

CHAPTER 21 — AIR DISTRIBUTION (VENTILATION)

CONTENTS — MAINTENANCE PROCEDURES

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CONSUMABLE MATERIAL LIST

The following consumable materials are required to perform the maintenance procedures within this chapter.

ITEM NO.	NOMENCLATURE	CAGE/FSCM/ SOURCE
C-300	Adhesive, 299-947-152, Type I, Class I (Dapcotac 3300)	97499
C-306	Toluene, TT-T-548	Commercial
C-314	Adhesive, 299-947-152, Type III or RTV 20-046 or 94-002	97499 01139
C-347	Xylene TT-X-916, Grade A	Commercial
C-403	Glass Cloth, Scotchbrand 361, Flame Resistant	76381
C-404	Glass Cloth, 0.010 inch thick, MIL-C-9084	Commercial
C-405	Lockwire, MS20995C32 (0.032 Inch Dia.)	Commercial
C-439	Aluminum Foil Tape, No. 425	26066

AIR DISTRIBUTION (VENTILATION)

21-1. AIR DISTRIBUTION (VENTILATION).

The cabin air distribution system includes two subsystems which provide optional use of heated or ventilation air from separate sources directed through the same ducting. Functional separation of the systems is obtained by flow actuated Y-valves located under the windshield defrost-defog nozzles. Refer to figure 21-1 for air distribution system schematic.

Heated air for cabin heating and defrosting windshields is provided by bleed air from power section compressors. The system pumps air through ducting to outlets at both door posts, either side of center pedestal, each side of instrument panel, lower forward window nozzles, and left and right windshield defrosting nozzles. Heating is controlled by switches on overhead console, a temperature selecting dial on right side door post, and heater defrost control lever on right side of center pedestal.

Ventilating-defogging system uses ram air as source from intake grilles on cabin nose, with optional use of blowers for windshield nozzle and outlets ahead of crew stations. Air intake is controlled by actuating a cable knob. Blowers are controlled by an overhead panel switch.

The temperature selecting dial, through an electrical positioning motor, controls a remote sensor which is mounted on plenum chamber in compartment on right side below engine deck. This sensor, using a bi-metallic element, senses temperature in heater duct and controls mixing valve through a small tube which operates a bleed port valve.

When heater-defrost lever, on front right pedestal, is moved forward to ON, a valve in base of pedestal is closed by linkage to shut off heated air flow to the four valves in pedestal base. Simultaneously, lever linkage activates a micro-switch in base and closes two valves on single shaft in air distribution outlet control valve and shuts off heated air flow to passenger compartment valves. When lever is moved aft to OFF, the reverse actions occur to open the valves.

Engine compressor air flow noise is muffled by a noise suppressor in rear of fuselage forward of the mixing valve. Heated air exits from the noise suppressor into a plenum chamber aft of the cabin area. A temperature limit switch in aft cabin prevents overheating. If temperature in plenum exceeds 220°F (104.4°C), the limit switch activates MASTER CAUTION light and HEATER AIR LINE segment in caution panel. Cycling continues until heater is turned off or problem is corrected.

21-2. TROUBLESHOOTING.

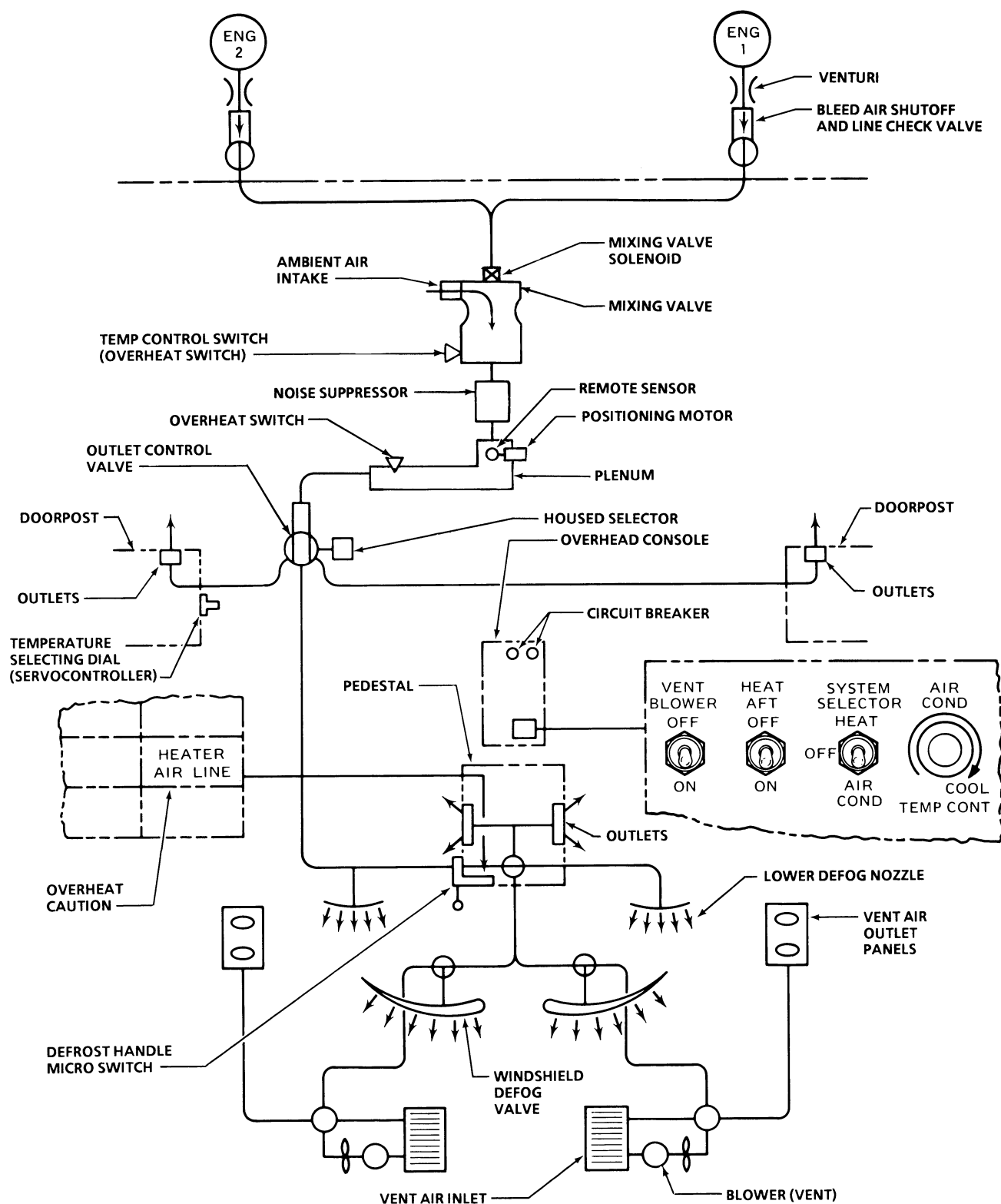
Troubleshoot bleed air heating system in accordance with table 21-1.

Table 21-1. Troubleshooting

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
No bleed flow to mixing valve.	Ruptured bleed air line.	Repair damaged line.
	No voltage to bleed air valve.	Refer to Chapter 96.
	Bleed air valve stuck.	Replace valve.
No bleed air flow through mixing valve.	No voltage to mixing valve.	Refer to Chapter 96.
	Inadequate air pressure.	Repair leakage in line from mixing valve to sensor.
	Inoperative mixing valve.	If bleed air and voltage exists, replace mixing valve.
Temperature of heated ventilation air will not modulate.	Faulty selector dial cable assembly.	Replace and cable assembly.
	Faulty temperature sensor.	Replace sensor unit.
Ventilation air all hot.	Plugged sensor line from mixing valve to sensor.	Clear line.
	Faulty temperature sensor.	Replace sensor unit.
Ventilation air all cool.	Faulty temperature selector dial cable.	Replace cable assembly.
	Faulty temperature sensor.	Replace sensor unit. Check for leaking sensor line and repair.
No air out of door post outlets.	No voltage to door post outlet valve.	Repair wiring (Chapter 96).

Table 21-1. (Cont)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
	Inoperative limit switch on console.	Refer to Chapter 96.
Unable to shut off air to door post outlets.	No voltage to door post outlet valve.	Refer to Chapter 96.
HEATER AIR LINES caution segment illuminates - HEATER switch ON or OFF.	Defective overheat switch or wiring.	Replace switch or repair wiring (Chapter 96).
HEATER AIR LINES caution segment illuminates when HEATER switch is ON. Heater system operating normally.	Defective overheat switch or wiring.	Replace switch or repair wiring (Chapter 96).



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Figure 21-1. Air distribution system schematic (typical)

BLEED AIR HEATING SYSTEM COMPONENTS

21-3. BLEED AIR HEATING SYSTEM COMPONENTS.

The following paragraphs provide maintenance information for various miscellaneous components. These procedures are typical for all serial number helicopters. Minor differences may exist due to helicopter configuration and various kits which may be installed.

21-4. BLEED AIR SHUTOFF VALVE.

NOTE

Refer to figure 21-2 for S/N 30504 through 30553 and figure 21-3 for S/N 30554 and sub.

Two bleed air shutoff valves are installed on engine deck to control air flow to cabin heating system. Valves are opened by 28 Vdc to actuate a solenoid and are closed by air pressure.

NOTE

Maintenance procedures for both bleed air shutoff valves are the same. The following procedures are for valve (3, figure 21-3).

21-5. Removal.

1. Disconnect Y-tube assembly (1, figure 21-2 or figure 21-3) from shutoff valve (3) through large access under engine deck at underside of fuselage.
2. Remove B nut below engine deck and on engine deck remove electrical connector and bleed air line from engine compressor.
3. Remove valve from airframe.

21-6. Installation.

MATERIALS REQUIRED

NUMBER	NOMENCLATURE
C-314	Adhesive

1. Position valve in place on engine deck and install B nut under deck. Torque 40 to 58 ft.lbs. (54.23 to 78.63 Nm).
2. Connect Y-tube assembly, electrical connector and bleed air line from engine compressor.
3. Use adhesive (C-314) or equivalent, to install shroud over connections.

21-7. VARIABLE CONTROL MIXING VALVE.

The mixing valve (5, figure 21-2 and 21-3) is installed on the right side below the engine deck. This valve controls bleed air and ambient air flow as directed by the remote sensor (18). A bleed air nozzle inside the mixing valve acts as a jet pump through a venturi to draw in ambient air and control the mixed air flow. When heated air is not at the selected temperature, the remote sensor causes the variable control mixing valve to increase or decrease engine bleed air flow and to regulate ambient air flow as required to correct the temperature variation. A temperature limit switch (6) is located on mixing valve to protect the structure from damage if a distribution system duct ruptures. This switch is set at 220°F (104°C). If this temperature is exceeded, the CABIN HTR circuit breaker will open.

21-8. Removal.

1. Open access door at rear of fuselage under engine compartment to gain access to heater compartment.

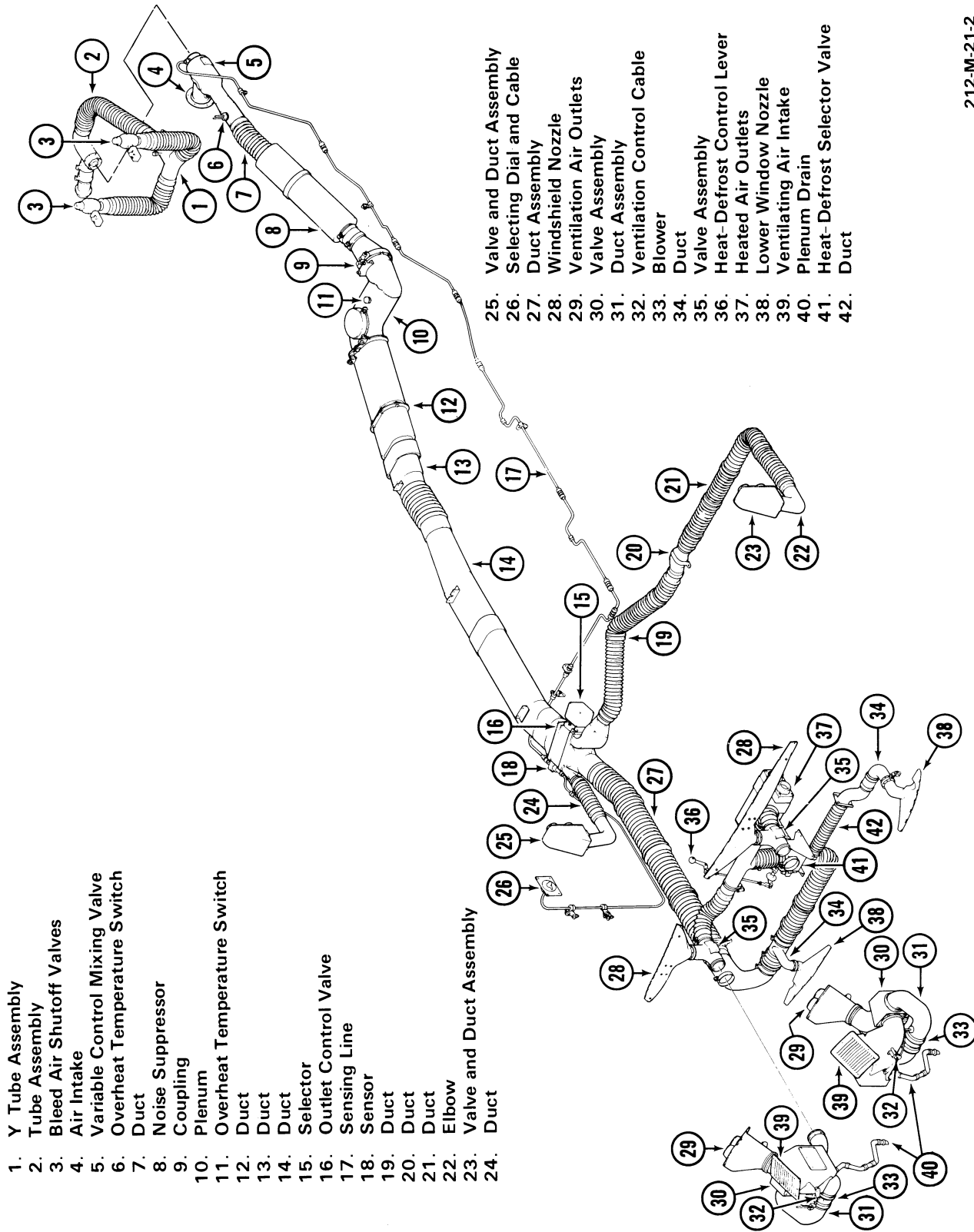


Figure 21-2. Bleed air heating system (S/N 30504 through 30553)

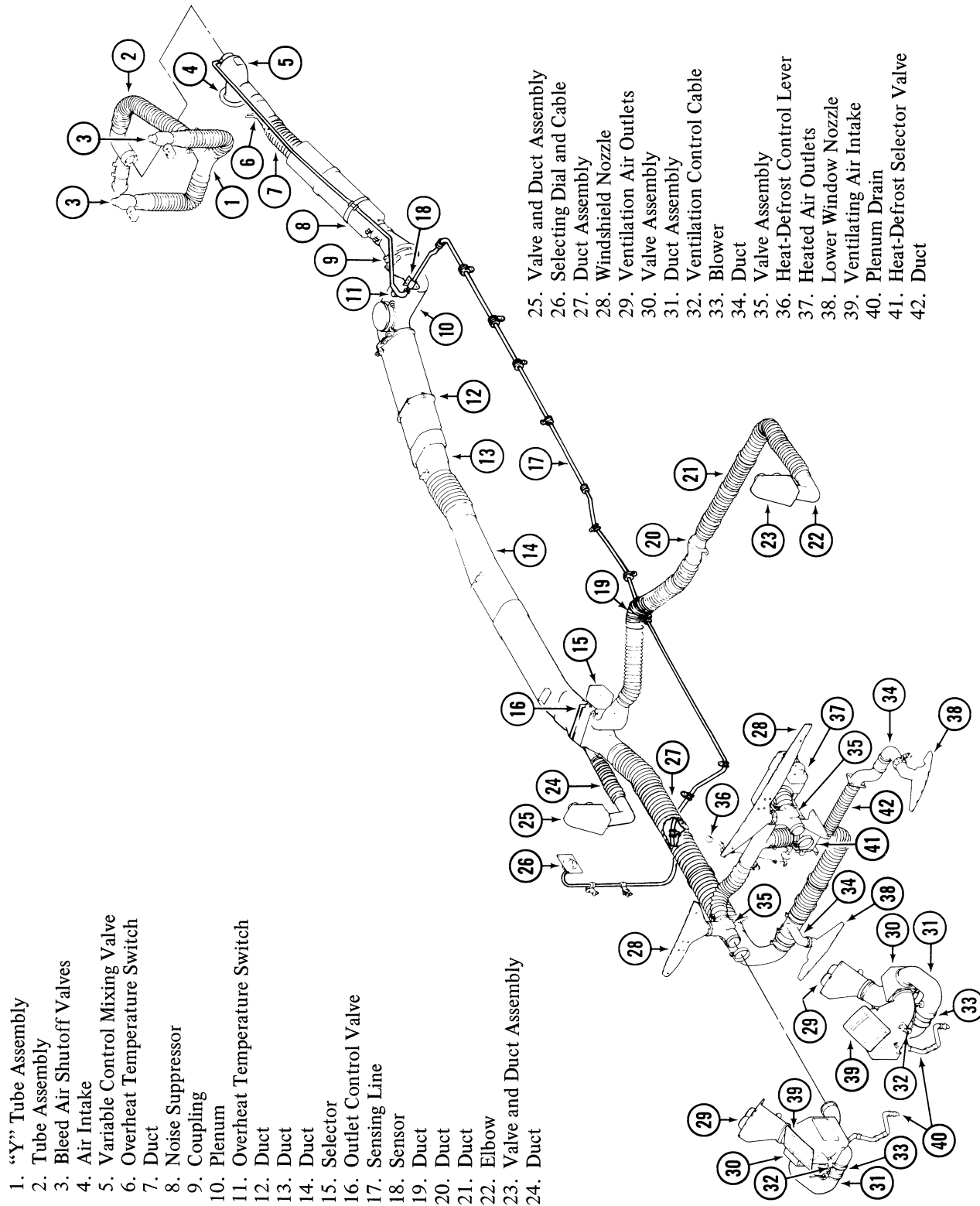


Figure 21-3. Bleed air heating system (S/N 30554 and sub.)

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2. Remove two sensing lines, on-off valve wiring and overheat temperature switch (6, figure 21-2 or figure 21-3) wiring.

3. Disconnect tube, remove clamp, large B nut and attaching hardware and remove valve (5).

21-9. Installation.

1. Position valve (5, figure 21-2 or figure 21-3) in heater system and secure in place with clamp and large B nut. Torque nut 40 to 58 ft.lbs. (54.23 to 78.63 Nm).

2. Connect two sensing lines, tube, overheat temperature switch wiring and on-off wiring.

21-10. REMOTE SENSOR.

The remote sensor (18, figure 21-2 or 21-3) is installed on top of plenum chamber. The sensor controls the mixing valve through a bleed air port.

21-11. Removal.

1. Remove access plate on side of fuselage below cabin door edge.

2. Disconnect sensing line (17, figure 21-2 or figure 21-3) and selecting dial cable (26) from sensor (18).

3. Remove screws attaching sensor to outlet control valve (16). Remove sensor.

21-12. Installation.

MATERIALS REQUIRED

NUMBER	NOMENCLATURE
C-405	Lockwire

1. Position sensor in place on side of control valve and secure with attaching screw. Secure screws with lockwire (C-405).

2. Connect pressure sensing line and selecting dial cable.

3. Phase controller sensor and motor (Chapter 96).

21-13. SELECTOR.

21-14. Removal.

1. Remove access plate on underside of fuselage to right of center line and under the outlet control valve (16, figure 21-2 or figure 21-3).

2. Disconnect electrical cable and remove four mount screws on selector (15).

3. Remove selector and small shaft adapter.

21-15. Installation and rigging.

NOTE

This rigging procedure is to be used when replacing selector (15, figure 21-2) or outlet control valve.

1. Set AFT outlet switch located on the overhead panel to ON.

2. Connect selector (4, figure 21-4) to wire harness and allow selector to rotate to open position.

3. Remove sensor (16, figure 21-2), or cover (3, figure 21-4), as applicable.

NOTE

The position of flapper (1, figure 21-4) may be checked by looking through opening under cover (3) with a inspection mirror.

4. Rotate flapper (1) to horizontal (open) position.

5. Install adapter (5) on shaft (2), position as shown on view B-B, and install selector (4) on outlet control valve.

6. Turn AFT outlet switch to OFF and observe shaft (2) rotates to closed position.

7. Turn AFT outlet switch to ON and check flapper (1) returns to horizontal (open) position.

8. Install four mount screws securing selector to control valve.

9. Perform operational check to ensure proper operation of cabin heater valve.

21-16. OUTLET CONTROL VALVE.

21-17. Removal.

1. Remove cabin deck plate adjacent to right doorpost.

2. Remove selector (15, figure 21-2 or figure 21-3), sensor (18), and connecting ducts from valve.

3. Remove valve mounting hardware and remove valve.

21-18. Installation.

1. Position valve on mounting brackets in airframe and secure in place with attaching hardware.

2. Install selector and sensor. Connect ducts to valve.

3. Check for proper operation and install deck plate.

21-19. HEAT/VENT AIR DUCTS.

The air ducts carry and selected temperature air to areas within cabin as directed by crew. The flexible air ducts are made from silicone impregnated fiberglass cloth. The rigid ducts are made from polycarbonate material. These are secured in airframe by clamps, brackets, and couplings.

21-20. Removal.

1. Remove applicable deck plates and access doors to provide access to component to be removed.

2. Remove necessary clamps, couplings, and/or tape wrapping securing component to airframe and connecting parts.

3. Remove component through access opening.

4. Cover opening to prevent entry of foreign material.

21-21. Repair.

MATERIALS REQUIRED

NUMBER	NOMENCLATURE
C-306	Toluene
C-314	Adhesive
C-347	Xylene
C-404	Glass Cloth

1. Repair damage which does not penetrate flexible air ducts as follows:

a. Repair scuffs and abrasions which do not penetrate through cloth and are not more than 3.0 in. (76.2 mm) long by 1.5 in. (38.1 mm) wide. A maximum of two repairs per 12.0 in. (20.5 cm), covering up to 10% of surface area are acceptable.

b. Clean damaged area using toluene (C-306) or xylene (C-347). Allow area to air dry for at least 30 minutes.

c. Apply brush coat of adhesive (C-314) over damaged area with a minimum of 0.50 in. (12.7 mm) overlap beyond damage.

d. Smooth adhesive and cure by air drying for a minimum of two hours at room temperature or until dry to the touch.

2. Repair damage which penetrates duct as follows:

NOTE

Repairs covering up to 10% of the surface area of the duct are acceptable.

a. Clean circumference of duct damaged area with toluene (C-306) or xylene (C-347). Allow area to air dry for at least 30 minutes.

b. Cut one piece of glass cloth (C-404) to cover duct circumference with at least 1.0 in. (25.4 mm) overlap of damaged area.

c. Apply one thin smooth brush coat of adhesive (C-314) around duct circumference in area to be covered by cloth.

d. Wrap cloth around duct and smooth out. Allow area to air dry at least two hours or until dry to the touch before using or handling the duct.

21-22. Installation.**MATERIALS REQUIRED**

NUMBER	NOMENCLATURE
C-300	Adhesive
C-403	Glass Cloth

MATERIALS REQUIRED (CONT)

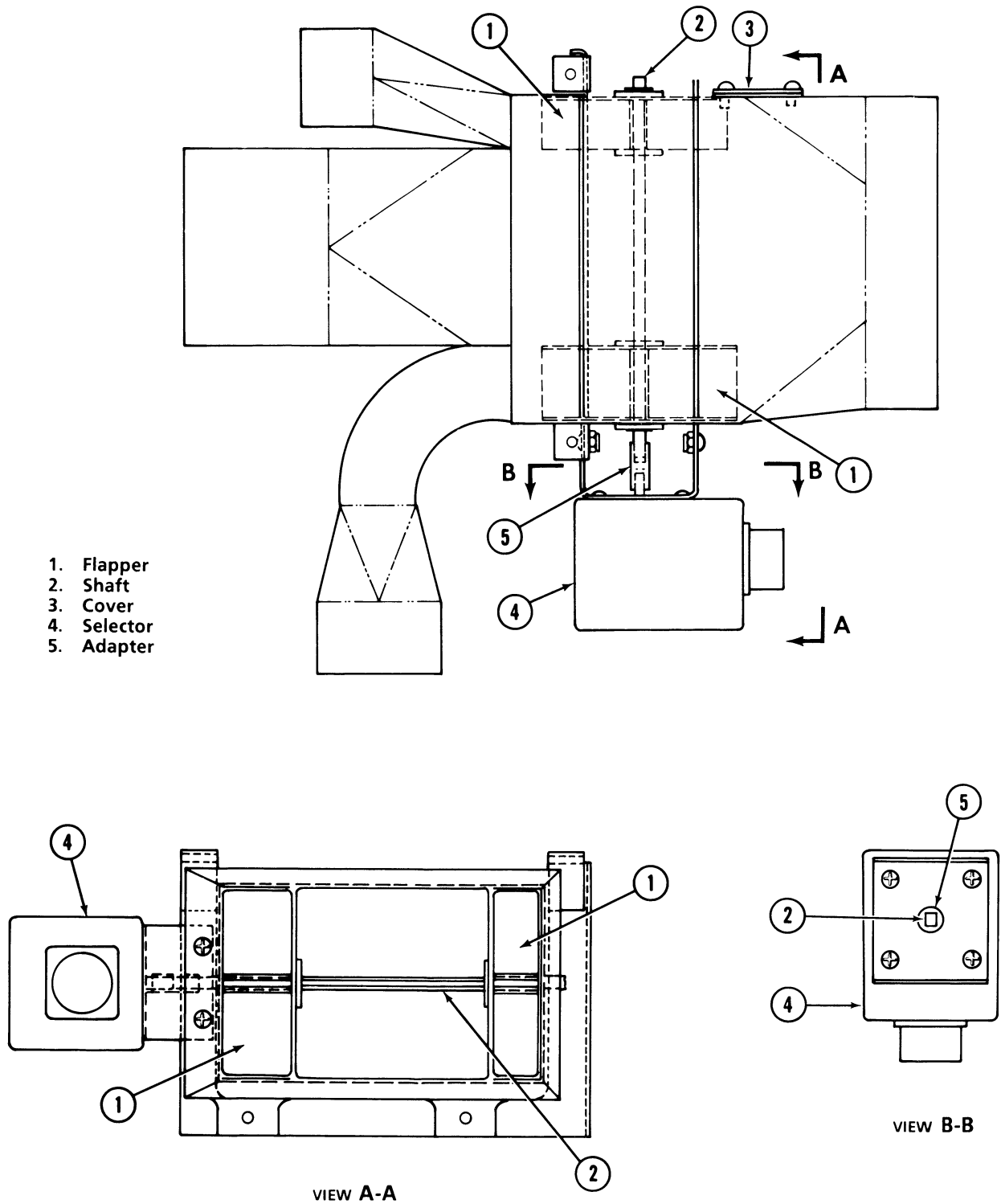
NUMBER	NOMENCLATURE
C-439	Tape

1. Position component in place within the system.

2. Install applicable clamps and couplings.

3. At connecting ends of ducts (13 and 14, figure 21-2) apply adhesive (C-300) to soft ends and apply three complete wraps of glass cloth (C-403), two inches wide. Do not stretch last wrap.

4. Wrap insulation on duct (12) with two turns of tape (C-439). Tape edges of tape applied at preceding step together and tape end of the tape to duct.



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Figure 21-4. Outlet control valve

VENTILATION/DEFOG SYSTEM

21-23. VENTILATION/DEFOG SYSTEM.

Ventilation/defog system delivers outside air to windshield nozzles and nozzles on sides of instrument panel. Ram air intake grills are located on cabin nose below each windshield. Each grill is connected to a plenum chamber and ducts connect chambers to output nozzles. Air intake volume is controlled by knobs near instrument panel nozzles. When ram air is low, outside air may be pulled in by turning on the blower which is part of the system.

21-24. VENTILATION BLOWER.

21-25. Removal.

1. Remove clamps on flexible ducts at each end of blower (33, figure 21-2) and slide ducts back clear of blower.

2. Disconnect electrical wire to blower and remove unit.

21-26. Installation.

1. Position blower in system and slide flexible duct over ends of blower.
2. Install clamps and connect electrical wire to blower.
3. Perform operational check (Chapter 96).

