve travel for each valve takes 30 to 45 seconds as shown on position indicator located on flight engineer's panel while position indicator located on valve travels to full open.

(2) Toggle the mid zone switch to COOLER. Check that:

(a) Full valve travel takes 60 to 90 seconds.

(b) As mid zone indicator passes through the mid zone neutral position, the forward zone indicator also moves in the COOLER direction.

(c) Upon full travel of the mid zone indicator to COOLER, the forward zone indicator reads neutral position.

NOTE: Similiar indications will result if the forward zone switch is toggled to COOLER with the mid zone indicator at full WARMER.

(3) Drive the temperature control system to full cool. Check that after 30 to 40 seconds the mid zone indicator indicates neutral and the forward indicator indicates full WARMER.

(4) Drive the main cabin temperature control system out of full cool setting.

(5) Toggle forward zone switch to COOLER. Check that:

(a) The forward zone indicator moves toward COOLER.

(b) As the forward indicator moves through the neutral position the mid and forward indicators move together toward the COOLER position.

(6) Close the safety relay circuit breaker. Check that both indicators indicate neutral position in 30 to 45 seconds.

C. Close Up

(1) Turn right air conditioning switch off.

(2) Restore circuit breakers to normal position.

(3) Remove external power if there is no further need for it.

4. Test Zone Temperature System Overheat Switches

A. Prepare to Test

(1) Open safety relay circuit breaker.

(2) Provide external electrical power.

(3) Position main cabin temperature control valve to any position other than full cold.

(4) Gain access to the overheat switches.

(a) To gain access to forward zone overheat switch remove left aft section of forward cargo compartment ceiling.

(b) To gain access to mid zone overheat switch remove seats, rugs and floor panel at station 730, left buttock line 30. See Passenger Seats and Floor Coverings, Chapter 25.

(c) The aft zone overheat switch is accessible from the left wheel well bay.

B. Test Zone Temperature System Overheat Switches

(1) Toggle both forward and mid zone switches to warmer.

(2) Open Zone Temperature Control breaker on P5.

(3) Remove electrical connector from forward zone overheat switch.

(4) Install jumper between sockets 1 and 2.

(5) Cloze Zone Temperature Control breaker on P5.

(6) Check that Cabin Temperature Zone Control Overheat warning light illuminates.

(7) Open Zone Temperature Control breaker on P5.

(8) Remove jumper and connect plug to switch.

(9) Repeat steps (3) thru (8) for mid zone overheat switch.

(10) Position either forward or mid zone switch to cooler. Check that aft value opens and both indicators move to cooler.

(11) Repeat steps (3) thru (8) for aft zone overheat switch.

(6) Remove mid zone overheat switch with electrical connector intact.

(7) Apply controlled heat t switch probe. Check that:

(a) Switch opens at approximately 195°F.

(b) The mid zone valve closes.

(c) Overheat warning light illuminates.

(8) Cool overheat switch probe to approximately 155°F. Check that warning light goes out.

(9) Install mid zone overheat switch.

(10) Position either forward or mid zone switch to COOLER. Check that aft valve opens and both indicators move to COOLER.

(11) Disconnect aft zone overheat switch with electrical connector intact.

(12) Apply controlled heat to switch probe. Check that:

(a) Switch opens at approximately 195°F.

(b) Both forward and mid zone indicators move to neutral as the aft valve closes.

(c) Overheat warning light illuminates.

(13) Cool overheat switch probe to approximately 155°F. Check that warning light goes out.

(14) Install aft zone overheat switch.

C. Close Up

(1) Install forward cargo compartment ceiling panel, main cabin floor panel, rug and seats. See Passenger Seats and Floor Coverings, Chapter 25.

(2) Restore circuit breakers to normal position.

(3) Remove external power if there is no further need for it.

ZONE TEMPERATURE OVERHEAT SWITCHES - REMOVAL/INSTALLATION

1. General

   A. The forward, mid and aft zone temperature overheat switches are all identical and their removal/installation is the same once access is gained to each switch.

2. Prepare to Remove Zone Temperature Overheat Switches

   A. The forward switch is in the left forward main cabin distribution duct at station 600G. Gain access by lowering the aft portion of the left aft section of the forward cargo compartment ceiling.

   B. The mid zone overheat switch is in the left mid zone distribution duct at station 730, buttock line 30. Gain access by removing the applicable passenger seats and main cabin floor panel. See Passenger Seats and Floor Coverings, Chapter 25.

   C. The aft zone overheat switch is in the left aft zone distribution duct at station 830 and is accessible from the left wheel well area.

3. Remove Zone Temperature Overheat Switch (See figure 401.)

   A. Pull zone temperature overheat circuit breaker.

   B. Remove electrical connector.

   C. Remove three mounting screws.

   D. Remove switch with gasket.

4. Install Zone Temperature Overheat Switch (See figure 401.)

   A. Clean mating surfaces and check that gasket is satisfactory for use.

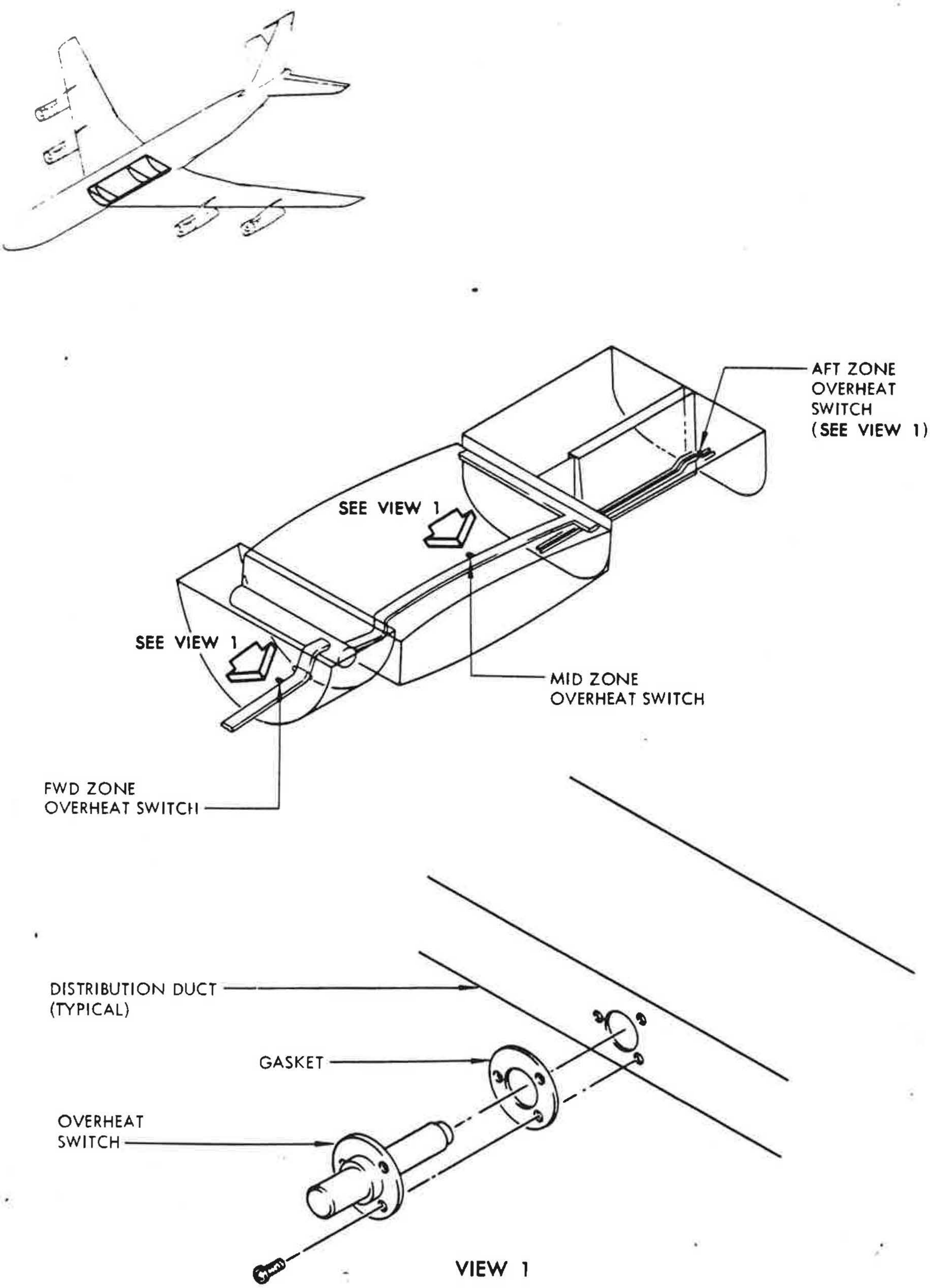
   B. Install gasket and switch, tighten screws to obtain seal.

   C. Install electrical connector.

5. Close Up

   A. If forward zone overheat switch was replaced, reinstall forward cargo ceiling left aft panel.

   B. If mid zone overheat switch was replaced reinstall floor panel, coverings and seats. See Passenger Seats and Floor Coverings, Chapter 25.



Zone Overheat Switch
Figure 401

ZONE TEMPERATURE CONTROL VALVE - REMOVAL/INSTALLATION

1. Removal/Installation Zone Temperature Control Valve

   A. Preparation

      (1) Remove aft bulkhead from the forward cargo compartment.

      (2) Pull zone temperature control circuit breaker.

   B. Remove Zone Temperature Control Valve (See figure 401.)

      (1) Disconnect bonding cable.

      (2) Disconnect electrical connector.

      (3) Remove both V-band clamps and remove valve.

         NOTE: The mid zone valve will have an orifice plate at the downstream joint.

C. Install Zone Temperature Control Valve (See figure 201.)

(1) Check that mating surfaces and valve joints are clean.

(2) On mid zone valve position orifice plate on downstream joint.

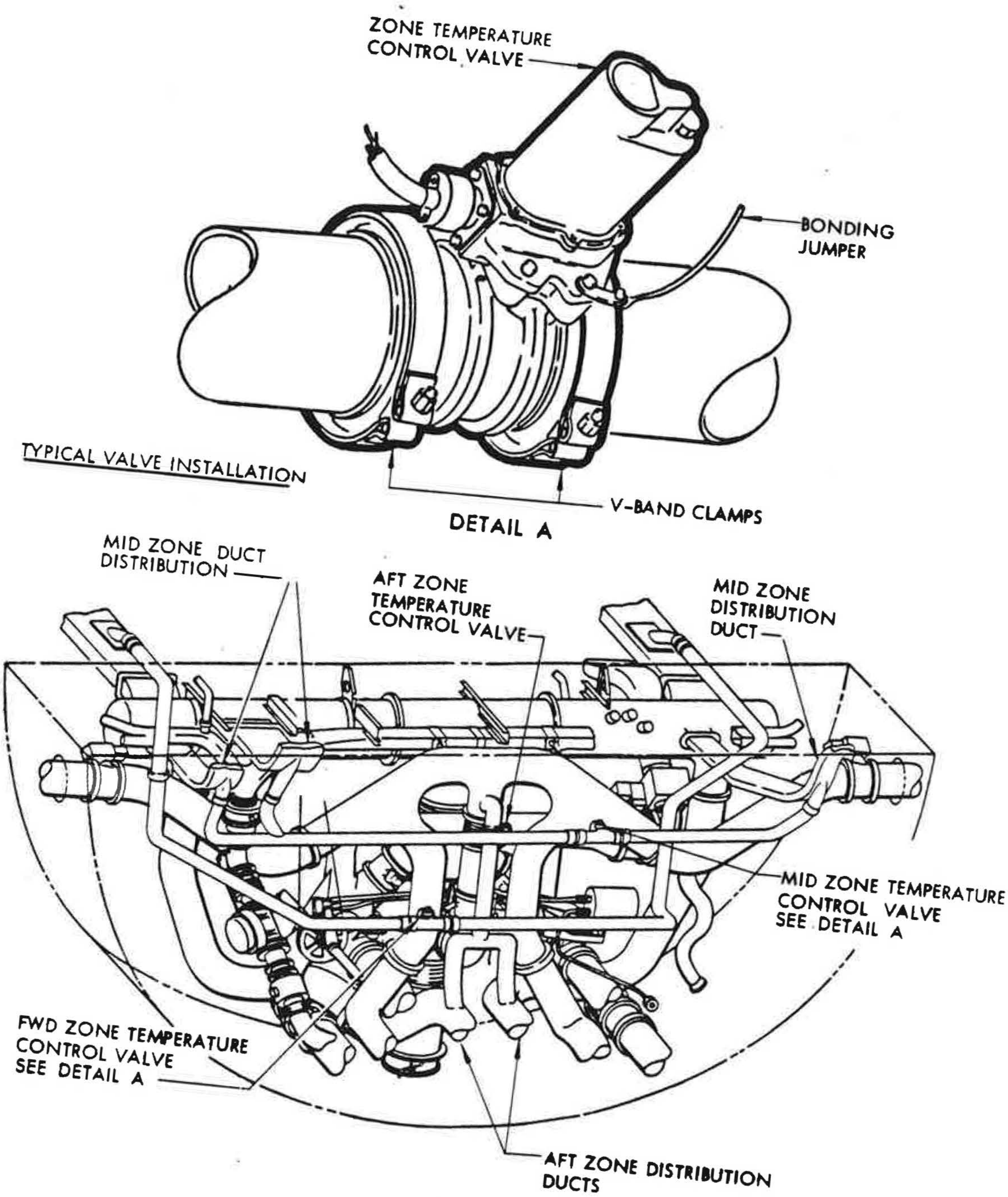
(3) Position valve in ducting with arrow pointing downstream and motor facing outboard and install V-band clamps. Torque clamp bolts at 35 to 45 inch-pounds.

(4) Install bonding cable.

(5) Connect electrical connector.

(6) Perform operational test of zone temperature control system.

(7) Install aft bulkhead of forward cargo compartment.



Zone Temperature Control Valve Installation
Figure 401