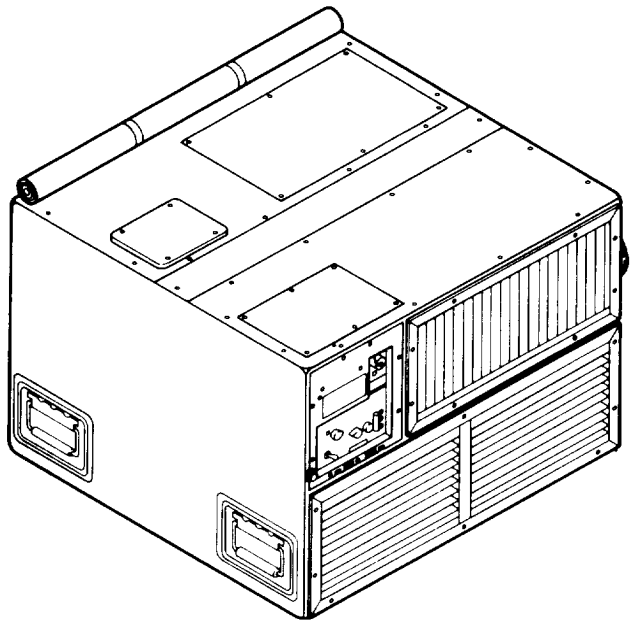
TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT & GENERAL SUPPORT MAINTENANCE MANUAL
AIR CONDITIONER, HORIZONTAL, COMPACT, 18,000 BTU

208 VOLT, 3 PHASE, 50-60 HERTZ
NSN 4120-01-105-5746
MODEL NUMBER MIL-AC-1832



HEADQUARTERS, DEPARTMENT OF THE ARMY
25 NOVEMBER 1982

CHANGE

NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 1 July 1992

Operator's, Organizational, Direct Support and General Support Maintenance Manual

AIR CONDITIONER, HORIZONTAL, COMPACT, 18,000 BTU 208 VOLT, 3 PHASE, 50/60 HERTZ MODEL NUMBER MIL-AC-1832 NSN 4120-01-105-5746

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TM 5-4120-369-14, 25 November 1982 is changed as follows:

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CHANGE

NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 20 November 1990

Operator's, Organizational, Direct Support and General Support
Maintenance Manual

AIR CONDITIONER, HORIZONTAL, COMPACT, 18,000 BTU 208 VOLT, 3 PHASE, 50/60 HERTZ, MODEL MIL-AC-1832 NSN 4120-01-105-5746

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2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

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The Adjutant General

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WARNING

HIGH VOLTAGE is used in the operation of this equipment.

DEATH ON CONTACT or severe injury may result if personnel fail to observe safety precautions. Always disconnect the air conditioner from power source before performing maintenance on this equipment. If power must remain on for troubleshooting, exercise extreme care to avoid contact with any electrical component , fan, fan motor , etc. Do not operate the air conditioner without louvers , top controls , and guards in place and tightly secured.

WARNING

REFRIGERANT UNDER PRESSURE is used in the operation of this equipment

DEATH or severe injury may result if personnel fail to observe safety precautions. Never use a heating torch on any part that contains refrigerant-22. Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas.

WARNING

The burning of polyurethane foams is dangerous. Due to the chemical composition of a polyurethane foam, toxic fumes are released when it is burned or heated. If it is burned or heated indoors, such as during a welding operation in its proximity , precautions should be taken to adequately ventilate the area. An exhaust system equivalent to that of a paint spray booth should be used. Air supply respirators, approved by the National Institute for Occupational Safety and Health or the US Bureau of Mines, should be used for all welding in confined spaces and when ventilation is inadequate.

Individuals who have chronic or recurrent respiratory conditions, including allergies and asthma, should not be employed in this type of environment.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C).

TECHNICAL MANUAL
NO. 5-4120-369-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 25 November 1982

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL AIR CONDITIONER, HORIZONTAL, COMPACT, 18,000 BTUH 208 VOLT, 3 PHASE, 50/60 HERTZ NSN 4120-01-105-5746 MODEL NUMBER MIL-AC-1832

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help inprove this manual. If you find any mistakes or if your know of a way to improve procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Troop Support & Aviation Material Readiness Command, ATTN: DRSTS-MPSD, 4300 Goodfellow Boulevard, St. Louis, MO 63120. A reply will be furnished to you.

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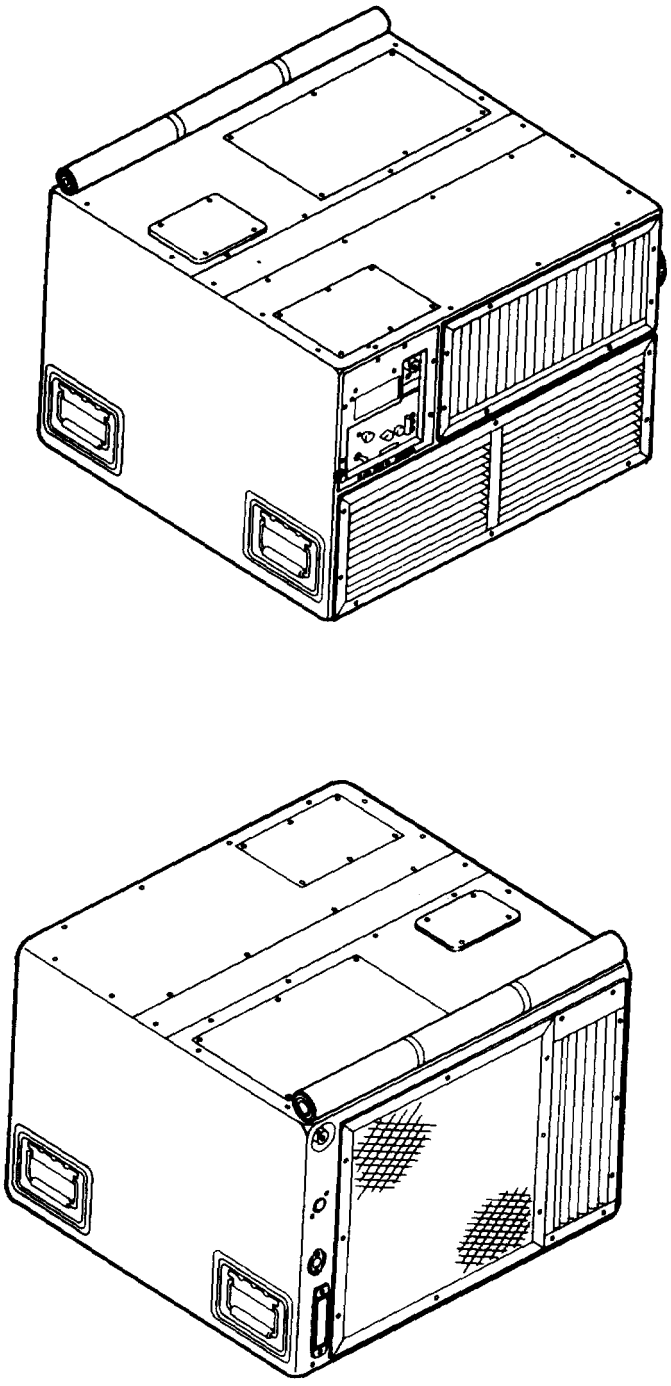


Shipping Dimensions

Length --- 30.0 in (72.4 cm)
Height --- 20.0 in (48.3 cm)
Width --- 27.9 in (67.3 cm)
Weight --- 265lb (132kg)

Figure 1-1. Air conditioner, three quarter view, with shipping dimensions

CHAPTER 1. INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE.

This manual is for your use in operating and maintaining the MIL-AC-1832 air conditioner.

1-2. MAINTENANCE FORMS AND RECORDS.

Maintenance forms and records that you are required to use are explained in TM 38-750.

1-3. REPORTING OF EQUIPMENT IMPROVEMENTS RECOMMENDATIONS.

EIR can and must be submitted by anyone who is aware of any unsatisfactory condition with the equipment design or use. It is not necessary to show a new design or list a better way to perform a procedure, just simply to tell why the design is unfavorable or why a procedure is difficult . EIR may be submitted on SF 368 (Quality Deficiency Report). Instructions for preparing EIR's are provided in TM 38-750, the Army Maintenance Management System. Send EIR to Commander, US Army Troop Support and Aviation Materiel Readiness Command, ATTN: DRSTS-MPSD, 4300 Goodfellow Blvd., St. Louis, MO 63210. A reply will be forwarded directly to you.

1-4. EQUIPMENT AND SERVICEABILITY CRITERIA.

This equipment is not covered by an ECS.

1-5. HAND RECEIPT MANUAL.

Hand receipts for the End Items/Components of End Item (COEI), Basic Issue Items BII), and Additional Authorization List (AAL) items are published in a Hand Receipt Manual. The Hand Receipt Manual numerical designation is the same as the related Technical Manual with the letters HR added to the number. These manuals are published to aid in property accountability and are available through: Commander, US Army Adjutant General, 2800 Eastern Blvd., Baltimore, MD 21220.

Not applicable to the Marine Corps. Refer to SL-1-3.

Section II. EQUIPMENT DESCRIPTION

1-6. EQUIPMENT PURPOSE, CAPABILITIES AND FEATURES.

Air conditioner (figure 1-1) is a completely self-contained, compact, horizontal unit designed for cooling and heating air to a desired predetermined range, and circulating the conditioned air to provide heating or cooling of equipment or personnel within the air conditioned area. It is designed for continuous operation, with varying bads. It is used primarily in van type enclosures to provide the filtered cooling and ventilating or heated air required to maintain service conditions necessary for efficient operation of electronic equipment and the comfort of operating personnel. It is equipped with internal ducting so that ventilation air may be drawn into the area being air conditioned. The evaporator and condenser sections of the air conditioner are seperated by an insulated metal partition that forms pert of the unit housing.

1-7. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

a. Evaporator Section. The evaporator section (figure 1-2), located in the front of the air conditioner, contains intake and discharge air louvers, air filter, mist eliminator, evaporator coil, evaporator motor and fans, heater elements, heater thermal protector, primary expansion valve, condensate drain hose, electrical control panel and controls, main input power connector, control module, and the ventilation air damper door and control knob. The evaporator fan draws air into the unit, from the space being conditioned, through the inlet louver and air conditioning filter, or

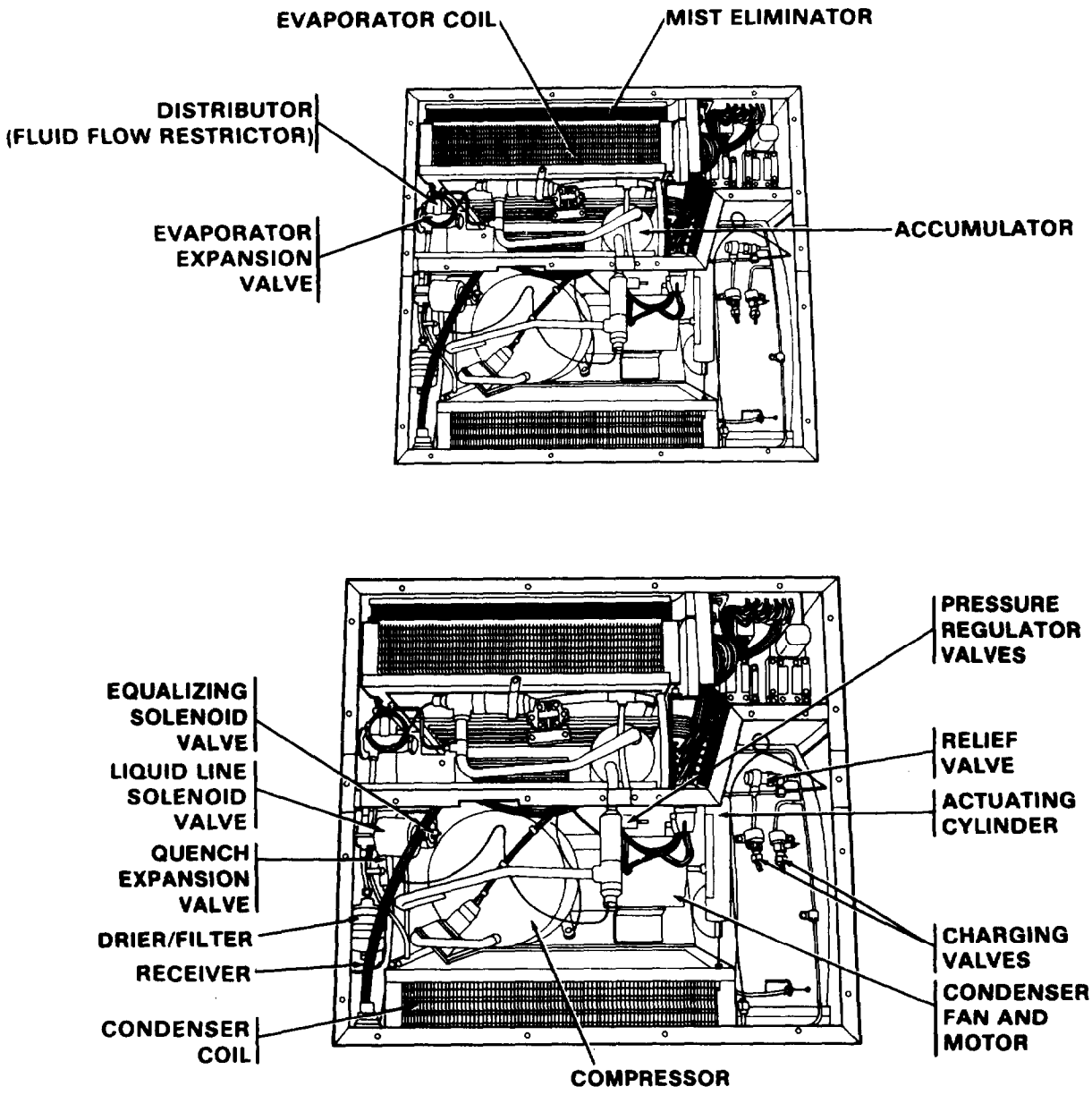


Figure 1-2. Air Conditioner top view, top covers removed

when required, from the outside of the unit, through the fresh air filter and ventilation duct; air is then forced over the heater elements through evaporator coil, mist eliminator and outlet louver. The outlet louver has adjustable blades for directing the air flow into a desirable pattern within the space being conditioned. The evaporator fan speed is controlled by a toggle switch on the control module.

b. Condenser Section. The condenser section (figure 1-2) located in the rear part of the air conditioner contains the condenser coil, condenser coil guard, two condenser motors and fans, motor compressor, condensor, condensor fan housings and louvers, louver actuator, ventilation air duct, fresh air filter and vent screen, thermal switch, refrigerant liquid sight indicator, solenoid valves, expansion valve, pressure relief valve, system access service valves, filter drier, refrigerant liquid receiver, accumulator, associated electrical wiring and refrigerant tubing and an alternate power input connector. The condenser fan speed controlled by a thermal switch located on the rear of unit. At ambient temperatures of 100°F ±5°F (38°C ±3°C) or higher, the condenser fan motors will operate at high speed (3750 RPM); and at ambient temperatures below 100°F (38°C) , the motor will operate at low speed (1800 RPM). Due to possible thermal lag, the change over may be slow to react when the ambient temperature drops below the 100°F (38°C) changeover point.

1-8. DIFFERENCE BETWEEN MODELS.

Difference data sheets are not applicable to this manual.

1-9. PERFORMANCE DATA.

The following listing contains the performance and dimensional data applicable to the air conditioner.

(1) Air conditioner, model MIL-AC-1832

Nomenclature	Air conditioner, horizontal, compact
Manufacturer	Crippen and Graen Model No. MIL-AC-1832
Capacity:	
Cooling	18,000 BTUH
Heating:	
High	14,300 BTUH
Low	7,500 BTUH
Ventilation	590 scfm
Phase	3
Hertz	50/60
AC Volts	208
Current input, full load, amperes	
Coding	26.4
High heat	15
Low heat	15
Ventilating	15
Refrigerant	R22
Amount of charge, pounds	4 lbs (1.816 kg)

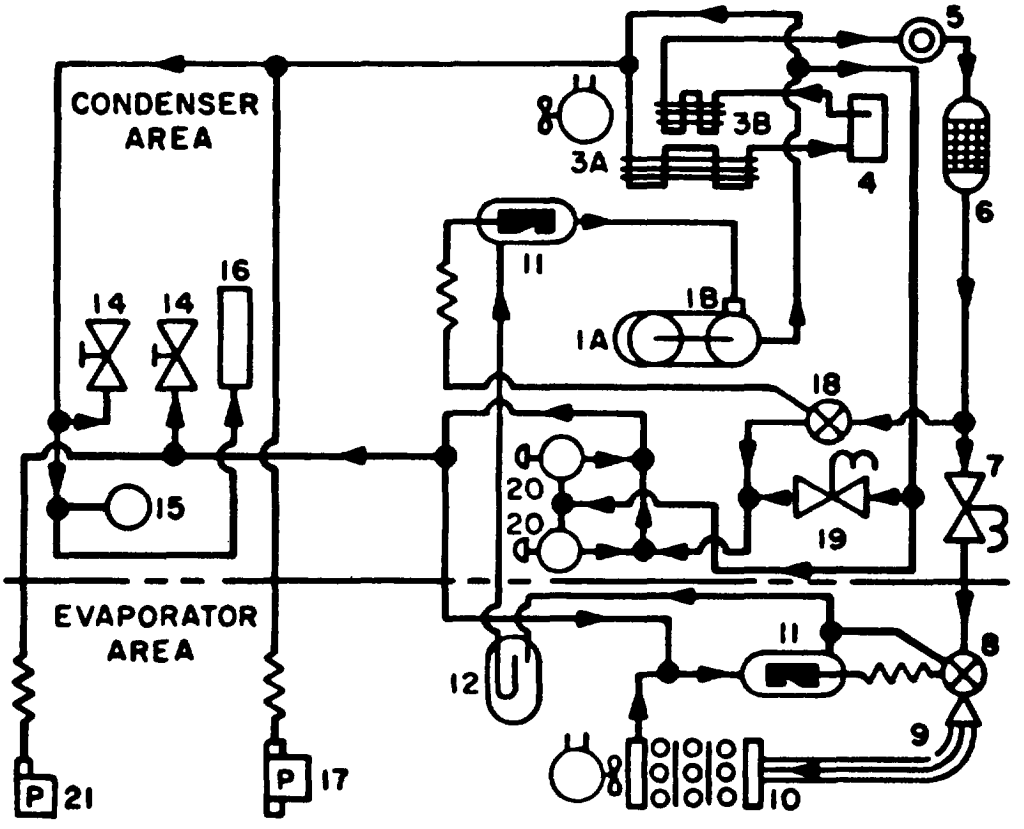
(2) Dimensions and weights:

Length	30.0 in. (72.4 cm)
Height	20.0 in. (48.3 cm)
Width	27.9 in. (67.3 cm)
Weight	265 lbs

Section III. TECHNICAL PRINCIPLES OF OPERATION

1-10. REFRIGERATION CYCLE.

a. The Refrigerant Cycle. The refrigeration system removes heat from a given area. See Figure 1-3 for a schematic of the refrigeration cycle.



Find No.	Nomenclature	Find No.	Nomenclature
1A	Compressor	11	Bulb Well
1B	Suction Line Filter	12	Accumator
3A	Coil, Condenser	14	Valve, Charging
3B	Subcooler	15	Valve, Pressure Relief
4	Receiver	16	Actuator
5	Indicator, Sight, Liquid	17	Switch, Pressure
6	Dehyrator/Dryer	18	Valve, Expansion (Quench)
7	Solenoid Valve	19	Valve, Solenoid
8	Expansion Valve (Primary)	20	Regulator, Fluid Pressure
9	Restrictor, Fluid Flow	21	Switch, Pressure
10	Coil, Evaporator		

Figure 1-3. Refrigerant Flow Diagram

The compressor (1) takes cold, low pressure refrigerant gas and compresses it to a high temperature, high pressure gas. This gas flows through the copper tubing to the split condenser coil (3) and receiver (4).

The condenser fan draws outside ambient air over and through the two section condenser coil (3). The high temperature, high pressure gas from the compressor (1) is cooled by the flow of air and is changed into a high pressure liquid.

The liquid sight glass (5) indicates the presence of moisture and quantity of refrigerant in the system.

The drier/filter dehydrator (6) removes any moisture (Water vapor) or dirt that may be carried by the liquid refrigerant.

The solenoid valve (7) is controlled by the temperature selector on the control panel. This valve will shut off the flow of refrigerant to the evaporator section when the temperature in the conditioned area reaches the set point.

The expansion valve (8) senses the temperature and pressure of the refrigerant as it leaves the evaporator coil. By use of the feeler bulb in the bulb well (11) and "external equalizer line" the valve constantly adjusts the flow of liquid refrigerant to the evaporator coil (10).

As the high pressure liquid refrigerant leaves the expansion valve (8) it enters the evaporator coil (10). As the liquid enters the coil, due to the size difference between the coil and the tubing, the pressure is suddenly decreased. As the pressure decreases the liquid refrigerant "flashes" to a gas. The evaporator blower circulates the warm air from the conditioned space over and through the evaporator coil. Liquid absorbs heat when it changes from a liquid to a gas. As the air from the conditioned spaces comes in contact with evaporator coil (10), the air is cooled.

The accumulator (12) holds any liquid refrigerant which did not change to a gas in the evaporator. Heat in the evaporator section will boil this liquid to a gas before entering the compressor.

To prevent compressor damage during start-up, solenoid valve (19) is normally open to equalize pressure on both sides of the compressor.

b. Bypass System. This unit has a bypass system which allows cooling operation at low cooling loads without cycling the compressor on and off. In bypass the refrigerant is from the discharge to the suction side of the compressor, bypassing the evaporator coil (10).

When the temperature selector on the control panel senses that cooling conditions have reached the set point, it closes the solenoid valve (7) to shut off refrigerant flow to the evaporator coil (10).

As the compressor suction pressure starts to drop, the pressure regulators (20) open to allow flow of hot gas from the compressor.

The quench valve (18) senses the temperature of the gas at the suction side of the compressor. To prevent excessively hot gas from reaching the compressor the quench valve (18) opens to allow liquid refrigerant to mix with the hot gas.

1-11. HEATING.

a. When the MODE SELECTOR is set for HIGH Heat, six heating elements. located behind the evaporator coil are energized. These elements are protected from overheating by a thermal cutout switch . Three of the elements are controlled by the TEMPERATURE SELECTOR, and remaining three are on all of the time. When set for LOW, only the three thermostatically controlled elements are energized.

b. The two speed fan can be set for either HIGH or LOW operation during heating.

1-12. LIST OF ACRONYMS AND ABBREVIATIONS.

AC	Alternating Current
C	Centigrade
CBR	Chemical-Biological-Radiological
cm^2	Centimeter Squared
DC	Direct Current
F	Fahrenheit
HP	Horse Power
HPCO	High Pressure Cut-Out
Kg	Kilogram
lbs	Pounds
LPCO	Low Pressure Cut-Out
psi	Pounds Square Inch
psig	Pounds Square Inch Gauge
RPM	Revolution per Minute
VDC	Volts Direct Current

CHAPTER 2. OPERATING INSTRUCTIONS

CAUTION

If equipment fails to operate refer to troubleshooting procedures in chapter 3.

Section I. CONTROLS AND INSTRUMENTS

2-1. GENERAL.

This section describes, locates and illustrates the various controls and provides the operator/crew sufficient information to insure proper operation of the air conditioner.

2-2. CONTROLS AND INSTRUMENTS.

a. General. The location of the function of the controls and instruments are illustrated in figure 2-1. The control module contains the control circuit breaker, the manually operated temperature selector switch, mode selector switch, evaporator fan speed switch and compressor circuit breaker. The thermostatic control point of the air temperature is determined by the location of the temperature selector switch sensing bulb.

b. Temperature Selector Switch. The temperature selector switch is a thermostatic switch which-responds to temperature variations from 60°F in the maximum cooler position to 90°F (15.6°C to 32.2°C) in maximum warmer position. The best preliminary adjustment of the temperature selector is midway between the cooler and warmer positions, corresponding to approximately 75°F (24°C). A ten minute period should be allowed between adjustments of the temperature selector for the full effect of the adjustment to be realized. Once the desired temperature of the air conditioner space is obtained, no further adjustment is required for either cooling or heating modes of operation.

c. Mode Selector Switch. The mode selector switch is an electrical switch that can be manually positioned to select the desired operational mode of the air conditioner. The five positions of the mode selector are:

(1) Off. The off mode position is used to stop operation. All major electrical components are isolated from electrical power except the compressor crankcase heater, which is thermostatically controlled as long as input power is connected to the unit.

(2) Vent. In the vent mode position, the evaporator motor operates and the fans circulate filtered air. Ventilation air will be drawn into the unit through the fresh air filter and vent duct if the damper door in the vent duct is open. Some coding effect will occur if the ventilation air is cold. Ventilation air flow is controlled by opening and closing the damper door with the vent adjusting knob.

(3) Cool. In the cooler mode position, the refrigerant cycle begins, and the unit will cool under the thermostatic control of the temperature selector switch. The evaporator fan motor, condenser fan motors and compressor are activated and will operate continuously. The speed of the evaporator fan motor is controlled by manually selecting the desired speed position of the evaporator fan speed switch. The speed of condenser fan motors is automatically controlled by an outdoor thermal switch. The motors will operate in low speed when ambient temperature is below 100°F (38°C). The thermal switch automatically switches the motors to high speed if ambient temperature rises above 100°F (38°C). To prevent starting surge current of the compressor coinciding with the starting surge current of the fan motors, the compressor starts about 30 seconds after the fan motors. Although the compressor and fan motors operate continuously in this mode, thermostatic action of the temperature selector switch causes refrigerant to bypass the evaporator coil and stop coding when the desired temperature setting of the temperature selector switch is satisfied. Ventilation air will be drawn into the unit if the vent damper door is open.

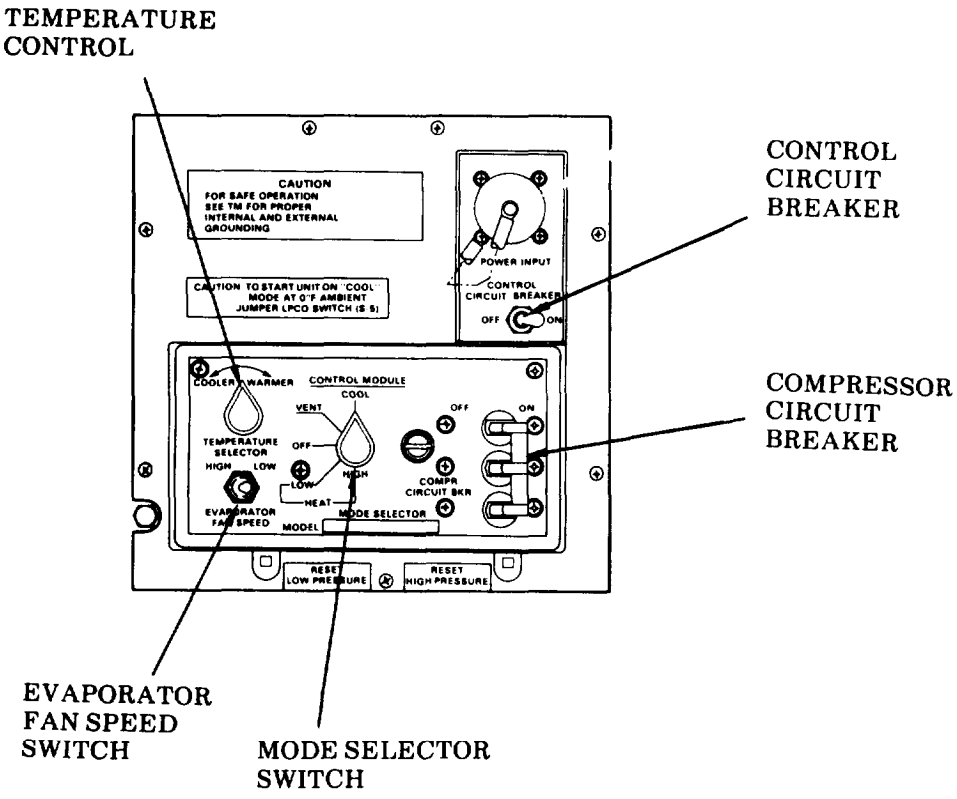


Figure 2-1. Controls and Instruments (Sheet 1 of 2)

(4) Low Heat. In the low heat mode, the evaporator fan motor operates continuously and three of the six heater elements cycle on and off under thermostatic control of the temperature selector switch. This mode will produce half of the unit's heating capability. Ventilation air will be drawn into the unit if the vent damper door is open.

(5) High Heat. In the high heat mode, the evaporator fan motor operates continuously and all six of the heater elements are activated, but only three of the heater elements will cycle on and off under thermostatic control of the temperature selector switch. This mode will produce maximum heating capability of the unit. Ventilation air will be drawn into the unit if the vent damper door is open.

d. Evaporator Fan Speed Switch. The evaporator fan speed switch has two positions, “low” and "high." The positions are manually selected to control the evaporator fan speed in all operating modes. Normally the "low" speed should be selected as it is quieter and requires less electrical power; however, the “high” speed position has three advantages over "low" which may dictate its selection:

(1) Maximum cooling capacity can only be achieved in "high."

(2) The increased flow of evaporator air improves sir distribution in the conditioned space.

(3) Twice as much ventilation air is drawn into the unit in “high.”

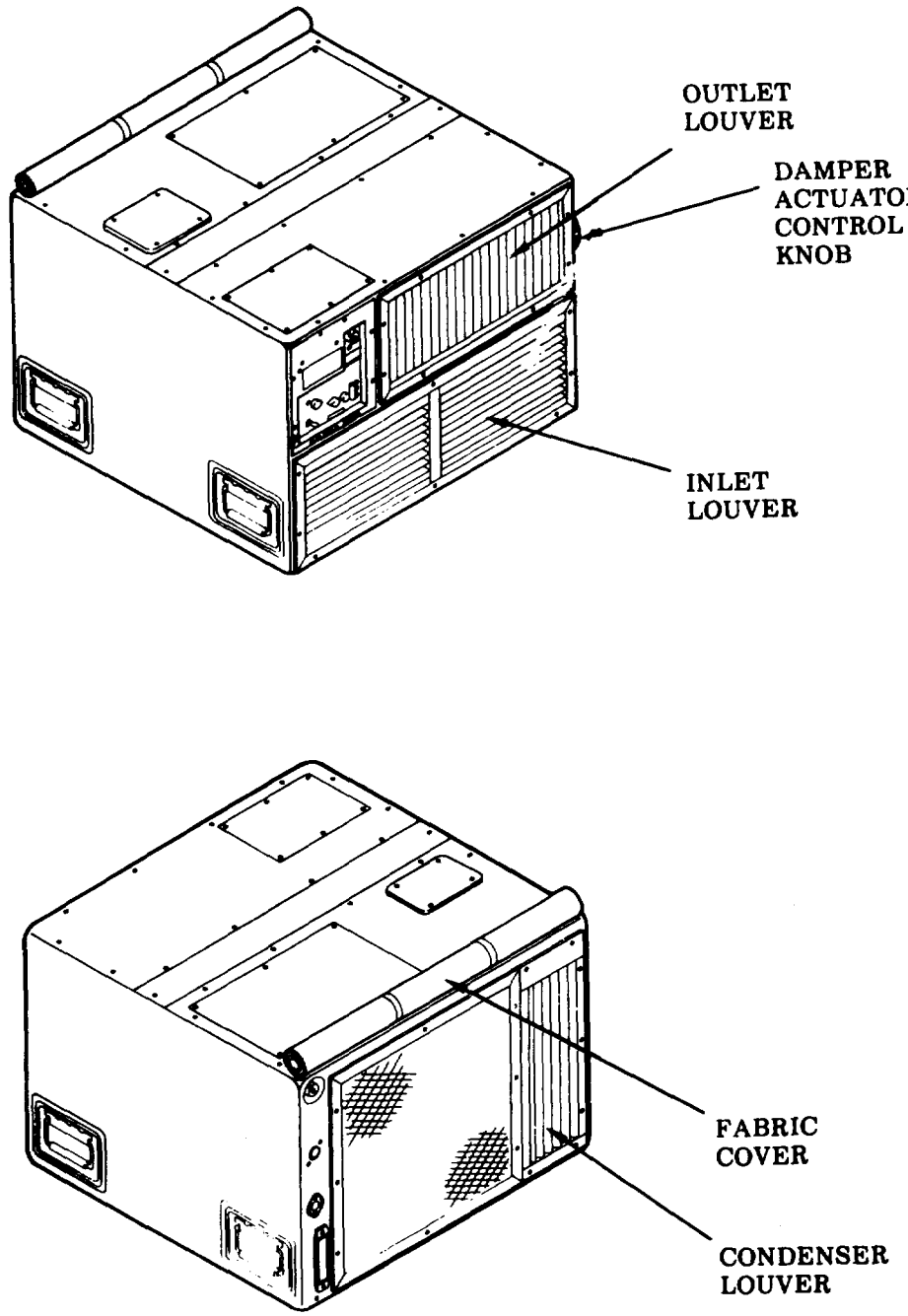


Figure 2-1. Controls and Instruments (Sheet 2 of 2)

e. Vent Adjusting Knob. The vent adjusting knob controls the flow of ventilation air into the unit. The knob is connected by the damper cable to a damper located in the vent duct. The knob controls the flow of ventilation air by adjusting the position of the damper from full closed to full open. Turning the knob upward closes the damper, turning the knob downward opens the damper. The force that draws ventilation air into the unit is the small pressure difference between the ambient and the evaporator fan. This is the same small pressure difference that exists between the conditioned space and the evaporator fan; the pressure difference that draws return air through the inlet louver and the return air filter. When ventilation air enters the conditioned space a like flow of air must exhaust from the space to prevent a pressure build-up . Cracks in the space may be sufficient; but if a large flow of ventilation air is desired, some positive means of air exhaust should be provided.

f. Inlet Louver. The inlet louver is finger-adjustable from full open to full closed. Normally the louver shutter tab adjustment is kept at 45° position, which is essentially the same as a full open inlet louver. If the inlet louver is closed, return air will still manage to flow through it; but at a reduced rate with high pressure drop. The increase in pressure drop will cause additional ventilation air to be drawn into the unit. The "vent" mode of operation is normally the only mode where closing the inlet louver (to create increased ventilation airflow) would be considered a real advantage. Sufficient ventilation air flow for other modes of operation can be achieved with the inlet louver open and the damper open. The return air filter is attached to the back side of the inlet louver. A dirty filter can easily be observed by looking through the inlet louver blades. Since maximum cooling capability of the unit is obtained with maximum evaporator air flow, a closed inlet louver or a dirty air filter will decrease cooling capacity, and may cause ice to form on the evaporator coil.

g. Outlet Louver. The out let louver is finger-adjustable in both horizontal and vertical planes. This adjustment on an individual blade basis allows maximum control over the direction of outlet air. The best distribution pattern for outlet air is the operator's judgement; but blades should not be adjusted beyond 45°, as evaporator air flow will be impeded.

h. Condenser Louvers. The condenser louvers, located on the rear of the air conditioner (figure 1-2), are automatically opened and closed by the action of the refrigerant system. The condenser louvers cannot be manually opened and closed.

i. Compressor Circuit Breaker. The compressor circuit breaker is a safety device which provides overcurrent protection for the compressor. The compressor circuit breaker is not a control switch to be used for operating the unit. This breaker should always be kept in the ON position, a defective compressor will cause circuit breaker to trip. The unit control circuit is also connected to auxiliary contacts on the compressor circuit breaker. When this circuit breaker trips to OFF, it disconnects the control circuit allowing the time delay relay to reset and the refrigerant system pressures to equalize. Manually resetting the compressor circuit breaker to ON restores electrical continuity.

j. Control Circuit Breaker. The control circuit breaker is a safety device which provides overcurrent protection for the control circuit of the unit.

CAUTION

The control circuit breaker is not a control switch to be used for operating the unit. This breaker should always be maintained in the ON position. If the breaker trips to the OFF position, an electrical defect in the control circuit is indicated and corrective act ion should be taken. Manually resetting the circuit breaker to ON restores electrical continuity.

Section II. PREVENTATIVE MAINTENANCE CHECKS AND SERVICES

2-3. GENERAL.

To insure that the air conditioner is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventative maintenance checks and services (PMCS) to be performed are listed and described in paragraph 2-4. The item numbers indicate the sequence of minimum inspection requirements.

a. Before you operate. Always keep in mind the CAUTIONS and WARNINGS. Perform your check before (B) PMCS.

b. While you operate. Always keep in mind the CAUTIONS and WARNINGS. Perform your check–during (D) PMCS.

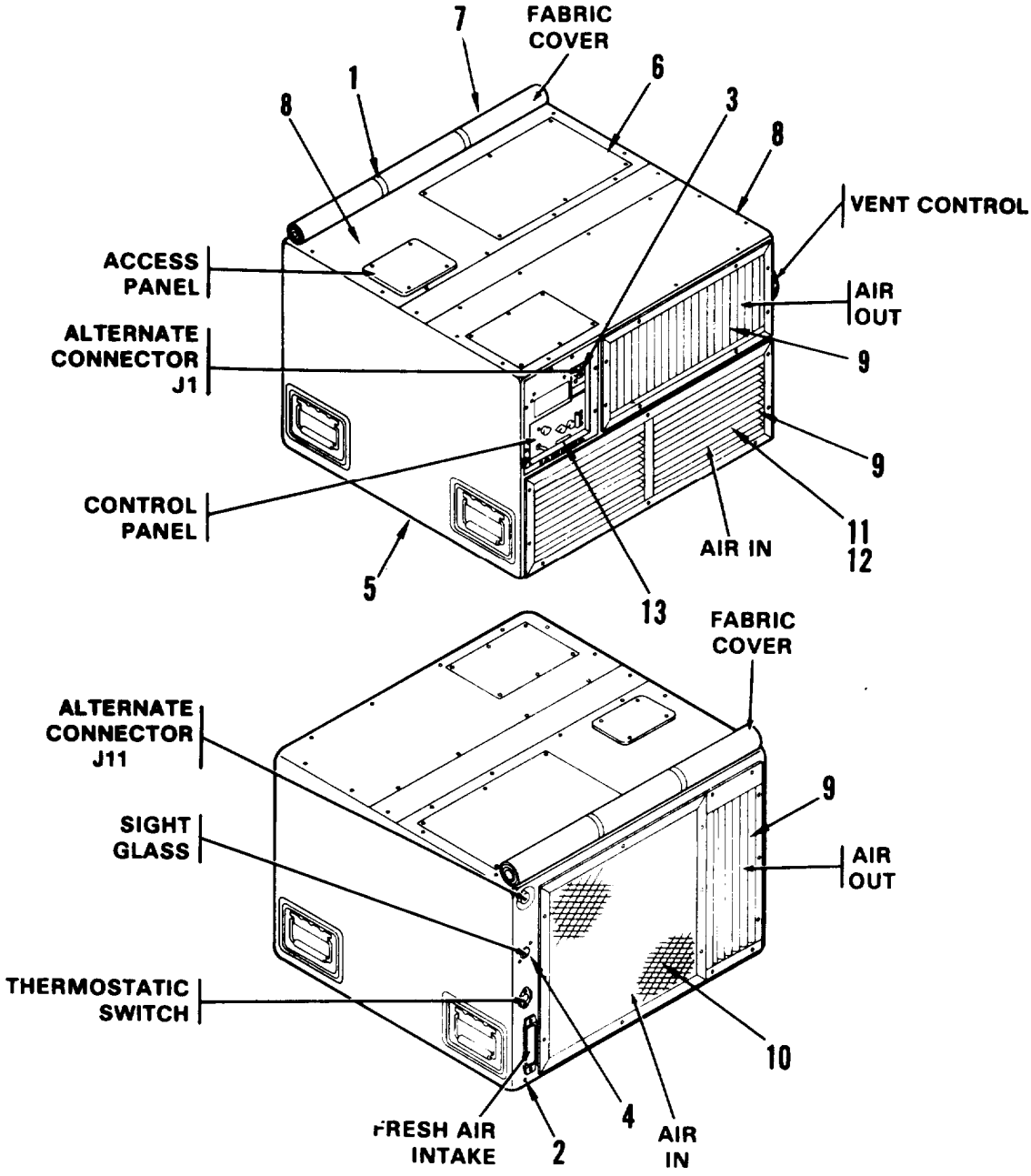
c. After you operate. Be sure to perform your check after (A) PMCS.

d. If your equipment fails to operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms, see TM 38-750.

Defects discovered during operation of the unit will be noted for future correction to be made as soon as operation of the unit has ceased. Stop operation immediately if during operation a deficiency is noted which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded, together with the corrective action taken, on DA Form 2404 at the earliest possible opportunity.

2-4. DAILY PREVENTATIVE MAINTENANCE SERVICES.

This paragraph contains a tabulated listing of preventative maintenance services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to table 2-1 for the daily preventative maintenance services.



NOTE: Item numbers are per Table 2-1.

Figure 2-2. Preventative Maintenance Checks and Service

Table 2-1. Preventative Maintenance Checks and Services

NOTE: If the air conditioner must be kept in continuous operation, check and service only those items that can be checked and services without disturbing operation. Make complete checks and services when the air conditioner can be shut down.

B - Before Operation D - During Operation A - After Operation

ITEM NO.	INTERVAL B	D	A	ITEMS TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	FOR READINESS REPORTING, EQUIPMENT IS NOT READY/ AVAILABLE IF
1	●			Condenser Fabric Cover	With cover rolled up for air conditioner operation, check securing ties for damage.	
2	●	●		Condensate Drains	Inspect for obstruction to drainage. Remove obstruction.	Obstructions can not be removed.
3	●			Main Power Receptacle Connector	Check for secure power connection. Tighten if necessary.	Damage to connector prevents satisfactory connection.
4.		●		Liquid Sight Indicator (Sight Glass)	Check for moisture and low refrigerant charge. (After unit has run for a minimum of 2 hours.)	Yellow indicates moisture; bubbles or milky appearante indicates low charge.
5		●		Air Conditioner Operation	Check for abnormal operation vibration, unusual noise, failure to respond to controls.	Any condition in procedures column is observed.
6	●			Information Plates	Missing or damaged.	
7	●			Covers	Missing, damaged, no mildew. All snaps in good condition. Cover must be rolled and stored on top of unit during operation.	
8	●			Panels	No major dents or cracks. No missing or loose screws.	
9	●			Grilles (Louvers)	No major dents or cracks. No missing or loose screws.	
10	●			Screens and Guards	No major dents or cracks. No missing or loose screws.	
11	●			Air Filter	Check that filter is clean.	
12	●			Condensate Drain	No water dripping anywhere except through drain.	
13	●			Control Module	Check that knobs are not missing.	

Section III. OPERATING UNDER USUAL CONDITIONS

2-5. GENERAL.

a. The instructions in this section are published for the information and guidance of the personnel responsible for the operation of the air conditioner.

b. The operator must know how to perform every operation of which the air conditioner is capable. This section gives instructions on starting and stopping the air conditioner, and detailed operating instructions. Since nearly every condition presents a different problem, the operator may have to vary the given procedure to fit the condition.

2-6. UNLOADING EQUIPMENT.

The total weight of the air conditioner is 290 pounds (132 kg.). Use a hand truck or fork-lift of at least 500 pounds capacity to unload the unit. Keep unit upright during the unloading operation.

2-7. UNPACKING EQUIPMENT.

Move the unit as near to the site of installation as possible. Remove crating hardware and metal straps being careful not to damage the unit with the tools used for uncrating.

2-8. INSPECTING AND SERVICING EQUIPMENT.

a. Inspection. Inspect the entire air conditioner for signs of damage, missing or loose hardware, an any defects that may have been incurred during shipment. Report all damage and defects to organizational maintenance.

b. Servicing. Perform the daily preventative maintenance services listed in paragraph 2-4. Be sure all hardware is securely in place.

2-9. INSTALLATION.

a. General. The air conditioner is shipped assembled and ready for operation. It contains a full charge of refrigerant and compressor oil. Install the unit on a firm, level surface to allow proper condensate drainage. Place it so that the control panel and condenser and evaporator louvers are accessible to the operator and to maintenance personnel. Be sure there are no obstructions in front of any air intake or discharge louvers or other openings that may cause insufficient flow of air in to or out of the air conditioner. If the unit is van mounted, report any such obstructions to organizational maintenance.

b. Lifting. Check for broken or deformed lifting ring attachment and hardware before lifting air conditioner. Lift with crane or forklift truck.

CAUTION

Use lifting harness with 4-leg spreader bar. Each leg must be capable of withstanding a concentrated load of more than 500 pounds. If spreader bar cannot be used, the angle between the harness legs and the top of the air conditioner must not be less than 45-degrees.

c. Mounting. Base mounting hole dimensions are shown on figure 2-3. The resilient mount parts shown in figure 2-4 are shipped with the air conditioner.

CAUTION

For safe operation connect a No. 10 AWG (min.) ground wire between the air conditioner ground connection and an earth ground, as shown in figure 2-5.

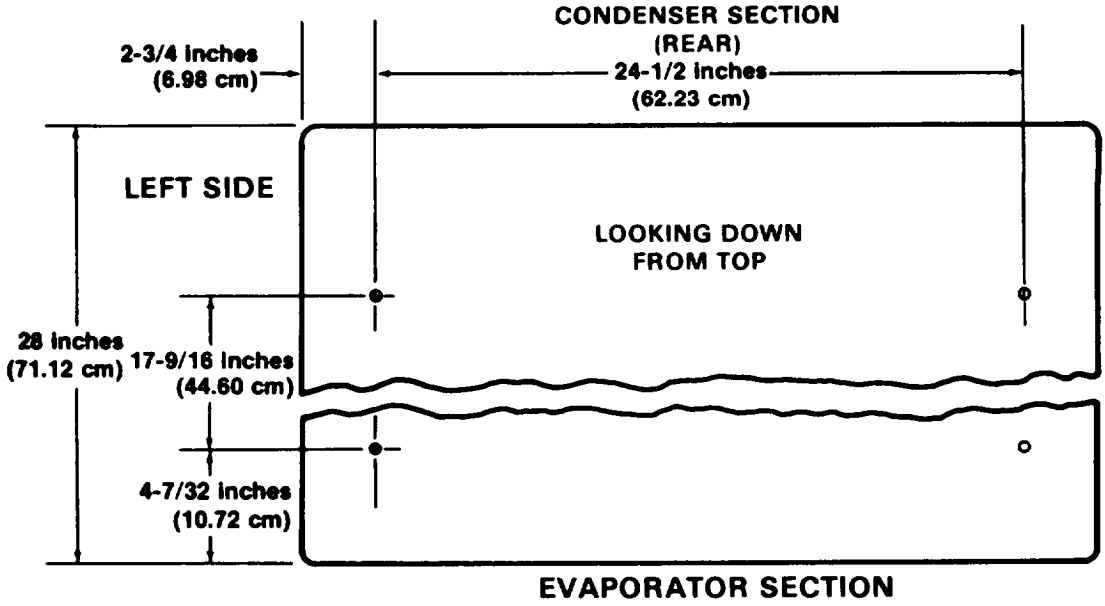


Figure 2-3. Base mounting holes

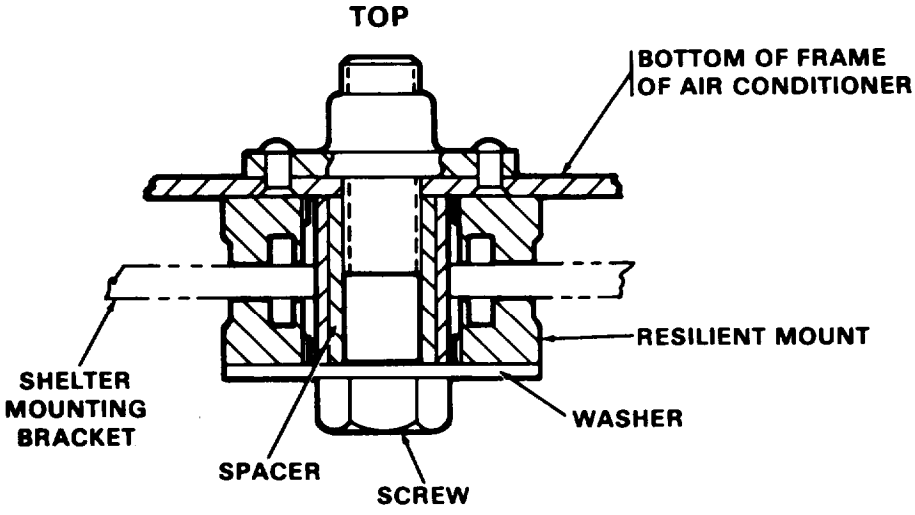


Figure 2-4. Typical installation of air conditioner to enclosure

d. Connections.

(1) Conned to earth ground (see Figure 2-5) as follows:

Step 1. Clean front of ground connection to obtain a bright metal surface.

Step 2. Remove insulation from ends of grounding wire or use bare ends. Make loop at wire ends.

Step 3. Using 1/4-20 screw and washer, attach one end of wire to air conditioner front panel ground connection.

Step 4. Wrap a suitable length of perforated strap around clean surface on water pipe or grounding rod. Do not use gas pipe.

Step 5. Using 1/4-20 screw, two washers and nut, attach other end of grounding wire to strap in a manner such as to securely tighten strap to pips and wire to strap.

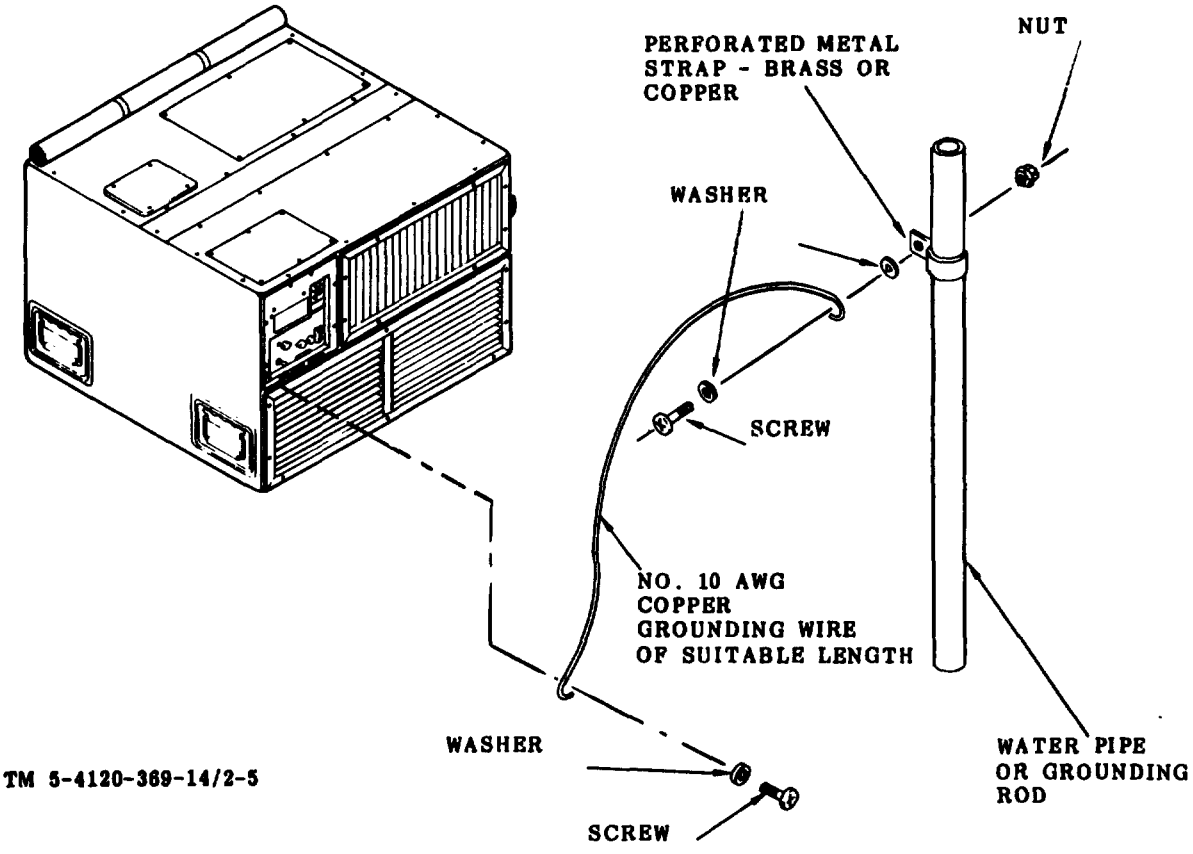


Figure 2-5. Ground wire installation

(2) Connect air ducts to the unit as applicable to the site of installation. If the inlet grille is removed, a return air filter should be relocated in the return air duct at a maintainable location. Operation of unit without a return air filter will cause clogging of the evaporator fan and evaporator.

(3) Connect a condensate drain line into female pipe threaded connection (Figure 1-2) to carry condensate water away from site of installation only if the drop of condensate is objectionable.

(4) Connect the power input connector plug (per Components of End Item List Appendix B) furnished with the air conditioner to a suitable electrical power cable. Connect the cable to the proper electrical power source and install the plug end of cable to either the main power receptacle or the alternate power receptacle. If alternate power receptacle (Figure 1-2) is used, refer to wiring diagram (FO-1) and change wire lead connection at TB-4.

CAUTION

To avoid damage to the compressor, electrical input power must be applied to energize the compressor crankcase heater at least 4 hours before operating unit in the cool mode.

2-10. STARTING AND OPERATING INSTRUCTIONS.

a. Reparation for Starting.

(1) Perform the daily preventative maintenance service (paragraph 2-4).

(2) Connect the main power cable.

(3) Check drain holes to insure that they are open.

(4) Be sure the unit is firmly secured.

(5) Roll up condenser cover and tie at top of unit to clear condenser opening.

NOTE

When vent damper door is open to admit fresh air, partially close evaporator inlet louver to balance incoming air. Keep vent or damper door closed during heavy rain.

b. Starting Instructions for Cooling (See Figure 2-6). Start the air conditioner for cooling as follows:

Step 1. Roll up and tie condenser fabric cover.

Step 2. Open intake louvers by lifting tabs.

step 3. Turn vent control actuator to close ventilation damper.

Step 4. Turn temperature selector switch to maximum counter clockwise position (lowest cooling).

Step 5. Turn ON compressor and control circuit breakers.

Step 6. Turn mode selector switch to vent and allow fan to reach full speed, then to cool.

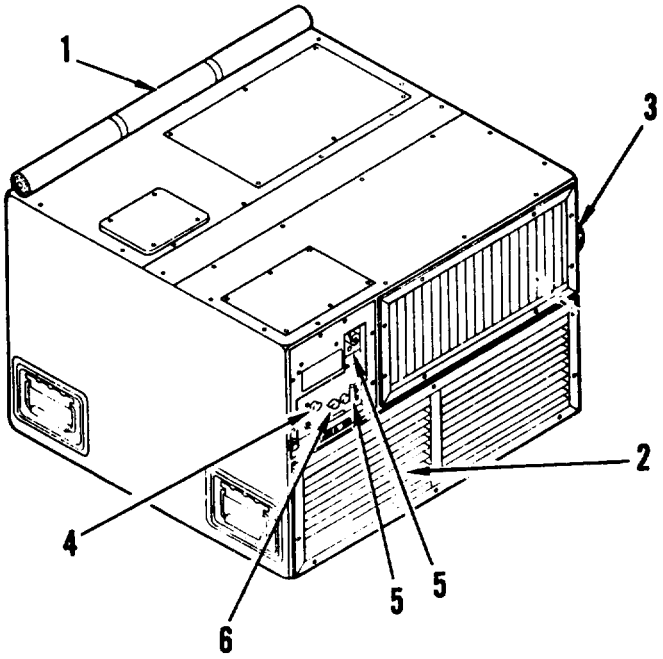


Figure 2-6. Starting instructions for coding

c. Operating Insstructions for Cooling (see Figure 2-7). Operate the air conditioner for cooling as follows:

Step 1. With mode selector switch on cool, adjust temperature selector switch to degree of cooling desired.

Step 2. Set evaporator fan speed switch to desired position.

Step 3. Adjust air outlet louvers to direct air flow as desired.

Step 4. Adjust vent control actuator to admit desired amount of ventilation air.

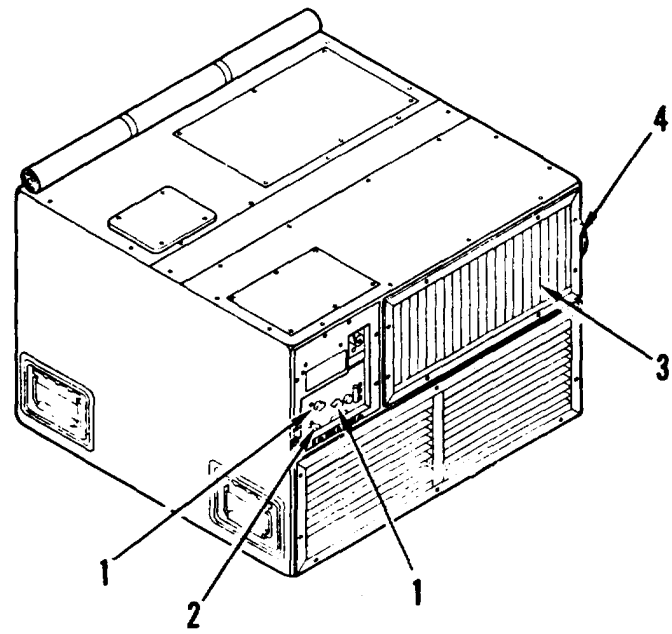


Figure 2-7. Operating instructions for cooling

d. Starting Instructions for Heating (See Figure 2-8). Start the air conditioner for heating as follows:

Step 1. Make sure condenser cover is rolled up.

Step 2. Open intake louvers by lifting tabs.

Step 3. Turn vent control actuator to close ventilation damper.

Step 4. Turn temperature selector switch to maximum clockwise position (warmer).

Step 5. Turn on control circuit breaker.

Step 6. Turn mode selector switch to low heat. Turn to high if more heat is desired.

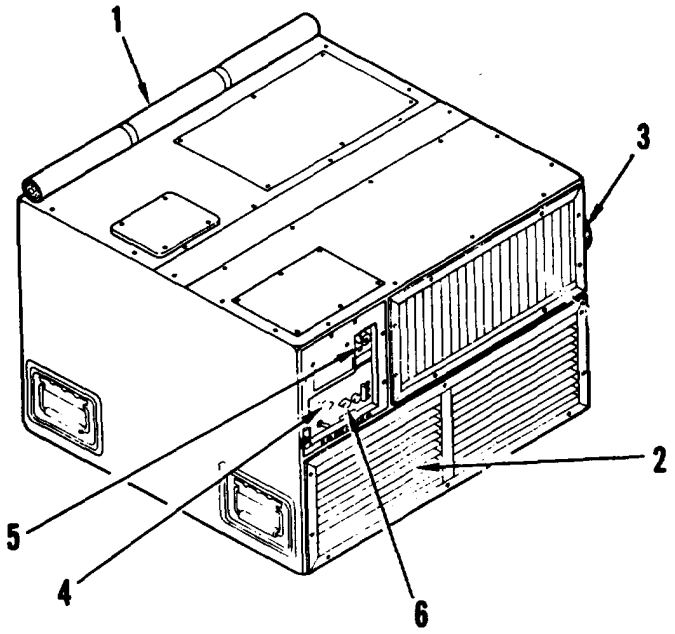


Figure 2-8. Starting instructions for heating.

e. Operating Instructions for Heating (See Figure 2-9). Operate the air conditioner for heating as follows:

NOTE

After starting, adjust temperature selector switch to obtain desired enclosure temperature.

Step 1. Turn vent control actuator to open damper door.

Step 2. Position tabs to partially close intake louver blades.

Step 3. Turn mode selector to high heat or low heat for desired temperature range.

Step 4. Adjust temperature selector switch to desired enclosure temperature.

Step 5. Adjust air out let louvers to direct airflow as desired.

NOTE

After turnoff, operate in vent mode for 2 - 3 minutes to cool off heating elements.

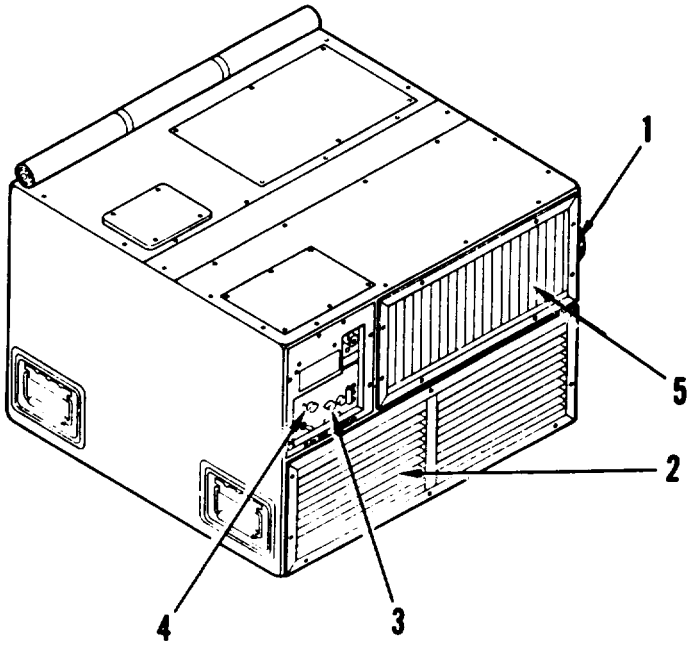


Figure 2-9. Operating instructions for heating.

f. Operating Instructions for Ventilating (See Figure 2-10). Operate the air conditioner for ventilation as follows:

Step 1. Make sure condenser cover is rolled up.

Step 2. Turn vent control actuator to open damper door.

Step 3. Position tabs to partially close intake louver blades.

Step 4. Turn move selector switch to vent.

Step 5. Adjust air outlet louvers to direct airflow as desired.

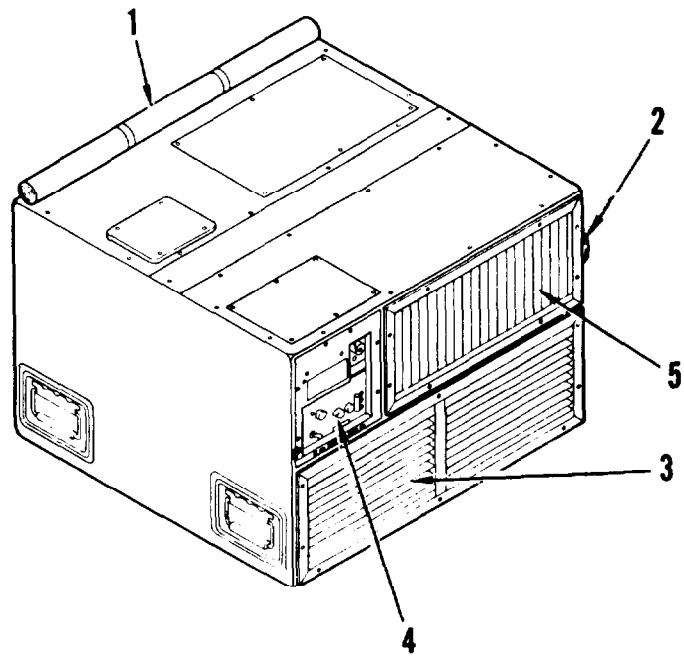


Figure 2-10. Operating instructions for ventilation

g. Stopping Instructions for Air Conditioner (See Figure 2-11). Stop air conditioner as follows:

Step 1. Turn mode selector switch to OFF.

Step 2. Position tabs to close intake louvers.

Step 3. Turn actuator to close fresh air vent damper.

NOTE

If shutdown is for an extended period, cover evaporator and condenser grilles and disconnect power cable.

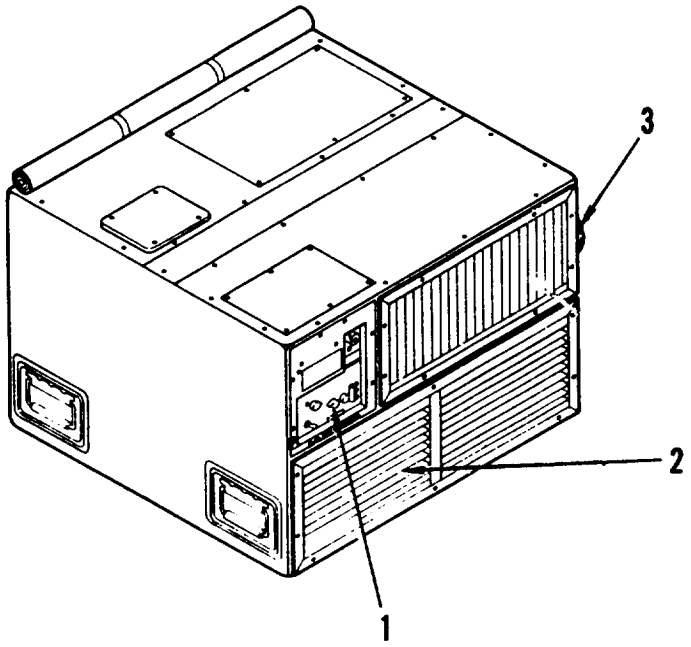


Figure 2-11. Air conditioner stopping instructions

2-13. IDENTIFICATION.

a. Identification. Each air conditioner has one major identification plate mounted on the side of the unit. The plate specifies nomenclature, military part number, BTU/hr., phase, hertz, volts, serial number, contract number, shipping weight, the manufacturer's name and address, and the model and serial numbers.

b. Information Plates. The air conditioner has the following information plates pertinent to operation.

(1) Wiring Diagram Plate. It is located on the top of the unit. This illustrates complete air conditioner wiring.

(2) Fluid Diagram Plate. It is located on the top of the unit. The plate illustrates complete air conditioner refrigerant system.

(3) Ventilation Instruction Plate. It is located on the right front side of the unit. This plate indicates the direction to turn vent adjusting knob to open or close the damper door in the ventilation air duct.

(4) Control Module Instruction Plate. It is located on the front of the unit. This plate indicates the following.

(a) The ON and OFF positions of the control circuit breaker.

(b) The ON and OFF position of the compressor circuit breaker.

(c) The various heating and cooling positions for the mode selector switch.

(d) Temperature increase and decrease positions for temperature selector switch.

(e) The HIGH and LOW position of the evaporator fan speed switch.

(f) The manufacturer's model number of the unit.

(5) Operation Caution Plate. It is located on the front of the unit above the control module. This plate warns to see TM for proper and safe operation.

(6) High Pressure and Low Pressure Reset Plates. They are located on the left side of the unit below the control module. These plates indicate location of the high and low pressure reset buttons.

(7) Service Valves (Charging). The high pressure and low pressure service valves (charging) are located on the top left side of the unit inside the service valves (charging) access panel. These plates indicate the location of the service valves (charging).

(8) Danger Warning Plate. It is located on the left side of the air conditioner near the front. This plate warns of the hazard in operating the air conditioner without a grounding wire.

(9) Nameplate. It is located on the left side of the air conditioner near the front, and contains the manufacturer's name, the air conditioner serial and model number and other pertinent nameplate data.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

NOTE

The air conditioner can be equipped for operation in chemical biological radiological (CBR) environment by connecting filtering equipment to the rectangular covered opening at the lower left side of the rear surface of the unit.

2-14. OPERATION IN EXTREME COLD.

a. General. The air conditioner is designed to operate on the heating cycle in ambient temperatures as low as minus 50°F (-45°C) and on cooling cycle with 0°F (-18°C) air entering the condenser and 70°F (21°C) air entering the evaporator.

To start unit in cool mode at 0°F (-18°C) ambient, have organizational maintenance personnel jumper LPCO switch (S-5).

b. Before Operating. Before starting on cooling cycle be sure cover is removed from condenser air intake and discharge. Clear all ice and snow from openings. Be sure all dampers are in operating condition.

c. After Operation. Install cover over condenser air intake and discharge openings.

Do not disturb wiring during cold weather unless absolutely necessary. Cold temperatures make wiring and insulation brittle and easily broken.

2-15. OPERATION IN EXTREME HEAT.

NOTE

Unit Preventive Maintenance Checks and Services (PMCS) should be performed at daily intervals.

a. General. The air conditioner is designed to operate in temperatures up to 120°F (49°C). Extra care should be taken to minimize the cooling load when operating in extreme high temperatures.

b. Protection.

(1) Check all openings in the enclosure, especially doors and windows, to be sure they are tightly closed. Limit in and out traffic if possible.

(2) When appropriate, use shades or awnings to shut out direct rays of the sun.

(3) When possible, limit the usc of electric lights and other heat producing equipment.

(4) Limit the amount of hot, outside air introduced through the fresh air damper to that essential for ventilation.

NOTE

Weatherstripping, the installation of' storm doors, and windows, if appropriate, and insulation of surfaces exposed to the outside is recommended when operating in extremely high temperatures for extended periods.

c. Cleaning.

(1) Clean outside grilles, coils, filters, and mist eliminator more frequently.

2-16. OPERATION IN DUSTY OR SANDY AREA.

NOTE

Unit Preventive Maintenance Checks and Services (PMCS) should be performed at daily intervals.

a. General. Dusty and sandy conditions can seriously reduce the efficiency of the air conditioner by clogging the air filter, mist eliminator, and coils. This will cause a restriction in the volume of airflow. Accumulation of dust or sand in

the condenser coil and/or in the compressor compartment may cause overheating of the refrigeration system. Dust or sand may also clog the condensate trap and water drain lines.

Never operate the air conditioner without having the air filters in place.

b. Protection.

(1) Shield the air conditioner from dust as much as possible.

(2) Take advantage of any natural barriers which offer protection.

(3) Limit the amount of dusty or sandy outside air introduced through the fresh air damper.

(4) Roll down and secure the fabric cover on the back of the cabinet during periods of shutdown.

c. Cleaning.

(1) Keep the air conditioner as clean as possible.

(2) Pay particular attention to the outside grilles, condenser, filters, mist eliminator, louvers, and electrical components.

(3) In extreme conditions, daily cleaning of condenser, filters, and outside grilles may be necessary.

2-17. OPERATION UNDER RAINY OR HUMID CONDITIONS.

Take special precautions to keep equipment dry. If installed outdoors, cover the equipment with a waterproof cover when it is not in use. Remove cover during dry periods. Take all necessary precautions to keep the electrical components free from moisture.

WARNING

Make sure power is disconnected from air conditioner before touching any wiring or other electrical parts.

2-18. OPERATION IN SALT WATER AREAS.

WARNING

Disconnect power source prior to washing the air conditioner.

a. General. Wash the exterior and condenser section of the unit, particularly condenser air discharge louver control mechanism, with clean fresh water at frequent intervals. Be careful not to damage electrical system with water. Special attention must be given to prevent rust and corrosion.

b. Painting. Paint all exposed areas where paint has cracked, peeled, or blistered, or report condition to organizational maintenance. Coat all exposed areas of polished metal with a light coat of grease.

*U.S. GOVERNMENT PRINTING OFFICE: 1991 554-123/20263

CHAPTER 3. MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS

3-1. FAN MOTORS.

The evaporator and condenser motors are premanently lubricated by the manufacturer and require no additional lubrication.

3-2. COMPRESSOR.

The compressor and compressor motor are fully lubricated by the manufacturer and require no additional lubrication.

Section II. TROUBLESHOOTING

3-3. GENERAL.

This section contains information that is useful in diagnosing and correcting troubles which cause the unsatisfactory operation or failure of the air conditioner.

3-4. OPERATOR'S TROUBLESHOOTING CHART.

Troubleshooting procedures for operator-crew are listed in table 3-1.

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the air conditioner. Each malfunction for an individual component, unit, or system is followed by a list of test or inspections which will help you to determine corrective actions to take. You should perform the tests/ inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

c. The table lists the common malfunctions which you may find during the operation or maintenance of the air conditioner or its components. You should perform the tests/inspections and corrective actions in the order listed.

Section III. MAINTENANCE PROCEDURES.

3-5. GENERAL.

This section contains maintenance procedures for the operator of the air conditioner. Operator maintenance is limited to inspection and procedures that can be accomplished without the aid of servicing tools. Any indications of need for servicing resulting from inspection will be reported to Direct Support.

3-6. CONDENSER FABRIC COVER.

Inspect condenser fabric cover for torn places. Repair minor tears with waterproof tape. Report extensive damage to organizational maintenance.

3-7. DRAINS.

Inspect condensate water drains, figure 1-2, for obstructions. Remove obstructions. Report total blockage to organizational maintenance.

3-8. LIQUID SIGHT INDICATOR.

Wipe refrigerant liquid sight indicator glass, figure 1-2, with a soft, clean cloth, set controls, figure 2-1, at COOL-COOLER, operate air conditioner for 15 minutes, then observe liquid sight indicator. Yellow appearance indicates moisture in system. Bubbles or milky flow indicate low refrigerant charge. Report presence of these conditions to Direct Support maintenance.

Table 3-1. Troubleshooting

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. AIR CONDITIONER FAILS TO OPERATE
Step 1. Check to see if main power cord is plugged in. Connect power cable to receptacle (Figure 2-1) supplying 208 VAC, 3 phase power of the proper frequency.
Step 2. Check to see if control and compressor circuit breakers are in OFF position. Reset circuit breakers (Figure 2-1).
Step 3. Check to see if mode selector switch is in OFF position. Turn selector switch to desired operation (Figure 2-1).
Step 4. If air conditioner still is inoperative, report condition to organization maintenance.
2. INSUFFICIENT COOLING
Step 1. Check to see if mode selector switch is in proper position. Set switch to COOL (Figure 2-1).
Step 2. Check to see if temperature selector switch is in correct position. Adjust setting to COOLER (Figure 2-1).
Step 3. Check to see if sufficient air is passing over evaporator coil. Open evaporator inlet louvers (Figure 2-1). Remove any obstructions from evaporator inlet and outlet louvers.
Step 4. Inspect for clogged air filter. Report clogged filter condition to organizational maintenance.
Step 5. Check to see if too much outside air is entering unit. Close or adjust damper door (Figure 2-1).
Step 6. Check to see if the system contains sufficient refrigerant by inspecting liquid sight indicator (paragraph 3-8).
Step 7. Check to see if evaporator fan speed switch is set to LOW speed position. Reset switch to HIGH speed position (Figure 2-1).
Step 8. Check to see if sufficient air is passing through condenser coil. Remove any obstructions from condenser fan inlet and outlet.
3. NO HEAT OR LOW CAPACITY HEAT
Step 1. Check to see if mode selector switch is properly set. Set switch to LOW HEAT or HIGH HEAT (Figure 2-1).
Step 2. Check to see if temperature selector switch is set correctly. Adjust to WARMER setting (Figure 2-1).
Step 3. Check for insufficient air movement over heaters. Remove any obstructions from evaporator air intake and discharge louvers. Make sure intake louvers are open (Figure 2-1).

CHAPTER 4. ORGANIZATION MAINTENANCE INSTRUCTIONS

Section I . SERVICE UPON RECEIPT OF MATERIAL

4-1. GENERAL.

Instructions for unloading, unpacking and installing the air conditioner are covered in Chapter 2, Section III.

4-2. INSPECTING AND SERVICING EQUIPMENT.

General inspection of the equipment is covered in Chapter 2, Section II. If possible damage has occurred, requiring removal of covers or other components not authorized for removal by the operator, further inspection of internal components is to be performed by organizational maintenance personnel. If other than new equipment has been received, a thorough inspection is to be performed. Make a thorough check to see that all wiring, lines and tubing are secure. Pay particular attention to the evaporator and condenser coils and main power receptacle connectors. Be sure that all visible wiring and insulation are not broken or frayed. Also check the evaporator and condenser fan motors.

Section II. MOVEMENT TO A NEW WORKSITE.

4-3. PREPARATION FOR MOVEMENT. To prepare the air conditioner for movement, proceed as follows.

4-4. DISMANTLING FOR MOVEMENT.

a. Disconnect main power cable, and grounding strap.

b. Disconnect drain line from outlet.

c. Disconnect air ducts and install the evaporator inlet and outlet grilles.

d. Remove unit from mounting surface.

e. If air conditioner is to be moved over a long distance, recrate it.

4-5. REINSTALLATION AFTER MOVEMENT.

After movement, follow procedures in paragraph 2-9 to reinstall the air conditioner.

Section III. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

4-6. TOOLS AND EQUIPMENT.

No tools or equipment are issued with the air conditioner. Appendix C lists the standard tools required to service the unit.

4-7. SPECIAL TOOLS AND EQUIPMENT.

No special tools or equipment are required for maintenance of the air conditioner.

4-8. MAINTENANCE REPAIR PARTS.

Repair parts and equipment are listed and illustrated in the repair parts and special tool list covering organizational maintenance for this equipment. (See TM 5-4120-369-24P.)

Section IV. LUBRICATION INSTRUCTIONS

4-9. FAN MOTORS.

The evaporator fan and condenser fan motors are permanently lubricated by the manufacturer and require no additional lubrication.

4-10. COMPRESSOR.

The compressor and compressor motor are fully lubricated by the manufacturer and requires no additional lubrication.

Section V. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

4-11. GENERAL.

Periodic maintenance checks are required by organizational maintenance personnel to check the performance of daily preventive maintenance services are required beyond the scope if the operator's maintenance.

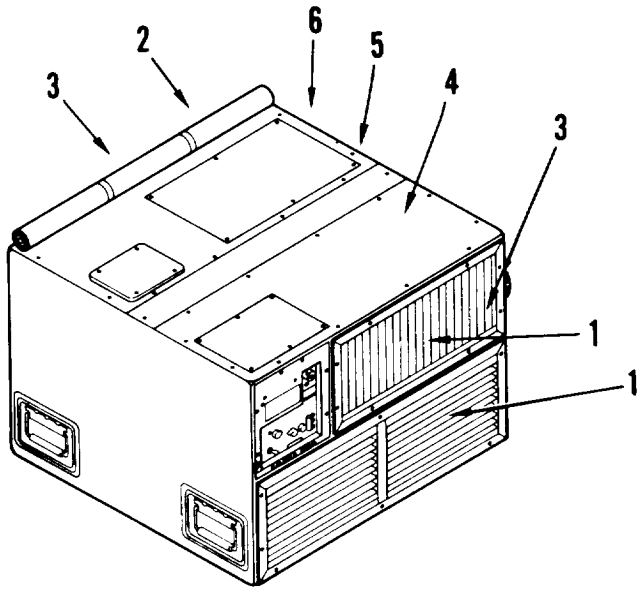
4-12. PREVENTIVE MAINTENANCE SERVICES.

a. Refer to table 4-1 for preventive maintenance services which must be performed by Organizational Maintenance personnel at the specified intervals. (A quarterly interval is equal to three calendar months, or 250 hours of operation, whichever occurs first.)

b. The item numbers are listed consecutively and indicate the sequence of inspection and minimum requirements.

c. Service intervals should be shortened under extreme or unusal conditions.

Table 4-1. Organizational Preventive Maintenance Checks and Services



	D - Daily				W-Weekly	M-Monthly	Q-Quarterly
Item No.	Interval D	W	M	Q	Item To Be Inspected	Procedures	Equipment Will Be Reported Not Ready (Red) If:
1				X	Air Filter and Mist Eliminator	Inspect and service as necessary (para. 4-3 and 4-9)	Air Filter or Mist Eliminator faulty beyond servicing
2				X	Fresh Air Screen	Inspect and clean or replace as necessary	Fresh air screen faulty beyond servicing
3				X	Evaporator Coil and Condenser Coil	Clean and Inspect (paragraph 4-5)	Coil damaged
4				X	Housing Covers	Repair or replace damaged covers (paragraph 4-18)	---
5				X	Wiring and Electrical Components	Check for damaged or frayed wiring. Check for defective electrical components. Repair or replace defective wiring. Replace defective electrical components	Repair requires opening refrigeration system.
6				X	Refrigeration System	Check compressor, valves, and piping for damage. Report damage to direct support maintenance	Repair requires opening refrigeration system.

Section VI. TROUBLESHOOTING

4-13. GENERAL.

This section contains troubleshooting instructions for the isolation of causes and common troubles that may occur during operation, and also gives the possible remedies to correct the trouble.

4-14. ORGANIZATIONAL TROUBLESHOOTING CHART.

a. General. Troubleshooting procedures for organizational maintenance personnel are listed in table 4-2. As shown in the table, troubleshooting begins by identifying the malfunction. Next, suitable tests of inspections are made in step-by-step order. Finally, a corrective action is given. Remedies beyond the scope of organizational maintenance must be given in paragraph (b) and (c) which follow :

b. Control Circuit. The cause for the failure of the system to operate can be narrowed to a specific portion of the system if the control component associated with the failure can be isolated. It is the purpose of safety devices to open the circuit under certain overload or fault conditions. If a safety device is open, additional check is required to determine if the open is due to faulty safety device or if the safety device is performing its intended function, and the fault is located else where in the system. To check the control circuit, proceed as follows:

(1) Disconnect air conditioner from source of power.

(2) Using a series test lamp or ohmmeter, check the continuity through each control in the affected circuit with the control in the closed position while being checked. Use the system schematic and wiring diagram for point-to-point circuit tracing.

(3) Replace each defective part with a serviceable like item.

c. Safety Devices. When testing the control circuit and associated components, take into account the normal state of the safety device. Determine (1) whether it is normal for the device to be open under the existing conditions or (2) if the open condition indicates trouble else where in the air conditioner.

Table 4-2. Troubleshooting

NOTE

Before you use this table, be sure you have performed all applicable operating checks.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. AIR CONDITIONER FAILS TO OPERATE
Step 1. Check to see if main power cable is connected.
Connect cable to power source.
Step 2. Check to see if main power receptacle is defective.
Replace defective connector. (Paragraph 4-16.)
Step 3. Check for loose electrical connections.
Tighten loose connections.

Table 4-2. Troubleshooting - Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. AIR CONDITIONER FAILS TO OPERATE - Continued

Step 4. Check to see if mode selector rotary switch is improperly positioned or is defective.

Turn selector to COOL or VENT. Replace switch if defective (paragraph 4-26).

Step 5. Check to see if control circuit breaker or compressor circuit breaker is in OFF position or is defective.

Reset circuit breaker(s) or replace defective circuit breaker (paragraph 4-26).

Step 6. Check to see if high pressure or low pressure switch has cutout.

Reset high pressure or low pressure cutout. Note that time delay relay starts compressor 30 seconds after reset.

Step 7. Test control circuit transformer and rectifier for faulty operation.

Replace defective transformer and/or rectifier (paragraph 4-28 and 4-29).

2. INSUFFICIENT COOLING

Step 1. Check to see if the mode selector switch is improperly positioned.

Set switch to COOL.

Step 2. Check to see if temperature selector control is inproperly positioned or is defective.

Adjust setting or replace switch (paragraph 4-26).

Step 3. Check to see if fresh air damper control is incorrectly set or improperly adjusted.

Verify setting and, if neceesary, correct adjustment of damper control (paragraph 4-39).

Step 4. Check to see if evaporator outlet louver is bent or stuck in closed position.

Repair or replace louver. (paragraph 4-7)

Step 5. Inspect condenser coil for dirt accumulation.

Clean coil (paragraph 4-5).

Step 6. Inspect evaporator return air filter for dirt accumulation.

Clean filter (paragraph 4-3).

Step 7. Check to see if evaporator fan is loose or defective.

Tighten if loose or replace if defective (paragraph 4-21).

Table 4-2. Troubleshooting - Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. INSUFFICIENT COOLING - Continued

Step 8. Check evaporator fan motor for a defective thermal protective device or evaporator fan motor is defective.

Replace motor (paragraph 4-21).

Step 9. Check refrigerant system for insufficient charge by inspecting liquid sight indicator. Presence of bubbles indicates a low refrigerant charge.

Report condition to Direct Support maintenance.

Step 10. Check for intermit tent compressor operation.

Report condition to Direct Support maintenance.

3. EVAPORATOR OR CONDENSER FAN FAILS TO OPERATE

Step 1. Check to see if main power cable is connected.

Connect cable to power source.

Step 2. Check to see if main power receptacle or plug connectors are defective.

Replace connectors or receptacle.

Step 3. Check to see if mode selector rotary switch is improperly adjusted or is defective.

Replace switch if defective (paragraph 4-26).

Step 4. Check to see if evaporator fan speed control switch is defective.

Replace defective switch (paragraph 4-26).

Step 5. Check to see if condenser fan motor thermal protector or evaporator fan motor thermal protector is defective.

Replace defective fan motor(s) (paragraph 4-22 or 4-23).

Step 6. Check to see if evaporator fan or condenser fans are binding.

Relieve binding or replace fan (paragraph 4-21 or 4-22).

Step 7. Check to see if condenser fan high-low thermostat switch is defective.

Replace defective thermostat switch (paragraph 4-31).

Step 8. Test condenser fan relay for defective operation.

Replace defective relay (paragraph 4-27).

Step 9. Test evaporator fan motor and condenser fan motor for defective operation.

Replace defective fan motor (paragraph 4-21 and 4-23).

Table 4-2. Troubleshooting - Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

4. COMPRESSOR WILL NOT START

Step 1. Set circuit breakers to ON position. Turn mode selector switch to COOL position and temperature selector switch to COOLER position.

Reset controls properly.

Step 2. Check for defective or tripped compressor internal overload switch.

Set circuit breaker and mode selector switch to off. Disconnect main power cable for at least 45 minutes; then, reconnect cable and reset controls. If condition continues, report deficiency to Direct Support maintenance.

Step 3. Check for loose electrical connections or faulty wiring.

Tighten loose connections. Repair faulty wiring.

Step 4. Test for open control circuit by means of continuity check (paragraph 4-32).

Report open-circuit condition to Direct Support maintenance.

Step 5. Check to see if contacts on high or low pressure cutout switch are open.

Reset pressure switches. If condition continues, report deficiency to Direct Support maintenance.

Step 6. Test control circuit breaker and compressor circuit breaker for faulty operation.

Replace defective circuit breaker (paragraph 4-27).

Step 7. Test control transformer and rectifier for defective opertion.

Replace defective transformer (paragraph 4-28) and defective rectifier (paragraph 4-29).

Step 8. Test for defective time delay relay.

Replace defective relay (paragraph 4-27).

Step 9. Test for defective compressor relay.

Replace defective relay (paragraph 4-27).

Step 10. Check to see if compressor motor is defective. Test for open or grounded winding (paragraph 4-35).

Report motor-fault condition to Direct Support maintenance.

5. COMPRESSOR STARTS BUT CUTS OUT ON OVERLOAD

Step 1. Check for high pressure due to improper condenser coil air flow.

Clean condenser coil and louvers. Verify proper operation of condenser fans and louvers.

Table 4-2. Troubleshooting - Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

5. COMPRESSOR STARTS BUT CUTS OUT ON OVERLOAD

Step 2. Test condenser fan for motor failure.

Replace defective motor (paragraph 4-23).

6. EVAPORATOR AIR OUTPUT VOLUME LOW

Step 1. Check to see if evaporator fan speed switch is set at low speed.

Reset switch to HIGH speed.

Step 2. Check for dirty or damaged filter or mist eliminator.

Clean or replace filter (paragraph 4-3). Clean or replace mist eliminator (paragraph 4-9).

Step 3. Check for iced or dirty evaporator coil.

De-ice by operating in low heat mode and clean coil (paragraph 4-5).

Step 4. Inspect evaporator fan for defect.

Replace defective fan.

Step 5. Test fan motor for faulty operation.

Replace motor (paragraph 4-21).

7. CONDENSER AIR OUTLET VOLUME LOW

Step 1. Check for dirty condenser coil or guard.

Clean coil and guard (paragraph 4-4).

Step 2. Check to see if air outlet louvers are stuck in closed position.

Free louvers and control cable. Adjust control, or notify Direct Support maintenance if actuating cylinder is not functioning properly.

Step 3. Check for defective HIGH-LOW condenser fan thermostatic switch.

Replace switch (paragraph 4.26).

Step 4. Inspect for defective condenser fan.

Replace fan.

Step 5. Test for defective fan motor.

Replace motor (paragraph 4-23).

8. AIR CONDITIONER FAILS TO HEAT

Step 1. Check to see if mode selector switch improperly adjusted.

Reset selector LOW heat or HIGH heat.

Table 4-2. Troubleshooting - Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

8. AIR CONDITIONER FAILS TO HEAT - Continued

Step 2. Check to see if temperature selector control is set correctly.

Adjust control to WARMER.

Step 3. Inspect evaporator return air filter for dirty condition.

Clean filter (paragraph 4-3).

Step 4. Inspect for defective temperature selector switch or mode selector switch.

Replace defective switch (paragraph 4-26).

Step 5. Inspect for defective heater high temperature cutout thermostatic switch.

Replace defective thermostatic switch (paragraph 4-31).

Step 6. Test for defective heater relay.

Relay defective relay (paragraph 4-27).

Step 7. Inspect and test for defective heaters and associated wiring.

Tighten connections and repair damaged wiring. Replace defective heater (paragraph 4-30).

Step 8. Test for defective evaporator fan motor.

Replace motor (paragraph 4-21).

9. EXCESSIVE NOISE

Step 1. Check evaporator fan or condenser fan for loose blades or loose mounting.

Tighten fan blade on motor shaft. Tighten all mounting hard ware.

Step 2. Test for defective or worn evaporator or condenser fan motor.

Replace worn or defective motor (paragraph 4-21 and 4-23).

Step 3. Check to see if compressor knocks or chatters.

Stop air conditioner and report condition to Direct Support maintenance.

Section VII. MAINTENANCE OF AIR CONDITIONER

4-15. GENERAL.

This section describes the testing, removal, and installation of the system components which are the responsibility y of organizational maintenance. Use the wiring digram (FO-1) to check the exact connections of wiring. Refer to the schematic (FO-2) for component nomenclature and as a guide for troubleshooting.

NOTE

When disconnecting any electrical wiring tag or mark wire as to location removed from, for easy reconnection.

4-16. ELECTRICAL CONNECTOR (P1)

NOTE

Remove connector only when inspection reveals need for replacement.

a. Test.

Using continuity tester test each connection to shell, any continuity is cause for replacement.

Using continuity tester test from pin mating surface to rear connection of wire, no continuity is cause for replacement.

b. Removal.

(1) Remove connector.

(2) Tag wires, and unsolder from connector.

c. Replacement.

(1) Using wiring diagram, (FO-1) solder wires to connector.

4-17. SHOCK MOUNTS

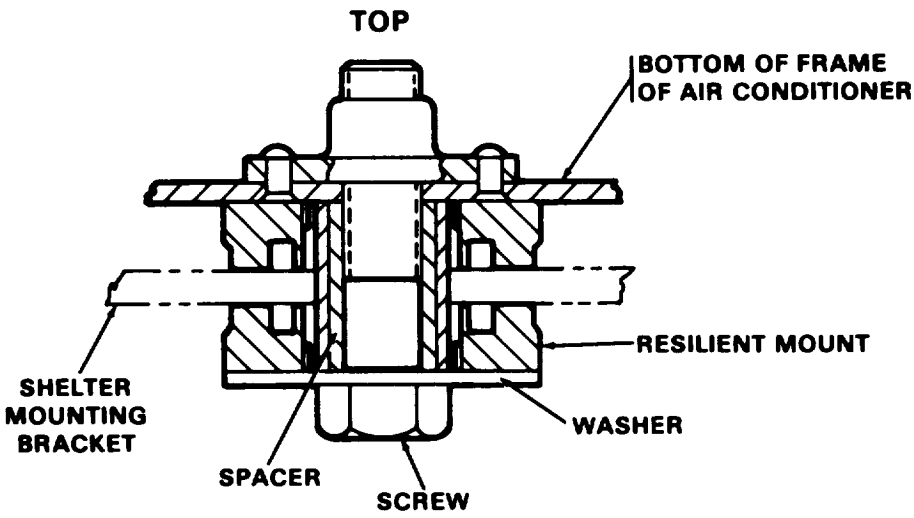


Figure 4-1. Shock mount removal and installation.

a Inspection.

Inspect for looseness of hardware. Tighten as required. Inspect for deterioration. Deterioration is cause for replacement.

b. Removal. (Typical for all four shock mounts.)

(1) Remove screw and washer.

(2) Remove shock mount.

c. Installation.

(1) Put shock mount in place.

(2) Install washer and screw.

4-18. TOP COVERS AND CONDENSER FABRIC COVER.

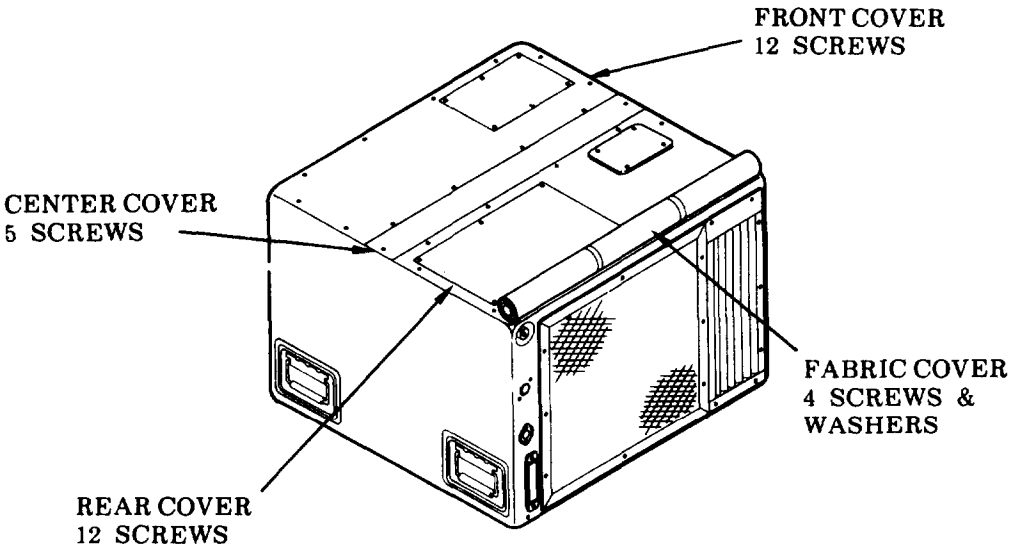


Figure 4-2. Top covers and condenser fabric cover removal and installation.

a. Removal.

(1) Remove top front cover 12 screws. Remove this front cover first as it provides access to one screw of the center cover that is not visible from the outside. Remove cover.

(2) Remove 4 screws and washers holding condenser fabric cover in place. Remove fabric cover.

(3) Remove top rear cover 12 screws. Remove cover.

(3) Remove top center cover 5 screws. Remove cover.

b. Inspection and Repair.

Inspect condenser fabric cover for tears. Repair minor tears with waterproof tape. Inspect top covers for dents, breaks, chipped paint and damaged gaskets or insulation. Inspect for minor dents in top covers and make sure that covers are installed flush with mating surfaces of the housing. If top covers cannot be repaired, install replacement covers.

c. Installation.

(1) Install top center cover, secure with 5 screws.

(2) Install top rear cover, secure with 12 screws.

(3) Install condenser fabric cover, secure with 4 screws and washers.

(3) Install top front cover, secure with 12 screws.

4-19. RETURN AIR FILTER, RETURN (INLET) LOUVERS, AND OUTLET LOUVERS.

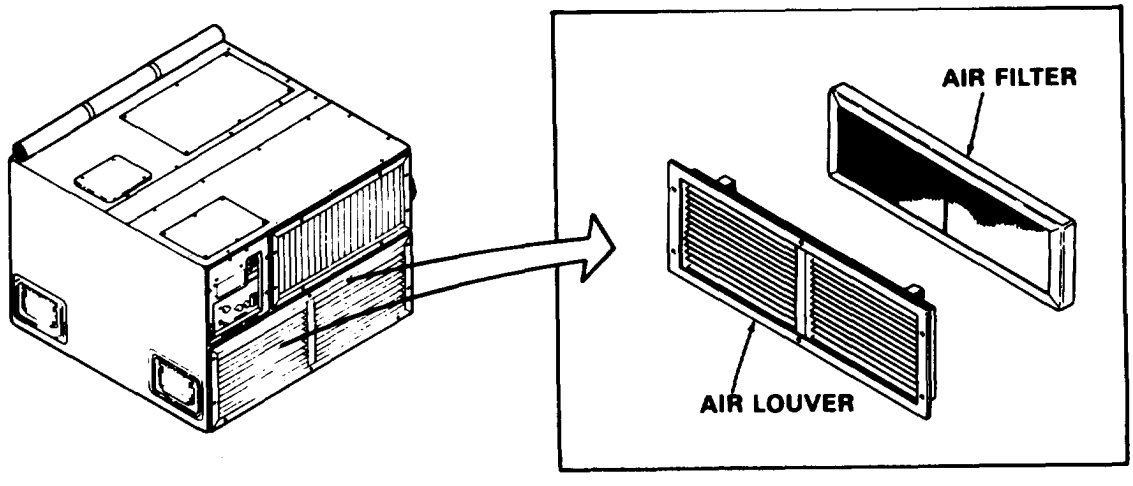


Figure 4-3. Evaporator inlet, outlet louvers, and filter removal and installation.

a. Removal.

(1) Remove 8 screws and lock washers.

(2) Remove evaporator air inlet louver.

(3) Slide the return air filter from the four filter retaining clips.

(4) Remove screws and lock washers

(5) Remove air outlet louvers.

4-19. RETURN AIR FILTER, RETURN (INLET) LOUVERS, AND OUTLET LOUVERS. - Continued

b. Service the return air filter as follows:

WARNING

Cleaning solvent, Federal Specification P-i) -680, Type II, used for cleaning electrical parts, is flammable and gives off poisonous vapors. Use only in a well ventilated area. A void prolonged breathing of vapors. Keep solvent and vapors away from open flame. Do not use in excessive amounts.

(1) Clean filter with cleaning solvent (Federal Specification P-D-680) if lubricating oil is used as the dust collecting adhesive. Clean filter with water if a water soluble filter coater (Appendix D) is used as the duct collecting adhesive. Flush the filter with sol vent or water in opposite direction of air flow. Be careful not to damage filter during cleaning. Replace filter if the frame is bent or the filtering material is damaged.

(2) Shake excess solvent or water from filter and allow to dry thoroughly. If available, low pressure compressed air (15 psig) can be used to speed drying. When using compressed air for drying filter, always direct the air stream in the opposite direction of the filter air flow. Hold the air nozzle a safe distance away from the filter to prevent compressing or separating the filtering material.

(3) Coat the filter with a dust collecting adhesive (see Appendix D) by immersion or spraying. Make sure that the total air filtering surface is thoroughly covered with the adhesive when spraying the filter. Allow excessive adhesive to drain before installing filter.

c. Installation.

(1) Slide the air filter into four filter retaining clips.

(2) Install evaporator inlet louver.

(3) Replace the 8 screws and washers.

(4) Install evaporator outlet louver.

(5) Replace the 8 screws and the 4 washers.

4-20. CONDENSER GUARD.

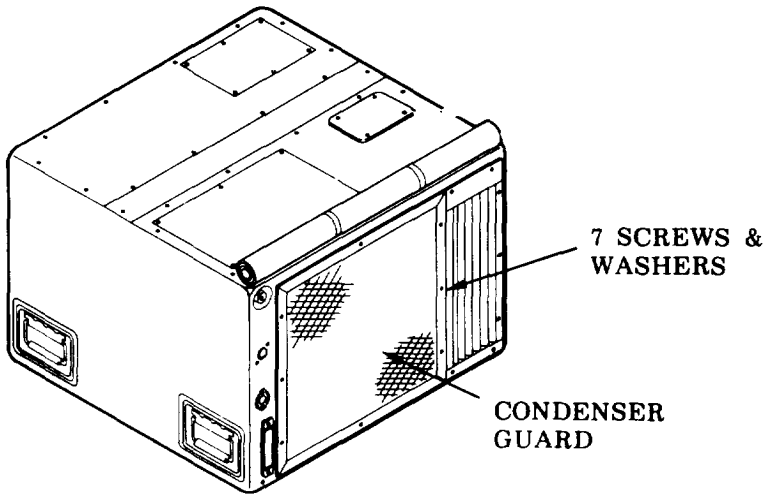


Figure 4-4. Condenser guard removal and installation.

NOTE

Remove any obstructions. Brush off loose dirt and wipe clean.

a. Removal :

(1) Remove the 7 screws and lock washers.

(2) Remove condenser guard.

(3) With guard removed, wipe condenser coil clean.

b, Installation.

(1) Install guard, secure with 7 screws and lock washers.

4-21. MIST ELIMINATOR.

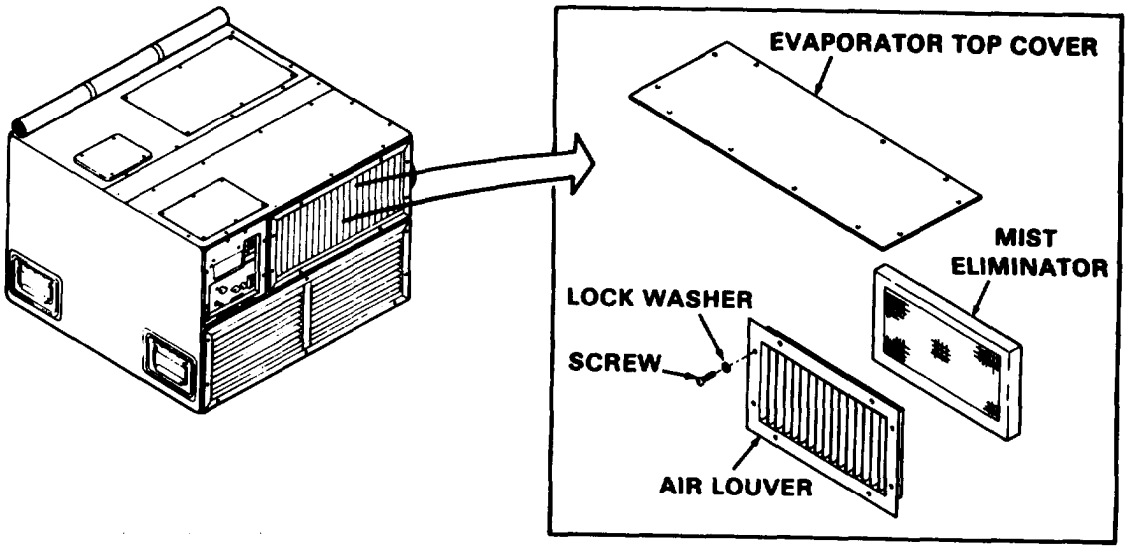


Figure 4-5. Mist eliminator removal and installation

a. Removal.

(1) Remove top front cover (paragraph 4-18) .

(2) Lift out mist eliminator.

b. Inspection and Service.

(1) Inspect the face area of the mist eliminator for breaks, or any other physical damage, and clogged areas.

4-21. MIST ELIMINATOR - Continued.

(2) Although the mist eliminator should not require any service normally, it may become clogged and dirty. The cleaning procedure is as follows:

WARNING

Cleaning solvent, Federal Specification P-D-680, Type 11, used for cleaning electrical parts, is flammable and gives off poisonous vapors. Use only in a well ventilated area. Avoid prolonged breathing of vapors. Keep solvent and vapors away from open flame. Do not use in excessive amounts.

(a) Clean filter with cleaning solvent (Federal Specification P-D-680) if lubricating oil is used as the dust collecting adhesive. Clean filter 'with water if a water soluble filter coaster (Appendix D) is used as the duct collecting adhesive. Flush the filter with solvent or water in opposite direction of air flow. Be careful not to damage filter during cleaning. Replace filter if the frame is bent or the filtering material is damaged.

(b) Shake excess solvent or water from filter and allow to dry thoroughly. If available, low pressure campressed air (15 psig) can be used to speed drying. When using compressed sir for drying filter, always direct the air stream in the opposite direction of the filter air flow. Hold the air nozzle a safe distance away from the filter to prevent compressing or separating the filtering material.

(c) Coat the filter with a dust collecting adhesive (see Appendix D) by immersion or spraying. Make sure that the total air filtering surface is thoroughly covered with the adhesive when spraying the filter. Allow excessive adhesive to drain before installing filter.

c. Installation.

(1) Install mist eliminator by sliding down into position.

(2) Replace top front cover (paragraph 4-18) .

4-22. EVAPORATOR COIL AND AND CONDENSING COIL.

The coils (heat exchangers) should be serviced as often as necessary to insure maximum operating capacity of unit Dirt and lint loaded coils or bent coil fins not only restrict normal volume of air flow, but also insulate the coils, thus reducing their efficiency as heat exchangers. Frequent cleaning of the external coil surfaces may avoid internal clogging. Clean external surfaces with a soft bristled brush or a plastic fin comb. The plastic fin comb can be used to straighten bent coil fins. Clean internally-clogged coils with compressed air. Always direct the compressed sir stream straight into coils, to avoid bending fins, and in the opposite direction of normal air flow. Remove covers and louvers (paragraphs 4-18, 4-19, 4-20) to service coils.

4-23. DAMPER DOOR VENT SCREEN.

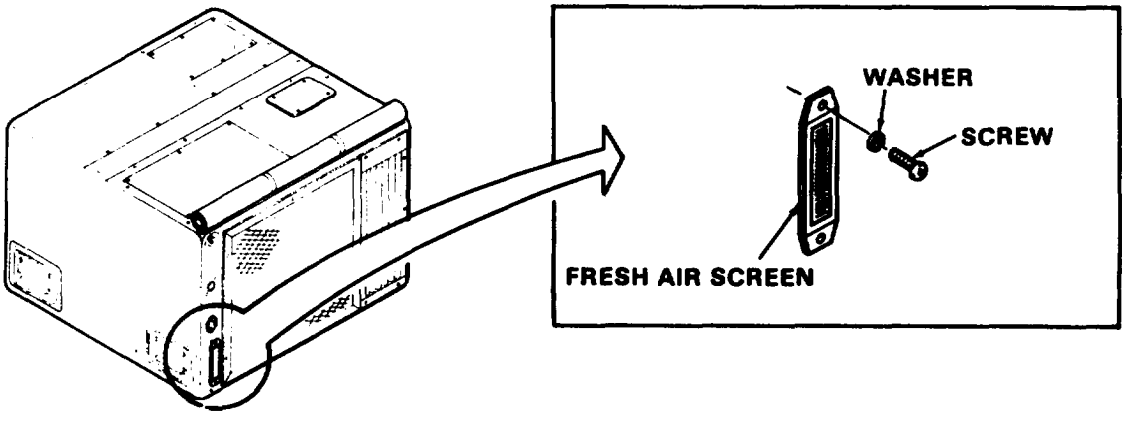


Figure 4-6. Damper door vent screen removal and installation.

a. Removal.

(1) Remove 2 screws and washers.

(2) Remove damper door vent screen.

b. Service Vent Screen. Flush the screen with clear water and dry.

c. Installation.

(1) Install vent door screen, secure with 2 screws and lock washers.

4- 24 CONDENSER LOUVERS

a. Inspect.

(1) Inspect condenser louvers for looseness of hardware

(2) Inspect for bent or jammed louvers.

b. Service.

(1) Clean louvers, and remove any dirt jamming the opening.

(2) Clean top and bottom of louvers at hinge points to be sure louvers can rotate easily.

4-25. CONDENSATE WATER DRAIN TUBES.

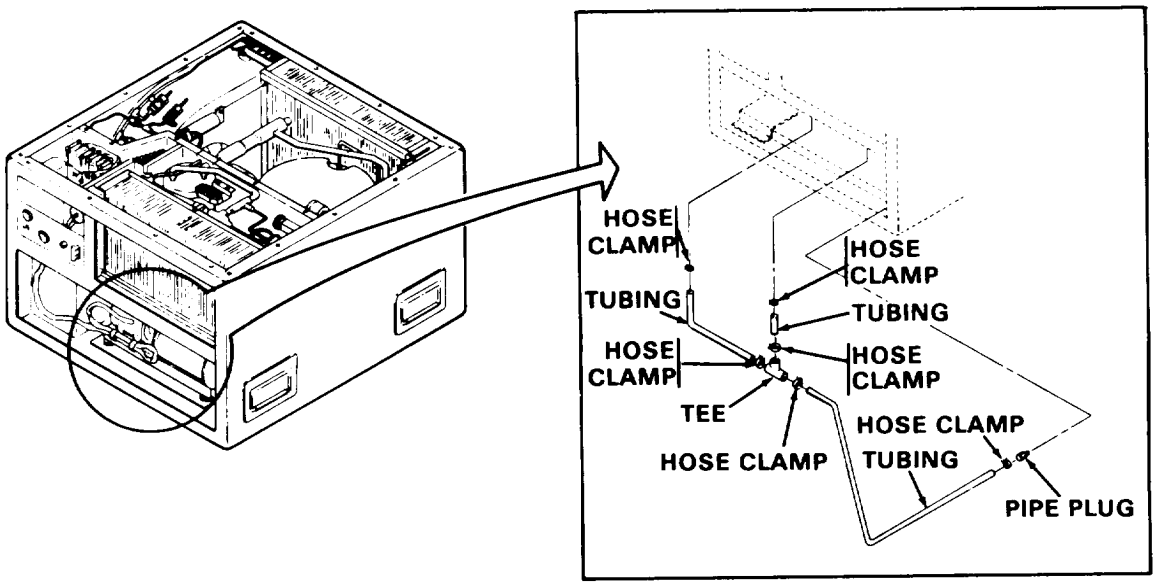


Figure 4-7. Condensate water drain tubes.

a. Removal,

(1) Refer to paragraph 4-19 and remove the evaporator air inlet louver and air filter.

(2) Refer to figure 4-7 and remove clamps which hold plastic drain tubes to fittings.

b. Inspection and Servicing.

(1) Inspect tubes for cracks, obstructions and loose connections.

(2) Clean tubes wit h low pressure compressed air or flush with water.

c. Installation.

(1) Refer to figure 4-7 and replace tubes and clamp securely.

(2) Refer to paragraph 4-19 and replace the evaporator air inlet louver.

4-26. VENT DAMPER AND ACTUATOR KNOB.

a. Removal.

(1) Refer to paragraph 4-18 and remove top covers.

(2) Refer to paragraph 4-19 and remove the evaporator air inlet and outlet louver.

(3) Refer to figure 4-8 and disassemble the vent damper and knob as follows:

(a) Loosen the two cable setscrews (in both ends).

(b) Remove the cable.

(c) Remove the damper.

(d) Raise the damper.

(e) Remove screws, nuts and knob.

b. Installation.

(1) Refer to figure 4-8 and install the vent actuator as follows:

(a) With inner nuts in place, install the outer cable in the support bracket.

(b) Install the grommet in the intermediate cable support.

(c) Fasten the cable ends in the support brackets by installing the outer nuts.

(d) Thread the cable through the housing. Attach the end of the cable to the vent door.

(e) Lubricate the threads on the actuator, install actuator and nut in the fixed actuator bracket, then install the removable bracket. Ensure that bushings are in both brackets with the bushing flange adjacent to the actuator nut. Rotate actuator nut to the left (counter-clock wise) to place the actuator in the uppermost position.

(2) Adjust the damper actuator as follows:

(a) Ensure that the damper door is closed.

(b) Insert cable end in actuator, adjusting, if necessary, the cable nuts to properly seat the cable end in the actuator.

(c) Tighten the actuator setscrew onto the cable.

(3) Refer to paragraph 4-19 and install the evaporator air inlet and outlet louvers.

(4) Refer to paragraph 4-18 and install top covers.

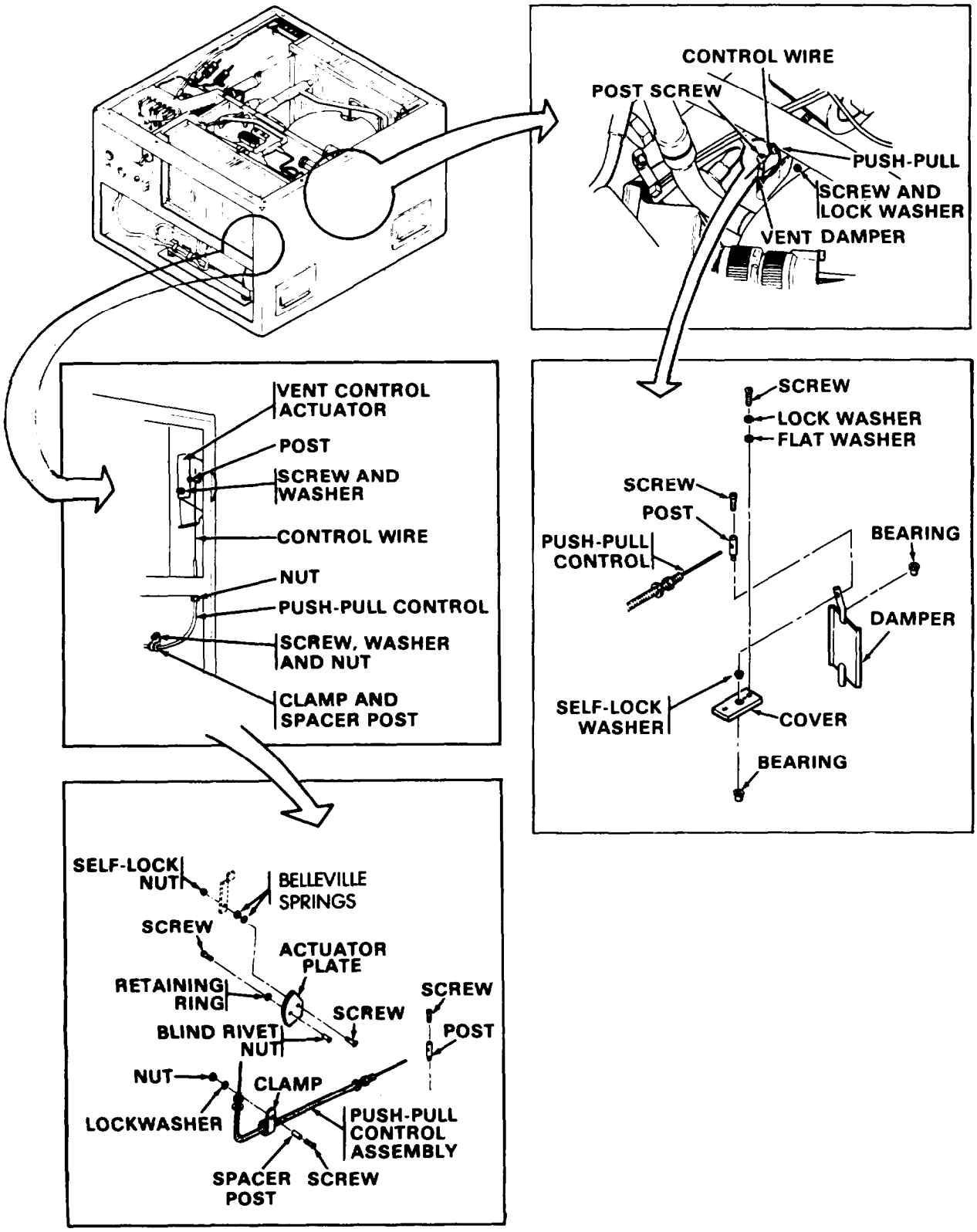


FIGURE 4-8. Vent Damper actuator and actuator knob.

4-27. CONTROL MODULE.

a. General. The control panel is located in the upper left front corner of evaporator section. The control module is mounted on the junction box by a long bolt with a slotted steel knob. The function box and control module contain all of the electrical controls on the unit.

NOTE

After the control module has been removed only the defective component shall be removed.

CAUTION

Do not turn control module mounting bolt unless unit has been disconnected from power source.

b. Removal.

(1) Refer to paragraph 4-19 and remove the evaporator and inlet louver.

(2) Remove 2 screws and clamp holding thermocouple.

(3) Loosen mounting bolt, do not pull control module from unit.

(4) Slowly pull control module from junction box, as module clears unit feed thermocouple lead through hole. Be careful to avoid kinking lead.

(5) Remove control module from unit.

c. Installation.

(1) Feed thermocouple through hole in junction box.

(2) Slide control module into junction box, tighten mounting bolt.

(3) Position thermocouple, secure with 2 clamps and screws,

(4) Refer to paragraph 4-19 and install front air inlet louver

4-28. CONTROL MODULE COMPONENTS,

a. General. The control module components consist of the compressor circuit breaker, mode selector switch (rotary) , temperature control switch, and the evaporator fan speed relay switch. All components have the save inspection and test requirements. The compressor circuit breaker is a safety device which provides overcurrent protection for the compressor. The control circuit breaker provides protection for the DC control system.

b. Inspection and Test. Before removing any of the control module components check for loose connections, pitted contacts, and cracked or broken casings. Refer to wiring diagram (FO - 1) and check for continuity with a multimeter. If no continuity exists with the circuit breaker in the ON position, or if a casing is broken or cracked, replace the circuit breaker.

(1) Compressor circuit breaker (CB - 1)

(a) Testing.

Check for loose connections, loose control knob and cracked or broken casing Check for continuity with a multimeter.

If no continuity exists in either one of the two “ON” positions or if the casing is broken or cracked, replace the circuit breaker. If knob is loose, tighten set screw. If knob is defective, replace.

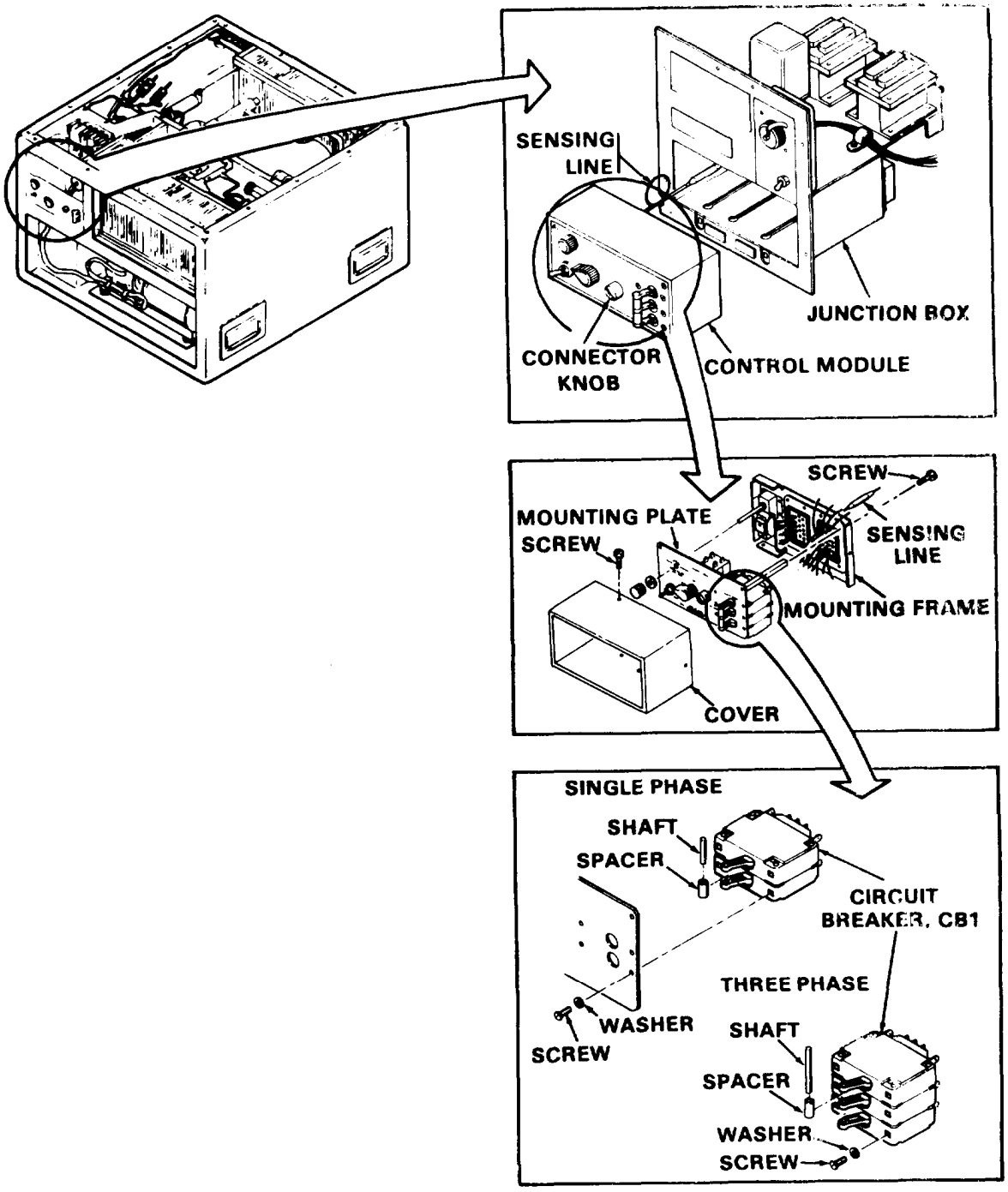


Figure 4-9. Compressor circuit breaker (CB - 1)

4-28. CONTROL MODULE COMPONENTS - Continued.

(b.) Removal.

(1) Remove control module per paragraph 4-27

(2) Remove pin from circuit breaker.

(3) Remove 4 screws.

(4) Remove wires from circuit breaker.

(5) Remove circuit breaker,

(c) Installation.

(1) Install the compressor circuit breaker, reconnect the wires, secure circuit breaker with 4 screws.

(2) Replace pin.

(3) Install the control module per paragraph 4-27.

(2) Mode Selector Switch (Rotary). (S-1)

(a) Testing Check for loose connections, loose control knob and cracked or broken casing. Check for continuity with a mulimeter.

If no continuity exists with switch in either one of the four “ON” positions or if the casing is broken or cracked, replace the mode selector switch. If knob is loose, tighten set screw. If knob is defective, replace.

(b) Removal,

(1) Remove control module per paragraph 4-27

(2) Remove knob from switch.

(3) Remove 3 screws

(4) Remove wires from switch,

(5) Remove switch.

(c) Installation.

(1) Install the mode selector switch, reconnect the wires, secure switch with 3 screws.

(2) Replace knob.

(3) Install the control module per paragraph 4-27.

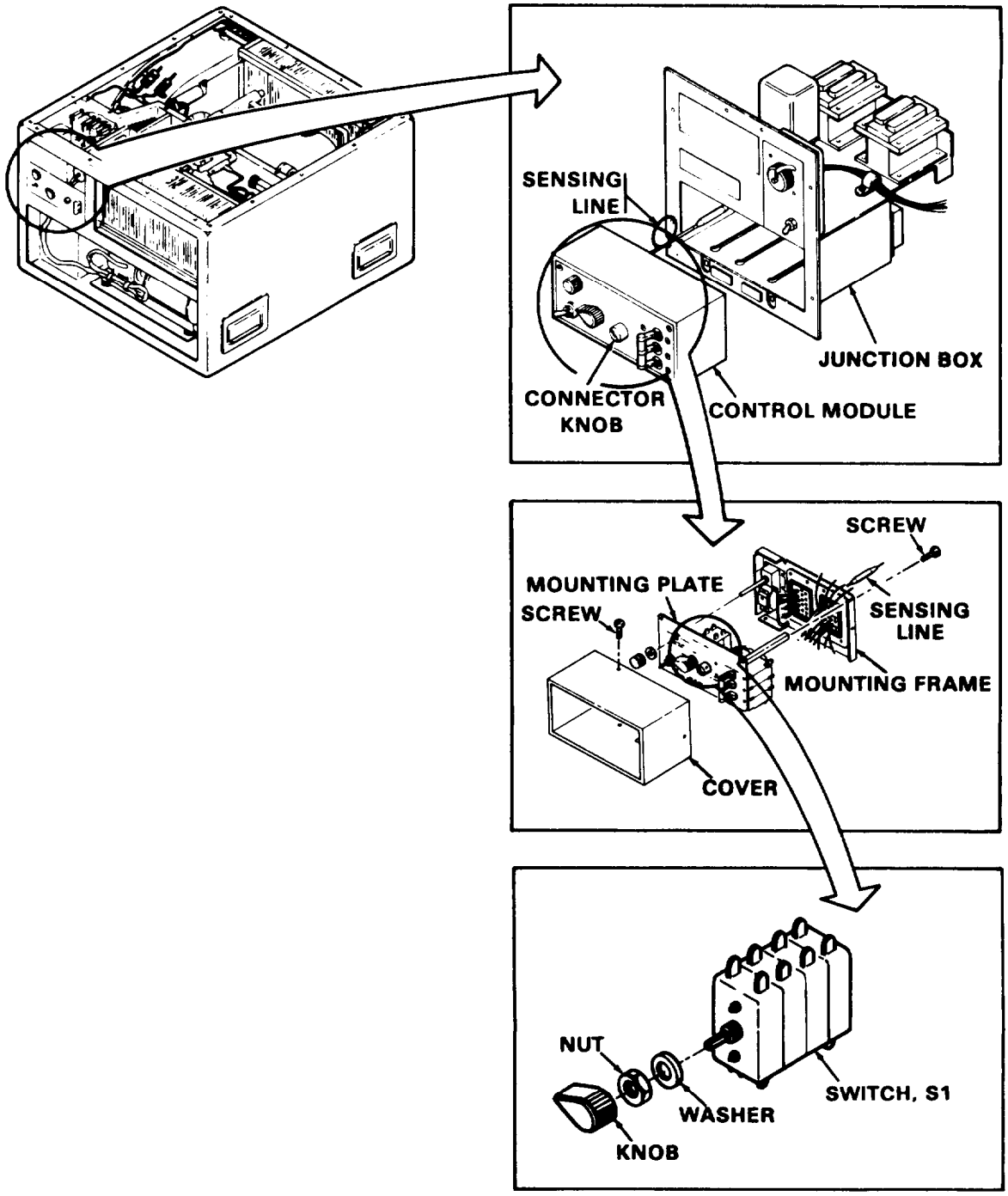


Figure 4-10. Mode selector switch removal and installation

4-28. CONTROL MODULE COMPONENTS - Continued.

(3) Evaporator fan switch (S-2).

(a) Testing Check for loose connections, loose control knob and cracked or broken casing. Check for continuity with a multimeter.

If no continuity exists with switch in either one of the four "ON" positions or if the casing is broken or cracked, replace the mode selector switch. If knob is loose, tighten set screw. If knob is defective, replace.

(b) Removal.

(1) Remove control module per paragraph 4-27

(2) Refer to figure 4-11 and remove the evaporator fan speed switch.

(c) Installation.

(1) Refer to figure 4-11 and install the evaporator fan speed switch.

(2) Refer to para 4-27 and install the control module.

(4) Temperature Control Switch (S-3)

(a) Testing Check for loose connections, loose control knob and cracked or broken casing. Check for continuity with a multimeter.

If no continuity exists or if the casing is broken or cracked, replace the temperature control switch . If knob is loose, tighten set 'screw. If knob is defective, replace.

(b) Removal.

(1) Remove control module per paragraph 4-27

(2) Refer to figure 4-12 and remove the temperature control switch.

(c) Installation.

(1) Refer to figure 4-12 and install the temperature control switch.

(2) Refer to para 4-27 and install the control module.

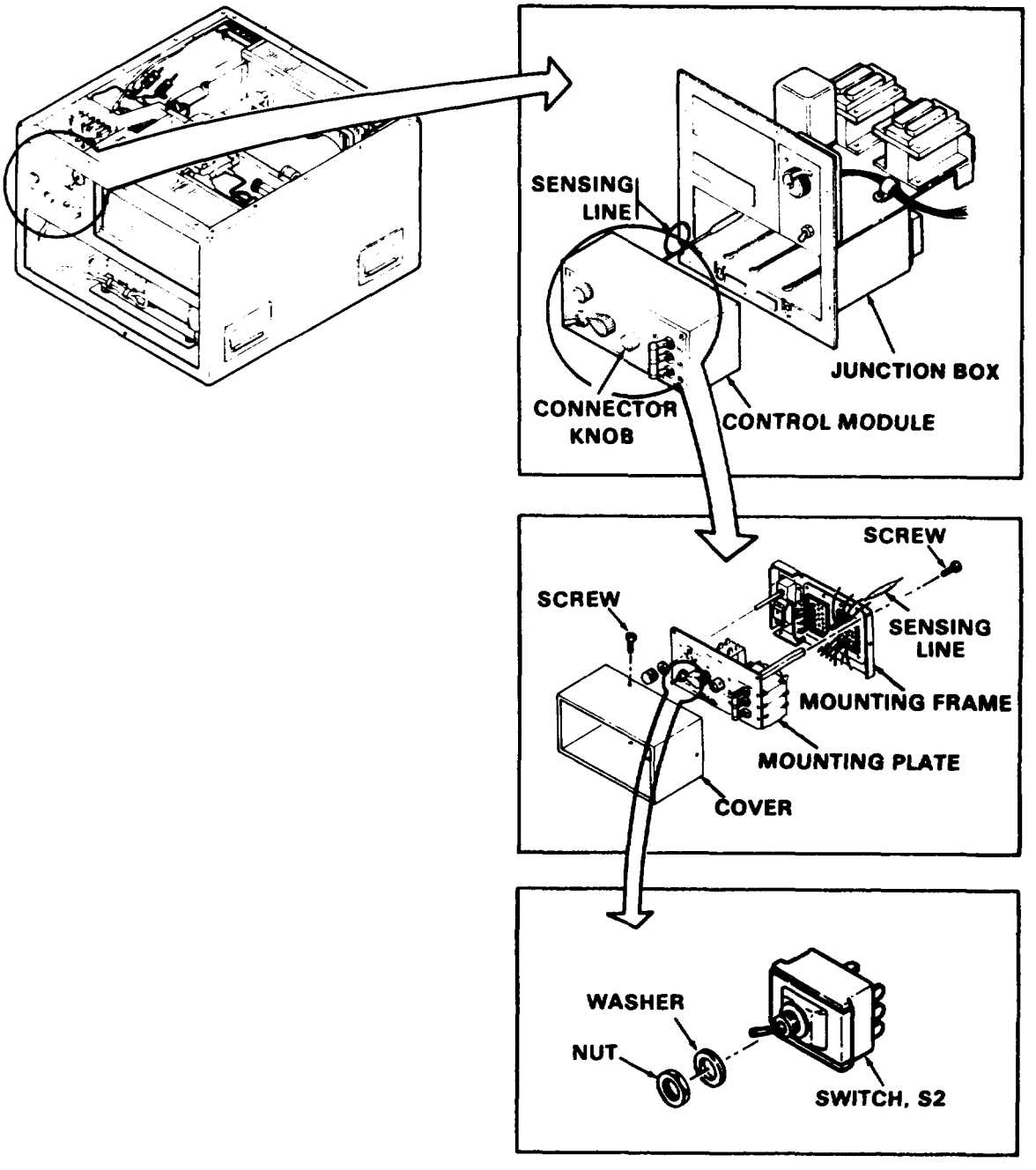


Figure 4-11. Evaporator Fan Switch. (S-2)

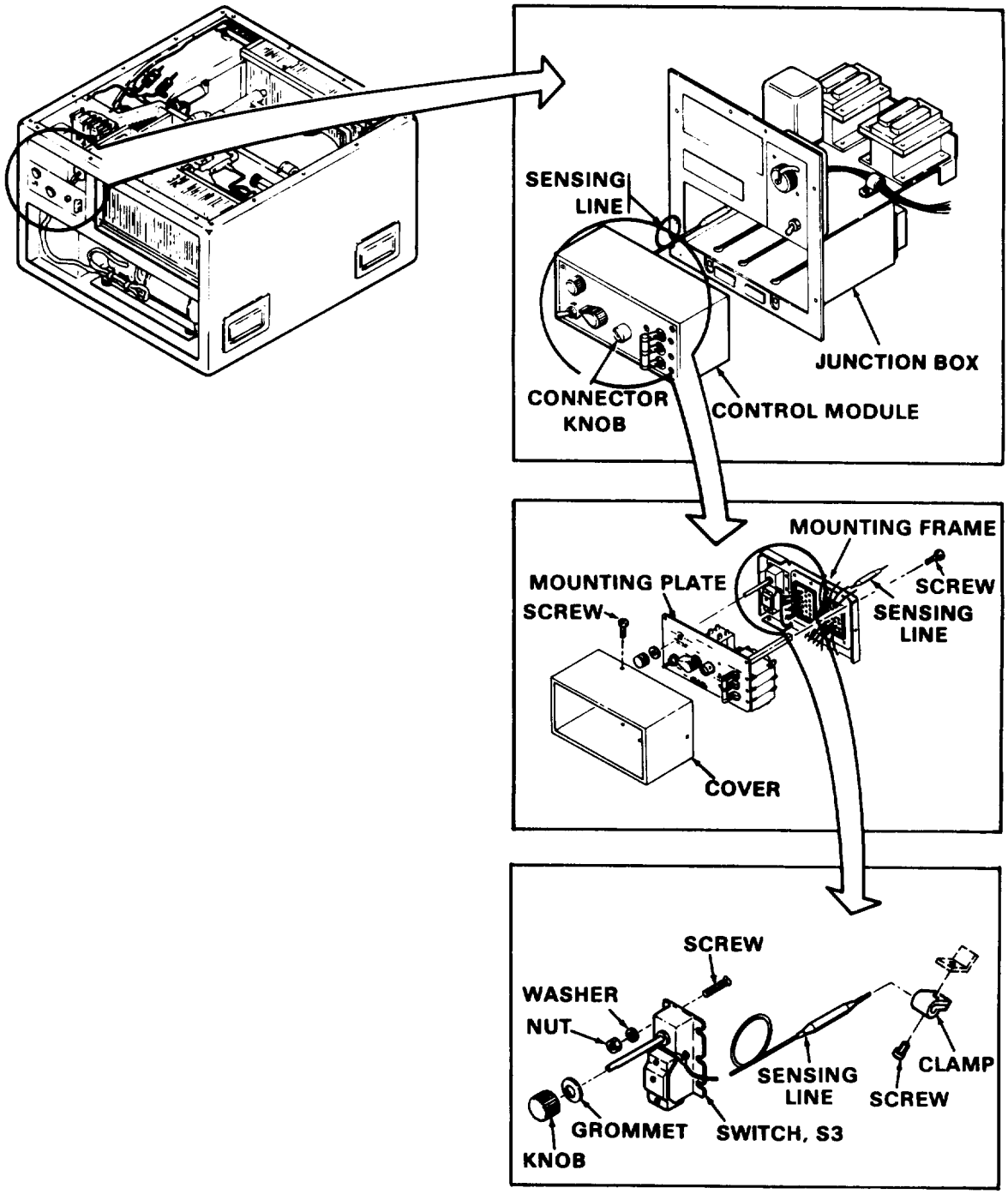


Figure 4-12. Temperature Control Switch (S3)

4-29. JUNCTION BOX.

a. General. The junction box is located in the upper left front corner of evaporator section. The control module is mounted on the junction box by a long bolt with a slotted steel knob. The junction box and control module contain all of the electrical controls on the unit.

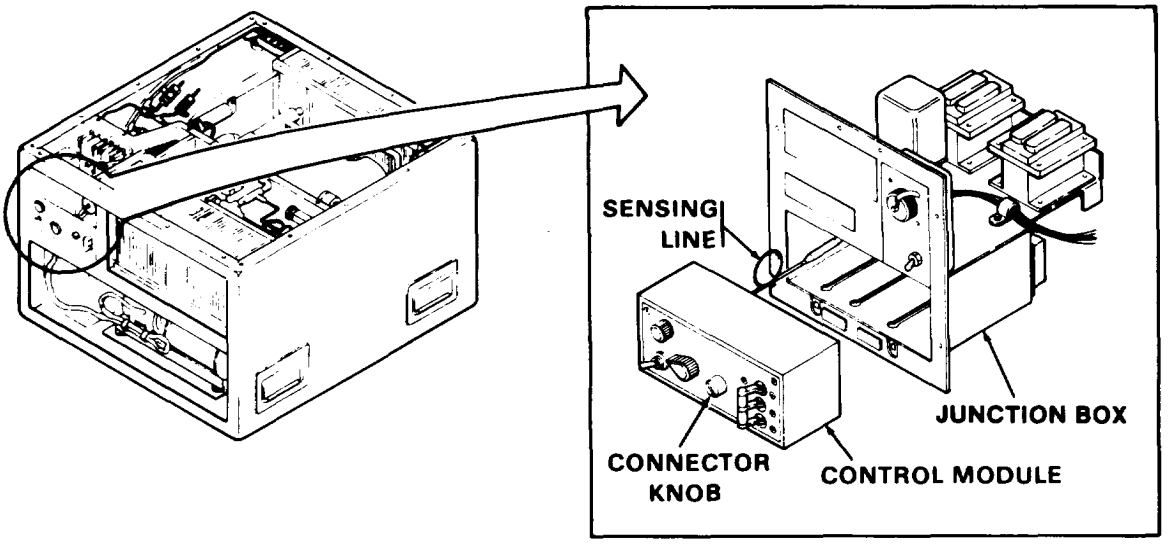


Figure 4-13. Junction Box

CAUTION

Do not remove junction box unless unit has been disconnected from power source.

b. Removal.

(1) Refer to paragraph 4-18 and remove the top front cover.

(2) Refer to paragraph 4-27 and remove control module.

(3) Remove 7 screws holding junction box in place.

(4) Pull junction box from unit to expose wiring, disconnect wiring.

(5) Remove junction box.

c. Installation.

(1) Install junction box part way into unit reconnect wires (refer to diagram FO-1).

(2) Slide junction box into unit and secure with 7 screws.

(3) Refer to paragraph 4-27 and install control module.

(4) Refer to paragraph 4-18 and install top front cover.

4-30. JUNCTION BOX COMPONENTS.

a. General. The junction box components consist of the following: contol circuit breaker, time delay relay, heater relay, condenser fan motor relay, compressor relay, terminal boards and power input connector.

b. Inspection and Test. Before removing any of the junction box components, check for loose connections, pitted contacts, and cracked or broken casings. Refer to wiring diagram (FO-1) and check for continuity with a multimeter. If no continuity exists, or a casing or a casting is broken or cracked, replace only the defective component.

(1) 'Time Delay Relay (Compressor) (K-1).

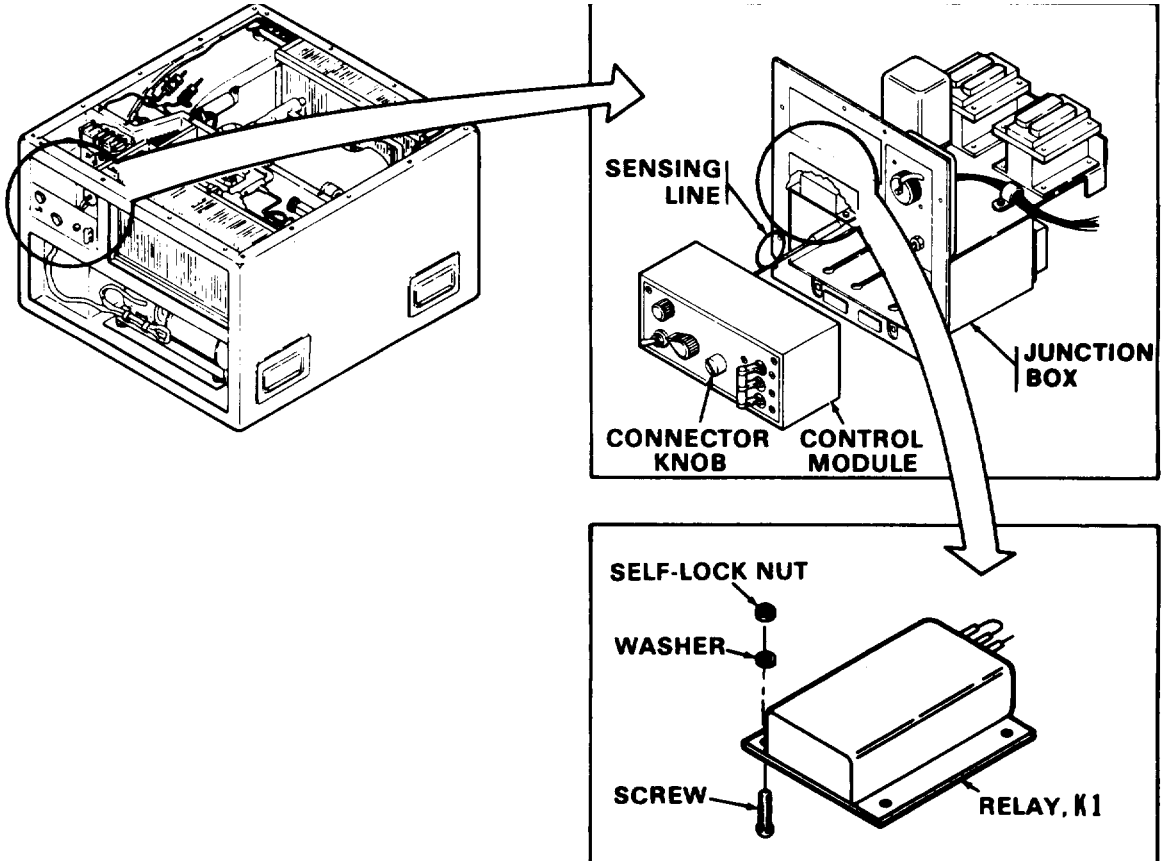


Figure 4-14. Time Delay Relay.

(a) Testing Turn mode selector switch to cool and note time lapse between starting of fan motors and starting of compressor. If time lapse is less than 27 seconds or more than 33 seconds, replace the relay.

(b) Removal.

(1) Refer to paragraph 4-29 and remove the junction box.

(2) Refer to figure 4-14 and remove the time delay relay.

(c). Installation.

(1) Refer to figure 4-14 and install the time delay relay.

(2) Refer to paragraph 4-29 and install the junction box.

4-30. JUNCTION BOX COMPONENTS - Continued.

(2) Heater Relay (K-2).

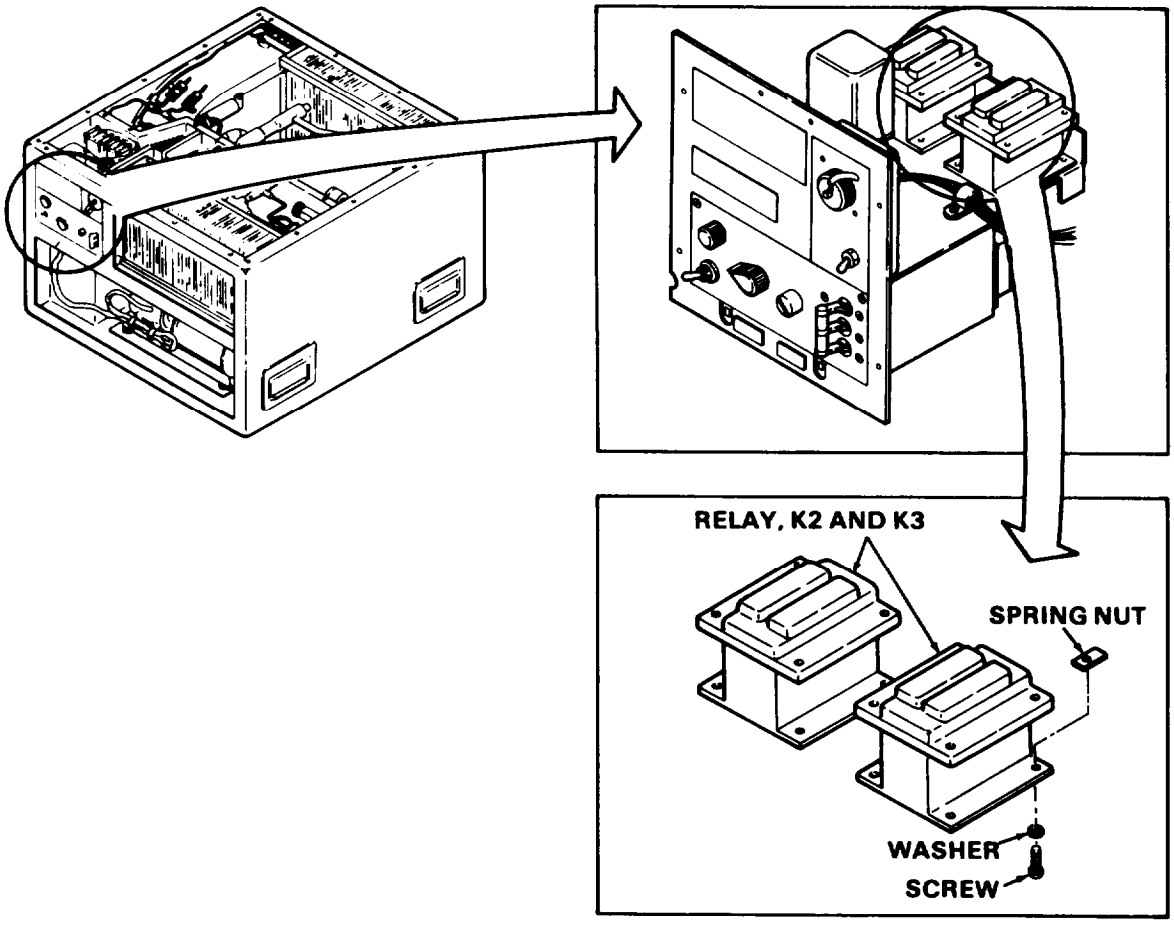


Figure 4-15. Heater Relay (K-2)

(a) Testing Check for loose connections and cracked or broken casing. Check for continuity with a multimeter. If no continuity exists, or if the casing is cracked or broken, replace the relay.

(b) Removal.

(1) Refer to paragraph 4-29 and remove the junction box.

(2) Refer to figure 4-15 and remove the heater relay.

(c) Installation.

(1) Refer to figure 4-15 and install the fixed heater relay.

(2) Refer to paragraph 4-29 and install the junction box.

4-30. JUNCTION BOX COMPONENTS - Continued.

(3) Control Circuit Breaker. (CB-2)

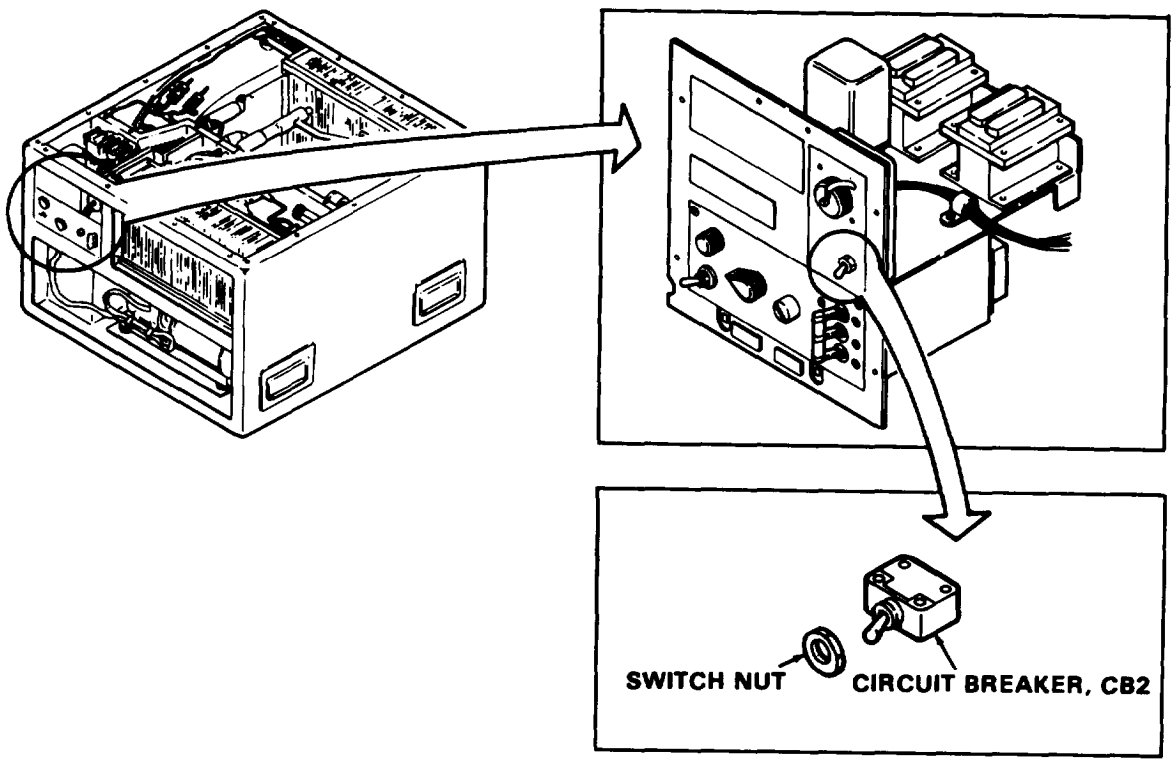


Figure 4-16. Control Circuit Breaker.

(a) Testing Check for loose connections, mountings, and cracked or broken casing. Check for continuity with a multimeter. If no continuity exists or if the casing is broken or cracked, replace the circuit breaker.

(b) Removal.

(1) Refer to paragraph 4-29 and remove the Junction Box .

(2) Refer to figure 4-16 and remove the control circuit breaker.

(c) Installation.

(1) Refer to figure 4-16 and install the control circuit breaker.

(2) Refer to paragraph 4-29 and install the junction box.

4-30. JUNCTION BOX COMPONENTS - Continued.

(4) Compressor Relay (K-3)

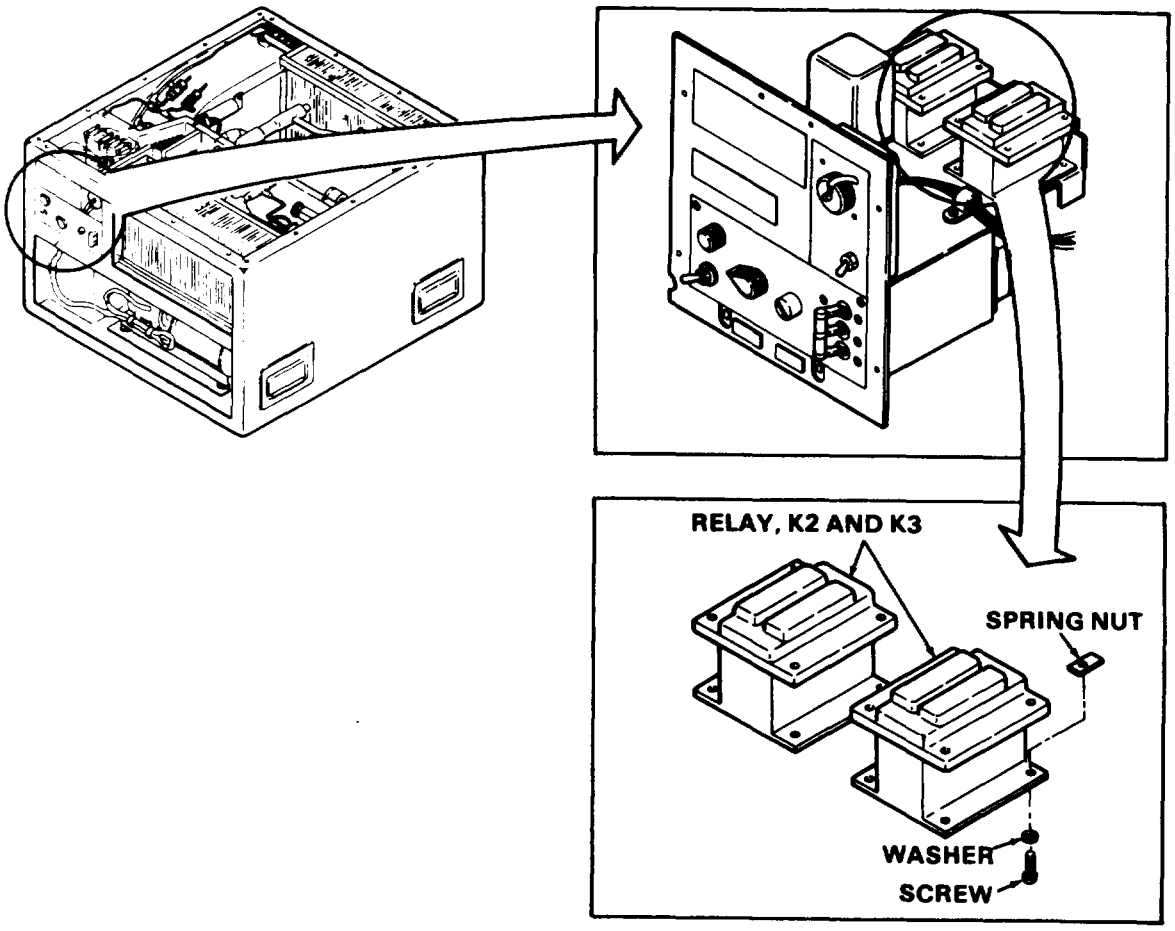


Figure 4-17. Compressor Relay

(a) Testing Check for loose connections and cracked or broken casing. Check for continuity with a multimeter. If no continuity exists, or if the casing is cracked or broken, replace the relay.

(b) Removal.

(1) Refer to paragraph 4-29 and remove the junction box,

(2) Refer to figure 4-17 and remove the compressor relay.

(c) Installation.

(1) Refer to figure 4-17 and install the compressor relay.

(2) Refer to paragraph 4-29 and install the junction box.

4-30. JUNCTION BOX COMPONENTS - Continued.

(5) Condenser Fan Relay (K-4).

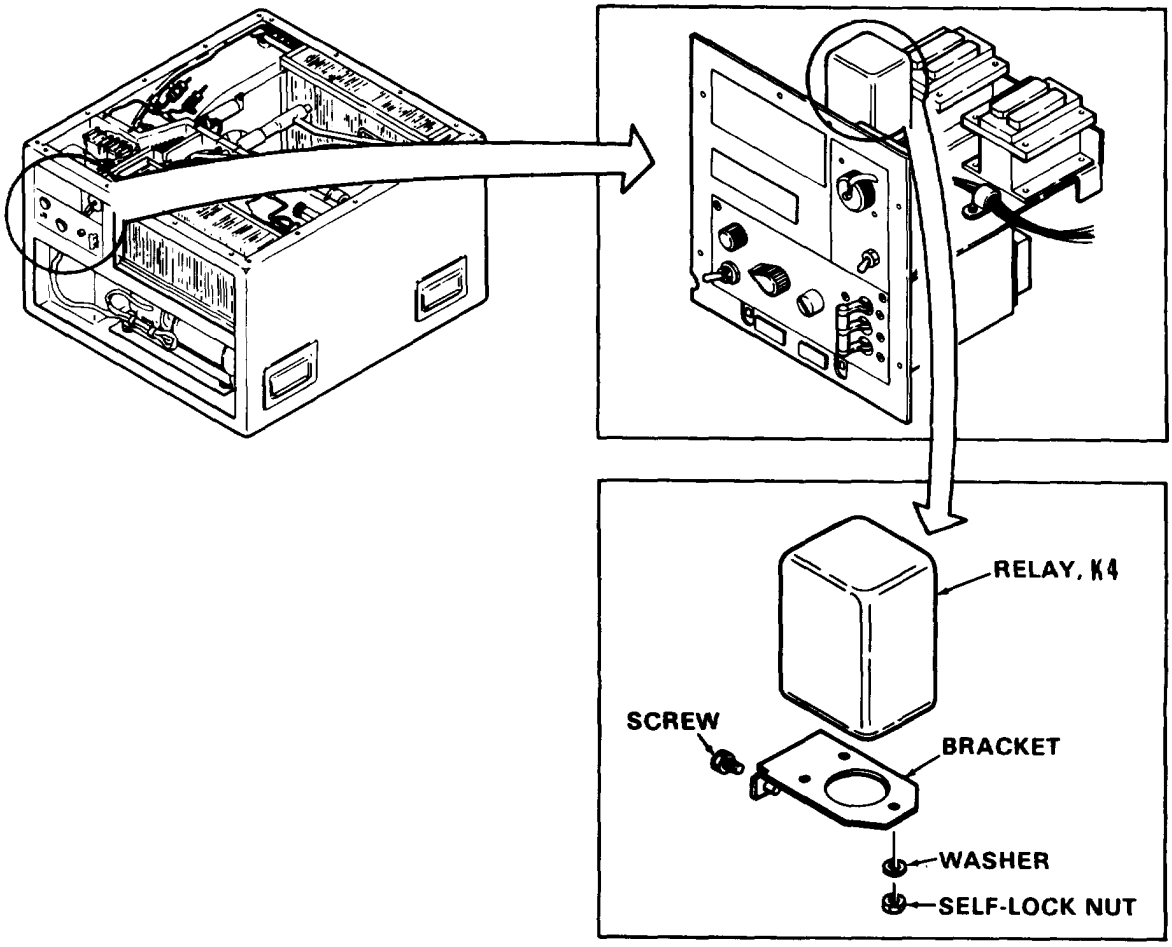


Figure 4-18. Condenser Fan Relay

(a) Testing. Check for loose connections and cracked or broken casing. Check for continuity with a multimeter. If no continuity exists or if the casing is cracked or broken, replace the relay.

(b) Removal.

(1) Refer to paragraph 4-27 and remove the junction box.

(2) Refer to figure 4-18 and remove the condenser high speed relay.

(c) Installation.

(1) Refer to figure 4-16 and install the condenser high speed relay.

(2) Refer to paragraph 4-29 and install the junction box.

4-30. JUNCTION BOX COMPONENTS - Continued.

(6) Connector (P-2).

(a) Testing Check for loose connections, loose mounting or cracked or broken casing; replace if defetive.

(b) Removal.

(1) Refer to para 4-27 and remove the junction box.

(2) Refer to figure 4-19 and remove the connector.

(c) Installation.

(1) Refer to figure 4-19 and install the connector.

(2) Refer to paragraph 4-27 and install the junction box.

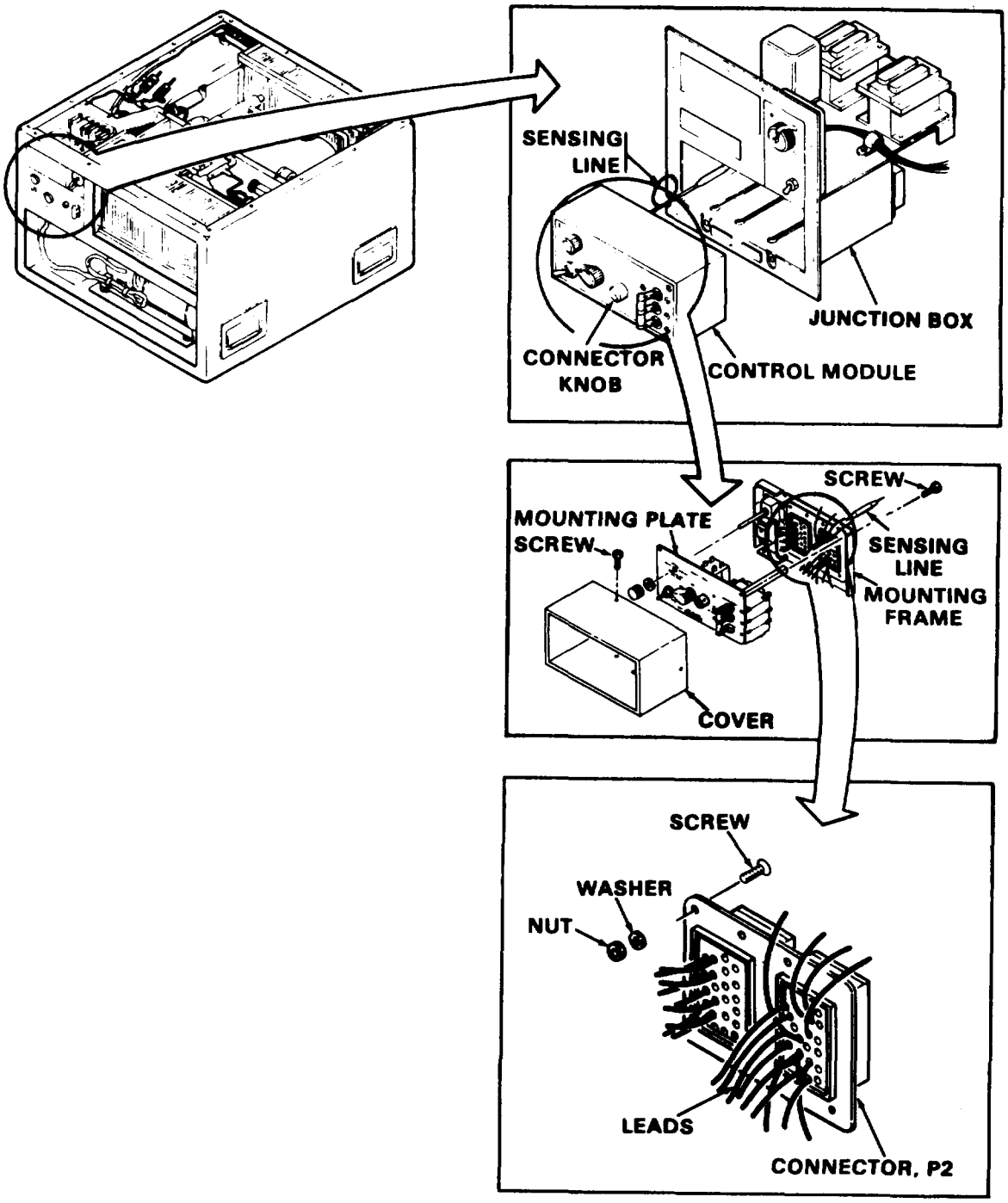


Figure 4-19. Connector

4-30. JUNCTION BOX COMPONENTS - Continued.

(7) Transformer (T-1) , and Resistor (R-1)

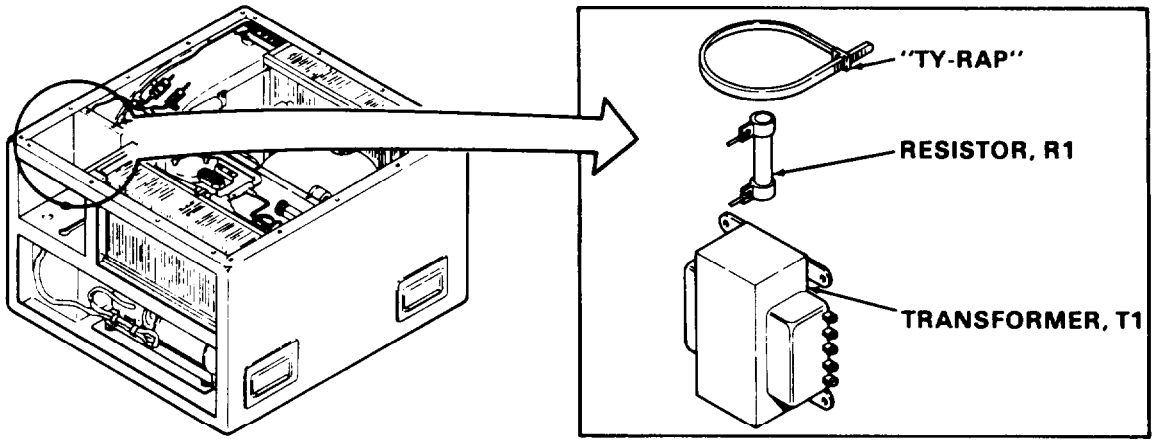


Figure 4-20. Transformer and Resistor

(a) Testing.

(1) Refer to wiring diagram (FO-1) and use a multimeter to test the transformer for continuity through both the primary winding and the secondary winding. If no continuity exists through either winding, replace the transformer.

(2) Use the multimeter to verify the resistor ohms. If measurement shows other than 10 ±1 ohm, replace the resistor.

(b) Removal.

(1) Refer to paragraph 4-29 and remove the junction box.

(2) Refer to figure 4-20 and remove the transformer and resistor. Remove resistor from transformer if either is faulty when tested.

(c) Installation.

(1) Refer to figure 4-17 and install the transformer and resistor.

(2) Refer to paragraph 4-29 and install the junction box.

4-31. RECTIFIER (CR-1) AND CAPACITORS (C-1 and C-2)

a. General. The rectifier and capacitors are located on the bulkhead of the junction box compartment.

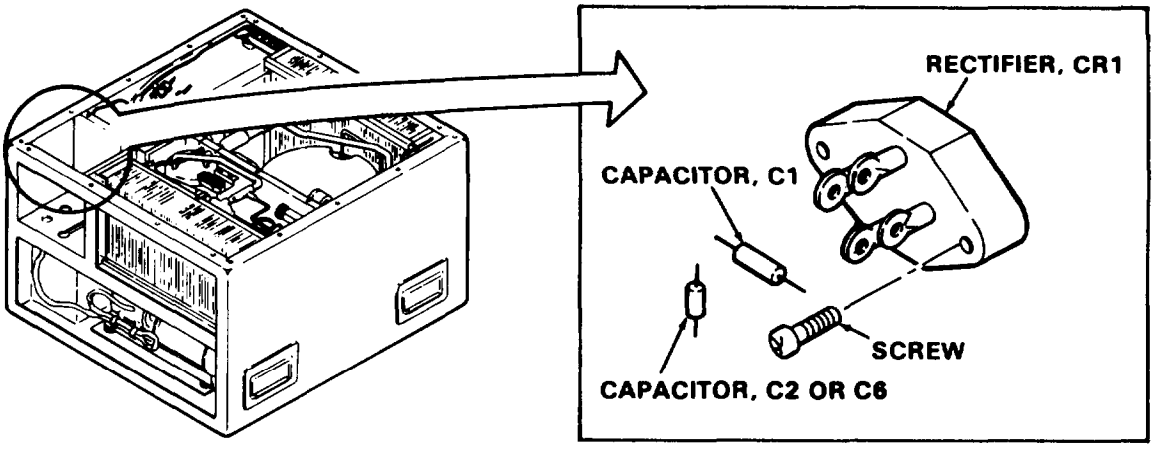


Figure 4-21. Rectifier and capacitors

b. Removal.

(1) Refer to paragraph 4-27 and remove the junction box.

(2) Refer to figure 4-21 and detach the cable from the rectifier.

(3) Remove the capacitors from the rectifier cable terminals.

(4) Remove the rectifier by removing the two mounting screws and washers.

c. Inspection and Test.

(1) Inspect rectifier and both capacitors for cracked or broken case and signs of overheating. Replace if scorched or blistered, or if case is damaged.

4-31. RECTIFIER (CR-1) AND CAPACITORS (C-1 and C-2) - Continued.

(2) Using the ohms function of a multimeter, measure the resistance between the + and the - terminals of the rectifier:

(a) With the + lead of the meter on the - terminal of the rectifier and the - lead of the meter on the + terminal of the rectifier, conductivity should be indicated.

(b) Reverse the meter leads to the rectifier; meter should indicate an open circuit (infinity).

(c) Replace rectifier if measurements differ from those given in (a) and (b).

(3) Using multimeter, test capacitor for continuity. Replace capacitor if continuity exists.

d. Installation.

(1) Refer to figure 4-21 and install rectifier.

(2) Refer to FO-1 and install capacitors by crimping leads into cable terminals.

(3) Refer to FO-1 and attach cable to rectifier.

(4) Refer to paragraph 4-27 and install the junction box.

4-32. EVAPORATOR FAN AND MOTOR ASSEMBLY. (B-3)

a. General. The evaporator fan motor is a multispeed motor. The motor operates at 3450 RPM in high speed and 1725 RPM in low speed operation and each winding is thermally protected, Motor speed is manually controlled by the evaporator fan speed switch.

b. Controls. Before removing the evaporator fan and motor assembly, test the mode selector switch, evaporator fan speed switch, and control circuit breaker (paragraph 4-30) and evaporator fan motor low/high speed switch (paragraph 4-30) which control operation of the motor. If electrical control components or wiring that supply power to the motor are not defective and the motor does not operate, proceed as follows:

c. Test.

Test the motor for open-circuit or grounded windings as follows.

(1) Using a multimeter, test at P3 for continuity across a combination of two leads until each of the three high speed winding leads is tested. Do the same for the three low speed winding leads. if continuity is not indicated, the winding is open and the motor should be replaced.

(2) Using a multimeter, test for continuity by placing one test probe against the motor housing (on bare metal only) and the other probe against each of the motor winding leads. If continuity is indicated, the winding is grounded, and the motor should be replaced.

4-32. EVAPORATOR FAN AND MOTOR ASSEMBLY (B-3) - Continued

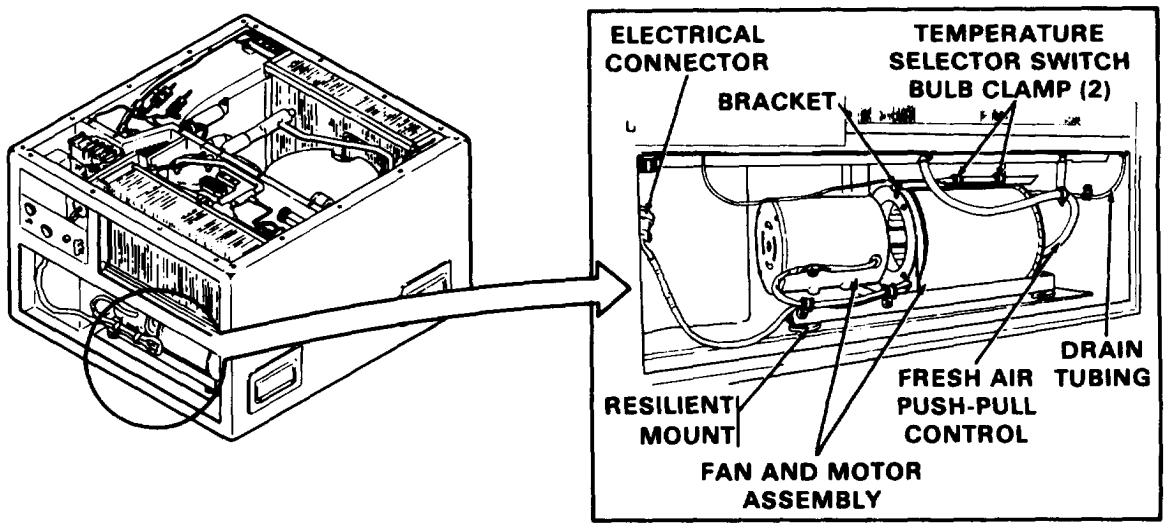


Figure 4-22. Evaporator fan and motor assembly, removal and installation

d. Removal.

(1) Refer to paragraph 4-19 and remove the evaporator air inlet louver.

(2) Remove the evaporator fan and motor assembly as follows:

(a) Disconnect connector.

(b) Remove 2 screws and clamps holding thermocouple in place.

(c) Remove 2 screws.

(d) Remove 4 mounting screws (allen head).

(e) Remove fan/motor assembly.

(3) Disassemble the fan/motor assembly as follows:

(f) Remove 2 screws and clamps.

(g) Loosen 2 setscrews and pull fan from motor shaft,

(h) Remove 4 screws and remove motor.

(i) Remove 2 screws and washers holding bracket in place.

(j) Remove nut and impeller.

(k) Remove 4 screws and fan housing.

4-32. EVAPORATOR FAN AND MOTOR ASSEMBLY (B-3) - Continued

e. Installation.

(1) Assemble the fan and motor assembly as follows:

(a) Install fan housing and secure in place with 4 screws.

(b) Install impeller and secure in place with 1 nut.

(c) Install bracket and secure in place with 2 screws and washers.

(d) Install motor and secure in place with 4 screws.

(e) Slide fan into place and secure with 2 setscrews.

(f) Install 2 clamps and secure in place with screws.

(2) Install evaporator fan and motor assembly as follows:

(a) Slide fan/ motor assembly into place, secure in place with 4 allen head mounting screws.

(b) Install 2 set screws holding fan in place.

(c) Install thermocouple, secure with 2 clamps and screws.

(d) Reconnect connector.

(3) Refer to paragraph 4-19 and install the evaporator air inlet louver.

4-33. CONDENSER FAN AND MOTOR ASSEMBLY. (B-2)

a. General. The condenser fan motor is a multispeed motor . The motor operates at 3450 RPM in high and 1725 RPM in low speed. The motor contains separate windings for high or low speed operation and each winding is thermally protected. Motor speed is automatically y controlled by an outdoor thermal switch (FO-1). The motor will operate at low speed until the outdoor ambient temperature rises above 100°F ±5°F (37.8°C ±3°C).

b. Test. Before removing condenser fan motor, test mode selector switch and control circuit breaker (paragraph 4-28) and the fan motor high/low speed switch (paragraph 4-28) that control operation of the condenser fan motor. If electrical control components or wiring that supply power to the motor are not defective and the motor does not operate, remove the condenser fan and motor assembly and make the following tests:

(1) Test the high and low motor winding thermal protectors, using a multimeter, test for continuity across each terminal connection. If continuity is not indicated, the thermal protector is defective and motor must be replaced.

(2) With the high and low speed motor winding leads disconnected from the thermal protectors, test for open or grounded windings as follows:

(a) Using a multimeter, test for continuity across a combination of two leads until each of the three high speed winding leads is tested. Do the same for the three low speed winding leads. If continuity is not indicated, the winding is open and the motor should be replaced.

(b) Using a multirneter, test for continuity by placing one test probe against the motor housing (on bare metal only) and the other probe against each of the motor winding leads. If continuity is indicated, the winding is grounded and the motor should be replaced.

4-33. CONDENSER FAN AND MOTOR ASSEMBLY (B-2) - Continued

c. Removal.

(1) Refer to paragraph 4-18 and remove the top rear cover.

(2) Disconnect connector.

(3) Remove 4 screws and remove the condenser fan and motor assembly by tilting as lifting.

(4) Disassemble fan from motor by loosening setscrew and sliding fan free.

d. Installation.

(1) Replace fan and secure with setscrew.

(2) Install the condenser fan and motor assembly, secure with 4 mounting screws. Ensure correct direction of rotation.

(3) Reconnect connector.

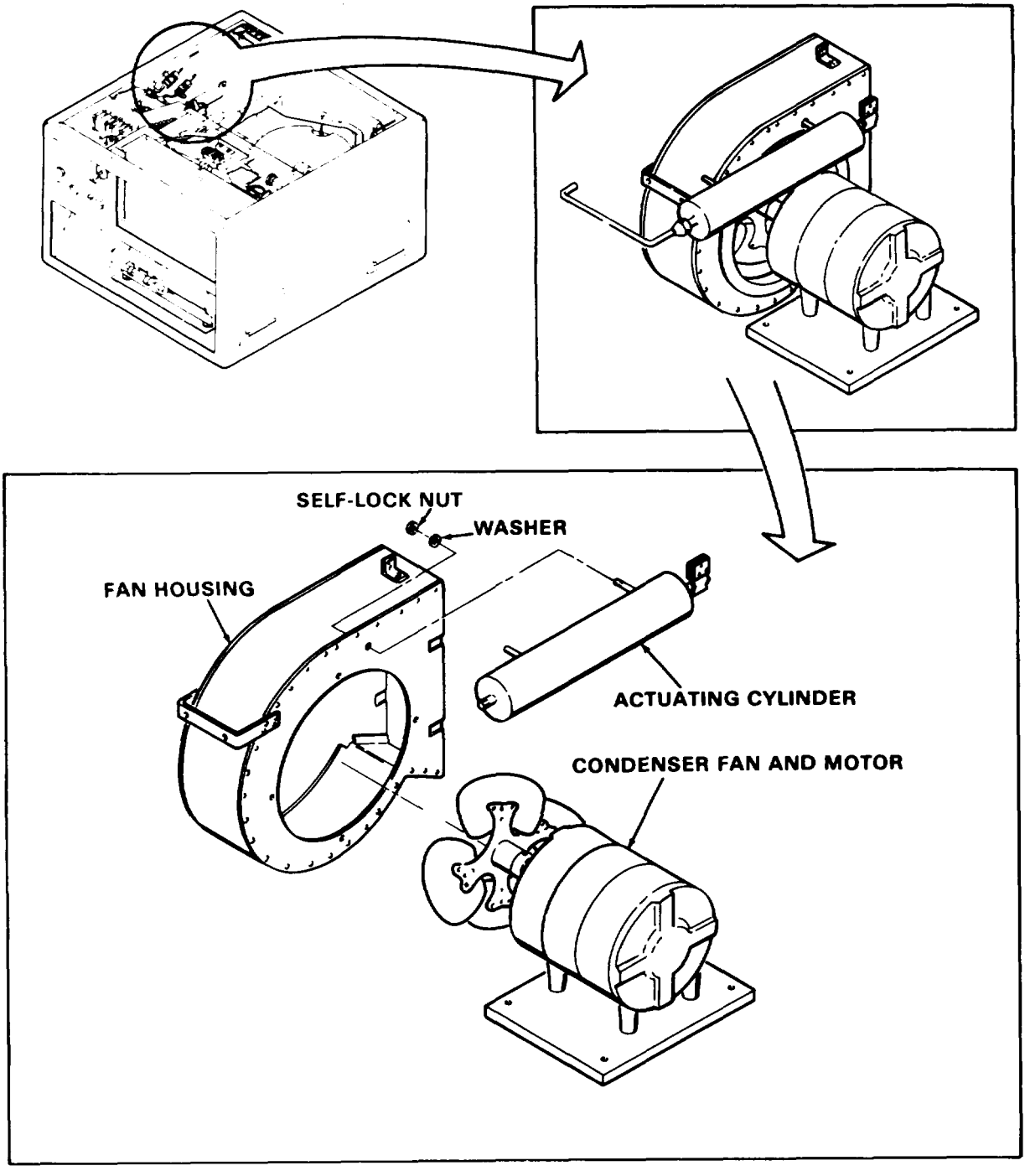
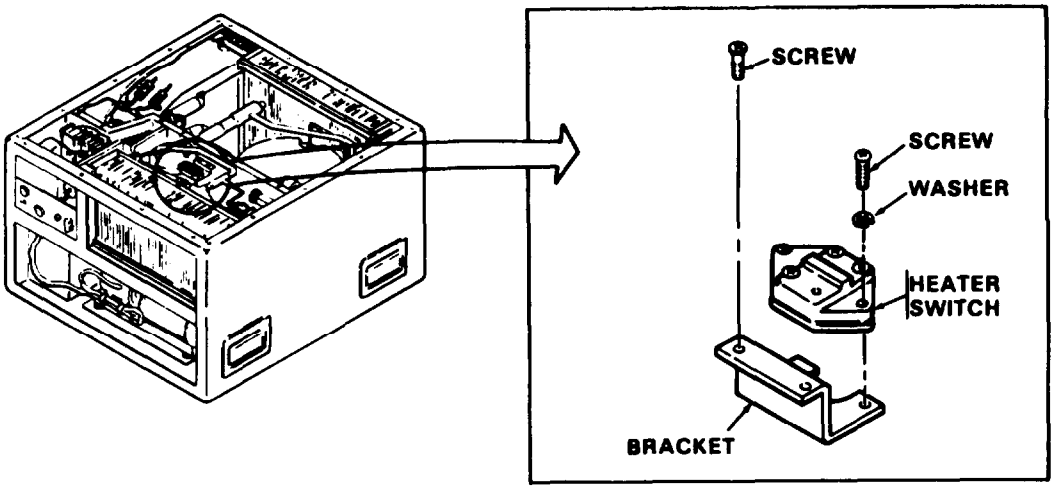


Figure 4-23. Condenser fan and motor assembly, removal and installation.

4-34. THERMOSTATIC SWITCH AND CONNECTOR.

a. General. The thermostatic switch automatically changes the condenser fan speed-by sensing ambient temperature. With the ambient temperature at 95°F (35°C) or below, the condenser fan will run at low speed. If the ambient temperature rises to approximately 105°F (40.6°C), the condenser fan will run at high speed. Conversely, if the fan is running at high speed and the ambient drops to approximately 95°F (35°C), the fan will run at low speed.

b. Testing. If no speed change is noted (change in noise level) during operations, when the ambient temperatures change as described in paragraph a. above, the switch is defective and must be replaced.



TM 5-4120-369-14/4-24

Figure 4-24. Thermostatic Switch

c. Removal.

(1) Refer to paragraph 4-18 and remove top covers.

(2) Refer to figure 4-24 and remove thermostatic switch and connector.

d. Installation.

(1) Refer to figure 4-24 and install.11 the thermostatic switch and connector.

(2) Refer to paragraph 4-18 and install the front covers.

4-35. HEATING ELEMENTS AND HEATER CUT-OUT SWITCH.

a. General. A bank of six elements provides heat for the heating mode; three elements are energized in the LOW and all six in the HIGH heat position. Temperature is controlled by temperature selector switch. Dangerously high temperatures are prevented by the heater cut-out switch.

b. Testing. Refer to wiring diagram (FO-1) and test across the heating elements leads for continuity, using a multimeter, If no continuity exists, replace the heating element. Using a multimeter, test the heater cut-out switch for continuity between terminals 1 and 2 (also between terminals 3 and 4) . If no continuity exists, replace the heater cut-out switch.

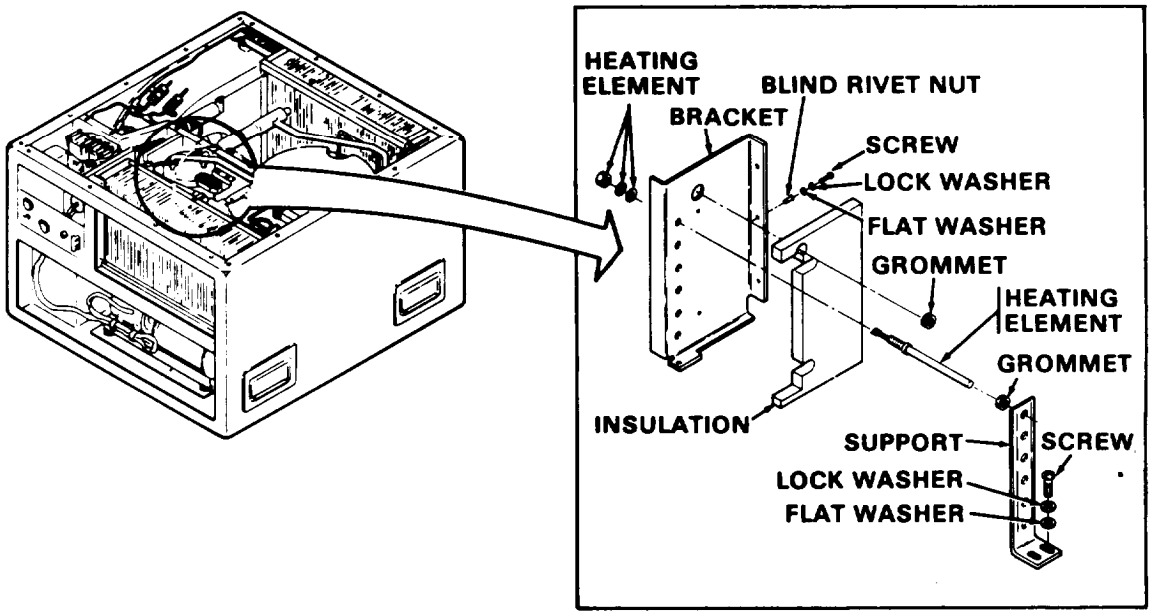


Figure 4-25. Heating Elements and Heater Cut-out Switch

c. Removal.

(1) Refer to paragraph 4-18, remove top front cover.

(2) Refer to paragraph 4-29 and remove the control module and junction box.

(3) Refer to figure 4-25 and remove the heating elements or the heater cut-out switch .

d. Installation.

(1) Refer to figures 4-25 and FO-1 and install the heating element or heater cut-out switch.

(2) Refer to paragraph 4-29 and install the junction box and control module.

(3) Refer to paragraph 4-18, install the top front cover.

4-36. WIRING.

a. Inspection. Inspect insulation for cracks and signs of deterioration. Pay particular attention to wires passing through holes in the frame and over rough metal edges. If inspection reveals a broken or cut wire, and the wire is exposed, it must be repaired. If the break in the wire is in the wiring harness or in an inaccessible area, replace wire per 4-34 c. below).

b. Testing Test a wire for continuity by disconnecting each end from the camponent(s) to which it is connected. Touch the test probes of a multimeter to the ends of the wire under test. If continuity is not indicated, the wire is defective and must be repaired or replaced.

c. Replacement. To replace a defective wire lead, disconnect both ends at the components and install new wire with an exact duplicate of wire being replaced. If the defective wire is difficult to remove from wiring harness, cut the wire back from the components about two inches and cover ends to outside of harness with electrical tape or plastic clamps.

4-37. HIGH PRESSURE CUT-OUT SWITCH (S-4) AND LOW PRESSURE CUT-OUT SWITCH (S-5).

a. General. The high pressure cut-out switch prevents the compressor from operating if the &charge pressure exceeds 445 ±10 psig. The low pressure cut-out switch prevents the compressor from operating if the suction pressure drops below 15 ±5 psig. Each is reset manually. Inspect and test the switches if the compressor fails to operate after the switch is reset.

b. Inspection.

(1) Refer to paragraph 4-18, and remove the top covers

(2) Inspect for broken or damaged wire leads kinked or broken capiliary tubes.

c. Testing.

WARNING

REFRIGERANT UNDER PRESSURE
is used in this equipment Organizational personnel
are not authorized to open the pressurized system.

(1) Using a multimeter, test for continuity between terminals 1 and 2 of each pressure cut-out switch.

(2) If continuity is not indicated, the pressure cut-out switch is defective and must be replaced. Report to Direct Support maintenance for replacement of defective switch.

4-38. LIQUID LINE SOLENOID VALVE (L1) .

a. General. The normally-open liquid line solenoid valve is electrically closed when the mode selector switch is turned to COOL. When the temperature control thermostat is satisfied, the liquid line solenoid valve opens placing the refrigerant system in the bypass condition.

4-38. LIQUID LINE SOLENOID VALVE (L-1) - Continued.

b. Inspection.

WARNING

REFRIGERANT UNDER PRESSURE
is used in this equipment Organizational personnel are not authorized to open the pressurized system.

WARNING

HIGH VOLTAGE
is used in the operation of this equipment.

DEATH ON CONTACT
or severe injury may result if personnel fail to observe safety precautions. Always disconnect the air conditioner from power source before performing maintenance on this equipment. If power must remain on for troubleshooting, exercise extreme care to avoid contact with any electrical component, fan, fan motor, etc. Do not operate the air conditioner without louvers, top controls, and guards in place and tightly secured.

(1) Refer to para 4-18 and remove top covers.

(2) Remove valve cover and inspect coil for cracks, breaks, loose connect ions, frayed wires or other defects.

(3) Report any defects to Direct Support maintenance.

c. Test. Using a multimeter, test across the valve leads for continuity at connector P-8, pins A and B. If no continuity is indicated , 'the coil may be defective. Report to Direct Support maintenance for replacement.

4-39. PRESSURE EQUALIZING SOLENOID VALVE (L2) .

a. General. The normally-open equalizing solenoid valve is electrically closed when the mode selector is turned to COOL. When power is switched from the solenoid coil the valve opens, equalizing the high side to low side pressure.

b. Inspect.

(1) Refer to para 4-18 and remove top covers.

(2) Remove the valve cover and inspect coil for cracks, breaks, loose connections, frayed wires or other defects.

(3) During the cooling cycle, inspect the compressor suction line. If it feels hot, the pressure equalizing solenoid valve is defective.

(4) Report all defects to Direct Support maintenance.

c. Test. Test the pressure equalizing solenoid valve for continuity across electrical leads-at connector P-9 pins A and B, with a multimeter. If no continuity is indicated, the valve is defective and should be replaced. Report all defects to Direct Support maintenance.

4-40. EXPANSION VALVE (PRIMARY) INSPECTION AND TEST.

a. General. If the air conditioning unit is not cooling properly, inspect and test the expansion valve for defects.

b. Inspection.

(1) Refer to paragraph 4-8 and remove top covers.

(2) Refer to figure 4-26 and check that the required length of the expansion valve's sensing bulb is fully in the suction line bulb well.

(3) Refer to figure 4-26 and examine the flow restrictor capillary tubes carefully. They should be very cold and evenly frosted. Unfrosted tubes are blocked and should be replaced.

(4) If the capillary tube is cold and frosted, the valve is blocked or the valve's power assembly is ruptured, The test for the power assembly is listed in the following paragraph.

c. Test. Test the power assembly by removing the valve's sensing bulb from the suction bulb well (figure 4-26). Hold the sensing bulb firmly in both hands for two or three minutes. The warmth from holding the bulb should put enough pressure on the bellows to start the refrigerant flowing into the system. If cooling does not commence, the expansion valve is defective and should be replaced. Report all defects to Direct Support maintenance.

4-41. COMPRESSOR

WARNING

REFRIGERANT UNDER PRESSURE
is used in this equipment Organizational personnel are not authorized to open the pressurized system.

WARNING

HIGH VOLTAGE
is used in the opertion of this equipment

DEATH ON CONTACT
or severe injury may result if personnel fail to observe safety precautions. Always disconnect the air conditioner from power source before performing maintenance on this equipment. If power must remain on for troubleshooting, exercise extreme care to avoid contact with any electrical component, fan, fan motor, etc. Do not operate the air conditioner without louvers, top controls, and guards in place and tightly secured.

a. General. The compressor is a hermetically sealed unit and is not repairable. An inoperative compressor is usually due to a mechanical failure causing the compressor to freeze, a control failure, or motor burnout. Compressor replacement is required in all cases of mechanical or motor burnout. If the motor is defective, report to Direct Support maintenance.

b. Test.

(1) Refer to paragraph 4-18 and remove the top covers.

(2) Disconnect receptacle connector.

(3) Refer to wiring diagram (FO-1) and test for continuity using a multimeter. Lack of continuity indicates an open winding. Report to Direct Support Maintenance.

(4) Place one contact of the multimeter against the compressor housing and the other against the motor terminals, one at a time. If a circuit is indicated, the motor is grounded. Report to Direct Support maintenance.

CHAPTER 5

DIRECT SUPPORT AND GENERAL SUPPORT

MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

5-1. TOOLS AND EQUIPMENT.

No Tools or equipment are issued with the air conditioner.

5-2. SPECIAL TOOLS AND EQUIPMENT.

A Recovery/Recycling Unit is required to discharge refrigerant from the refrigeration system.

5-3. MAINTENANCE REPAIR PARTS.

Repair parts and equipment are listed and illustrated in the repair parts and special tool list covering direct and general support maintenance for this equipment. (See TM 5-4120-369-24 P.)

CAUTION

Prior to removing any refrigerant system component, be sure system is properly charged, and retest defective component.

Section 11. TROUBLESHOOTING

5-4. GENERAL.

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the air conditioner or any of its components. Electrical schematic and wiring diagrams shown in FO-1 and FO-2 will be helpful for checking electrical circuits. A refrigerant flow diagram is shown in figure 5-1. System pressure test instructions are in paragraph 6-2. Troubleshooting procedures for Direct and General Support maintenance are listed in table 5-1. Each trouble system or malfunction stated is followed by a step-by-step procedure for inspecting and testing the system to determine the specific cause of fault or failure. The corrective action recommended follows the determination of probable cause.

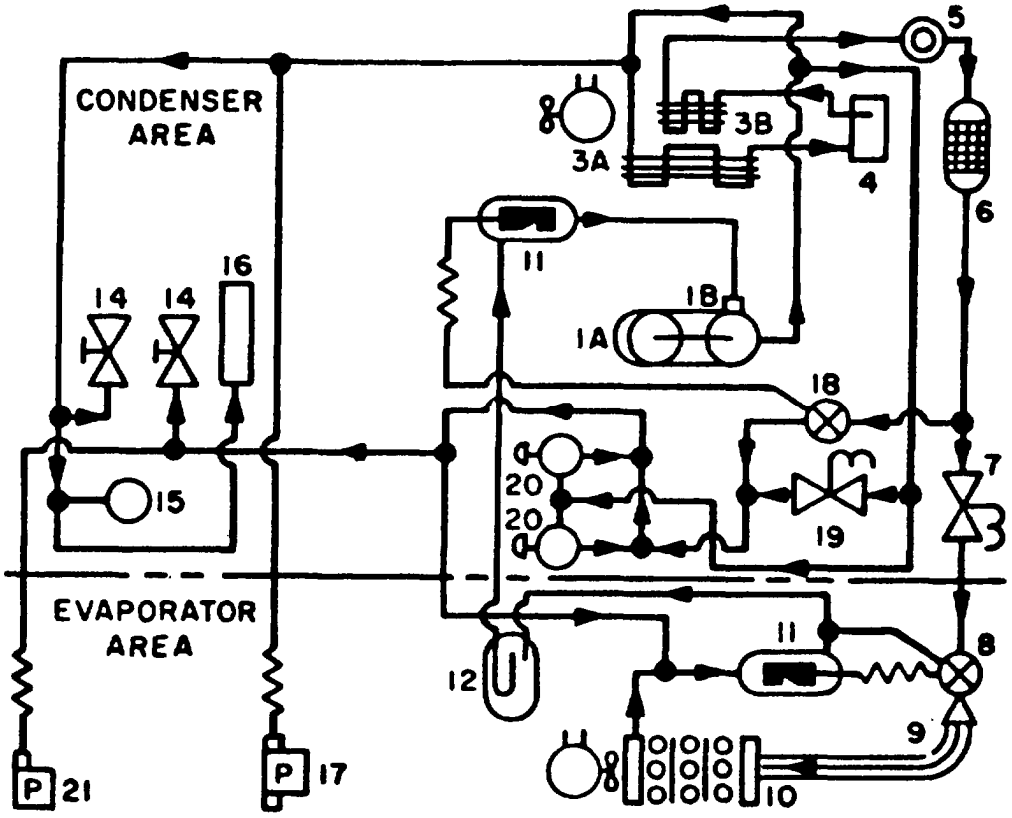


Figure 5-1. Refrigerant flow diagram.

Table 5-1. Troubleshooting.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. COMPRESSOR WILL NOT START
Step 1. Test for an open-circuit condition in the control circuit by means of a continuity check. Replace component or wire causing open circuit (paragraph 4-32).
Step 2. Test circuit breaker for defective operation. Replace defective circuit breaker (paragraph 4-26).
Step 3. Check to see if high or low pressure cutout switch is defective. Replace defective switch (paragraph 5-22).
Step 4. Check to see if compressor motor or thermal protectors are defective. Replace compressor (paragraph 5-16).
2. COMPRESSOR STARTS BUT IMMEDIATELY STOPS
Step 1. Check to see if thermal Protector or circuit breaker is tripped. Reset circuit breaker, or allow thermal protector to cool and reset. If condition repeats, replace compressor (paragraph 5-16).
3. LITTLE OR NO HEATING CAPACITY.
Step 1. Check for loose electrical connections or faulty wiring. Repair or replace wiring as necessary (paragraph 4-32).
Step 2. Test mode selector switch and temperature selector for faulty closure in heat control circuit. Replace defective switch (paragraph 4-23).
Step 3. Test heater relay for faulty contact closure. Replace defective relay (paragraph 4-27).
Step 4. Test for defective operation of heater high temperature cutout. Replace defective thermostat switch (paragraph 4-30).
Step 5. Test heater elements for open-circuit. Replace any defective heater elements (paragraph 4-30).
4. INSUFFICIENT COOLING
Step 1. Test for low refrigerant charge. Add refrigerant (figure 6-3).
Step 2. Check for indications of a clogged dehydrator. Replace clogged dehydrator (paragraph 5-24).

Table 5-1. Troubleshooting - Continued.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
4. INSUFFICIENT COOLING - Continued
Step 3. Check idications of a defective pressure regulator valve. Replace defective valve (paragraph 5-30).
Step 4. Check for indications of air in system. Purge and charge system (figures 6-1 and 6-2).
Step 5. Check for indications of a defective thermal expansion valve. Replace defective valve (paragraph 5-28).
Step 6. Check for indications of defective solenoid valve. Replace defective solenoid valve (paragraph 5-25).
Step 7. Check for indications of defective quench valve. Replace defective valve (paragraph 5-29) .
5. LOW SUCTION PRESSURE (See Table 6-1)
Step 1. Check for indications of a clogged dehydrator, Replace clogged dehydrator (paragraph 5-24).
Step 2. Check for indications of a defective thermal expansion valve. Replace defective valve (paragraph 5-28) .
Step 3. Check for indications of a defective quench valve, Replace defective valve (paragraph 5-29).
6. LOW DISCHARGE PRESSURE (See Table 6-1)
Step 1. Check to see if compressor is not pumping due to defective compressor. Replace defective compressor (paragraph 5-31).
Step 2. Check to see if HIGH/LOW condenser fan thermostatic switch is defective. Replace defective switch (paragraph 4-26).
7. LOW SUCTION AND DISCHARGE PRESSURE (See Table 6-1)
Step 1. Check for low refrigerant charge by inspecting sight glass for bubbles or milky appearances. Also check for leaks. Repair leaks and add refrigerant as necessary.
Step 2. Check for indications of defective thermal expansion valve. Replace valve (paragraph 5-28).
Step 3, Check for indications of defective quench valve. Replace valve (para 5-29).

Table 5-1. Troubleshooting - Continued.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
8. HIGH SUCTION PRESSURE (See Table 6-1)
Step 1. Check for indications of defective thermal expansion valve.
Replace valve (paragraph 5-28).
Step 2. Check for indications of defective quench valve.
Replace valve (paragraph 5-29).
9. HIGH HEAD PRESSURE (See Table 6-1)
Step 1. Check to see if condenser coil is dirty.
Clean Coil.
Step 2. Check for indications of refrigerant overcharge icing of components.
Discharge refrigerant (fig. 6-1) while observing head pressure and sight glass.
Step 3. Inspect or test condenser fan motor for defective operation.
Repair motor (paragraph 6-8).
Step 4. Inspect condenser louvers and actuating mechanism for correct adjustment and proper operation.
Adjust and clean as necessary. Replace inoperative cmnponents (paragraph 5-20).
Step 5. Check for indications of defective quench valve.
Replace defective valve (paragraph 5-29).
Step 6. Check to see if the compressor is defective.
Replace defective compressor (paragraph 5-16).

Section III. DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

5-5. GENERAL.

This section contains general servicing instructions that otherwise would have to be repeated several times in this manual.

5-6. TESTING FOR LEAKS .

The air conditioner can be tested for refrigerant leaks by the use of an electronic leak detector, by the halide teat or by the soap bubble method. The preferred method is use of the electronic leak detector. If sufficient pressure is not present in the system to accomplish an adequate leak test, add dry nitrogen at the receiver charging valve to increase the system pressure to 200 psig, then conduct the leak test. If the system is totally discharged, to conserve leak test refrigerant, pressurise the system with R-22 to 72 psig, isolate the compressor by front-seating the service valves (1 and 2, figure 3-2). At the receiver charging valve pressurize the system with dry nitrogen to 300 psig, them conduct the leak test.

(1) By Electronic Leak Detector. Using a G.E. Type H-2 Leak Detector, or equivalent, proceed as follows:

(a) Turn on and calibrate the leak detector as described in the instructions supplied with the instrument.

(b) S1owly pass the detector probe tip over the sweat fittings, mechanical couplings and valves in the refrigerant circuit. If refrigerant is leaking, detector will provide a visible or audible signal.

(c) Use the soap-bubble method to localize the leak to a defective component or connection.

(2) By Halide Leak Test. Using a propane flame halide leak detector, proceed as follows:

(a) Slowly pass the exploring tube on the torch over the sweat fittings, mechanical couplings and valves. If refrigerant is leaking, the flame will be affected as follows:

Small leak — flame changes from blue to green

Large leak — flame changes from blue to dense blue with reddish tip

Massive leak — may extinguish flame

(b) Use the soap-bubble method to localize the leak to a defective component or connection.

(3) By Soap Solution Method. Using either a prepared bubble-type leak detector compound or a solution of hand soap in water, proceed as follows:

(a) Apply the solution to all points of possible leakage, and watch for bubble formation indicating a refrigerant leak.

NOTE

Allow solution to remain on joints long enough for small leaks to form noticeable bubbles.

(b) Wipe solution from joints and mark spots where leakage is observed,

5-7. REFRIGERATION SYSTEM.

a. Opening System. When the refrigeration system must undergo maintenance that requires the system to be opened for removal of parts, the system must first be discharged with a Recovery/Recycling Unit (paragraph 6-3). After the repair has been made and all soldering completed, the system must be tested for leaks and charged (paragraph 6-3),

b. Removal of Parts. When the refrigeration system must undergo maintenance that requires the refrigerant system to be opened for removal of parts, the system must first be discharged with a Recovery/Recycling Unit and purged (figure 6-1). After the repair has been made and all soldering completed, the system must be tested for leaks and charged (paragraph 6-3). Except for flare nut connection, all the tubing attachments in the refrigerant ion system are “sweat joints” which are opened by heating with a brazing torch. During unseating, shield the wiring, insulation, painted metal, and valves from the heat of the torch. Use wet cloths to protect the gas charge in expansion valve bulbs and capillary tubing.

NOTE

Replace dehydrator each time refrigerant system is opened.

WARNING

Brazing operations should be carried out using approved eye protection equipment and rods not containing cadmium.

WARNING

Certain brazing operations may require mechanical ventilation.

WARNING

Local preventative maintenance personnel should be questioned if doubt exists as to rod composition or ventilation requirement 9.

c. Brazing. Braze copper-to-copper joints with silver solder type 3, 4 or 6 A specification QQ-S-561) and copper-to-brass or copper-to-steel with type 4 or 6 A specification QQ-S-561 per ML-B-7883. Solder melting point is 1160°F (625°C). All brazed or soldered joints shall be made with an atmosphere of inert gas to prevent internal oxidation.

5-8. INSULATION AND GASKETS.

Replace damaged insulation and gaskets, (See appendix F) Cement loose insulation. (See appendix D).

5-9. HARDWARE.

Replace any damaged screws, washers, lock washers or nuts. Use screws of correct length to hold parts securely. In some applications screws that are too long may hit bottom before the head is tight against part it is to hold or may cause damage to the threads or other parts.

5-10. SHIMS.

Be sure to remove all shims where used. Keep shims together and identify them as to location.

5-11. REPAIRING DAMAGED THREADS.

Damaged threads should be repaired by use of a thread restorer or by chasing in a lathe. Internal threads should be repaired with a tap of the correct size. If threads cannot be satisfactorily repaired, replace the part. Drill out and replace blind rivet nuts having defective threads.

5-12. REPAIR OF DAMAGED MACHINED AND POLISHED SURFACES.

Smooth rough spots, scores, burrs, galling, and guages from damaged machines and polished surfaces so that part will efficiently perform its normal function. The finish of the repaired part is to approximate that of the original finish. In performing any of these operations, critical dimensions must not be altered.

5-13. REMOVAL OF RUST OR CORROSION.

Remove corrosion from all parts of material. 'Co remove rust or corrosion, use wire brush, abrasive cloth, or rust remover except on highly polished surfaces. On these surfaces, buffing or the use of crocus cloth is recommended.

5-14. TUBES AND FITTINGS.

Check tubes and fittings for cracked or split condition, Check tubing for kinks. Replace defective fittings. Replace damaged tubing with tubing of same size. Take care in making bends in tubing to prevent kinking of tubing. All tubing and fitting must be completely clean on inside prior to installation.

5-15. VALVES.

Valves and other parts should be handled carefully to prevent damage. Capillary tubes must be handled very carefully to prevent kinking of the tubes.

Section IV. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS AND ASSEMBLIES.

5-16. GENERAL.

WARNING

REFRIGERANT UNDER PRESSURE
is used in this equipment Organizational personnel are not authorized to open the

WARNING

HIGH VOLTAGE
is used in the opertion of this equipment

DEATH ON CONTACT
or severe injury may result if personnel fail to observe safety precautions. Always disconnect the air conditioner from power source before performing maintenance on this equipment. If power must remain on for troubleshooting, exercise extreme care to avoid contact with any electrical component, fan, fan motor, etc. Do not operate the air conditioner without louvers, top controls, and guards in place and tightly secured.

This section covers removal of all major assemblies of the air conditioner which are the responsibility of the Direct Support and General Support maintenance. The refrigerant piping and valves cannot be removed as a unit , and only those parts that require replacement should be removed. (Prior to removing a component verify by test the need to replace.) Removal and installation instructions for individual valves and other components of the refrigeration system are contained in this section. Refer to paragraph 5-6 after performing removal and installation on the refrigeration system.

5-17. SERVICE (CHARGING) VALVES.

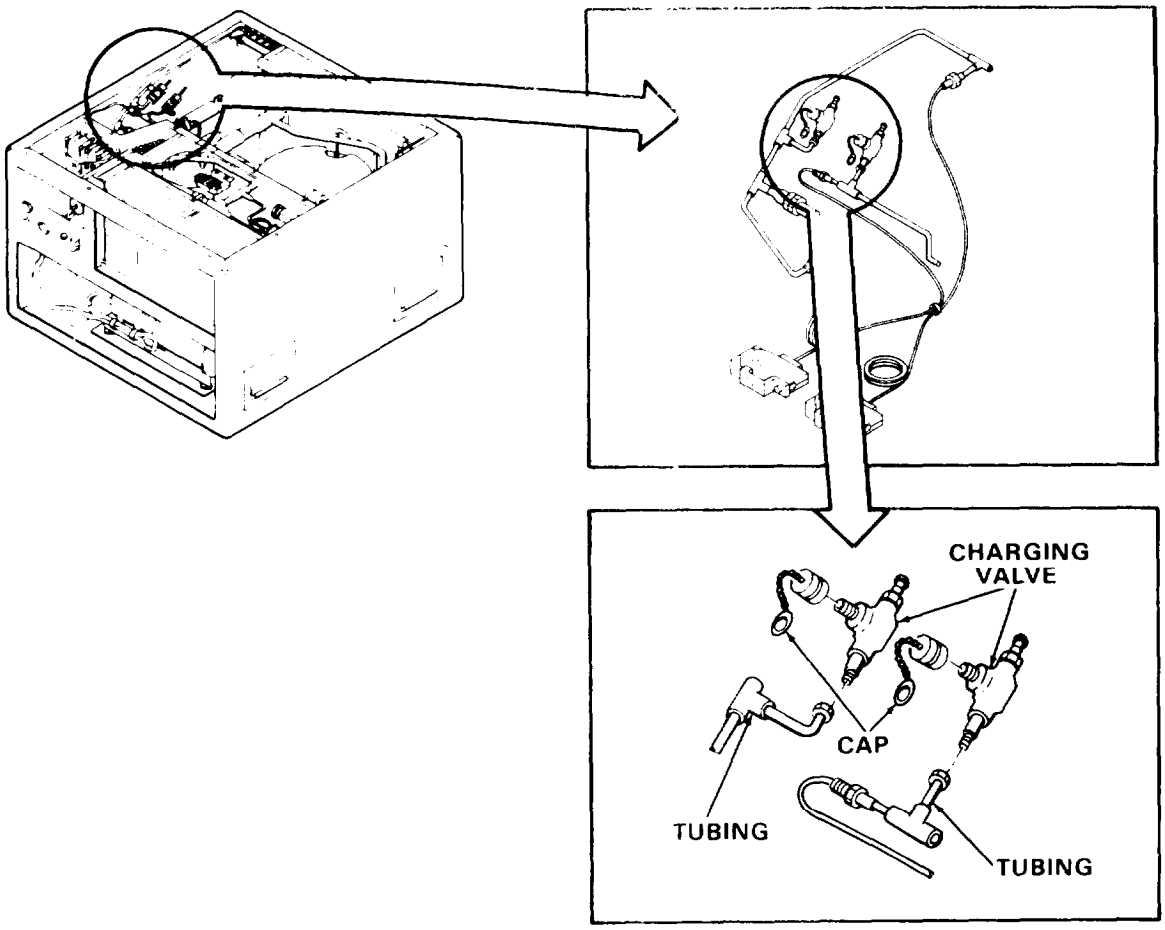


Figure 5-1A. Service Valves

a. Removal.

(1) .Refer to para 4-18 and remove top covers.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of carliac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrythmias, as a result of exposure to fluorocarbon refrigerant gases. Such individuals should be evaluated by local medical authorities before working in environments where potential refrigerant exposure may occur.

Refer to figure 6-3 and discharge the refrigeration system .

Refer to figure 5-1A and disconnect the service valve flare nuts.

5-17. SERVICE VALVES - Continued.

b. Installation.

(1) Refer to figure 5-1A and mount service valve.

(2) Attach refrigerant line flare nut to service valve.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to fluorocarbon refrigerant gases. Such individuals should be evaluated by local medical authorities before working in environments where potential refrigerant exposure may occur.

(3) Refer to figure 6-3 and discharge tine refrigeration system.

(4) Refer to figure 5-1A and disconnect the service valve flare nuts.

(5) Refer to paragraph 6-3 and leak test the system.

(6) Refer to figure 6-3 and purge the refrigeration system.

(7) Refer to figure 6-3 and charge the refrigeration system.

(8) Refer to paragraph 4-18 and install top covers.

5-18. HIGH PRESSURE CUT OUT (HPCO) AND LOW PRESSURE CUTOUT (LPCO) SWITCHES.

a. Removal .

(1) Refer to para 4-18 and remove the top covers.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to fluorocarbon refrigerant gases (freons) . Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

(2) Refer to paragraph 6-3 and discharge the refrigerant system.

(3) Refer to paragraph 5-17 and disconnect the service valve flare nuts.

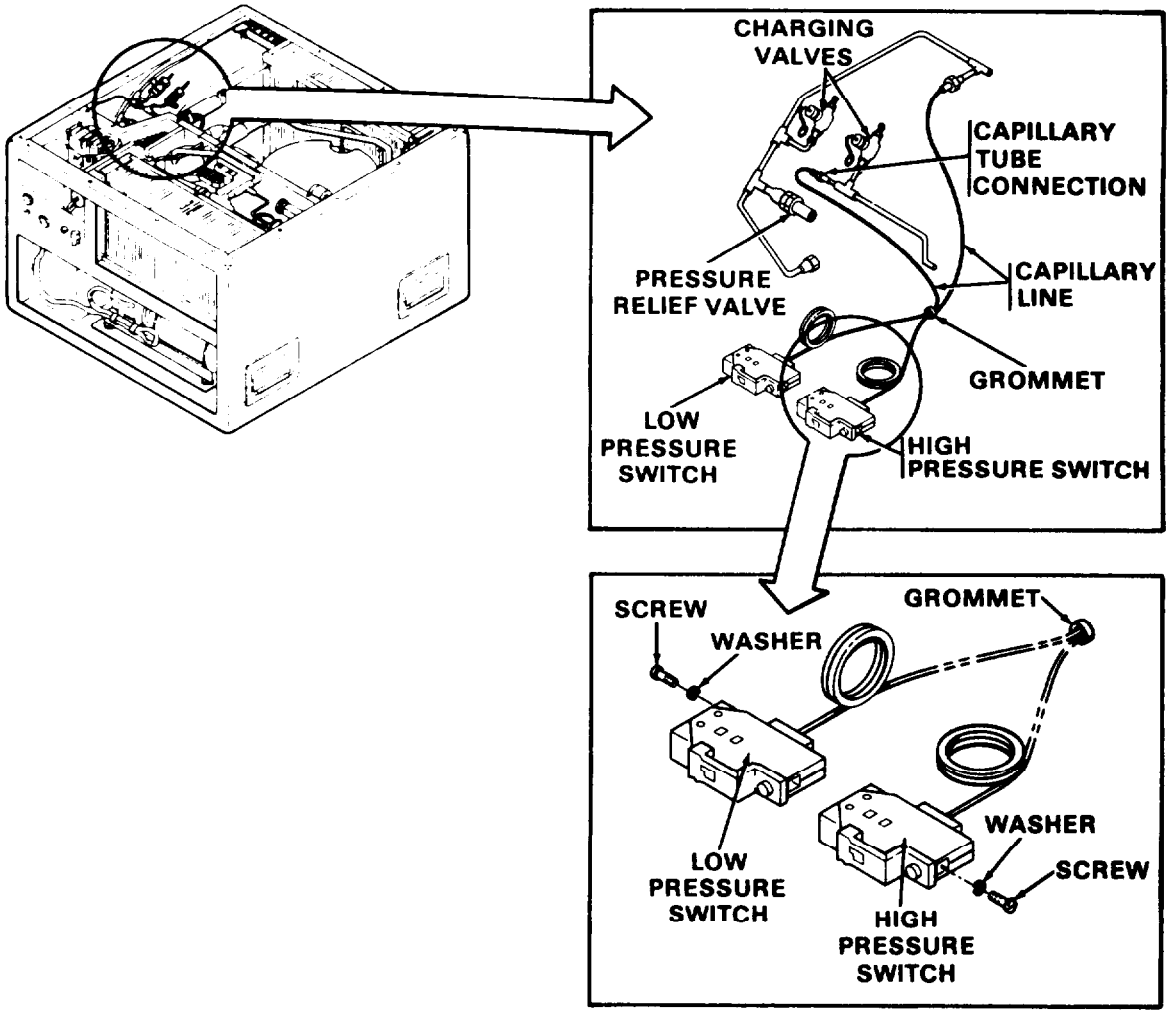


Figure 5-2. High Pressure Cut-Out and Low Pressure Cut-Out Switches

5-18. HIGH PRESSURE CUT OUT (HPCO) AND LOW PRESSURE CUTOUT (LPCO) SWITCHES - Continued.

(4) Refer to paragraph 4-29 and remove Junction Box.

(5) Refer to figure 5-2 and disconnect the pressure cutout switch electrical leads.

(6) Remove pressure cutout switch mounting screws.

(7) Disconnect pressure cutout switch flare nut from the refrigerant line tee.

(8) Remove the capillary tube grommet in the back wall, extract the capillary tube and flare nut through the opening.

b. Testing.

Check for loose connections and cracked or broken casing. Check for continuity with a multimeter. If no continuity exists, or if the casing is cracked or broken, replace the switch.

5-18. HIGH PRESSURE CUT OUT (HPCO) AND LOW PRESSURE CUTOUT (LPCO) SWITCHES - Continued.

c. Installation.

(1) Refer to figure 5-2 and install capillary tube and grommet,

(2) Mount pressure cutout switch to Housing.

(3) Attach pressure cutout switch and charging valve flare nuts to refrigeration lines.

(4) Refer to paragraph 6-3 and leak test the refrigeration system.

(5) Refer to wiring diagram (FO-1) and attach electrical leads to pressure cutout switch. Attach service valve flare nuts.

(6) Refer to paragraph 6-3 and purge the refrigeration system.

(7) Refer to paragraph 4-29 and install Junction Box.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to fluorocarbon refrigerant gases. Such individuals should be evaluated by local medical authorities before working in environments where potential refrigerant exposure may occur.

(8) Refer to paragraph 6-3 and charge the refrigeration system.

(9) Refer to paragraph 4-18 and install top covers.

5-19. PRESSURE RELIEF VALVE.

a. General. In the event the refrigerant system pressure should exceed 540 ± 10 psig, the plessure valve "popsoff" to restor normal pressure in the system. It may happen. that having once opened, the pressure relief valve doe-s not totally seal closed when normal pressure is restored. In order not to constitute a continuous system leak, the valve must be replaced,

b. Removal.

(1) Refer to paragraph 4-18 and remove top covers.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to flourocarbon refrigerant gases (freons) . Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

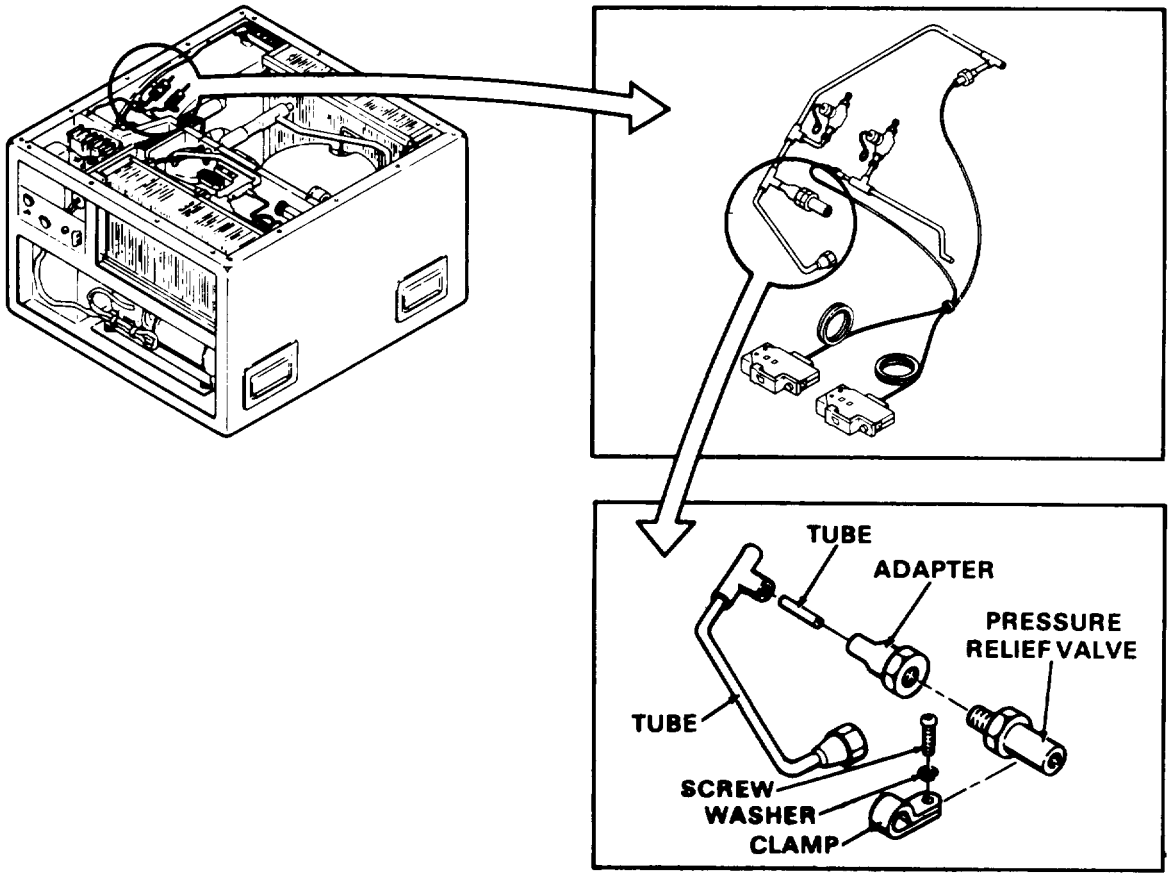


Figure 5-3. Pressure Relief Valve

5-19. PRESSURE RELIEF VALVE - Continued

(2) Refer to paragraph 6-3 and discharge the refrigerant system.

(3) Refer to figure 5-3 and remove the clamp around the pressure relief valve by removing the screw and washer that hold the clamp to the condenser fan housing.

(4) Unscrew the flare nut and remove the pressure relief valve.

b. Installation.

(1) Refer to figure 5-3 and install the pressure relief valve by fastening the refrigerant circuit flare nut to the pressure relief valve.

(2) Using the screw and washer install the clamp that fastens the pressure relief valve to the condenser fan housing.

WARNING

Caution should be exercised with flourocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to flourocarbon refrigerant gases (freons). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

(3) Refer to paragraph 6-3 and leak test the refrigeration system.

(4) Refer to paragraph 6-3 and purge the refrigeration system.

(5) Refer to figure 6-3 and charge the refrigeration system.

(6) Refer to figure 4-18 and install top cover.

5-20. DEHYDRATOR.

a. General. The dehydrator (filter drier) is to be replaced whenever the refrigeration system is opened for maintenance.

b. Removal.

WARNING

Caution should be exercised with flourocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to flourocarbon refrigerent gases freons. Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

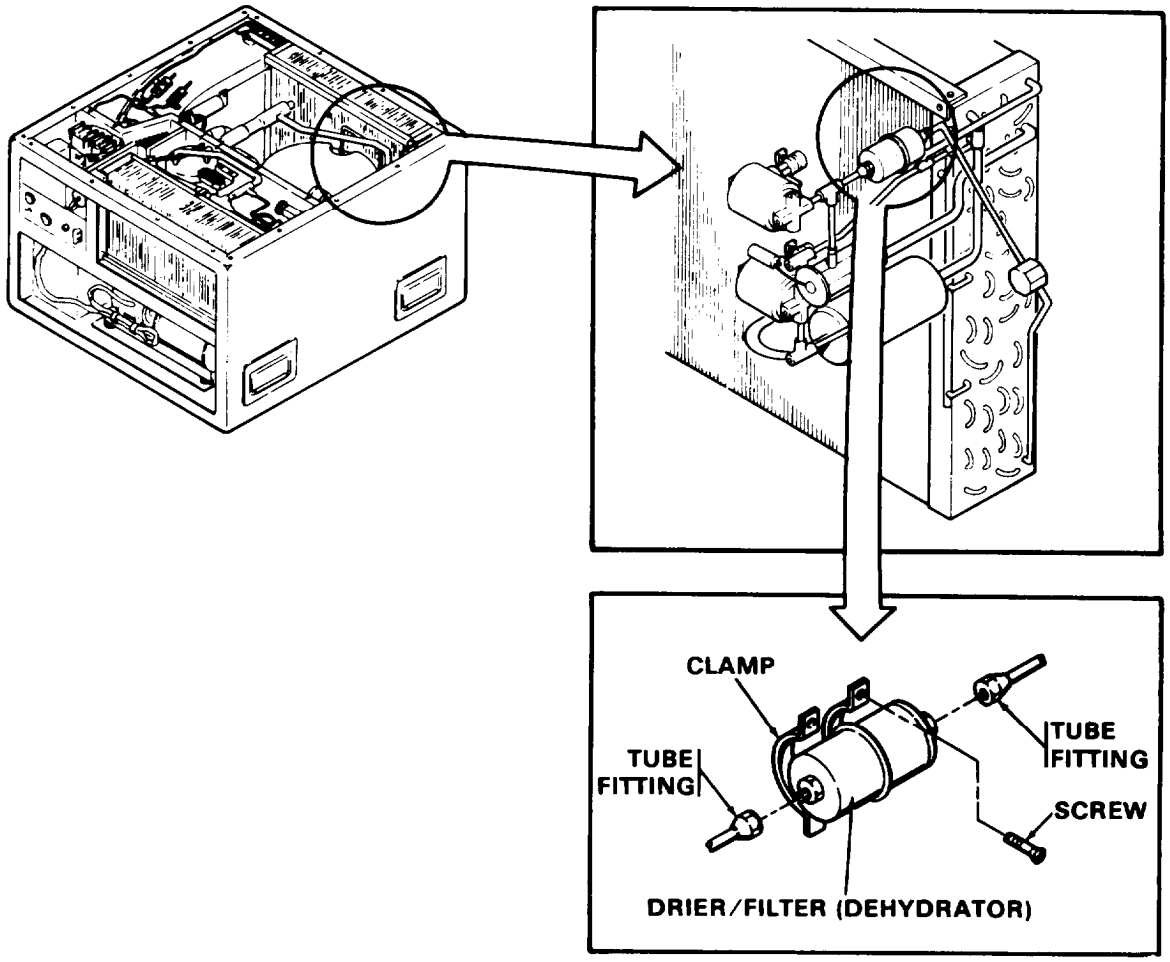


Figure 5-4. Dehydrator

5-20. DEHYDRATOR - Continued.

(2) Refer to paragraph 4-18 and remove rear top cover.

(3) Refer to figure 5-6 and remove dehydrator.

(4) Unsolder dehydrator from refrigerant system tubing.

b. Installation.

(1) Refer to figure 5-4 and install dehyrator into refrigeration lines.

WARNING

Brazing operations should be carried out using approved eye protection equipment and rods not containing cadmium.

Certain brazing operations may require mechanical ventilation.

Local preventive medicine personnel should be queried if doubt exists as to rod composition or ventilation requirements.

(2) Refer to paragraph 5-6 and solder receiver to refrigerant system tubing.

(3) Refer to paragraph 6-3 and leak test the refrigeration system.

(4) Refer to paragraph 4-18 and install rear top cover.

(5) Refer to para 6-3 and purge the refrigeration system.

(6) Refer to para 6-3 and charge refrigeration system.

5-21. LIQUID LINE AND PRESSURE EQUALIZING SOLENOID VALVES (L1) , (L2).

a. General. The solenoid valves are electrically-operated valves, which close when electrical power is applied to the solenoid coils. Both are alike, only the usage is different. L1 is open in cooling mode. When the air in the conditioned space has lowered to the Temperature Control Switch (S3) setting, (By-pass mode) the valves reverse.

b. Removal.

WARNING

Caution should be exercised with flourocarbon refrigerant gas (freon) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to flourocarbon refrigerant gases. Such individuals should be evaluated by local medical authorities before working in environments where potential refrigerant exposure may occur.

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to paragraph 4-18 and remove top covers.

(3) Refer to figure 5-5 and remove solenoid cover and coil.

(4) Remove two solenoid valve mounting screws.

(5) Unsolder solenoid valve from tubing.

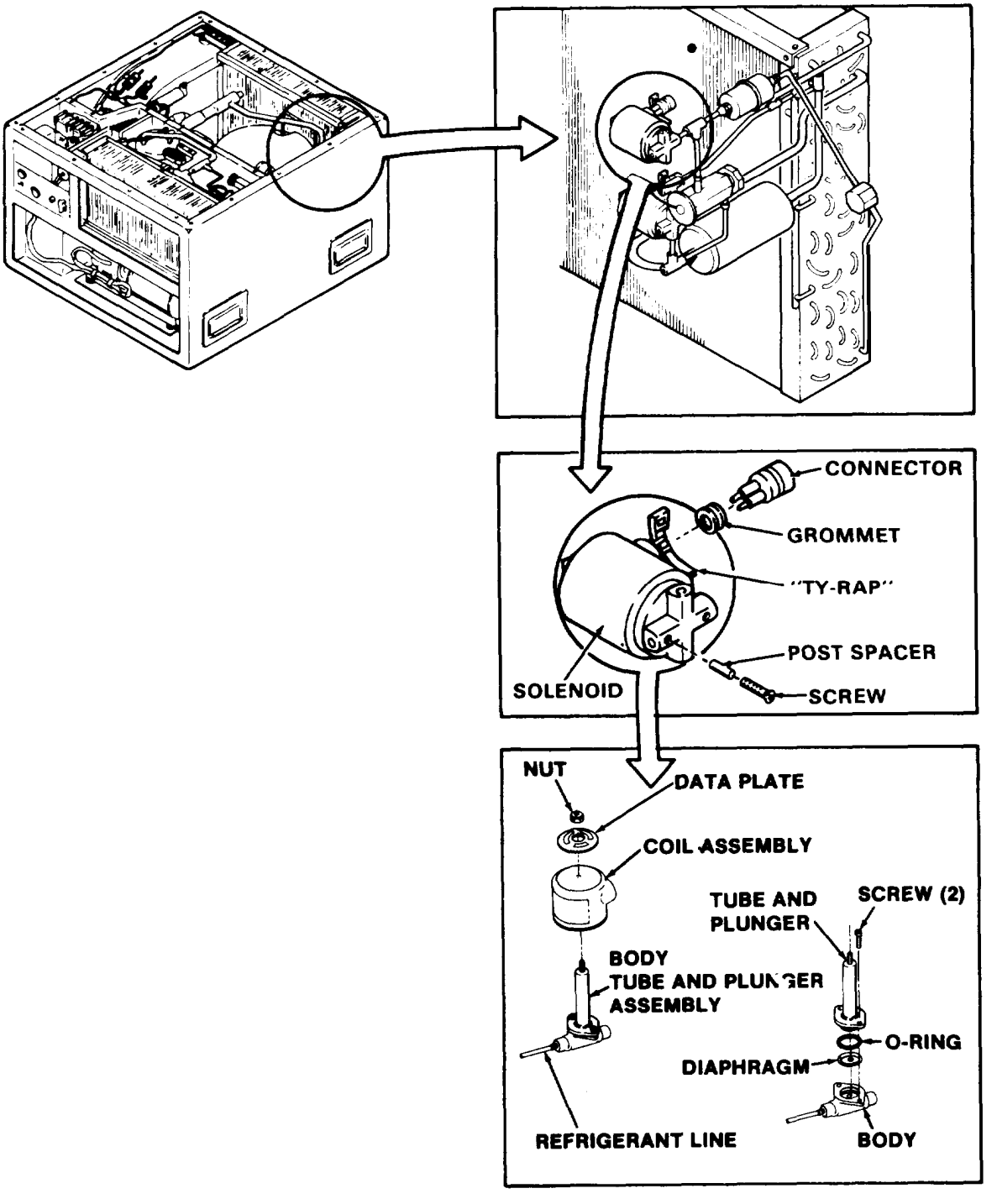


Figure 5-5. Liquid Line and Pressure Equalizing solenoid valves

5-21. LIQUID LINE AND PRESSURE EQUALIZING SOLENOID VALVES (L1) , (L2) - Continued.

c. Installation.

(1) Refer to figure 5-5 and mount solenoid on compartment wall.

WARNING

Blazing operations should be carried out using approved eye protection equipment and rods not containing cadmium.

Certain brazing operations may require mechanical ventilation.

Local preventive maintenance personnel should be questioned if doubt exists as to rod composition or ventilation requirements.

(2) Install coil to valve.

(3) Refer to paragraph 5-6 and solder solenoid valve to refrigerant system tubing.

(4) Refer to paragraph 6-3 and leak test the refrigerant system.

(5) Refer to paragraph 6-3 and purge the refrigeration system.

(6) Refer to paragraph 4-18 and install top covers.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to flourocarbon refrigerant gases (freon). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

(7) Refer to paragraph 6-3 and charge refrigerant system.

5-22. RECEIVER.

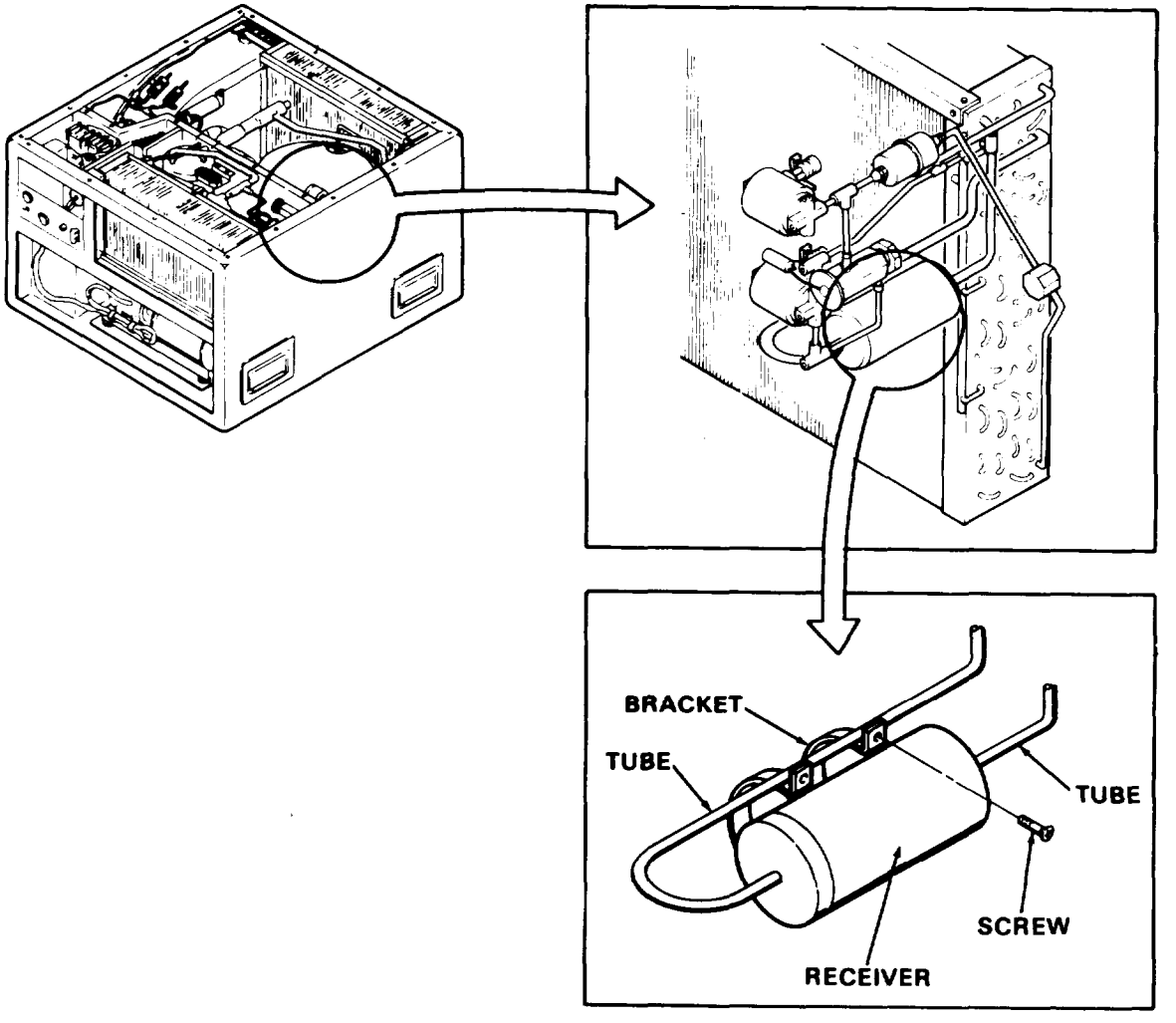


Figure 5-6. Receiver

a. Removal.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to flourocarbon refrigerant cases (freons). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

5-22. RECEIVER - Continued

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to paragraph 4-18 and remove rear top cover.

(3) Refer to figure 5-6 amd remove receiver mounting bracket.

(4) Unsolder receiver from refrigerant system tubing.

b. Installation.

(1) Refer to figure 5-6 and mount receiver on compartment wall.

WARNING

Brazing operations should be carried out using approved eye protection equipment and rods not containing cadmium.

Certain brazing operations may require mechanical ventilation.

Local preventive medicine personnel should be queried if doubt exists as to rod composition or ventilation requirements.

(2) Refer to paragraph 5-6 and solder receiver to refrigerant system tubing.

NOTE

Curved end of tube installed in top at receiver enters in length sufficient for tip of tube to face inner wall of receiver.

(3) Refer to paragraph 6-3 and leak test the refrigeration system.

(4) Refer to paragraph 4-18 and install rear top cover.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrythmias, as a result of exposure to fluorocarbon refrigerant gases (freons). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

(5) Refer to paragraph 6-3 and purge the refrigeration system.

(6) Refer to paragraph 6-3 and charge refrigeration system.

5-23. ACCUMULATOR.

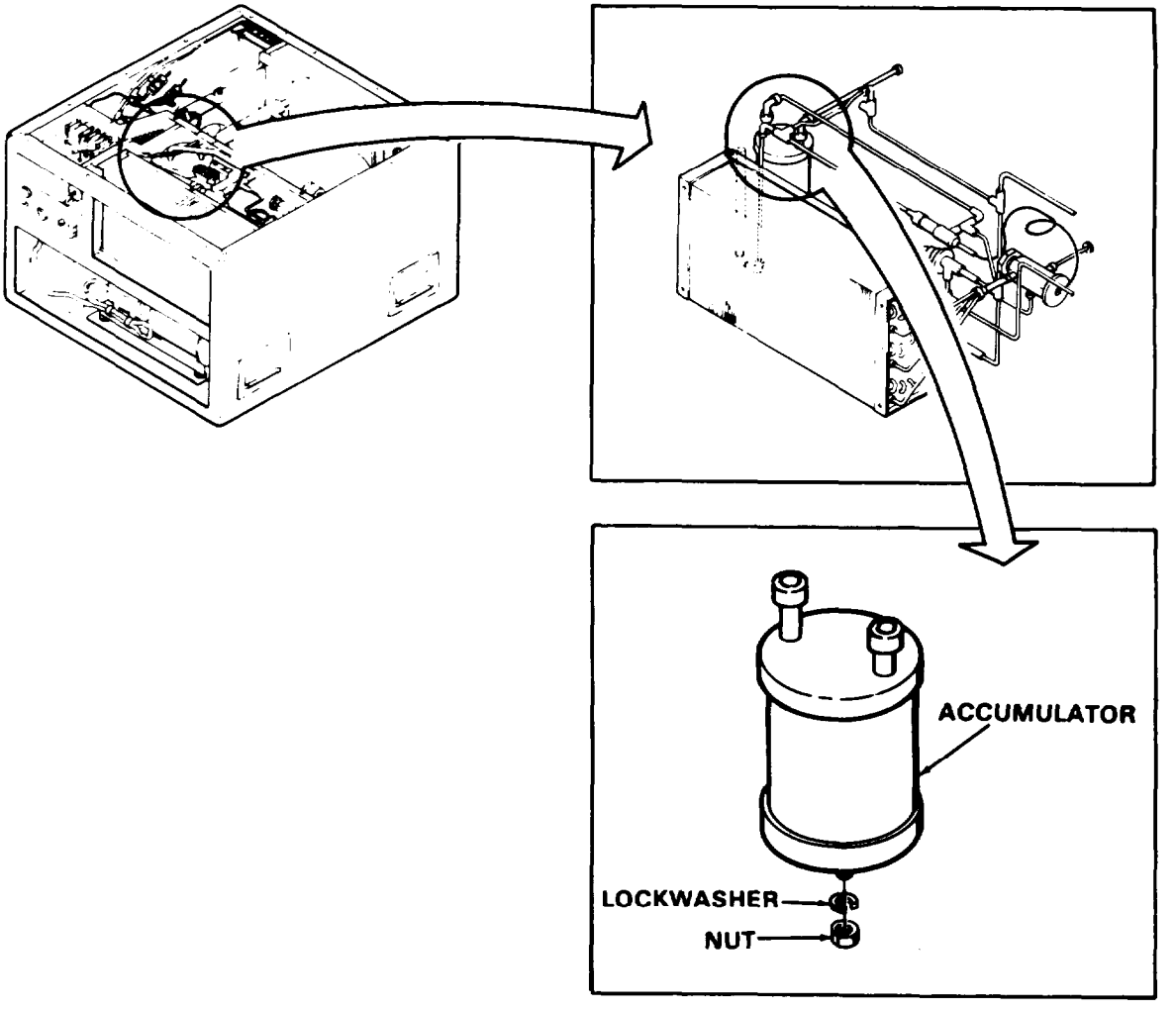


Figure 5-7. Accumulator

a. Removal

WARNING

Caution should be exercised with fluorocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to fluorocarbon refrigerant gases (freons). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

5-23. ACCUMULATOR - Continued

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to paragraph 4-18 and remove top covers.

(3) Refer to figure 5-7 and unsolder system tubing from acumulator.

(4) Remove two screws and washers holding accumulator bracket. Remove accumulator.

(5) Remove nut to seperate accumulator from bracket.

WARNING

Brazing operations should be carried out using approved eye protection equipment and rods not containing cadmium.

Certain brazing operations may require mechanical ventilation.

Local preventive medicine personnel should be queried if doubt exists as to rod composition or ventilation requirements.

b. Installation

(1) Mount bracket on accumulator.

(2) Refer to figure 5-7 and install accumulator secure with washer and lock nut.

(3) Refer to paragraph 5-7 and solder system tubing to accumulator.

(4) Refer to paragraph 6-3 and leak test the refrigeration system.

(5) Refer to paragraph 4-18 and install top cover.

(6) Refer to paragraph 6-3 and purge the refrigerant system.

(7) Refer to paragraph 6-3 and charge refrigerant system.

5-24. LIQUID SIGHT INDICATOR.

a. General. The liquid sight indicator provides a heavy glass porthole to give visible indication of refrigerant flow. Figure 1-2 shows the location and figure 5-8 is a closeup view.

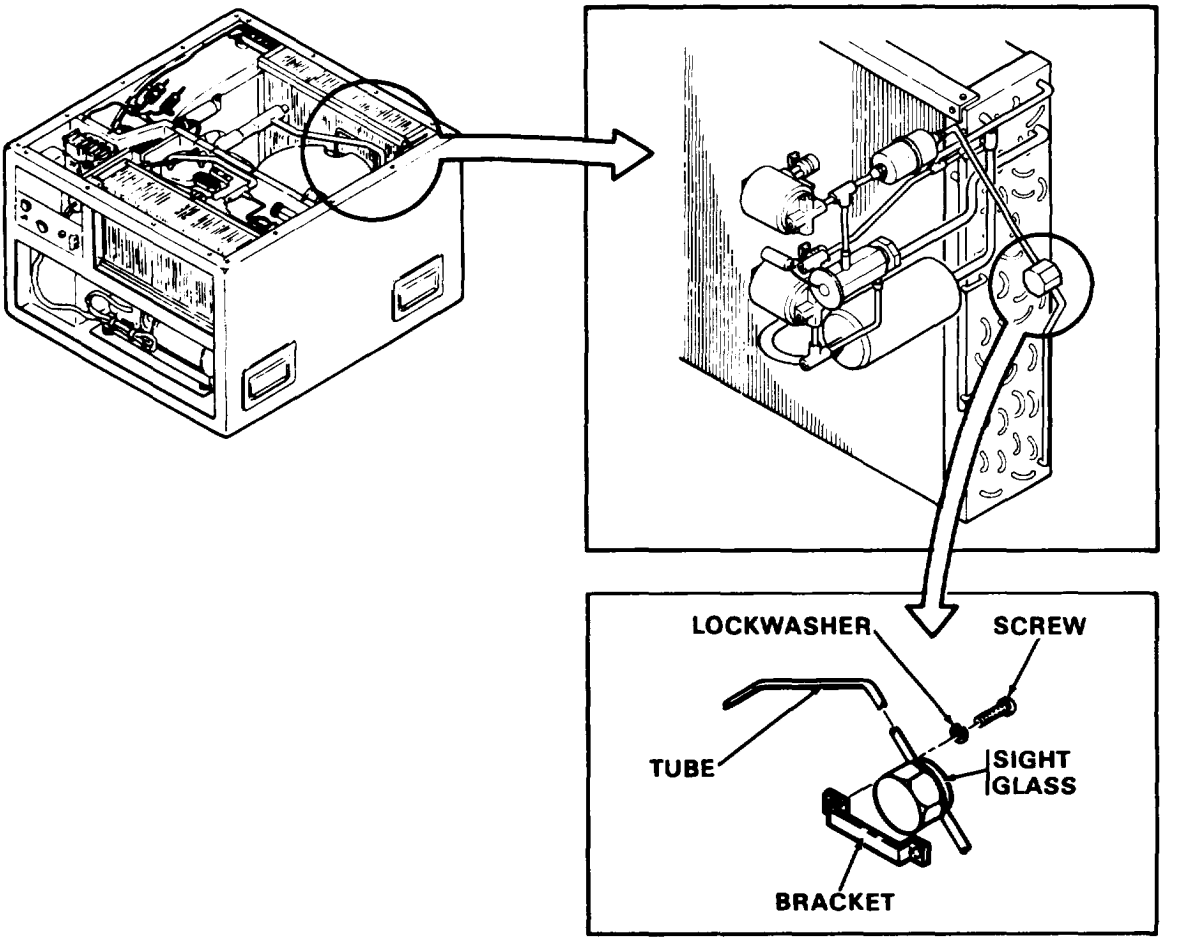


Figure 5-8. Liquid Sight Indicator

b. Removal.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to fluorocarbon refrigerant gases (freons). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

5-24. LIQUID SIGHT INDICATOR - Continued.

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to figure 4-4 and remove rear top cover.

(3) Refer to figure 5-8 and remove the liquid sight indicator mounting plate.

(4) Unsolder the liquid sight indicator from the refrigerant system tubing.

c. Installation.

(1) Refer to figure 5-8 and install the liquid sight indicator and its mounting bracket.

WARNING

Brazing operations should be carried out using approved eye protection equipment and rods not containing cadmium.

Certain brazing operations may require mechanical ventilation.

Local preventive maintenance personnel should be queried if doubt exists as to rod composition or ventilation requirements.

(2) Refer to paragraph 5-6 and solder the liquid sight indicator tot he refrigerant system tubing.

(3) Refer to paragraph 6-3 and leak test the refrigerant system.

(4) Refer to paragraph 6-3 and purge the refrigeration system.

(5) Refer to paragraph 4-18 and install the rear top cover.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrythmias, as a result of exposure to fluorocarbon refrigerant gases (freons). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

(6) Refer to paragraph 6-3 and charge the refrigerant system.

5-25. PRIMARY THERMAL EXPANSION VALVE.

a. General. The primary thermal expansion valve is hermetically sealed and requires no adjustment.

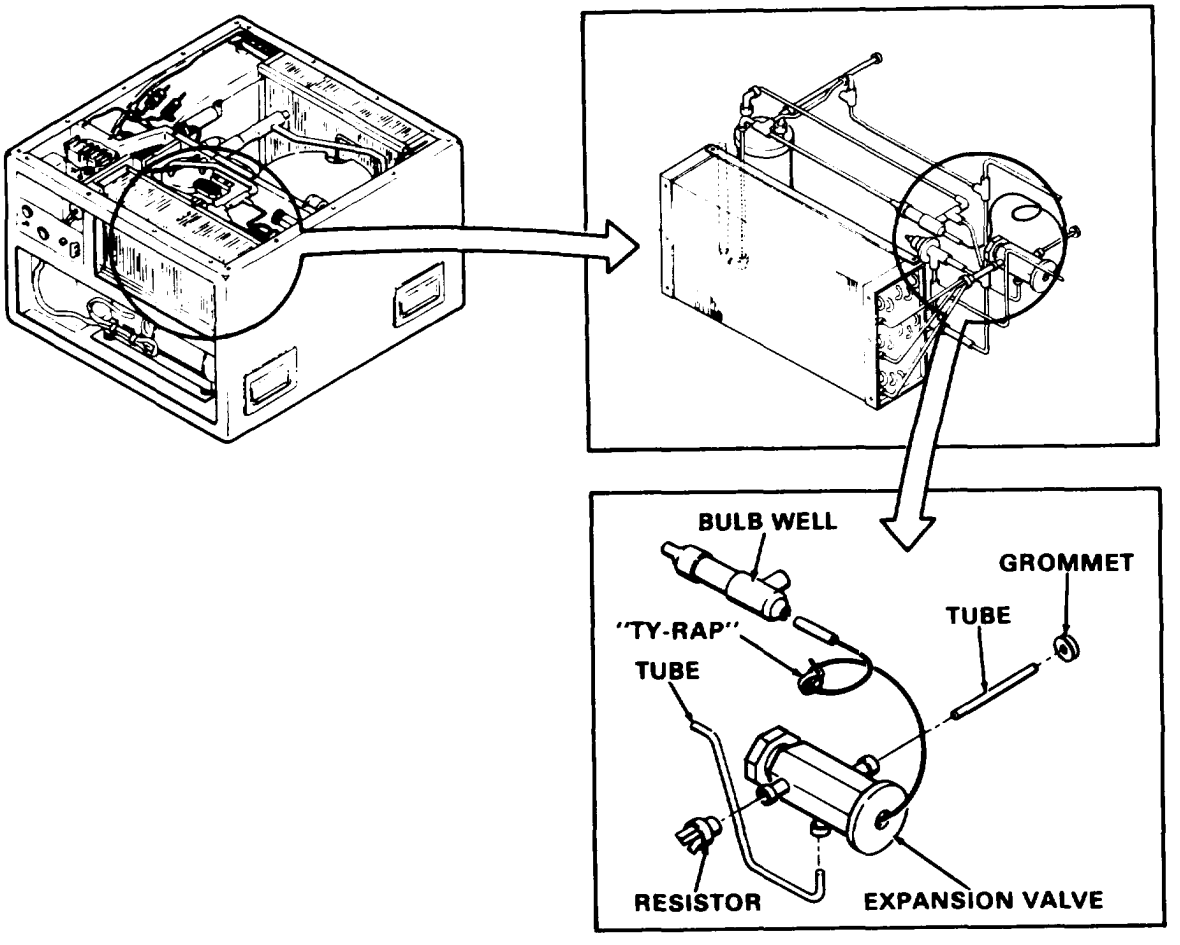


Figure 5-9. Primary Thermal Expansion Valve

b. Removal.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to fluorocarbon refrigerant gases (freons). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

5-25. PRIMARY THERMAL EXPANSION VALVE - Continued.

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to paragraph 4-18 and remove the top covers.

(3) Refer to figure 5-9 . Soften the mastic in the bulb well and remove the expansion valve bulb. Take care to avoid damaging the capillary tube.

(4) Remove the expansion valve clamp.

(5) Unsolder the expansion valve from the refrigerant system tubing.

c. Installation.

(1) Refer to figure 5-9 and mount the expansion valve against the compartment wall using the mounting clamp.

WARNING

Brazing operations should be carried out using approved eye protection equipment and rods not containing cadmium.

Certain brazing operations may require mechanical ventilation.

Local preventive medicine personnel should be queried if doubt exists as to rod composition or ventilation requirements.

(2) Solder the expansion valve to the refrigerant system tubing.

(3) Refer to paragraph 6-3 and leak test the refrigeration system.

(4) Insert approximately one ounce of thermal mastic (See appendix D) in bulb well. Insert sensing bulb of expansion valve and move bulb back and forth to distribute mastic. Position bulb approximate y one inch beyond open end of bulb well.

(5) Refer to paragraph 6-3 and purge the refrigerant system.

(6) Refer to paragraph 4-18 and install top front cover.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to fluorocarbon refrigerant gases (freons). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

(7) Refer to paragraph 6-3 and charge refrigerant system.

5-26. QUENCH THERMAL EXPANSION VALVE.

a. General. The quench thermal expansion valve (removes super heated air) is hermetically sealed and cannot be repaired.

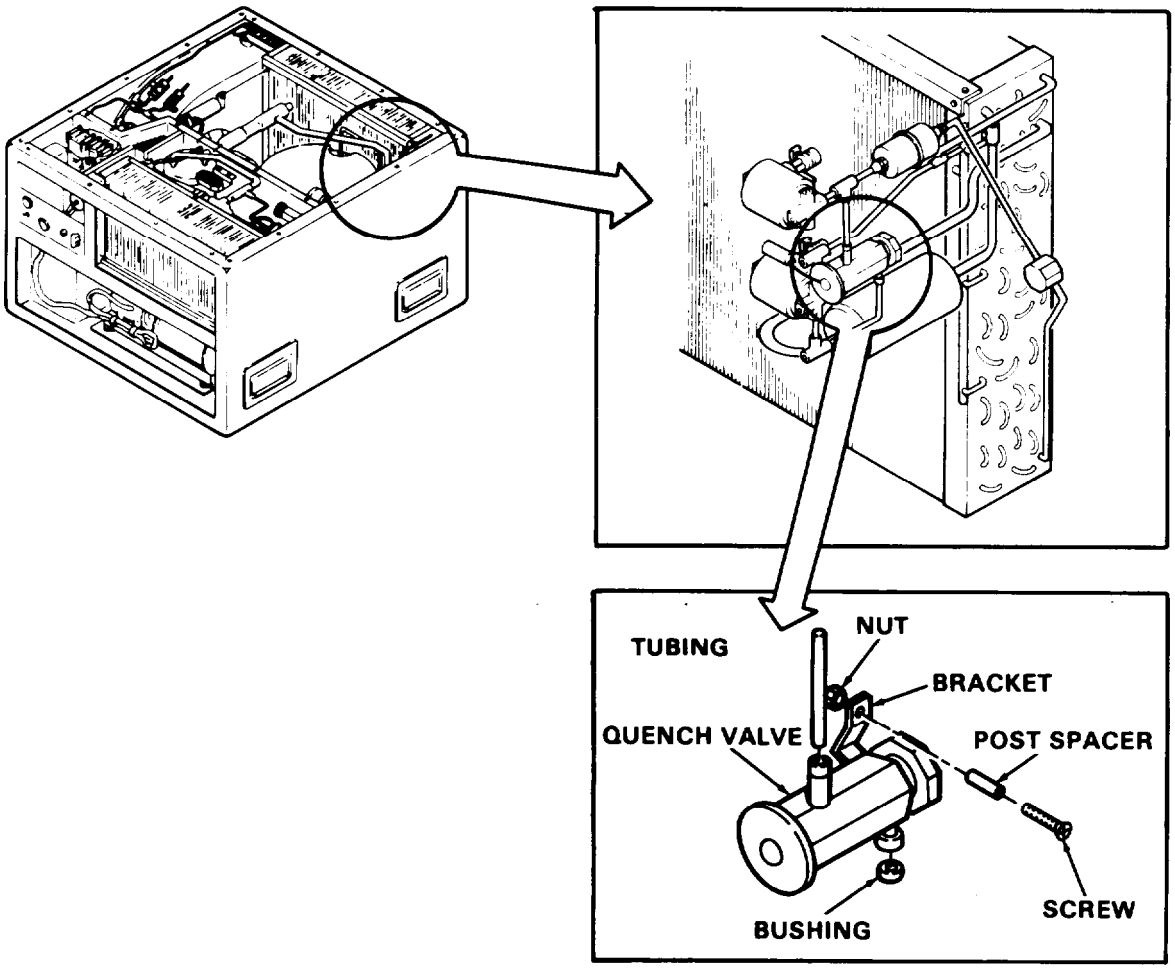


Figure 5-10. Quench Thermal Expansion Valve

b. Removal.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to fluorocarbon refrigerant gases (freons). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

5-26. QUENCH THERMAL EXPANSION VALVE - Continued.

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to paragraph 4-18 and remove the top rear cover.

(3) Refer to figure 5-10. Soften the mastic in the bulb well and remove the expansion valve bulb. Take care to avoid damaging the capillary tube.

(4) Remove the expansion valve clamp.

(5) Unsolder the expansion valve clamp.

c. Installation.

(1) Refer to figure 5-10 and mount the expansion valve against the compartment wall using the mounting clamp.

WARNING

Brazing operations should be carried out using approved eye protection equipment and rods not containing cadmium.

Certain brazing operations may require mechanical ventilation.

Local preventive medicine personnel should be queried if doubt exists as to rod composition or ventilation requirements.

(2) Solder the expansion valve to the refrigerant system tubing.

(3) Refer to paragraph 6-3 and leak test the refrigerant system.

(4) Insert approximately one ounce of thermal mastic in bulb well. Insert sensing bulb of expansion valve and move bulb back and forth to distribute mastic. Position bulb approximately one inch beyond open end of bulb well.

(5) Refer to paragraph 6-3 and purge the refrigeration system.

(6) Refer to paragraph 4-18 and install top rear cover.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to fluorocarbon refrigerant gases (freons). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

(7) Refer to paragraph 6-3 and charge refrigerant system.

5-27. FLUID PRESSURE REGULATOR VALVES.

a. General. Regulates pressure in the by-pass mode. The fluid pressure regulator valve is hermetically sealed and cannot be repaired.

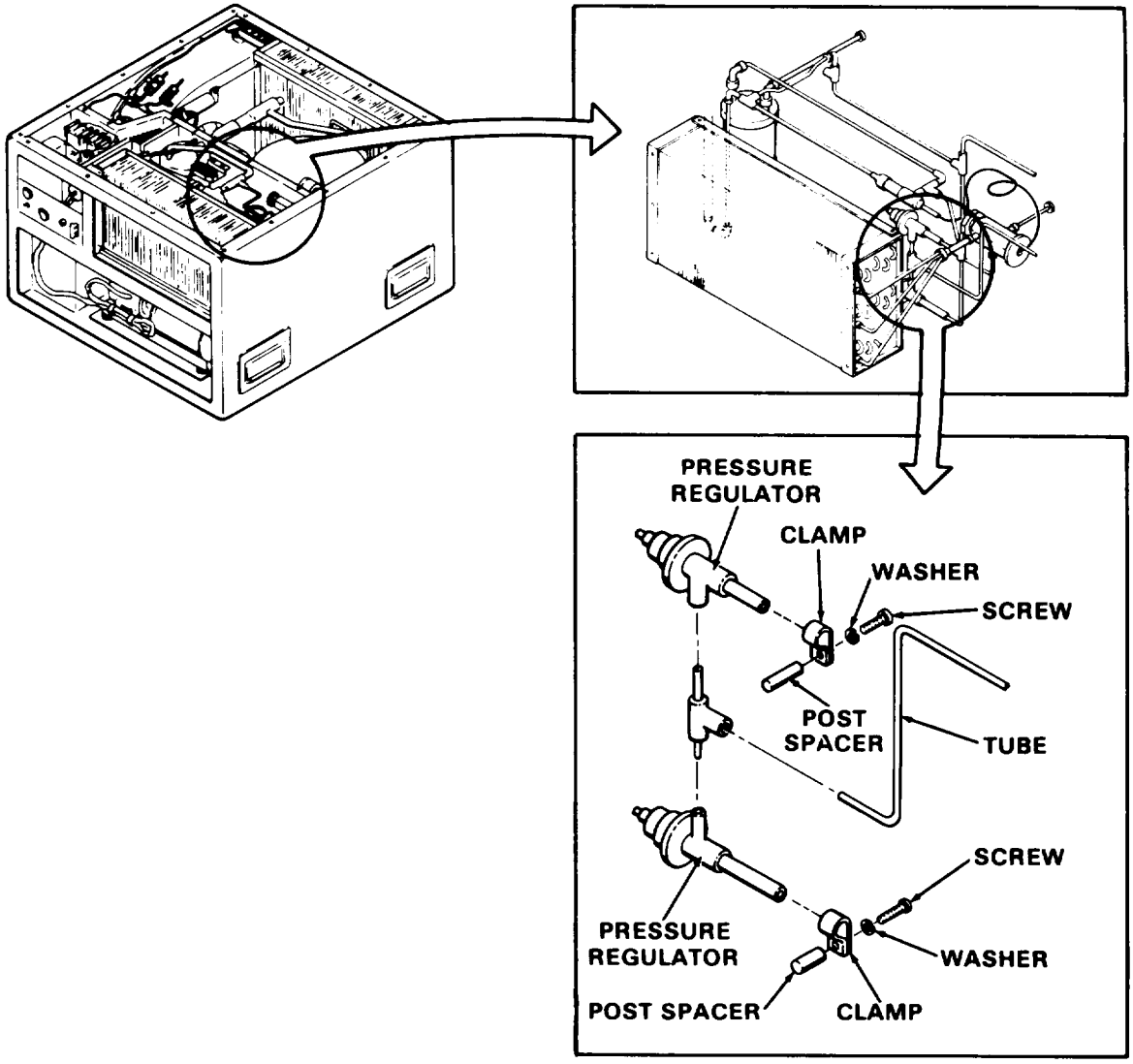


Figure 5-11. Fluid Pressure Regulator Valve

b. Removal.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrythmias, as a result of exposure to fluorocarbon refrigerant gases (freons). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

5-27. FLUID PRESSURE REGULATOR VALVES - Continued

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to paragraph 4-18 and remove the air conditioner top rear cover.

(3) Refer to figure 5-11 and unclamp the regulator valve sensing bulb.

(4) Remove the regulator valve mounting clamp.

(5) Unsolder the regulator valve from the refrigerant system tubing. Remove by drawing the bulb through the compartment wall.

c. Installation.

(1) Refer to figure 5-11 and mount the fluid pressure regulator against the compartment wall using the mounting clamp.

WARNING

Brazing operations should be carried out using approved eye protection equipment and rods not containing cadmium.

Certain brazing operations may require mechanical ventilation.

Local preventive medicine personnel should be queried if doubt exists as to rod composition or ventilation requirements.

(2) Solder the pressure regulator valve to the refrigerant system tubing.

(3) Feed the sensing bulb through the compartment wall and clamp in place.

(4) Refer to paragraph 6-3 and leak test the refrigeration system.

(5) Refer to paragraph 6-3 and purge the refrigeration system.

(6) Refer to paragraph 4-18 and install the top covers.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrythmias, as a result of exposure to fluorocarbon refrigerant gases (freons). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

(7) Refer to paragraph 6-3 and charge the refrigerant system.

5-28. EVAPORATOR COIL

a. General. A portion of the evaporator coil mounting hardware is used to attach the mist eliminator holder. Therefore, coil and mist eliminator holder are removed under the same procedure.

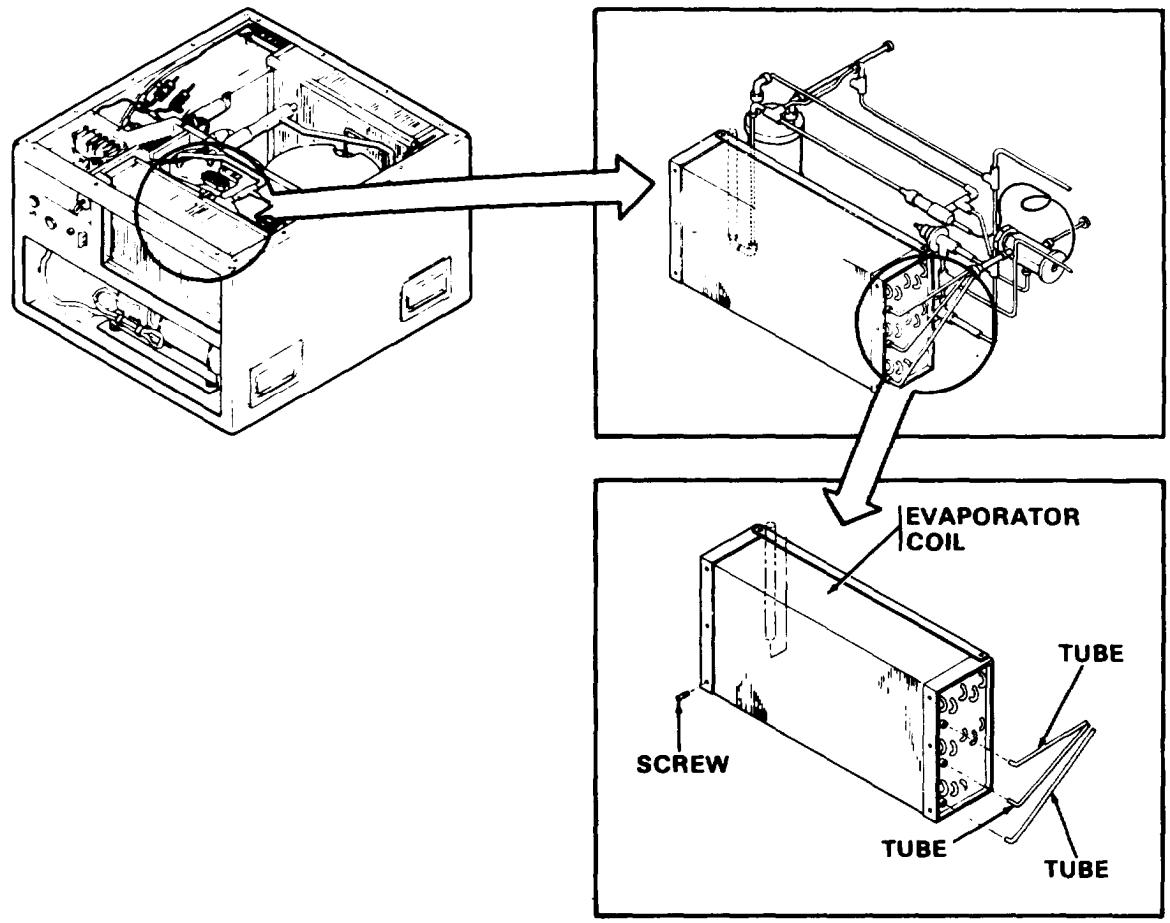


Figure 5-12. Evaporator Coil and Mist Eliminator Holder

b. Removal. Remove the evaporator coil and mist eliminator holder as follows:

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to paragraph 4-18 and remove housing top covers.

(3) Refer to figure 4-19 and remove evaporator air outlet louvers and mist eliminator.

(4) Refer to para 4-33 and remove heating elements.

(5) Refer to figure 5-12 and remove support plate that holds coil to housing.

5-28. EVAPORATOR COIL - Continued.

(6) Refer to figure 5-12 and disconnect tubing from evaporator coil.

(7) Remove six screws, washers, and lock washers that hold evaporator coil and mist eliminator holder to air conditioner. Remove holders and coil.

c. Installation. Install evaporator coil and mist eliminator holder as follows:

(1) Install coil and mist eliminator holder in air conditioner and secure to brackets with six screws, washers, and lockwashers attach both the coil and mist eliminator holder; the lower two hold the coil only.

(2) Refer to figure 5-12 and install coil support plate.

(3) Connect tubing to coil. Leak test as described in paragraph 6-3.

(4) Refer to paragraph 4-19 and install evaporator air outlet louver.

(5) Refer to paragraph 4-33 and install heating elements.

(6) Refer to figure 4-18 and install housing top covers.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to fluorocarbon refrigerant gases (freons). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

(7) Refer to paragraph 6-3 and purge the refrigerant system.

(8) Refer to paragraph 6-3 and charge the refrigerant system.

5-29. CONDENSER LOUVER ACTUATOR

a. Removal. Remove actuator as follows:

WARNING

Caution should be exercised with fluorocarbon refrigerant gas as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to fluorocarbon refrigerant gases (freons). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to paragraph 4-18 and remove housing covers.

(3) Refer to figure 5-13 and loosen mechanical screw end to loosen control wire.

(4) Remove screw, lockwasher and loop clamp.

(5) Remove push-pull control assembly clips at each end and remove push-pull control.

(6) Disconnect flare nut from end of actuator cylinder.

(7) Remove two nuts and lockwashers (located inside fan housing) from bracket and remove actuator cylinder. If cylinder is to be replaced, remove rivets and retain push-pull control assembly brackets.

b. Installation. Install actuator cylinder as follows:

(1) Reinstall push-pull control assembly brackets on replacement cylinder.

(2) Install actuator cylinder (figure 5-13) with studs through openings in fan housing. Install lockwashers and nuts on studs.

(3) Connect flare nut to actuator

(4) Install push-pull control clips to hold control in position.

(5) Adjust control as described below.

c. Adjustment. Before system is charged, adjust louver push-pull control as follows:

(1) Close louver blades and tighten screw in mechanical post to lock wire on that end.

(2) Extend actuator rod until there is a 1/4 inch space between inner edge of mechanical post bracket and the face of the cylinder. Tighten the screw.

(3) Refer to paragraph 4-19 and install housing top covers.

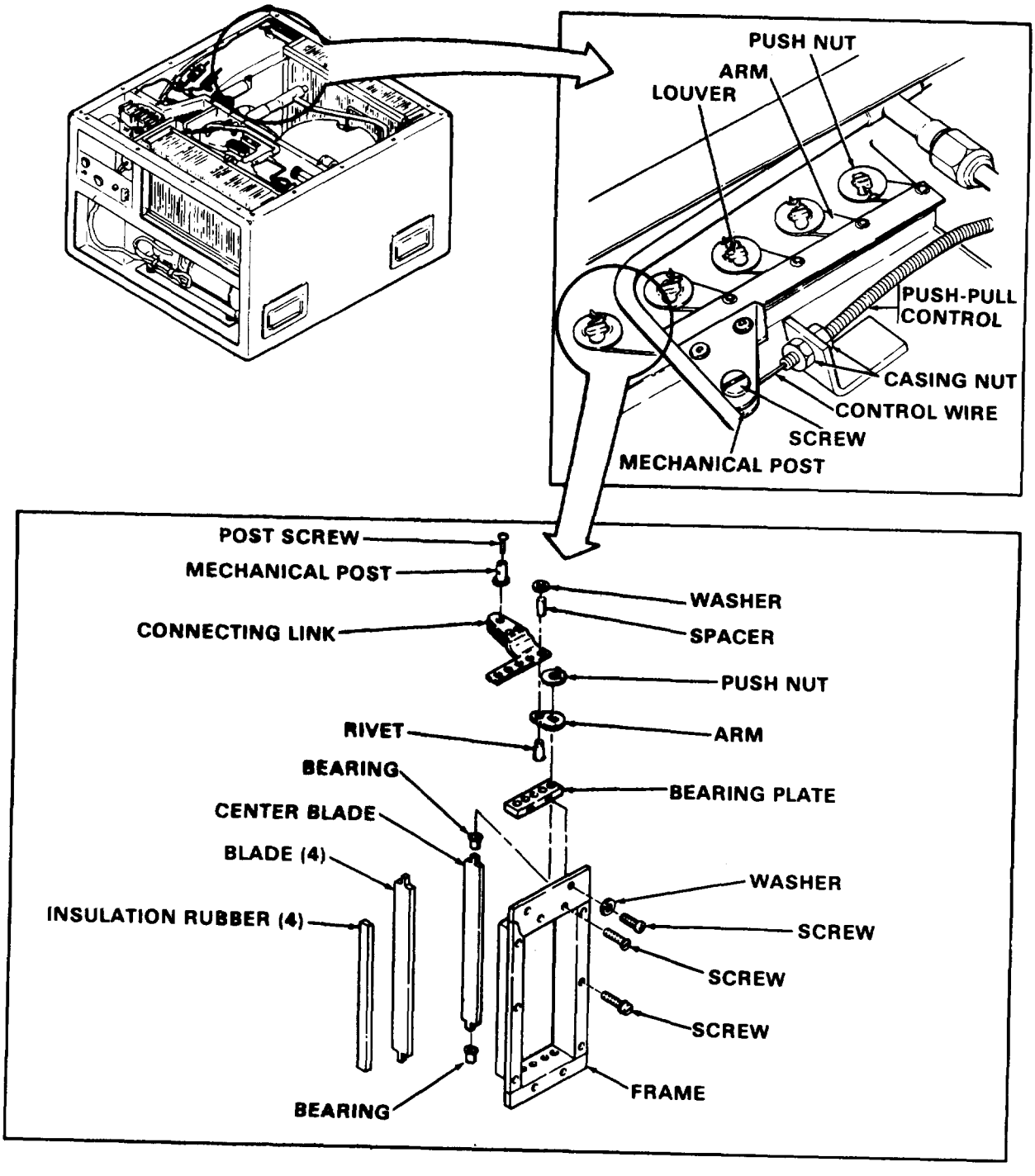


Figure 5-13. Condenser Louver Actuator and Control.

5-29. CONDENSER LOUVER ACTUATOR - Continued

WARNING

Caution should be exercised with fluorocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to fluorocarbon refrigerant gases (freons). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

(4) Refer to paragraph 6-3 and charge the refrigerant system.

5-30. CONDENSER COIL.

a. Removal. Remove condenser coil as follows:

WARNING

Caution should be exercised with fluorocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to fluorocarbon refrigerant gases (freons). Such individuals should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to paragraph 4-18 and remove housing top covers.

(3) Refer to paragraph 4-20 and remove condenser guard.

(4) Refer to paragraph 5-29 and remove lower actuator.

(5) Disconnect tubing from condenser coil and remove other tubing and fittings as required.

(6) Remove screws that secure coil to base of housing.

(7) Remove coil from air conditioner. Use care when removing coil to prevent damage to coils and fins.

b. Installation. Install condenser coil as follows:

(1) Be sure sheet spring nuts are in place on bottom of coil. Position coil in air conditioner and install four counter-sunk-head screws from underside of housing.

(2) Connect tubing to condenser and attach actuator flare nut.

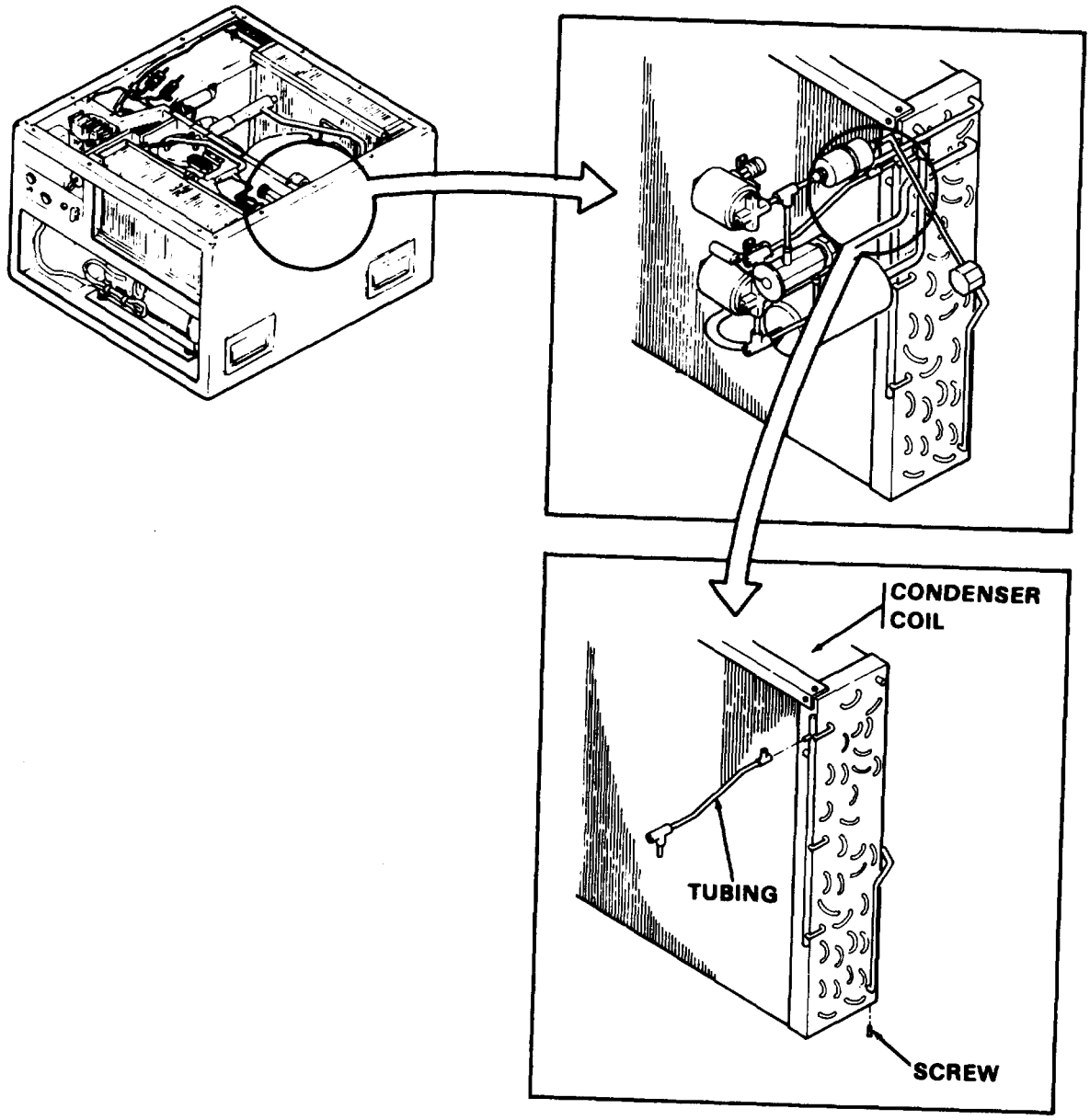


Figure 5-14. Condenser Coil

5-30. CONDENSER COIL - Continued.

(3) Leak test as described in paragraph 6-3.

(4) Refer to paragraph 4-20 and install condenser guard.

(5) Refer to paragraph 5-29 and install lower actuator.

(6) Refer to paragraph 4-18 and install housing top covers.

(7) Refer to paragraph 6-3 and purge the refrigerant system.

WARNING

Caution should be exercised with flourocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to fluorocarbon refrigerant gases. Such individuals should be evaluated by local medical authorities before working in environments where potential refrigerant gases exposure may occur.

(8) Refer to paragraph 6-3 and charge the refrigerant system.

5-31. COMPRESSOR.

a. General. The compressor is a self-contained hermetically sealed unit and cannot be repaired.

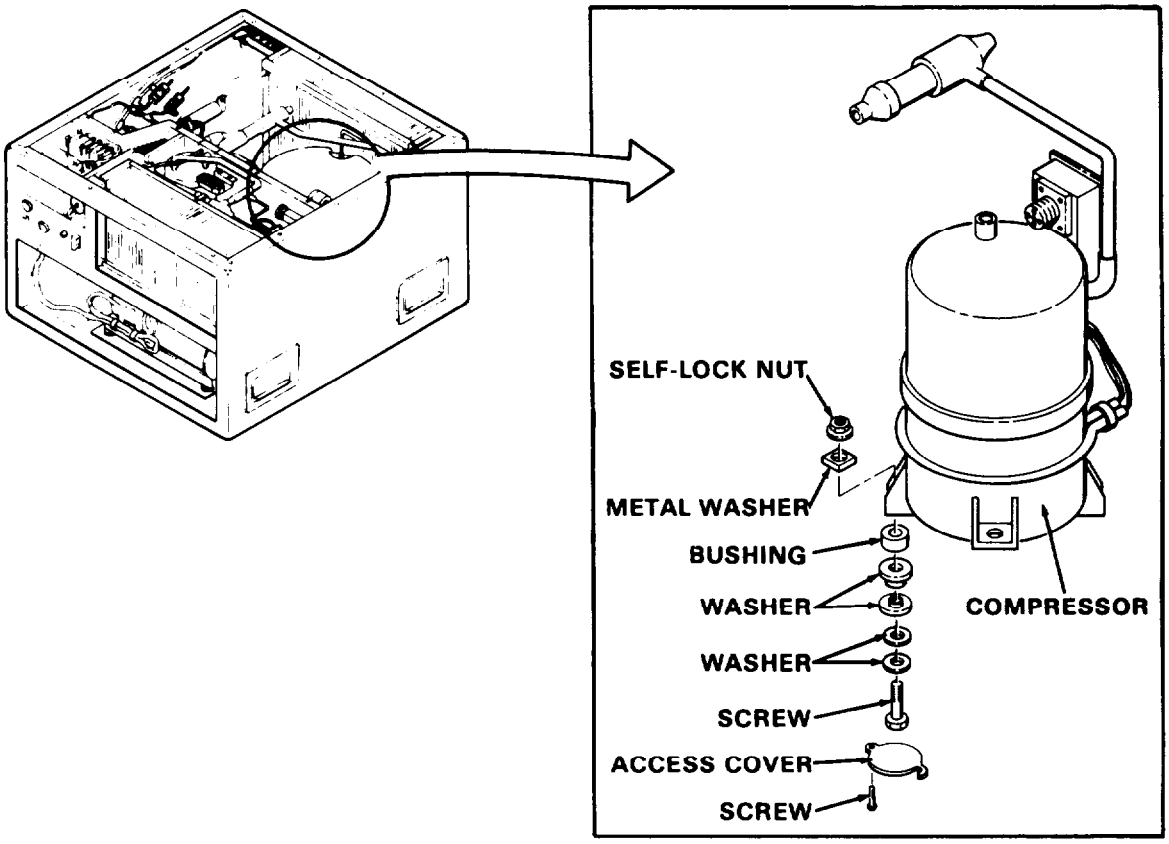


Figure 5-15. Compressor

b. Removal. Refer to figure 5-15 and remove compressor as follows:

WARNING

Caution should be exercised with flourocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation rhythm abnormalities or the induction of arrhythmias, as a result of exposure to fluorocarbon refrigerant gases. Such individuals should be evaluated by local medical authorities before working in environments where potential refrigerant gases exposure may occur.

5-31. COMPRESSOR - Continued.

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to paragraph 4-18 and remove top covers.

(3) Refrigerant tubing as required to permit removal of compressor.

(4) Disconnect electrical connector P1 from compressor.

(5) Position unit to gain access to bottom of unit. Remove bolt access plates.

(6) Remove four screws, washers, lock washers and compressor mount bushings.

(7) Lift compressor from air conditioner.

CAUTION

If compressor is being replaced because of a motor burnout, decontaminate system as instructed in paragraph 6-5. Failure of the replacement compressor will result if all the contaminants are not removed.

c. Installation. Install compressor as follows:

(1) Refer to figure 5-15, place compressor on mounts and install four compressor mount bushings. Secure compressor with four screws, washers and lock washers. Install bolt access plates.

(2) Connect compressor tubing. Refer to paragraph 5-20 and install new dehydrator.

(3) Refer to paragraph 6-3 and leak-test connections.

(4) Connect electrical connector P6.

(5) Refer to paragraph 4-33 and install condenser motor and motor supports.

(6) Refer to paragraph 6-3 and purge the refrigerant system.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas (freons) as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware rhythm abnormalities or the induction of arrythmias, as a result of exposure to fluorocarbon refrigerant gases. Such individuals should be evaluated by local medical authorities before working in environments where potential refrigerant gases exposure may occur.

(7) Refer to paragraph 6-3 and recharge the refrigerant system.

(8) Refer to paragraph 4-18 and install top covers.

CHAPTER 6. REPAIR INSTRUCTIONS

Section I. REFRIGERATION SYSTEM

6-1. GENERAL.

The refrigerant system, illustrated by the refrigerant flow diagram (Figure 6-1), is a mechanical, vapor cycle type circuit consisting of the evaporator, thermal expansion valve, motor-compressor, condenser, and the necessary valves and cutout devices for automatic control during operation. the thermal expansion valve releases high-pressure liquid refrigerant into the evaporator at reduced pressure, The liquid refrigerant begins to vaporize by absorbing heat from the air passing over the external surface of the evaporator coil. The heated vapor is sucked out of the evaporator section by the motor-compressor and forced into the condenser section under high--pressure where it is cooled and condensed back into a liquid. The heat released during condensation is carried off by the condensing air stream. The liquid refrigerant flows from the condenser to a receiver, to a subcooler, and then to the thermal expansion valve. If the temperature control switch (evaporator return air thermostat) becomes satisfied, or the evaporator return air temperature is lower than the control switch set point, the refrigerant system will switch to a bypass condition. The temperature control switch will activate the normally-open liquid bypass solenoid valve, closing the valve, and therefore shutting off the evaporator section of the unit. The motor-compressor will continue to pump as usual and the suction pressure will begin to drop. When it reaches approximately 58 psig (400 kPa), the pressure regulating valve will start to open in an effort to maintain the suction pressure above 55 psig (380 kPa) (approximately) . As the suction temperature increases, due to the pressure regulating valve opening, the quench expansion valve will start to meter liquid refrigerant into the suction line in an effort to maintain the suction temperature below 75°F (24°C) (approximately), or 30°F (-1°C) superheat (approximately). This action (the pressure regulator and quench valve actions) is totally automatic and also may occur at extreme conditions in an attempt to maintain the suction pressures (even during the cooling mode) at a condition above 55 psig (380 kPa) and the suction temperatures (measured at the quench bulb well) below 75°F (24°C). The condenser louvers are operated by a refrigerant powered piston located in the high pressure part of the system. This piston should be full extended (louvers open at 80°F (27°C) approximately) at 250 psig (1140 kPa) head pressure and fully closed at 165 psig (1140 kPa). Failure to perform this function could result in icing of the evaporator coil and/or cutout on the low pressure cutout.

Table 6-1. Normal Operating Pressures.

	Outdoor Ambient Temperature			
	50°F (10°C)	75°F (24°C)	100°F (38°C)	120°F (49°C)
	At 90°F (32°C) DB return air to unit			
Suction Pressure	58-65 psi (400-450 kPa)	58-70 psi (400-485 kPa)	60-75 psi (255-295 kPa)	75-90 psi (515-620 kPa)
Discharge Pressure .	125-160 psi (860-1100kPa)	175-210 psi (1200-1450kPa)	255-295 psi (1750-2025kPa)	375-410 psi (2550-2825kPa)
	At 80°F (27°C) DB return air to unit			
Suction Pressure	58-65 psi (400-450 kPa)	58-70 psi (400-485 kPa)	60-75 psi (415-515 kPa)	65-75 psi (450-515 kPa)
Discharge Pressure	120-155 psi (825-1070kPa)	170-205 psi (1170-1415kPa)	250-290 psi (1725-2000kPa)	270-410 psi (2550-2825kPa)

6-2. PRESSURE TESTING THE REFRIGERANT SYSTEM.

a. General. A pressure test will indicate whether the air conditioner is operating at normal or at abnormal pressures. When the air conditioner is not operating at normal pressures, the cause should be ascertained and corrected. Refer to Table 5-1 for troubleshooting chart.

b. System Pressure Test. Remove caps from high and low pressure service valves (Figure 5-6), connect suction and discharge pressure gages to their respective service valves. Compare the gage reading with the normal range of system pressure shown in Table 6-1.

6-3. SERVICING REFRIGERANT SYSTEM.

WARNING

Caution should be exercised with fluorocarbon refrigerant gas as they can displace oxygen and thereby cause suffocation.

Personnel with a history or other evidence of cardiac rhythm abnormalities should be made aware of the potential for aggravation of existing cardiac rhythm abnormalities or the induction of arrhythmias, as a result of exposure to fluorocarbon refrigerant gases. Such individuals should be evaluated by local medical authorities before working in environments where potential refrigerant gas exposure may occur.

a. General. When the air conditioner must undergo maintenance that requires opening the system, the system must be discharged with a Recovery/Recycling Unit prior to maintenance, then leak tested and purged, a new dehydrator installed (paragraph 5-20), and the system charged after maintenance. Basic procedures involved in servicing the refrigerant system are as follows:

(1) Discharging System. Refer to Figure 6-1 and proceed as follows to discharge the refrigerant system:

WARNING

Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that refrigerant 22 does not come in contact with eyes. In case of refrigerant leaks, ventilate area immediately.

Step 1 Remove access cover.

Step 2 Remove Low Pressure charging valve cap. Attach a suitable hose to charging valve.

NOTE

In accordance with Environmental Protection Agency regulations, refrigerants cannot be discharged into the atmosphere. A refrigerant recovery & recycling unit must be used whenever discharging the refrigerant system.

Operation of the recovery/recycling unit must be by AUTHORIZED PERSONNEL ONLY

Step 3 Connect and operate a recovery/recycling unit in accordance with the manufactuere's instructions.

(2) Testing System for Leaks. Refer to paragraph 5-6 and leak test the refrigeration system.

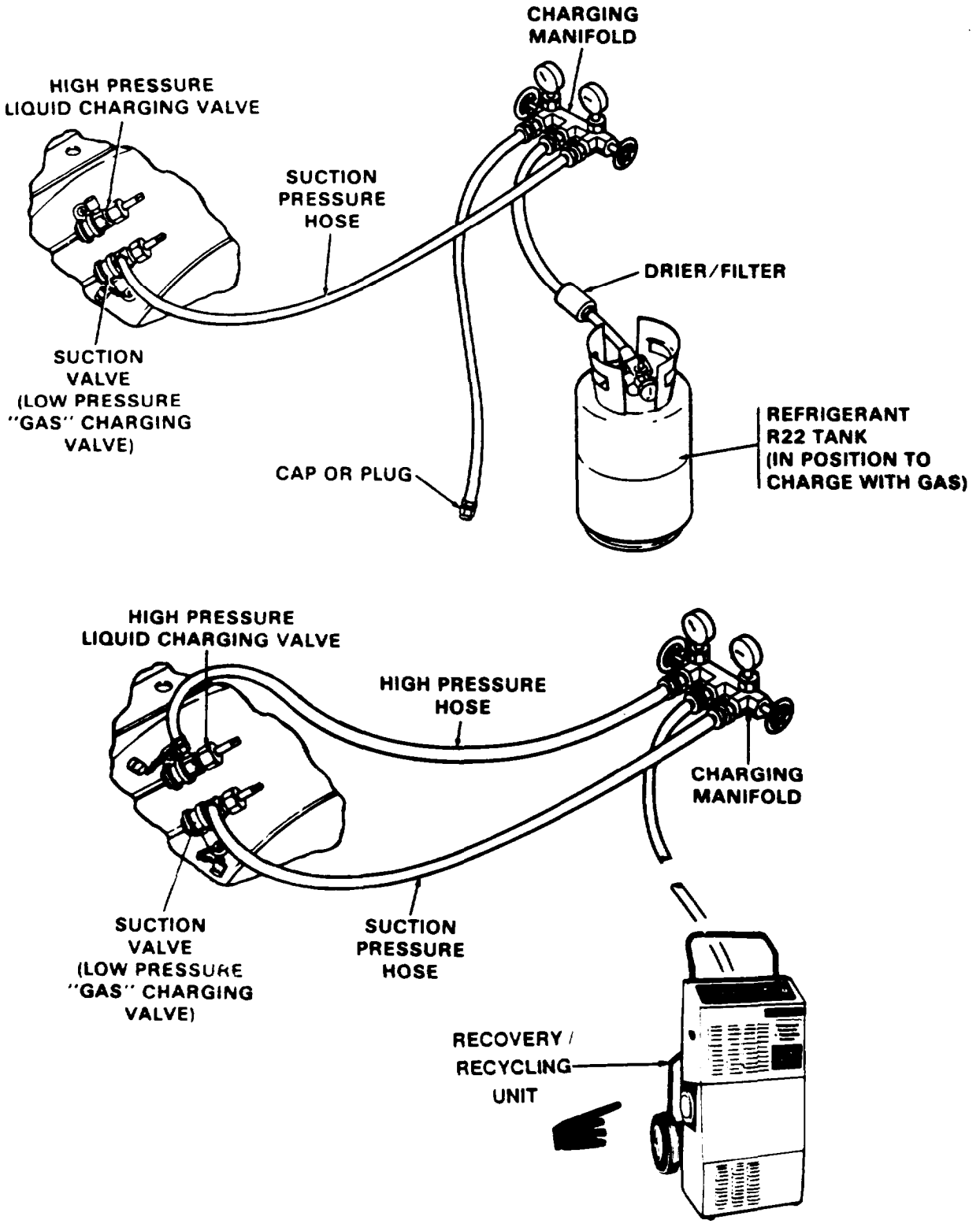


Figure 6-1. Discharging and charging valves.

(3) Purging the Refrigerant System. Refer to figure 6-1 and purge the refrigerant system as follows:

WARNING

Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that refrigerant 22 does not come in contact with eyes. In case of refrigerant leaks, ventilate area immediately.

Step 1. Remove high pressure charging valve cap.

Step 2. Connect valve to a cylinder of dry nitrogen.

Step 3. Attach a suitable discharge hose to low pressure charging valve.

Step 4. Open Nitrogen valve and allow nitrogen to flow through system until all moisture is forced out.

Step 5. Close nitrogen cylinder valve.

Step 6. Charge system.

(4) Evacuating the System. Refer to Figure 6-1 and evacuate the system as follows:

Step 1. Connect a vacuum pump to high and low pressure charging valves.

Step 2. Start vacuum pump and record time for maximum vacuum reading on gage.

Step 3. Continue evacuating for an equal period of time.

Step 4. Stop pump and observe gage. If vacuum holds for a time equal to pump down time, evacuation is satisfactory.

Step 5. Charge refrigeration system.

(5) Charging the System. Refer to Figure 6-1 and charge the system with refrigerant as follows:

WARNING

Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that refrigerant 22 does not come in contact with eyes. In case of refrigerant leaks, ventilate area immediately.

NOTE

Steps 1, 2, 3 and 4 apply only to a completely evacuated system. A fully charged system contains 5 ± .5 pounds (1 .23 KG) of refrigerant 22. To add refrigerant to an incompletely charged system, refer to STEP 5.

NOTE

Before proceeding with charging procedure all covers, panels and grilles must be in place.

6-3. SERVICING REFRIGERANT SYSTEM -Continued.

(5) Charging the System - Continued.

NOTE

Whenever available, use recycled refrigerant for charging the refrigeration system.

Step 1. Remove service valve access cover. Remove valve caps and loosely connect charging manifold service lines to air conditioner charging valves. Attach line from refrigerant drum to manifold.

Step 2. Open refrigerant drum valve and manifold valves and purge air both from manifold and service lines. Tighten service line connections at charging valves and close low side valve on charging manifold.

Step 3. Position refrigerant drum upside down on a scale. Open air conditioner high pressure charging valve and charge system until scale indicates a full charge, then close both high pressure charging valve and drum valve. Disconnect charging lines unless, due to pressure qualization in drum and air conditioner system, a full charge is not measured, then proceed to step 4.

Step 4. Position refrigerant drum upright on scale with lines connected for gas charging. If the weight or refrigerant to fully charge the system is known, operate air conditioner with controls set for maximum cooling. Open refrigerant drum valve, low pressure charging valve, and low side manifold valve. Continue operation until the system is fully charged, then close valves. Stop air conditioner operation and disconnect charging lines.

Step 5. To add refrigerant to system with low charge as indicated by bubbles in liquid sight indicator: with refrigerant drum upright, connect lines for gas charging through low side manifold valve. Purge charging lines by loosely connecting line at drum valve and slightly opening air conditioner charging valves. Tighten line at drum valve. Operate air conditioner with controls set for maximum cooling. Open refrigerant drum valve, low side manifold valve, and low pressure charging valve on air conditioner. Continue operation until bubbles no longer appear in sight indicator. Then close low pressure charging valve on air conditioner. Repeat charging if bubbles reappear in sight indicator. When bubbles do not reappear after 15 minutes of operation, the system is fully charged. Close charging valves and disconnect lines.

6-4. REPAIRING REFRIGERANT LEAKS.

a. Locate leak (paragraph 5-6).

b. Discharge system (paragraph 6-3), repair leak, and recharge system (paragraph 6-3).

NOTE

If soldering is necessary on any part of the system, a constant purge of dry nitrogen must be fed through the system being soldered to prevent scale formation within the system.

6-5. DECONTAMINATION.

a. General. The compressor is a hermetically sealed unit and cannot be repaired. An inoperative compressor is usually due to a mechanical failure or motor burnout. If the compressor is mechanically frozen or sustains a motor burnout, it must be replaced. A compressor failure generates high temperature causing a breakdown of oil, refrigerant and motor insulation. with the resulting formation of acid, moisture, and sludge. These products are extremely corrosive and must be flushed from the system or repeated burnouts will occur.

6-5. DECONTAMINATION - Continued.

b. Procedure. Decontaminate system as follows:

Step 1. Discharge system (paragraph 6-4) and purge with nitrogen (paragraph 6-4).

Step 2. Remove defective motor-compressor (paragraph 5-31).

Step 3. Remove dehydrator (paragraph 5-20).

Step 4. With compressor out of system, purge all lines with dry nitrogen (paragraph 6-4).

Step 5. Install a new compressor (paragraph 5-31) containing a full and proper oil charge.

Step 6. Install new dehydrator (paragraph 5-20). In step (10) this dehydrator will again be replaced.

Step 7. Triple evacuate system and charge with refrigerant R22.

Step 8. Start air conditioner (paragraph 2-5) and operate unit for 24 hours.

Step 9. Discharge system and purge with nitrogen (paragraph 6-4).

Step 10. Install new dehydrator (paragraph 5-20).

Step 11. Evacuate system (paragraph 6-4) and recharge with refrigerant (paragraph 6-4)

Step 12. Operate air conditioner.

6-6. EVAPORATOR AND CONDENSER COILS.

a. Inspection. Inspect coils for damaged tubing and bent fins. Inspect threaded holes for damaged or stripped threads.

b. Repair. Repair any leaks. Straighten bent fins. Repair or replace damaged tubing if possible. Replace coil if repair is not practical.

APPENDIX A

REFERENCES

A-1. Fire Protection.

TB 5-4200-200-10	Hand Portable Fire Extinguisher for Army Users

A-2. Lubrication.

C9100IL	Fuels, Lubricants, Oils and Waxes

A-3. Painting

TM- 9-213	Painting Instructions for Field Use

A-4. Maintenance.

TM-5-4120-369-24P	Organizational, Direct and General Support Maintenance Repair Parts and Special Tool List for Air Conditioner, Horizontal, Compact, 18,000 BTUH
TM 38-750	Army Maintenance Management System
TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use
Fed . Spec. P-D-680	Dry Cleaning Solvent

A-5. Shipment and Storage.

TM 740-90-1	Administration Storage of Equipment

APPENDIX B

COMPONENTS OF END ITEM LIST

Section I. INTRODUCTION

A-1. Scope .

This appendix lists Integral Components of and Basic Issue Items (BII) for the air conditioner to help you inventory items required for safe and efficient operation.

A-2. General.

This components of end item list is divided into the following sections:

a. Section II. Integral Components of the End Item.
These items, when assembled, comprise the air conditioner and must accompany it whenever it is transferred or turned in. The illustrations will help you identify these items.

b. Section III. Basic Issue Items.
These are the minimum essential items required to place the air conditioner in operation, to operate it , and to perform emergency repairs. Although shipped seperately packed, they must accompany the air conditioner during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard-to-identify items. This manual is your authority to requisition replacement BII, based on Table(s) of Organization and Equipment (TOE)/ Modification Table of Organization and Equipment (MTOE) authorization of the end item.

A-3. Explanation of Columns.

a. Illustration. This column is divided as follows:

(1) Figure Number. Indicates the figure number of the illustration on which the item is shown (if applicable).

(2) Item Number. The number used to identify item called out in the illustration.

b. National Stock Number (NSN). Indicates the National stock number assigned to the end item and which will be used to requisitioning.

c. Part Number (P/N). Indicates the primary number used by the manufacturer which controls the design and characteristics, of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

d. Description. Indicates the federal item name and, if required, a minumum description to identify the item.

e. Location. The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent area.

f. Usable on Code. "USABLE ON" codes are not used in this manual.

g. Quantity Required (QTY Reqd .) This column lists the quantity of each item required for a complete major item.

h. Quantity. This is left blank for use during inventory. Under the received column, list the quantity you actually receive on your major item. The date columns are for your use when you inventory the major item at a later date; such as for shipment to another site.

Section II. INTEGRAL COMPONENTS OF END ITEM

(1) ILLUSTRATION (a) Figure No.	(b) Item No.	(2) NATIONAL STOCK NUMBER	(3) P/N & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCV'D	DATE	DATE	DATE
		5340-01-042-5759	13216E6137	Mount, Resilient			8				
		4720-01-038-2334	13216E6153	Tube, Elastomeric			4				
		5310-00-566-9504	13216E6138-2	Washer			4				
		5305-00-269-2807	MS90726-64	Screw,Cap, Hex HD			4				
		5935-00-725-415	MS3106R-18-11S	Connector, Plug			1				

Section III. BASIC ISSUE ITEMS

(1) ILLUSTRATION (a) Figure No.	(b) Item No.	(2) NATIONAL STOCK NUMBER	(3) P/N & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCV'D	DATE	DATE	DATE
		5220-00-559-9618		Case, Manual			1				
				Department of Army Technical Manual; Operator, Organizational, Direct Support and General Support Maintenance Manual TM 5-4120-369-14			1				

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

C-1. GENERAL.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III list a the special tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions on explanatory notes for a particular maintenance function.

C-2. MAINTENANCE FUNCTIONS.

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments os test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, or replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly y, module (component or assembly) , and item, or system.

j. Overhaul. That maintenance effort (services/actions) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return en item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipments/components.

C-3. COLUMN ENTRIES USED IN THE MAC.

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph B-2.)

d. Column 4, Maintenance Level. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform the maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels appropriate work time figures will be shown for each level. The number of man-hours specified by the work time figure represents the average time required to restore an item (assembly, subassembly y, component, module, end item, or system) to a serviceable condition. The symbol designations for the various maintenance levels are as follows:

C. . . . . Operator or crew
O . . . . . Organization maintenance
F. . . . . Direct support maintenance
H . . . . . General support maintenance
D. . . . . Depot maintenance

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks. This column shall contain a letter code in alphabetical order which shall be keyed to the remarks contained in Section IV.

C-4. COLUMN ENTRIES USED IN TOOL AND TEST EQUIPMENT REQUIREMENTS.

a. Column 1, Tool or Test Equipment Reference Code. The tool and test equipment reference code correlates with a maintenance function on the identified end item or component.

b. Column 2, Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National/NATO Stock Number. The National or or NATO stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number.

C-5 . EXPLANATION OF COLUMNS IN SECTION IV.

a. Reference Code. The code scheme recorded in column 6, Section II.

b. Remarks. This column lists information pertinent to the maintenance function being performed as indicated on the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
01	AIR CONDITIONER and ACCESSORY ITEMS								
	Air Conditioner	Inspect		0.5					
		Service		0.5					
		Install		0.75					
		Replace		2.0					
	Accessory Items Electrical Power Connector	Inspect	0.5						
		Test		0.5					
		Install		0.5					
		Replace		2.0					
	Resilient Mounts	Inspect		0.5					
		Replace		1.0					
02	HOUSING COVERS, LOUVERS, and GUARDS								
	Covers	Inspect	0.5						
		Service	0.5						
		Repair		2.0					
		Replace		1.0					
	Louvers, Evaporator Section	Inspect	0.5						
		Adjust	0.5						
		Service	0.5						
		Repair		1.0					
		Replace		1.0					
	Louvers, Condenser	Inspect	0.5						
		Service	0.5						
		Adjust		0.5					
		Repair		1.0					
		Replace		1.0					
	Guards	Inspect	0.5						
		Service	0.5						
		Repair		1.0					
		Replace		0.5					
03	FILTERS, CONDENSATE DRAIN and VENTILATION DAMPER								
	Air Conditioning Filter	Inspect	0.5						
		Service		0.5					
		Replace		1.0					
	Damper Door	Inspect	0.5						
		Service	0.5						
		Replace		2.0					

Section II. MAINTENANCE ALLOCATION CHART (Continued)

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
03 (Cont)	Mist Eliminator	Inspect		0.5					
		Service		0.5					
		Replace		1.0					
	Condensate Water Drains	Inspect	0.5						
		Service		1.0					
		Replace		2.0					
	Ventilation, Damper & Actuator Knob	Inspect	0.5						
		Adjust	0.5						
		Replace		2.0					
04	CONTROL MODULE ASSEMBLY								
	Control Module	Inspect		0.5					
		Repair		2.0					
		Replace		2.0					
	Switch, Thermostatic	Inspect		0.5					
		Adjust	0.5						
		Test		0.5					
		Replace		1.0					
	Switch, Rotary (Mode Selector)	Inspect		0.5					
		Adjust	0.5						
		Test		0.5					
		Replace		1.0					
	Switch, Evaporator	Inspect		0.5					
		Adjust	0.5						
		Test		0.5					
		Replace		1.0					
	Circuit Breaker, Compressor	Inspect		0.5					
		Test		0.5					
		Replace		1.0					
05	JUNCTION BOX ASSEMBLY								
	Junction Box	Inspect		0.5					B
		Repair		2.0					
		Replace		2.0					
	Electrical Connectors, Terminal Boards and Harness	Inspect		0.5					
		Test		0.5					
		Replace		3.0					
	Relays	Inspect		0.5					
		Test		0.5					
		Replace		1.0					
	Rectifier	Inspect		0.5					
		Test		0.5					
		Replace		1.0					

Section II. MAINTENANCE ALLOCATION CHART

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
05 (Cont)	Control Circuit Breaker	Inspect		0.5					
		Test		0.5					
		Replace		1.0					
	Transformer	Inspect		0.5					
		Test		0.5					
		Replace		1.0					
	EMI Capacitors	Inspect		0.5					
		Test		0.5					
		Replace		1.0					
06	EVAPORATOR FAN ASSEMBLY								
	Housing and Base Assembly	Inspect		0.5					
		Service		1.0					
		Replace		2.0					
	Impeller	Inspect		0.5					
		Service		0.5					
		Replace		2.0					
	Motor	Inspect		0.5					
		Test		0.5					
		Replace		3.0					
07	CONDENSER FAN ASSEMBLY								
	Fan Motor	Inspect		0.5					
		Test		1.0					
		Replace		3.0					
	Fan, Axial	Inspect		0.5					
		Service		0.5					
		Replace		1.0					
	Fan Housing and Motor Base	Inspect			0.5				
		Service			0.5				
		Replace			2.0				
	Condenser Fan Thermostatic Switch & Connector	Inspect		0.5					
		Test		1.0					
		Replace		1.0					
08	ELECTRICAL HEATING								
	Heater Cut-Out Switch	Inspect		0.5					
		Test		0.5					
		Replace		0.5					
	Electrical Wiring	Inspect		0.5					
		Test		1.0					
		Replace		4.0					

Section II. MAINTENANCE ALLOCATION CHART (Continued)

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
08 (Cont)	Heating Elements	Inspect			0.5				
		Test			0.5				
		Replace			2.0				
09	REFRIGERATION SYSTEM								
	Tubing and Fittings	Inspect			0.5				
		Test			1.0				
		Replace			2.0				
	Pressure Switches	Inspect			0.5				
		Test			0.5				
		Replace			2.0				
	Valves	Inspect			0.5				
		Test			0.5				
		Replace			2.0				
	Cylinder Assembly Louver Actuating	Inspect			0.5				
		Test			0.5				C
		Adjust			0.5				
		Replace			2.0				
	Dehydrator	Inspect			0.5				
		Replace			1.5				
	Liquid Indicator	Inspect		0.5					
		Service		0.5					
		Replace			4.0				
	Liquid Accumulator	Inspect			0.5				
		Replace			3.0				
	Compressor	Inspect			0.5				
		Test			1.5				
		Service			1.0				
		Replace			12.0				
	Condenser Coil	Inspect		0.5					
		Service		0.5					
		Replace			8.0				
	Evaporator Coil	Inspect		0.5					
		Service		0.5					
		Replace			8.0				
10	HOUSING ASSEMBLY								
	Housing	Inspect			0.5				
		Repair			2.0				

Section II. MAINTENANCE ALLOCATION CHARGE (Continued)

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
	Information Plates	Inspect		0.2					
		Replace		0.5					
	Insulation	Inspect		0.5					
		Replace		2.0					

Section III. TOOLS AND TEST EQUIPMENT REQUIREMENTS

(1) Reference Code	(2) Maintenance Level	(3) Nomenclature	(4) National/NATO Stock Number	(5) Tool Number
		No special tools & test equipment required. Standard tools and test equipment contained in the following tool kits are adequate to accomplish the maintenance functions listed in Section II:		
		Tool Kit, Service, Refrigeration Unit (SC 5180-90-CL-N18)	5180-00-597-1474	
		Soldering Gun Kit	3439-00-930-1638	
		Vacuum Pump	4310-00-098-5272	
		Recovery and Recycling Unit, Refrigerant	4130-01-338-2707	(07295) 17500B

Section IV. MAINTENANCE ALLOCATION CHART

REFERENCE CODE	REMARKS
	No supplemental instructions or explanatory remarks for a particular maintenance function listed in Section II are required. All functions are sufficiently defined in Section 1. Due to various methods of installing the air conditioner, all active time listed for maintenance tasks are with the air conditioner in the off-equipment position at organizational user level or in a repair shop facility.
A	Replace gasket, fasteners, insulation and information plates
B	Replace component parts
C	Adjust louver linkage only

APPENDIX D

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. SCOPE.

This appendix lists expendable supplies and materials you will need to operate and maintain the air conditioner. These items are authorized to you by CTA 50-970. Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

D-2. EXPLANATION OF COLUMNS.

a. Column 1- Item number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5, App. D").

b. Column 2- Level. This column identifies the lowest level of maintenance that requires the listed item.

O- Organizational Maintenance
F- Direct Support Maintenance

c. Column 3- National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column 4- Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parentheses. if applicable.

e. Column 5- Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.b. ea, in, pr). If the unit of measure differes from the unit ofissue, requisition the lowest unit ofissue that will satisfy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	O	4130-00-860-0042	Dust Collecting Adhesive **NOTE** Whenever available, use recycled refrigerant for charging the refrigeration system.	pt
2	F	6830-00-106-1659	R-22 (monochlorodifluoro-methane, $CHC1F_2$)	lb
3	O	4130-00-860-0042	Coater, Air Filter	pt
4	O	8040-00-664-0439	Adhesive, General Purpose	pt

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APPENDIX E

ILLUSTRATED LIST OF MANUFACTURED ITEMS

Section I. GENERAL

E-1 This appendix contains the procedures for fabricating the manufactured items you are authorized to make. Section II is the index. The index shows the RPSTL part number, the procedure page of the appendix and the paragraph in the text in which it can be found. Section III contains the procedures, drawings and dimensions to fabricate these items.

Section II. INDEX

Section III. MANUFACTURED ITEMS

E-2 MAINTENANCE SUMMARY. This task covers:

a. Fabrication of tubes

b. Fabrication of seals

c. Fabrication of insulation

d. Fabrication of electrical leads.

E-3 INITIAL SETUP

Personnel Required	General Safety Instructions
1	Observe all WARNINGS when working on refrigerant system
	Disconnect unit from electrical power before attempting any work.

E-4 FABRICATION OF TUBES

This task covers :

Fabrication of tubes

INITIAL SETUP

Tools
Tube cutter

Materials/Parts

Tubing -	ASTM-B-360	0.156 OD x 0.032 wall
	ASTM-B-280	0.250 OD X 0.035 wall
	ASTM-B-280	0.375 OD X 0.032 wall
	ASTM-B-280	0.500 OD X 0.032 wall
	ASTM-B-280	0.625 OD X 0.035 wall

Personnel Required:
1 technician

Approximate Time Required (minutes) :
15

	LOCATION/ITEM	ACTION	REMARKS
1.	Tube	Measure to length and cut.	Remove old tube measure tube and cut new tube to length.

FABRICATED PART NUMBER	LENGTH	TUBE SIZE
Not assigned	A/R	per old removed tube

NOTE: All dimensions are in inches.

E-5 FABRICATION OF SEALS

This task covers :

Fabrication of seals

INITIAL SETUP

Tools
Knife

Materials /Parts
Seal - MIL-R-6130, Type II, Grade A, 0.750 wide x 0.06 thick

Personnel Required:
1 technician

Approximate Time Required (minutes):
15

	LOCATION/ITEM	ACTION	REMARKS
1.	Seal	Measure to length and cut.	

FABRICATED PART NUMBER	LENGTH	SEAL SIZE
Not assigned	A/R	3/4 wide X 0.06 thick

NOTE: All dimensions are in inches.

E-6 FABRICATION OF INSULATION

This task covers :

Fabrication of insulation

INITIAL SETUP

Tools
Knife

Materials /Parts
Insulation - ASTM-3570 2.5 lbs per cubi inch, .25 thick

Personnel Required:
1 technician

Approximate Time Required (minutes) :
15

	LOCATION/ITEM	ACTION	REMARKS
1.	Insulation	Measure to length and cut.	Remove old insulation and measure

FABRICATED PART NUMBER	LENGTH	INSULATION SIZE
Not assigned	A/R	0.025 thick

NOTE: All dimensions are in inches.

E-7 FABRICATION OF ELECTRICAL LEADS

This task covers:

Fabrication of electrical leads

INITIAL SETUP

Tools
Wire cutter

Materials /Parts
Wire - MIL-W-5086 12 AWG, white
16 AWG, white
18 AWG, white
20 AWG, white

Personnel Required:
1 technician

Approximate Time Required (minutes):
15

	LOCATION/ITEM	ACTION	REMARKS
1.	Electrical lead	Measure to length and cut.	Remove old wire determine AWG sise and measyre length.

FABRICATED PART NUMBER	LENGTH	LEAD SIZE
Not assigned	A/R	12, 16, 18 or 20 AWG

NOTE: All dimensions are in inches.

APPENDIX F

TORQUE LIMITS

This appendix lists standard torque values and provides general information and methods for applying torque. Special torque values and sequences are indicated in the maintenance procedures for applicable components.

NOTE

To determine breakaway torque, thread nut onto screw or bolt until at least two threads stick out. Nut shall not make contact with a mating part. Stop the nut. Torque necessary to begin turning nut again is the breakaway torque. Do not reuse selflocking nuts that do not meet minimum breakaway torque.

THREAD SIZE	MINIMUM BREAKAWAY TORQUE (In-lbs)	TREAD SIZE	MINIMUM BREAKAWAY TORQUE (In-lbs)
10-32	2.0	5/8-18	32.0
1/4-28	3.5	3/4-16	50.0
5/16-24	6.5	7/8-14	70.0
3/ 8-24	9.5	1-12	90.0
7/16-20	14.0	1-1/8-12	117.0
1/2-20	18.0	1-1/4-12	143.0
9/16-18	24.0		

ALPHABETICAL INDEX

ALPHBETICAL INDEX - Continued

ALPHBETICAL INDEX - Continued

ALPHABETICAL INDEX - Continued

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25C, Operator's Maintenance requirements for 18,000 BTU Compact Air Conditioners.

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)
PFC JOHN DOE
COA, 3d ENGINEER BN
FT. LEONARDWOOD, MO 63108

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 5-4120-369-14	25 Nov 82	Air Conditioner, Horizontal, Compact, 18,000 BTU

BE EXACT PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	
6	2-1 a			In line 6 of paragraph 2-1a the manual states the engine has 6 Cylinders. The engine on my set only has 4 Cylinders. Change the manual to show 4 Cylinders.
B1		4-3		Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please correct one or the other.
125	line 20			I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER
JOHN DOE, PFC (268) 317-7111

SIGN HERE John Doe
JOHN DOE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

DRSTS-M Overprint 1, 1 Nov 80

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 5-4120-369-14	25 Nov 82	Air Conditioner, Horizontal Compact, 18,000 BTU

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER

SIGN HERE

TEAR ALONG PERFORATED LINE

DA FORM 1 JUL 79 2028-2

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.365	metric tons	short tons	1.102
pound-inches	mewton-meters	.11375			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

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