

CHAPTER 21  
ENVIRONMENT CONTROL

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## CHAPTER 21

## ENVIRONMENT CONTROL

21-00 Description

Fresh air vents are located in each door and in the nose. Door vents are opened and closed using the knob near the vent door hinge. A rotating knob is provided to seal and lock vents closed. For maximum ventilation, open door vents wide during hover but only one inch or less during cruise. The rotating knob can be used to hold vents partially open.

See Chapter 52 for door vent maintenance instructions.

The fresh air inlet in the nose is opened by pulling the vent handle on the console face. Rotating the vent handle clockwise will lock its position. Air from the nose inlet is directed along the inside surface of the windshield for defogging as well as for ventilation.

The optional cabin air conditioning system, shown schematically in Figure 21-2, is similar to conventional automotive and light aircraft systems. The system consists of a compressor mounted immediately aft of the main gearbox, a condenser mounted to the vertical firewall in the engine compartment, an evaporator mounted to the front of the center seat support, a blower, an overhead outlet duct, and interconnecting lines and hoses. The system uses R134a refrigerant.

The compressor is belt-driven, by a pulley mounted to the main gearbox tail rotor drive yoke assembly, and is equipped with an electromagnetic clutch. When the system is off, the compressor clutch is disengaged, allowing the compressor pulley to freewheel.

Cooling air for the condenser is supplied via an opening in the belly. The engine cowling air scoop collects the necessary cooling air for the condenser during forward flight. In a hover, electric fans help to draw cooling air through the condenser.

The evaporator blower draws warm cabin air through the evaporator inlet grill and evaporator, where the air is cooled. Cool air is drawn through the blower and blown through ducts under the center seat, up the cabin aft wall, and to the overhead duct.

The system is controlled by a toggle switch on the overhead duct which allows selection of off, low, and high fan settings. The compressor requires main rotor gearbox oil pressure to engage. The compressor is automatically engaged by switching the fan on. A temperature (freeze) switch disengages the compressor when evaporator temperature drops below freezing. Safety (pressure) switches disengage the compressor if excessive refrigerant leakage occurs or if refrigerant pressure is excessive. When the collective is lowered to the full-down position another switch disengages the compressor for 10 seconds to ensure that aircraft performance is not affected. All circuits are protected by the 25 amp A/C circuit breaker; the evaporator blower, the condenser fans, and the compressor clutch circuits are further protected by fuses.

Bleed air from the engine compressor is used for cabin heat. Tubing routes hot air from the engine to outlets forward of the tail rotor pedals and in the rear footwells. A heater control knob located to the left of the cyclic stick actuates a valve in the aft end of the control tunnel through a push-pull cable to control cabin heat. Because the cabin heat uses engine compressor air, some performance degradation occurs with heat ON.

**CAUTION**

In case of engine fire, cabin heat should be turned off.

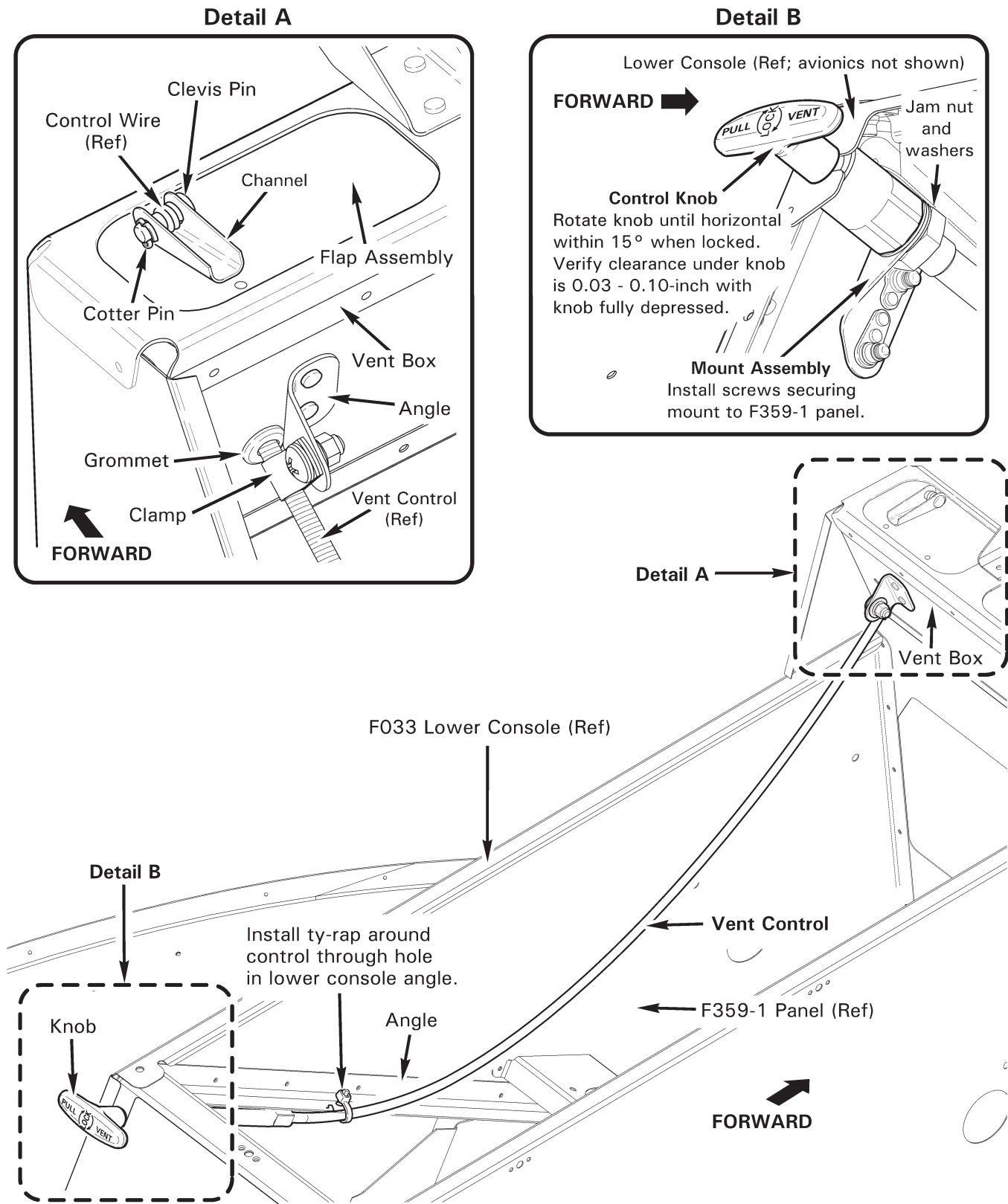


FIGURE 21-1 NOSE VENT

## 21-10 Ventilation

### 21-11 Nose Vent

Refer to R66 Illustrated Parts Catalog (IPC) Figures 21-1.

#### **A. Removal**

1. Remove hardware securing avionics face to F033-1 lower console and remove face. Unscrew and remove radios. Remove hardware securing radio trays to lower console and remove trays. Disconnect OAT wiring.
2. Refer to Figure 21-1. Remove screws attaching upper console to lower console and hinge console aft. Protect instrument face with foam support or equivalent.
3. Remove and discard cotter pin securing clevis pin and C522-5 (air vent) control inner wire to C062-1 vent box assembly channel. Remove and retain clevis pin.
4. Remove hardware securing AN742-3 clamp and control housing to vent box angle.
5. Cut and discard ty-rap securing control housing to lower console angle.
6. Remove screws securing C365-13 mount assembly to lower console and remove control. As required, remove MS35489-4 grommet and clamp; remove jam nut & lockwashers securing mount assembly to control housing, and remove mount assembly.

#### **B. Installation**

1. Refer to Figure 21-1. As required, install C365-12 mount assembly, lockwashers, and jam nut on C522-5 (air vent) control housing, but do not tighten jam nut. Install AN742-3 clamp and (new, as required) MS35489-4 grommet on control housing.
2. Position control in lower console and install screws securing mount assembly to lower console. Verify security.
3. Rotate control knob until horizontal within 15° when locked; tighten jam nut against mount assembly. Verify security.
4. Route control inner wire through C062-1 vent box assembly channel. Adjust grommet position as required, and install clevis pin through channel and control inner wire. Install cotter pin. Verify security.
5. Install clamp and hardware securing clamp and control housing to vent box angle.
6. Install ty-rap around control housing through hole in lower console angle. Cinch ty-rap until snug without over-tightening, and trim tip flush with head.
7. Actuate vent and adjust clamp position as required for proper vent operation. Verify control housing does not slip through clamp when opening and closing vent. Verify clearance under knob is 0.03-0.10 inch with knob fully depressed.
8. Close and secure upper console. Connect OAT wiring. Install radio trays and hardware securing trays to lower console. Verify security. Install and secure radios. Install avionics face and hardware securing face to lower console.

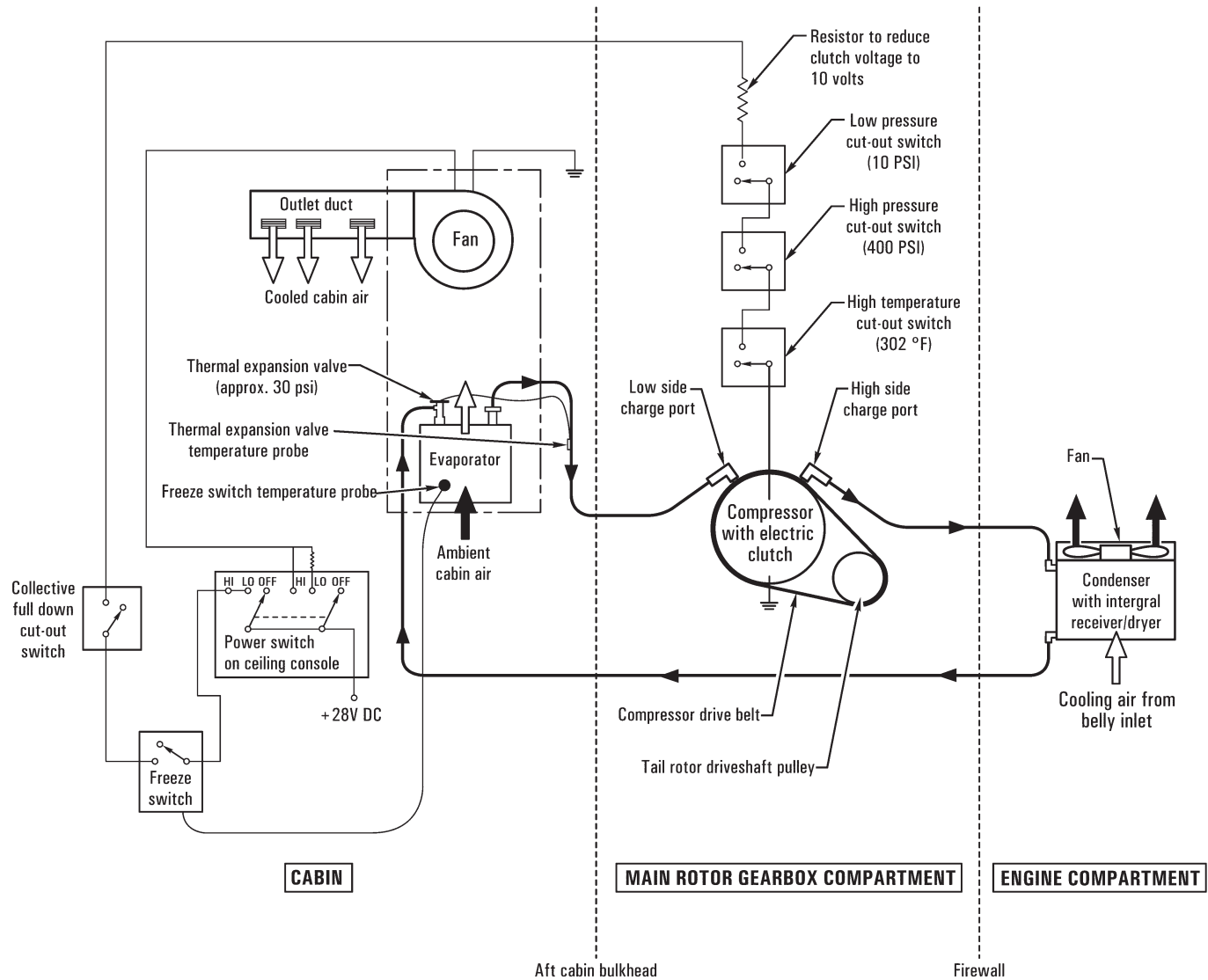


FIGURE 21-2 AIR CONDITIONING SCHEMATIC

## 21-20 Air Conditioning

### 21-21 Compressor Assembly

Refer to R66 Illustrated Parts Catalog (IPC) Figure 21-3.

#### **A. Belt Replacement**

1. Remove tailcone cowling per § 53-23.
2. Remove hardware securing F196-1 tail rotor drive fan shaft to C947-3 plate assemblies, noting hardware removed.
3. Loosen hardware securing G777-1 compressor assembly to G781-1 arm weldment.

#### **CAUTION**

Do not use refrigerant hose assemblies or fittings to rotate compressor. Do not rotate compressor further than necessary, to avoid damaging system wiring and refrigerant hoses or fittings.

4. Rotate compressor down and inboard as required to disengage B173-5 v-belt from pulleys. Route belt around drive shaft flange and remove belt.
5. Route new B173-5 v-belt around drive shaft flange and fit belt onto G779-1 pulley and compressor pulley.
6. Rotate compressor up and outboard to tension belt, then tighten hardware securing compressor to weldment. Adjust belt until 4.5-5.5 lb of force applied mid-span deflects belt 0.16-inch. Standard torque bolts per § 20-32 and torque stripe per Figure 5-1.
7. Install hardware securing drive shaft to plate assemblies, as removed. Standard torque bolts per § 20-32 and torque stripe per Figure 5-1.
8. Install tailcone cowling per § 53-23.

21-21 Compressor Assembly (continued)**B. Removal**

1. Remove tailcone cowling per § 53-23.
2. Turn BATTERY switch OFF. Cut and discard ty-raps as required and disconnect compressor assembly wiring from airframe harness at connectors.
3. Recover refrigerant per § 12-81. Remove hardware securing refrigerant hose assemblies to G777-1 compressor assembly. Cap fittings.
4. Remove hardware securing compressor to G781-1 arm weldment and G782-1 mount weldment and remove compressor.

**C. Installation**

1. Remove G777-1 compressor assembly service port caps and completely drain oil. Using a syringe, service compressor with  $120 \pm 10$  cc A257-20 pag oil into the high pressure port. Install service port caps; verify security.
2. Refer to § 5-45. Inspect B173-5 v-belt condition and replace as required. Fit belt around G779-1 pulley and compressor pulley, and install hardware securing compressor to G782-1 mount weldment. Standard torque bolts per § 20-32.
3. Install hardware securing compressor to G781-1 arm weldment. Rotate compressor up and outboard to tension belt, then tighten hardware securing compressor to weldment. Adjust belt until 4.5-5.5 lb of force applied mid-span deflects belt 0.16-inch. Standard torque bolts per § 20-32, and torque stripe all compressor mounting hardware per Figure 5-1.
4. Remove caps and install refrigerant hose assemblies and hardware securing hoses to compressor. Special torque screws per § 20-33 and torque stripe per Figure 5-1.
5. Connect compressor assembly wiring to airframe harness at connectors and install ty-raps as required. Cinch ty-raps until snug without over-tightening, and trim tips flush with heads.
6. Perform leak detection per § 12-83.
7. Charge system with refrigerant per § 12-82.
8. Install tailcone cowling per § 53-23.



## 21-22 Condenser and Fan Assemblies

Refer to R66 Illustrated Parts Catalog (IPC) Figure 21-7.

### **A. Removal**

1. Recover refrigerant per Section 12-82.
2. Remove engine cowling per Section 53-21.
3. Turn BATTERY switch OFF. Cut and discard ty-raps as required and disconnect G780-1 fan assembly wiring from airframe harness at connectors.
4. Remove hardware securing G786-1 box assembly to G783-1 condenser.
5. Using backup wrench, disconnect G810-1 and G811-1 line assembly b-nuts from condenser fittings.
6. Supporting condenser, remove hardware securing condenser to G787 support assemblies. Taking care not to damage line assemblies and condenser fittings, carefully remove condenser. Cap fittings.

### **B. Installation**

1. Remove caps. Install hardware securing G783-1 condenser to G787 support assemblies. Verify security.
2. Connect G810-1 and G811-1 line assembly b-nuts to condenser fittings. Using backup wrench, special torque b-nuts per Section 20-33, and torque stripe per Figure 5-1.
3. Install hardware securing G786-1 box assembly to condenser. Verify security.
4. Connect G780-1 fan assembly wiring to airframe harness at connectors and install ty-raps as required. Cinch ty-raps until snug without over-tightening, and trim tips flush with heads.
5. Perform leak detection per Section 12-83.
6. Charge system with refrigerant per Section 12-82.
7. Install engine cowling per Section 53-21.

### 21-23 Evaporator Assembly

Refer to R66 Illustrated Parts Catalog (IPC) Figure 21-11.

#### **A. Removal**

1. Recover refrigerant per Section 12-82.
2. Refer to Section 6-70. Detach F931-1 seat assembly (secured via hook and loop tape) from F474-1 cover assembly and remove seat. Remove hardware securing cover assembly and F380-8 angle to F377-1 middle seat assembly; remove cover and angle.
3. Cut and discard ty-raps as required and disconnect D799-7 (freeze) switch assembly wiring from airframe harness at connector.
4. Remove screws securing G798-1 cover assembly to seat assembly. Remove hardware securing G784-1 evaporator assembly and switch to seat assembly.
5. Using backup wrench, disconnect D795-8 line assembly and evaporator line b-nuts from G794 hose assemblies.
6. Remove aluminum tape securing F380-7 cover to middle seat (if installed). Detach grommet from seat assembly and carefully remove evaporator and attached components forward through seat assembly vertical wall relief. Cap fittings.

#### **B. Installation**

1. Remove caps. Position G784-1 evaporator assembly and associated components in F377-1 middle seat assembly. Install screws securing evaporator and D799-7 (freeze) switch assembly to seat assembly. Install screws securing G798-1 cover assembly to seat assembly.
2. Connect D795-8 line assembly and evaporator line b-nuts to G794 hose assemblies. Using backup wrench, special torque hose b-nuts per Section 20-33, and torque stripe per Figure 5-1.
3. Connect freeze switch wiring to airframe harness at connector and install ty-raps as required. Cinch ty-raps until snug without over-tightening, and trim tips flush with heads.
4. Perform leak detection per Section 12-83.
5. Charge system with refrigerant per Section 12-82.
6. Install screws securing F474-1 cover assembly and F380-8 angle to middle seat. Attach F931-1 seat assembly (secured via hook and loop tape) to cover.

## 21-24 Troubleshooting

### 1. If air exiting overhead duct is not cold:

POSSIBLE CAUSE	TROUBLESHOOT/CORRECTIVE ACTION
Low Refrigerant Charge/ Refrigerant Leak	Recover refrigerant per § 12-82. System should operate normally on approximately 2.5 lb refrigerant.  If less than 2.5 refrigerant is recovered, perform leak detection per § 12-83, repair leaks if any, and charge system with refrigerant per § 12-82.
Switch or Wiring Problem Interrupting Compressor Power	With aircraft not running, temporarily connect a jumper from ground to wire 1898 at main gearbox oil pressure switch. Raise collective to full-up position. Turn on Master switch and A/C switch on overhead duct (low or high setting ok). Have observer listen to and observe compressor clutch through cowl door. Clutch should engage (click and snap against pulley) whenever A/C is switched on. Remove temporary jumper.  Check wiring at freeze switch (refer to § 21-23), high and low pressure switches (near compressor assembly), and full-down collective switch. Repair any damaged wiring or connectors. Check continuity through each switch. All switches should be closed with a properly charged system and aircraft at rest on ground. Replace any defective switch.
Failed Compressor V-Belt	Inspect belt.  Replace belt per § 21-21 as required.
Insufficient Condenser Airflow	Inspect condenser installation. Verify no blockage and all seals in place.  Remove blockage and/or repair seals to ensure airflow through core.
Extreme Environmental Conditions	Extreme temperature and humidity may result in cooling effect less than a typical automobile.  No corrective action available.

### 2. If excessive condensation is found near evaporator assembly:

POSSIBLE CAUSE	TROUBLESHOOT/CORRECTIVE ACTION
Blocked or Kinked Evaporator Drain	Verify system is draining normally. After several minutes ground run in humid conditions with A/C on, water should be seen draining from the drain tube.  If water drainage is not observed, inspect drain line (refer to § 5-45). Correct any damaged or kinked lines. Clean sediment trap as required. Verify proper function of check ball.
Extreme Humidity	Some condensation is unavoidable in extreme humidity.  Ensure all fresh air vents closed. Limit opening and closing cabin doors as much as practical to limit humidity entering cabin.

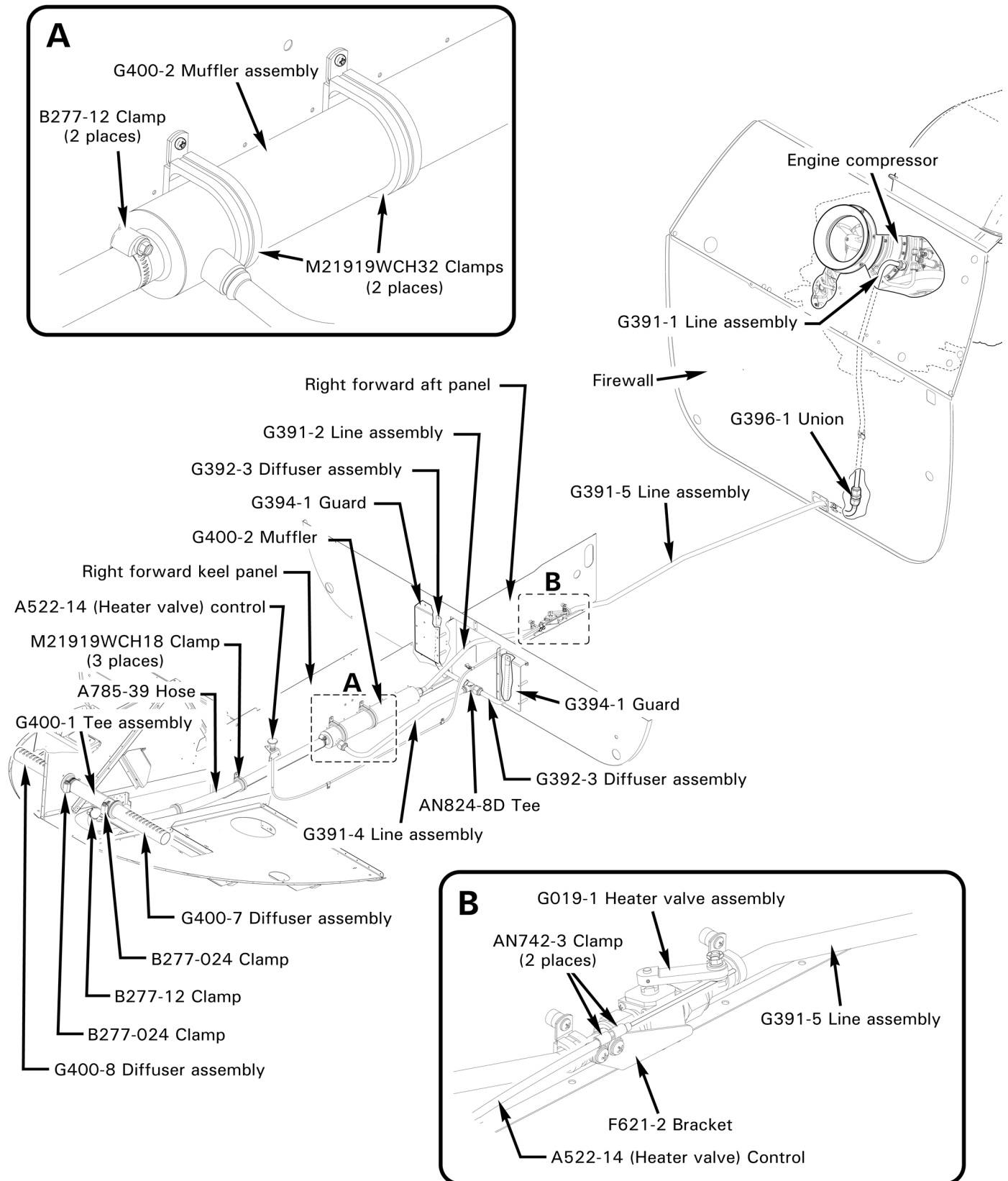


FIGURE 21-3 CABIN HEAT

## 21-30 Cabin Heat

### 21-31 Valve Assembly and Control Rigging

Refer to R66 Illustrated Parts Catalog (IPC) Figures 21-31 and 21-35.

#### **A. Removal**

1. Refer to Section 6-70. Remove hardware securing F794-1 and F794-2 (belly cover) panels and remove panels. Remove engine cowling per Section 53-21.
2. Refer to Figure 21-3. Remove hardware securing A522-14 (heater valve) control inner wire to G019-1 (heater) valve assembly arm.
3. Remove hardware securing AN742-3 clamps and control housing to F621-2 bracket.
4. Hinge aft right seat forward. Remove clamps, spacers, and hardware securing G391-2 and G391-5 line assemblies to aft right keel panel. Hinge seat back.
5. Loosen line assembly B-nuts from G400-2 muffler assembly & G396-1 union; disconnect lines from valve assembly fittings and remove valve. Plug lines & cap fittings.

#### **B. Installation**

1. Refer to Figure 21-3. Remove caps and plugs, install G019-1 (heater) valve assembly and connect G391-2 and G391-5 line assembly B-nuts to valve assembly fittings. Hand-tighten B-nuts at valve assembly, G400-2 muffler assembly, and G396-1 union, but do not torque.
2. Hinge aft right seat forward. Install clamps, spacers, and hardware securing line assemblies to aft right keel panel. Verify security. Hinge seat back.
3. Position valve assembly so F621-2 bracket is vertical within 5°; special torque line assembly B-nuts at valve assembly, muffler assembly, and union, and torque stripe per Figure 5-1.
4. Perform control rigging per Part C, steps 3 thru 6.
5. Install engine cowling per Section 53-21.

#### **C. Control Rigging**

1. Refer to Section 6-70. Remove hardware securing F794-1 and F794-2 (belly cover) panels and remove panels.
2. Refer to Figure 21-3. Remove palnut and loosen nut securing A462-4 fitting and A522-14 (heater valve) control inner wire to G019-1 (heater) valve assembly arm.
3. As required, loosen hardware securing AN742-3 clamps and control housing to F621-2 bracket. Position end of control housing flush-0.25 inch at or beyond edge of aft clamp and install fasteners. Verify security.
4. Refer to detail in Figure 76-3. Push heater valve knob ON then pull up slightly to create 0.03-0.10 inch clearance under knob. Position valve assembly arm in full open detent. Verify sufficient inner wire beyond aft edge of fitting and special torque fitting nut per Section 20-33.
5. Install fitting palnut, standard torque per Section 20-32, and torque stripe per Figure 5-1. Trim control wire 0.10-0.30 inch beyond aft edge of fitting.
6. Install (belly cover) panels, and install hardware. Verify security.

### 21-32 Muffler Assembly

Refer to R66 Illustrated Parts Catalog (IPC) Figure 21-35.

#### **A. Removal**

1. Refer to Section 6-70. Remove hardware securing F794-1 and F794-2 (belly cover) panels and remove panels.
2. Refer to Figure 21-3. Loosen B277-12 clamp and pull A785-39 hose off of G400-2 muffler assembly. Install temporary covers on muffler and hose openings.
3. Loosen G391-4 line assembly B-nut at AN824-8D tee; disconnect G391-2 and -4 line assemblies from muffler.
4. Remove hardware securing MS21919WCH32 clamps and muffler to forward right keel panel and remove muffler. Plug & cap fittings. As required, remove clamps from muffler.

#### **B. Installation**

1. Refer to Figure 21-3. As required, install MS21919WCH32 clamps on G400-2 muffler assembly. Install hardware securing clamps and muffler to forward right keel panel. Verify security.
2. Remove caps and plugs and connect G341-2 and G341-4 line assembly B-nuts to muffler assembly fittings. Special torque B-nuts at AN824-8D tee and muffler assembly, and torque stripe per Figure 5-1.
3. Remove temporary covers and slide B277-12 clamp and A785-39 hose onto muffler assembly and tighten clamp. Verify security.
4. Install (belly cover) panels, and install hardware. Verify security.

### 21-33 Diffuser and Tee Assemblies

Refer to R66 Illustrated Parts Catalog (IPC) Figure 21-33.

#### **A. Forward Diffuser and Tee Assembly Removal**

1. Refer to Figure 21-3. Remove screws attaching upper console to lower console and hinge console aft. Protect instrument face with foam support or equivalent.
2. Loosen two B277-24 clamps securing G400-1 tee assembly collars to G400-7 and G400-8 diffuser assemblies. Slide diffusers outboard from tee and lower console assembly.
3. Loosen B277-12 clamp securing A785-39 hose to tee assembly can weldment and pull hose and clamp off of can.
4. Remove hardware securing MS21919WCH16 clamp and tee assembly to angle and remove tee. As required, remove clamps from tee.

21-33 Diffuser and Tee Assemblies (continued)**B. Forward Diffuser and Tee Assembly Installation**

1. Refer to Figure 21-3. As required, install MS21919WCH16 and (two) B277-24 clamps on G400-1 tee assembly. Install tee with clamps, and install hardware securing MS21919WCH16 clamp and tee to angle.
2. Insert G400-7 and G400-8 diffuser assemblies through lower console and into tee assembly. Orient diffuser holes vertically within 5°, and tighten clamps (against spacers) securing tee assembly collars to diffusers. Verify security.
3. Slide A785-39 hose and B277-12 clamp onto tee assembly can weldment and tighten clamp. Verify security.
4. Close and secure upper console.

**C. Aft Diffuser Assemblies and Tee Removal**

1. Refer to Section 6-70. Remove hardware securing F794-1 (belly cover) forward panel and remove panel.
2. Refer to Figure 21-3. Hinge aft right and left seats forward. Remove hardware securing G394-1 guards and G392-3 diffuser assemblies to aft seat assemblies and remove guards. Hinge seats back.
3. Disconnect diffuser assembly B-nuts from AN824-8D tee and remove diffusers. As required, disconnect G391-4 line assembly B-nut from tee and remove tee. Cap fittings.

**D. Aft Diffuser Assemblies and Tee Installation**

1. Refer to Figure 21-3. As required, remove caps, install AN824-8D tee, and connect G391-4 line assembly B-nut, but do not torque.
2. Remove caps and install G392-3 diffuser assemblies; connect diffuser assembly B-nuts to tee, but do not torque. Hinge aft right and left seats forward and install hardware securing diffusers to aft seat assemblies. Special torque line assembly and diffuser B-nuts per Section 20-33, and torque stripe per Figure 5-1.
3. Install G394-1 guards and hardware securing guards to aft seat assemblies. Verify security. Hinge seats back.
4. Install (belly cover) panel, and install hardware. Verify security.

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