

**TECHNICAL MANUAL**

**OPERATOR'S, UNIT, DIRECT SUPPORT  
AND GENERAL SUPPORT MAINTENANCE MANUAL**

**AIR CONDITIONER, 24,000 BTU  
ELECTRIC MOTOR DRIVEN  
208 V, 3-PHASE, 50/60 HZ,  
5 WIRE**



**MODEL - MOAC 226  
NSN 4120-01-158-7465**

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**HEADQUARTERS, DEPARTMENTS OF  
THE ARMY, THE NAVY AND THE AIR FORCE  
30 JUNE 1993**

**WARNING**

HIGH VOLTAGE  
is used In the operation of this equipment.

**WARNING**

DEATH ON CONTACT  
may result If personnel fail to observe safety precautions.

Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

Whenever possible, the input power supply to equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working Inside the equipment. after the power has been turned off. always ground every part before touching it.

Be careful not to contact high-voltage connections of 208 volts AC input when installing or operating this equipment.

Whenever the nature of the operation permits. Keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

Do not operate the equipment without all panels and covers in place and tightly secured.

Do not be misled by the term "low voltage". Potentials as low as 50 volts may cause death under adverse conditions.

**WARNING**

Do not allow anyone under equipment suspended from a lifting device. Do not allow the unit to swing while suspended from a lifting device. Failure to observe this warning may result In injury to personnel and damage to the equipment.

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes. Gloves and other suitable protective clothing.

**WARNING**

BEWARE of strange odors that could be caused by refrigerant leakage. In case of leaks, ventilate area immediately and notify Direct Support Maintenance

**WARNING**

Panels, covers, screens, grilles and guards installed on unit are there for a purpose. Do not operate unit with them off unless instructions tell you to. When necessary, do so with care

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

**WARNING**

Acetone and Methyl-Ethyl Ketone (MEK) are flammable and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, wear rubber gloves, and keep away from sparks or flame.

**WARNING**

Industrial process must be evaluated by the Medical Service Bioenvironmental Engineer in accordance with local laws and regulations.

Waste treatment/disposal must be approved by the Medical Service Bioenvironmental Engineer and Civil Engineer in accordance with local laws and regulations.

Solutions will be disposed of in accordance with local State Water Pollution Control Laws Consult local Medical Services for guidance.

**WARNING**

DANGEROUS CHEMICAL (R-22) is used in this equipment.

**WARNING**

**DEATH**

or severe damage may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible. Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly poisonous and corrosive gas.

**WARNING**

REFRIGERANT UNDER PRESSURE  
is used In the operation of this equipment.

**WARNING**

DEATH  
or severe injury may result If you fail to observe safety precautions. Never use a heating torch on any part that contains refrigerant-22. Do not let liquid refrigerant touch you, and do not Inhale refrigerant gas.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (2.1 kg/cm<sup>2</sup>). Do not direct compressed air against the skin. Use goggles or full face shield.

**WARNING**

All refrigerant-22 must be discharged from the system, and the entire system must be purged with dry nitrogen before beginning any debrazing operation.

The polyurethane foam used as insulation in the air conditioner will break down to form toxic gases if exposed to the flame of a torch at brazing temperature.

**WARNING**

The burning of polyurethane foam is dangerous. Toxic fumes are released when it is burned or heated. If burned or heated indoors, such as during a welding operation nearby, take care to ventilate the area thoroughly. An exhaust system like that of a paint spray booth should be used.

Air-supplied respirators, approved by the National Institute for Occupational Safety and Health or the U. S. Bureau of Mines, should be used for all welding in confined spaces and in places where ventilation is inadequate. Persons who have chronic or recurrent respiratory conditions, including allergies and asthma, should not work in these areas.

**WARNING**

Personnel injury and/or equipment damage may result if compressor is started when service valves are not in a backseated (counterclockwise) position.

**WARNING**

When performing maintenance around condenser or evaporator coil. Avoid coming in contact with coil to avoid injury to personnel and to reduce fin damage on the coil.

**WARNING**

Heating element can be extremely hot. Severe burns can be caused by touching with bare skin.

**WARNING**

Compressor weighs approximately 100 lbs. Personnel may be injured and/or internal components can be damaged If compressor falls off of mounting bracket and shims

**WARNING**

Avoid skin contact or inhaling fumes from any acid formed by burnout of oil and refrigerant. Wear a gas mask if area is not thoroughly ventilated. Wear protective goggles or glasses to protect eyes. Wear rubber gloves to protect hands.

**WARNING**

Clean parts in a well-ventilated area. Avoid inhalation of solvent fumes and prolonged exposure of skin to cleaning solvent. Wash exposed skin thoroughly. Dry cleaning solvent (Fed. Spec. P-D-680) used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100 °F (38°C). Wear eye protection when blowing solvent from parts.

TECHNICAL MANUAL  
NO 9-4120-380-14

HEADQUARTERS, DEPARTMENTS OF THE  
ARMY, AIR FORCE AND NAVY  
WASHINGTON, D.C., 30 JUINE 1993

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

AIR CONDITIONER, 24,000 BTU  
ELECTRIC MOTOR DRIVEN  
208 V, 3-PHASE, 50/60 HZ,  
5 WIRE  
DOD MODEL - MOAC 226  
NSN 4120-01-158-7465

### REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistake or if you know of a way to improve the 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 directly to- Commander, U.S. Army Aviation and Troop Command, ATTN-AMSAT-I-MP, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. A reply will be furnished directly to you.

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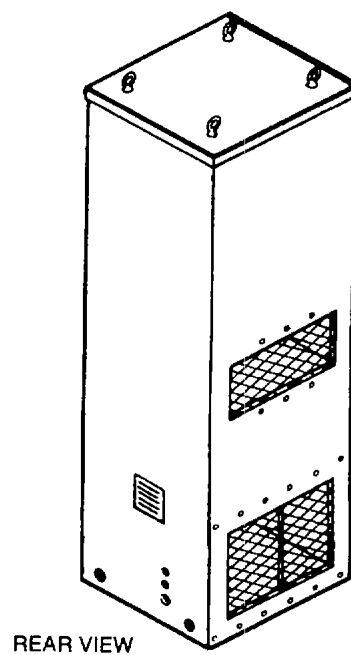
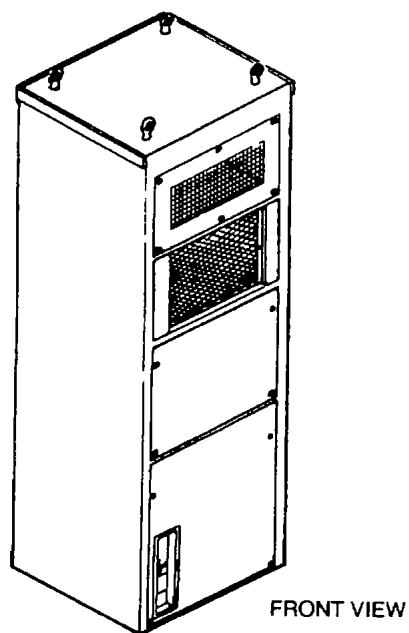


Figure 1-0. MOAC 24,000 Btu Air Conditioner

## CHAPTER 1

### INTRODUCTION

#### Section I. GENERAL INFORMATION

**1.1 SCOPE.** This manual is for use by personnel responsible for the operation and maintenance of the MOAC 226 air conditioner

**1.1.1 Type of Manual.** Operator, Unit, Direct Support and General Support Maintenance Manual.

**1.1.2 Model Number and Equipment Name.** Elhs and Watts Corporation, model MOAC 226, 24,000 Btu/hr Cooling, 17,075 Btu/hr Heating, 208 volt, 3-phase, 50/60 Hertz air conditioner.

**1.1.3 Purpose of Equipment.** The air conditioner is designed for cooling and heating air to a desired predetermined range and for circulating the conditioned air to provide heating and cooling of equipment and/or personnel within the conditioned area.

**1.2 MAINTENANCE FORMS, RECORDS, AND REPORTS.** Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DAPAM 738-750, The Army Maintenance Management System (TAMMS). Air Force personnel will use AFR 66-1 for maintenance reporting and TO 00-35D54 for unsatisfactory equipment reporting Navy personnel will report maintenance performed utilizing the Maintenance Data Collection Subsystem (MDCS), IAW OPNAVINST 4790 2, Vol. 3, and unsatisfactory material/conditions (UR submissions) IAW OPNAVINST 4790 2, Vol. 2, Chapter 17.

#### **1.3 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)**

**1.3.1 Army.** If your air conditioner needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you do not like about your equipment. Let us know why you do not like the design or performance Put it on an SF 368 (Product Quality Deficiency Report) Mail it to: Commander, U S Army Aviation and Troop Command, ATN AMSAT-I-MDO, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. We will send you a reply.

**1.3.2 Air Force.** Air Force personnel are encouraged to submit EIRs in accordance with AFR 900-4.

**1.3.3 Navy.** Navy personnel are encouraged to submit EIRs through their local Beneficial Suggestion Program.

**1.4 WARRANTY INFORMATION.** The air conditioner, model MOAC 226, is warranted by Ellis and Watts Corporation for a period of one year from date of shipment when properly installed. Warranty starts on the date found in block 23 of DA Form 2408-9 in the logbook. Report all defects in material or workmanship to your supervisor who will take appropriate action.

#### **1.5 LIST OF ABBREVIATIONS.**

CBR	Chemical, biological, radiological hazard
CGV	Compound gage valve
EIR	Equipment Improvement recommendation
EMI	Electromagnetic interference
CV	Charging valve
MAC	Maintenance allocation chart

MEK	Methyl-ethyl ketone (solvent)
MTOE	Modified table of organization and equipment
PGV	Pressure gage valve
PMCS	Preventive maintenance checks and services
RFI	Radio frequency interference
TMDE	Test, measurement and diagnostic equipment
VAC	Vacuum
VPV	Vacuum/purge valve
WC	Water column

**1.6 DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.** Command decisions, according to tactical situation, will determine when destruction of the air conditioning unit will be accomplished. A destruction plan will be prepared by the user organization unless one has been prepared by higher authority. For general destruction procedures for this equipment, refer to TM 750-244-3, Procedures for Destruction of Equipment to Prevent Enemy Use.

**1.7 PREPARATION FOR STORAGE OR SHIPMENT.** Contact unit maintenance for air conditioning unit preparation for storage or shipment. Refer to paragraph 4.62 for instructions.

## Section II. EQUIPMENT DESCRIPTION

**1.8 EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.** The MOAC 226 air conditioning unit is designed to ventilate, to cool or heat, and to filter and circulate air in enclosures. (See paragraph 1.10 for Equipment Data )

- a. Provides a maximum of 24,000 Btu/hr of cooling and 17,075 Btu/hr of heating.
- b. Has two stages of heat.
- c. Is self-contained in a single cabinet that is suited for van, shelter or other enclosed areas.
- d. Operates in environmental conditions from arctic to tropic
- e. Provides for return air temperature control
- f. Capable of control and interface for operation with remote control panel
- g. Automatic unit shutdown in fault condition, with manual reset
- h. Provides for local and remote fault indications.
- i. The hot gas bypass system permits continuous running of the compressor.

### **1.9 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.**

#### **1.9.1 External Major Components.** (See fig. 1-1).

- a. Lifting Eyebolts (1) Used to hoist unit.
- b. Supply Air Outlet (2). Emits supply air.
- c. Return Air Filter (3) Filters return air
- d. Control Panel (4). Contains operating controls.
- e. Condenser Air Outlet (5) Emits condenser air
- f. Condenser Air Inlet (6). Receives condenser air.

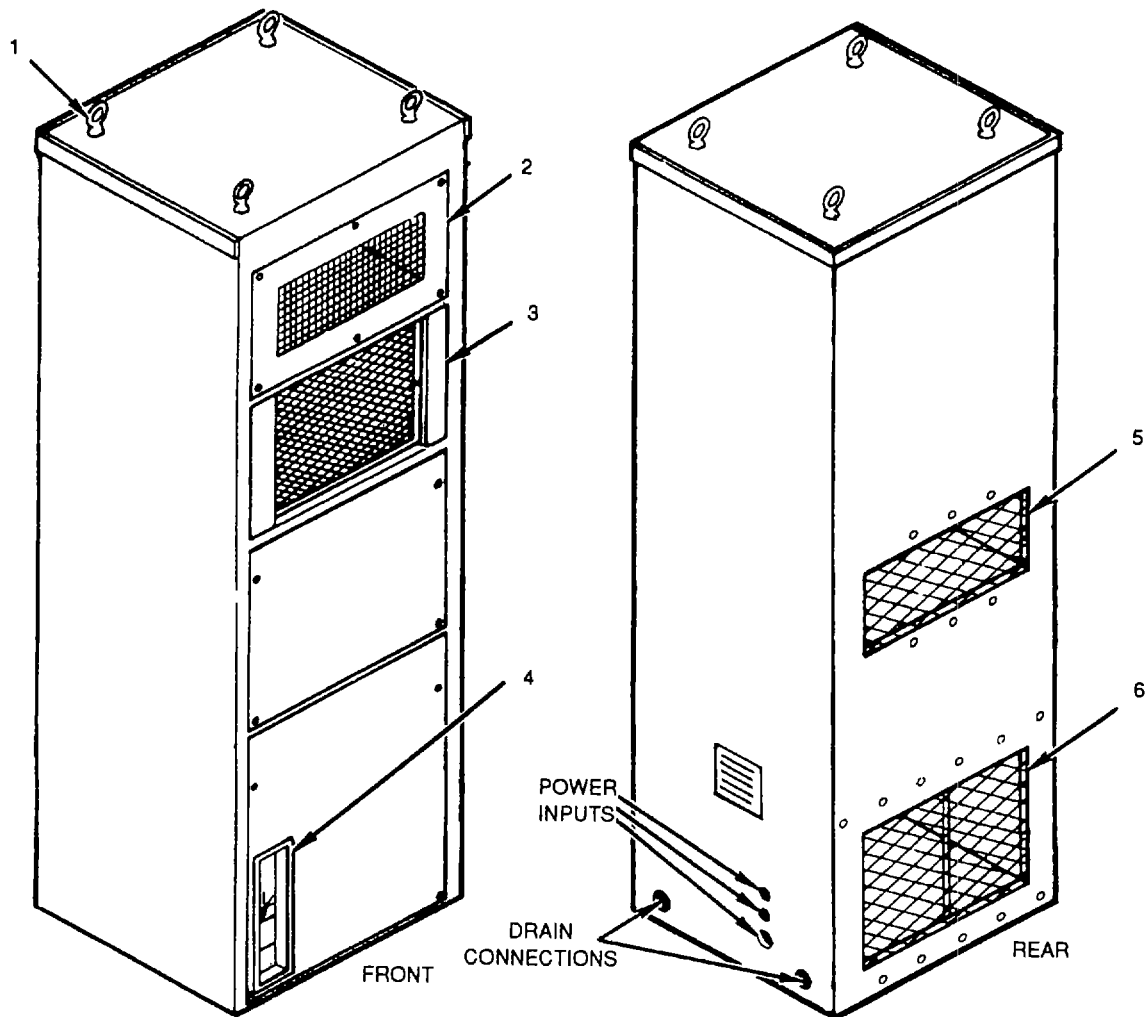
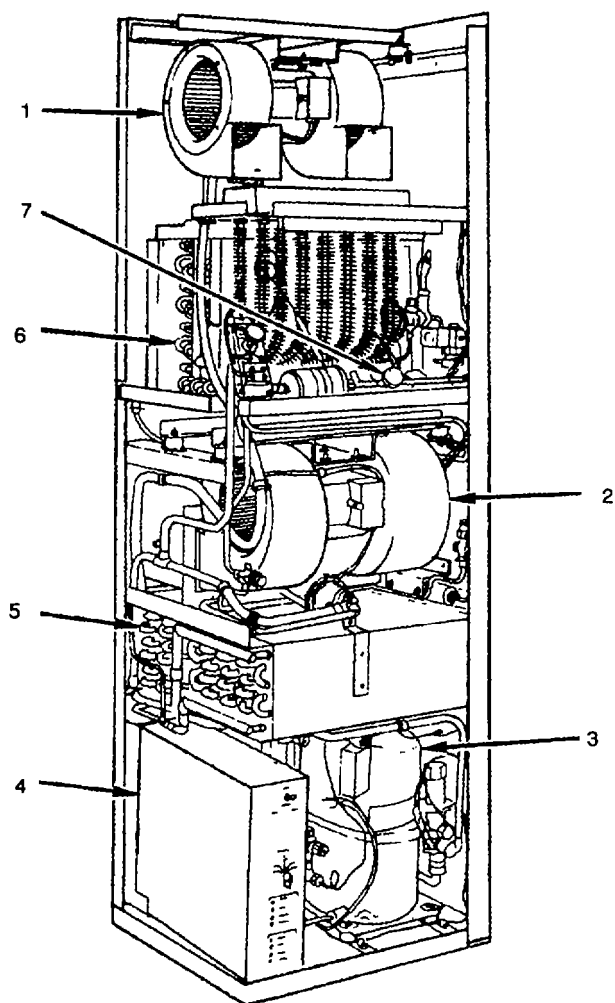


Figure 1-1. External Major Components



**1.9 2 Internal Major Components.** (See fig 1-2).

- a. Evaporator Fan and Motor (1). Draws air across evaporator coil and blows out supply air.
- b. Condenser Fan and Motor (2) Draws outside air over and through condenser cod.
- c. Compressor (3) Pumps refrigerant through condenser coil and evaporator coil back to compressor.
- d. Electric Box (4). Houses control circuits.
- e. Condenser Coil (5). Changes refrigerant from gas to liquid form.
- f. Evaporator Coil (6) Changes refrigerant from liquid to gas (vapor). Absorbs heat and cools air being drawn across coil by evaporator fan
- g. Sight Glass (7). Used for checking refrigerant level m air conditioner.



**Figure 1-2. Internal Major Components**

## 1.10 EQUIPMENT DATA.

### Physical Data:

#### Dimensions (see fig FO1):

Height.....70 inches (177.8 cm)  
Width.....22 inches (55.9 cm)  
Depth.....19 5 inches (49.5 cm)  
Weight.....395 pounds (179 kg)

#### Cabinet:

Material .....Aluminum  
Finish .....White, Rust-O-Thane 9400 Paint System

### Performance Data:

#### Capacities:

Cooling .....24,000 Btu/hr at 90°F (32° DC) ambient condenser air  
inlet temperature below the altitude of 10,000 ft  
(20,000 Btu/hr at 50 Hz)

Return air.....80°F (dry bulb)  $\pm$  3°F, 50% R/H  
27 °C (dry bulb)  $\pm$  1.7°C

Heating .....17,075 Btu/hr (5 kW) (2-stage)

Air circulating.....800 cfm (22.4 m3/min) at 1 5 in.  
(3.81 cm) water gage external static pressure

#### Environmental Limits:

##### Ambient Air Temperature

Operating-Cooling.....0°F to +125°F (-17.70°C to +52°C)  
-Heating .....40°F (-40°C) min, 90°F (32°C) max.

### Mechanical Data-

#### Refrigeration:

Number of stages .....One(1)  
Refrigerant .....R-22

#### Condenser Section:

Compressor .....Welder hermetic, 2.5 hp motor  
Condenser coil.....Copper tube, aluminum fin (iridited)  
Condenser fan .....Forward curved centrifugal, 1425 rpm with 3/4 hp motor (2.2A)

#### Evaporator Section:

Expansion valve .....Thermostatic  
Evaporator coil .....Copper tube aluminum fin (iridited)  
Evaporator fan .....Forward curved centrifugal, 1425 rpm with 1/2 hp motor (1.65A)

Air filter.....Permanent, cleanable type

Electrical Data:

Power:

Input voltage.....208 Vac, 3-phase, 50/60 Hz, 5-wire  
Power consumption (total) .....4.5 kW cooling, 8 kW heating  
Continuous transients ..... 10% voltage (187.2 to 228.8 Vac)  
5% frequency (47.5 to 52.5/57 to 63 Hz)

Fan Motors.

Type .....3-phase, induction, ball bearing  
Protection ..... Pilot break thermal overloads

Heating:

Number of stages .....Two (2)  
Type ..... 208 Vac, single phase, six (6) elements  
Controls.....Thermostat  
Safety switches.....High temperature cutout

Cooling:

Controls.....Thermostat  
Safety switches.....High and low refrigerant pressure and high  
temperature cutouts, dirty filter switch

**1.11      SAFETY, CARE AND HANDLING.** Read and understand all instructions relating to the specific function you are to perform before starting task.

**1.11.1**      Carefully read and understand all notes, cautions, and warnings contained in this manual that pertain to the task you are to perform

**1.11.2**      Carefully read and understand all WARNING and CAUTION plates located on the air conditioner.

**1.11.3**      Never operate the air conditioner with any cover, air filter, or panel removed unless the instructions specifically instruct you to do so Then do so only with extreme caution.

**1.11.4**      Carefully plan all maintenance tasks and never take unnecessary risks.

### Section III. TECHNICAL PRINCIPLES OF OPERATION

**1.12 SCOPE.** This section tells how the air conditioner works in its different cycles (see fig. 1-3).

**1.13 PRIMARY/BACK-UP OPERATION.** The air conditioner provides automatic and manual cooling and heating modes, and a manual venting mode when the control panel PRIMARY/BACK-UP switch is set to PRIMARY. When the switch is set to BACK-UP and the POWER ON light is on, the air conditioner can start operating immediately in the selected mode of operation.

**1.14 OPERATING CYCLE.** Normal operation of this air conditioner is in AUTO (automatic) mode, which provides supply air cooling or heating temperature regulation as required to maintain a pre-set value. This temperature regulation is accomplished by cooling, bypass and heating cycles. A manually selected venting or recalculating ambient compartment air flow cycle is also available for use. These cycles are described in the following paragraphs.

**1.14.1 Cooling Cycle.** Air conditioner operation when cooling is initiated.

- a. Evaporator fan (B1) starts immediately. Compressor (B2) starts about 5 seconds later, and condenser fan (B3) starts about 5 seconds after the compressor (B2).
- b. The compressor (B2) receives low pressure superheated refrigerant gas and compresses it to a high pressure, high temperature gas. This gas flows through metal tubing to the condenser coil (C).
- c. The condenser fan (B3) draws outside ambient air over and through the condenser coil (C). The high pressure, high temperature gas from the compressor (B2) is cooled by the flow of air and condensed into a high pressure liquid. If ambient air temperature increases, the gas entering the condenser coil (C) will increase in pressure, causing the condenser fan damper actuator (A) to open the damper and allow an increased flow of air across the condenser coil (C).
- d. The receiver (R) stores excess refrigerant during periods of decreased load or low ambient temperature, or during maintenance pump down procedures.
- e. The high pressure liquid from the condenser is subcooled by the tube-in tube heat exchanger (H), which at the same time superheats the low pressure refrigerant gas returning to the compressor (B2).
- f. The drier filter (F1) removes any moisture (water vapor) or dirt that may be carried by the liquid refrigerant leaving the heat exchanger (H).
- g. The sight glass (G) indicates the quantity of refrigerant in the system.
- h. The solenoid valve (L1) is used to control refrigerant flow to the primary expansion valve (VS5). The solenoid valve (L1) is cycled open and closed by the thermostat located in the return air filter section of the air conditioner. The thermostat also opens and closes solenoid valve (L2) during the bypass cycle.

Item No.	Nomenclature	Item No	Nomenclature
B1	Evaporator fan	V8	Service valve (suction)
B2	Compressor	V9	Service valve (discharge)
B3	Condenser fan	S4	Switch, low refriger. pressure
F1	Drier filter	S5	Switch, high refriger. pressure
F2	Strainer, refrigerant (suction gas)	A	Condenser fan damper actuator
L1	Solenoid valve	C	Condenser coil
L2	Solenoid valve	D	Distributor
V1	Service valve (condenser fan damper)	E	Evaporator coil
V2	Service valve (receiver)	G	Sight glass
V3	Service valve (expansion)	H	Heat exchanger
V4	Service valve (hot gas bypass)	R	Receiver
V5	Expansion valve (primary)	VE1	Vibration eliminator, suction
V6	Expansion valve (liquid quench)	VE2	Vibration eliminator, discharge
V7	Service valve (hot gas bypass)		

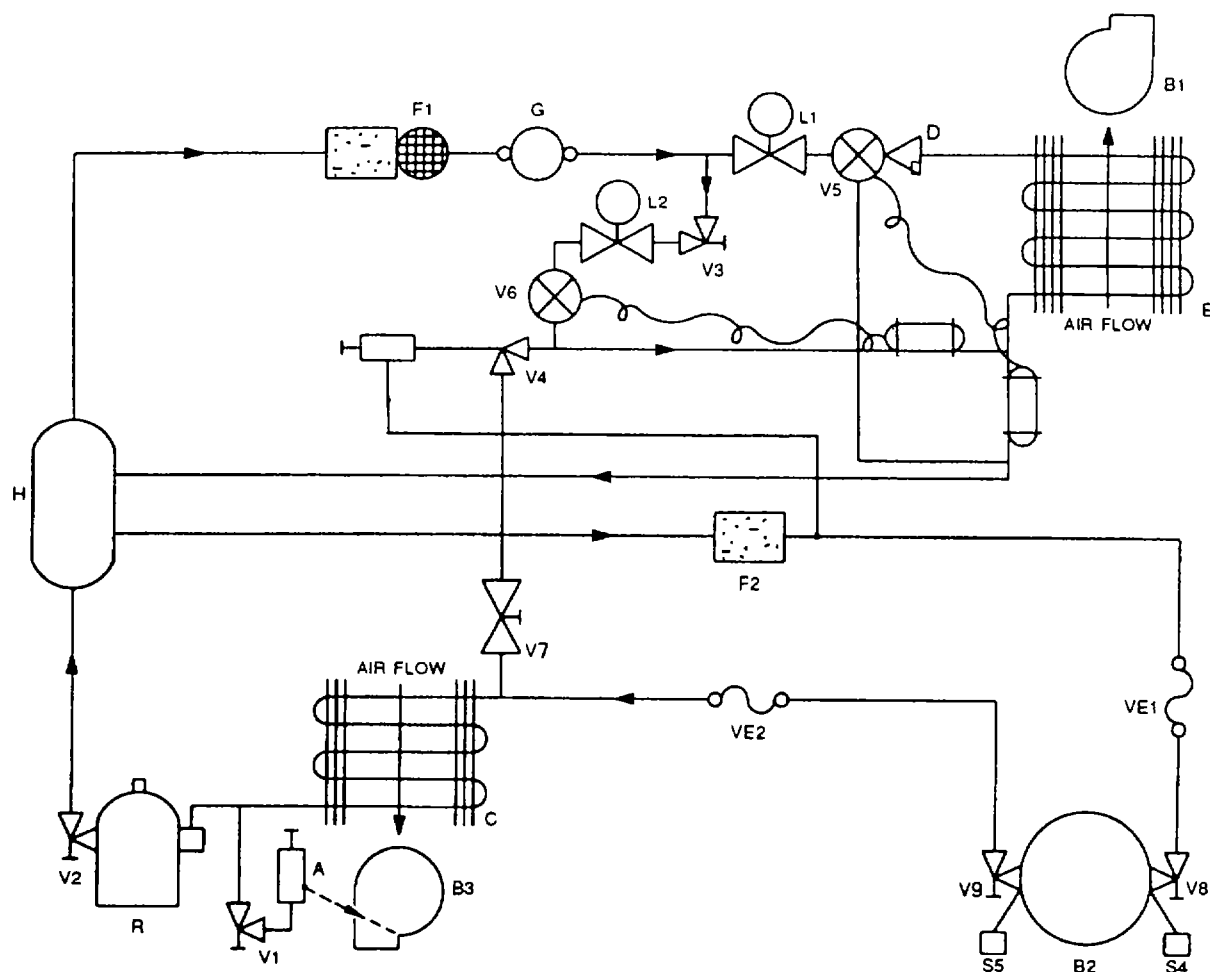


Figure 1-3. Functional Block Diagram

- i. The primary expansion valve (VS) controls the amount and pressure of liquid refrigerant to the evaporator coil (E). By use of a sensing bulb and external equalizer line, the primary expansion valve (V5) senses the temperature and pressure of the refrigerant as it leaves the evaporator coil (E) and constantly adjusts the flow of liquid refrigerant.
- j. As the liquid refrigerant leaves the expansion valve (V5), it passes through a distributor (D) and enters the evaporator coil (E). The evaporator fan (B1) circulates warm air from the conditioned space over and through the evaporator coil (E). As the liquid refrigerant enters the coil at reduced pressure, the combination of pressure reduction and warmer air being forced across the tubes of the coil causes the refrigerant to boil and change from a liquid to a gas. Refrigerant absorbs heat when it changes from a liquid to a gas. As the air from the conditioned space comes in contact with the evaporator coil (E), the air is cooled.
- k. After the low pressure refrigerant gas passes through the evaporator coil (E), the gas then flows through the other half of the heat exchanger (H) where it is superheated by the high pressure liquid refrigerant leaving the condenser coil (C).
- l. The superheated refrigerant gas flows through a refrigerant strainer (F2) to remove any particles from the gas before it flows into the compressor (B2).
- m. The refrigerant gas is then drawn back to the compressor (B2) and the cycle is repeated.
- n. A service valve (V1) allows the condenser fan damper actuator (A) to be isolated from the refrigerant lines during maintenance. A second service valve (V2) located between the receiver (R) and the heat exchanger (H) isolates the refrigeration system low side from the high side during pump down.
- o. Service valves (V3, V7) can be used to isolate the liquid quench and hot gas bypass systems during pump down or for maintenance purposes.
- p. Discharge service valve (V9) and suction service valve (V8) are provided for isolation of the compressor (B2) during maintenance or replacement procedures.
- q. The high refrigerant pressure switch (S5) and low refrigerant pressure switch (S4) are provided to protect the compressor (132) from damage due to pressure extremes.
- r. Vibration eliminators (VE1, VE2) are installed in the compressor (B2) suction and discharge lines to isolate compressor vibration from the other refrigerant piping.

**1.14.2 Bypass Cycle.** The air conditioner has a bypass cycle which allows the cooling operation during low cooling loads without cycling the compressor (B2) on and off. In the bypass cycle, the refrigerant is routed from the compressor discharge (high) side to the suction (low) side of the compressor, bypassing the evaporator coil (E).

- a. During low load cooling conditions, excess cooling capacity causes a reduction in suction line pressure. This low pressure condition is caused by closing of the solenoid valve (L1).
- b. The low cooling load produces decreasing return air temperature, causing the thermostat to open solenoid valve (L2). As the compressor suction pressure starts to drop, the hot gas bypass valve (V4) opens to allow flow of hot gas to the suction line between the evaporator coil (E) and heat exchanger (H).
- c. The liquid quench expansion valve (V6) senses the temperature of the hot gas being bypassed through the hot gas bypass valve (V4) to the suction line. To prevent excessively hot gas from reaching the compressor, the liquid quench expansion valve (V6) opens, when necessary, to allow liquid refrigerant to mix with the hot gas.

**1.14.3 Venting Cycle.** Recirculated air flow can be provided by the air conditioner when the MODE SELECT switch is set to VENT. The evaporator fan (B1) is turned on, and the compressor (B2) and condenser fan (B3) remain off.

**1.14.4 Heating Cycle.** When the MODE SELECT switch on the control panel is set to either AUTO or HEAT, the electric heating elements in front of evaporator coil (E) are capable of being energized. Operation of the heating is controlled by two stages of the 4-stage thermostat, located in the return air filter section of the air conditioner. The thermostat automatically switches on three or six of the electric heating elements, depending on return air temperature and thermostat setting.

## CHAPTER 2

### OPERATING INSTRUCTIONS

#### Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

**2.1 GENERAL.** The air conditioner is designed for a variety of installations and for operation under a wide range of climate conditions. Operators must be aware of any peculiarities or operational limitations for their specific installation. See the appropriate shelter or system manual for instructions peculiar to your specific installation.

**2.2 OPFRATOR'S CONTROLS AND INDICATORS.** See fig 2-1 for a general description of the controls and indicators with which an operator will normally be concerned For specific operating instructions, see Sections III and IV of this chapter.

- a. PRIME UNIT SELECT Toggle Switch (1) Allows selection of unit as primary or backup.
- b. MODE SELECT Rotary Switch (2). Allows selection of mode of operation (see paragraph 2.8 through 2.12).
- c. POWER ON (3) (green) Indicates power available.
- d. HEAT (4) (green) Indicates HEAT mode on.
- e. COOL (5) (green). Indicates COOL mode on
- f. CIRCULATE (6) (green) Indicates VENT mode on.
- g. HIGH DISC PRESS (7) (red) Indicates pressure too high in discharge line
- h. LOW SUC PRESS (8) (red) Indicates pressure too low in suction line.
- i. DIRTY FILTER (9) (red) Indicates return air filter requires servicing.
- j. FAULT RESET Push Button (10) Used to reset circuits after unit has been repaired..

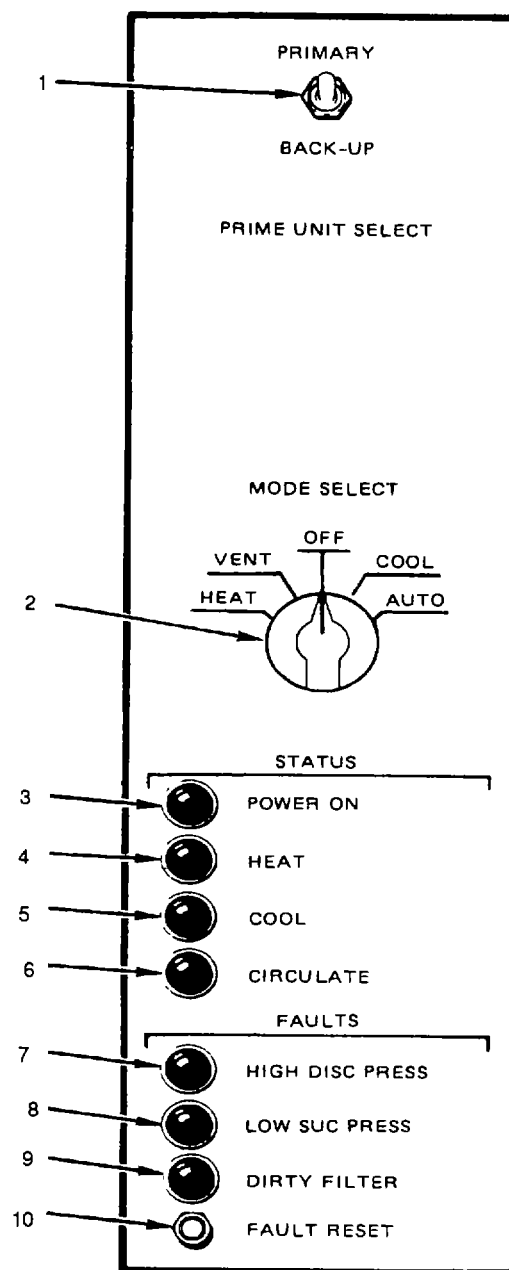


Figure 2-1. Controls and Indicators



## Section II. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

### 2.3 INTRODUCTION

**2.3.1 General.** Operator Preventive Maintenance Checks and Services (PMCS) are essential to the efficient operation of the air conditioner and to prevent possible damage that might occur through neglect or failure to observe warning symptoms in a timely manner. Checks and services performed by operators are limited to these functions which are described in table 2-1. Your Preventive Maintenance Checks and Services table lists the inspections and care of your equipment required to keep it in good operating condition.

- a. Before you operate. Always keep in mind the CAUTIONS and WARNINGS Perform your before PMCS.
- b. While you operate. Always keep in mind the CAUTIONS and WARNINGS Perform your during PMCS.
- c. After you operate. Be sure to perform your after PMCS.
- d. If your equipment fails to operate. If your equipment does not perform as required, refer to table 3-1 for possible problems Report any malfunctions or failures on the proper DA Form 2404 or refer to DA PAM 738-750.

**2.3.2 PMCS Columnar Entries.** The PMCS table column headings and column entries are defined in the following subparagraphs.

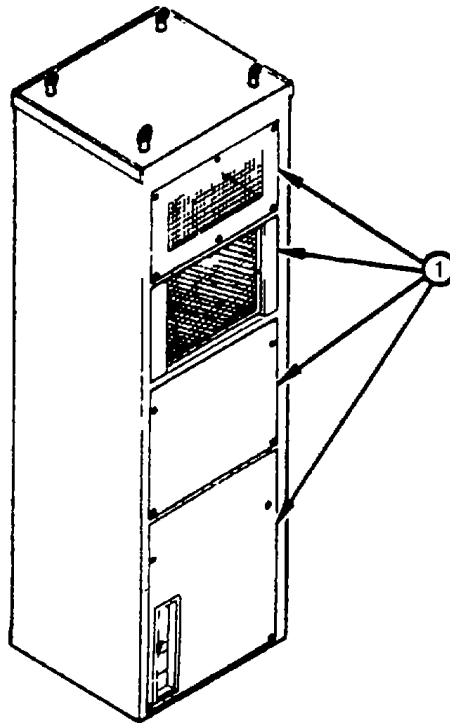
- a. "Item Number" Column. This is the order in which you perform checks and services on the air conditioner. The entry in this column will also be used as a source of Item numbers for the "TM Item Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.
- b. "Interval" Column. The interval column of your PMCS table tells you when to do a certain check or service.
- c. "Item To Check/Service" Column. Identification of Item to be inspected.
- d. "Procedure" Column. The procedure's column of your PMCS table tells you how to do the required checks and services. Carefully follow these instructions If you do not have the tools, or If the procedure tells you to, have the next higher level of maintenance do the work.
- e. "Not Fully Mission Capable If" Column. Entries in this column will be keyed specifically to checks listed in the "Procedure" column for the purpose of Identifying, for the check, the criteria that will cause the equipment to be classified as not fully mission capable because of inability to perform its primary Combat Mission. An entry in this column will
  - (1) Identify conditions that make the equipment not fully mission capable for readiness reporting.
  - (2) Deny use of the equipment until corrective maintenance has been performed.

**NOTE**

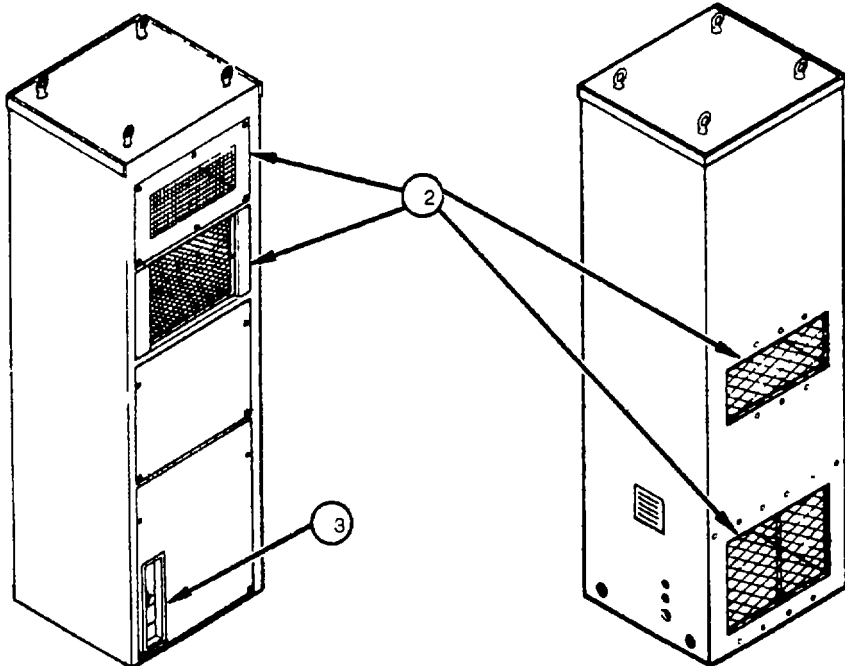
Within designated interval, these checks are to be performed in the order listed. If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

**Table 2-1. Operator-Preventive Maintenance Checks and Services**

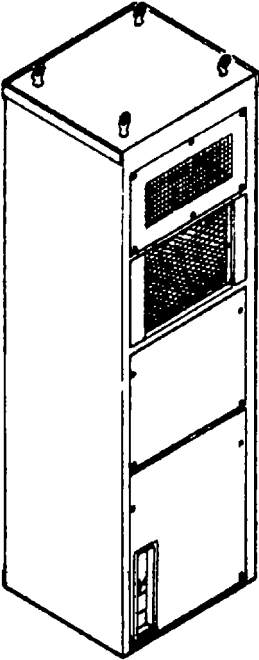
Item No	Interval	Item To Check/Service	Procedure	Not Fully Mission Capable If
1	Before  Before	Outside Panels	a . Check that panels are in place  b. Check panels for cracks, dents or missing hardware	Panels missing or damage that would cause operating hazard



**Table 2-1. Operator-Preventive Maintenance Checks and Services - Continued**

Item No	Interval	Item To Check/Service	Procedure	Not Fully Mission Capable If
2	Before	Inlets/Outlets	a. Check that filter is In place	Panels missing or damage that would cause operating hazard
	Before		b. Check for obstructions, damage and loose or missing hardware.	Obstructions, damage, loose or missing hardware.
				
3	Before	Control Panel	a. Check panels for obvious damage and missing parts	Control panel damaged.
	During		b. Check for proper operation	Unit not operating properly.

**Table 2-1. Operator-Preventive Maintenance Checks and Services - Continued**

Item No	Interval	Item To Check/Service	Procedure	Not Fully Mission Capable If
4	After	Air Conditioner	Check for obstructions, damage, missing or loose hardware	Obstructions, damage, missing or loose hardware
				

### Section III. OPERATION UNDER USUAL CONDITIONS

**2.4 GENERAL.** This section describes the initial setup and modes of operation for the MOAC 226, 24,000 Btu air conditioner.

**2.5 ASSEMBLY AND PREPARATION FOR USE.** Contact unit maintenance personnel for original unpacking, installation, and preparation for use.

**2.6 INITIAL ADJUSTMENTS AND CHECKS.** Inspect panels for loose mounting or shipping damage. Report any deficiencies to unit maintenance.

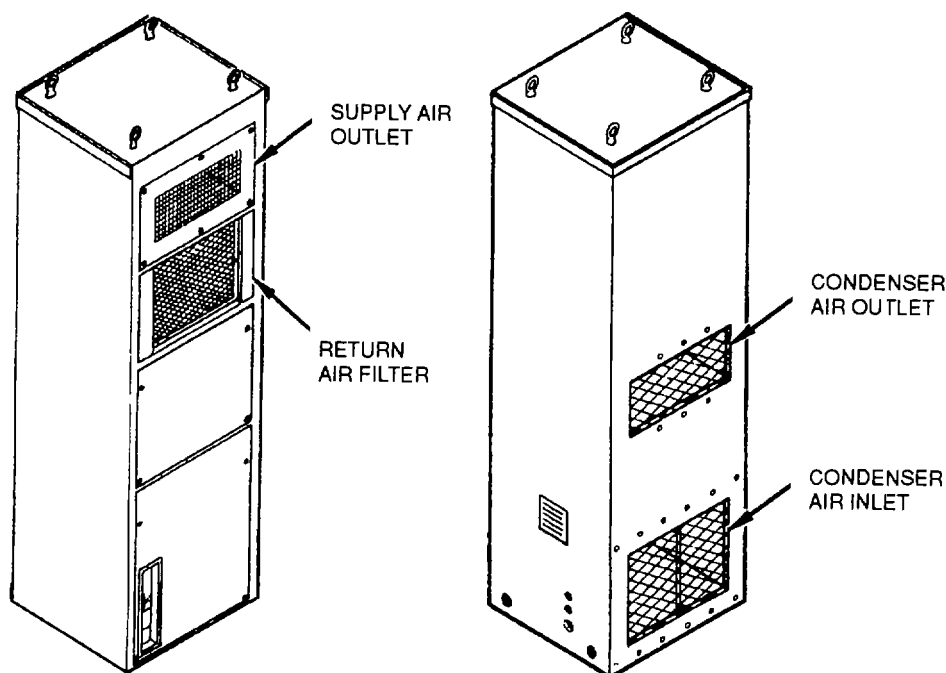
**2.7 OPERATING PROCEDURE.**

<b>CAUTION</b>
----------------

Before operating the air conditioner, ensure that MODE SELE.CT switch is in the OFF position and that AC power has been applied to air conditioner for at least 30 minutes. This is necessary so that the crankcase heater has sufficient time to operate. Heating the compressor is necessary to remove all liquid refrigerant from the crankcase, thereby eliminating the possibility of damage during starting operations at low ambient temperatures.

**2.7.1 Before Operation.**

- a. Perform the before operator preventive maintenance checks and services listed in table 2-1.
- b. Check to see that the power cable has been connected from a source of 208 Vac, 3-phase, 50/60 Hz power to the input power connector on the unit.
- c. Check that the following air inlet and outlet openings are clear (see fig. 2-2):
  - (1) Return air filter
  - (2) Supply air outlet
  - (3) Condenser air outlet
  - (4) Condenser air inlet



**Figure 2-2. Air Inlets and Outlets**

- d. If the system or shelter has two units, set one unit PRIME UNIT SELECT switch to PRIMARY Set other unit to BACK-UP.
- e. If both units are needed for temperature control, set PRIME UNIT SELECT switch on both units to PRIMARY.

#### **2.7.2 General Information.**

- a. During warm or cold weather (air conditioner operation in AUTO mode):
  - (1) Limit traffic through doors as much as possible, and
  - (2) Keep doors and windows tightly closed.
- b. During cold weather
  - (1) Adjust shades, blinds, etc. (when applicable);
  - (2) Admit sunlight during day, and
  - (3) Close them at night.
- c. During hot weather:
  - (1) Adjust shades, blinds, etc. (when applicable), and
  - (2) Block out sunlight during day.

**2.8. OPERATION IN VFNT MODE** (see fig. 2-3)

- a. Check that POWER ON light is on
- b. Set MODE SELECT switch to VENT
- c. Check that CIRCULATE light is on.
- d. Check that the following lights are off:
  - (1) HEAT,
  - (2) COOL,
  - (3) HIGH DISC PRESSURE,
  - (4) LOW SUC PRESSURE, and
  - (5) DIRTY FILTER

**NOTE**

If any light (except POWER ON and CIRCULATE) Is on, turn MODE SELECT switch to OFF. Contact unit maintenance

- e. Perform "during operation" preventive maintenance checks and services (table 2-1).

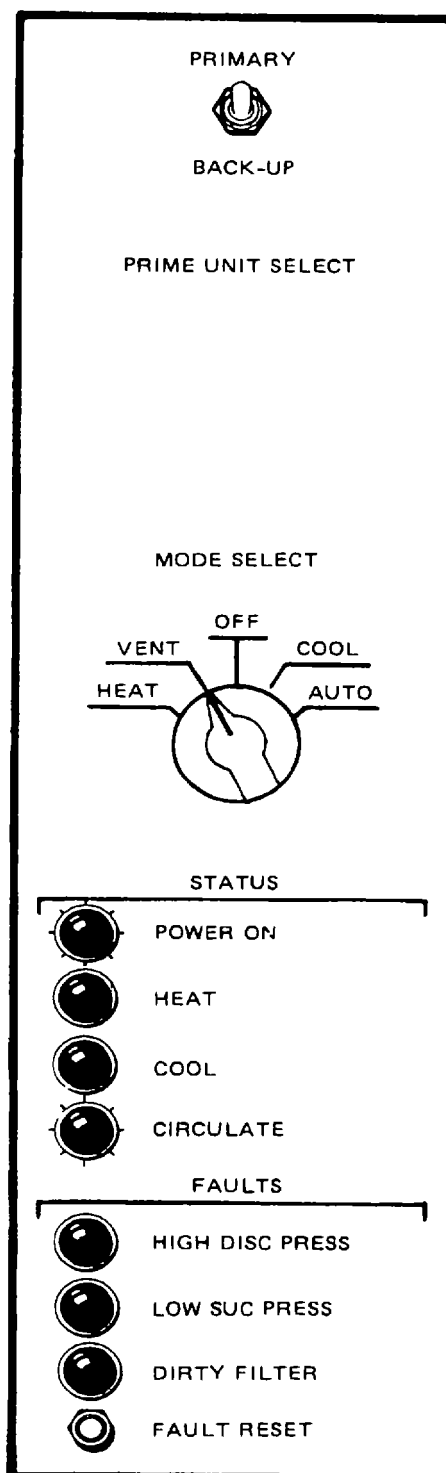


Figure 2-3. Ventilate Mode  
(Settings and Indicators)



**2.9 OPERATION IN HEAT MODE (see fig. 2-4)**

- a Request that Unit Maintenance set the thermostat (S2) to desired temperature. If the unit has been regulated and settings are satisfactory, it should not be changed.
- b Check that POWER ON light is on.
- c Set MODE SELECT switch to HEAT.
- d Check that HEAT light is on. HEAT Light goes on and off with thermostat.
- e Check that CIRCULATE light is on.
- f Check that the following lights are off:
  - (1) COOL,
  - (2) HIGH DISC PRESSURE,
  - (3) LOW SUC PRESSURE, and
  - (4) DIRTY FILTER

**NOTE**

If any light (except POWER ON, HEAT, or CIRCULATE) is on, turn MODE SELECT switch to OFF. Contact unit maintenance.

- g. Perform "during operation" preventive maintenance checks and services (table 2-1).

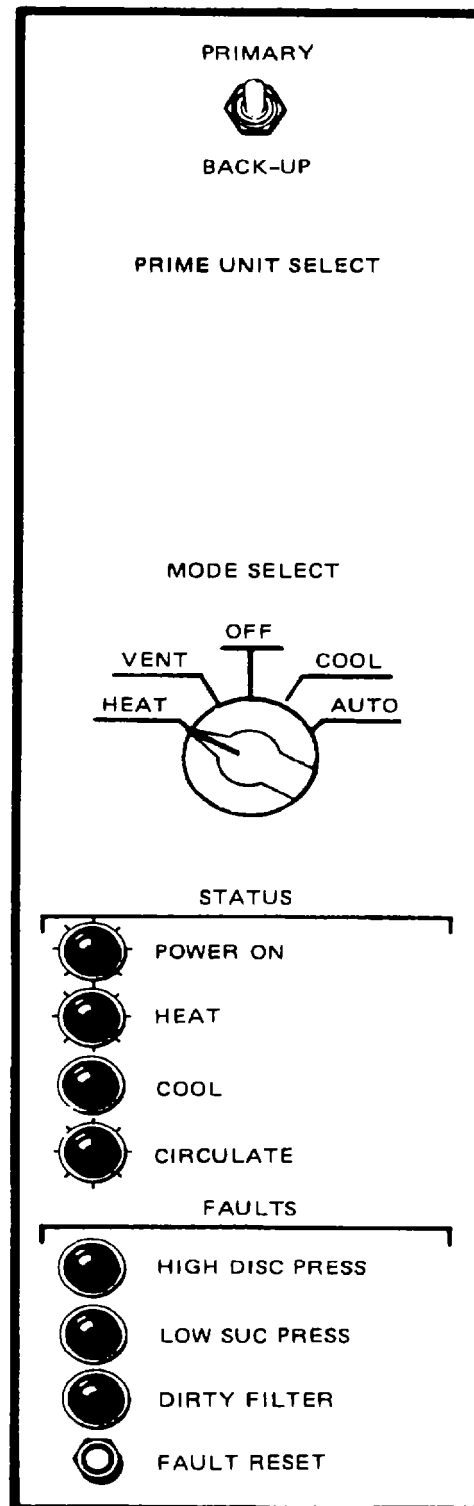


Figure 2-4. Heat Mode  
(Settings and Indicators)

**2.10 OPERATION IN COOL MODE** (see fig. 2-5)

- a. Request that Unit Maintenance set the thermostat (S2) to desired temperature. If the unit has been regulated and settings are satisfactory. It should not be changed.
- b. Check that POWER ON light is on.

**CAUTION**

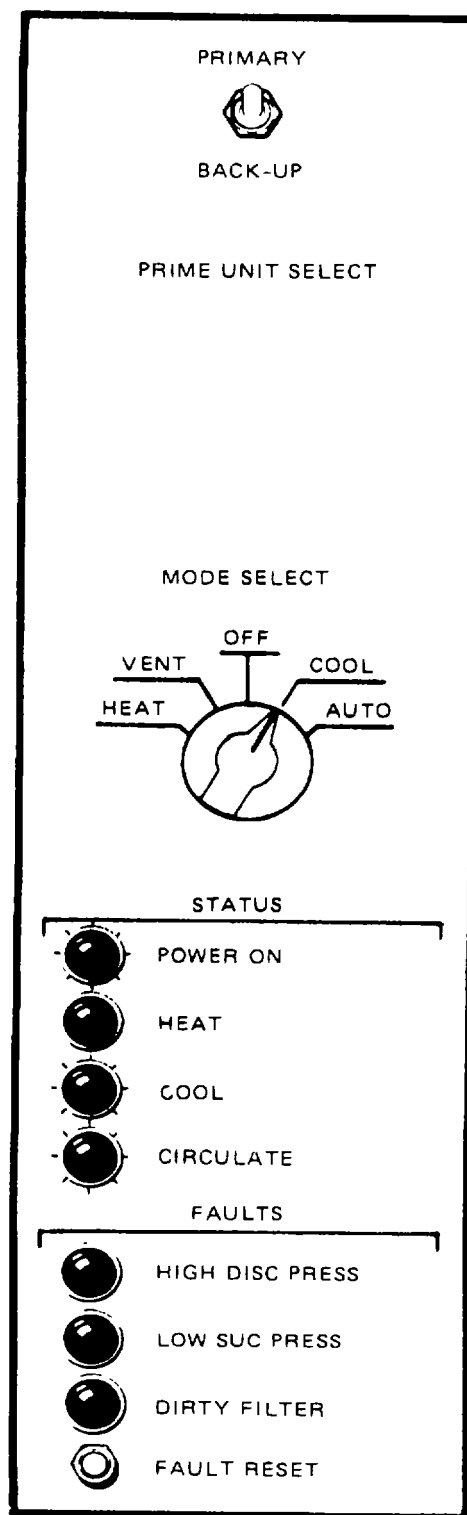
Ensure AC power has been on a minimum of 30 minutes for compressor crankcase heater warmup. If compressor slugs, turn MODE SELECT switch to OFF, then to AUTO position.

- c. Set MODE SELECT switch to COOL.
- d. Check that COOL light is on.
- e. Check that CIRCULATE light is on.
- f. Check that the following lights are off:
  - (1) HEAT.
  - (2) HIGH DISC PRESSURE.
  - (3) LOW SUC PRESSURE, and
  - (4) DIRTY FILTER

**NOTE**

If any light (except POWER ON, COOL or CIRCULATE) is on, turn MODE SELECT switch to OFF. Contact unit maintenance.

- g. Perform "during operation" preventive maintenance checks and services (table 2-1)



**Figure 2-5. Cool Mode  
(Settings and Indicators)**

**2 11 OPERATION IN AUTO MODE (see fig. 2-6)**

- a. Check that POWER ON light is on.

**CAUTION**

Ensure AC power has been on a minimum of 30 minutes for compressor crankcase heater warmup. If compressor slugs, turn MODE SELECT switch to OFF, then to AUTO position.

- b. To start automatic operation, set MODE SELECT switch to AUTO. This mode automatically changes from heating to cooling and vice versa on demand of thermostat (HEAT light will be on during heating cycle only).
- c. Check that CIRCULATE light is on.
- d. Check HEAT and COOL pilot lights. Both cycle on and off depending upon which cycle is operating according to the thermostat.
- e. Check that the following heights are off:
- (1) HIGH DISC PRESSURE,
  - (2) LOW SUC PRESSURE, and
  - (3) DIRTY FILTER.

**NOTE**

If any light (except POWER ON, HEAT, COOL or CIRCULATE) is on, turn MODE SELECT switch to OFF. Contact unit maintenance.

- f. Perform "during operation" preventive maintenance checks and services (table 2-1).

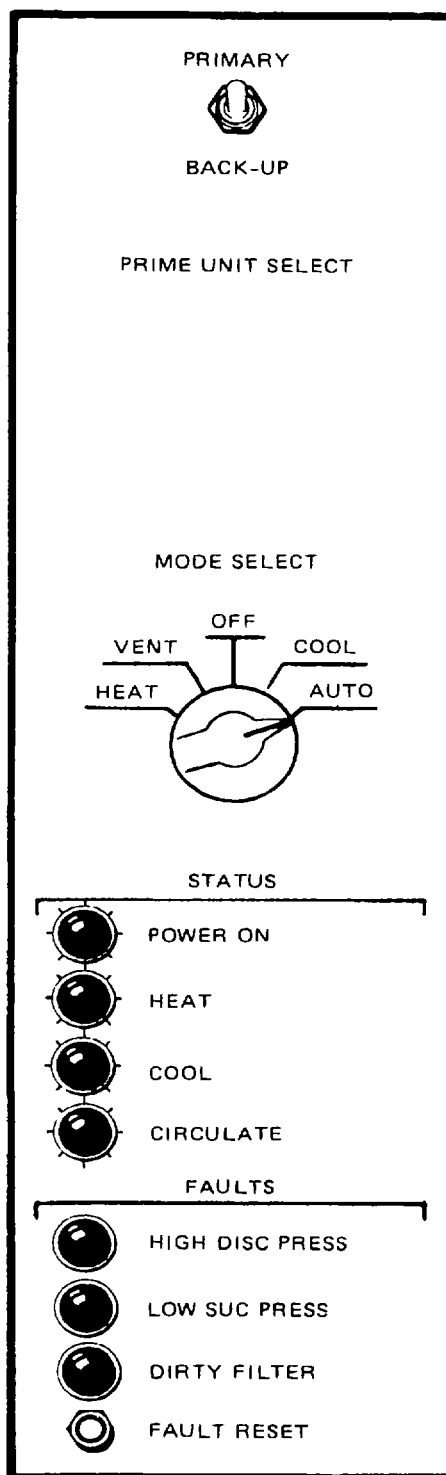


Figure 2-6. Auto Mode  
(Settings and Indicators)

2.12 **SHUTDOWN (OFF)** (see fig. 2-7).

**CAUTION**

Allow air conditioner to cool down if HEAT or AUTO mode was selected to prevent system damage.

**NOTE**

Do not disconnect or turn off power to the air conditioner during periods of normal shutdown. Power should be disconnected only if unit is to be serviced during emergency conditions, or during periods of extended shutdown.

- a. For shutdown after HEAT or AUTO mode, select VENT mode for 1 minute.
- b. Turn MODE SELECT switch to OFF.
- c. Check that POWER ON light is on.

**NOTE**

Always turn MODE SELECT switch to OFF before breaking the main power supply to the unit.

- d. Perform "after operation" preventive maintenance checks and services (table 2-1).

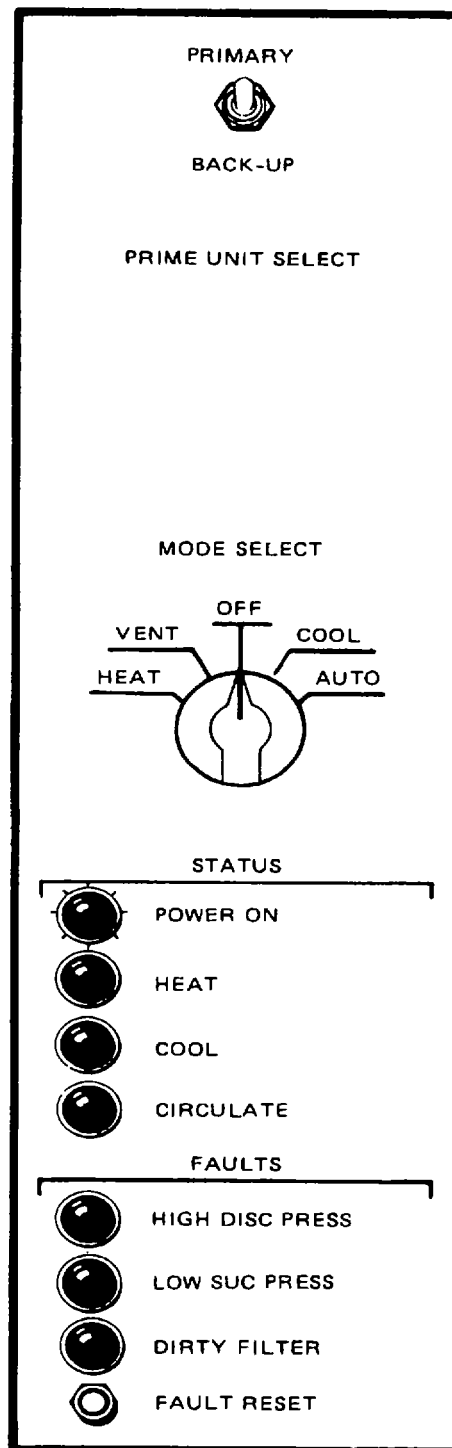
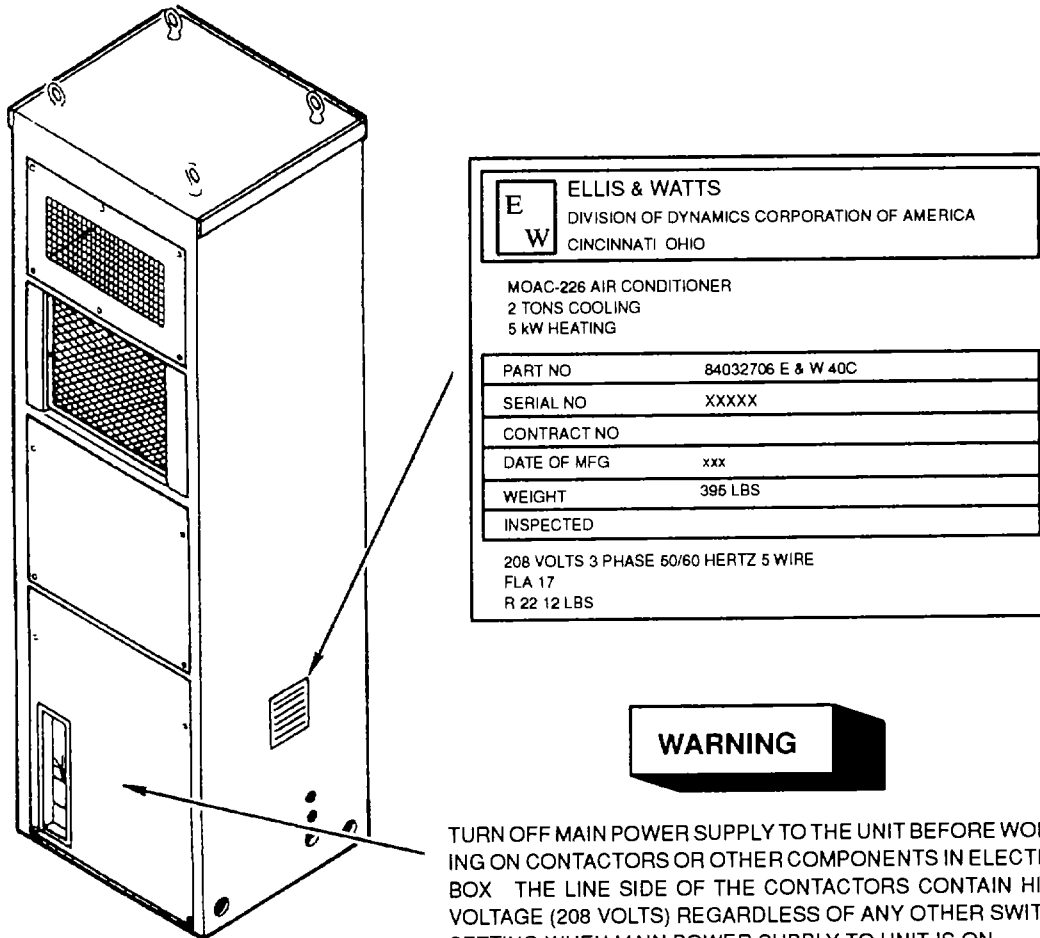


Figure 2-7. Off Mode  
(Settings and Indicators)



2.13 PREPARATION FOR MOVEMENT. When the unit is to be moved, the services of unit maintenance shall be employed for the necessary preparation.

2.14 INFORMATION PLATE. A number of instructions and Identification plates are provided with the unit.



#### Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2.15 GENERAL. The air conditioner is designed to operate normally within a wide range of climatic conditions. However, some extreme conditions require special operating and servicing procedures to prevent undue loading and excessive wear in the equipment.

2.16 OPERATION IN EXTREME HEAT. The air conditioner is designed to operate in temperatures up to 125°F (52°C). Extra care should be taken to minimize the cooling load when operating in extremely high temperatures. Some of the steps that may be taken are:

##### NOTE

Weather stripping, the installation of storm doors and windows (if appropriate), and insulation of surfaces exposed to the outside are recommended when operating in extremely high temperatures for extended periods is anticipated.

- a. Check all openings in the shelter or enclosure, especially doors and windows, to be sure they are tightly closed. Limit in and out traffic, if possible.
- b. When possible, use shades or awnings to shut out direct rays of the sun.
- c. Limit the use of electric lights and other heat producing equipment.

2.17. OPERATIONAL EXTREME COLD. The air conditioner is designed to operate with return air temperatures down to 40°F (4.4 °C). Extra care should be taken to minimizing the cooling load when operating in extremely low temperatures. Some of the steps that may be taken are:

##### CAUTION

Do not disturb electrical wiring that has been exposed to extremely low temperatures. Both the wire and insulation become brittle when cold and are easily broken.

Before operating the air conditioner, ensure that MODE SELECT switch is in the OFF position and that AC power has been applied to air conditioner for at least 30 minutes (can take up to 24 hours). This is so that the crankcase heater has sufficient time to operate. Heating the compressor is necessary to remove all liquid refrigerant from the crankcase, thereby eliminating the possibility of damage during starting operations at low ambient temperatures.

If compressor begins to slug, turn MODE SELECT switch to OFF, wait a few minutes, then turn MODE SELECT switch to COOL position. Turning the MODE SELECT switch to OFF then to COOL mode prevents the compressor from slugging, thereby eliminating the possibility of damage during starting operations at low ambient temperatures.

**NOTE**

Weather stripping, the installation of storm doors and windows (if appropriate), and insulation of surfaces exposed to the outside are recommended when operating. In extremely low temperatures for extended periods is anticipated .

- a. Check all openings in the enclosure, especially doors and windows, to be sure they are tightly closed. Limit in and out traffic, if possible.
- b. Open shades and awnings to permit entry of direct rays of the sun, if appropriate.

2.18 OPERATION IN DUSTY OR SANDY CONDITIONS Dusty and sandy conditions can seriously reduce the efficiency of the air conditioner by clogging the air filters and thereby causing a restriction of the airflow volume. 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. One of the steps that may be taken is frequent cleaning of filters and all other areas of dust and sand accumulation. In extreme conditions, daily cleaning of filters may be necessary.

2.19 OPERATION IN UNUSUALLY WET CONDITIONS. The air conditioner is designed for normal exposure to the elements, so it is reasonably waterproof. Some of the steps that should be taken in an extremely wet climate are

- a. More frequent inspections and cleaning of the condensate trap and drain lines to insure proper drainage and to prevent accumulation of water inside the cabinet.
- b. Cover the condenser air inlet and outlet on the back of the cabinet during periods of wet windy weather when the air conditioner is not in operation.

2.20 OPERATION IN SALT AIR OR SEA SPRAY. Salt air or sea spray may cause many of the same clogging problems as encountered when operating in a dusty or sandy environment. In addition, the nature of salt presents serious corrosion problems. Frequent cleaning is necessary during which all exposed surfaces should be thoroughly spray rinsed or sponged with fresh water to remove salt.

2.21 OPERATIONAL UNDER EMERGENCY CONDITIONS.

2.21.1 Power conservation. During periods when full 208 volt, 3-phase power is in critically short supply, and if the air conditioner cannot be turned off completely, it should be operated in AUTO mode only.

2.21.2 Chemical. biological. radiological (CBR) hazard. Should it be necessary to operate in conditions requiring use of CBR filtration equipment. see specific instructions for your shelter or facility installation. The fresh air inlet should be closed. The opening should be covered with a suitable material and sealed airtight.

## CHAPTER 3

### OPERATOR MAINTENANCE

#### Section I. OPERATOR LUBRICATION INSTRUCTIONS

3.1 GENERAL. All fan bearings are permanently lubricated and sealed. The motors use ball bearings which are given initial lubrication at the factory. Additional lubricant is not required.

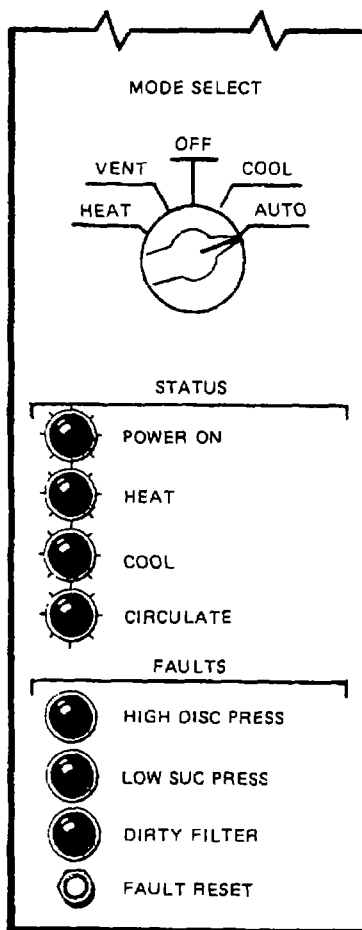
#### Section II. OPERATOR TROUBLESHOOTING

3.2 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.

3.3 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.

**Table 3-1. Operator Troubleshooting**

Malfunction	Test or Inspection	Corrective Action
1. AIR CONDITIONER WILL NOT START IN AUTO MODE		
	Step 1. Check that MODE SELECTOR switch is set to AUTO.	Set switch to AUTO.
	Step 2. Check that POWER ON light is ON.	Contact Unit Maintenance.
	Step 3. Check fault status.	Press FAULT RESET switch (S12).



**Table 3-1. Operator Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
-------------	--------------------	-------------------

**2. REDUCED COOLING CAPACITY**

Step 1 Check that all doors, windows, and other openings in the room or enclosure are tightly closed..

Tightly close all openings.

Step 2 Check to be sure that excessive hot outside air is not being introduced through the condenser air inlet.

Shade inlet, then, if condition improves, adjust accordingly.

Step 3 Check to be sure condenser air inlet and outlet are not obstructed.

Remove obstructions.

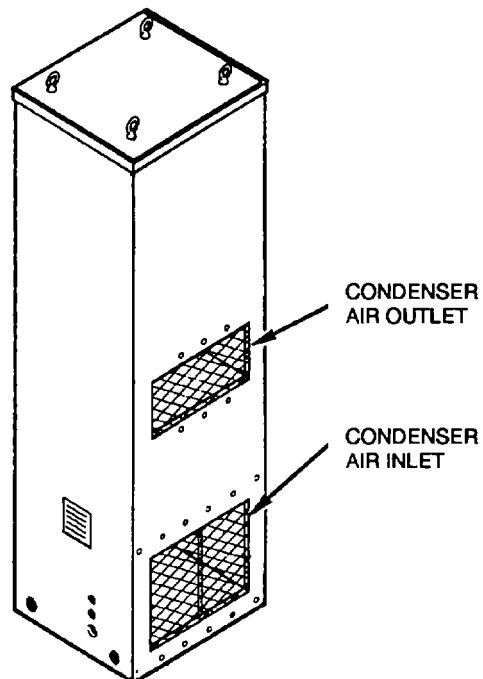


Table 3-1. Operator Troubleshooting - Continued

Malfunction	Test or Inspection	Corrective Action
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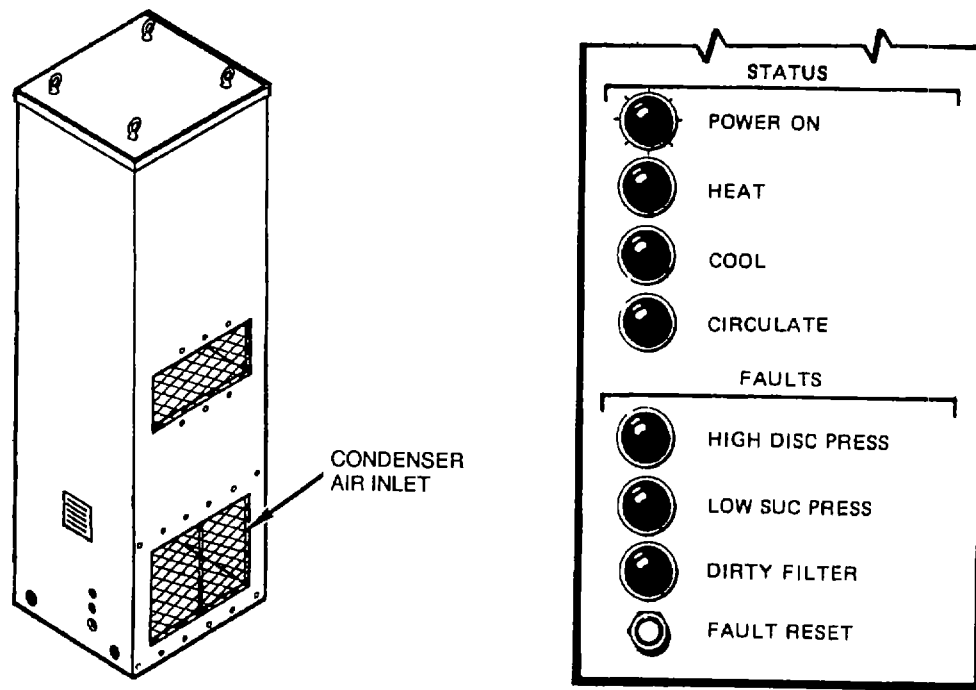
3. REDUCED HEATING CAPACITY

Step 1. Check that all doors, windows, and other openings in the room or enclosure are tightly closed.

Tightly close all openings.

Step 2. Check to be sure that excessive cold, outside air is not being introduced through condenser air inlet.

Partially cover inlet, then, if condition improves, adjust accordingly.



4. ONE OR MORE CONTROL PANEL FAULT INDICATOR LIGHTS ARE ON

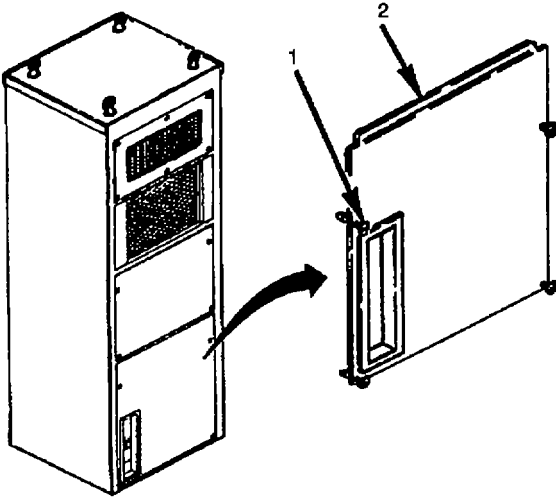
Step 1. Check that POWER ON light is on.

Contact Unit Maintenance.

Step 2. Check that no red light (fault) on control panel is on.

Contact Unit Maintenance.

**Table 3-1. Operator Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
5. EXCESSIVELY NOISY OPERATION		
Step 1.	Isolate source of noise as near as possible, both by ear and touch.	Contact Unit Maintenance
Step 2.	Check all external panels and filters for looseness, vibration and security.	Contact Unit Maintenance.
		



### **Section III. OPERATOR MAINTENANCE PROCEDURES**

3.4 GENERAL. This section contains maintenance procedures which are authorized to operator (C) by the Maintenance Allocation Chart (MAC), Appendix B.

3.5 CONTROL PANEL. Report any malfunction or failure on the proper DA Form 2404 or refer to DA PAM 738-750 Maintenance is limited to inspection in accordance with table 2-1.

## CHAPTER 4

### UNIT MAINTENANCE PROCEDURES

#### Section I. UNIT LUBRICATION INSTRUCTIONS

4.1 GENERAL. The refrigerant compressor and its drive motor are hermetically sealed in a canister. The compressor crankcase has a lifetime supply of oil and the drive motor has permanently lubricated, sealed bearings. The evaporator and condenser fan motors also have permanently lubricated, sealed bearings. No lubrication of these items is required.

#### Section II. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

4.2 COMMON TOOLS AND EQUIPMENT. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

4.3 SPECIAL TOOLS; TEST, MEASUREMENT AND DIAGNOSTIC EQUIPMENT (TMDE). AND SUPPORT EQUIPMENT. Special tools required for maintenance of the equipment are listed in Appendix B Test, maintenance, and diagnostic equipment (TMDE) and support equipment include standard equipment found in any unit maintenance shop Appendix B, Section in contains a list of the tools.

4.4 REPAIR PARTS. Repair parts are listed and illustrated in the Repair Parts and Special Tools List (RPSTL), TM 9-4120-380-24P. covering unit, direct support and general support maintenance for this equipment.

### Section III. SERVICE UPON RECEIPT

4.5 UNLOADING. The air conditioner is packaged in a container designed for shipment and handling with the cabinet in an upright position. The base of the container is constructed as a shipping pallet with provisions for the insertion of the tongs of a fork on material handling equipment (see fig 4-1).

4.5.1 Remove Tie Downs. Remove all blocking and tie downs that may have been used to secure the container to the carrier.

#### **WARNING**

Do not allow anyone under equipment suspended from a lifting device. Do not allow the unit to swing while suspended from a lifting device. Failure to observe this warning may result in injury to personnel and damage to the equipment.

#### **CAUTION**

Use care in handling to avoid damage to the air conditioner. If an overhead lifting device must be used, use an appropriate sling so that the weight of the unit is supported by the shipping container.

4.5.2 Material Handling. Use a forklift truck or other suitable material handling equipment to remove the unit from the carrier.

4.6 UNPACKING. Normally, the packaged air conditioner should be moved into the immediate area in which it is to be installed before it is unpacked.

#### **NOTE**

The shipping container is of such a design that it may be retained for reuse if frequent relocation of the air conditioner is anticipated.

4.6.1 Remove Shipping Container. Cut the metal bands that hold the top and sides of the container to the base. Lift the container vertically and remove it from the base and cabinet.

4.6.2 Remove Packaging. Remove the cushioning around the top of the cabinet and retain, if reuse is anticipated. Remove the technical publications envelope and accessory sack that are taped to the cabinet and put them in a safe place.

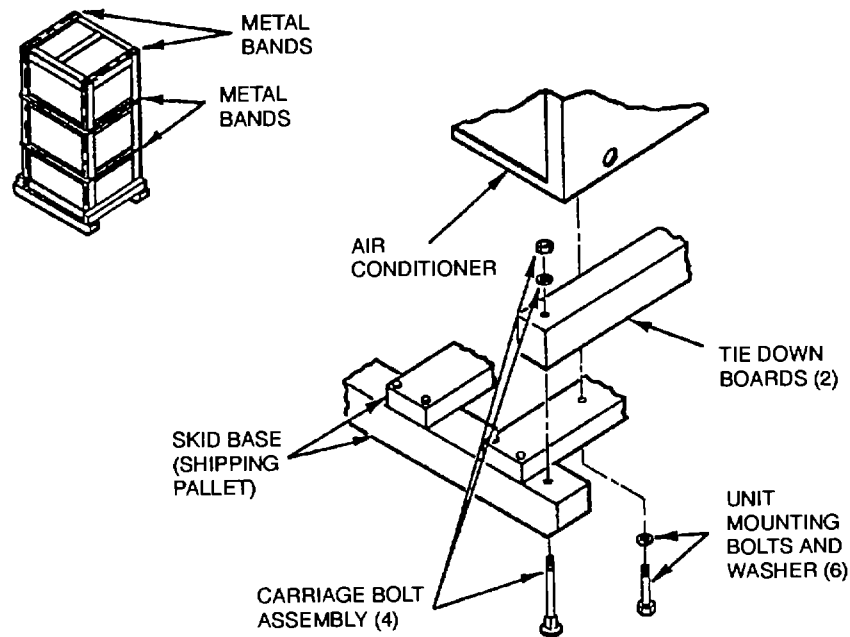


Figure 4-1. Typical Crated Air Conditioner

**WARNING**

Do not allow anyone under equipment suspended from a lifting device. Do not allow the unit to swing while suspended from lifting device. Failure to observe this warning may result in injury to personnel and damage to the equipment.

4.6.3 Remove Pallet. Attach an overhead hoist with an appropriate sling and spreader bar to the lifting eyes provided at top of the cabinet. Raise the cabinet and remove the carriage bolt assemblies that hold the tie down boards to the pallet from the underside of the pallet. Remove the bolts that hold the tie down boards to the unit base. Remove and retain the pallet and carriage bolt assemblies and the tie down boards and bolts, if reuse is anticipated. Be sure to remove all remaining barrier material from the underside of the cabinet base. Lower the cabinet to the floor in the desired position and remove the sling and hoist.

**NOTE**

Bolts used to anchor cabinet base to tie down boards may be used to anchor it in place in installed location if installation method allows for anchoring from beneath.

4.7 RECEIVING INSPECTION. Perform receiving inspection of the air conditioner as follows:

- a Inspect the unit for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6, Packaging Improvement Report.

- b. Check the unit against the packing slip to see if shipment is complete. Report all discrepancies in accordance with the instructions of DA PAM 738-750.
- c. Modified. Check to see whether the equipment has been modified.

4.8 INSTALLATION SITE PREPARATION. The air conditioner is designed so that it is adaptable to a variety of installation arrangements. Most typical installations are made by preparing an opening in an exterior wall of the room or enclosure to be conditioned and by positioning the air conditioner so that the front of the cabinet is inside the room or enclosure and the back is outside. Alternate installations may be made with the entire cabinet either inside or outside the conditioned area.

4.8.1 General. The following are minimum requirements for all installations See fig. FO-1 for installation dimensions.

- a. A relatively level surface capable of bearing the weight of the air conditioner on which to set the base. To insure proper condensation drainage, the surface should be level within 5 degrees from front to back and side to side.
- b. An unobstructed flow of air from outside the conditioned area to the inlet and outlet of the condenser.
- c. An unobstructed flow of air from inside the conditioned area to the conditioned air intake and discharge .
- d. Access to the front of the cabinet for routine operation and servicing and for necessary maintenance actions.
- e. Access to the front of the cabinet for removal of the return air filter.
- f. A source of 208 Vac, 3-phase, 50/60 hertz input power rated at 24.4 amps. The power source outlet should be located as near as possible to the installed location of the air conditioner. The power source wiring must include a disconnect switch. However, provisions should be made to insure that power is not disconnected during normal operation and that the disconnect is not used to turn off the air conditioner for normal shutdown.
- g. An earth ground capable of handling 24.4 amps.
- h. Check that no source of dangerous or objectionable fumes are located near the air inlets.

**WARNING**

BEWARE of strange odors that could be caused by refrigerant leakage. In case of leaks, ventilate area immediately and contact Direct Support Maintenance.

- i. If possible, make use of terrain features such as trees and buildings to provide a shaded location. This will minimize the cooling load on the air conditioner.

- j. If possible, avoid locations where the condenser and fresh air intakes will be laden with dust, dirt, soot, smoke or other debris.
- 4.8.2 Through the Wall Installation. Prepare an opening in the wall large enough to slide the air conditioner through (see fig. FO-1.). Consideration should be given to service of internal components. All openings around air conditioner must be sealed airtight.
- 4.8.3 Inside Installation. Manufacture an arrangement of ducts for the condenser inlet and outlet air openings.

**NOTE**

Easy access to return air filter must be provided. Filter may be left in position in unit or relocated in duct work. Some installations (filter relocated in duct work) may require different size filter.

4.8.4 Outside Installation. Manufacture an arrangement of ducts for the conditioned air intake and discharge air. Ducts may be made for attachment to the air conditioner cabinet using the mounting holes for the conditioned air intake and discharge grilles or some other arrangement may be made. Ducts may also be made for installation of conditioned air intake and discharge grilles on the inside ends or replacements for these items may be used. Prepare appropriate openings in the appropriate wall for the ducts.

4.9 PREPARATION OF AIR CONDITIONER FOR INSTALLATION. No preparation is necessary if the air conditioner is to be installed by the typical exterior wall method and operated as a self-contained unit. For alternate installation methods, some preparation is necessary.

4.9.1 Instructors. The unit is designed to provide for several basic types of installation. See the following paragraphs for instructions only if they are applicable to your requirements.

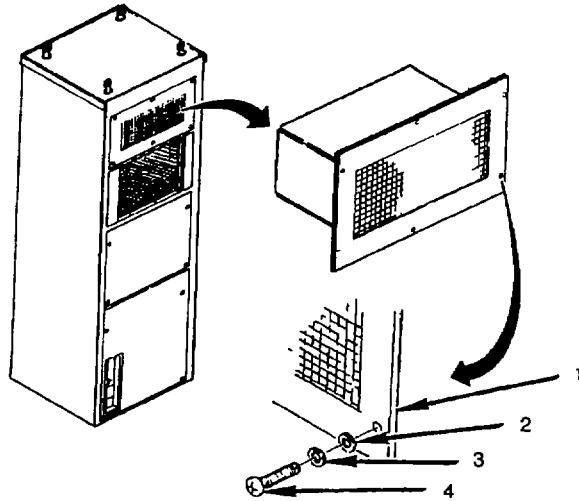
- a. Access panels removal (paragraph 4.10).
- b. Installation instructions (paragraph 4.11).
- c. Front access panels installation (paragraph 4.12).

4.10 ACCESS PANELS REMOVAL.

**WARNING**

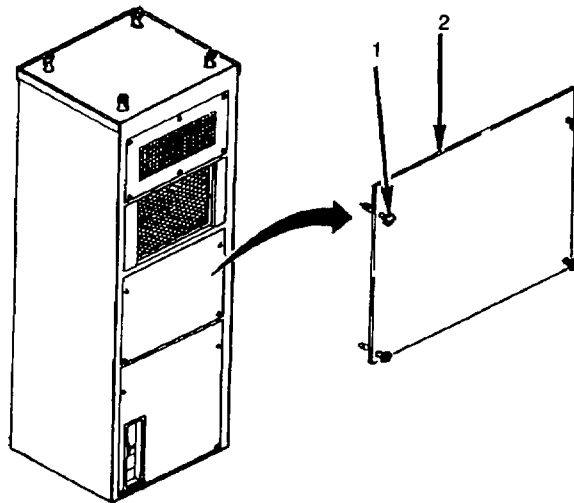
Be sure input power is disconnected before doing any work inside the air conditioner cabinet. Voltages used can KILL.

4.10.1 Evaporator Duct/Panel. Remove six screws (4), lockwashers (3), flat washers (2), and remove panel (1) (see fig 4-2).



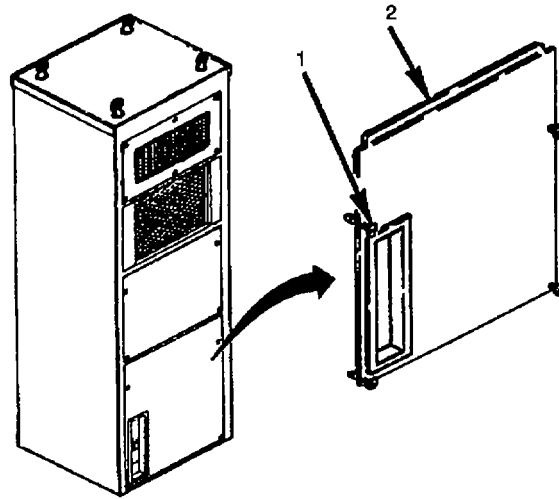
**Figure 4-2. Evaporator Duct/Panel Removal**

4.10.2 Condenser Fan Section Panel. Loosen four captive fasteners (1) and remove panel (2) (see fig 4-3).



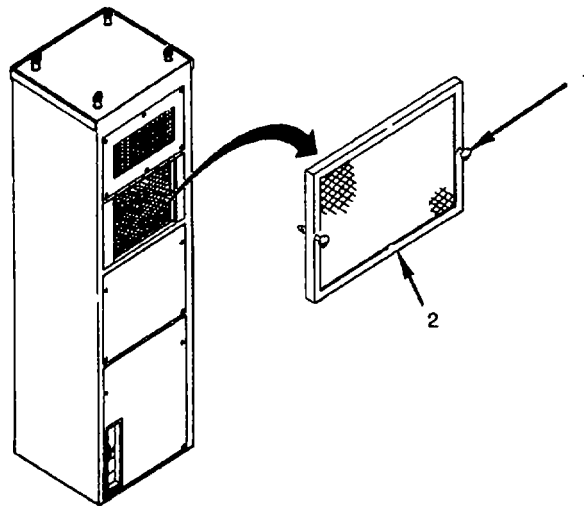
**Figure 4-3. Condenser Fan Section Panel Removal**

4.10.3 Compressor Section Panel. Loosen four captive fasteners (1) and remove panel (2) (see fig 4-4).



**Figure 4-4. Compressor Section Panel Removal**

4.10.4 Return Air Filter. Loosen two captive fasteners (1) and remove filter (2) (see fig 4-5).



**Figure 4-5. Return Air Filter Removal**



4.11 INSTALLATION INSTRUCTIONS. All alterations to the enclosure into which the air conditioner is to be installed should be completed before installation of the air conditioner.

**WARNING**

Do not allow anyone under equipment suspended from a lifting device. Do not allow the unit to swing while suspended from a lifting device. Failure to observe this warning may result in injury to personnel and damage to the equipment.

**CAUTION**

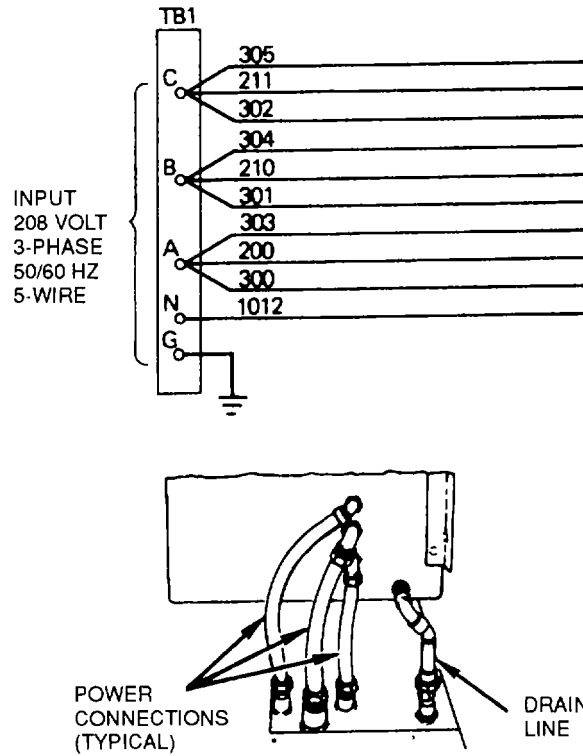
Use care in handling to avoid damage to the air conditioner. If an overhead lifting device must be used, use an appropriate sling and spreader bar so that the weight of the unit is supported equally by the lifting eyes.

- 4.11.1 Position Unit. Attach an overhead hoist, sling and spreader bar to the lifting rings on top of cabinet and move the air conditioner into position and align mounting holes (see fig. FO-1.).
- 4.11.2 Secure Unit. Secure unit with appropriate mounting hardware per site installation instructions.
- 4.11.3 Seal Unit. Seal all openings around cutouts for air conditioner, air- and watertight. Use gasket, caulking or other suitable material.
- 4.11.4 Prepare Hole. The air conditioner is provided with two drain holes in side of base. The drain line should lead to an appropriate facility drain, storm sewer, dry sump, or an acceptable outside area. Be sure the entire length of the drain line is slightly lower than the unit base and sloping away to ensure gravity drainage. Plug unused drain hole.
- 4.11.5 Control Box Cover Removal. Remove four screws, flat washers, lockwashers and control box cover (see fig. 4-18).
- 4.11.6 Connect Electrical Connection. (see fig. FO-2.).
  - a. Turn control panel MODE SELECT switch to OFF.

**WARNING**

Ensure input power source is off before making electrical connections. Voltages used can KILL.

- b. Using No. 12 AWG wires and applicable grommets, route wires from power source through 1-inch hole located at the bottom on the right side of the air conditioner. Connect the wires to terminals within the control box assembly. Connect wires as shown in fig 4-6.
- c. Connect wires to a power source of 208 volt, 3-phase, 50/60 hertz.
- d. Install a 12 AWG minimum ground wire between the air conditioner cabinet and an adequate earth ground.
- e. See air conditioner schematic wiring diagram fig. FO-2 for additional wiring information. Use grommets as required.
- f. Install control box cover using four screws, lockwashers, and flat washers (see fig 4-18).



**Figure 4-6. Electrical Connections**

4.11.7 Condenser and Evaporator Fans Rotation Check (see fig. 4-7).

- a. Momentarily turn MODE SELECT switch to COOL then back to OFF.
- b. Verify evaporator fan expels air at high velocity out the front of the air conditioner and condenser fan expels air out the rear.
- c. If fan outputs are low velocity, unit power is not wired properly, Disconnect power at source and exchange wires connected to Control Box Assembly, terminals A and B. (See Step 4.11.6 above).

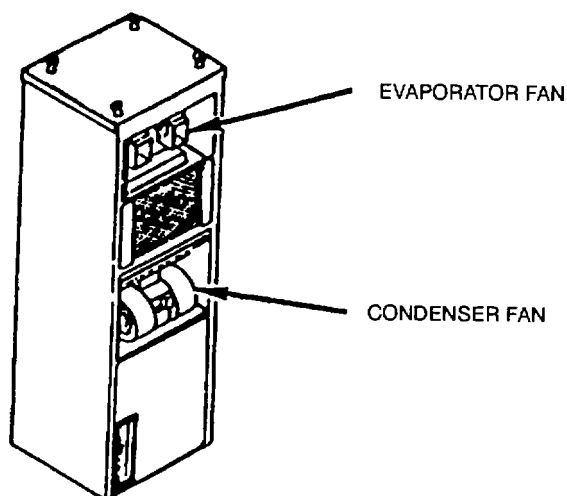


Figure 4-7. Condenser and Evaporator Fan Location

4.12 FRONT ACCESS PANELS INSTALLATION.

- 4.12.1 Evaporator Duct/Panel Install panel (1) and secure with six lockwashers (3), flat washer, (2), and screws (4) (see fig. 4-8).

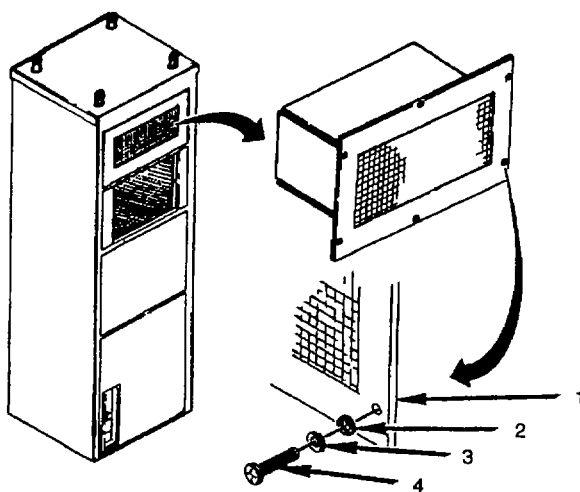
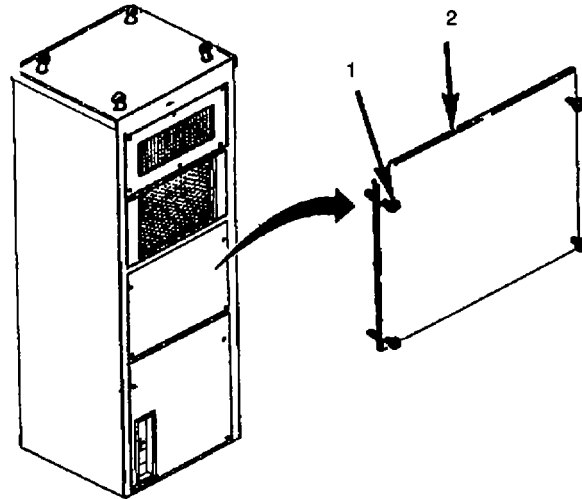


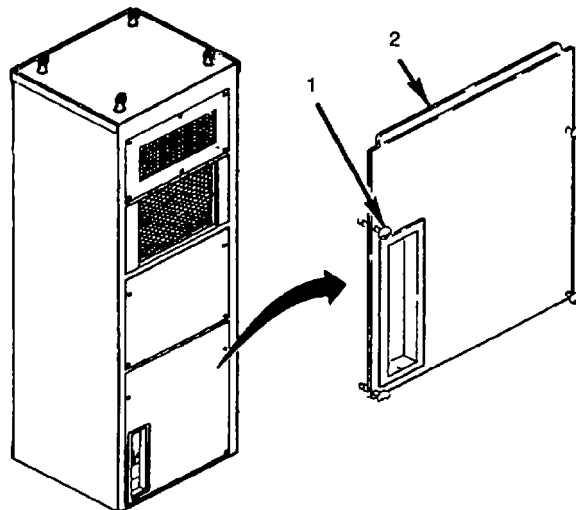
Figure 4-8. Evaporator Duct/Panel Installation

4.12.2 Condenser Fan Section Panel. Install panel (2) and tighten four captive fasteners (1) (see fig 4-9).



**Figure 4-9. Condenser Fan Section Panel Installation**

4.12.3 Compressor Section Panel. Install panel (2) and tighten four captive fasteners (1) (see fig. 4-10).



**Figure 4-10. Compressor Section Panel Installation**

4.12.4 Return Air Filter. Install filter (2) and tighten two captive fasteners (1) (see fig. 4-11).

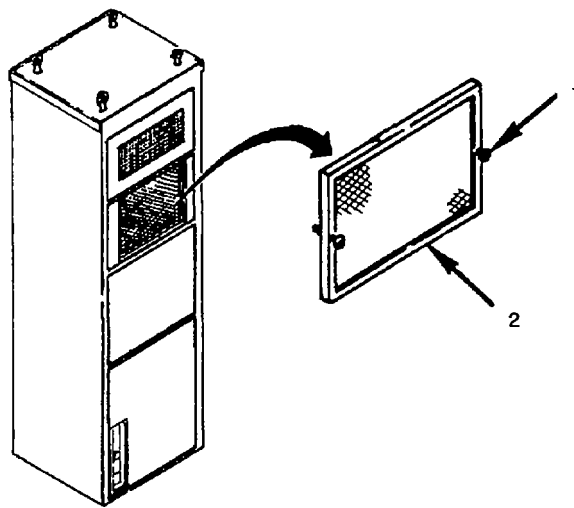


Figure 4-11. Return Air Filter Installation

#### Section IV. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4.13 GENERAL. The Preventive Maintenance Checks and Services (PMCS) are defined in the following paragraphs.

- a. Systematic, periodic, preventive maintenance checks and services are essential to ensure that the air conditioner is ready for operation at all times. The purpose of a preventive maintenance program is to discover and correct defects and deficiencies before they can cause serious damage or complete failure of the equipment. Any effective preventive maintenance program must begin with the indoctrination of operators to report all unusual conditions noted during daily checks or actual operation to unit maintenance. All defects and deficiencies discovered during maintenance inspections must be recorded, together with corrective action taken, on DA Form 2404 (Equipment Inspection and Maintenance Worksheet).
- b. A schedule for unit preventive maintenance inspection and service should be established immediately after installation of the air conditioner. A quarterly interval, equal to three calendar months or 250 hours of operation (whichever occurs first) is recommended for usual operating conditions. When operating under unusual conditions, such as a very dusty or sandy environment, it may be necessary to reduce the interval to monthly or even less if conditions are extreme.
- c. Table 4-1 lists the unit preventive maintenance checks and services that should be performed at quarterly (or otherwise established) intervals. The PMCS items in the table have been arranged and numbered in a logical sequence to provide for greater personnel efficiency and least amount of required maintenance downtime.

4.14 PMCS COLUMNAR ENTRIES. The PMCS table column headings and column entries are defined in the following subparagraphs.

- a. "Item Number" Column. This is the order in which you perform checks and services on the air conditioner. The entry in this column will also be used as a source of item numbers for the "TM Item Number" column in DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.
- b. "Interval" Column. The interval column tells you when to do a certain check or service.
- c. "Item To Check/Service" Column. Identification of item to be inspected.

- d. "Procedure" Column. The procedure's column of your PMCS table tells you how to do the required checks and services. Carefully follow these instructions. If you do not have the tools, or if the procedure tells you to, have the next higher level of maintenance do the work.
- e. "Not Fully Mission Capable If" Column. Entries in this column will be keyed specifically to checks listed in the "Procedure" column for the purpose of identifying, for the check, the criteria that will cause the equipment to be classified as not fully mission capable because of inability to perform its primary combat mission.

Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS) Quarterly Schedule

**WARNING**

Disconnect input power before disassembly of the air conditioner for PMCS to prevent dangerous, possible fatal, electrical shock.

Item No.	Interval	Item to Check/Service	Procedure	Not Fully Mission Capable if:
1	Quarterly	Return Air Filter	<ul style="list-style-type: none"> <li>a. Remove, dean, and Inspect filter (paragraph 4.26).</li> <li>b. Wash filter in mild detergent and water solution. Rinse thoroughly In clean water. Shake out excess water. Spray filter with air filter oil.</li> <li>c. Inspect filter for damage. Re-place if damaged.</li> <li>d. Replace filter (paragraph 4.26).</li> </ul>	<p>Filter is dirty.</p> <p>Filter is damaged</p>
2	Quarterly	Control Box Assembly	<ul style="list-style-type: none"> <li>a. Access control box (paragraph 4.27)</li> <li>b. Check operation of controls for stiffness or binding</li> <li>c. Inspect wiring harness for damage or chafing and all electrical connections for tightness.</li> <li>d. Repair control box (paragraph 4.27).</li> </ul>	<p>Controls are stiff or bind.</p> <p>Wiring harness Is damaged or chafed.</p>
3	Quarterly	Evaporator Fan	<ul style="list-style-type: none"> <li>a. Access fan (paragraph 4.47).</li> <li>b. Check fan for cracked or broken blades and all mounting hardware for tightness and Security. Replace if damaged.</li> <li>c. Replace fan (paragraph 4.47).</li> </ul>	<p>Control box is damaged.</p> <p>Blades are cracked or broken. Mounting hardware is loose.</p> <p>Fan is damaged</p>

**Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS)  
Quarterly Schedule - Continued**

Item No.	Interval	Item to Check/Service	Procedure	Not Fully Mission Capable if:
4	Quarterly	Evaporator Motor	<ul style="list-style-type: none"> <li>a. Access motor (paragraph 4.48).</li> <li>b. Check motor for rotational freedom by spinning shaft. If there is stiffness or binding, replace motor. Check motor bearings for shaft end play. If there is excessive end play, replace motor.</li> <li>c. To repair motor, contact Direct Support Maintenance.</li> <li>d. Replace motor (paragraph 4.48).</li> </ul>	<p>Shaft is stiff or binds. Motor bearings have excessive shaft end play.</p> <p>Motor is damaged.</p>
5	Quarterly	Condenser Fan	<ul style="list-style-type: none"> <li>a. Access fan (paragraph 4.50).</li> <li>b. Check fan for cracked or broken blades. Replace if damaged.</li> <li>c. Replace fan (paragraph 4.50).</li> </ul>	<p>Blades are cracked or broken.</p>
6	Quarterly	Condenser Motor	<ul style="list-style-type: none"> <li>a. Access motor (paragraph 451).</li> <li>b. Check motor for rotational freedom by spinning shaft. If there is stiffness or binding, replace motor. Check motor bearings for shaft end play. If there is excessive end play, replace motor.</li> <li>c. To repair motor, contact Direct Support Maintenance.</li> <li>d. Replace motor (paragraph 451).</li> </ul>	<p>Shaft is stiff or binds. Motor bearings have excessive shaft end play.</p>
7	Quarterly	Electric Heater	<ul style="list-style-type: none"> <li>a. Access heater (paragraph 4.52).</li> <li>b. Check heater elements for deformation, damaged terminals, threads, cracked or broken terminals. Replace if damaged.</li> </ul>	<p>Heater elements are deformed; terminals are damaged, cracked or broken.</p>



**Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS)  
Quarterly Schedule - Continued**

Item No.	Interval	Item to Check/Service	Procedure	Not Fully Mission Capable if:
8	Quarterly	Thermostat (S2)	<ul style="list-style-type: none"> <li>c. Replace heater (paragraph 4.52).</li> <li>a. Access thermostat (paragraph 4.54).</li> <li>b. Inspect for obvious damage, overheating, and all mounting hardware for tightness and security. Check that sensing bulb and capillary line are not damaged. Replace if damaged.</li> <li>c. Replace thermostat (paragraph 4.54).</li> </ul>	<p>Mounting hardware is loose. Sensing bulb or capillary line is damaged.</p> <p>Thermostat is damaged.</p>
9	Quarterly (S8)	Heat Fault Thermostat	<ul style="list-style-type: none"> <li>a. Access thermostat (paragraph 4.56).</li> <li>b. Inspect for obvious damage, overheating, and all mounting hardware for tightness and security. Check that sensing coil is not damaged. Replace if damaged.</li> <li>c. Replace thermostat (paragraph 4.56).</li> </ul>	<p>Mounting hardware is loose. Sensing coil is damaged.</p> <p>Thermostat is damaged.</p>
10	Quarterly	Crankcase Heater	<ul style="list-style-type: none"> <li>a. Access heater (paragraph 4.57).</li> <li>b. Visually inspect for damage. Replace if damaged.</li> <li>c. Replace heater (paragraph 4.57).</li> </ul>	<p>Heater is damaged.</p>

**Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS)  
Quarterly Schedule - Continued**

Item No.	Interval	Item to Check/Service	Procedure	Not Fully Mission Capable if:
11	Quarterly	Compressor	<ul style="list-style-type: none"> <li>a. Remove compressor section panel (paragraph 4.24) to access compressor.</li> <li>b. Inspect wiring harness for damage or chafing and all electrical connections for tightness. Check all compressor mounting hardware for tightness and security. Replace if damaged.</li> <li>c. To replace compressor, contact Direct Support Maintenance.</li> </ul>	Wiring harness is damaged or chafed. Electrical connections and/or compressor mounting hardware is loose.
12	Quarterly	Condenser Coil	<ul style="list-style-type: none"> <li>a. Access coil (paragraph 4.59)</li> <li>b. Inspect coil for dirt or obvious damage and all mounting hardware for tightness and security. Repair or replace if damaged.</li> <li>c. To repair or replace coil, contact General Support Maintenance.</li> </ul>	Coil is dirty or damaged. Mounting hardware is loose.
13	Quarterly	Evaporator Coil	<ul style="list-style-type: none"> <li>a. Access coil (paragraph 4.60).</li> <li>b. Inspect coil for dirt or obvious damage and all mounting hardware for tightness and security. Repair or replace if damaged.</li> <li>c. To repair or replace coil, contact General Support Maintenance.</li> </ul>	Coil is dirty or damaged. Mounting hardware is loose.
14	Quarterly	Condenser Intake Screen	Clean condenser air inlet and condenser coil (paragraph 4.59).	Condenser air inlet and condenser coil are dirty.

Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS)  
Quarterly Schedule - Continued

Item No.	Interval	Item to Check/Service	Procedure	Not Fully Mission Capable if:
15	Quarterly	Sight Glass	<div> </div> <p>This inspection is performed with power on. Proceed with extreme caution to prevent dangerous, possible fatal shock.</p> <ol style="list-style-type: none"> <li>Remove return air filter (paragraph 4.26) to access sight glass.</li> <li>Check that glass window is not broken or cracked. Check for evidence of leakage. Check for bubbles or milky appearance. Contact direct support maintenance if bubbles or milky appearance are present.</li> <li>To repair or replace sight glass, contact Direct Support Maintenance.</li> </ol>	Glass window is cracked or broken or there is evidence of leakage. Bubbles or milky appearance are evident.

## Section V. UNIT TROUBLESHOOTING

4.15 GENERAL. This section contains unit troubleshooting information for locating and correcting most of the operating troubles which may develop in the air conditioner.

### NOTE

Before you use the table, be sure you have performed all applicable PMCSs (table 4-1).

4.16 TROUBLESHOOTING. Each malfunction for an individual component is listed in table 4-2. The malfunction is followed by a list of tests or inspections which help to determine probable causes and corrective actions to take. All malfunctions that may occur and all tests or inspections and corrective actions may not be listed. If a malfunction is not listed or is not corrected by corrective action, notify your supervisor.

### WARNING


HIGH VOLTAGE  
is used in the operation of this equipment.

### NOTE

DEATH ON CONTACT  
may result if personnel fail to observe safety precautions.

- Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.
- Whenever possible, the input power supply to equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.
- Be careful not to contact high-voltage connections of 208 volts AC input when installing or operating this equipment.
- Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.
- Do not operate the equipment without all panels and covers in place and tightly secured. Do not be misled by the term "low voltage." Potentials as low as 50 volts may cause death under adverse conditions.

**Table 4-2. Unit Maintenance Troubleshooting**

Malfunction	Test or Inspection	Corrective Action
<b>1. AIR CONDITIONER WILL NOT START</b>		
<div style="text-align: center;">  <p><b>WARNING</b></p> </div> <p>Disconnect input power before performing internal electrical troubleshooting. Voltages used can KILL.</p>		
Step 1.	Check to see if input power has been disconnected.	Connect input power.
Step 2.	Make sure that power is 208 volt, 3-phase, 50/60 hertz.	Connect correct input power.
Step 3.	Check to see if circuit breaker (CB1) is tripped (paragraph 4.39).	Replace circuit breaker (CB1) (paragraph 4.39).
Step 4.	Check to see if circuit breaker (CB2) is tripped (paragraph 4.39).	Replace circuit breaker (CB2) (paragraph 4.39).
Step 5.	Check operation of circuit breakers (CB1-CB2).	Test circuit breakers (paragraph 4.39). Replace circuit breaker if defective.
Step 6.	Check operation of phase relay (K6).	Test relay (paragraph 4.35) Replace relay if defective.
Step 7.	Check terminal boards (TB1 -TB2) (paragraph 4.43).	Check all terminals and internal wiring within electric box for tightness and damage. Tighten terminals. If wires are damaged, contact Direct Support Maintenance.

**Table 4-2. Unit Maintenance Troubleshooting**

Malfunction
Test or Inspection
Corrective Action

2. EVAPORATOR AND CONDENSER FANS BOTH RUN, BUT COMPRESSOR DOES NOT START AFTER TIME DELAY

Step 1. Check operation of MODE SELECT switch (S1) (paragraph 4.28).

Set switch to OFF, then reset to COOL.

**NOTE**

Allow 10 seconds time delay before compressor starts.

**WARNING**

Disconnect input power before performing internal electrical troubleshooting.  
Voltages used can KILL.

Step 2. Check terminal boards (TB1 -TB2) (paragraph 4.43). Check for loose or damaged electrical connections or damaged wires in wiring harnesses (figure FO-2.).

Tighten or replace connections and lugs (paragraph 4.43) If wires are damaged, contact Direct Support Maintenance.

Step 3. Check operation of compressor timing relay (TR1).

Step 4. Check operation of compressor contactor (K1). Test contactor (paragraph 4.34). Replace contactor if defective.


Step 5. Feel compressor to see if it is warm. If compressor is not warm, contact Direct Support Maintenance.

Step 6. Check operation of compressor (B1) (table 4-1, Step 11).  
If not operating, contact Direct Support Maintenance.

**Table 4-2. Unit Maintenance Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
3	COMPRESSOR STARTS NORMALLY, BUT CONTROL CIRCUIT BREAKER (CB1) SOON TRIPS	<p>Step 1. Check circuit breaker (CB1).</p> <p>Test circuit breaker (paragraph 4.39) Replace circuit breaker if defective. Restart air conditioner in COOL mode.</p> <div style="text-align: center;"> <div style="border: 2px dashed black; padding: 5px; display: inline-block;"><b>CAUTION</b></div> </div> <p>If circuit breaker trips again soon after restart in COOL mode, do not attempt another restart, damage may occur to compressor. Contact Direct Support Maintenance for refrigeration system troubleshooting.</p>
4	REDUCED COOLING CAPACITY	<p>Step 1. Check that all doors, windows and other openings in the room or enclosure are tightly closed.</p> <p>Tightly close all openings.</p> <p>Step 2. Check operation of thermostat (S2).</p> <p>Test thermostat (paragraph 4.54). Replace thermostat if defective.</p> <p>Step 3. Check to be sure that condenser air inlet and outlet are not obstructed (paragraph 1.9)</p> <p>Remove obstructions.</p> <p>Step 4. With unit operating in COOL mode, check condition of refrigerant in sight glass (table 4-1, Item 14).</p> <ol style="list-style-type: none"> <li>Check sight glass (table 4-1, Item 14).</li> <li>Clean evaporator coil (paragraph 4.60).</li> </ol>

**Table 4-2. Unit Maintenance Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
<b>5. REDUCED HEATING CAPACITY</b>		
	Step 1.	Check that all doors, windows and other openings in the room or enclosure are tightly closed Tightly close all openings.
	Step 2.	Check operation of thermostat (S2).  Test thermostat (paragraph 4.54). Replace thermostat if defective.
	<div style="text-align: center;">  <p><b>WARNING</b></p> </div> <p>Disconnect input power before performing internal electrical troubleshooting. Voltages used can KILL</p>	
	Step 3.	Check for loose or damaged electrical connections or damaged wires in wiring harnesses (see fig FO-2).  Tighten loose terminals.
	Step 4.	Check individual elements of heater (HR1 and HR2).  Test heater elements (paragraph 4.52). Replace element(s) if defective.
	Step 5.	Check operation of heater contactors (K4) and (K5).  Test contactor (paragraph 4.34). Replace contactor if defective.
	Step 6.	Check operation of heat fault thermostat (S8).  Test thermostat (paragraph 4.56) Replace thermostat if defective.
	Step 7.	Check operation of heat limit switches (S9) and (S10).  Test switches (paragraph 4.53) Replace switches if defective.
	Step 8.	Check operation of heat fault slave relay (K15).  Test relay (paragraph 4.40). Replace relay if defective.
	Step 9.	Check operation of heat fault relay (K10).  Test relay (paragraph 4.36). Replace relay if defective.



**Table 4-2. Unit Maintenance Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**6. EVAPORATOR FAN MOTOR (B2) DOES NOT OPERATE**

**WARNING**

Disconnect input power before performing internal electrical troubleshooting. Voltages used can KILL.

Step 1. Using wiring diagram (figure FO-2 ), check electrical connections and individual wires for tightness.

Tighten as required if wires are damaged, contact Direct Support Maintenance.

Step 2. Check operation of fan motor contactor (K2).

Test contactor (paragraph 4.34). Replace contactor if defective.

Step 3. Check operation of fan motor (B2).

Inspect and test motor (paragraph 4.48). Replace motor if defective.

Step 4. Check operation of MODE SELECT switch (S1).

Inspect switch (paragraph 4.28). Replace switch if defective.

**7. CONDENSER FAN MOTOR (B3) DOES NOT OPERATE**

**WARNING**

Disconnect input power before performing internal electrical troubleshooting. Voltages used can KILL.


Step 1. Using wiring diagram (figure FO-2.), check electrical connections and individual wires for tightness.

Tighten as required. If wires are damaged, notify Direct Support Maintenance.


**Table 4-2. Unit Maintenance Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
<b>7. CONDENSER FAN MOTOR (B3) DOES NOT OPERATE - Continued</b>		
	Step 2. Check operation of fan motor contactor (K3).	Test contactor (paragraph 4.34). Replace contactor if defective.
	Step 3. Check operation of fan motor (B3).	Inspect and test motor (paragraph 4.51). Replace motor if defective.
	Step 4. Check operation of MODE SELECT switch (S1).	Inspect switch (paragraph 4.28). Replace switch if defective
	Step 5. Check operation of condenser timing relay (TR2).	Test relay (paragraph 4.41). Replace relay if defective.
<b>8. EXCESSIVE NOISE WHEN COMPRESSOR STARTS</b>		
	<div style="border: 2px dashed black; padding: 5px; text-align: center; width: fit-content; margin: 0 auto;"><b>CAUTION</b></div> <p>If a knocking or hammering sound is heard when compressor starts, turn MODE SELECT switch to OFF immediately. Such noise is usually caused by liquid refrigerant in compressor, which can seriously damage or destroy compressor.</p>	
	Step 1. Turn compressor OFF, wait a minute and turn to AUTO.	If compressor continues to knock, turn compressor OFF immediately and contact Direct Support Maintenance.
<b>9. EXCESSIVE NOISE OPERATION</b>		
	Step 1. Isolate source of noise as near as possible, both by ear and touch. Listen and feel at both the front and back of the cabinet.	
	Step 2. Check fans for looseness or damage and for rotational clearance.	Tighten loose fans (paragraphs 4.47 and 4.50).
	Step 3. Check all internal components for looseness, vibration and security.	Tighten, adjust and secure as necessary.

**Table 4-2. Unit Maintenance Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
10. FAULT RESET SWITCH (S12) DOES NOT RESET		
<div style="text-align: center;">  </div> <p>Disconnect input power before performing internal electrical troubleshooting. Voltages used can KILL.</p>		
Step 1.	Check operation of reset switch (S12).	Test switch (paragraph 4.30) Replace switch if defective.
Step 2.	Check operation of latching relay (K11).	Test relay (paragraph 4.37). Replace relay if defective.
Step 3.	Check operation of latching relay (K11) 11-pin socket.	Test socket (paragraph 4.42) Replace socket if defective.
11. DIRTY FILTER LIGHT (DS5) ON		
Step 1.	Check return air filter.	Clean filter (paragraph 4.26).
Step 2.	Check operation of dirty filter relay (K7).	Test relay (paragraph 4.36). Replace relay if defective.
Step 3.	Check operation of relay (K7) 11-pin socket..	Test socket (paragraph 4.42). Replace socket if defective.
Step 4.	Check operation of dirty filter slave relay (K13).	Test relay (paragraph 4.40). Replace relay if defective.
Step 5.	Check operation of airflow filter switch (S3).	Test switch (paragraph 4.55). Replace switch if defective.

**Table 4-2. Unit Maintenance Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
<hr/>		
12.	LOW SUCTION PRESSURE INDICATOR (DS7) ON	
	Step 1.	Check sight glass for bubbles (table 4-1, item 14). If bubbles are present, contact Direct Support Maintenance.
	Step 2.	Feel outlet line of refrigerant strainer (see fig 5-31). If outlet line is much colder than inlet line, contact Direct Support Maintenance.
	Step 3.	Check all piping and connections for leaks. If leaks are present, contact Direct Support Maintenance.
	Step 4.	Check operation of low suction pressure fault relay (K9). Test relay (paragraph 4.36). Replace relay if defective.
	Step 5.	Check operation of relay (K9) socket. Test socket (paragraph 4.42). Replace socket if defective.
	Step 6.	Check operation of slave relay (K12). Test relay (paragraph 4.40). Replace relay if defective.
	Step 7.	If low suction light is still on, contact Direct Support Maintenance.
<hr/>		
13.	HIGH DISCHARGE PRESSURE LIGHT (DS6) ON	
	Step 1.	Check that condenser fan motor (B3) runs. Go to Malfunction No. 7.
<div style="text-align: center;">  </div> <p>Disconnect input power before performing internal electrical troubleshooting. Voltages used can KILL.</p>		
	Step 2.	Feel condenser coil (see fig 4-49). If coil is exceptionally hot, contact Direct Support Maintenance for refrigeration system troubleshooting.

**Table 4-2. Unit Maintenance Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
<hr/>		
13.	HIGH DISCHARGE PRESSURE LIGHT (DS6) ON - Continued	
Step 3	Check condenser coil for cleanliness.	If dirty, clean coil (paragraph 4.59).
Step 4	Check sight glass for bubbles (table 4-1, Step 14).	If bubbles are present, contact Direct Support Maintenance for refrigeration system troubleshooting.
Step 5.	Check operation of high discharge pressure relay (K8).	Test relay (paragraph 4.36) Replace relay if defective.
Step 6	Check operation of relay (K8) 11-pin socket.	Test socket (paragraph 4.42). Replace socket if defective.
Step 7.	Check operation of high pressure fault slave relay (K14).	Test relay (paragraph 4.40). Replace relay if defective.
Step 8	If high discharge pressure indicator (DS6) is still on, contact Direct Support Maintenance for refrigeration system troubleshooting.	
<hr/>		
14.	COMPRESSOR STARTS NORMALLY, BUT CRANKCASE HEATER CIRCUIT BREAKER (CB2) SOON TRIPS	
Step 1	Check operation of circuit breaker (CB2).	Test circuit breaker (paragraph 4.39). Replace circuit breaker if defective.
Step 2.	Check operation of crankcase heater (HR3) (paragraph 4.57).	Feel compressor to see if it is warm; if not, contact Direct Support Maintenance.
Step 3.	Reset circuit breaker and restart in COOL mode.	
<div style="text-align: center; border: 2px dashed black; padding: 5px; margin: 10px auto; width: fit-content;"> <b>CAUTION</b> </div> <p>If circuit breaker trips again soon after restart in COOL mode, do not attempt another restart. Contact Direct Support Maintenance.</p>		
<hr/>		

## Section VI. UNIT MAINTENANCE PROCEDURES

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## Section VI. UNIT MAINTENANCE PROCEDURES - Continued

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4.17 **GENERAL.** This section contains functional description and maintenance procedures which are authorized to Unit Maintenance (O) by the Maintenance Allocation Chart (MAC), Appendix B and Source Maintenance and Recoverability (SMR) coded items. Each paragraph covers a complete maintenance procedure but may require other tasks to be included (i.e. initial setups references and follow-on procedures). Perform procedures/tasks in designated order.

4.18 **FUNCTIONAL DESCRIPTION.** The air conditioner control circuits are described in the following paragraphs. It is very important for the technician to note that even when the air conditioner mode switch is positioned to OFF and circuit breakers CB1 and CB2 are open, live voltage is available throughout the air conditioner and at least one input phase C circuit is complete to neutral. (See fig 4-12 and fig. FO-2.).

4.18.1 When 208 V, 3-phase AC power is applied to the air conditioner through terminal board (TB1) the following circuits are enabled:

- a. Input phases A B and C are applied to one side of the relay contacts of compressor contactor (K1) evaporator fan motor contactor (K2) condenser fan motor contactor (K3) first stage heater contactor (K4), second stage heater contactor (K5) and to the coil of the phase relay (K6).
- b. In addition, phase B is also routed through the compressor crankcase heater (HR3) and to the line side of the crankcase heater circuit breaker (CB2).
- c. Phase C is also applied to the load side of the crankcase heater circuit breaker (CB2) and the line side of the control circuit breaker (CB1), illuminates the POWER ON indicator (DS1 ) and completes the circuit at the neutral side of the compressor contactor (K1) coil.

4.18.2 With the PRIME UNIT SELECT switch (S11) set to PRIMARY, phase C input power is also routed through contacts of the latching relay (K11), to contacts of the compressor and condenser fan motor time delay relays (TR1 and TR2), to the center contacts of the thermostat (S2) and the MODE SELECT switch (S1) and is present on the remote status terminal board (TB2).

4.18.3 When the PRIME UNIT SELECT switch (S11) is set to BACKUP electrical power is not applied to the operating modes control circuits unless the primary air conditioner in a dual configuration has failed. This function is described in a subsequent subparagraph.

Item No	Nomenclature	Item No	Nomenclature	Item No	Nomenclature
B1	Compressor	K3	Cond fan motor contactor	S2	Thermostat
B2	Evap fan motor	K4	1st stage heater contactor	S3	Airflow filter switch
B3	Cond fan motor	K5	2nd stage heater contactor	S4	Low refrigerant pressure switch
CB1	Control circuit overload	K6	Phase relay	S5	High refrigerant pressure switch
CB2	Crankcase heater circuit breaker	K7	Relay-dirty filter fault	S6	Evap fan motor thermal switch
DS1	Power on indicator	K8	Relay-high discharge pressure fault	S7	Cond fan motor thermal switch
DS2	Cool on indicator	K9	Relay-low suction pressure fault	S8	Heat fault thermostat
DS3	Heat on indicator	K10	Relay-heat fault	S9	1st stage heat limit switch
DS4	Circulate on indicator	K11	Latching relay	S10	2nd stage heat limit switch
DS5	Dirty filter indicator	K12	Low suction press fault slave relay	S11	Prime unit select switch
DS6	High dis press indicator	K13	Dirty filter slave relay	S12	Fault reset switch
DS7	Low suc press indicator	K14	High press fault slave relay	TB1	Power terminal board
HR1	1st stage heat	K15	Heat fault slave relay	TB2	Control (remote status) terminal board
HR2	2nd stage heat	L1	R22 Liquid solenoid	TR1	Compressor time delay relay
HR3	Crankcase heater	L2	Aux R22 liquid solenoid	TR2	Condenser fan motor time delay relay
K1	Compressor contactor	R1-R7	3 Ok Resistor		
K2	Evap fan motor contactor	S1	Mode select switch		

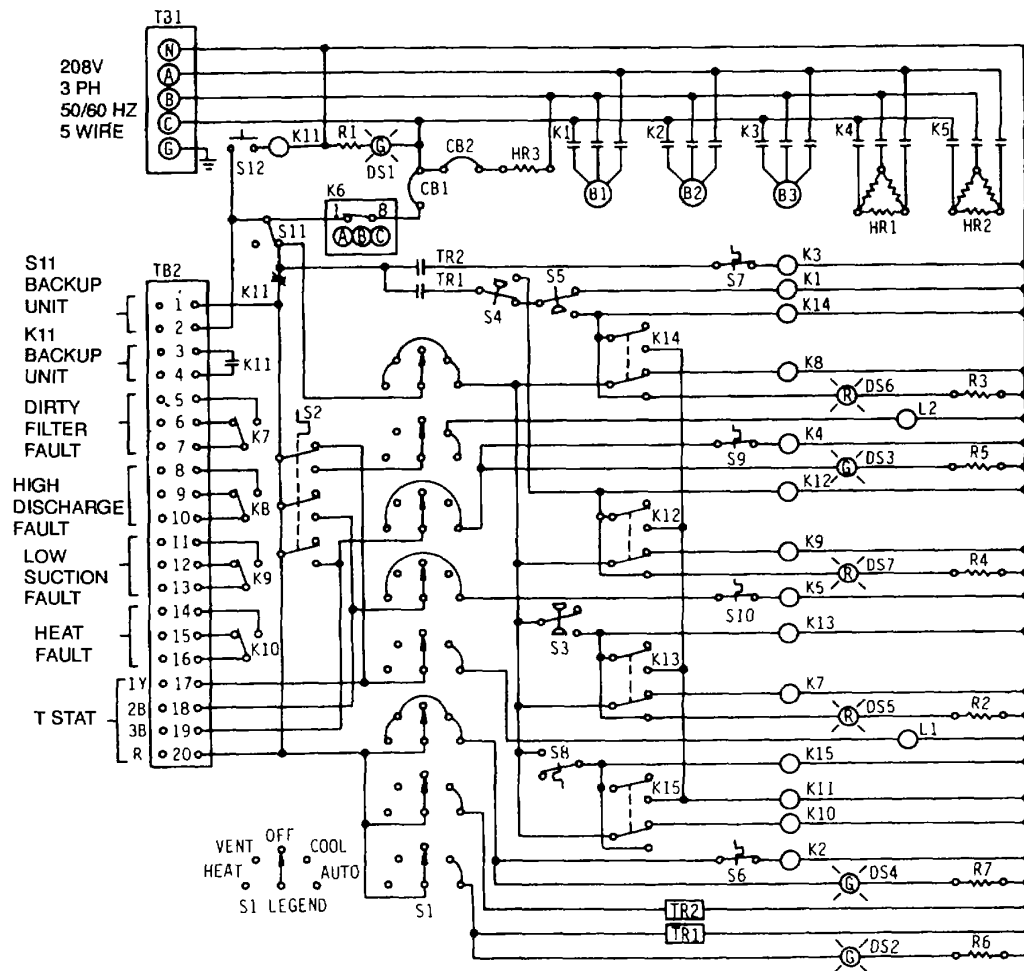


Figure 4-12. Electrical Schematic



4.19 COOL FUNCTION. The principles of operation for the air conditioner, operating as the primary unit while in the COOL or AUTO mode of Operation, are described in the following subparagraphs (see fig. 4-12 and fig FO-2.).

**NOTE**

The air conditioner utilizes a hot gas bypass system to maintain temperature control instead of switching the compressor on and off each time air temperature crosses the threshold at thermostat (S2).

In AUTO mode of operation, all HEAT functions are also enabled under the control of the thermostat (S2).

- a. The control circuit overload circuit breaker (CB 1) and the crankcase heater circuit breaker (CB2), accessible only by disassembling the control panel, are automatic-reset type breakers. There are no manual controls for these circuit breakers. Their protective functions are as described by their respective names.
- b. The phase relay (K6) monitors the voltage levels of phases A, B, and C input power. If any phase voltage drops below a preset value, the relay deenergizes and shuts down the air conditioner by removing voltage from the control circuits.
- c. When MODE SELECT CT switch (S1) is placed in the AUTO or COOL position, four fault relays (K7, K8, K9 and K10) are immediately energized to enable the fault circuits. (These four relays are also energized in VENT and HEAT modes of operation.)
- d. The evaporator fan motor contactor (K2) is energized to close the circuits to the evaporator fan motor (B2) and to start airflow within the unit. The compressor and condenser fan motor time delay relays (TR1 and TR2) start their timing cycles.
- e. Input power is applied to the COOL indicator (DS2) and the CIRCULATE indicator (DS4), causing both to light. In AUTO mode, the HEAT indicator (DS3) is also enabled. Seven resistors (R1 through R7) provide voltage drop regulate n for the power, mode selection, and fault indicating lights on the control panel.
- f. The solenoid valve (L1) which allows refrigerant flow to the primary expansion valve (V5) is energized (opened). The solenoid valve (L2) which allows refrigerant flow to the liquid quench expansion valve (V6) is enabled for operation as required by thermostat (S2) switch action.
- g. After about 5 seconds, the condenser fan motor time delay relay (T R2) energizes, causing the condenser fan motor contactor (K3) to energize and start the condenser fan motor (B3).
- h. About 10 seconds after mode selection, the compressor time delay relay (TR1) energizes, causing the compressor contactor (K1) to energize and start the compressor motor (B1).
- i. The remainder of the COOL mode control circuitry consists of the following fault detection equipment protection circuits.
  - (1) High Discharge Pressure. If the high refrigerant pressure switch (S5) located at the output port of the compressor senses excessive pressure, it opens to deenergize the compressor contactor (K1) and shut down the compressor (B 1), and it energizes the high pressure fault slave relay (K14).

This relay (K14) then acts to deenergize the high discharge pressure fault relay (K8), enabling the fault to be reported at the remote status terminal board (TB 2), closes a circuit which causes the HIGH DISC PRESSURE fault indicator (DS6) to light on the control panel; and energizes the latching relay (K11), which opens the normally closed contacts in the input voltage circuit and shuts down the air conditioner.

The normally open contacts of this relay (Ku) will close across terminals 3 and 4 of the remote status terminal board (TB2. If the air conditioner is installed in a dual configuration with a similar backup unit, this contact closure {through site interconnecting cabling} will place phase C input voltage on terminal 1 of the

backup unit remote status terminal board (TB2), bypassing the PRIME UNIT SELECT switch (S 11) on the backup unit and enabling the backup unit to operate.

After a fault is cleared, momentarily pressing the FAULT RESET switch (S 12) on the air conditioner control panel will reset the latching relay (K1) to normal operating status

- (2) Low Suction Pressure. If the low refrigerant pressure cutout switch (S4) located at the input port to the compressor senses low pressure, it opens to de-energize the compressor contactor (K1) and to shut down the compressor (B 1), and it energizes the low pressure fault slave relay (K 12)

This relay (K12) then acts to de-energize the low suction pressure relay (K9), enabling the fault to be reported at the remote status terminal board (TB2), closes a circuit which causes the LOW SUC PRESSURE fault indicator (DS7) to light on the control panel; and energizes the latching relay (K 11) to shut down the air conditioner and enable the backup unit

- (3) Dirty Filter If the airflow through the return air filter decreases to a level that causes the airflow filter switch (S3) to close (usually caused by blockage of the air filter or failure of the evaporator fan motor B2), the dirty filter slave relay (K13) energizes.

This relay (K13) then acts to de-energize the dirty filter fault relay (K7), enabling the fault to be reported at the remote status terminal board (TB2), closes a circuit which causes the DIRTY FILTER fault indicator (DS5) to high on the control panel, and energizes the latching relay (K11) to shut down the air conditioner and to enable the backup unit

- (4) Fan Motor Overheat. If the condenser fan motor (B3) or evaporator fan motor (B2) overheat, internal thermal switches (S7 or S6) will open to de-energize the condenser fan motor contactor (K3) or evaporator fan motor contactor (K2) and shut down the respective fan Both thermal switches (S6 and S7) will automatically reset when the fan motor housing internal temperature decreases within preset limits.

**4.20 HEAT FUNCTION.** The principles of operation for the air conditioner, operating as the primary unit while in the HEAT or AUTO mode of operation, are described in the following subparagraphs (see fig. 4-12).

- a. AUTO Mode. All the control and fault circuits described under the cooling function in the preceding paragraphs apply, in addition to those functions listed in the following subparagraphs.
- b. HEAT Mode. When the MODE SELECT switch (S 1) is positioned to HEAT, the following items associated with AUTO mode are disabled
  - (1) Solenoid valve (L1) is disabled, stopping refrigerant flow to the primary expansion valve (V5).
  - (2) Solenoid valve (L2) is disabled, stopping refrigerant flow to the liquid quench expansion valve (V6)
  - (3) The compressor and condenser fan time delay relays (TR1 and TR2) are deenergized, shutting off operation of the compressor (B1) and the condenser fan motor (B3)
  - (4) The COOL indicator (DS2) does not light.
- c. If the return air temperature is below the first stage setting of the thermostat (S2) setting, the first stage heater contactor (K4) will be energized. This contactor (K4) will cause power to be applied to three of the six 750-watt heating elements (HR1). In addition, power is applied to the HEAT indicator (DS3) on the control panel, causing it to light.
- d. Should the return air temperature fall 1-1/in degrees F below the first stage setting, the thermostat (S2) will enable added heating by energizing the second stage heater contactor (K5). This contactor (K5) will cause power to be applied to three additional 750-watt heating elements (HR2).

- e. Fault Detection/Protection Circuits. The air conditioner is equipped with one external equipment protection heat fault detection circuit and two internal unit temperature over-limit protection circuits:
- (1) Heat fault detection resulting in automatic switch over to a backup air conditioner is provided by the heat fault thermostat (S8). If the return air temperature exceeds the setting of 82 degrees F at the thermostat (S8), the heat fault slave relay (K15) is energized. This results in the heat fault relay (K10) de-energizing, enabling the fault to be reported at the remote status terminal board (TB2) and the latching relay (K11) energizing to shut down the air conditioner and to enable the backup unit.
  - (2) Internal air conditioner over-temperature protection is provided by the first and second stage heat limit switches (S9 and S10). If the first and/or second stage heating elements (HR1/HR2) remain on after the thermostat (S2) should have deactivated them, and internal air conditioner unit temperature rises above 160 degrees F (71 degrees C), the first and second stage heat limit switches will open. The first and second stage heater contactors (K4 and K5) will de-energize and disconnect power from the heating elements (HR1 and HR2).

4.21 VENT (CIRCULATE) FUNCTION. When the MODE SELECT switch (S1) is set to VENT, all heating and cooling functions are disabled, except that the four fault relays (K7, K8, K9 and K10) are energized to prevent the air conditioner from reporting itself faulted at the remote status terminal board (I32).

The evaporator fan motor contactor (K2) is energized, applying power to the evaporator fan motor (B2), and the CIRCULATE indicator (DS4) is lighted on the control panel. Equipment protection is provided by the evaporator fan motor thermal switch (S6) which, when opened at a preset limit by evaporator fan motor heat, de-energizes the evaporator fan motor contactor (K2) and shuts down the evaporator fan motor (B2). The fault is not reported and the backup air conditioner is not enabled.

The thermal switch (S6) will automatically reset when the evaporator fan motor temperature decreases within a preset range, energizing the evaporator fan motor contactor (K2) and restarting the evaporator fan motor (B2).

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4.22 EVAPORATOR DUCT/PANEL. This task covers removal, inspection, repair/replace and installation.

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INITIAL SETUP

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Drill, electric, portable (Item 2, Appendix B)  
Drill set, twist (Item 3, Appendix B)  
Riveter blind hand (Item 4, Appendix B)  
Gloves, chemical (Appendix C)  
Goggles, industrial (Appendix C)

Personnel: 1

Materials:

Adhesive (Item 1, Appendix E)  
Bulk gasket material (see RPSTL)  
Bulk foam material (see RPSTL)  
Rags (Item 7, Appendix E)  
Methyl-ethyl ketone (MEK) (Item 8, Appendix E)

Equipment Condition

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

Disconnect air conditioner input power at source

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REMOVAL

- a. Remove six screws (3), lockwashers (2), and flat washers (1) (see fig. 4-13).
- b. Remove panel (4)

INSPECTION

- a. Check that panel is not bent, cracked or punctured.
- b. Check that gaskets (9) and (10), and foam (6) are not torn, loose or missing.
- c. Check that screen (7) is not damaged
- d. Check that rivets (5) and (9) are not damaged or missing.

4.22 EVAPORATOR DUCT/PANEL. -Continued

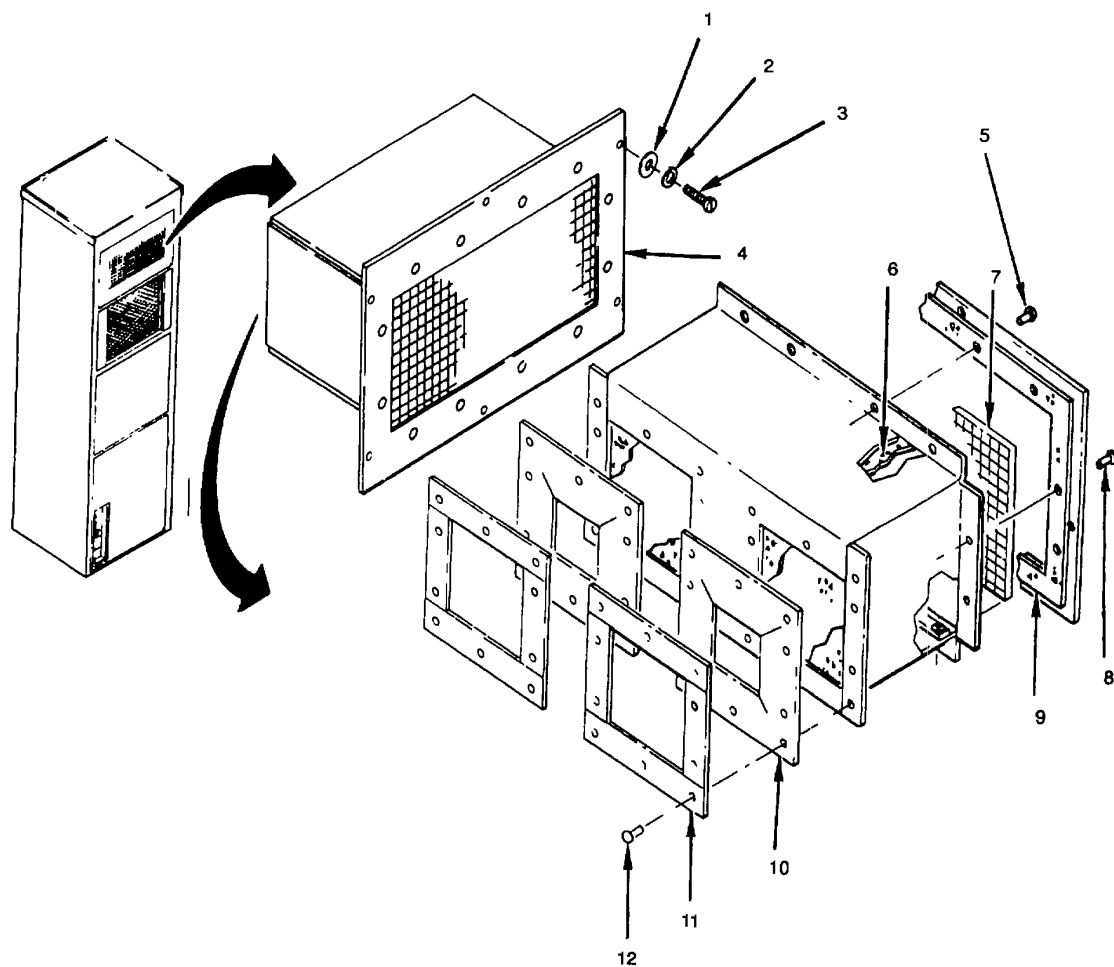


Figure 4-13. Evaporator Duct Panel

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#### 4.22 EVAPORATOR DUCT/PANEL. - Continued

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REPAIR/REPLACE
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**NOTE**

Repair consists of replacement foam gasket, rubber gasket, foam, screen, rivets, or replacing evaporator duct/panel

a. Foam Gasket.

- (1) Remove damaged gasket (9) from panel (4).

**WARNING**

Acetone and Methyl-Ethyl Ketone (MEK) are flammable and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic Use a well-ventilated area, wear gloves, and keep away from sparks or flame

- (2) Clean area for new gasket, using acetone or MEK and a stiff brush
- (3) Coat surfaces of metal and gasket with adhesive. Let both surfaces dry until adhesive is tacky but will not stick to fingers
- (4) Starting with an end, carefully attach gasket to metal surface. Press into firm contact all over.

b. Rubber Gasket

- (1) Remove 10 rivets (12) securing rubber gasket (10)
- (2) Remove mounting frame (11) and damaged rubber gasket (10)
- (3) Cut new rubber gasket (10) to fit.
- (4) Secure new rubber gasket (10) to mounting frame (11) with 10 rivets (12).

c. Foam.

- (1) Remove 12 rivets (5) and (8) securing front panel (4) and screen (7)
- (2) Remove front panel (4) and screen (7).
- (3) Remove damaged foam (6)

---

#### 4.22 EVAPORATOR DUCT/PANEL. - Continued

---

#### REPAIR/REPLACE-Continued

### WARNING

Acetone and Methyl-Ethyl Ketone (MEK) are flammable and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic Use a well-ventilated area, wear gloves, and keep away from sparks or flame.

- (4) Clean area for new foam, using acetone or MEK and a stiff brush
- (5) Coat surfaces of metal and foam with adhesive Let both surfaces dry until adhesive is tacky but will not stick to fingers
- (6) Carefully attach foam (6) to metal surface Press into firm contact all over.
- (7) Secure front panel (4) and screen (7) with 12 rivets (5) and (8)

#### d. Screen

- (1) Remove 12 rivets (5) and (8) securing front panel (4) and screen (7).
- (2) Remove front panel (4) and screen (7).
- (3) Install new screen (7) and front panel (4) and secure with 12 rivets (5) and (8)

#### INSTALLATION

- a. Position panel (4) in place.
- b. Secure with six screws (3), lockwashers (2), and flat washers (1).

#### FOLLOW ON PROCEDURE

Connect air conditioner input power at source.

---

4.23 CONDENSER FAN SECTION PANEL. This task covers removal, inspection, repair/replace and installation.

---

INITIAL SETUP

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Gloves, chemical (Appendix C)

Personnel:1

Materials:

Adhesive (Item 1, Appendix E)  
Bulk gasket material (see RPSTL)  
Bulk foam material (see RPSTL)  
Rags (Item 7, Appendix E),  
Methyl-ethyl ketone (MEK) (Item 8, Appendix E)

Equipment Condition:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

Disconnect air conditioner input power at source

---

REMOVAL

- a. Loosen four captive fasteners (2) (see fig. 4-14)
- b. Remove panel (1).

INSPECTION

- a. Check that panel (1) is not bent, cracked or punctured.
- b. Check that gasket (4) and foam (8) are not torn, loose or missing
- c. Check that captive fasteners (2) are not damaged or missing.

REPAIR/REPLACE

**NOTE**

Repair consists of replacing captive fasteners (2), gasket (4), foam (8) or replacing condenser fan section panel (1).



4.23 CONDENSER FAN SECTION PANEL. - Continued

REPAIR/REPLACE - Continued

a. Captive Fasteners.

- (1) Remove split ring retainer (3), fastener (7), thermoplastic wear washer (5), and ejector spring (6).
- (2) Install ejector spring (6), thermoplastic wear washer (5), fastener (7), and split rig retainer (3).

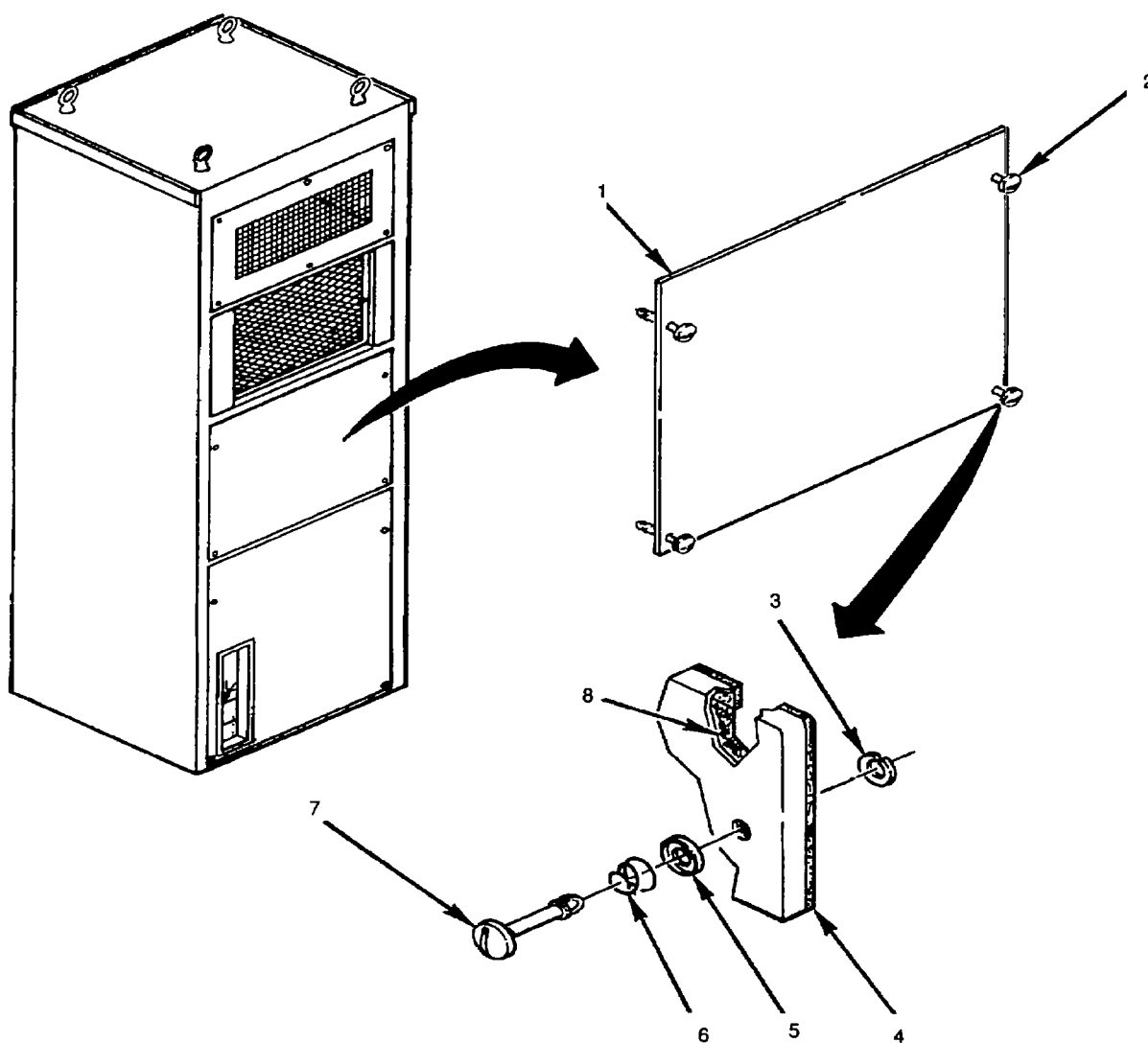


Figure 4-14. Condenser Fan Section Panel

---

4 23 CONDENSER FAN SECTION PANEL. - Continued

---

REPAIR/REPLACE - Continued

b. Gasket.

- (1) Remove captive fasteners (2).
- (2) Remove damaged gasket (4) from panel (1).

**WARNING**

Acetone and Methyl-Ethyl Ketone (MEK) are flammable and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic Use a well-ventilated area, wear gloves, and keep away from sparks or flame

- (3) Clean area for new gasket, using acetone or MEK and a stiff brush.
- (4) Coat surfaces of metal and gasket with adhesive Let both surfaces dry until adhesive is tacky but will not suck to fingers
- (5) Starting with an end, carefully attach gasket to metal surface. Press into firm contact all over
- (6) Install captive fasteners (2)

c. Foam.

- (1) Remove damaged foam (8) from back of panel (1).

**WARNING**

Acetone and Methyl-Ethyl Ketone (MEK) are flammable and their vapors can be explosive Repeated or prolonged skin contact or inhalation of vapors can be toxic Use a well-ventilated area, wear gloves, and keep away from sparks or flame

- (2) Clean area for new foam, using acetone or MEK and a stiff brush
- (3) Coat surfaces of metal and foam with adhesive. Let both surfaces dry until adhesive is tacky but will not stick to fingers
- (4) Starting with an end, carefully attach foam to metal surface Press into firm contact all over

---

4 23 CONDENSER FAN SECTION PANEL. - Continued

---

INSTALLATION

- a Position panel (1) in place
- b. Tighten four captive fasteners (2).

FOLLOW ON PROCEDURE

Connect air conditioner input power at source.

---

4.24 COMPRESSOR SECTION PANEL. This task covers removal, inspection, repair/replace and installation.

---

**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Drill, electric, portable (Item 2, Appendix B)  
drill set, twist (Item 3, Appendix B)  
Riveter blind hand (Item 4, Appendix B)  
Tool kit, rivet nut (Item 5, Appendix B)  
Gloves, chemical (Appendix C)  
Goggles, industrial (Appendix C)

Personnel: 1

Materials:

Adhesive (Item 1, Appendix E)  
Bulk gasket material (see RPSTL)  
Bulk foam material (see RPSTL)  
Rags (Item 7, Appendix E)  
Methyl-ethyl ketone (Item 8, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
- (2) Remove condenser fan section panel (paragraph 4.23).

---

**REMOVAL**

- a. Loosen four captive fasteners (2) (see fig. 4-15).
- b. Remove panel (3)

**INSPECTION**

- a. Check that panel (3) is not bent, cracked or punctured.
- b. Check that foam (1), foam gasket (11), or sponge gasket (7) are not torn, loose or missing.
- c. Check that captive fasteners (2), rivets (4), or gasket retainers (6) are not damaged or missing.

4.24 COMPRESSOR SECTION PANEL. - Continued

REPAIR/REPLACE

**NOTE**

Repair consists of replacing captive fasteners (2), foam gasket (11), foam (1), sponge gasket (7), gasket retainer (6), rivets (4), or replacing the compressor section panel (3).

a. Captive Fasteners

- (1) Remove split ring retainer (5), fastener (10), thermoplastic wear washer (8), and ejector spring (9).
- (2) Install ejector spring (9), thermoplastic wear washer (8), fastener (10), and split ring retainer (5).

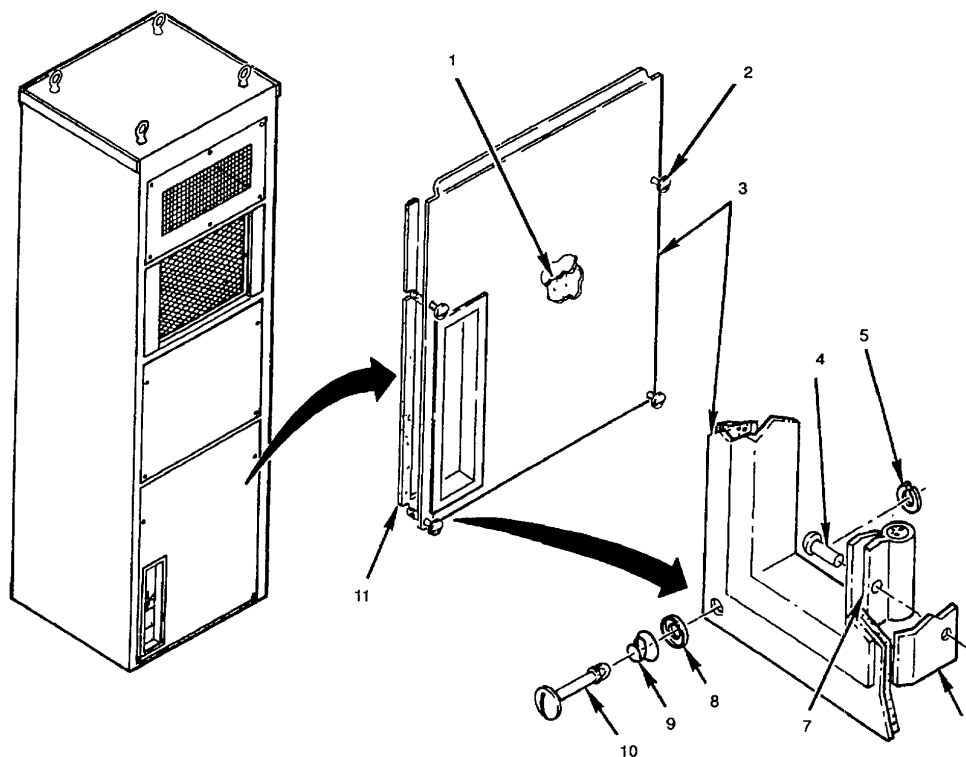


Figure 4-15. Compressor Section Panel

---

4.24 COMPRESSOR SECTION PANEL. - Continued

---

REPAIR/REPLACE - Continued

b. Foam Gasket.

- (1) Remove captive fasteners (2).
- (2) Remove damaged gasket (11) from panel (3)

**WARNING**

Acetone and Methyl-Ethyl Ketone (MEK) are flammable and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, wear gloves, and keep away from sparks or flame.

- (3) Clean area for new gasket, using acetone or MEK and a stiff brush
- (4) Coat surfaces of metal and gasket with adhesive. Let both surfaces dry until adhesive is tacky but will not stick to fingers
- (5) Starting with an end, carefully attach foam gasket to metal surface. Press into firm contact all over.
- (6) Install captive fasteners (2)

c. Foam

- (1) Remove damaged foam (1) from back of panel (3).

**WARNING**

Acetone and Methyl-Ethyl Ketone (MEK) are flammable and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, wear gloves, and keep away from sparks or flame (2) Clean area for new foam, using acetone or MEK and a stiff brush

- (3) Coat surfaces of metal and foam with adhesive. Let both surfaces dry until adhesive is tacky but will not stick to fingers
- (4) Starting with an end, carefully attach foam to metal surface. Press into firm contact all over

d.. Sponge Gasket.

- (1) Remove 10 rivets (4) securing gasket (7) to panel (3) and gasket retainers (6).
- (2) Remove damaged gasket (7).

---

#### 4.24 COMPRESSOR SECTION PANEL-Continued

---

##### REPAIR/REPLACE - Combined

- (3) Install new gasket (7) and secure to panel (3) with gasket retainers (6) and 10 rivets (4).
- e. Gasket Retainer.
  - (1) Remove two or three rivets (4) securing damaged retainer (6) to panel (3).
  - (2) Remove damaged retainer (6).
  - (3) Install new retainer (6) and secure to panel (3) with two or three rivets (4)

##### INSTALLATION

- a. Position panel (3) in place.
- b. Tighten four captive fasteners (2)

##### FOLLOW ON PROCEDURES

- a. Install condenser fan section panel (paragraph 4.23).
- b. Connect air conditioner input power at source

---

4.25 INFORMATION PLATE. This task covers inspection and replace.

---

INITIAL SETUP

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
DRILL, electric, portable (Item 2, Appendix B)  
Drill set, twist (Item 3, Appendix B)  
Riveter blind hand (Item 4, Appendix B)  
Goggles, industrial (Appendix C)

Personnel 1

---

INSPECTION

- a. Check that information plate (1) is readable and in place (see fig. 4-16).
- b. Check for missing rivets (2).

REPLACE

**NOTE**

Replace consists of replacing rivets or damaged information plate

- a. Remove four rivets (2).
- b. Remove information plate (1)
- c. Position new information plate (1) in place.
- d. Install four rivets (2)



4.25 INFORMATION PLATE, - Continued

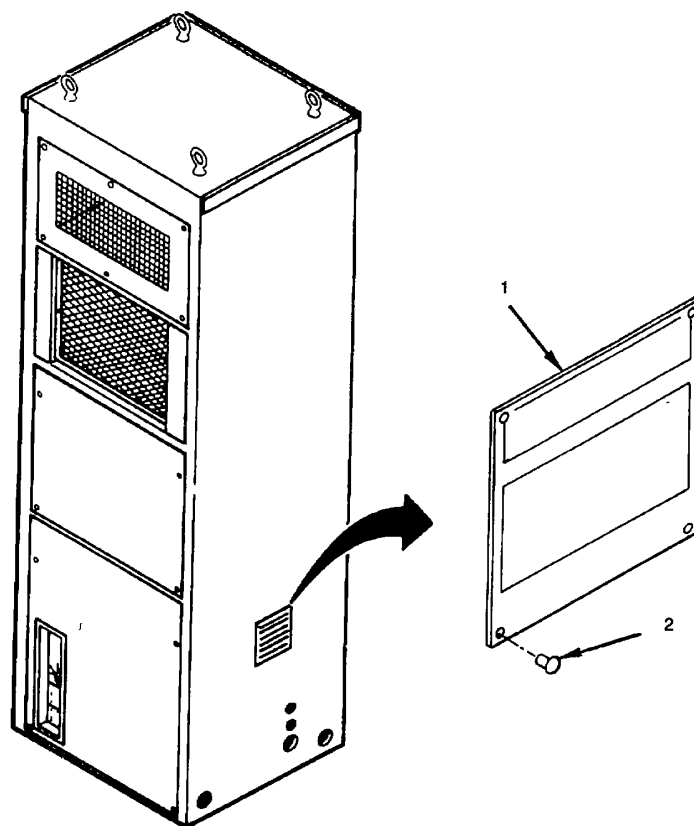


Figure 4-16. Information Plate

---

4.26 RETURN AIR FILTER. This task covers inspection, removal, service, repair/replace and installation.

---

INITIAL SETUP

Tool:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Materials:

Detergent, dishwashing (Item 18, Appendix E)

Rags (Item 7, Appendix E)

Oil, air filter (Item 23, Appendix E)

Equipment Condition.

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

Disconnect air conditioner input power at source

---

INSPECTION

- a. Check that filter (1) is not bent, cracked or punctured (see fig NO TAG).
- b. Check that captive fasteners (2) are not damaged or missing

REMOVAL

- a. Loosen two captive fasteners (2).
- b. Remove filter (1)

SERVICE

- a. Clean filter (1) with mild detergent and water.
- b. Spray filter with air filter oil.

REPAIR/REPLACE

**NOTE**

Repair consists of replacing captive fasteners (2) or replacing filter (1)

#### 4.26 RETURN AIR FILTER - Continued

##### REPAIR/REPLACE - Continued

###### Captive Fasteners

- (1) Remove split ring retainer (3), fastener (6), thermoplastic wear washer (4), and ejector spring (5)
- (2) Install ejector spring (5), thermoplastic wear washer (4), fastener (6), and split ring retainer (3)

##### INSTALLATION

- a. Position filter (1) in place.
- b. Tighten two captive fasteners (2)

##### FOLLOW ON PROCEDURE

Connect air conditioner input power at source.

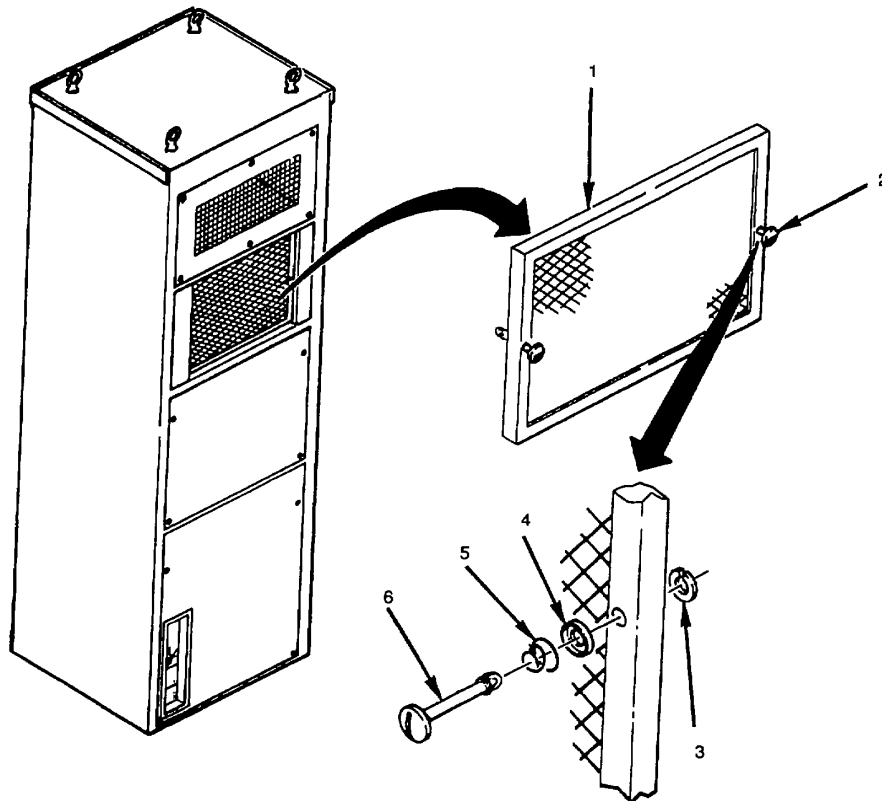


Figure 4-17. Return Air Filter

---

4.27 CONTROL BOX ASSEMBLY AND COMPONENTS. This task covers removal, inspection, testing, repair/replace and installation.

---

INITIAL SETUP

Tool.

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source,
  - (2) Remove condenser fan section panel (paragraph 4.23), and
  - (3) Remove compressor section panel (paragraph 4.24).
- 

**REMOVAL**

- a. Remove screw (10), lockwasher (11), and flat washer (12) securing wire harness clamp (13) to cover (7) of control box assembly (15) (see fig. 4-18).
- b. Remove two bolts (2) and flat washers (1) securing control box assembly (15) to bracket (14).

**CAUTION**

Remove control box assembly with care in order not to damage wires leading into the back of the box

- c. Remove control box assembly (15).
- d. Remove four screws (8), lockwashers (4), and flat washers (9)
- e. Remove cover (7)
- f. Remove three screws (5), lockwashers (4), and flat washers (6)
- g. Pull wire entry panel (3) far enough to access components inside control box (15).

4.27 CONTROL BOX ASSEMBLY AND COMPONENTS. - Continued

INSPECTION, TESTING, REPAIR AND REPLACE

**NOTE**

Inspection, testing, repair, and replacement of the control box components and control box are covered in the following referenced paragraphs Control Box Assembly

- (1) Mode select switch (S1) and knob (paragraph 4.28).
- (2) Prime unit select switch (S11) (paragraph 4.29).

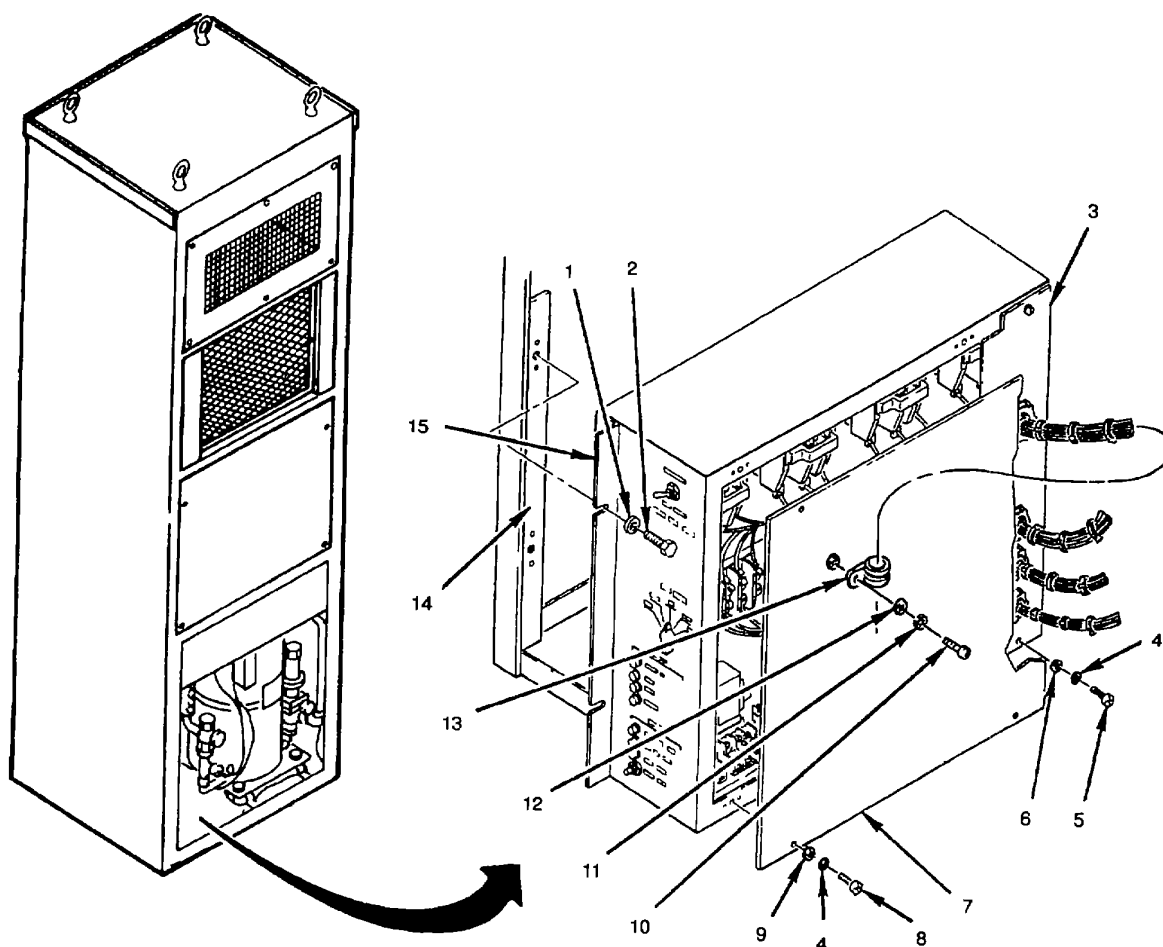


Figure 4-18. Control Box Assembly

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4.27 CONTROL BOX ASSEMBLY AND COMPONENTS. - Continued

---

**INSPECTION, TESTING, REPAIR AND REPLACE** Continued

- (3) Fault reset switch (S12) (paragraph 4.30).
- (4) Resistor board (paragraph 4.31).
- (5) Resistors (R1-R7) (paragraph 4.32)
- (6) Indicator lights (DS1-DS7) (paragraph 4.33).
- (7) Contactors (K1-K5) (paragraph 4.34).
- (8) Phase relay (K6) (paragraph 4.35).
- (9) Fault relays (K7-K10) (paragraph 4.36)
- (10) Latching relay (K 11) (paragraph 4.37)
- (11) Relay mounting plate (paragraph 4.38)
- (12) Circuit breakers (CB 1 and CB2) (paragraph 4.39).
- (13) Slave relays (K12-K15) (paragraph 4.40).
- (14) Time delay relays (TR1 and TR2) (paragraph 4.41)
- (15) Relay sockets (K6-K11, TR1 and TR2) (paragraph 4.42)
- (16) Terminal boards (TB 1 and TB2) (paragraph 4.43).
- (17) Electrical box (paragraph 4.44)
- (18) Wire harness (paragraph 4.45).

**INSTALLATION**

**CAUTION**

Install control box assembly with care to avoid damage to wires connected to the back of the assembly. After installation check to be sure wires are not caught behind control box assembly.

- a. Install wire entry panel (3) with three screws (5), lockwashers (4), and flat washers (6).
- b. Install front cover (7) with four screws (8), lockwashers (4). and flat washers (9)

---

4.27 CONTROL BOX ASSEMBLY AND COMPONENTS - Continued

---

**INSTALLATION** - Continued

- c. Position control box assembly (15) in frame with rear guide pin inserted into hole in rear bracket.
- d. Install control box assembly (15) to front bracket (14) with two bolts (2) and flat washers (1).
- e. Secure wire harness clamp (13), with flat washer (12), lockwasher (11), and screw (10).

**FOLLOW ON PROCEDURES**

- a. Install compressor section panel (paragraph 4.24)
- b. Install condenser fan section panel (paragraph 4.23).
- c. Connect air conditioner input power at source.

---

4.28. MODE SELECT SWITCH (S1) AND KNOB This task covers inspection, testing, repair/replace, removal and installation

---

INITIAL SETUP

Tools.

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Screw driver, flat tip, 1/8" WD (Item 6, Appendix B)  
Solder gun (Item 7, Appendix B)  
Heat gun (Item 8, Appendix B)  
Goggles, industrial (Appendix C)

Personnel. 1

Materials.

Solder, lead-tin alloy (Item 16, Appendix E)  
Flux, solder, liquid rosin base (Item 17, Appendix E)

Equipment Conditions

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power

- (1) Disconnect air conditioner input power at source, and
- (2) Remove control box assembly (paragraph 4.27)

---

INSPECTION

- a Check that wire leads are properly connected to switch S1 and are not damaged (see fig FO-2 ).
- b. Check switch (4) for smoothness of operation Replace switch if defective (see fig. 4-19).
- c. Check switch (4) for signs of overheating or other visible damage If wires are damaged, replace as necessary
- d Check that knob (1) is not cracked or damaged

TESTING

**NOTE**

In this test, switch contacts are Identified by the wire number attached to the contact  
Each wire is labeled with a wire number. Refer to fig FO-2 as an aid during testing

Set switch to each position m turn. Using multimeter, check continuity as listed m table 4-3 If conditions are abnormal at any switch setting, replace switch.



4.28 MODE SELECT SWITCH (S1) AND KNOB - Continued

**Table 4-3. Mode Select Switch Test**

Set SW To	Check Continuity		
	From	- To	Read
OFF	Wire	111-112	Open
	Wire	111-113	Open
	Wire	111-140	Open
	Wire	111-141	Open
	Wire	115-120	Open
	Wire	116-121	Open
	Wire	117-122	Open
	Wire	118-124	Open
	Wire	119-125	Open
	Wire	119-123	Open
	Wire	119-1014	Open
COOL	Wire	111-112	Closed
	Wire	111-113	Closed
	Wire	111-140	Closed
	Wire	111-141	Closed
	Wire	115-120	Closed
	Wire	116-121	Open
	Wire	117-122	Open
	Wire	118-124	Closed
	Wire	119-125	Closed
	Wire	119-123	Closed
	Wire	119-1014	Closed
AUTO	Wire	111-112	Closed
	Wire	111-113	Closed
	Wire	111-140	Closed
	Wire	111-141	Closed
	Wire	115-120	Closed
	Wire	116-121	Closed
	Wire	117-122	Closed
	Wire	118-124	Closed
	Wire	119-125	Closed
	Wire	119-123	Closed
	Wire	119-1014	Closed

4.28 MODE. SELECT SWITCH (S1) AND KNOB. - Continued

**Table 4-3. Mode Select Switch Test - Continued**

Set SW To	Check Continuity		
	From	- To	Read
VENT	Wire	111-112	Open
	Wire	111-113	Open
	Wire	111-140	Open
	Wire	111-141	Closed
	Wire	115-120	Open
	Wire	116-121	Open
	Wire	117-122	Open
	Wire	118-124	Open
	Wire	119-125	Closed
	Wire	119-123	Closed
	Wire	119-1014	Closed
HEAT	Wire	111-112	Open
	Wire	111-113	Open
	Wire	111-140	Open
	Wire	111-141	Closed
	Wire	115-120	Open
	Wire	116-121	Closed
	Wire	117-122	Closed
	Wire	118-124	Open
	Wire	119-125	Closed
	Wire	119-123	Closed
	Wire	119-1014	Closed

**REPAIR/REPLACE**

Repair consists of replacing knob (1) or switch (4).

**REMOVAL**

- a Unsolder and tag leads
- b Loosen set screw (5) and remove knob (1).
- c Remove nut (2)
- d Remove switch (4) from panel and retain star washer (3)

**INSTALLATION**

- a Install star washer (3) on switch shaft, then position switch (4) through panel and secure with nut (2)
- b Solder leads as tagged in removal and remove tags.

4.28 MODE SELECT SWITCH (S1) AND KNOB. - Continued

**INSTALLATION** - Continued

- c. Install knob (1) and tighten set screw (5).

**FOLLOW ON PROCEDURES**

- a. Install control box assembly (paragraph 4.27)  
b. Connect air conditioner input power at source.

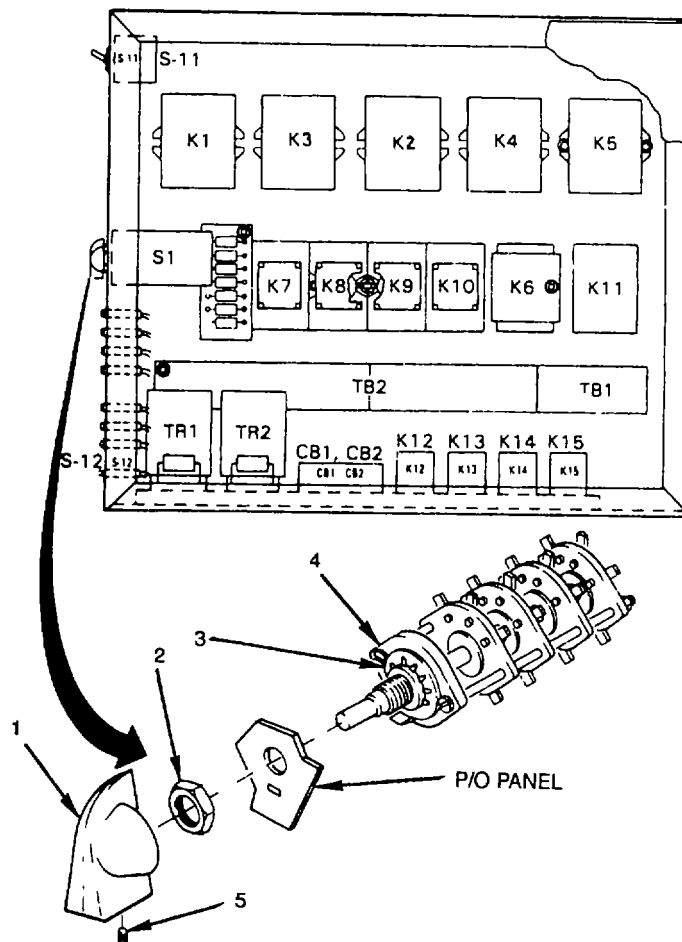


Figure 4-19. Mode Select Switch (S1)

---

4.29 PRIME UNIT SELECT SWITCH (S11). This task covers inspection, testing, removal and installation

---

INITIAL SETUP

Tool:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Equipment Conditions

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
- (2) Remove control box assembly (paragraph 4.27)

---

INSPECTION

- a. Check that wire leads are properly connected (see fig. FO-2.)
- b. Check that leads are not loose or broken. Tighten loose leads Replace if defective
- c. Check switch (3) for signs of overheating or other visible damage. If wires are damaged, replace as necessary (see fig 4-20).

TESTING

- a. Using multimeter, check continuity between center and outer terminals with wire connected. Set switch to PRIMARY, then BACKUP.

PRIMARY - Continuity should be indicated  
BACKUP - Continuity should not be indicated.

- b. If switch fails test, replace switch

REMOVAL

- a. Tag and disconnect leads.
- b. Remove nut (1), washer (2), and switch (3) from panel.

#### 4.29 PRIME UNIT SELECT SWITCH (S11) - Continued

##### INSTALLATION

- a. Reconnect leads and remove tags.
- b. Position switch (3) through panel and secure with nut (1) and washer (2).

##### FOLLOW ON PROCEDURES

- a. Install control box assembly (paragraph 4.27).
- b. Connect air conditioner input power at source.

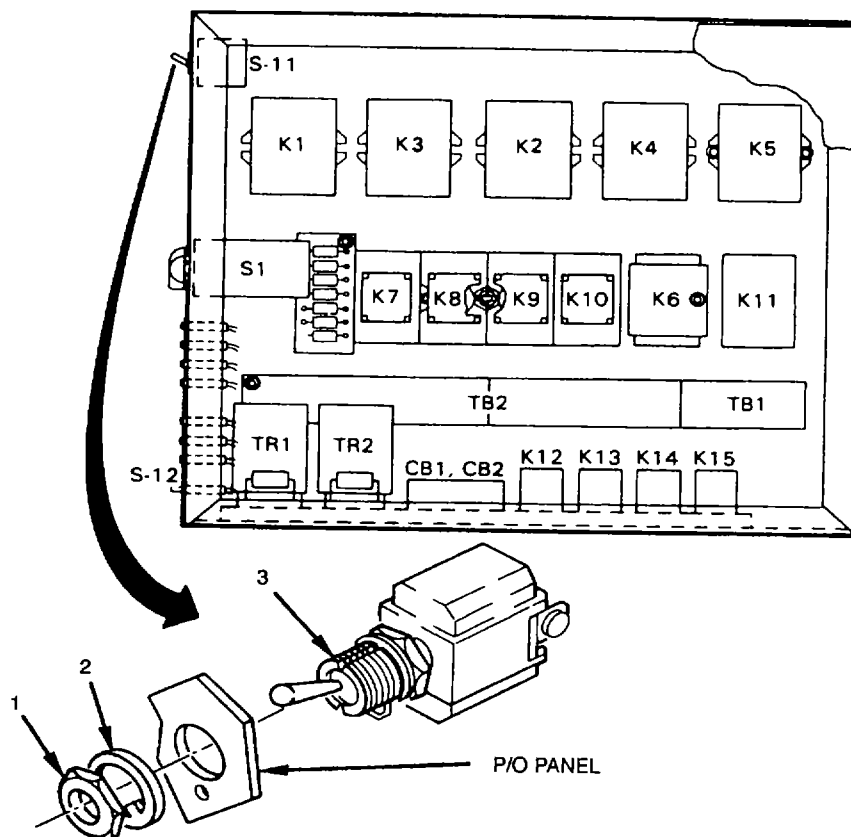


Figure 4-20. Prime Unit Select Switch (S11)

---

4.30 FAULT RESET SWITCH (S12). This task covers inspection, testing, removal and installation

---

INITIAL SETUP

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Solder gun (Item 7, Appendix B)  
Heat gun (Item 8, Appendix B)  
Goggles, industrial (Appendix C)

Personnel. 1

Materials

Solder, lead-tin alloy (Item 16, Appendix E)  
Flux, solder, liquid rosin base (Item 17, Appendix E)

Equipment Conditions.

**WARNING**

Disconnect input power to the air conditioner before performing any maternal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
- (2) Remove control box assembly (paragraph 4 27).

---

INSPECTION

- a Check that wire leads are properly connected (see fig FO-2 ).
- b. Check that leads are not loose or broken. Tighten loose leads Replace if defective (see fig 4-21).
- c. Check switch for signs of overheating or other visible damage. If wires are damaged, replace as necessary.

TESTING

- a. Using multimeter, check continuity between two switch terminals, then push switch to ON, then OFF ON - Continuity should be indicated. OFF - Continuity should not be indicated.
- b If switch fails test, replace switch

#### 4.30 FAULT RESET SWITCH (S12) - Continued

##### REMOVAL

- a Tag and unsolder leads.
- b. Remove nut (1) and switch (2).

##### INSTALLATION

- a Reconnect leads and remove tags.
- b Install switch (2) with nut (1)

##### FOLLOW ON PROCEDURES

- a. Install control box assembly (paragraph 4.27).
- b Connect air conditioner input power at source.

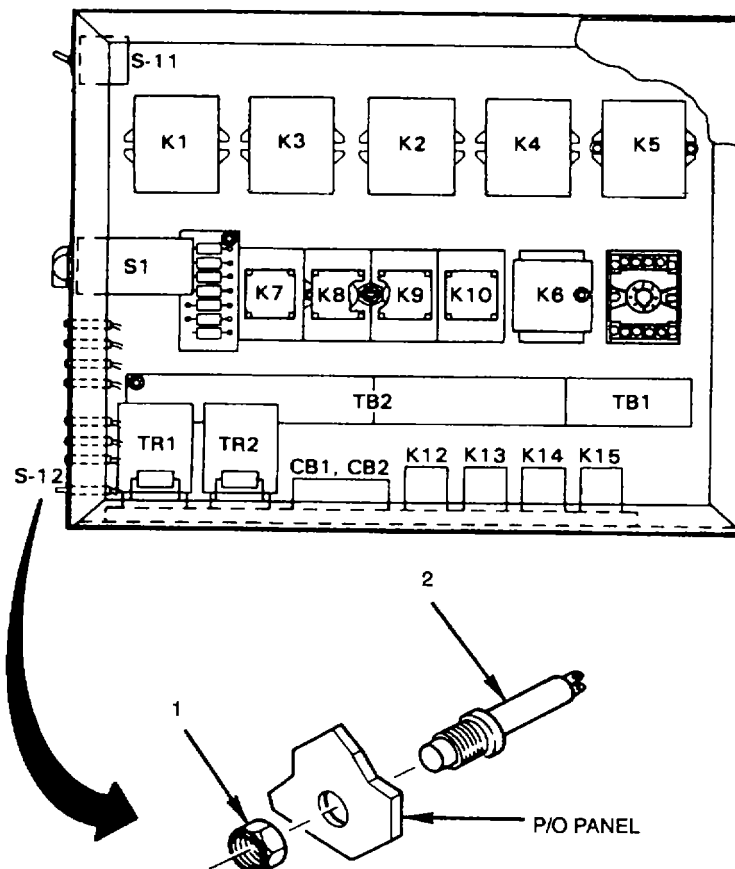


Figure 4-21. Fault Reset Switch (S12)

---

4.31 RESISTOR BOARD This task covers inspection, repair/replace, removal and installation

---

INITIAL SETUP

Tools

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Solder gun (Item 7, Appendix B)  
Goggles, industrial (Appendix C)

Personnel. 1

Materials

Solder, lead-tin alloy (Item 16, Appendix E)  
Flux, solder, liquid rosin base (Item 17, Appendix E)

Equipment Conditions.

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
- (2) Remove control box assembly (paragraph 4.27).

---

INSPECTION

- a. Check board for signs of overheating or other visible damage. Replace if damaged (see fig. 4-22)
- b. Check resistors for signs of overheating and other visible damage. (Refer to paragraph 4.32 If resistor is defective.)

REPAIR/REPLACE

**NOTE**

Repair consists of replacing resistor board.

If resistor R1-R7 is damaged refer to paragraph 4.32 for replacement.

REMOVAL

- a. Tag and unsolder wrong harness leads from resistor board (3).
- b. Remove four screws (5), four flat washers (2), and four locknuts (1)
- c. Remove resistor board (3) and standoff spacers or fiber board (4)



#### 4.31 RESISTOR BOARD - Continued

##### INSTALLATION

- Position fiber board (4) and resistor board (3) in mounting position
- Secure with four screws (5), flat washers (2), and four locknuts (1)
- Reconnect leads and remove tags

##### FOLLOW ON PROCEDURES

- Install control box assembly (paragraph 4.27).
- Connect air conditioner input power at source.

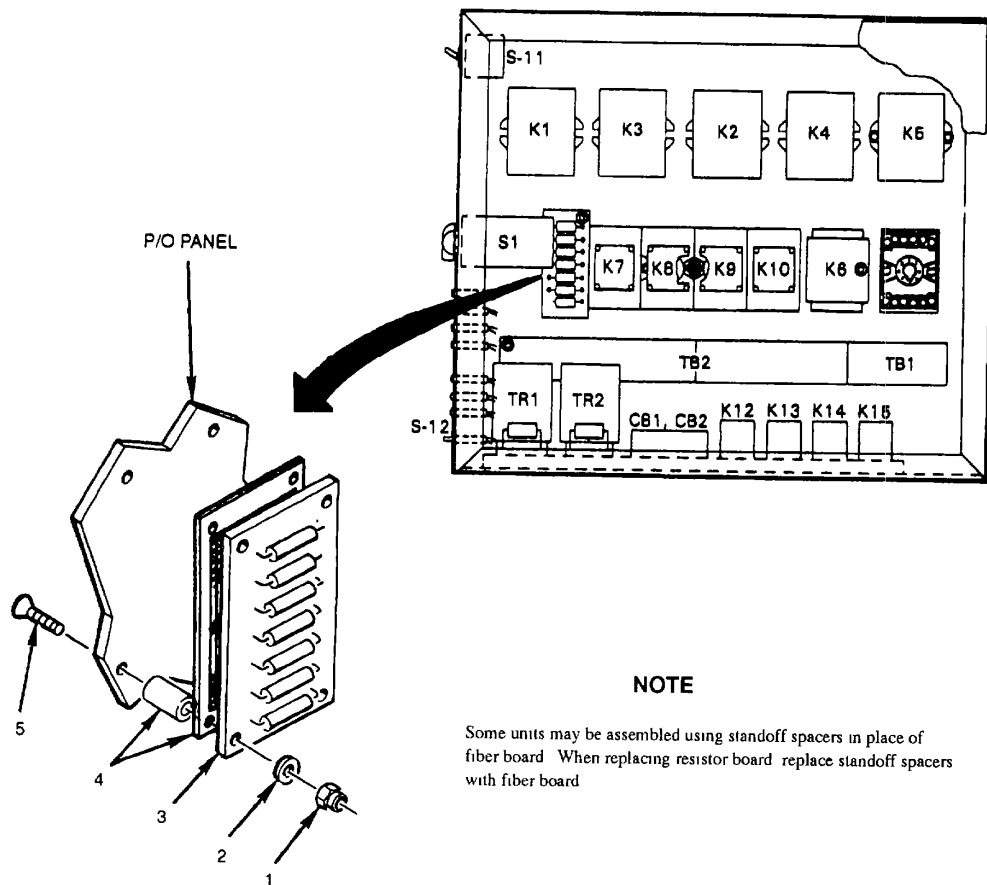


Figure 4-22. Resistor Board

---

4.32 RESISTORS (R1-R7) This task covers inspection, testing, removal and installation

---

INITIAL SETUP

Tools

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Solder gun (Item 7, Appendix B)  
Goggles, industrial (Appendix C)

Personnel 1

Materials

Solder, lead-tin alloy (Item 16, Appendix E)  
Flux, solder, liquid rosin base (Item 17, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power

- (1) Disconnect air conditioner input power at source,
- (2) Remove control box assembly (paragraph 4.27), and
- (3) Remove resistor board if necessary for access (paragraph 4.31).

---

INSPECTION

Check resistors for signs of overheating or other visible damage Replace if damaged (see fig 4-23).

TESTING

Using multimeter, measure each resistor for proper resistance Resistance should measure 2850-3150 ohms. Replace if damaged.

REMOVAL

Unsolder damaged resistors (2) and remove from resistor board (1).

INSTALLATION

Solder resistors (2) to resistor board (1).

#### 4.32 RESISTORS (R1-R7). - Continued

##### FOLLOW ON PROCEDURES

- a. Install resistor board if removed for access (paragraph 4.31)
- b. Install control box assembly (paragraph 4.27)
- c. Connect air conditioner input power at source

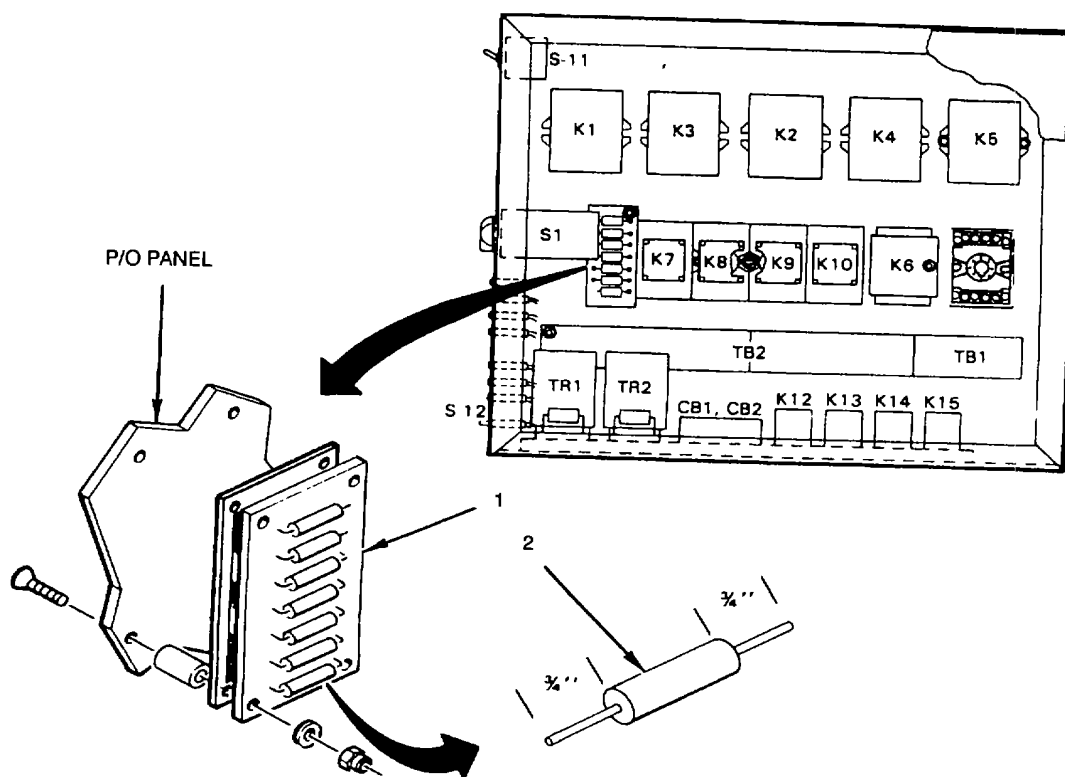


Figure 4-23. Resistors (R1-R7)

---

4.33 INDICATOR LIGHTS (DS 1-DS7). This task covers inspection, testing, removal and installation

---

INITIAL SETUP

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Solder gun (Item 7, Appendix B)  
Heat gun (Item 8, Appendix B)  
Goggles, industrial (Appendix C)

Personnel: 1

Materials

Solder, lead-tin alloy (Item 16, Appendix E)  
Flux, solder, liquid rosin base (Item 17, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source, and
- (2) Remove control box assembly (paragraph 4.27)

---

INSPECTION

- a. Check that light lenses are not cracked or broken. Replace light if damaged (see fig. 4-24)
- b. Check that leads are properly connected (see fig. FO-2.) Repair all broken leads. If wiring harness is damaged, repair as necessary (paragraph 4.45)

TESTING

- a. Using multimeter, test each light assembly resistor for proper resistance. Resistance should measure 2850-3150 ohms
- b. Replace resistor if defective (paragraph 4.32).
- c. Replace lamp If resistor measurement is correct.

REMOVAL

- a. Tag and disconnect leads
- b. Remove clip (2).
- c. Remove indicator light (1) through front of panel.

#### 4.33 INDICATOR LIGHTS (DS1-DS7). - Continued

##### INSTALLATION

- Install indicator light (1) through front of panel.
- Install clip (2).
- Reconnect leads and remove tags.

##### FOLLOW ON PROCEDURES

- Install control box assembly (paragraph 4.27).
- Connect air conditioner input power at source.

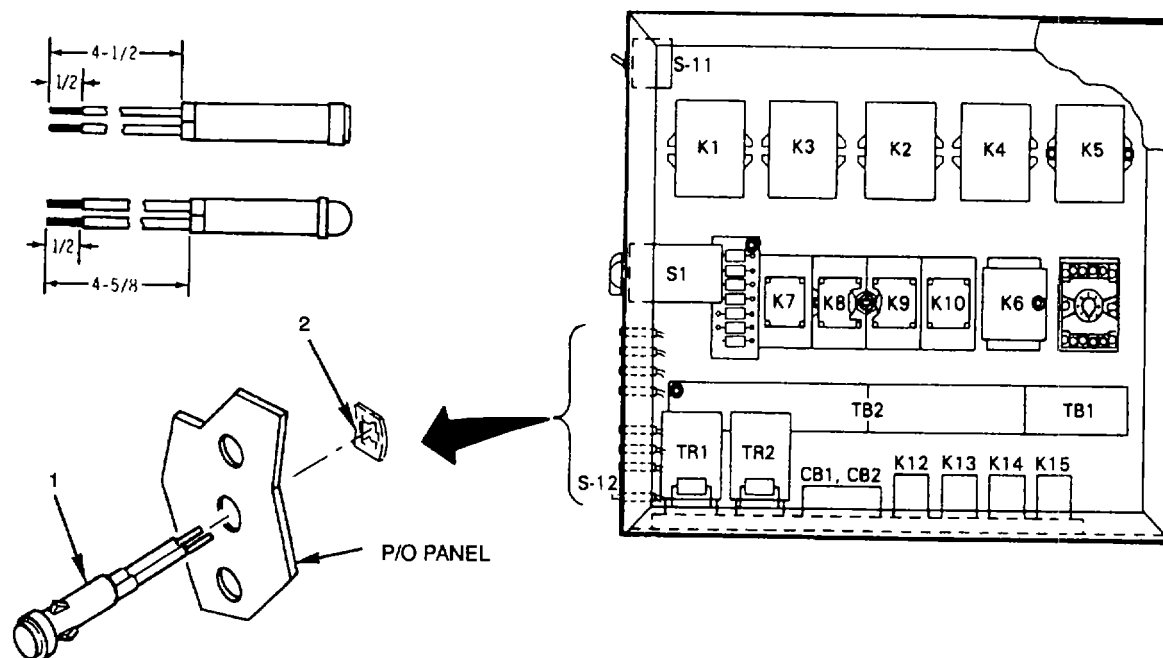


Figure 4-24. Indicator Lights (DS1-DS7)

---

4.34 CONTACTORS (K1-K5). This task covers inspection, testing, removal and installation.

---

INITIAL SETUP

Tool:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Equipment Conditions

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
- (2) Remove control box assembly (paragraph 4.27)

---

INSPECTION

Checks for cracks, corrosion, loose electrical connections, and loose mounting hardware. Replace contactor if damaged (see fig 4.25).

TESTING

**WARNING**

Using multimeter, check continuity of each relay coil and verify relay contactors open and close by pressing on contacts. Replace if defective (see fig 4-25).

REMOVAL

- a Tag and disconnect leads
- b Remove two screws (3) and locknuts (1)
- c Remove contactor (2).

INSTALLATION

- a Place contactor (2) in mounting position and align holes.
- b Install two screws (3) and locknuts (1).
- c Reconnect leads and remove tags.

4.34 CONTACTORS (K1-K5) - Continued

FOLLOW ON PROCEDURES

- a Install control box assembly (paragraph 4.27)
- b Connect air conditioner input power at source

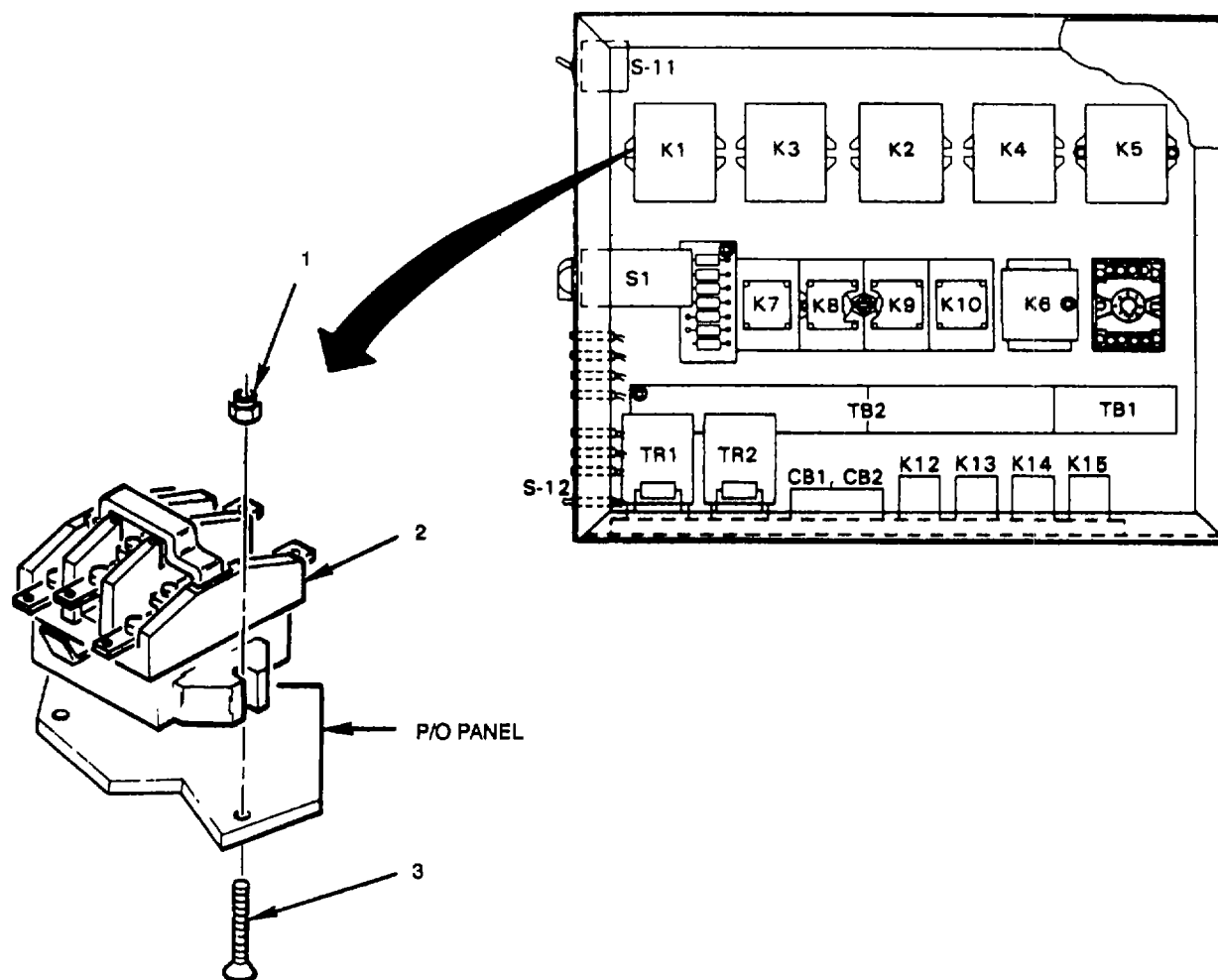


Figure 4-25. Contactors (K1-K5)

---

4.35 PHASE RELAY (K6). This task covers inspection, testing, removal, installation and adjustment.

---

**INITIAL SETUP**

Tool:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel. 1

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source, and
- (2) Remove control box assembly (paragraph 4.27).

---

**INSPECTION**

Inspect for cracks, corrosion, loose electrical connections, and loose mounting hardware. Replace relay if damaged (see fig. 4-26).

**TESTING**

**WARNING**

The following test must be conducted with power on. Use extreme caution and follow steps carefully. Death or serious injury may result.

- a. Turn on external electrical power.
- b. Set MODE SELECT switch to AUTO.
- c. Turn relay failure level adjustment (3) fully clockwise. Check that indicator unit (2) comes on.
- d. Turn relay failure level adjustment (3) slowly counterclockwise until indicator light goes out Adjust set point voltage by measuring across relay socket (1), terminals 3 to 4, 3 to 5, and 4 to 5 (see fig FO-2.) Set point voltage should be  $185 \pm 5$  Vac across each phase
- e. If relay fails above testing and adjustment, replace relay
- f. Set MODE SELECT switch OFF.
- g. Turn external electrical power off.



#### 4.35 PHASE RELAY (K6). - Continued

##### REMOVAL

Pull relay (4) from socket (1).

##### INSTALLATION

Plug relay (4) into socket (1).

##### ADJUSTMENT

- a Turn relay failure level adjustment (3) slowly counterclockwise until indicator light (2) goes out.
- b Adjust set point voltage to  $185 \pm 5$  Vac (see TESTING, Step d)

##### FOLLOW ON PROCEDURES

- a. Install control box assembly (paragraph 4 27).
- b Connect air conditioner input power at source.

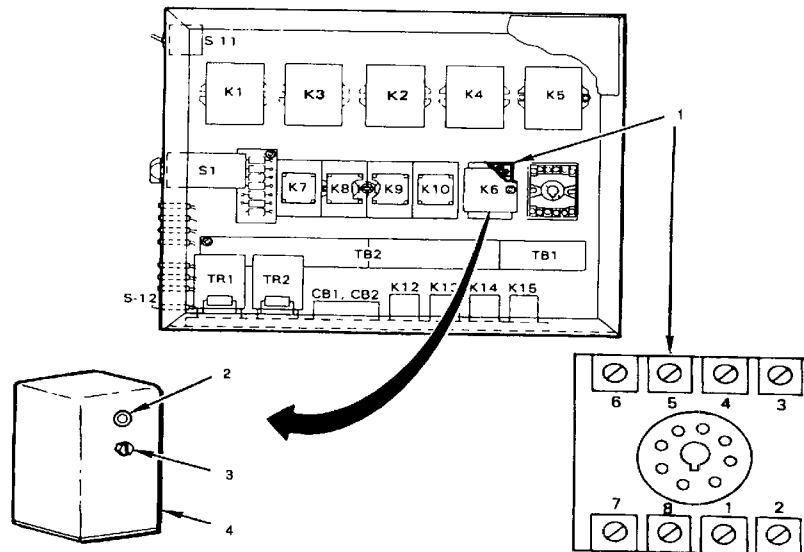


Figure 4-26. Phase Relay (K6)

4.36 FAUIT RELAYS (K7-K10). This task covers removal, inspection, testing and installation.

#### INITIAL SETUP

Tool

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Material:

Varnish, moisture and fungus resistant (Item 11, Appendix E)

Equipment Conditions'

#### WARNING

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

(1) Disconnect air conditioner input power at source; and

(2) Remove control box assembly (paragraph 4.27).

#### REMOVAL

Pull relay (1) from socket (2) (see fig 4-27)

#### INSPECTION

a Check for loose, corroded, missing or broken pins.

b Check relay for cracks, signs of overheating and other visible damage Replace if damaged

#### TESTING

Use multimeter to check continuity between the following pins. If relay condition is incorrect, replace relay.

<u>Pins</u>	<u>Closed</u>	<u>Open</u>
1-3	X	
2-7	(Coil) 2000 $\pm$ 200 ohms	
3-6.		X

#### INSTALLATION

a. Fungus proof relay per MIL-V-173

b. Plug relay (1) into socket (2).

#### 4.36 FAULT RELAY (K7-K10)-Continued

##### FOLLOW ON PROCEDURES

- a. Install control box assembly (paragraph 4.27)
- b. Connect air conditioner input power at source

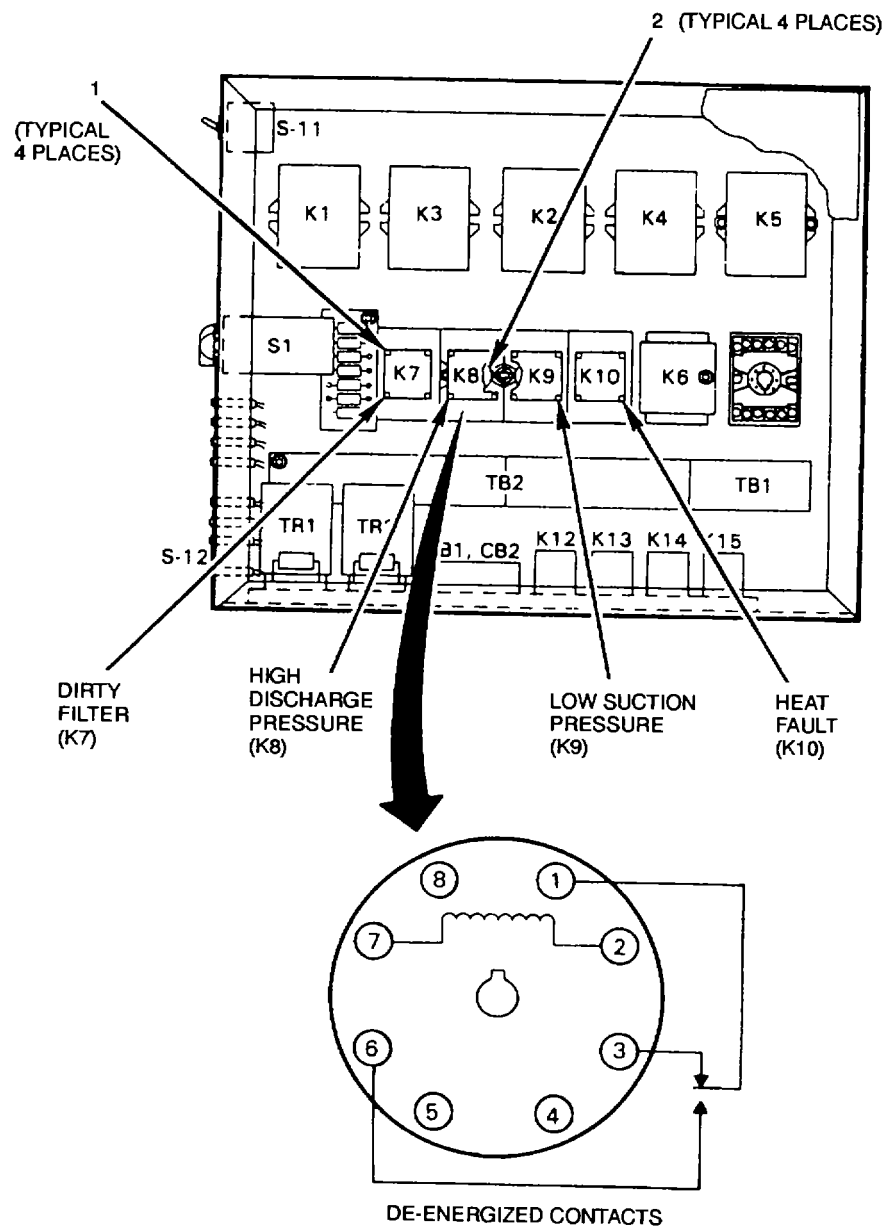


Figure 4-27. Fault Relays (K7-K10)

---

4.37 LATCHING RELAY (K11) This task covers removal, inspection, testing and installation.

---

**INITIAL SETUP**

Tool:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Material:

Varnish, moisture and fungus resistant (Item 11, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source, and
- (2) Remove control box assembly (paragraph 4 27).

---

**REMOVAL**

- a Pull relay (1) from socket (2) (see fig. 4-28).

**INSPECTION**

- a Check for loose, corroded, mulling or broken pins.
- b. Check relay for cracks, signs of overheating and other visible damage. Replace if damaged.

**TESTING**

Use multimeter to check continuity between pins. If relay condition is incorrect, replace relay

<u>Pins</u>	<u>Closed</u>	<u>Open</u>
1-11	1000 ± 100 ohms	
2-10	1000 ± 100 ohms	
3-4		X
3-5	X	
7-9	X	
8-9		X

#### 4.37 LATCHING RELAY (K11)-Continued

##### INSTALLATION

- a Fungus proof replacement relay per MIL-V-173
- b Plug relay (1) into socket (2).

##### FOLLOW ON PROCEDURES

- a Install control box assembly (paragraph 4.27).
- b. Connect air conditioner input power at source.

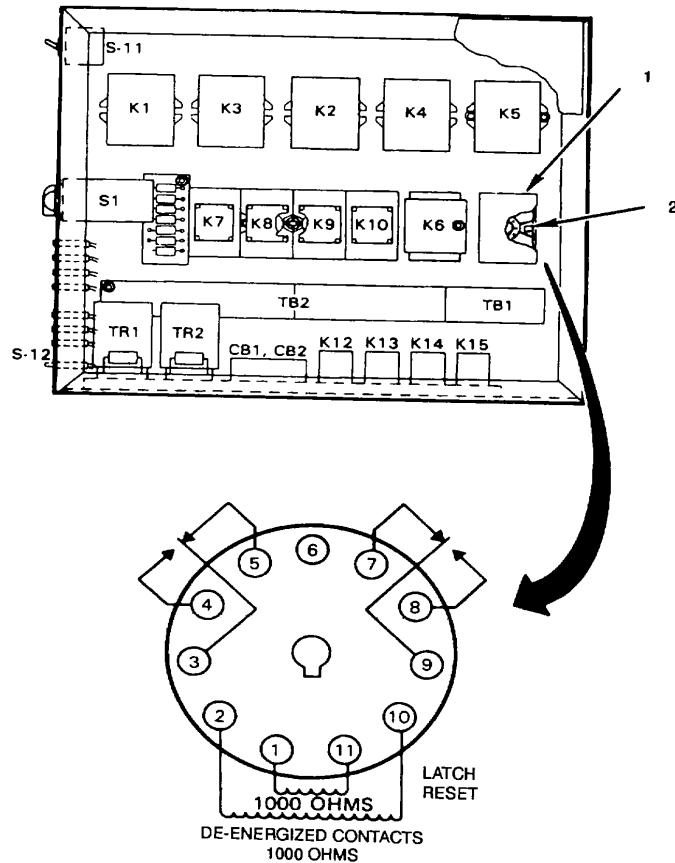


Figure 4-28. Latching Relay (K11)

---

4.38 RELAY MOUNTING PLATE This task covers inspection, disassemble, repair and reassemble

---

#### INITIAL SETUP

##### Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Drill, electric, portable (Item 2, Appendix B)  
Drill set, twist (Item 3, Appendix B)  
Riveter blind hand (Item 4, Appendix B)  
Goggles, industrial (Appendix C).

Personnel: 1

Equipment Conditions.

#### WARNING

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source,
- (2) Remove control box assembly (paragraph 4.27),
- (3) Remove circuit breakers (CB 1 and CB2) (paragraph 4.39);
- (4) Remove time delay relays CTR1 and TR2) (paragraph 4.41), and
- (5) Remove relay sockets (K6-K11, TR1 and TR2) (paragraph 4.42)

---

#### INSPECTION

Inspect plate (5) for missing rivets (2) or damaged floating locknuts (1). Replace if missing or damaged (see fig. 4-29).

#### DISASSEMBLE

- a Remove six screws (3).
- b Remove relay mounting plate (5) from control box assembly (4)
- c Remove slave relays (K12-K15) (paragraph 4.40).

4.38 RELAYMOUNTING PLATE. - Continued

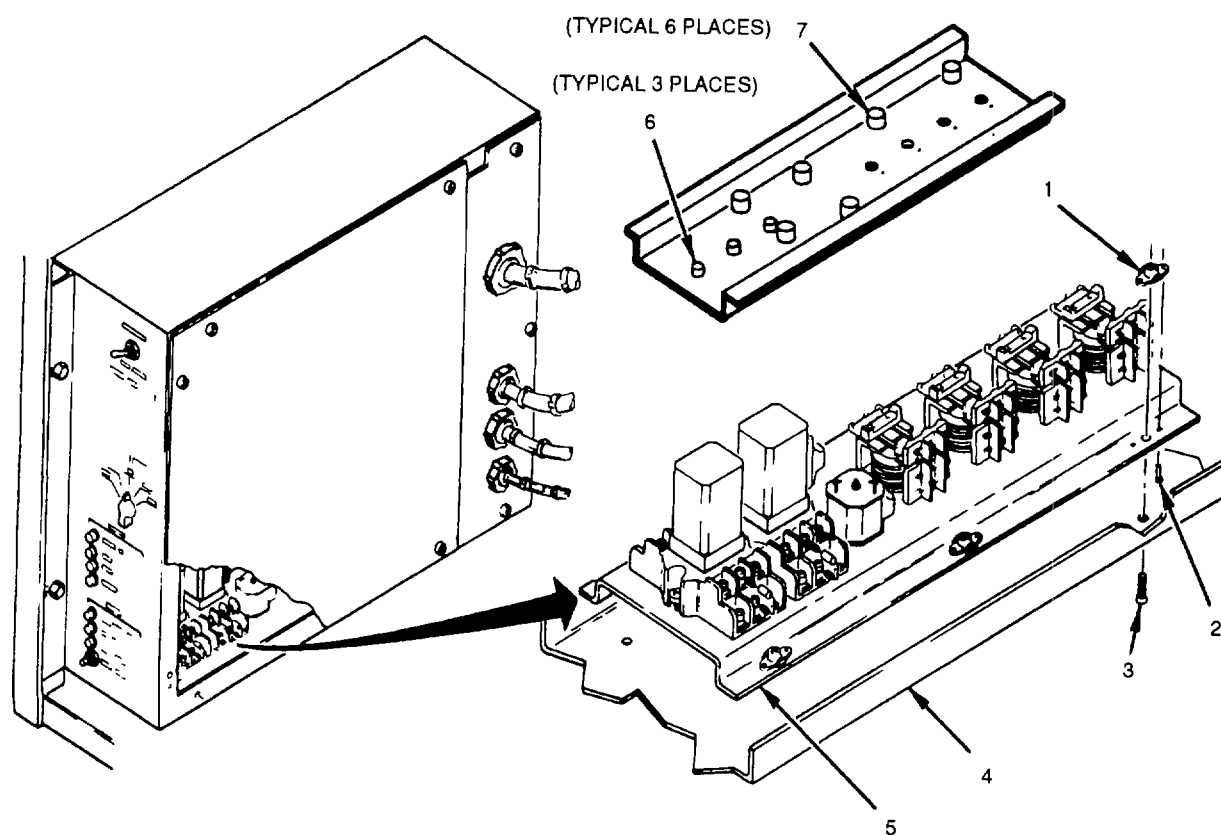


Figure 4-29. Relay Mounting Plate

---

4.38 RELAY MOUNTING PLATE. - Continued

---

**REPAIR**

**NOTE**

Repair consists of replacing rivets (2), floating locknuts (1), rivnuts (6,7) or mounting plate (5).

a Floating Locknuts.

- (1) Remove two rivets (2) securing floating locknut (1) to mounting plate (5).
- (2) Remove floating locknut (1)
- (3) Position new floating locknut (1) on plate (5) and secure with two rivets (2).

b. Rivnuts

- (1) Remove 6-32 (6) or 10-32 (7) rivnuts
- (2) Install new 6-32 (6) or 10-32 (7) rivnuts.

c. Relay Mounting Plate If the relay mounting plate is damaged or bent, replace plate (5)

**REASSEMBLE**

- a. Install slave relays K12-K15 (paragraph 4.40)
- b. Position plate (5) in control box assembly (4) and secure with six screws (3)

**FOLLOW ON PROCEDURES**

- a Install relay sockets (K6-K11, TR1 and TR2) (paragraph 4.42)
- b Install time delay relays (TR1 and TR2) (paragraph 4.41)
- c Install circuit breakers (CB 1 and CB2) (paragraph 4.39)
- d Install control box assembly (paragraph 4.27)
- e. Connect air conditioner input power at source.



---

4.39 CIRCUIT BREAKERS (CB 1 AND CB2). This task covers inspection, testing, removal and installation

---

**INITIAL SETUP**

Tool :

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel 1

Equipment Conditions:

**NOTE**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source, and
- (2) Remove control box assembly (paragraph 4 27).

---

**INSPECTION**

- a Check that mounting hardware and circuit breakers are in place and secure (see fig. 4-30)
- b Check that wire leads are properly connected to circuit breakers and are not damaged (see fig FO-2.).
- c Check circuit breakers for signs of overheating or other visible damage.

**TESTING**

- a. Disconnect one terminal and use multimeter to check continuity between circuit breaker terminals. Contacts should be closed
- b. If there is no continuity, replace circuit breaker

**REMOVAL**

- a. Tag and disconnect leads
- b. Remove two screws (5), lockwashers (1), and flat washers (2).
- c. Remove circuit breaker (4) from mounting plate (3).

4.39 CIRCUIT BREAKERS (CB 1 AND CB2). -Continued

INSTALLATION

- a. Position circuit breaker (4) on mounting plate (3).
- b. Install two screws (5), lockwashers (1), and flat washers (2)
- c. Reconnect leads and remove tags.

FOLLOW ON PROCEDURES

- a. Install control box assembly (paragraph 4.27).
- b. Connect air conditioner input power at source.

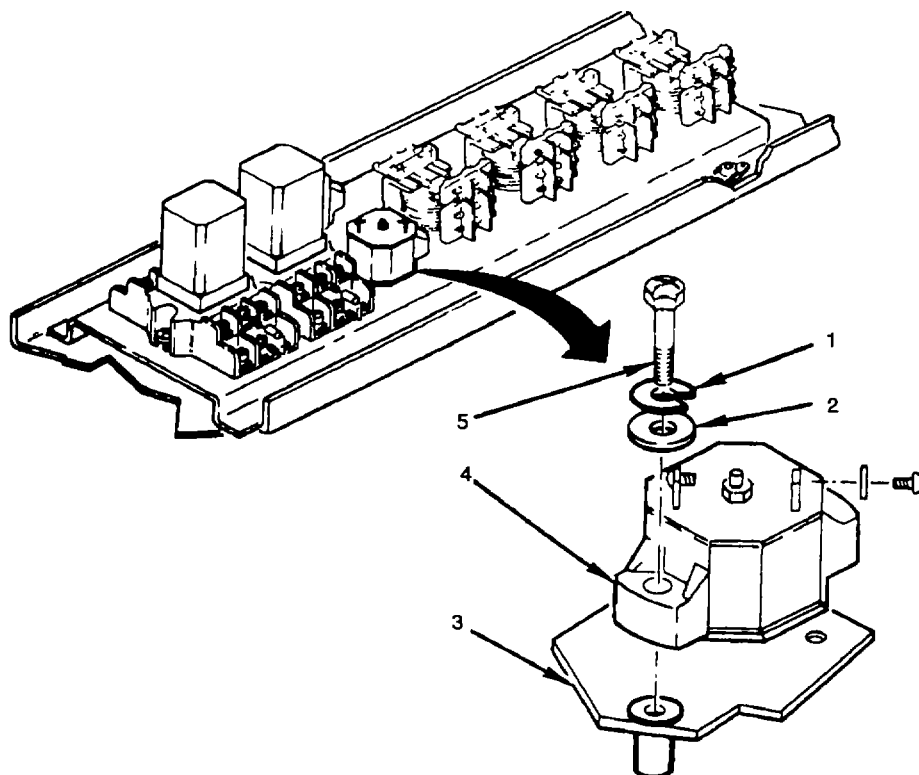


Figure 4-30. Circuit Breakers (CB1 and CB2)

---

4.40 SLAVE RELAYS (K12-K15). This task covers inspection, testing, removal and installation.

---

#### INITIAL SETUP

##### Tools':

- Tool kit, service, refrigeration unit (Item 1, Appendix B)
- Solder gun (Item 7, Appendix B)
- Goggles, industrial (Appendix C)

Personnel: . 1

##### Materials:

- Varnish, moisture and fungus resistant (Item 11, Appendix E)
- Solder, lead-tin alloy (Item 16, Appendix E)
- Flux, solder, liquid rosin base (Item 17, Appendix E)

Equipment Conditions.

#### WARNING

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source,
- (2) Remove control box assembly (paragraph 4.27), and
- (3) Remove relay mounting plate (paragraph 4 38), but do not remove slave relays K12-K15

---

#### INSPECTION

Check for cracks, corrosion, loose electrical connections, and loose mounting hardware. Replace relay if damaged (see fig. 4-31).

#### TESTING

Using multimeter, check continuity of each relay coil and verify relay contactors open and close by pressing on contacts. Replace if defective (see fig FO-2 ).

#### REMOVAL

- a. Tag and unsolder leads.
- b. Remove nut (4) and flat washer (3)
- c. Remove relay (1) from mounting plate (2).

---

4.42 SLAVE RELAYS (K12-K15). -Continued

---

**INSTALLATION**

- a. Fungus proof relay per ML-V-173.
- b. Position relay (1) on mounting plate (2).
- c. Install nut (4) and flat washer (3)
- d. Reconnect leads and remove tags.

**FOLLOW ON PROCEDURES**

- a. Install relay mounting plate (paragraph 4.38).
- b. Install control box assembly (paragraph 4 27).
- c. Connect air conditioner input power at source

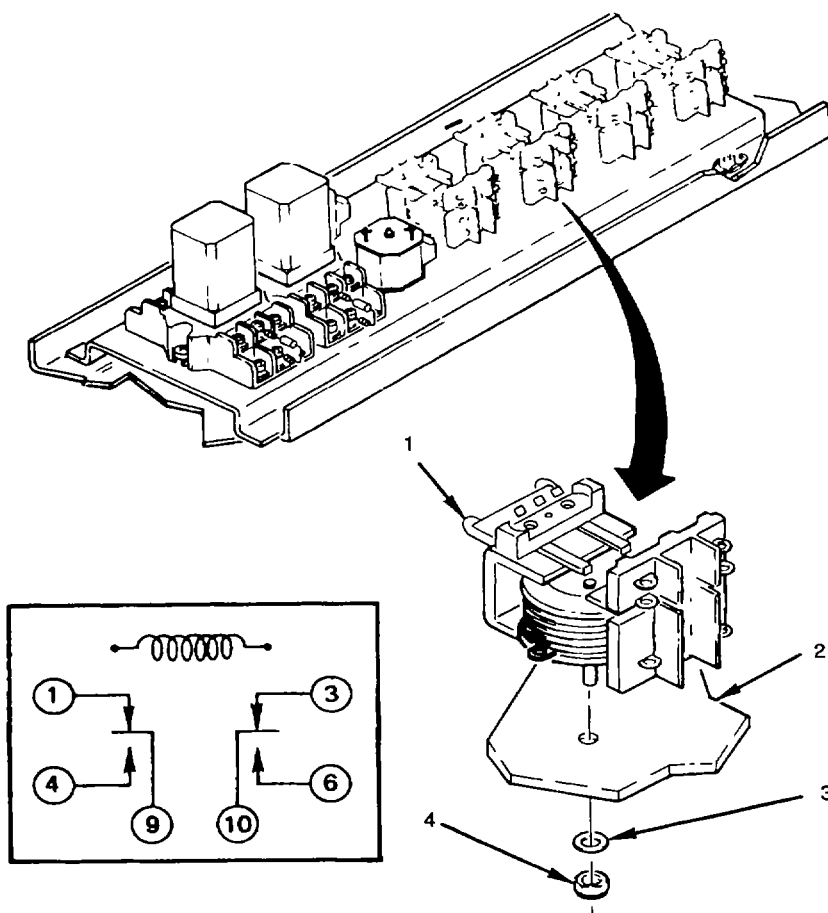


Figure 4-31. Slave Relays (K12-K15)

---

4.41 TIME DELAY RELAYS (TRI AND TR2). This task covers inspection, testing, removal and installation

---

#### INITIAL SETUP

##### Tools

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Solder gun (Item 7, Appendix B)  
Heat gun (Item 8, Appendix B)  
Goggles, industrial (Appendix C)

Personnel: 1

##### Materials:

Solder, lead-tin alloy (Item 16, Appendix E)  
Flux, solder, liquid rosin base (Item 17, Appendix E)

##### Equipment Conditions'

#### WARNING

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
- (2) Remove control box assembly (paragraph 4 27).

---

#### INSPECTION

- a. Check for loose wire connections (see fig 4-32)
- b. Check for cracks, signs of overheating, and other visible damage. Replace if damaged
- c. Check external resistor (3) for signs of overheating Replace if damaged.

#### TESTING

- a. Pull relays TRI and TR2 (1) from sockets (2).
- b. Using multimeter, measure resistance across external resistor (3). Resistance should be 285-315K for TR1 and 712-788K for TR2.
- c. Using multimeter, check relay continuity Replace relay if defective.

Terminal A to B'	Continuity (Positive lead to A)
Terminal 1 to 7:	Continuity
Terminal 3 to 9	Continuity
- d. Plug relays (1) back into sockets (2).

4-41. TIME DELAY RELAYS (TR1 AND TR2) - Continued

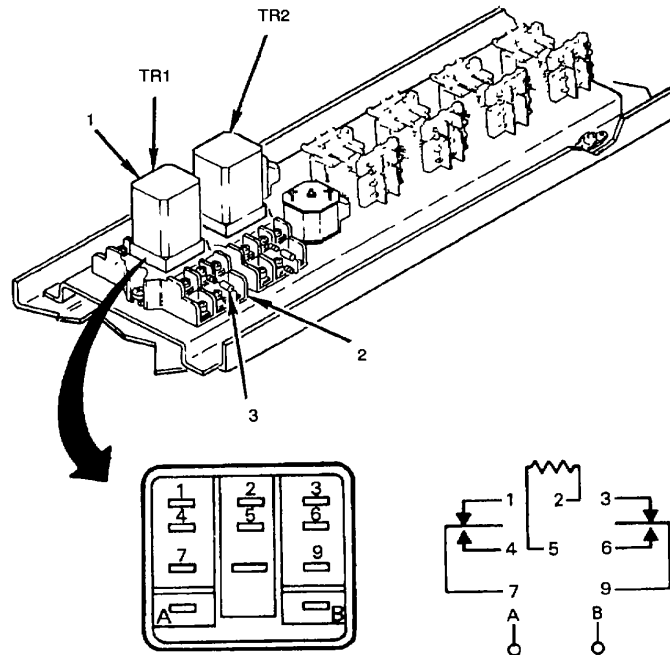


Figure 4-32. Time Delay Relays (TR1 and TR2)

**TESTING** Continued

**WARNING**

High voltage is used in operation of this equipment DEATH ON CONTACT may result if personnel fail to observe safety precautions

- e. Connect input electrical power to unit
- f. Set multimeter to measure 120 Vac. Connect probes across terminals A and 1.
- g. Set MODE SELECT switch to AUTO
- h. Check voltage drop across terminals A and 1 Voltage indicated should be 114 to 126 Vac. After about 10 seconds, voltage should drop to less than two volts. Replace relay if found defective.
- i. Set MODE SELECT switch to OFF
- j. Repeat Steps f through i for terminals A and 3.
- k. Disconnect input electrical power from unit.

---

4.41 TIME DELAY RELAYS (TR1 AND TR2). -Continued

---

REPAIR/REPLACE

**NOTE**

Repair consists of replacing defective external resistor (3) or time delay relay (1).

- a. Remove defective external resistor (3).
- b. Cut resistor leads to 3/4" (1.91 cm).
- c. Install shrink tubing.
- d. Solder ring terminals to ends of resistor leads.
- e. Shrink the tubing.
- f. Install new resistor (3) into place.

REMOVAL

Pull relay (1) from socket (2).

INSTALLATION

Plug relay (1) into socket (2).

FOLLOW ON PROCEDURES

- a. Install control box assembly (paragraph 4 27).
- b. Connect air conditioner input power at source.

---

**4.42 RELAY SOCKETS (K6-K11. TR1 AND TR2)** This task covers inspection, testing, removal and installation.

---

**INITIAL SETUP**

Tool:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
  - (2) Remove control box assembly (paragraph 4 27).
- 

**INSPECTION**

- a. Pull relay (1) from socket (5) (see fig. 4-33)
- b. Check that relay socket and terminals are not cracked, broken, loose or corroded.

**TESTING**

Use multimeter to measure resistance from each socket contact to its associated terminal (see fig FO-2.). Resistance should be 0.5 ohms or less. Replace socket if defective.

**REMOVAL**

- a. Tag and disconnect leads
- b. For relay sockets K6-K11, remove two screws (4), flat washers (3), and locknuts (2)
- c. Remove socket (5) from panel
- d. For relay sockets TR1 and TR2, remove two screws (4), lockwashers (2), and flat washers (3)
- e. Remove socket (5) from panel



---

**4.42 RELAY SOCKETS (K6-K11. TR1 AND TR2) (Continued)**

---

**INSTALLATION**

- a. For relay sockets K6-K11, position socket (5) in place and secure with two screws (4), flat washers (3), and locknuts (2).
- b. For relay sockets TR and TR2, position socket (5) in place and secure with two screws (4), lockwashers (2), and flat washers (3).
- c. Reconnect leads and remove tags.
- d. Plug relay (1) into socket (5).

**FOLLOW ON PROCEDURES**

- a. Install control box assembly (paragraph 4.27).
- b. Connect air conditioner input power at source.

4.42 RELAY SOCKETS (K6-K11, TR1 AND TR2) (Continued)

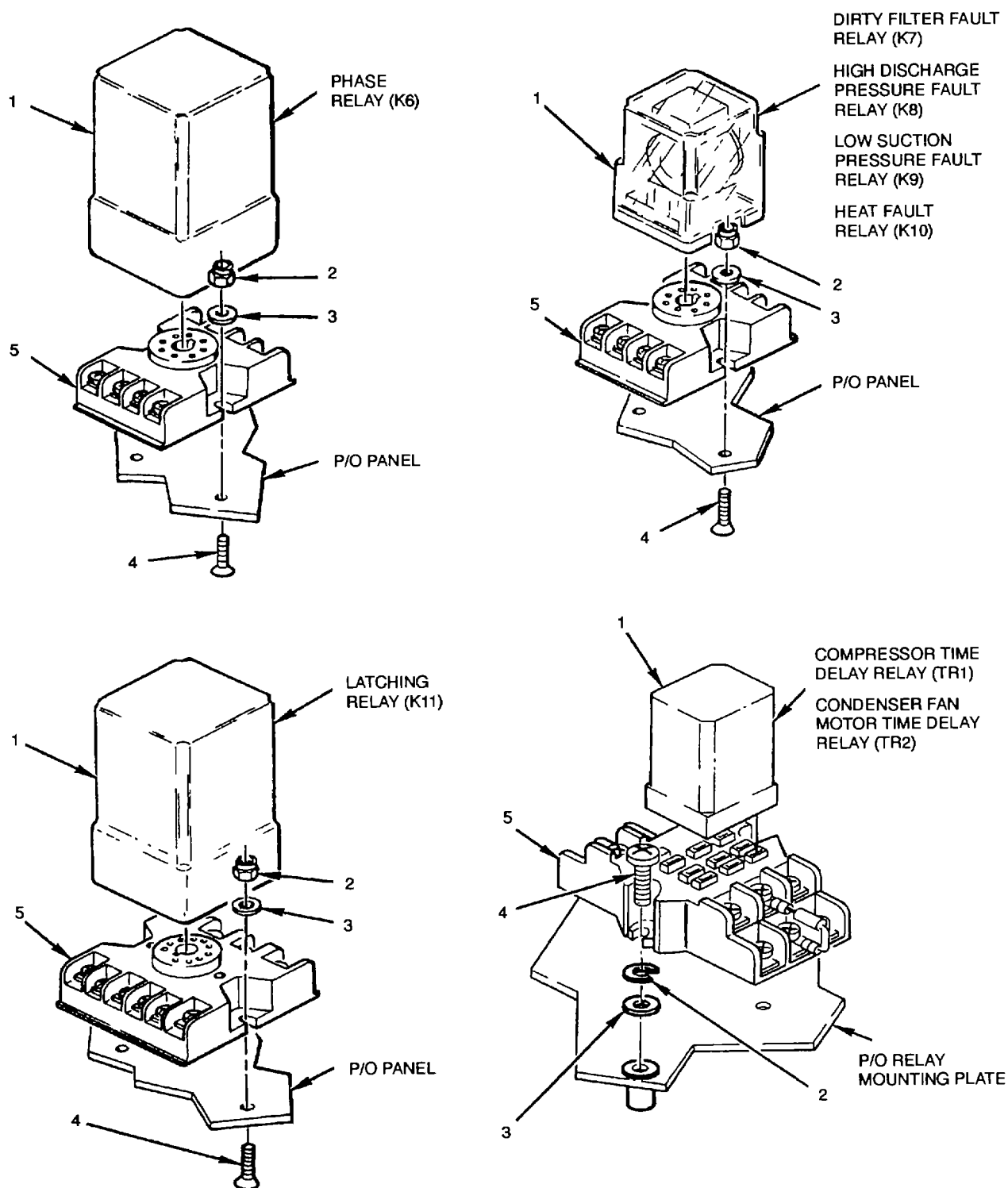


Figure 4-33. Relay Sockets (K6-K11, TR1 and TR2)

---

#### 4.43 TERMINAL BOARDS (TB1 AND TB2). This task covers inspection, removal and installation.

---

##### INITIAL SETUP

Tool:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Equipment Conditions:

##### WARNING

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
- (2) Remove control box assembly (paragraph 4 27).

---

##### INSPECTION

- a. Check terminal boards for loose or corroded terminals, cracks and obvious damage. Replace terminal board if cracked or broken (see fig. 4-34)
- b. Check that wire leads are secure and properly located (see fig FO-2).

##### REMOVAL

- a. Tag and disconnect leads
- b. For TB 1, remove four screws (4), flat washers (2), locknuts (1) and terminal board (6).
- c. For TB2
  - (1) Remove six screws (4), flat washers (2), and locknuts (1)
  - (2) Remove terminal board slide assembly (5)
  - (3) Remove two terminal board sections (6) and three mounting spacers (3)

##### INSTALLATION

- a. Cut terminal boards (6) length.
- b. For TB 1, install terminal board with four screws (4), flat washers (2), and locknuts (1).

#### 4.43 TERMINAL BOARDS (TB1 AND TB2). Continued

- c. For TB2:
  - (1) Position two terminal boards (6) and three mounting spacers (3) on terminal board slide assembly (5).
  - (2) Install terminal board slide assembly (5) with six screws (4), flat washers (2), and locknuts (1).
- d. Reconnect leads and remove tags.

#### FOLLOW ON PROCEDURES

- a. Install control box assembly (paragraph 4 .27)
- b. Connect air conditioner input power at source

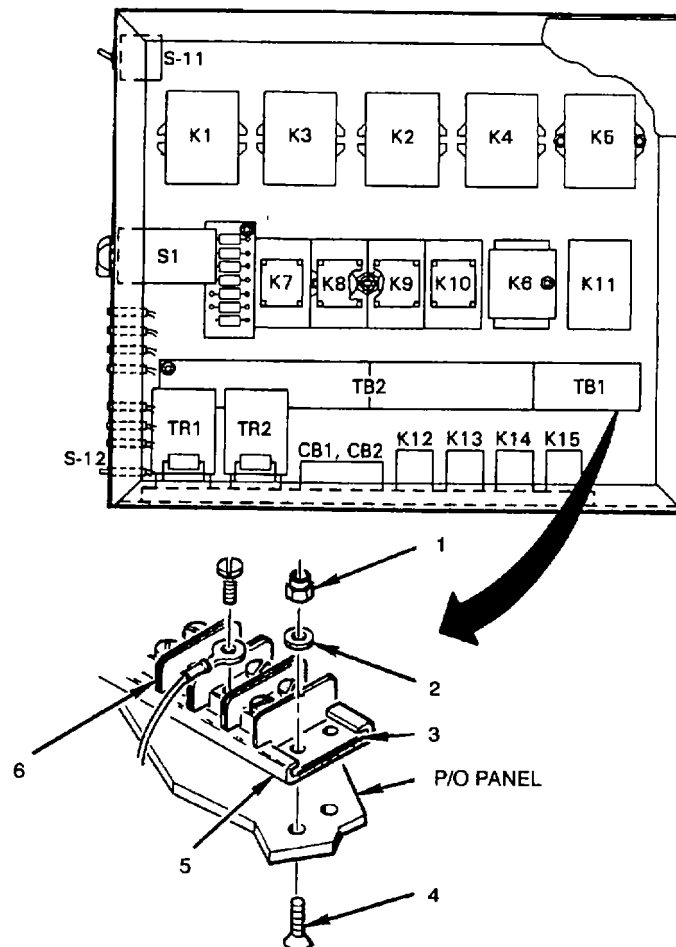


Figure 4-34. Terminal Boards (TB1 and TB2)

---

**4.44 ELECTRICAL BOX.** This task covers inspection and repair.

---

**INITIAL SETUP**

Tools:

- Tool kit, service, refrigeration unit (Item 1, Appendix B)
- Drill, electric, portable (Item 2, Appendix B)
- Drill set, twist (Item 3, Appendix B)
- Riveter blind hand (Item 4, Appendix B)
- Goggles, industrial (Appendix C)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
- (2) Remove control box assembly (paragraph 4.27)

---

**INSPECTION**

- a. Inspect mounting bracket (2) for missing rivets (1). Replace if missing (see fig. 4-35).
- b. Inspect electrical box (5) for missing or damaged floating locknuts (4) or missing rivets (3). Replace if missing or damaged.
- c. Inspect wire entry panel (7) for missing or damaged bushings (6, 8). Replace if missing or damaged.

**REPAIR**

**NOTE**

Repair consists of replacing rivets (1, 3), floating locknuts (4), mounting bracket (2) and bushings (6, 8).

- a. Floating Locknuts
  - (1) Remove two rivets (3) securing floating locknut (4)
  - (2) Remove floating locknut (4)
  - (3) Position new floating locknut (4) on electrical box (5)
  - (4) Install two rivets (3).

#### 4.44 **ELECTRICAL BOX.** Continued

##### **REPAIR** - Continued

- b. Mounting Bracket
  - (1) Remove four rivets (1) and mounting bracket (2).
  - (2) Install new mounting bracket (2) with four rivets (1)
- c. Bushings.
  - (1) Tag and disconnect wires from control box
  - (2) Pull wires through wire entry panel (7)
  - (3) Unscrew lockring (6) securing bushing (8) to wire entry panel (7).
  - (4) Remove bushing (8) and lockring (6) from wire entry panel (7)
  - (5) Install replacement bushing (8) through wire entry panel (7) and secure with locking (6).
  - (6) Feed wires through bushing (8) and connect to control box assemblies

##### **FOLLOW ON PROCEDURES**

- a. Install control box assembly (paragraph 4.27)
- b. Connect air conditioner input power at source.

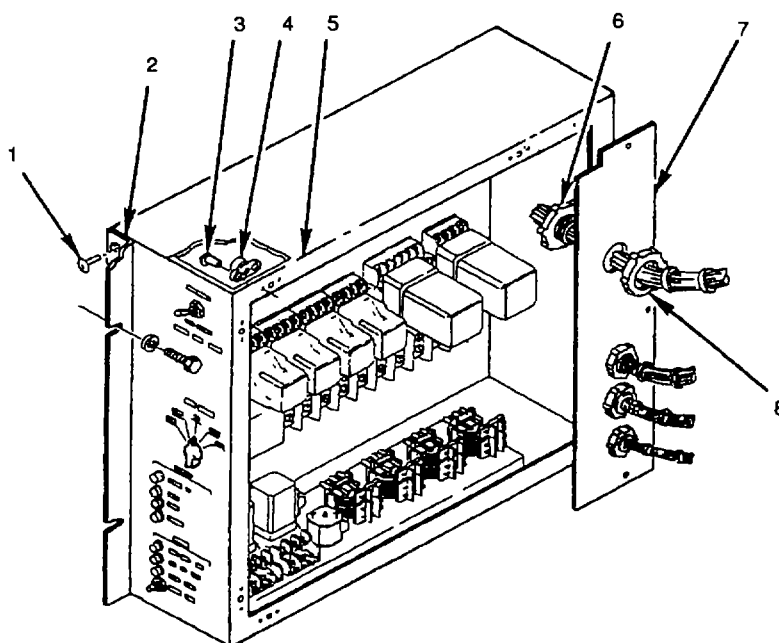


Figure 4-35. Electrical Box

---

#### 4.45 **WIRE HARNESS.** This task covers inspection, and repair.

---

##### **INITIAL SETUP**

###### Tools:

- Tool kit, service, refrigeration unit (Item 1, Appendix B)
- Solder gun (Item 7, Appendix B)
- Heat gun (Item 8, Appendix B)
- Crimping tool (pig tail) (Item 10, Appendix B)
- Crimping tool (Item 12, Appendix B)
- Goggles, industrial (Appendix C)

Personnel: 1

###### Materials.

- Solder, lead-tin alloy (Item 16, Appendix E)
- Flux, solder, liquid rosin base (Item 17, Appendix E)

Equipment Conditions:

##### **WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source;
- (2) Remove evaporator duct/panel (paragraph 4.22);
- (3) Remove return air filter (paragraph 4.26); and
- (4) Remove control box assembly (paragraph 4.27).

---

##### **INSPECTION**

Check wiring, terminals and connections for corrosion, frayed or broken wires, and signs of overheating. Replace wiring or connections as necessary.

##### **TESTING**

Using wiring diagram (see fig FO-2.), check continuity on suspected bad wiring

##### **REPAIR**

- a. General. Preferred repair methods consist of replacing wires, terminals, connectors, etc., rather than splicing wires, bending ends to form terminals, and other makeshift procedures although the latter may be appropriate for emergency field repairs. Determine the proper size and length of wire or terminal or connector to be used for replacement.

---

4.45 **WIRE HARNESS.** Continued

---

**REPAIR** - Continued

- b. **Soldering Connections.** Wire connections must be made mechanically sound before they are soldered. Solder alone does not provide sufficient strength to prevent breakage. Joining surfaces of connections to be soldered must be clean and bright. If a separate flux is used, it should conform to Specification, MIL-F- 14256, rosin base flux, and should be brushed onto the joint before soldering. If a flux-core solder is used, it should be rosin core electrical solder. If uncured solder is used, it should be lead-tin solder, conforming to Specification QQ-S-571. Wires should always be heated to the point at which the solder will melt completely and flow into all parts of the joint. Excessive buildup of solder on the joint should be avoided or removed.
- c. **Insulating Joints** The preferred method of insulating electrical joints is by the use of heat-shrink tubing. To apply, cut a piece of heat-shrink tubing of suitable diameter to a 1-inch length for covering joints at terminals or connectors, or to a length about 1/2 inch (1.3 cm) longer than the joint to be insulated, and slide the tubing over the wire before making the joint. After the joint is made slide the tubing so that it covers the joint, and shrink it in place with moderate heat.
- d. **Splicing Wires** To repair broken or cut wires that are otherwise sound, the mating ends can be stripped and spliced. A commercial butt splice can be crimped onto the ends to join them, or a "Western Union" wire splice can be made. The latter is made by stripping 1/4 - 1/2 inch (0.6 - 1.3 cm) of insulation from the wire ends, holding the ends parallel and facing opposite directions, then twisting each end around the other wire at least three turns. Apply insulation and solder as described above.
- e. **Crimping Terminals.** To install a terminal on the end of a wire, strip 1/4 - 1/2 inch (0.6 - 1.3 cm) of insulation from the end of wire, apply a 1-inch piece of heat-shrink tubing (if the terminals are of the uninsulated type), and insert wire end into the shank of the terminal. Crimp the shank and shrink tubing.

**FOLLOW ON PROCEDURES**

- a. Install control box assembly (paragraph 4.27).
- b. Install return air filter (paragraph 4.26).
- c. Install evaporator duct/panel (paragraph 4.22).
- d. Connect air conditioner input power at source.



---

**4.46 EVAPORATOR MOTOR AND HOUSING ASSEMBLY.** This task covers removal, inspection, testing, replacement and installation.

---

**INITIAL SETUP**

Tools.

- Tool kit, service, refrigeration unit (Item 1, Appendix B)
- Adapter, torque (Item 9, Appendix B)

Personnel: 1

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source, and
- (2) Remove evaporator duct/panel (paragraph 4 22)

---

**REMOVAL**

- a. Remove two screws (13) securing cover (14) to J-box (7) (see fig 4-36).
- b. Remove cover (14).
- c. Tag, disconnect and remove leads (8) from J-box (7).
- d. Remove screw (9), lockwasher (10), and flat washer (11) securing cable tie-down clamp (12) to housing assembly (6).

**NOTE**

The following steps require two people.

- e. Remove four mounting bolts (5), locknuts (3), and eight flat washers (4) on cross-frame (1) that mounts motor and housing assembly (6).
- f. Move motor and housing assembly (6) forward to gain access to rear motor mounting bolts (2).
- g. Loosen the two rear mounting bolts (2) and remove front two motor mounting bolts (15) and flat washers (16).
- h. While holding the cross-frame (1), slide motor and housing assembly (6) forward until free of rubber shockmounts (17).
- i. Rotate motor and housing assembly (6) and remove.

4.46 EVAPORATOR MOTOR AND HOUSING ASSEMBLY. - Continued.

INSPECTION, TESTING, AND REPLACEMENT

NOTE

Inspection, testing and replacement of the evaporator (circulator) motor and housing assembly components is covered in the following referenced paragraphs.

- a. Evaporator fan and housing assembly (paragraph 4.47).
- b. Evaporator motor (B2) (paragraph 4.48)

INSTALLATION

NOTE

Make sure rear mounting bolts (2) on the cross frame have at least 1/8 inch clearance between flat washer and mounting bracket. This is to ensure easy installation of the motor and housing assembly.

- a. Position motor and housing assembly (6) in cabinet and align to cross-frame (1).

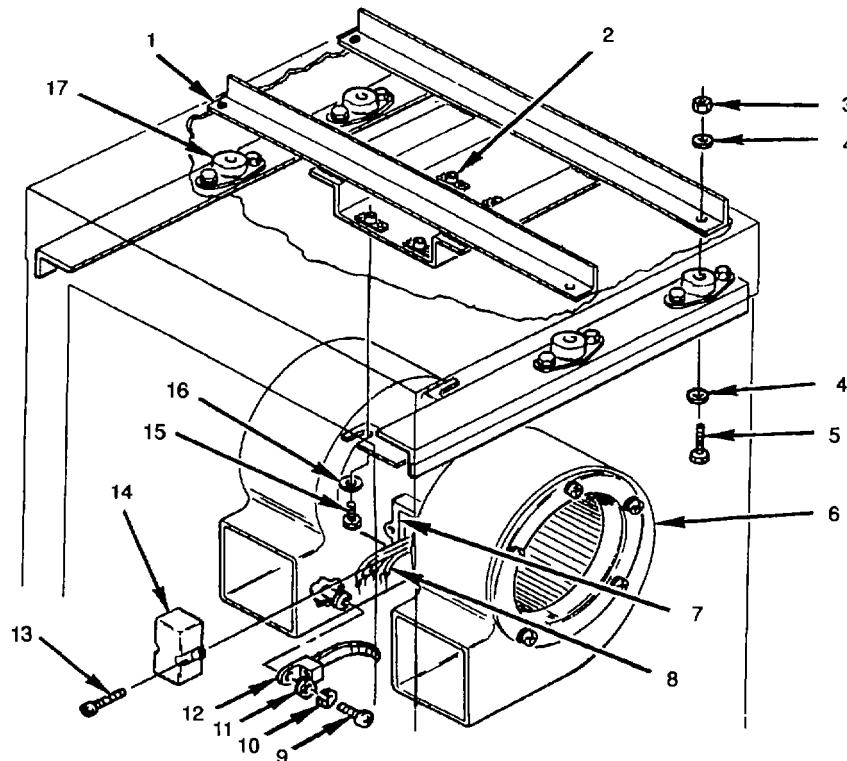


Figure 4-36. Evaporator Motor and Housing Assembly

---

**4.46 EVAPORATOR MOTOR AND HOUSING ASSEMBLY. - Continued.**

---

**INSTALLATION** - Continued

- b. While holding cross-frame (1), slide motor and housing assembly (6) into rear mounting bolts (2) and secure with front motor mounting bolts (15) and flat washers (16).
- c. Tighten two rear mounting bolts (2)
- d. Position cross-frame (1) over the four rubber shock mounts (17) and secure with four bolts (5), locknuts (3), and eight flat washers (4)
- e. Feed wires (8) into J-box (7), reconnect and remove tags
- f. Position J-box cover (14) on J-box (7) and secure with two screws (13).
- g. Position cable tie-down (12) on housing assembly (6) and secure with flat washer (11), lockwasher (10), and screw (9).

**FOLLOW ON PROCEDURES**

- a. Install evaporator duct/panel (paragraph 4.22).
- b. Connect air conditioner input power at source.

---

**4.47 EVAPORATOR FAN AND HOUSING ASSEMBLY** This task covers inspection, and repair.

---

**INITIAL SETUP**

Tools:

- Tool kit, service, refrigeration unit (Item 1, Appendix B)
- Drill, electric, portable (Item 2, Appendix B)
- Drill set, twist (Item 3, Appendix B)
- Goggles, industrial (Appendix C)

Personnel: 1

Materials:

- Primer, red epoxy (Item 13, Appendix E)
- Primer, gray epoxy (Item 14, Appendix E)
- Paint, white polyurethane (Item 15, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source, and
- (2) Remove evaporator motor and housing assembly (paragraph 4.46)

---

**INSPECTION**

- a. Inspect fan housing assembly (1) for loose or missing hardware or other visible damage. Replace if damaged (see fig 4-37)
- b. Inspect fan (5) for loose or missing hardware, broken blades, or other visible damage. Replace if damaged.

**REMOVAL**

- a. Remove five screws (6), lockwashers (7), and flat washers (8) securing inlet flange (9) to fan housing assembly (1).
- b. Remove flange (9) from fan housing assembly (1).
- c. Loosen set screw (10) securing fan (5) onto motor (11) shaft.
- d. Remove fan (5) from fan housing assembly (1).
- e. Remove four bolts (4), lockwashers (3), and flat washers (2) securing fan housing assembly (1) to motor (11).
- f. Remove fan housing assembly (1) from motor (11).

---

**4.47    EVAPORATOR FAN AND HOUSING ASSEMBLY Continued.**

---

<b>INSTALLATION</b>
---------------------

**NOTE**

When replacement of the fan housing assembly is necessary, perform the following. Enlarge the five flange mounting holes from 9/64 inches to 13/64 inches. Install nvnuts and pant the fan housing assembly. When replacement of the flange is necessary, paint the replacement flange.

- a. Position fan housing assembly (1) to motor (11) and secure with four bolts (4), lockwashers (3), and flat washers (2).
- b. Position fan (5) onto motor (11) shaft and secure with set screw (10)
- c. Position flange (9) to fan housing assembly (1) and secure with five screws (6), lockwashers (7), and flat washers (8)

**FOLLOW ON PROCEDURES**

- a. Install evaporator motor and housing assembly (paragraph 4.46).
- b. Connect air conditioner input power at source.

4.47 EVAPORATOR FAN AND HOUSING ASSEMBLY Continued.

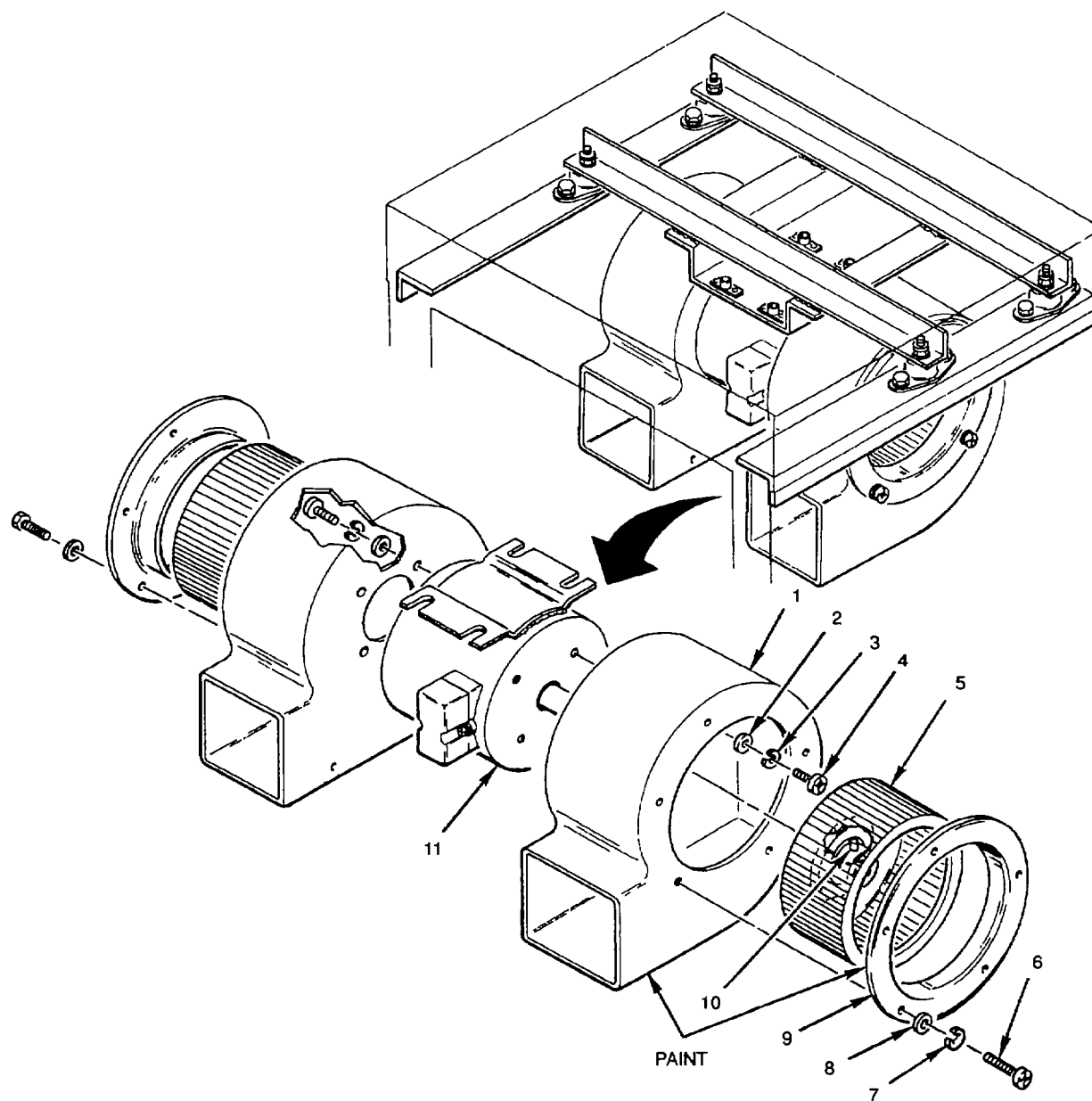


Figure 4-37. Evaporator Fan and Housing Assembly

---

**4.48 EVAPORATOR (B2).** This task covers inspection, testing, removal and installation.

---

**INITIAL SETUP**

Tools:

- Tool kit, service, refrigeration unit (Item 1, Appendix B)
- Crimping tool (pig tail) (Item 10, Appendix B)

Personnel: 1

Materials:

- Corrosion inhibiting compound (Item 12, Appendix E)
- Rags (Item 7, Appendix E)
- Varnish, moisture and fungus resistant (Item 11, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
- (2) Remove evaporator duct/panel (paragraph 4.22).

---

**INSPECTION**

- a. Check motor (1) for rotational freedom by spinning shaft (2). If there is any stiffness or binding, contact Direct Support Maintenance (see fig. 4-38).
- b. Check motor bearings for shaft end play. If there is excessive end play, contact Direct Support Maintenance.

**TESTING**

- a. Using multimeter, check continuity between wires 1 and 2, 1 and 3. and 2 and 3 Replace motor if there is no continuity between any pair of wires. Motor winding is open.
- b. Using multimeter, set on high OHMS scale, test stator insulation between each wire (1, 2, and 3) and motor housing. A reading of less than 500,000 ohms indicates insulation failure. Replace motor.

**REMOVAL**

- a. Remove evaporator motor and housing assembly (paragraph 4.46).
- b. Remove evaporator fan and housing assembly (paragraph 4.47)
- c. Remove motor (1).

---

**4.48 EVAPORATOR (B2). Continued.**

---

**INSTALLATION**

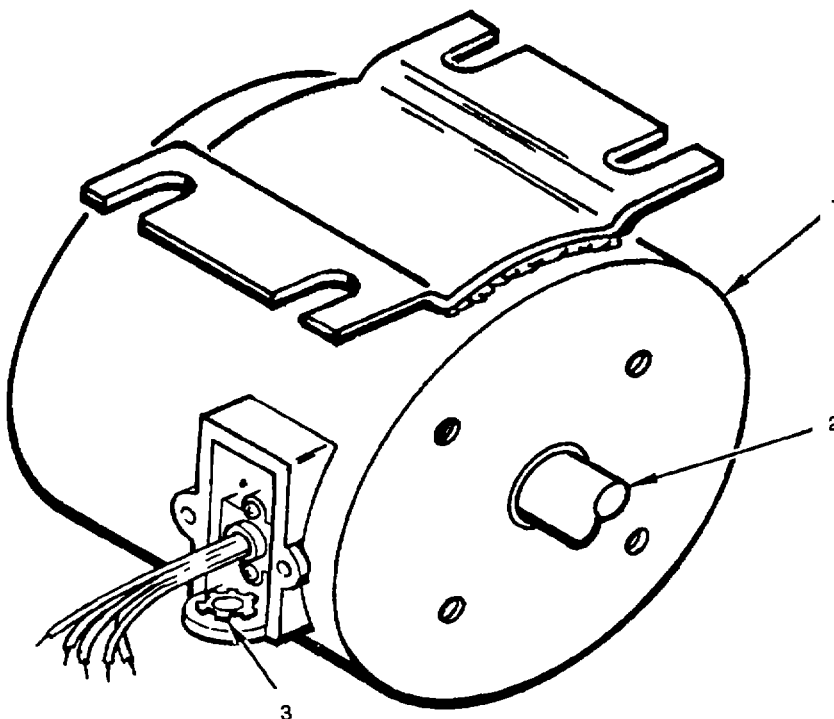
**NOTE**

When replacement of the motor is necessary, perform the following. Install insulator bushing (3). Cut wire leads to 5 inches. Strip and crimp wires together (see fig FO-2.)

- a. Fungus proof motor (1) per MIL-V-173.
- b. Apply corrosion inhibiting compound to both ends of shafts (2).
- c. Position motor (1)
- d. Install evaporator fan and housing assembly (paragraph 4.47).
- e. Install evaporator motor and housing assembly (paragraph 4.46).

**FOLLOW ON PROCEDURES**

- a. Install evaporator duct/panel (paragraph 4.22).
- b. Connect air conditioner input power at source.



**Figure 4-38. Evaporator Motor (B2)**



---

**4.49 CONDENSER MOTOR AND HOUSING ASSEMBLY.** This task covers inspection, testing, removal and installation.

---

**INITIAL SETUP**

Tools:

- Tool kit, service, refrigeration unit (Item 1, Appendix B)
- Adapter, torque (Item 9, Appendix B)

Personnel: 1

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
- (2) Remove condenser fan section panel (paragraph 4.23).

---

**REMOVAL**

- a. Remove two screws (16) securing cover (15) to J-box (12) (see fig. 4-39).
- b. Remove cover (15).
- c. Tag and disconnect leads from J-box (12).
- d. Remove screws (1), lockwashers (2), flat washers (3) securing cable tie-down clamps (4) to fan housing (11).

**NOTE**

The following steps require two people.

- e. Remove four mounting bolts (10), locknuts (5), and eight flat washers (6) and (9) on cross-frame (7) that mounts motor and fan assembly (11).
- f. Move motor and fan assembly (11) forward to gain access to rear motor mounting bolts (17).
- g. Loosen the two rear mounting bolts (17) and remove two front motor mounting bolts (14) and flat washers (13).
- h. While holding the cross-frame (7), slide motor and fan assembly (11) forward until free of rubber shock mounts (8).
- i. Remove fan and motor assembly (11).

4.49 **CONDENSER MOTOR AND HOUSING ASSEMBLY.** Continued.

**INSPECTION, TESTING, AND REPLACEMENT**

**NOTE**

Inspection, testing and replacement of the evaporator (circulator) motor and housing assembly components are covered in the following referenced paragraphs.

- a. Condenser fan and housing assembly (paragraph 4.50)
- b. Condenser motor (B3) (paragraph 4.51)

**INSTALLATION**

**NOTE**

Make sure rear mounting bolts (17) on the cross frame have at least 1/8 inch clearance between flat washer and mounting bracket. This is to ensure easy installation of the motor and housing assembly.

- a. Position motor and fan assembly (11) in cabinet and align to cross-frame (7).
- b. While holding cross-frame (7), slide motor and fan assembly (11) into rear mounting bolts (17) and secure two front motor mounting bolts (14) and flat washers (13).

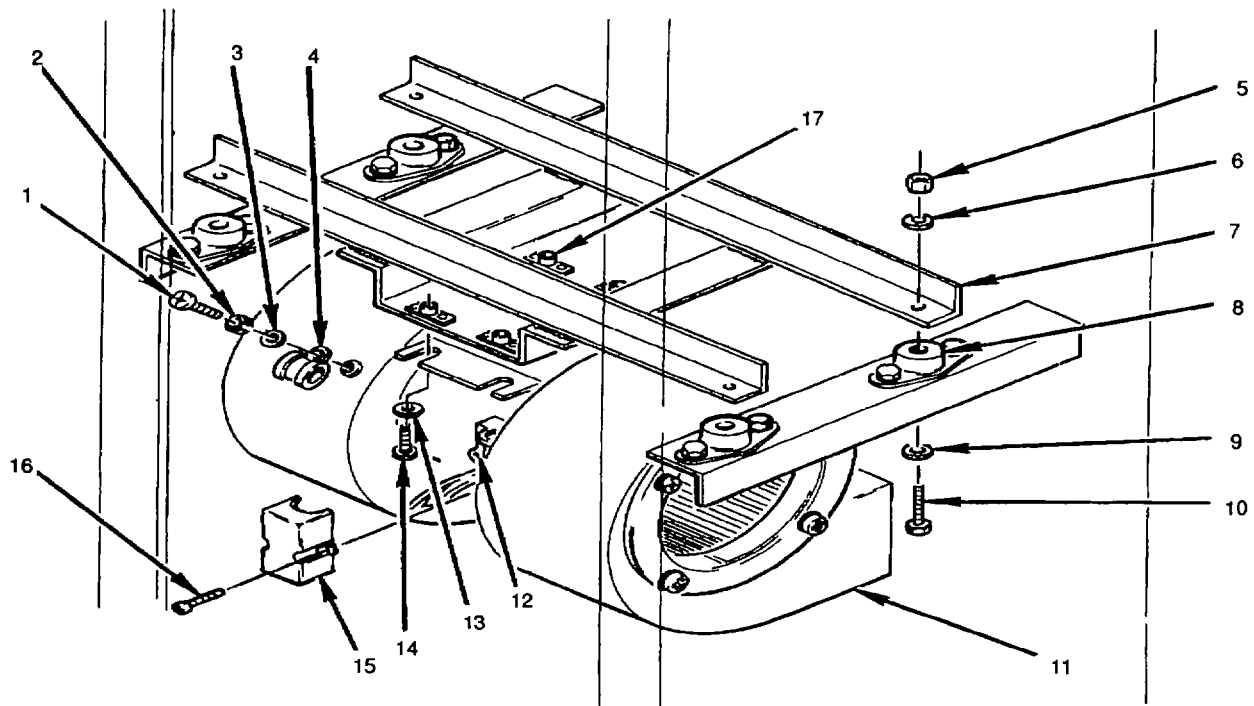


Figure 4-39. Condenser Motor and Housing Assembly

---

**4.49    CONDENSER MOTOR AND HOUSING ASSEMBLY. Continued.**

---

**INSTALLATION** - Continued

- c. Tighten two rear mounting bolts (17).
- d. Position cross-frame (7) over the four rubber shock mounts (8).
- e. Install four bolts (10), eight flat washers (6) and (9), and four locknuts (5).
- f. Reconnect leads and remove tags.
- g. Position J-box cover (15) and secure with two screws (16).
- h. Install cable tie-down clamps (4) with screws (1), flat washers (3), and lockwashers (2) to fan housing (11).

**FOLLOW ON PROCEDURES**

- a. Install condenser fan section panel (paragraph 4 23).
- b. Connect air conditioner input power at source.

---

**4.50 CONDENSER FAN AND HOUSING ASSEMBLY.** This task covers inspection, removal and installation.

---

**INITIAL SETUP**

Tools:

- Tool kit, service, refrigeration unit (Item 1, Appendix B)
- Drill, electric, portable (Item 2, Appendix B)
- Drill set, twist (Item 3, Appendix B)
- Goggles, industrial (Appendix C)

Personnel: 1

Materials:

- Primer, red epoxy (Item 13, Appendix E)
- Primer, gray epoxy (Item 14, Appendix E)
- Primer, white polyurethane (Item 15, Appendix E)

Equipment Conditions.

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source, and
- (2) Remove condenser motor and housing assembly (paragraph 4.49).

---

**INSPECTION**

- a. Inspect fan housing assembly (1) for loose or missing hardware or other visible damage. Replace if damaged (see fig. 4-40).
- b. Inspect fan (5) for loose or missing hardware, broken blades, or other visible damage. Replace if damaged.

**REMOVAL**

- a. Remove five screws (6), lockwashers (7), and flat washers (8) securing inlet flange (9) to fan housing assembly (1).
- b. Remove flange (9) from fan housing assembly (1).
- c. Loosen set screw (10) securing fan (5) to motor (11) shaft.
- d. Remove fan (5) from fan housing assembly (1).
- e. Remove four bolts (4), lockwashers (3), and flat washers (2) securing fan housing assembly (1) to motor (11).
- f. Remove fan housing assembly (1) from motor (11).

---

**4.50    CONDENSER FAN AND HOUSING ASSEMBLY.   Continued.**

---

**INSTALLATION**

**NOTE**

When replacement of the fan housing assembly is necessary, perform the following: Enlarge the five flange mounting holes from 9/64 inches to 13/64 inches. Install rivnuts and paint the fan housing assembly. When replacement of the flange is necessary, paint the replacement flange.

- a. Position fan housing assembly (1) to motor (11) and secure with four bolts (4), lockwashers (3), and flat washers (2).
- b. Position fan (5) onto motor (11) shaft and secure with set screw (10).
- c. Position flange (9) to fan housing assembly (1) and secure with five screws (6), lockwashers (7), and flat washers (8).

**FOLLOW ON PROCEDURES**

- a. Install condenser motor and housing assembly (paragraph 4.49).
- b. Connect air conditioner input power at source.

4.50 CONDENSER FAN AND HOUSING ASSEMBLY. Continued.

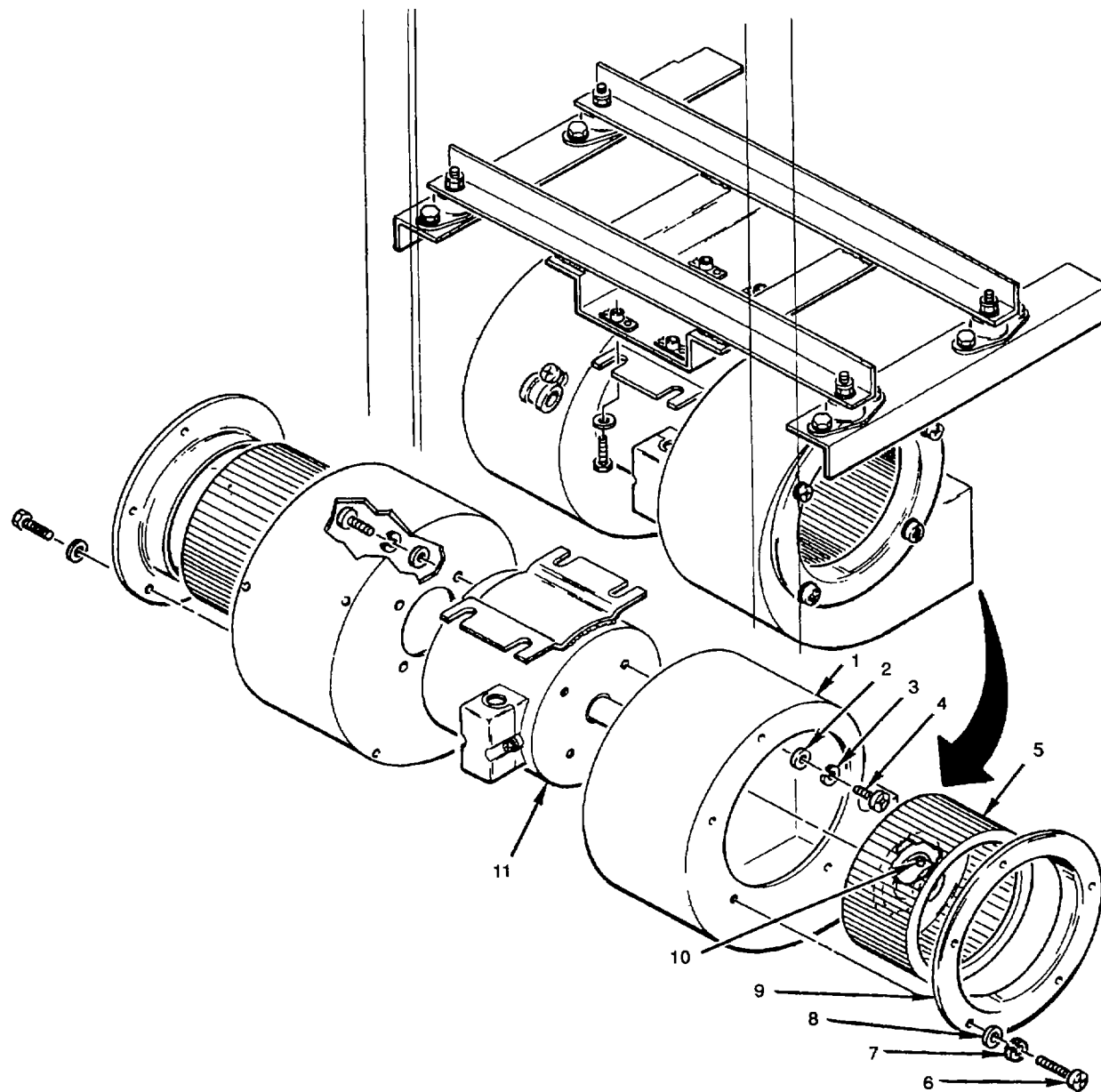


Figure 440. Condenser Fan and Housing Assembly

---

**4.51 CONDENSER MOTOR(B3).** This task covers inspection, testing, removal and installation.

---

**INITIAL SETUP**

Tools:

- Tool kit, service, refrigeration unit (Item 1, Appendix B)
- Crimping tool (pig tail) (Item 10, Appendix B)

Personnel. 1

Materials:

- Corrosion inhibiting compound (Item 12, Appendix E)
- Rags (Item 7, Appendix E)
- Varnish, moisture and fungus resistant (Item 11, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source, and
- (2) Remove condenser fan section panel (paragraph 4.23)

---

**INSPECTION**

- a. Check motor (1) for rotational freedom by spinning shaft (2) If there is any stiffness or binding, contact Direct Support Maintenance (see fig. 4-41)
- b. Check motor bearings for shaft end play. If there is excessive end play, contact Direct Support Maintenance.

**TESTING**

- a. Using multimeter, check continuity between wires 1 and 2, 1 and 3, and 2 and 3. Replace motor if there is no continuity between any pair of wires. Motor winding is open.
- b. Using multimeter, set on high OHMS scale, test stator insulation between each wire (1, 2, and 3) and motor housing. A reading of less than 500,000 ohms indicates insulation failure. Replace motor.

**REMOVAL**

- a. Remove condenser motor and housing assembly (paragraph 4.49).
- b. Remove condenser fan and housing assembly (paragraph 4.50).
- c. Remove motor (1).

---

4.51 **CONDENSER MOTOR(B3).Continued.**

---

**INSTALLATION**

**NOTE**

When replacement of the motor is necessary, perform the following: Install insulator bushing (3) Cut wire leads to 5 inches Strip and crimp wires together (see fig. FO-2.).

- a. Fungus proof motor (1) per MIL-V-173.
- b. Apply corrosion inhibiting compound to both ends of shaft (2).
- c. Position motor (1).
- d. Install condenser fan and housing assembly to motor (paragraph 4 50).
- e. Install condenser motor and housing assembly (paragraph 4 49).

**FOLLOW ON PROCEDURES**

- a. Install condenser fan section panel (paragraph 4.23).
- b. Connect air conditioner input power at source.

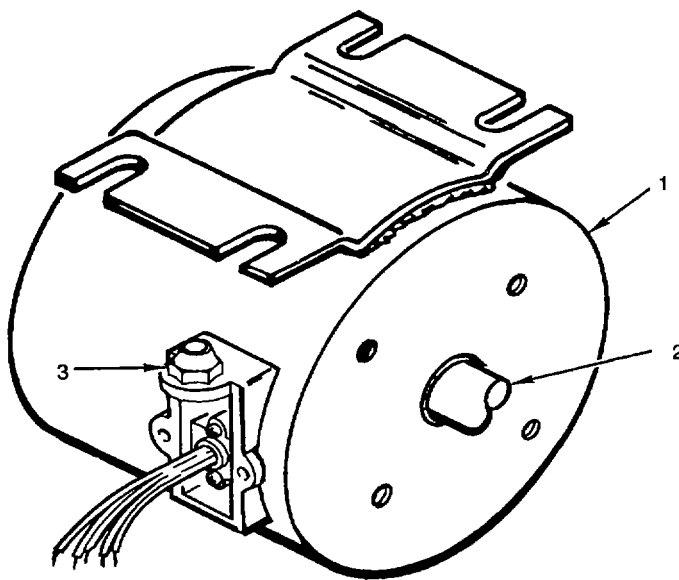


Figure 4-41. Condenser Motor (B3)



---

**4.52 ELECTRICAL HEATERS (HR1 AND HR2).** This task covers inspection, testing, removal and installation.

---

**INITIAL SETUP**

Tool:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power

- (1) Disconnect air conditioner input power at source; and
- (2) Remove return air filter (paragraph 4.26)

---

**INSPECTION**

- a. Remove two screws (1), lockwashers (2), flat washer (3), and plastic cover (11) (see fig 442).
- b. Check heater elements for deformation, damaged terminals, damaged threads, cracked or broken parts. Replace if damaged.

**TESTING**

- a. Disconnect one lead to heater
- b. Using multimeter, check for continuity between two terminal studs of each element Replace element if no continuity is indicated.

**REMOVAL**

**CAUTION**

Use two wrenches to ensure that the terminal stud does not turn, to prevent ceramic damage.

- a. Tag leads.
- b. Remove nut (4), lockwasher (5), two flat washers (6) and wire leads (7) from heater element (8).
- c. Remove nut (9) securing heater element (8) to plate (10).
- d. Remove heater element (8) from plate (10).

## 4.52 ELECTRICAL HEATERS (HR1 AND HR2).Continued.

### INSTALLATION

#### NOTE

Substitute cast iron hardware on replacement part with stainless steel.

- a. Position heating element (8) through plate (10) and secure with nut (9).
- b. Install two flat washers (6), lockwasher (5), nut (4) and wire leads (7)
- c. Remove tags
- d. Install plastic cover (11) with two screws (1), flat washers (3), and lockwashers (2).

### FOLLOW ON PROCEDURES

- a. Install return air filter (paragraph 4.26)
- b. Connect air conditioner input power at source.

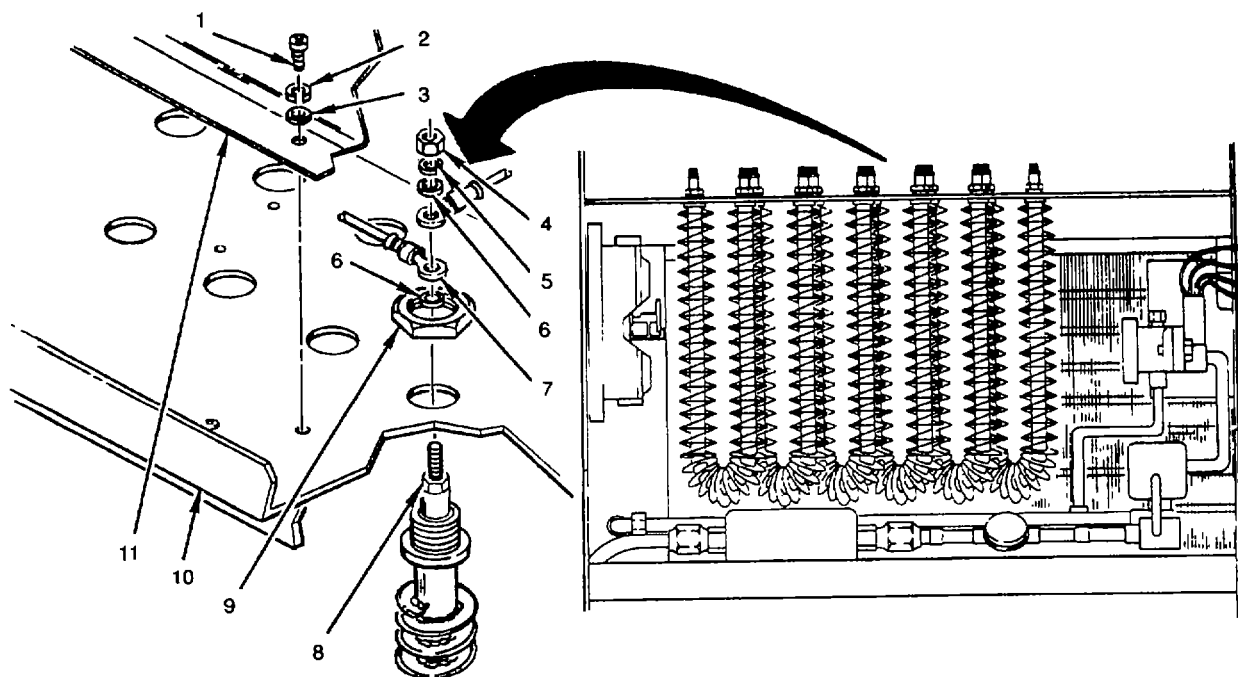


Figure 4-42. Electric Heaters (HR1 and HR2)

---

**4.53 HEAT LIMIT SWITCHES (S9 AND S10).** This task covers inspection, testing, removal and installation.

---

**INITIAL SETUP**

Tools:

- Tool kit, service, refrigeration unit (Item 1, Appendix B)
- Solder gun (Item 7, Appendix B)
- Heat gun (Item 8, Appendix B)
- Goggles, industrial (Appendix C)

Personnel: 1

Materials:

- Solder, lead-tin alloy (Item 16, Appendix E)
- Flux, solder, liquid rosin base (Item 17, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source,
- (2) Remove evaporator duct/panel (paragraph 4.22);
- (3) Remove return air filter (paragraph 4.26);
- (4) Remove two screws (1), lockwashers (2), flat washer (3). and plastic cover (7) (see fig 4-43); and
- (5) Remove cover (7) from plate (8).

---

**INSPECTION**

- a. Check to see that leads are properly connected (see fig. FO-2 ).
- b. Check for loose or broken leads. Repair wires if damaged.
- c. Check switch for signs of overheating or other visible damage. Replace switch if damaged.

**TESTING**

- a. Using multimeter and with MODE SELECT switch to OFF position, check continuity between terminals. Multimeter should indicate continuity.
- b. If switch fails test, replace switch.

**REMOVAL**

- a. Tag and unsolder leads.

**4.53 HEAT LIMIT SWITCHES (S9 AND S10)** This task covers inspection, testing, removal and installation.

**REMOVAL** - Continued

**NOTE**

Stand-off hardware may differ from air conditioner to air conditioner.

- b. Remove two nuts (4), lockwashers (5) and switch (6) from captive screws (9)

**INSTALLATION**

- a. Position switch (6) in mounting position on captive screws (9)
- b. Install two lockwashers (5) and nuts (4).
- c. Reconnect leads and remove tags.

**FOLLOW ON PROCEDURES**

- a. Install plastic cover (7) with two screws (1), flat washers (3), and lockwashers (2).
- b. Install return air filter (paragraph 4 26).
- c. Install evaporator/duct panel (paragraph 4 22).
- d. Connect air conditioner input at source.

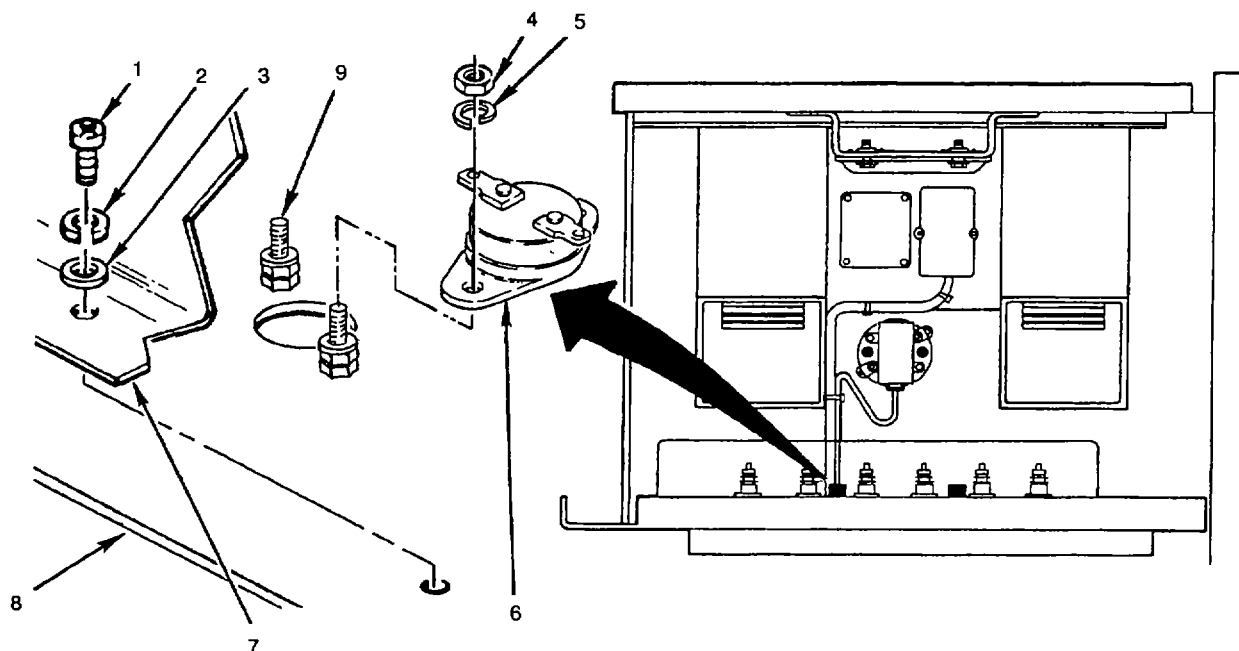


Figure 4-43. Heat Limit Switches (S9 and S10)

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**4.54 THERMOSTAT (S2)** This task covers inspection, testing, removal and installation.

---

**INITIAL SETUP**

Tool:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Material:

Varnish, moisture and fungus resistant (Item 11, Appendix E)

Equipment Conditions

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source, and
- (2) Remove return air filter (paragraph 4 26).

---

**INSPECTION**

- a. Check that leads are properly connected (see fig FO-2).
- b. Check that capillary line and sensing bulb are not damaged (see fig 4-44).
- c. Check thermostat for signs of overheating or other obvious damage Replace if damaged.

**TESTING**

- a. Using multimeter, place probes on each set of red and blue terminals, m turn.
- b. At each set, slowly turn dial back and forth slightly to check that switch opens and closes (see fig. FO-2)
- c. Repeat Steps a and b with probes on red and yellow terminals.
- b. Replace thermostat if it fails any of above tests

**REMOVAL**

- a. Tag and disconnect leads
- b. Remove two screws (1), locknuts (3), flat washers (4), clamps (5), and sensing bulb (2).
- c. Remove four nuts (6) flat washers (8), and lockwashers (7).
- d. Remove thermostat (9).

**4.54 THERMOSTAT (S2)** This task covers inspection, testing, removal and installation.

**INSTALLATION**

- a. Fungus proof thermostat (9) per MIL-V-173

**CAUTION**

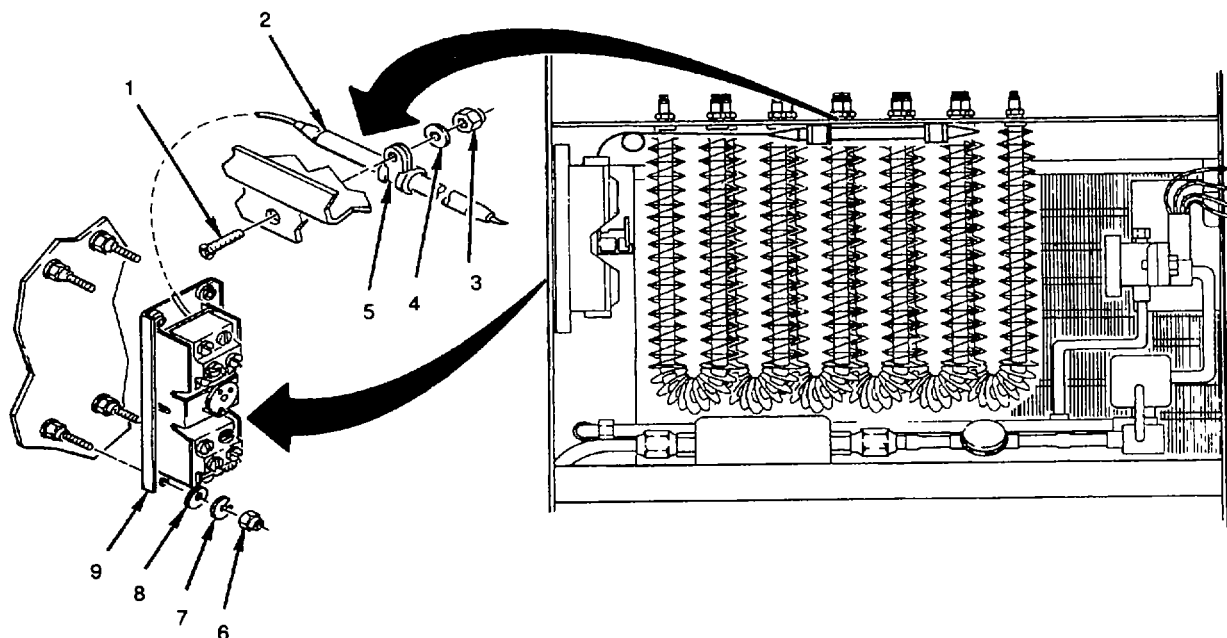
Ensure ground strap is connected to mounting bolt to prevent damage to thermostat.

- b. Place thermostat (9) in mounting position  
c. Install four lockwashers (7), flat washers (8), and nuts (6)

**CAUTION**

Ensure capillary line is not kinked or mashed to prevent damage to thermostat

- d. Install sensing bulb (2) with two screws (1), flat washers (4), clamps (5), and locknuts (3).  
e. Reconnect leads and remove tags



**Figure 4-44. Thermostat (S2)**

---

**4.54    THERMOSTAT (S2) Continued.**

---

**ADJUSTMENT**

Set thermostat for a nominal temperature setting of 80°F (26 7°C)

**FOLLOW ON PROCEDURES**

- a. Install return air filter (paragraph 4.26).
- b. Connect air conditioner input power at source.

---

**4.55    AIRFLOW FILTER SWITCH (S3)    This task covers inspection, testing, removal and installation.**

---

**INITIAL SETUP**

Tools:

- Tool kit, service, refrigeration unit (Item 1, Appendix B)
- Manometer (Item 11, Appendix B)

Personnel. 1

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
- (2) Remove evaporator duct/panel (paragraph 4 22).

---

**NOTE**

The following steps may require two persons.

**REMOVAL**

- a. Remove cover screw (2) and unsnap cover (1) from switch (3) (see fig. 4-45).
- b. Tag and disconnect leads
- c. Remove air hose (7).
- d. Remove two nuts (6), lockwashers (5), and flat washers (4)
- e. Remove switch (3)

**INSPECTION**

- a. Check for airflow through switch (3). If airflow is restricted, replace switch
- b. Check switch (3) for cracks, breaks or dents. Replace if damaged

**TESTING**

- a. Connect multimeter probes between the common and open electrical terminals. Check continuity between electrical terminals. Switch contacts should be open.
- b. Turn adjustment screw back and forth slightly and check that switch contacts open and close on narrow band
- c. Reset switch so contacts are open. If switch fails above tests, replace switch.



---

**4.55    AIRFLOW FILTER SWITCH (S3) Continued.**

---

**ADJUSTMENT**

- a. Connect manometer to air hose port (7).
- b. Blowing into other manometer hose, adjust setpoint adjustment screw until manometer pressure indicates 1.15-inches WC.

**INSTALLATION**

- a. Place switch (3) in mounting position.
- b. Install two flat washers (4), lockwashers (5), and nuts (6).
- c. Reconnect leads and remove tags.
- d. Snap cover (1) on switch (3) and secure with screw (2).
- e. Install air hose (7).

**FOLLOW ON PROCEDURES**

- a. Install evaporator/duct panel (paragraph 4 22)
- b. Connect air conditioner input power at source

4.55 **AIRFLOW FILTER SWITCH (S3).** Continued.

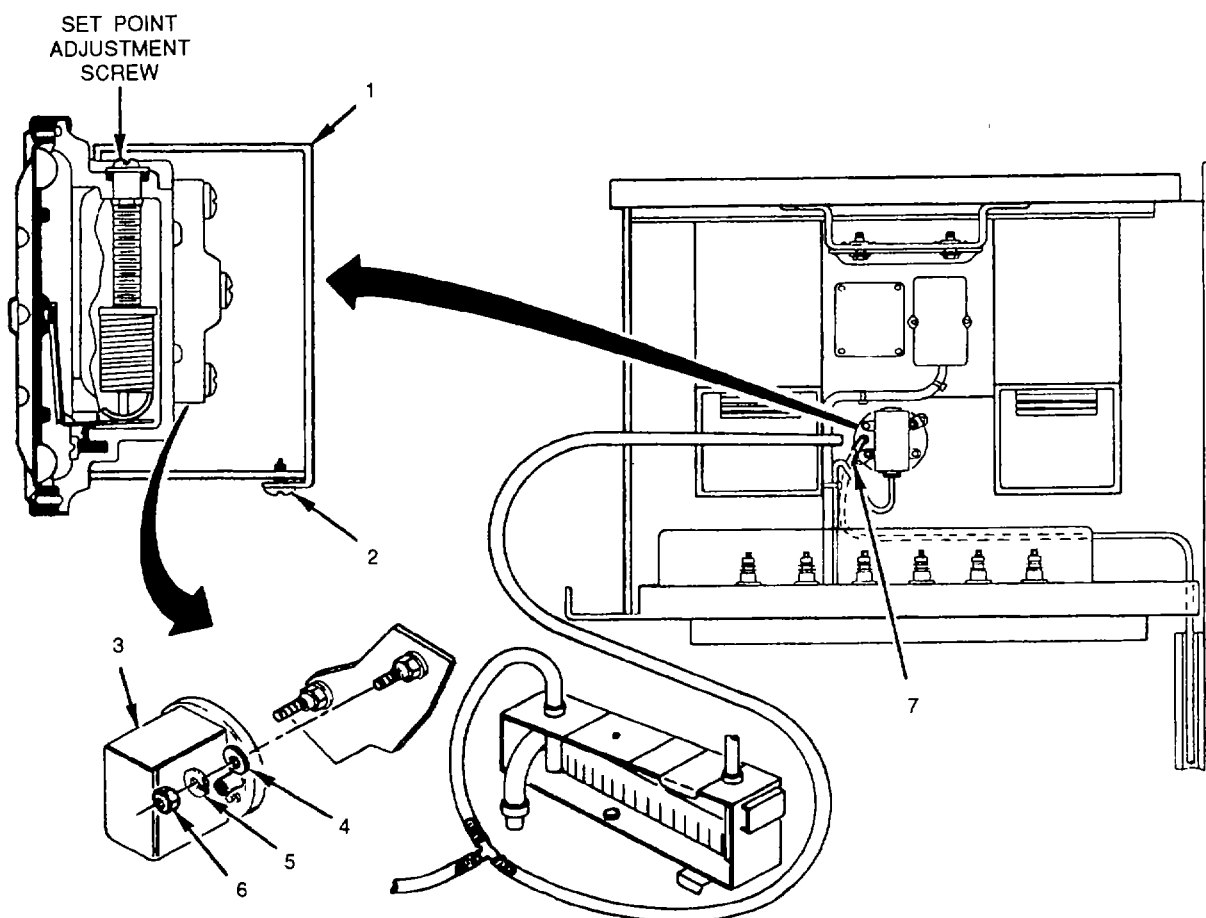


Figure 4-45. Airflow Filter Switch (S3)

---

**4.56 HEAT FAULT THERMOSTAT (S8)** This task covers inspection, testing, adjustment, removal and installation.

---

#### INITIAL SETUP

Tool:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Material:

Varnish, moisture and fungus resistant (Item 11, Appendix E)

Equipment Conditions:

#### WARNING

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source, and
- (2) Remove return air filter (paragraph 4 26)

---

#### INSPECTION

- a. Remove screw (6) from thermostat cover (5) (see fig 4-46)
- b. Remove cover (5) from thermostat (4).
- c. Check that leads are properly connected (see fig. FO-2 )
- d. Check that sensing coil (7) is not damaged.
- e. Check thermostat for signs of overheating or other obvious damage. Replace if damaged.

#### TESTING

- a. Using multimeter, place probes on red and yellow terminals.
- b. Slowly turn shaft counterclockwise until continuity is indicated. Turn dial back and forth slightly to check that switch contacts open and close.

#### ADJUSTMENT

Adjust thermostat to nominal 110 degrees F (43 3°C).

#### REMOVAL

- a. Tag and disconnect leads
- b. Remove two nuts (3), flat washers (1), and lockwashers (2).

---

4.56 **HEAT FAULT THERMOSTAT (S8)** Continued.

---

**REMOVAL** - Continued

- c. Remove thermostat (4).

**INSTALLATION**

- a. Fungus proof thermostat (4) per MIL-V-173.
- b. Place thermostat (4) in mounting position.
- c. Install two flat washers (1), lockwashers (2) and nuts (3).
- d. Reconnect leads and remove tags.
- e. Slide cover (5) on thermostat (4).
- f. Install screw (6).

**FOLLOW ON PROCEDURES**

- a. Install return air filter (paragraph 4.26).
- b. Connect air conditioner input power at source.

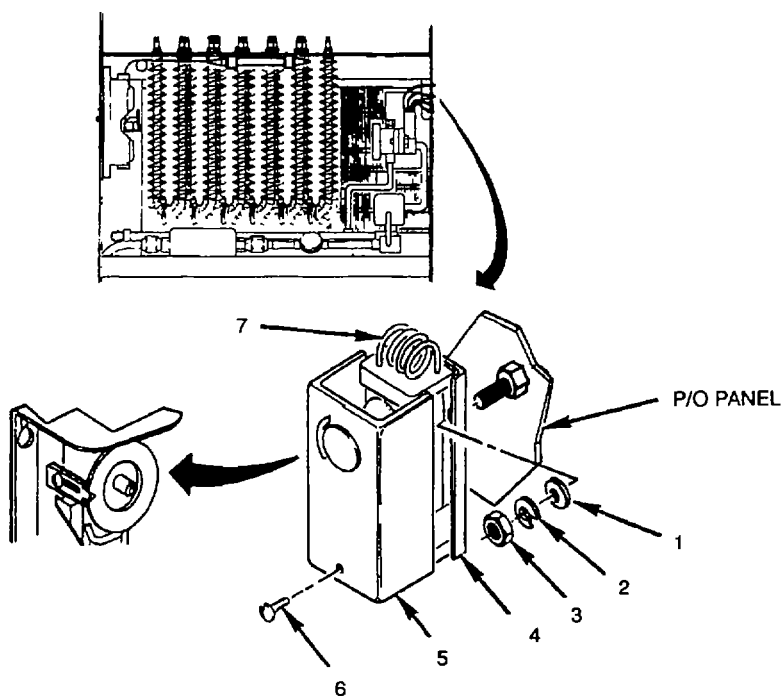


Figure 4-46. Heat Fault Thermostat (S8)

---

**4.57 CRANKCASE HEATER (HR3).** This task covers inspection, testing, adjustment, removal and installation.

---

**INITIAL SETUP**

Tool:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Material:

Insulating compound (Item 5, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source;
- (2) Remove condenser fan section panel (paragraph 4.23),
- (3) Remove compressor section panel (paragraph 4.24), and
- (4) Verify CB2 is closed (paragraph 4.39).

---

**INSPECTION**

- a. Check crankcase heater wires in J-box for corrosion or loose electrical connections.
- b. Check for signs of overheating or other visible damage. Replace heater if defective.

**TESTING**

**WARNING**

The following test must be conducted with power on. Use extreme caution and follow steps carefully. Death or serious injury may result.

- a. Connect air conditioner power at source.
- b. Using a clamp-on ammeter, verify current flow (100 mA) through compressor crankcase heater wires located in J-box.
- c. If no current flow is indicated, disconnect air conditioner power at source and replace crankcase heater.

**REMOVAL**

- a. Remove J-box cover (1) (see fig. 4-47).

4.57 **CRANKCASE HEATER (HR3).** Continued.

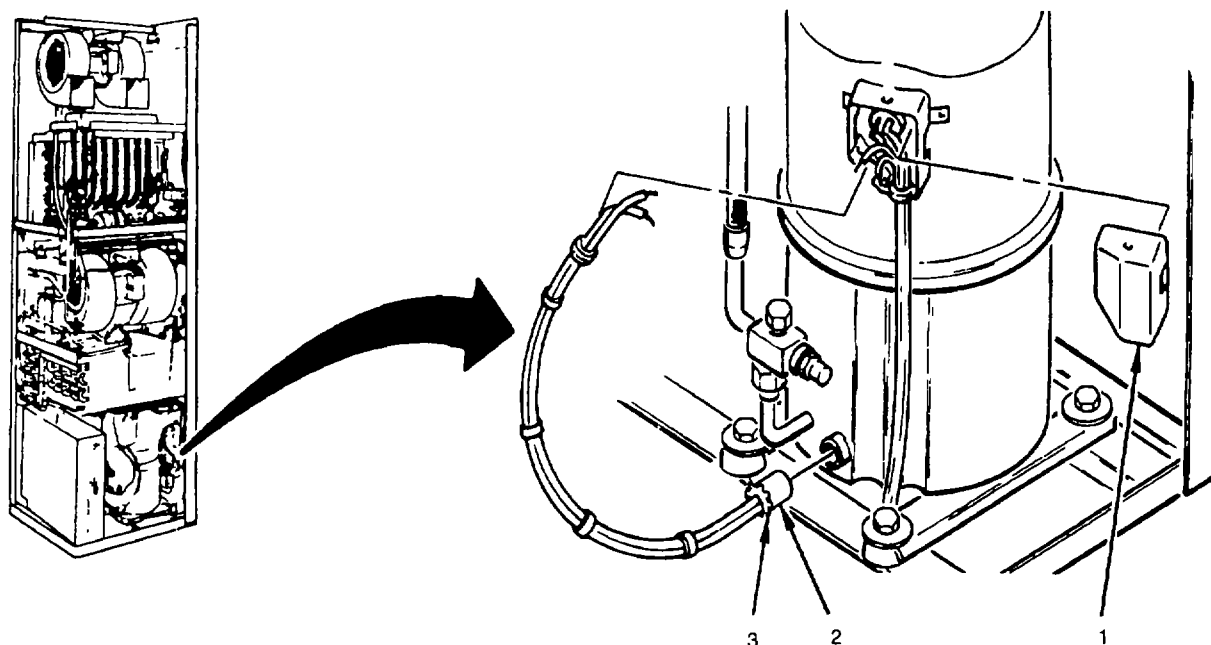


Figure 4-47. Crankcase Heater (HR3)

**REMOVAL** - Continued

**WARNING**

Allow crankcase heater to cool before touching crankcase heater. Surfaces are extremely hot. Serious injury can result.

- b. Tag and disconnect leads.
- c. Allow heater (2) to cool.
- d. Remove spring clip (3) and crankcase heater (2).

---

**4.57 CRANKCASE HEATER (HR3). Continued.**

---

**INSTALLATION**

**NOTE**

When replacing crankcase heater, perform the following: Cut wire leads to 16 inches long and strip ends back to 1/2 inch maximum.

- a. Coat replacement crankcase heater (2) with insulating compound
- b. Install crankcase heater (2) with spring clip (3)
- c. Reconnect wires and remove tags.
- d. Install J-box cover (1).

**FOLLOW ON PROCEDURES**

- a. Install compressor section panel (paragraph 4.24)
- b. Install condenser fan section panel (paragraph 4.23).
- c. Connect air conditioner input power at source.

---

**4.58 SOLENOID VALVES (L1 AND L2) COIL.** This task covers inspection, testing and replace.

---

**INITIAL SETUP**

Tool:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Material:

Varnish, moisture and fungus resistant (Item 11, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source;
- (2) Remove return air filter (paragraph 4.26); and
- (3) Remove condenser fan section panel (paragraph 4.23).

---

**INSPECTION**

- a. Check that leads are properly connected (see fig. 4-48 and fig. FO-2.).
- b. Check coil for signs of overheating or other obvious damage. Replace coil if damaged.

**TESTING**

- a. Check to be sure power has been disconnected.
- b. Tag and disconnect wires from coil.
- c. Use multimeter set on lowest OHMS scale to check for continuity between the coil wires. If continuity is not found, coil is open and must be replaced.
- d. Use multimeter to check for continuity between each wire and coil casing. If continuity is found between either wire and case, the coil is grounded and should be replaced.
- e. If continuity checks are satisfactory, apply 120 volt AC from an external power supply across coil wires and listen for a sharp click when the valve changes position. If a click is not heard, internal valve problems are indicated and entire valve should be replaced. Contact Direct Support Maintenance for further action.



4.58 SOLENOID VALVES (L1 AND L2) COIL. Continued.

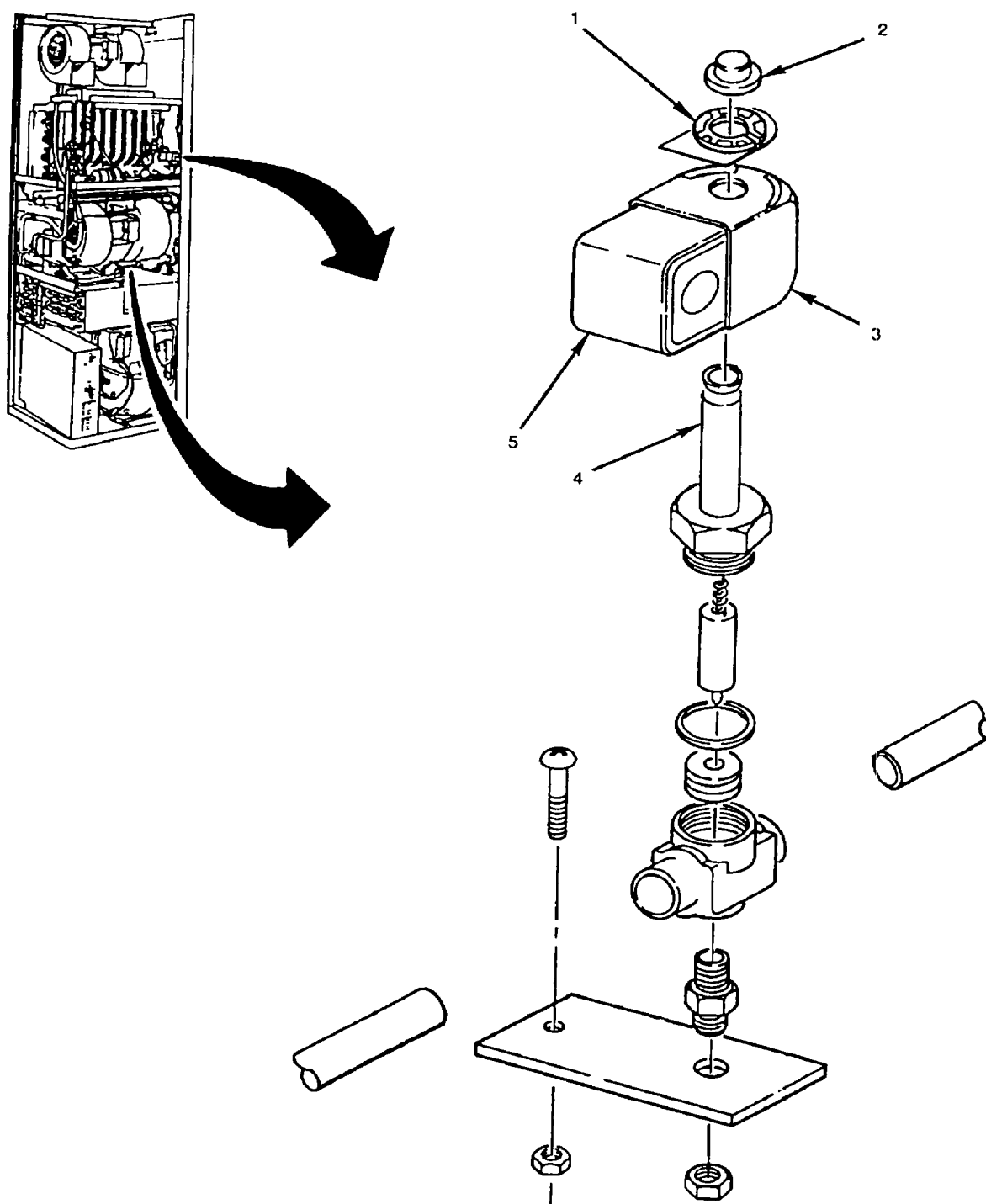


Figure 4-48. Solenoid Valves (L1 and L2) Coil

---

**4.58 SOLENOID VALVES (L1 AND L2) COIL. Continued.**

---

**REPLACE**

**NOTE**

Replacement consists of replacmg defective cold Refer all other solenoid repair replacement to Direct Support Maintenance.

- a. Remove coil cover (5).
- b. Tag and disconnect leads
- c. Remove coil retainer (2) and nameplate (1)
- d. Remove coil (3).

**NOTE**

When replacing coil, perform the following: Remove one knockout and mstall grommet.  
Strip and dead end wires

- e. Fungus proof replacement coil (3) per MIL-V-173
- f. Install new coil (3) on valve plunger (4)
- g. Reconnect wires and remove tags.
- h. Install coil cover (5).
- i. Install nameplate (1) and coil retainer (2)

**FOLLOW ON PROCEDURES**

- a. Install return air filter (paragraph 4.26)
- b. Install condenser fan section panel (paragraph 4 23).
- c. Connect air conditioner input power at source

---

**4.59    CONDENSER COIL. This task covers inspection and service.**

---

**INITIAL SETUP**

Tools:

- Tool kit, service, refrigeration unit (Item 1, Appendix B)
- Fm comb (Item 13, Appendix B)
- Goggles, industrial (Appendix C)
- Vacuum cleaner (Item 17, Appendix B)

Personnel: 1

Material:

- Rags (Item 7, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source,
- (2) Remove compressor section panel (paragraph 4.24); and
- (3) Remove condenser fan section panel (paragraph 4.23).

---

**INSPECTION**

- a. Check for accumulated dirt (see fig 4-49). Clean if dirt is evident.
- b. Check fins for dents, bent edges, or any condition that would block or distort airflow. Straighten all damaged fins with a plastic fm comb. If a leak or major damage is evident, refer to General Support Maintenance.

**SERVICE**

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (2.1 kg/cm<sup>2</sup>). Do not direct compressed air against the skin. Use goggles or full face shield.

---

4.59 **CONDENSER COIL.** Continued

---

**SERVICE** - Continued

**CAUTION**

Do not use steam to clean coil. Pressure can build up in system causing damage to components.

Clean condenser coil with a soft bristle brush, vacuum cleaner and brush attachment, or use compressed air at 30 psi (2.1 kg/cm<sup>2</sup>) or less from inside of unit to blow the dirt out. Take care to avoid fin damage. When using compressed air, wear safety glasses or goggles. Dirt can be blown into your eyes.

**FOLLOW ON PROCEDURES**

- a. Install compressor section panel (paragraph 4.24)
- b. Install condenser fan section panel (paragraph 4.23).
- c. Connect air conditioner input power at source.

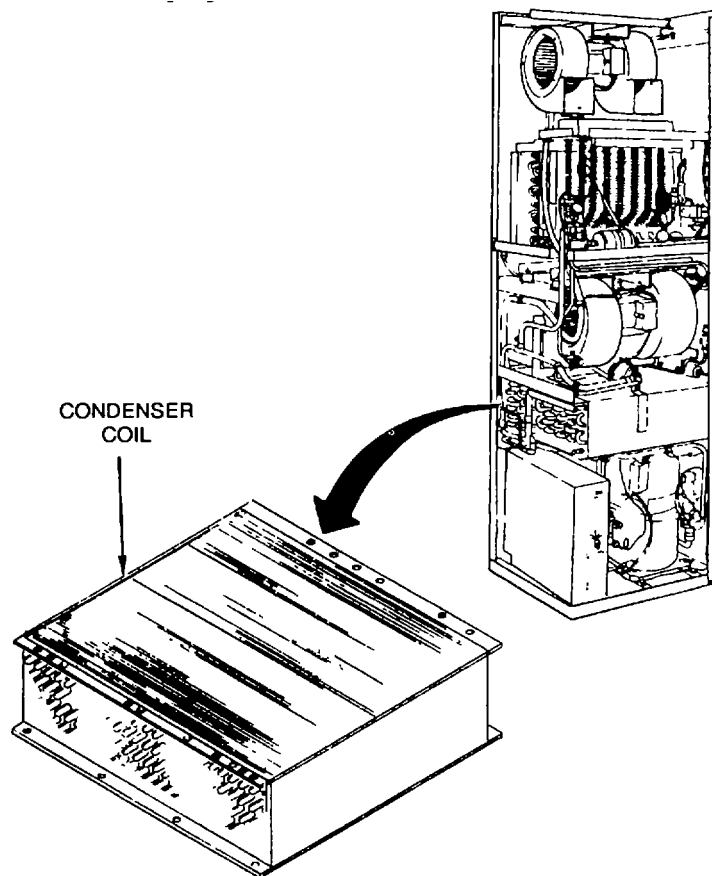


Figure 4-49. Condenser coil cleaning

---

**4.60 EVAPORATOR COIL.** This task covers inspection and service.

---

**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Fin comb (Item 13, Appendix B)  
Goggles, industrial (Appendix C)  
Vacuum cleaner (Item 17, Appendix B)

Personnel. 1

Material'

Rags (Item 7, Appendix E)

Equipment Conditions'

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source, and
- (2) Remove return air filter (paragraph 4 26)

---

**INSPECTION**

- a. Check for accumulated dirt (see fig. 4-50) Clean if dirt is evident.
- b. Check fins for dents, bent edges, or any condition that would block or distort airflow. Straighten all damaged fins with a plastic fin comb. If a leak or major damage is evident, refer to General Support Maintenance.

**SERVICE**

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (2 1 kg/cm<sup>2</sup>). Do not direct compressed air against the skin Use goggles or full face shield.

---

4.60 **EVAPORATOR COIL.** Continued

---

**SERVICE** - Continued

**CAUTION**

Do not use steam to clean coil. Pressure can build up in system causing damage to components.

Clean evaporator coil with a soft bristle brush, vacuum cleaner and brush attachment, or use compressed air at 30 psi (2.1 kg/cm<sup>2</sup>) or less from inside of unit to blow the dirt out. Take care to avoid fin damage. When using compressed air, wear safety glasses or goggles. Dirt can be blown into your eyes

**FOLLOW ON PROCEDURES**

- a. Install return air filter (paragraph 4 26).
- b. Connect air conditioner input power at source

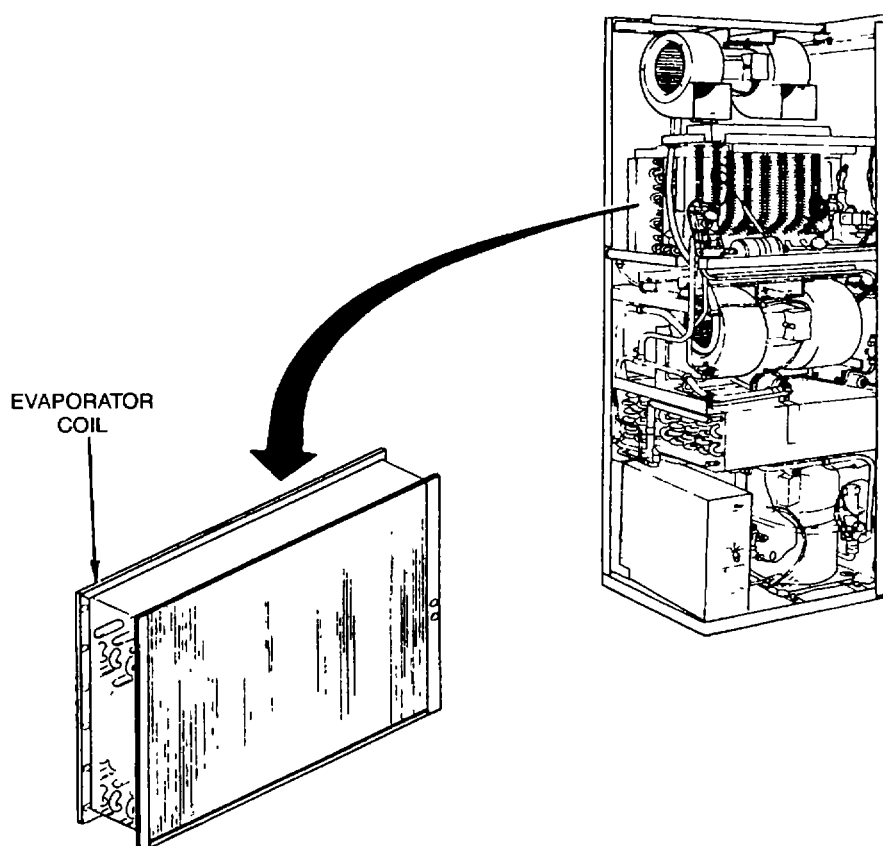


Figure 4-50. Evaporator Coil Cleaning

---

**4.61 DRAIN AREA.** This task covers inspection and service.

---

**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Vacuum cleaner (Item 17, Appendix B)  
Goggles, industrial (Appendix C)

Personnel. 1

Material:

Corrosion preventative #244 (Item 3, Appendix E)

Equipment Conditions'

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source, and
- (2) Remove return air filter (paragraph 4.22).

---

**INSPECTION**

- a. Check that drain area is clean (see fig, 4-51).
- b. Check that drain area does not contain water.
- c. Check drain pan for chipped, corroded, or worn corrosion preventative material, If damaged, scrape and vacuum repair area, then coat with corrosion preventative material.

**SERVICE**

- a. Pour some clean fresh water into drain area.
- b. If water does not freely flow out of dram tube or has a muddy appearance, insert flexible wire in drain tube. Agitate until clog and accumulated debris are loose.
- c. Pour additional water in drain area until unrestricted flow of clean water pours from drain rube.
- d. Vacuum dram pan and drain holes

---

4.61 **DRAIN AREA.** - Continued

---

**FOLLOW ON PROCEDURES**

- a. Install evaporator/duct panel (paragraph 4.22).
- b. Connect air conditioner input power at source.

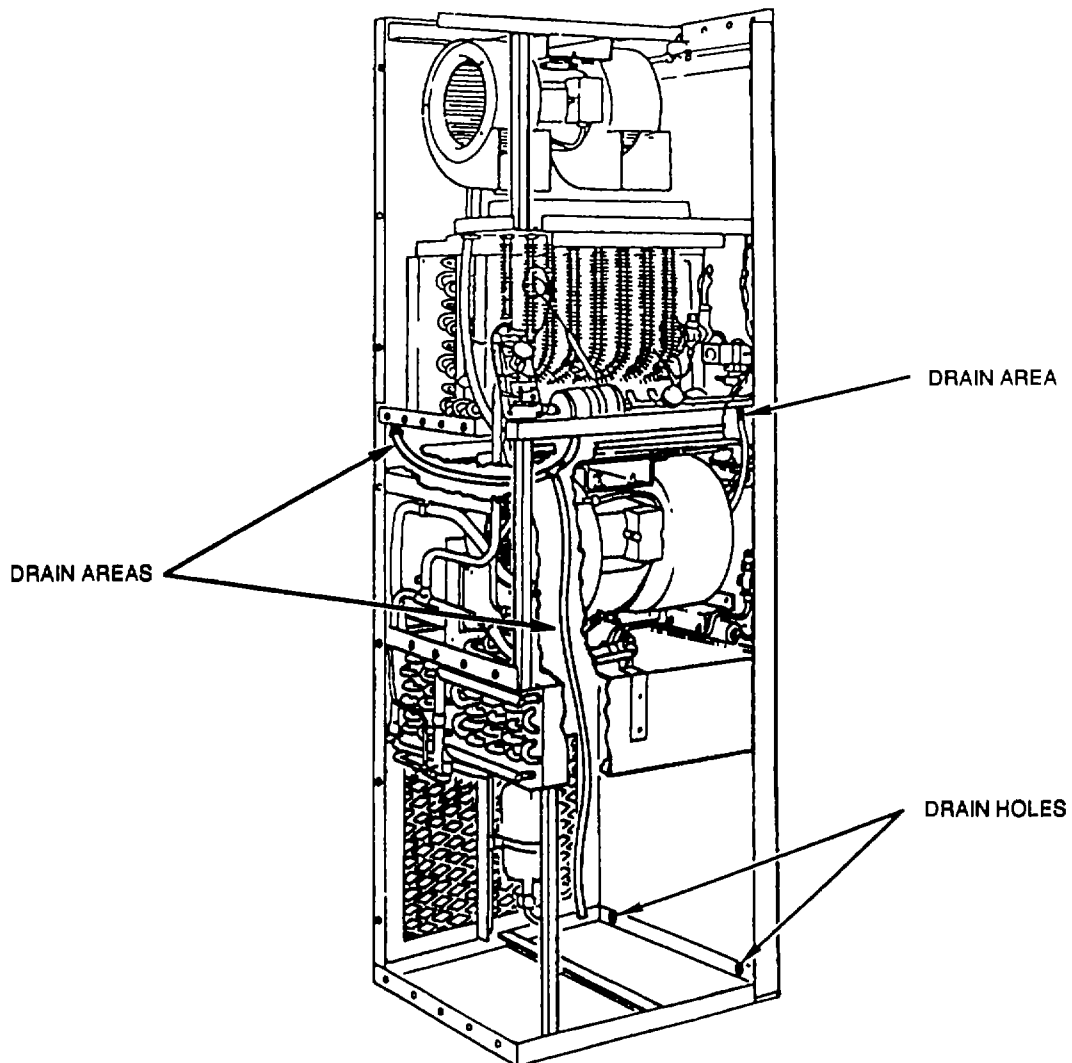


Figure 4-51. Drain Area



## Section VII. PREPARATION FOR STORAGE OR SHIPMENT

### 4.62 PREPARATION FOR STORAGE OR SHIPMENT.

#### 4.62.1 Administrative Storage of Equipment

a. Placement of equipment in administrative storage should be for short periods of time when a shortage of maintenance effort exists. Items should be in mission readiness within 24 hours or within the time factors as determined by the directing authority. During the storage period, appropriate maintenance records will be kept

b. Before placing equipment in administrative storage, current maintenance services and Preventive Maintenance Checks and Services (PMCS) evaluations should be completed, shortcomings and deficiencies should be corrected, and all modification work orders (MWOs) should be applied.

c. Storage site selection. Inside storage is preferred for items selected for administrative storage.. If inside storage is not available, trucks, vans, conex containers and other containers may be used.

**4.62.2 Intermediate Storage - 46 to 180 Days.** Same as administrative storage procedures. No additional special handling is required other than protection from damage and the elements. Place the air conditioner in a dry, covered area

**4.62.3 Long-Term or Flyable Storage - Over 180 Days.** Same as administrative storage procedures, plus the following:

- a. Bolt the unit to a skid base, preferably the original used to ship the unit if it has been preserved.
- b. Wrap the unit with two layers of heavy plastic sheet or barrier paper.
- c. Tape and strap the wrapping in place.
- d. Mark the air conditioner per standard Army, Air Force, or Navy procedures.

## CHAPTER 5

### DIRECT SUPPORT MAINTENANCE

#### Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE AND SUPPORT EQUIPMENT

5.1 COMMON TOOLS AND EQUIPMENT. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

5.2 SPECIAL TOOLS. TMDE, AND SUPPORT EQUIPMENT. No special tools are required for Direct Support Maintenance of the air conditioner.

5.3 REPAIR PARTS . Repair parts are listed and illustrated in the Repair Parts and Special Tools List (RPSTL) TM 9-4120-3B0-24P, covering Unit Direct Support, and General Support Maintenance for this equipment.

#### Section II. DIRECT SUPPORT MAINTENANCE PROCEDURES

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5.7	Condenser Motor (B3) ....	5-7
5.8	Refrigeration System, General Repairs.....	5-10
5.9	Service Manifold Installation .....	5-11
5.10	Discharging Refrigerant System .....	5-14
5.11	Purging Refrigerant System .....	5-16
5.12	Brazing/De brazing Procedures .....	5-18
5.13	Leak Testing Refrigerant System .....	5-20
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5.25	Hot Gas Bypass Service Valve (V7) .....	5-52

## Section II. DIRECT SUPPORT MAINTENANCE PROCEDURES-Continued

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5.41	Tubing end Fittings .....	5-101

5.4 GENERAL. This section contains maintenance procedures which are authorized to Direct Support Maintenance (F) by the Maintenance Allocation Chart (MAC) Appendix and Source. Maintenance and Recoverability (SMR) coded Items Each paragraph covers a complete maintenance procedure but may require other tasks to be included (I.e., initial setups, references and follow-on procedures). Perform procedures/tasks in designated order.

5.5 PANELS AND INFORMATION PLATES. For removal, inspection, cleaning, and installation refer to the following paragraphs.

- a. Evaporator Duct/Panel Refer to paragraph 4 22.
- b. Condenser Fan Section Panel. Refer to paragraph 4 23.
- c. Compressor Section Panel Refer to paragraph 4 24
- d. Condenser Duct Refer to General Support Maintenance.
- e. Information Plates Refer to paragraph 4 25
- f. Repair (Chassis). Repairs are limited to straightening of minor dents, rewelding of broken welds, installation of loose or missing rivets and rivnuts, replacement of captive fasteners, replacement of loose or missing bushings, grommets, gaskets and installation paint touch up, and replacement of damaged or missing information plates.

(1) Minor Dents Repair minor dents using standard sheet metal repair practices.

(2) Broken Welds. Repair broken welds using standard weld repair practices.

- (3) Rivets. To replace loose or missing rivets, drill old rivet out using a drill bit slightly smaller than the diameter of old rivet body, and install replacement rivet.
- (4) Rivets. To replace missing rivets, drill old rivet out using a drill bit slightly smaller than the diameter of rivet hole, and install replacement rivet
- (5) Receptacles. To replace or repair captive fastener receptacles, drill old rivet out using a drill bit slightly smaller than the diameter of old rivet body, and install replacement receptacle.
- (6) Bushings and Grommets. Replace damaged bushings or grommets using standard electrician's repair practices.
- (7) Gasket/insulation. To replace or repair gasket or insulation.
  - (a) Remove as much old gasket or insulation material as possible by pulling or scraping it away from the metal surface.

**WARNING**

Acetone and Methyl-Ethyl Ketone (MEK) are flammable and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic Use a well-ventilated area, wear gloves, and keep away from sparks or flame.

- (b) Soften and remove old adhesive and gasket and insulation residue, using acetone or MEK and a stiff brush.
  - (c) Coat surfaces of metal and gasket or insulation with adhesive. Let both surfaces dry until adhesive is tacky but will not stick to fingers
  - (d) Starting with an end, carefully attach the gasket or insulation to the metal Press into firm contact all over
- (8) Touch Up. Should touch up or refinishing be necessary, refer to TM 43-0139, Painting Instructions for Field Use.

---

5.6. EVAPORATOR MOTOR (B2). This task covers disassembly, repair and reassembly.

---

**INITIAL SETUP**

**Tool**

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

**Materials:**

Grease aeroshell 22 (Item 19, Appendix E)

Rags (Item 7, Appendix E);

Corrosion inhibiting compound (Item 12, Appendix E)

**Equipment Condition:**

Remove evaporator fan and housing assembly (paragraph 4.47)

---

**DISASSEMBLY**

- a. Match-mark motor frame (3) and end caps (2) and (9) (see fig 5-1)
- b. Remove four end cap nuts (8), lockwashers (7) and through bolts (1)

**CAUTION**

When removing end caps, rotor will be freed. Damage to rotor could occur if dropped while removing end caps from motor.

- c. Remove end caps (2) and (9).
- d. Identify location of wavy spring washer (13) and two spacer washers (14).
- e. Carefully pull rotor (6) from the motor frame (3).
- f. Carefully remove bearings (5) and (10) from shaft (4).
- g. Examine rotor (6), stator (12), and shafts for nicks, gouges, deformations, or evidence of overheating.

**REPAIR**

Dress high metal defects in shaft with a file. If rotor or stator are beyond repair, replace motor.

5.6. EVAPORATOR MOTOR (B2). Continued

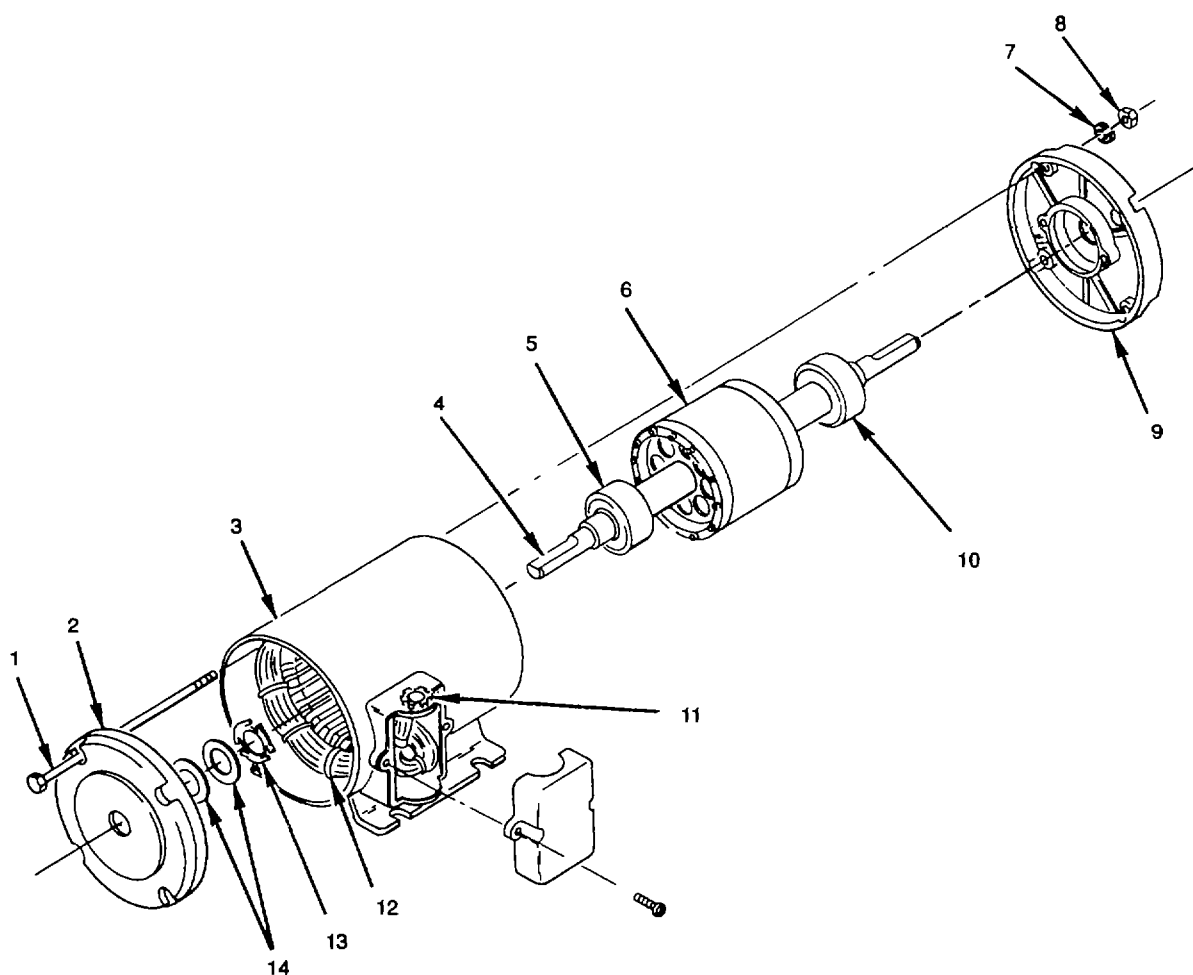


Figure 5-1. Evaporator Motor (B2)

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5.6. EVAPORATOR MOTOR (B2). Continued

---

REASSEMBLY

**NOTE**

When replacement of the motor is necessary perform the following. Install insulator bushing (11) cut wire leads to 5 inches strip and dead end wires together for 208 Vac 3-phase operation; and apply corrosion inhibiting compound to both shafts.

- a. Coat the bearing cavity of end caps (2) and (9) with grease.
- b. Install bearings (5) and (10) onto shaft (4).
- c. Insert wavy spring washer (13) and two spacer washers (14)

**CAUTION**

Damage to rotor could occur if rotor is dropped

- d. Carefully insert rotor (6) into motor frame (3)
- e. Carefully work end caps (2) and (9) onto shaft ends keeping the match-marks in alignment.
- f. Install four through bolts ( 1 ) through end caps (2) and (9). Install four lockwashers (7) and end cap nuts (8) and partially tighten.
- g. Before final tightening check freedom of rotation by turning shaft by hand. There should be no drag or binding
- h. Alternately tighten nuts (8) and adjust as necessary.
- i. Check for binding and drag.

FOLLOW ON PROCEDURE

Install evaporator fan and housing assembly (paragraph 4.47).

---

5.7. CONDENSER MOTOR (B3). This task covers disassembly, repair and reassembly.

---

INITIAL SETUP

Tool

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Materials

Grease areoshell 22 (Item 19, Appendix E)

Rags (Item 7, Appendix E)

Corrosion inhibiting compound (Item 12, Appendix E)

Equipment Condition

Remove condenser fan and housing assembly (paragraph 4.50)

---

DISASSEMBLY

- a. Match-mark motor frame (3) and end caps (2) and (9) (see fig. 5-2).
- b. Remove four end cap nuts (8), lockwashers (7), and through bolts ( 1).

**CAUTION**

When removing end caps, rotor will be freed. Damage to rotor could occur if dropped while removing end caps from motor.

- c. Remove end caps (2) and (9).
- d. Identify location of wavy spring washer (13) and two spacer washers (14).
- e. Carefully pull rotor (6) from the motor frame (3).
- f. Carefully remove bearings (5) and (10) from shaft (4).
- g. Examine rotor (6), stator ( 12), and shafts for nicks gouges, deformations, or evidence of overheating.



5.7. CONDENSER MOTOR (B3). Continued

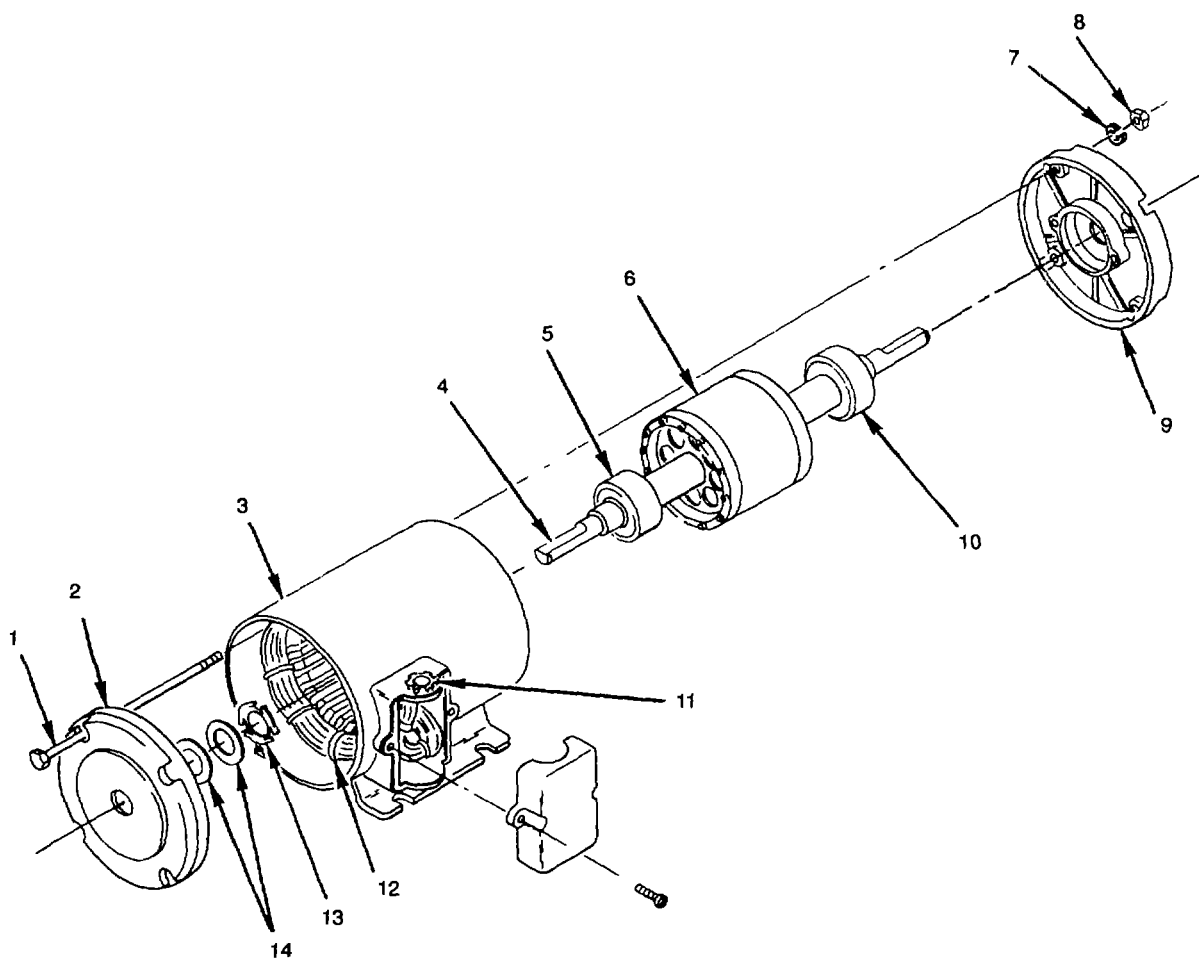


Figure 5-2. Condenser Motor (B3)

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5.7. CONDENSER MOTOR (B3). Continued

---

REPAIR

Dress high metal defects in shaft with a file. If rotor or stator are beyond repair, replace motor.

REASSEMBLY

**NOTE**

When replacement of the motor is necessary, perform the following. Install insulator bushing (11); cut wire leads to 5 inches, strip and dead end wires together for 208 Vac, 3-phase operation; and apply corrosion inhibiting compound to both shafts.

- a. Coat the bearing cavity of end caps (2) and (9) with grease.
- b. Install bearings (5) and (10) onto shaft (4).
- c. Insert wavy spring washer (13) and two spacer washers (14).

**CAUTION**

Damage to rotor could occur if rotor is dropped.

- d. Carefully insert rotor (6) into motor frame (3).
- e. Carefully work end caps (2) and (9) onto shaft ends, keeping the match-marks in alignment.
- f. Install four through bolts (1) through end caps (2) and (9).
- g. Install four lockwashers (7) and end cap nuts (8), and partially tighten.
- h. Before final tightening, check freedom of rotation by turning shaft by hand. There should be no drag or binding.
- i. Alternately tighten nuts (8) and adjust as necessary.
- j. Check for binding and drag.

FOLLOW ON PROCEDURE

Install condenser fan and housing assembly (paragraph 4 50).

---

5 8. REFRIGERATION SYSTEM GENERAL REPAIRS. This task covers service

---

INITIAL SETUP

Tools

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Recovery and recycling unit refrigerant (Item 22 Appendix B)  
Gloves, chemical, (Appendix C)  
Goggles, industrial (Appendix C)

---

**WARNING**

DANGEROUS CHEMICAL (R22) is used in this equipment.

DEATH or severe damage may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible. Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly poisonous and corrosive gas.

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 R-22. Do not let liquid refrigerant touch you, and do not inhale refrigerant gas.

**NOTE**

In accordance with Environmental Protection Agency regulations, refrigerants cannot be discharged into the atmosphere. A refrigerant recovery and recycling unit must be used whenever discharging the refrigerant system.

Operation of the recovery/recycling unit must be by AUTHORIZED PERSONNEL ONLY.

REPAIR

- a. The refrigeration system must be totally discharged before performing any maintenance action that requires opening of the pressurized system (paragraph 5.10).
- b. The drier filter replacement and leak testing are required after any system component has been removed and replaced (paragraphs 5.23 and 5.13).
- c. The system must be evacuated before it is charged (paragraph 5.14).
- d. The system must be properly charged to function properly (paragraph 5.14).

---

5.9. SERVICE MANIFOLD INSTALLATION. This task covers service.

---

**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Gloves, chemical (Appendix C)  
Goggles, industrial (Appendix C)

Personnel: 1

Equipment Conditions

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source, and
  - (2) Remove compressor section panel (paragraph 4 24).
- 

**SERVICE**

**WARNING**

Death or serious injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly poisonous and corrosive gas.

- a. Remove protective caps from compressor high and low pressure service valves (see fig 5-3).
- b. Insure all valves on service manifold are closed, then remove caps from service ports.
- c. Remove blue and red hoses from service manifold hose rack.
- d. Connect blue hose to compressor low pressure (suction) service valve and red hose to compressor high pressure (discharge) service valve.

---

5.9. SERVICE MANIFOLD INSTALLATION. -Continued

---

SERVICE Continued

- e. Open compressor high and low pressure service valves.
- f. Loosen blue hose at compound gauge port and allow refrigerant to purge for 3-5 seconds, then tighten.
- g. Loosen red hose at pressure gauge port and allow refrigerant to purge for 3-5 seconds, then tighten.
- h. The service manifold is now installed, purged and ready for test of maintenance operations.

FOLLOW ON PROCEDURES

- a. When all testing is complete, install compressor section panel (paragraph 4.24).
- b. Connect air conditioner input power at source.

5.9. SERVICE MANIFOLD INSTALLATION.-Continued

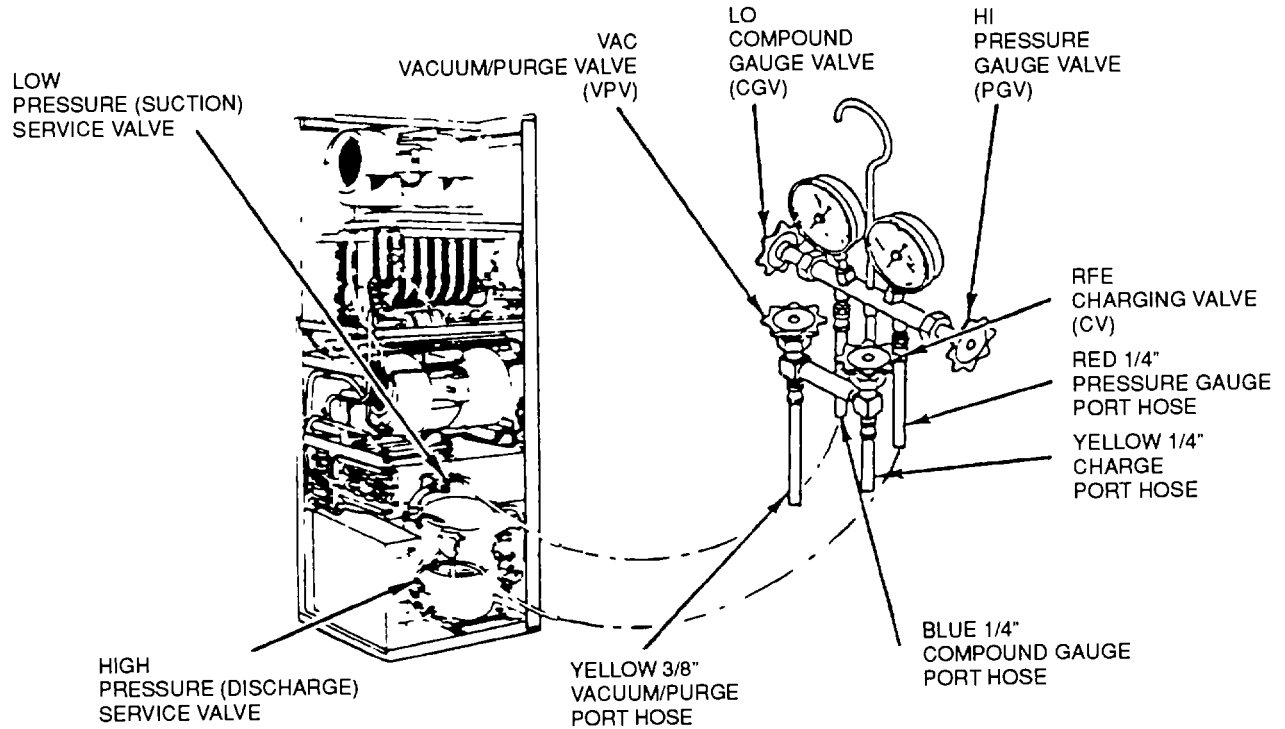


Figure 5-3. Service Manifold Installation

---

5.10. DISCHARGING REFRIGERANT SYSTEM. This task covers service.

---

**INITIAL SETUP**

Tools.

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Recovery and recycling unit, refrigerant (Item 22, Appendix B)  
Pail, utility (Appendix C)  
Gloves, chemical (Appendix C)  
Goggles, industrial (Appendix C)

Personnel. 1

Equipment Condition

Install service manifold (paragraph 5 9).

---

**NOTE**

In accordance with Environmental Protection Agency regulations, refrigerants cannot be discharged into the atmosphere. A refrigerant recovery and recycling unit must be used whenever discharging the refrigerant system.

Operation of the recovery/recycling unit must be by AUTHORIZED PERSONNEL ONLY

**SERVICE**

**WARNING**

Death or serious injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

Prevent contact of refrigerant gas with flame or hot surfaces Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly poisonous and corrosive gas

- a. Connect and operate a recovery/recycling unit in accordance with manufacturer's instructions (see fig. 54).

(

**CAUTION**

Do not permit the oil to escape from the unit. If oil is escaping, close the valve(s) slightly to prevent possible oil loss.

Do not permit the refrigerant to escape fast enough to form ice or frost on either the lines or the valve(s) to prevent possible damage to system

5.11. PURGING REFRIGERANT SYSTEM. This task covers service.

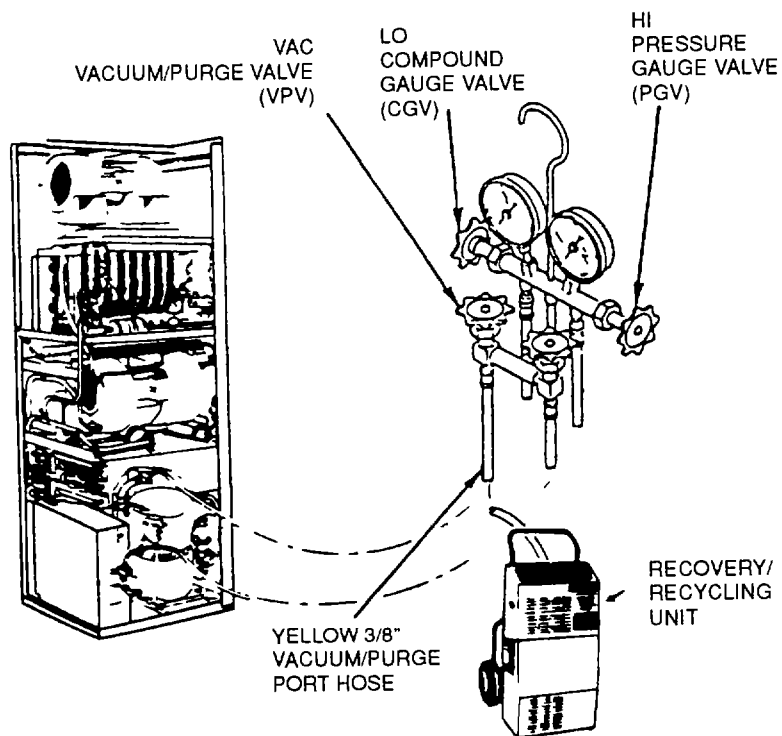


Figure 5-4. Discharging Refrigerant System



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5.11. PURGING REFRIGERANT SYSTEM. This task covers service.

---

INITIAL SETUP

Tools

- Tool kit, service, refrigeration unit (Item 1, Appendix B)
- Gloves, chemical (Appendix C)
- Goggles, industrial (Appendix C)

Personnel: 1

Material:

- Nitrogen, technical (Item 9, Appendix E)

Equipment Conditions.

- (1) Install service manifold (paragraph 5.9); and.
- (2) Discharge refrigerant system (paragraph 5.10).

---

SERVICE

**WARNING**

Death or serious injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly poisonous and corrosive gas.

**CAUTION**

Nitrogen cylinders are pressurized containers. The pressure in the cylinder can exceed 2000 psi. A nitrogen pressure regulator should be used at all times when nitrogen is used for leak check or purge operations. Do not allow nitrogen pressure regulator setting to exceed 200 psig during purging. Nitrogen is an inert gas. However, it also presents danger as a suffocant and, therefore, must also be discharged in a ventilated location.

**NOTE**

The refrigeration system must be purged with dry nitrogen (Item 9, Appendix E), before any brazing or debrazing is performed on any component. A flow of dry nitrogen at the rate of less than 1-2 cfm (0.028-0.057 m<sup>3</sup>/minute) should be continued during all brazing or debrazing operations to minimize internal oxidation and scaling.

5.11. PURGING REFRIGERANT SYSTEM. Continued

- a. If system was pumped down, connect manifold red hose to expansion service valve (V3) in air conditioner (paragraph 5.26).
- b. Connect yellow 1/4-inch (0.64 cm) charging hose (fig. S-S) from charge port to nitrogen regulator and dry nitrogen cylinder.
- c. Loosen low pressure hose (blue) at compound gauge port of service manifold.
- d. Open PGV on service manifold, then open expansion service valve (V3)
- e. Open charging valve (CV) on service manifold
- f. Open the nitrogen cylinder valve and adjust the regulator so that less than 1-2 cfm (0.028-0.057 m<sup>3</sup>/minute) of nitrogen flow rate is established
- g. Check to insure that nitrogen is flowing from loosened hose at compound gauge port of service manifold
- h. Allow nitrogen to sweep through the system for a minimum of 5 minutes before brazing or debrazing operations (paragraph 5.12) are started. Continue sweep during the operation and for 5 minutes after completion.
- i. Close nitrogen cylinder valve, service manifold valves, high and low pressure service valves on the compressor, and expansion service valve (V3).
- j. Disconnect hose from nitrogen regulator and return it to hose rack
- k. Assuming that all repairs are completed, go to Leak Testing Refrigerant System (paragraph 5.13).

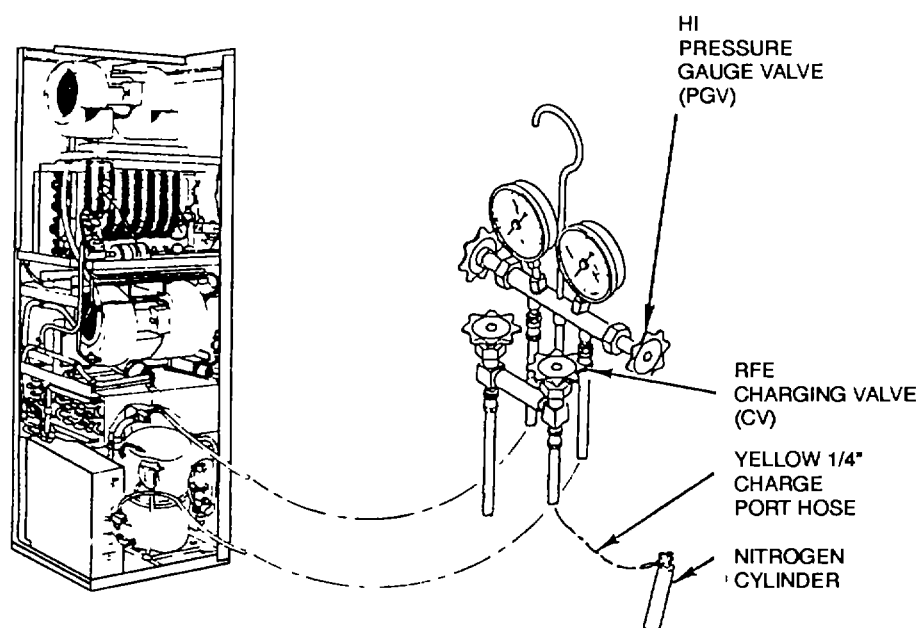


Figure 5-5. Purging Refrigerant System

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5.12. BRAZING/DEBRAZING PROCEDURES. Task covers service.

---

**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Gloves, chemical (Appendix C)

Personnel: 1

Materials:

Rags (Item 7, Appendix E)  
Nitrogen, technical (Item 9, Appendix E)  
Brazing alloy, silver (Item 21, Appendix E)  
Brazing flux (part of Item 1, Appendix B)  
Abrasive cloth (part of Item 1, Appendix B)

Equipment Conditions:

- (1) Discharge refrigerant system (paragraph 5 10), and
  - (2) Purge system with nitrogen (paragraph 5 11)
- 

**SERVICE**

**WARNING**

All refrigerant R-22 must be discharged from the system and the entire system must be purged with dry nitrogen before beginning any debrazing operation.

The polyurethane foam used as insulation in the air conditioner will break down to form toxic gases if exposed to the flame of a torch at brazing temperature.

**NOTE**

Grade IV or VI brazing alloy and Type B flux, as specified in MIL-B-7883, must be used for all copper to brass joints. Grade m brazing alloy may be substituted for Grade IV or VI for copper to copper joints, flux is not required for copper to copper joints.

All tubing in the refrigeration system is seamless copper with a bright internal finish that permits thorough cleaning and prevents entrapment of moisture and other impurities. Rigid grade copper is used for straight sections and soft grade for sections that must be bent. All interconnecting fittings, such as elbows, tees, etc. are also copper. The bodies of all valves and all connections on other components are brass. All Joints, except those provided with flare fittings are made by brazing in accordance with MJL-B-7883, except that radiographic examination is not required.

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5.12. BRAZING/DEBRAZING PROCEDURES. Continued

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**SERVICE** - Continued

- a. Debrazing. Debraze joints for removal of refrigeration system components as follows:
  - (1) Determine which joints are to be debrazed. Due to the limited work space inside the air conditioner it may be more convenient to remove a part of the interconnecting tubing with the component rather than debrazing the joint on the component itself.
  - (2) Before debrazing a joint on a valve disassemble the valve to the extent possible then wrap all but the joint with a wet rag to act as a heat sink.
  - (3) Protect insulation, wiring harnesses cabinet and other surrounding components with appropriate shields.
  - (4) Be sure the work area is well ventilated and that dry nitrogen is flowing through the refrigeration system at a rate of less than 1-2 cfm (0.028-0.057 m<sup>3</sup>/minute) (paragraph 5.11).
  - (5) Apply sufficient heat uniformly around the joint to quickly melt the filler alloy. If heat is applied slowly or only on one side the entire component or length of tubing will be heated and filler alloy in adjacent joints may also be melted. Remove heat as soon as the joint separates.
- b. Cleaning Debrazed Joints. All filler alloy must be cleaned from debrazed joints before reassembly. Heat each piece of the joint until the filler alloy is melted and then wipe it away with a damp cloth. Be sure no filler alloy or other debris is left inside any tubing fitting or component.
- c. Reassembly If tubing sections or fittings were removed with a component debraze them from the component. clean the joints and braze them to the new component before reinstallation.
- d. Brazing. Braze joints within the air conditioner as follows:
  - (1) Position the component to be installed.
  - (2) To prepare a joint on a valve for brazing disassemble the valve to the extent possible then wrap all but the joint with a wet rag to act as a heat sink.
  - (3) Protect insulation wiring harnesses and surrounding components with appropriate shields.
  - (4) Be sure the work area is well ventilated and that dry nitrogen is flowing through the refrigeration system at a rate of less than 1-2 cfm (0.0028-0.057 m<sup>3</sup>/minute).
  - (5) Apply sufficient heat uniformly around the joint to quickly raise it to a temperature that will melt the filler alloy. Remove the heat as soon as brazing is completed.
  - (6) Allow to cool. Reassemble the valve.
- e. Install new drier filter (F1) (paragraph 5.23).
- f. Leak test the repair and surrounding area (paragraph 5 13).

5.13. LEAK TESTING REFRIGERANT SYSTEM. Thus task covers service.

---

INITIAL SETUP

Tools:

Tool kit, service refrigeration unit (Item 1, Appendix B)  
Leak detector (part of Item 1, Appendix B)  
Gloves, chemical (Appendix C)  
Goggles, industrial (Appendix C)

Personnel: 1

Materials:

Nitrogen, technical (Item 9, Appendix E)  
Rags (Item 7, Appendix E)  
Refrigerant-22 (Item 6, Appendix E)

Equipment Conditions

- (1) Install service manifold (paragraph 5 9), and
  - (2) Install R-22 refrigerant cylinder (paragraph 5.15, Step d).
- 

SERVICE

**WARNING**

Death or serious injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

Prevent contact of refrigerant gas with flame or hot surfaces Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly poisonous and corrosive gas.

**CAUTION**

Nitrogen cylinders are pressurized containers. The pressure in the cylinder can exceed 2000 psig. A nitrogen pressure regulator should be used at all times when nitrogen is used for leak check or purge operations. Do not allow nitrogen pressure applied to unit to exceed 300 psig during leak testing.

Nitrogen is an inert gas. However, it also presents danger as a suffocant and, therefore, must also be discharged in a ventilated location.

---

5.13. LEAK TESTING REFRIGERANT SYSTEM-Continued

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**SERVICE** - continued

**NOTE**

The entire repaired area should be thoroughly leak tested after repair or replacement of any component before it is recharged with refrigerant-22. Leak testing is also the method for troubleshooting when a system has lost all or part of its refrigerant charge through an undetermined cause.

- a. Open compound and pressure gauges on service manifold. If system pressure is 50 psig or higher, proceed to Step 1, if not, continue with Step b.
- b. Open CV and PGV and allow refrigerant to enter system until compound and pressure gauges indicate a minimum pressure of 50 psig then close CV.
- c. Close R-22 refrigerant cylinder valve and remove yellow manifold hose.
- d. Install nitrogen cylinder (paragraph 5 11).
- e. Open nitrogen cylinder valve and adjust regulator to a pressure 10 psi greater than system pressure.
- f. Loosen 1/4-inch (0.64 cm) yellow hose at charge port and purge for 3-5 seconds, then tighten.
- g. Open charge valve and adjust nitrogen regulator to slowly raise compound and pressure gauge reading to 300 psig.
- h. Using a halon leak detector, check all fittings, connections and components in surrounding area for leaks. Insure pressure remains at 300 psig, add more nitrogen if necessary.
- i. Close CV and nitrogen cylinder valve. Remove yellow hose from nitrogen regulator and connect to service manifold hose rack.
- j. Always perform a final leak test before the air conditioner is reassembled and the refrigeration system is evacuated and charged.

---

5.14. EVACUATING REFRIGERANT SYSTEM. This task covers service.

---

INITIAL SETUP

Tools

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Pump, vacuum (part of Item 1, Appendix B)  
Goggles, industrial (Appendix C)  
Gloves, chemical (Appendix C)

Personnel: 1

Materials:

Refrigerant R-22 cylinder (Item 6, Appendix E)  
Rags (Item 7, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; end
- (2) Install service manifold (paragraph 5.9),

---

SERVICE

**WARNING**

Death or serious injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly poisonous and corrosive gas.

**CAUTION**

Do not evacuate a leaking system. The vacuum created can cause air, moisture, and dirt to enter system.

---

5.14. EVACUATING REFRIGERANT SYSTEM. Continued

---

**SERVICE** - continued

**NOTE**

The refrigeration system must be evacuated to remove all moisture before it is charged with refrigerant R-22. Check that system was leak tested and has NO LEAKS (paragraph 5.13).

If compressor was replaced as result of a burnout, check that compressor burnout procedures were followed (paragraph 5.37).

- a. Check that new drier filter was installed. If not, install one (paragraph 5.23).
- b. Check that both charging manifold valves are closed
- c. Remove yellow 3/8-inch (0.95 cm) hose from hose rack and connect to vacuum pump
- d. Remove 1/4-inch (0.64 cm) yellow hose from hose rack and connect to R-22 refrigerant cylinder positioned for dispensing gas.
- e. Open R-22 refrigerant cylinder. Loosen 1/4 inch (0.64 cm) yellow hose at charge port and purge for 3-5 seconds, then tighten.
- f. Open VPU CGV, and PGV.
- g. Start vacuum pump and open ballast valve (on vacuum pump) one turn.
- h. Observe vacuum pump gauge for a reading of 29-30 inches of Hg,
- i. Close VPV and open CV and add refrigerant until compound and pressure gauges read approximately 2 psig (4.41 kg), then close CV.
- j. Stop vacuum pump and close ballast valve.
- k. Allow refrigerant to remain in system for 1 hour.

**NOTE**

Refrigerant will act as a blotter for moisture. One hour is recommended time for maximum moisture removal. Shorter blotting period can be used if it is known that system is relatively dry.

- l. Open VPV.
- m. Repeat Steps g through k.
- n. Open VPV.
- o. Repeat Steps j and k.
- p. Close VPV and CGV.
- q. Stop vacuum pump.
- r. Disconnect hose from vacuum pump and return it to racks. Charge refrigeration system (paragraph 5.15).



5 15. CHARGING REFRIGERANT SYSTEM. This task covers service.

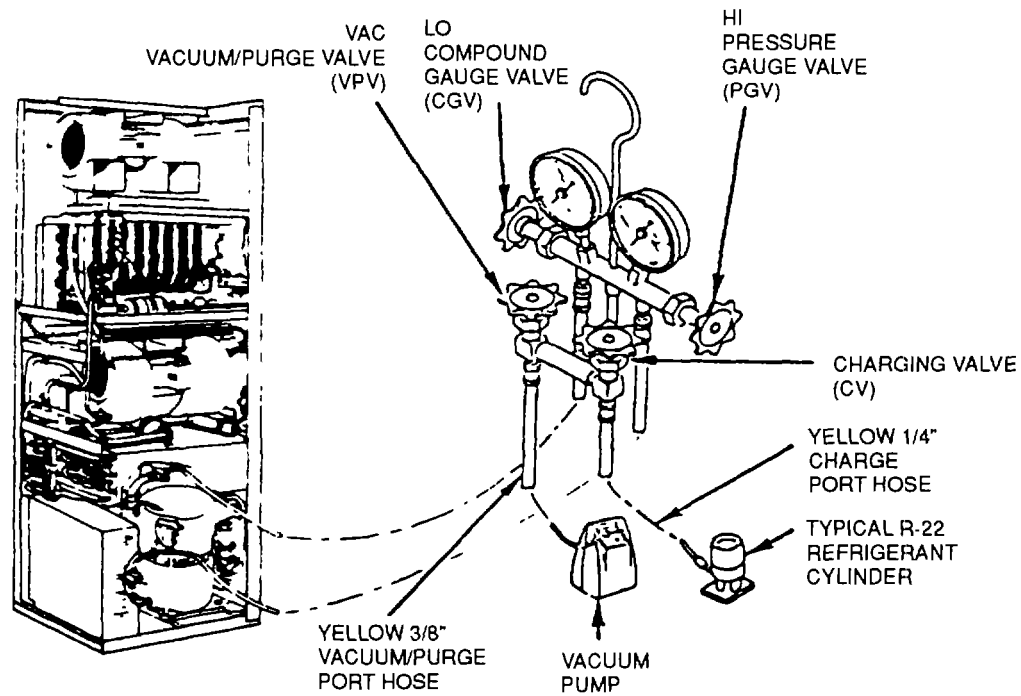


Figure 5-6. Evacuating Refrigerant System

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5 15. CHARGING REFRIGERANT SYSTEM. This task covers service.

---

INITIAL SETUP

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Recovery and recycling unit, refrigerant (Item 22, Appendix B)  
Goggles, industrial (Appendix C)  
Gloves, chemical (Appendix C)

Personnel. 1

Materials:

Refrigerant R-22 cylinder (Item 6, Appendix E)  
Rags (Item 7, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source;
- (2) Evacuate refrigerant system (paragraph 5.14); and
- (3) Remove return air filter (paragraph 4.26)

SERVICE

**WARNING**

Death or serious injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly poisonous and corrosive gas.

- a. After system has been satisfactorily evacuated, it must be fully charged with R-22 refrigerant

5 15. CHARGING REFRIGERANT SYSTEM. Continued

SERVICE - Continued

**CAUTION**

Never introduce liquid refrigerant into the low pressure (suction' service) valve  
Compressor damage may result The system must be evacuated before charging Use  
only R-22 refrigerant to charge unit.

**NOTE**

The system must be evacuated before charging. Whenever available, use recycled  
refrigerant for charging the refrigeration system.

- b. Check that service manifold is connected (paragraph 5.9).
- c. Check that 1/4-inch (0.64 cm) yellow hose is connected to R-22 refrigerant cylinder
- d. Position R-22 refrigerant cylinder so that liquid will be dispensed.
- e. Place cylinder on accurate scale, measure and record weight of cylinder.
- f. Open CV, VPV, and CGV Allow liquid refrigerant to enter system until the cylinder weight has decreased by 12 pounds (9.99 kg) or until system pressure has equalized with cylinder pressure g Close PGV.

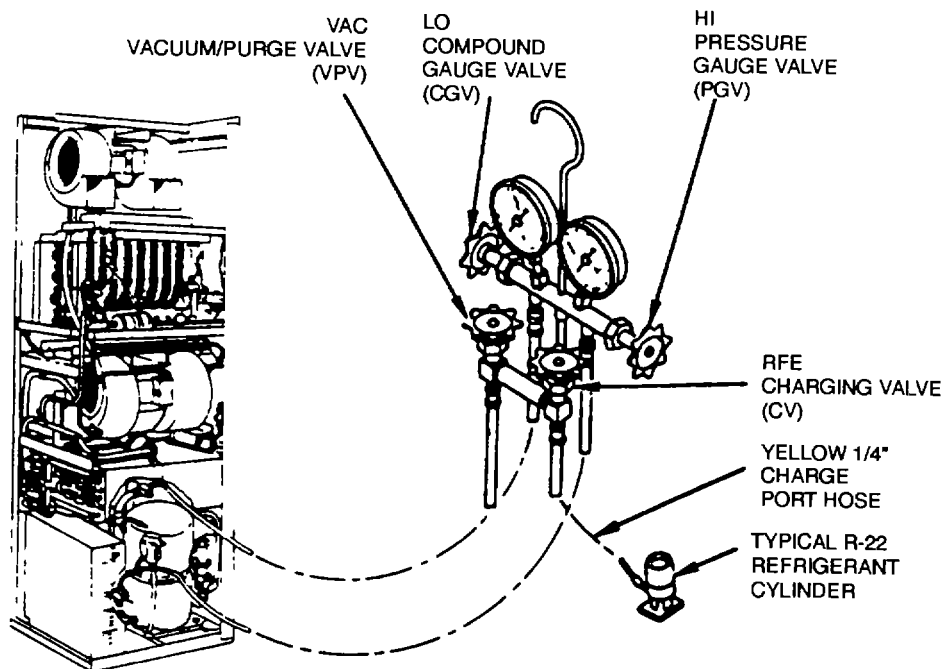


Figure 5-7. Charging Refrigerant System

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5 15. CHARGING REFRIGERANT SYSTEM. Continued

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**SERVICE** - continued

**NOTE**

If system pressure equalized prior to admitting a complete charge, proceed to Step h.

- h. Position refrigerant cylinder so that gas only will be dispensed.
- i. If air conditioner is set up for single mode of operation, proceed to Steps J and k if air conditioner is set up for remote operation, proceed to Step k.
- j. Set thermostat (S2) to lowest temperature setting (paragraph 4.54).
- k. Connect air conditioner input power at source
- l. Start air conditioner in COOL mode
- m. Open CGV when complete charge weight has been admitted
- n. Close CGV and monitor weight of refrigerant cylinder as compressor draws additional refrigerant into system
- o. Perform pressure check and repeat Steps m and n, if necessary (paragraph 5.16)
- p. After 15 minutes, observe sight glass (paragraph 5.24).
  - (1) Milky white or bubbly liquid means system has a low charge

**NOTE**

Bubbles may be visible at temperatures less than 70°F (21 °C) or greater than 100 °F (38 °C).

- (2) Clear bubble-free liquid means system is fully charged.
- q. If charge is low, add gas refrigerant.
  - (1) Be sure that drum is switched to gas positron.
  - (2) Open CGV.
  - (3) Continue to charge until sight glass is clear and bubble free.
  - (4) Close CGV.
- r. Check air conditioner for proper cooling. There should be at least a 15 temperature difference between evaporator discharge air and inlet air.

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5 15. CHARGING REFRIGERANT SYSTEM. Continued

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**SERVICE** -Continued

- s. Turn MODE SELECT switch to OFF
- t. Disconnect air conditioner input power at source
- u. Close all manifold valves.
- v. Install compressor section panel (paragraph 4.24).
- x. Install return air filter (paragraph 4.26).
- y. Connect air conditioner input power at source
- z. Set MODE SELECT switch for current configuration.

---

5.16. REFRIGERANT PRESSURE CHECK. This task covers service.

---

INITIAL SETUP

Tools

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Gloves, chemical (Appendix C)  
Goggles, industrial (Appendix C)

Personnel: 1

SERVICE

**WARNING**

Death or serious injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly poisonous and corrosive gas.

- a. Except in cases where it is obvious that the refrigerant charge has been lost, the first step in troubleshooting problems in the refrigeration system should be to check discharge and suction pressures under operating conditions.
- b. Check pressures as follows:
  - (1) Turn MODE SELECT switch to OFF
  - (2) Connect service manifold (paragraph 5.9).
  - (3) Open CGV and PGV. Both manifold gauges should read the same. Check the reading with the appropriate column in table 5-1. If the system is even partially charged, the pressure should be approximately equal to that shown in the table for the appropriate ambient temperature. If the pressure is considerably less than shown in the table, the system does not contain enough refrigerant to continue the pressure check, go to leak testing (paragraph 5.13).

5.16. REFRIGERANT PRESSURE CHECK. Continued

**Table 5-1 Pressure-Temperature Relationship of Saturated R-22 Refrigerant**

Temperature		Pressure		Temperature		Pressure	
Deg F	Deg C	Psig	kg/cm <sup>2</sup>	Deg F	Deg C	Psig	kg/cm <sup>2</sup>
10	-12.3	32.93	2.315	50	10.0	84.70	5.955
12	-11.1	34.68	2.439	52	11.1	88.10	6.257
14	-10.0	36.89	2.593	54	12.2	91.50	6.443
16	-8.9	38.96	2.739	56	13.3	95.10	6.686
18	-7.6	41.09	2.889	58	14.5	98.80	6.947
20	-6.6	43.28	3.043	60	15.6	102.5	7.206
22	-5.5	45.23	3.180	62	16.7	106.3	7.474
24	-4.3	47.85	3.364	64	17.8	110.2	7.748
26	-3.4	50.24	3.532	66	18.9	114.2	8.029
28	-2.2	52.70	3.705	68	20.0	118.3	8.318
30	-1.1	55.23	3.883	70	21.1	122.5	8.612
32		57.83	4.066	72	22.2	126.8	8.915
34	1.1	60.51	4.254	74	23.3	131.2	9.225
36	2.2	63.27	4.448	76	24.4	135.7	9.541
38	3.3	66.11	4.648	78	25.6	140.3	9.864
40	4.4	69.02	4.853	80	26.7	145.0	10.195
42	5.5	71.99	5.062	82	27.8	149.8	10.522
44	6.6	75.04	5.276	84	28.9	154.7	10.877
46	7.7	78.18	5.497	86	30.0	159.8	11.236
48	8.8	81.40	5.723	88	31.1	164.9	11.594

5.16. REFRIGERANT PRESSURE CHECK. Continued

**Table 5-1. Pressure-Temperature Relationship of Saturated R-22 Refrigerant-Continued**

Temperature		Pressure		Temperature		Pressure	
Deg F	Deg C	Psig	kg/cm <sup>2</sup>	Deg F	Deg C	Psig	kg/cm <sup>2</sup>
90	32.2	170.1	11.960	110	43.3	228.7	16.080
92	33.3	175.4	12.332	112	44.4	235.2	16.537
94	34.5	180.9	12.719	114	45.6	241.9	17.008
96	35.6	186.5	13.113	116	46.7	248.7	17.486
98	36.7	192.1	13.506	118	47.8	255.6	17.971
100	37.8	197.9	13.914				
102	38.9	203.8	14.329				
104	40.0	209.9	14.758				
106	41.1	216.0	15.187				
108	42.2	222.3	15.630				

**SERVICE** - continued

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance or adjusting thermostat. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (4) Adjust control thermostat to lowest temperature setting (paragraph 4.54)
- (5) Connect air conditioner Input power at source.
- (6) Turn MODE SELECT switch to COOL mode.
- (7) With unit operating, allow manifold gauges to stabilize Take readings of the two gauges.



---

5.16. REFRIGERANT PRESSURE CHECK. Continued

---

**SERVICE** - Continued

(a) If discharge and suction pressures are at, or near, same value, a pressure equalizer solenoid valve malfunction or an internal compressor failure is indicated

(b) If discharge pressure is low and suction pressure is normal (see table 5-2), a low refrigerant charge is indicated.

(c) If discharge pressure is normal and suction pressure is either high or low, failure or maladjustment of the pressure regulator valve or expansion valve is indicated.

(d) If discharge pressure is high and suction pressure is normal, a malfunction of the condenser fan, refrigerant overcharge, or clogged filter drier is indicated.

(8) When pressure tests are completed, proceed with maintenance action indicated.

(9) Turn MODE SELECT switch to OFF

(10) Disconnect air conditioner input power at source.

(11) Remove service manifold hoses from service valves.

(12) Install protective caps (paragraph 5.9) to high (discharge) and low pressure (suction) service valve stems

5.16. REFRIGERANT PRESSURE CHECK. Continued

**Table 5-2. Normal Operating Pressures (in full cooling mode)**

Temperature	Pressure Range (psig)			
Outdoor ambient 90°F (32 °C)	50°F (10°C) 52-62	75°F (24°C) 57-67	100 °F (38 °C) 66-76	120 °F (49 °C) 74-84
Return air to unit (dry bulb)	suction 175-195	suction 235-255	suction 300-320	370-390
80°F (27°C)	discharge 47-57	discharge 53-63	discharge 60-70	discharge 70-80
Return air to unit (dry bulb)	suction 165-185	suction 215-235	suction 290-310	360-380
	discharge	discharge	discharge	discharge

---

5 17. DISCHARGING COMPRESSOR. This task covers service

---

**INITIAL SETUP**

Tools

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Gloves, chemical (Appendix C)  
Goggles, industrial (Appendix C)

Personnel: 1

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL Shutting the unit off at the control panel does not disconnect unit power

- (1) Disconnect air conditioner input power at source, and
- (2) Remove compressor section panel (paragraph 4 24)

---

**SERVICE**

**WARNING**

Death or serious injury may result if personnel fail to observe safety precaution;. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly poisonous and corrosive gas.

- a. Remove discharge and suction gauge caps.
- b. Connect service manifold high pressure hose (red) to compressor discharge valve.
- c. Connect service manifold low pressure hose (blue) to compressor suction valve.
- d. Frontseat (clockwise) compressor suction service valve.
- e. Frontseat (clockwise) compressor discharge service valve.
- f. Discharge compressor (paragraph 5.10, Steps 2-6).
- g. Remove service manifold hoses from compressor.

---

5.18. PURGING COMPRESSOR. This task covers service

---

**INITIAL SETUP**

Tools:

Tool kit, service. refrigeration unit (Item 1, Appendix B)  
Gloves, chemical (Appendix C)  
Goggles, industrial (Appendix C)

Personnel: 1

Equipment Conditions.

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
- (2) Remove compress section panel (paragraph 4.24).

---

**SERVICE**

**WARNING**

Death or serious injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly poisonous and corrosive gas.

- a. Remove discharge and suction gauge port caps.
- b. Check that discharge and suction valves are frontseated (clockwise).
- c. Connect service manifold low pressure hose (blue) to compressor suction valve gauge port,
- d. Connect service manifold yellow 1/4-inch (0.64 cm) hose to R-22 refrigerant cylinder.
- e. Open low side valve and let refrigerant flow out discharge valve port for 30 seconds.
- f. Turn charging cylinder valve to reduce pressure of escaping refrigerant.
- g. Replace discharge valve port cap while refrigerant is escaping

5.18. PURGING COMPRESSOR - Continued

SERVICE - continued

- h. Backseat (counterclockwise) suction and discharge service valves (see fig. 5-27)
- i. Remove service manifold suction hose (blue) from suction valve gauge port
- j. Install suction valve protective caps

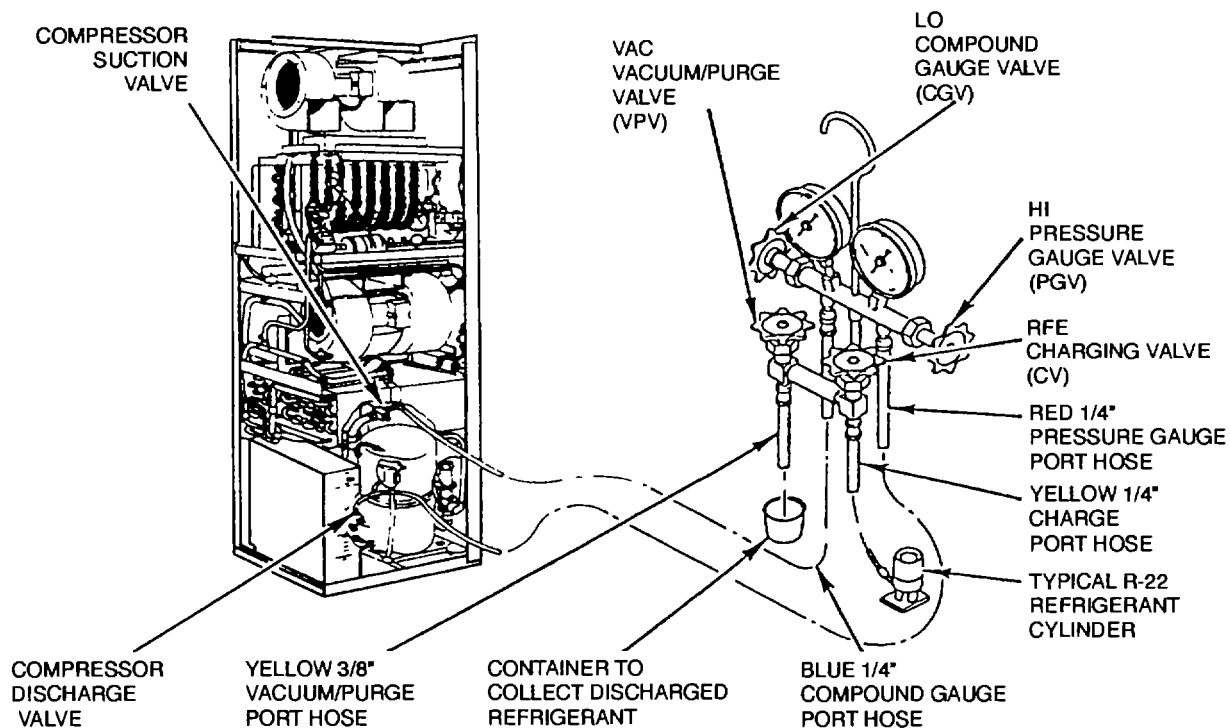


Figure 5-9. Purging Compressor

---

5.19. PUMP DOWN This task covers service

---

**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Gloves, chemical (Appendix C)  
Goggles, industrial (Appendix C)

Personnel. 1

Equipment Condition.

Remove compressor section panel (paragraph 4 24)

---

**SERVICE**

- a. Turn MODE SELECT switch to OFF
- b. Remove suction, discharge, receiver, and hot gas bypass protective caps.
- c. Backseat (counterclockwise) suction and discharge valves

**WARNING**

Death or serious injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and Reversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

- d. Connect service manifold to compressor suction and discharge valve (paragraph NO TAG, Steps c and d).
- e. Crack suction valve so gauge will function.
- f. Frontseat (clockwise) receiver service valve (paragraph 5 27) and bypass service valve (paragraph 5 25)

(

**CAUTION**

Never pump the system down below 1 to 2 lbs. gauge pressure. A slight positive pressure should always be left in the system. This prevents air and system damaging moisture from being drawn in through very small leaks.

Never pump the system down to a vacuum and then open to atmosphere. A vacuum in the lines, when opened, would fill the system with air carrying undesirable amounts of moisture into the system.

---

5 19. PUMP DOWN-Continued

---

**SERVICE** - continued

- g. Turn MODE SELECT switch to COOL mode
- h. The compressor will operate until the low pressure cutout shuts off the compressor
- i. The compressor will stand idle for a few minutes. During this time, pressure in the system may build up again due to refrigerant remaining in the crankcase oil. If the pressure builds up, let the compressor run to low pressure cutout. Allow the compressor to pump down until the pressure no longer builds up.
- J. Frontseat (clockwise) compressor discharge valve.
- k. Turn MODE SELECT ACT switch to OFF.

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance or adjusting thermostat. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- 1. Disconnect air conditioner input power at source.
- m. Open manifold VPV and let remaining refrigerant escape.
- n. Purge low side of system (paragraph 5.11).

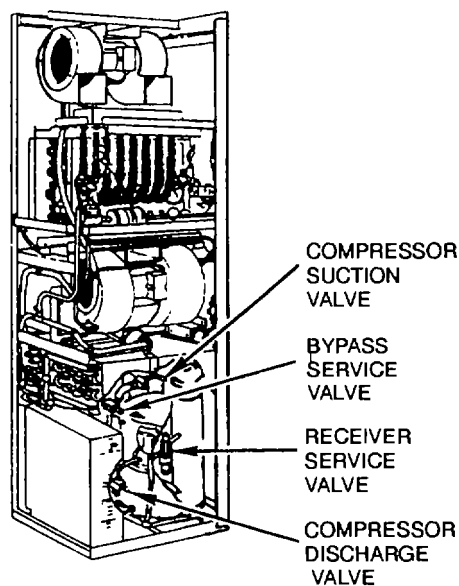


Figure 5-10. Pump Down

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5.20. START UP AFTER REPAIRS. This task covers service.

---

**INITIAL SETUP**

Tools

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Gloves, chemical (Appendix C)  
Goggles, industrial (Appendix C)

Personnel: 1

Equipment Conditions

- (1) Replacement part has been leak-tested per paragraph 5.13; and
- (2) Remove compressor section pane' (paragraph 4.24).

**SERVICE**

**WARNING**

Death or serious injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

- a. Remove discharge and suction gauge caps
- b. Connect high pressure hose (red) to compressor discharge valve.
- c. Connect low pressure hose (blue) to compressor suction valve
- d. Remove yellow 3/8-inch hose (fig 54) end from hose rack and place in container.
- e. Open CGV and PGV
- f. Check that compressor discharge service valve is frontseated (clockwise).
- g. Backseat (counterclockwise) compressor suction valve.
- h. Open receiver service valve (slowly) to allow liquid refrigerant to enter system (see fig. 5-18).
- i. Slowly open CV and allow refrigerant to flow out into container (30 seconds to 1 minute) until system is purged.
- j. Backseat (counterclockwise) bypass service valve (see fig. 5-16)
- k. Backseat (counterclockwise) compressor discharge valve



## 5.20. START UP AFTER REPAIRS-Continued

### SERVICE - continued

1. Remove red and blue manifold hoses from valves
- m. Install discharge, suction, receiver, and bypass service valve protective caps

### FOLLOW ON PROCEDURES

## WARNING

Personnel injury and/or equipment damage may result if compressor is started when service valves are not in a backseated (counterclockwise) position.

- a. Connect air conditioner input power at source.
- b. Check that new drier filter was installed. If not, install one (paragraph 5.23).
- c. Check supply of refrigerant in system (paragraph 5.15).
- d. Check that return air filter is installed (paragraph 4.26).
- e. Check that condenser fan section panel is installed (paragraph 4.23).
- f. Check that evaporator duct/panel is installed (paragraph 4.22).
- g. Check that compressor section panel was installed (paragraph 4.24).
- h. Return air conditioner to normal operation.

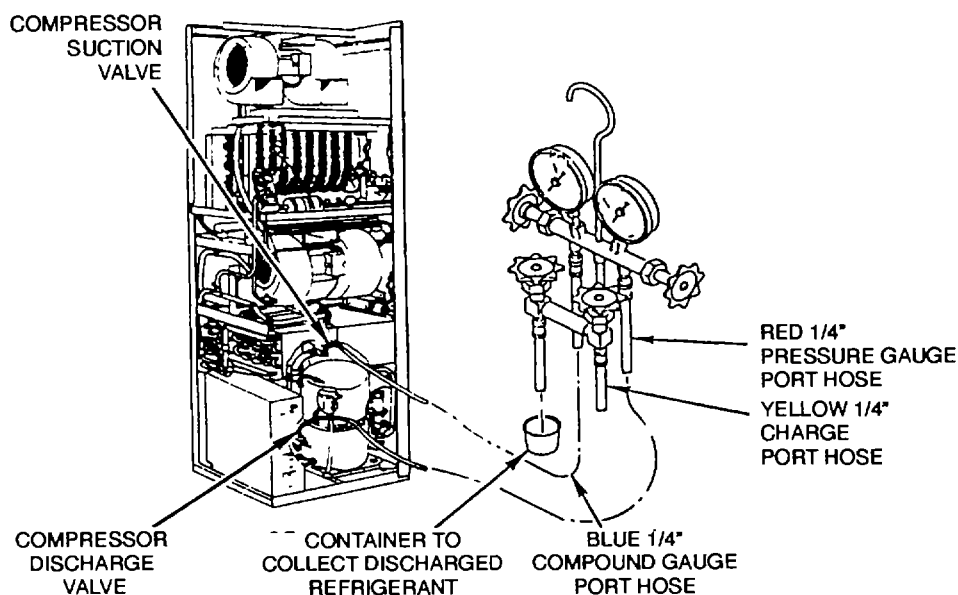


Figure 5-11. Start Up After Repairs

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5.21. HIGH REFRIGERANT PRESSURE SWITCH (S5). This task covers inspection, removal, testing/adjustment and installation

---

**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Drill, electric, portable (Item 2, Appendix B)  
Drill set, twist (Item 3, Appendix B)

Personnel: 1

Materials:

Rags (Item 7, Appendix E)  
Nitrogen, technical (Item 6, Appendix E)  
Varnish, moisture and fungus resistant (Item 11, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source,
- (2) Remove compressor section panel (paragraph 4.24), and
- (3) Discharge compressor (paragraph 5.17)

---

**INSPECTION**

- a. Check that switch and cover are not dented, broken or cracked. Replace switch and cover if defective (see fig. 5-12).
- b. Check bracket is not dented, broken or cracked. Replace bracket if defective.
- c. Check that wire leads are properly connected (see fig. FO-2.)

**REMOVAL**

- a. Remove cover (11)
- b. Tag and disconnect leads
- c. Disconnect high refrigerant pressure line (1).
- d. Remove screw (5), two flat washers (3), locknut (4), and clamp (2)
- e. Remove two screws (8), flat washers (6), and lockwashers (7)
- f. Remove switch (9)

5.21. HIGHER REFRIGERANT PRESSURE SWITCH (S5). - Continued

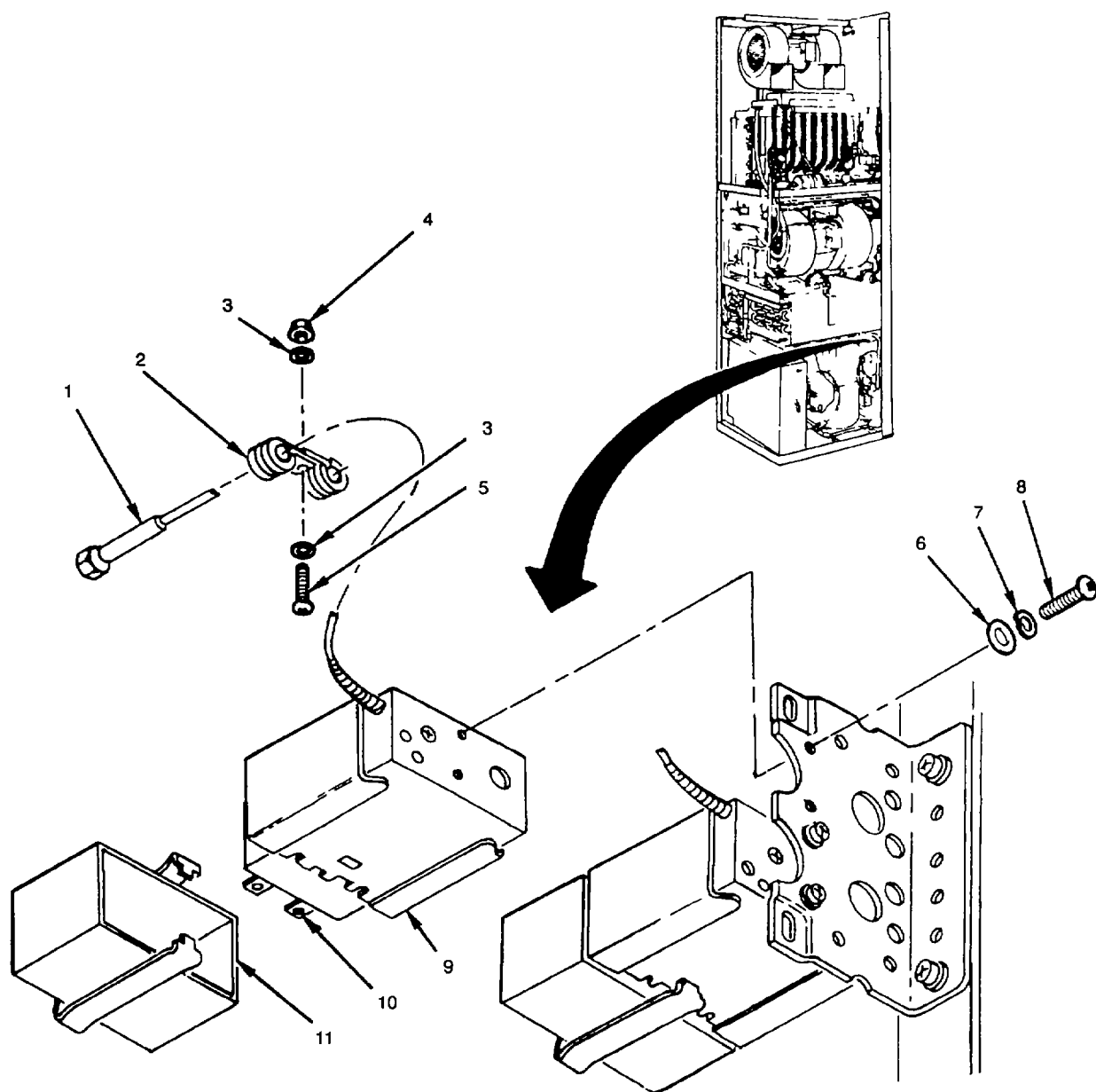


Figure 5-12. High Refrigerant Pressure Switch (S5)

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5.21. GRANT PRESSURE SWITCH (S5).- Continued

---

TESTING/ADJUSTMENT

- a. Using multimeter, check continuity between two lead terminals (10) If continuity is indicated (switch closed), switch is defective Replace switch.
- b. Connect service manifold blue hose to nitrogen cylinder
- c. Connect yellow 114-mch (0.64 cm) hose to pressure line (1)
- d. Using multimeter, switch shall close at 425 to 475 psig (30 to 33 kg/cm<sup>2</sup>) and open at 335 to 385 psig (24 to 27 kg/cm<sup>2</sup>).
- e. If switch cannot be adjusted to ranges in Step d, replace switch

INSTALLATION

- a. Drill three 5/32-inch holes in replacement switch terminals (10).
- b. Fungus proof switch per MIL-V-173.
- c. Place switch (9) in mounting position.
- d. Install two screws (8), lockwashers (7), and flat washers (6).
- e. Install clamp (2) with screw (5), two flat washers (3), and locknut (4).
- f. Install high refrigerant pressure line (1).
- g. Reconnect wire leads and remove tags.
- h. Install cover (11).

FOLLOW ON PROCEDURES

- a. Purge compressor (paragraph 5.18)
- b. Leak test all newly connected joints and those in the repair area (paragraph 5.13).
- c. Connect air conditioner input power at source
- d. Check refrigerant level and charge if necessary (paragraph 5.15).
- e. Install compressor section panel (paragraph 4.24)

5.22. LOW REFRIGERANT PRESSURE SWITCH (S4). This task covers inspection, removal, testing/adjustment and installation

---

#### INITIAL SETUP

##### Tools

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Drill, electric, portable (Item 2, Appendix B)  
Drill set, twist (Item 3, Appendix B)

Personnel 1

##### Materials.

Rags (Item 7, Appendix E)  
Nitrogen, technical (Item 6, Appendix E)  
Varnish, moisture and fungus resistant (Item 11, Appendix E).

##### Equipment Conditions:

#### WARNING

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source,
- (2) Remove compressor section panel (paragraph 4.24), and
- (3) Discharge compressor (paragraph 5.17)

#### INSPECTION

- a. Check that switch and cover are not dented, broken or cracked. Replace switch and cover if defective (see fig. 5-13).
- b. Check that bracket is not dented, broken or cracked. Replace bracket if defective.
- c. Check that wire leads are properly connected (see fig. FO-2.)

#### REMOVAL

- a. Remove cover (6).
- b. Tag and disconnect leads.
- c. Disconnect high refrigerant pressure line (9).
- d. Remove two screws (7), four flat washers (8), two locknuts (11), and two clamps (10).
- e. Remove two screws (3), flat washers (2), and lockwashers (1).
- f. Remove switch (4).

5.22. LOW REFRIGERANT PRESSURE SWITCH (S4) - Continued

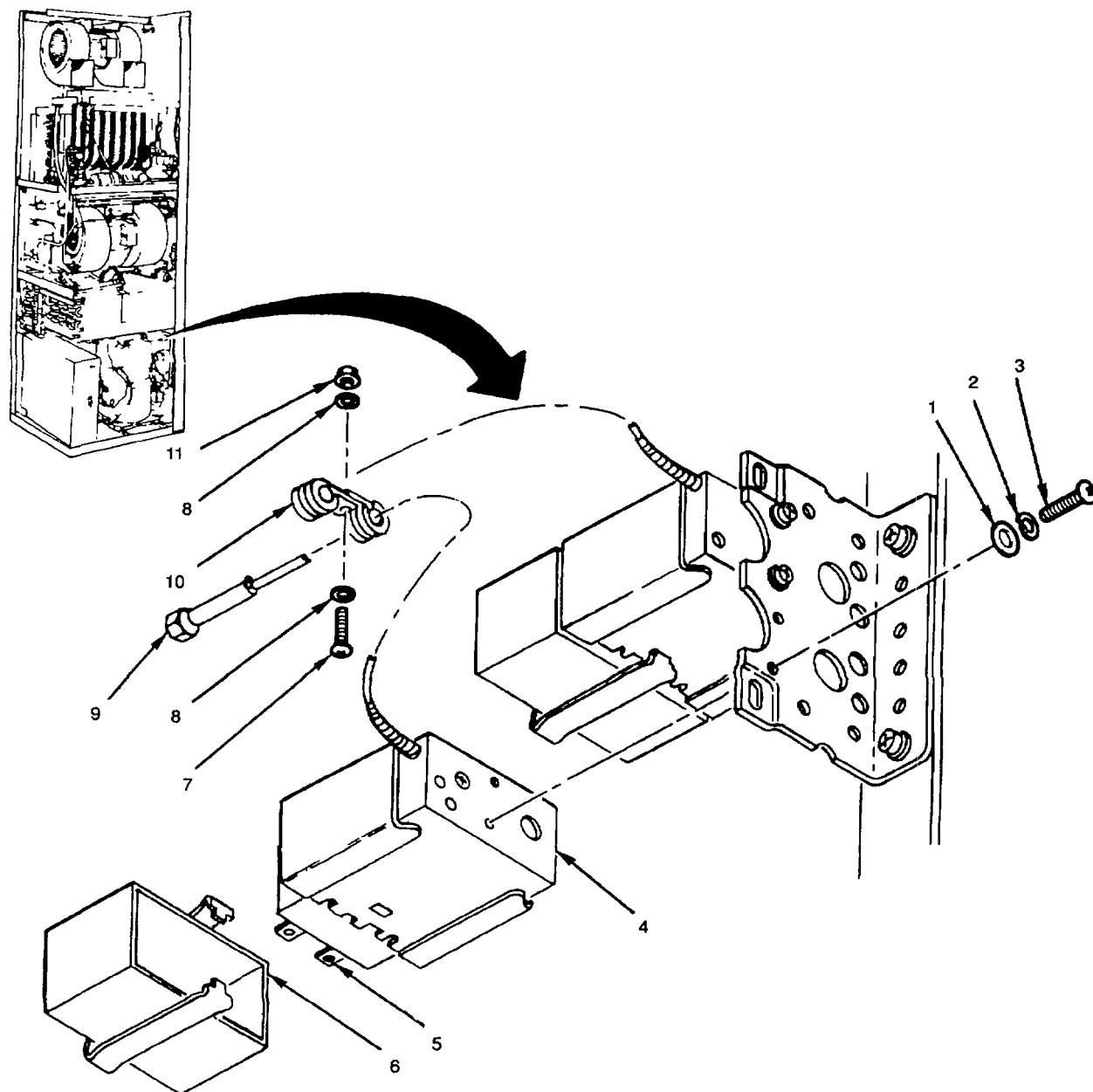


Figure 5-13. Low Refrigerant Pressure Switch (S4)

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5 22. LOW REFRIGERANT PRESSURE SWITCH (S4).-Continued

---

TESTING/ADJUSTMENT

- a. Using multimeter check continuity between two lead terminals (5). If continuity is indicated (switch closed), switch is defective Replace switch
- b. Connect service manifold blue hose to nitrogen cylinder
- c. Connect yellow 1/4-inch (0 64 cm) hose to low refrigerant pressure line (9)
- d. Using multimeter, switch should close at 15 to 25 psig (1 to 1 8 kg/cm<sup>2</sup>) and open at 35 to 45 prig (2 5 to 3.2 kg/cm<sup>2</sup>),
- e. If switch cannot be adjusted to ranges in Step d, replace switch.

INSTALLATION

- a. Drill three 5/32-inch holes in replacement switch terminals (5).
- b. Fungus proof switch per ~L-V-173.
- c. Place switch (4) in mounting position.
- d. Install two screws (3), lockwashers (2), and flat washers (1)
- e. Install two clamps (10) with two screws (7), four flat washers (8), and two locknuts (11)
- f. Install low refrigerant pressure line (9) to compressor
- g. Reconnect wire leads and remove tags.
- h. Install cover (6).

FOLLOW ON PROCEDURES

- a. Connect air conditioner input power at source
- b. Purge compressor (paragraph 5.18).
- c. Leak test all newly connected joints and those in the repair area (paragraph 5.13).
- d. Check refrigerant level and charge if necessary (paragraph 5.15)
- e. Install compressor section panel (paragraph 4.24).

---

5 23. DRY FILTER (F1) (DEHYDRATOR). This task covers inspection, removal and installation.

---

#### INITIAL SETUP

Tool:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel 1

Equipment Conditions.

#### **WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source;
- (2) Remove return air filter (paragraph 4 26); and
- (3) Pump down refrigerant system (paragraph 5.19).

**INSPECTION** (see fig. 5-14)

If a leak is suspected or indicated, test per paragraph 5.13.

#### REMOVAL

- a. Remove two flarenuts (1)
- b. Remove screw (4), locknut (5), clamp (3), and drier filter (2).

#### INSTALLATION

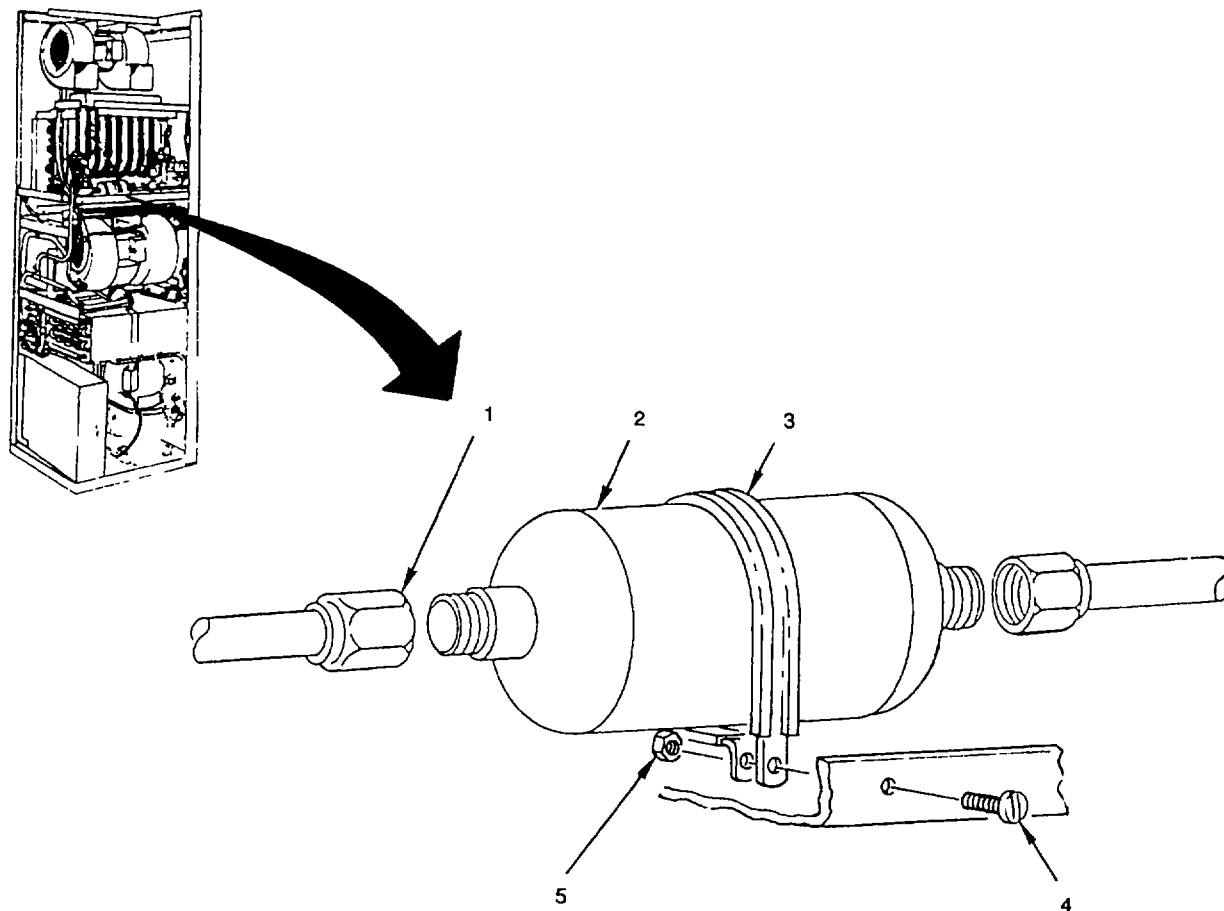
- a. Position drier filter (2) with arrow pointing towards sight glass.
- b. Install screw (4), clamp (3), locknut (5), and drier filter (2)
- c. Install and tighten two flarenuts (1)
- d. Leak test all newly connected Joints and those m the repair area (paragraph 5.13)



5.23. DRIER FILTER (F1) (DEHYDRATOR). - Continued

**FOLLOW ON PROCEDURES**

- a. Perform startup after repairs (paragraph 5.20).
- b. Install return air filter (paragraph 4.26).
- c. Connect air conditioner input power at source.



**Figure 5-14. Drier Filter (F1) (Dehydrator)**

---

5.24. SIGHT REFRIGERANT GLASS. This task covers inspection, repair, removal and installation.

---

#### INITIAL SETUP

Tool

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Equipment Conditions:

#### **WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source;
- (2) Remove return air filter (paragraph 4 26); and
- (3) Pump down refrigerant system (paragraph 5.19).

---

#### INSPECTION

- a. Aspect for evidence of leaks or damaged lines (see fig. 5-15).
- b. If a leak is suspected or indicated, test per paragraph 5.13.

#### REPAIR

Repair of the sight refrigerant glass consists of tightening the sight glass.

#### REMOVAL

- a. Remove plastic cover (3)
- b. Debraze tubing at joints (1) (paragraph 5.12)
- c. Remove sight refrigerant glass (2).

#### INSTALLATION

- a. Cut off one swaged end (either end) of replacement sight glass to shorten overall length to 5 inches (12.7 cm).
- b. Position sight glass (2) in unit.
- c. Braze tubing at joints (1) (paragraph 5.12).

5.24. SIGHT REFRIGERANT GLASS - Continued

FOLLOW ON PROCEDURES

- a. Perform starting up after repairs (paragraph 5.20).
- b. Install return air filter (paragraph 4.26).
- c. Connect air conditioner input power at source.

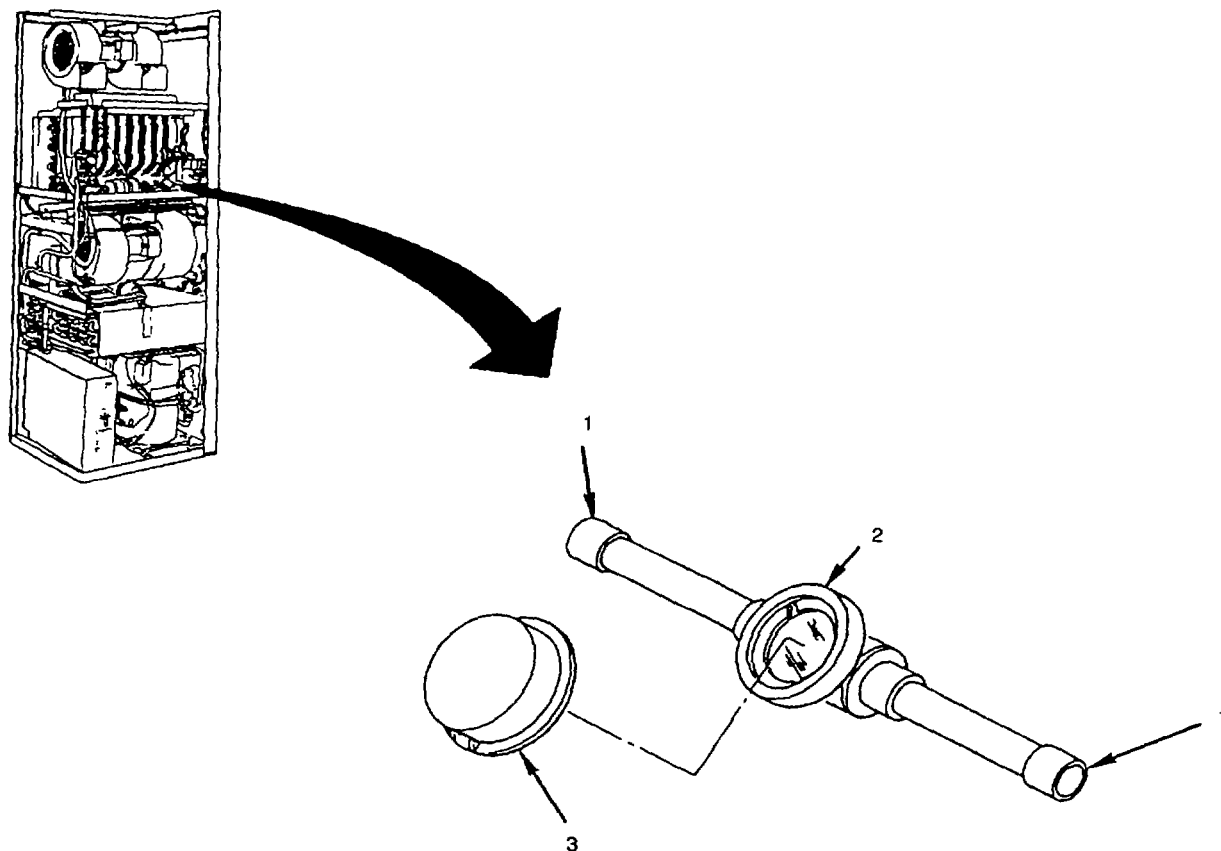


Figure 5-15. Sight Refrigerant Glass

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5 25. HOT GAS BYPASS SERVICE VAIN (V7). Thus task covers inspection, removal and installation.

---

#### INITIAL SETUP

##### Tool

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel 1

Equipment Conditions

#### **WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
- (2) Remove compressor section panel (paragraph 4.24)

---

#### INSPECTION

- a. Check for evidence of leaks or damaged lines, and loose or missing mounting hardware (see fig 5-16)
- b. If a leak is suspected or indicated, test per paragraph 5.13

#### REMOVAL

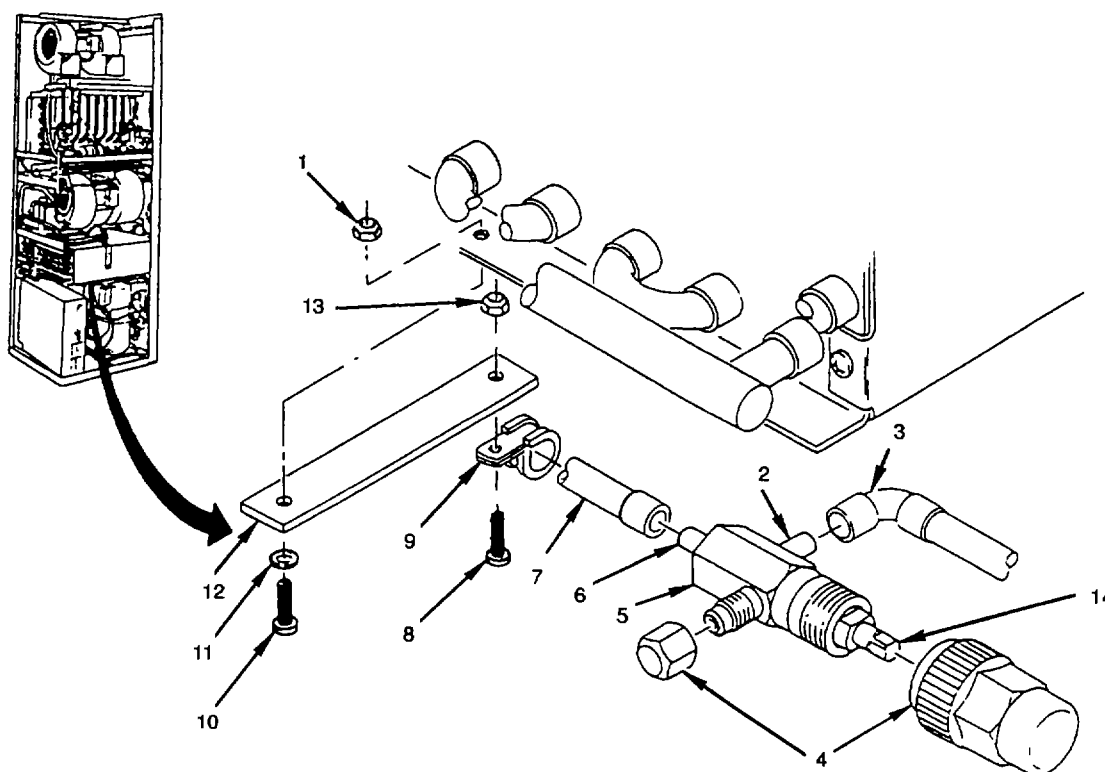
- a. Discharge refrigerant system (paragraph 5.10)
- b. Remove valve caps (4).
- c. Remove screw (10), flat washer (11), locknut (1), and bracket (12).
- d. Remove locknut (13), screw (8) and clamp (9)
- e. Debraze tubing (3) and (7) at Joints (2) and (6) (paragraph 5.12)
- f. Remove hot gas bypass service valve (5).

#### INSTALLATION

- a. Position hot gas bypass service valve (5) in unit
- b. Braze tubing (3) and (7) at Joints (2) and (6) (paragraph 5.12)
- c. Install clamp (9) with screw (8), and locknut (13) to bracket (12)

- d. Install bracket (12) with screw (10), flat washer (11) and locknut (1).
- e. Replace drier filter (paragraph 5.23).
- f. Backseat (counterclockwise) hot gas bypass service valve (14).
- g. Install valve caps (4).
- h. Leak test all brazed connections in repaired area (paragraph 5.13).

- Charge refrigerant system (paragraph 5.15).
- Install compressor section panel (paragraph 4.24).
- Connect air conditioner input power at source.



**5-53**

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5.26 LIQUID QUENCH SERVICE VALVE (V3). This task covers inspection, removal and installation.

---

**INITIAL SETUP**

Tool:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
- (2) Remove condenser fan section panel (paragraph 4.23).

---

**INSPECTION**

- a. Check for evidence of leaks or damaged lines, and loose or missing mounting hardware (see fig. 5-17).
- b. If a leak is suspected or indicated test per paragraph 5.13.

**REMOVAL**

- a. Pump down refrigerant system Paragraph 5.19).
- b. Remove screw (1) and locknut (3), slid clamps (2).
- c. Debraze tubing (4) and (9) at joints (5) and (10) (paragraph 5.12).
- d. Remove liquid quench service valve (7).

**INSTALLATION**

- a. Remove valve caps (6) and (8).
- b. Place liquid quench service valve (7) in mounting position.
- c. Braze tubing (4) and (9) at joints (5) and (10) (paragraph 5.12).
- d. Install clamps (2) with screw (1) and locknut (3).
- e. Backseat (counterclockwise) liquid quench service valve (11).
- f. Install valve caps (6) and (8).
- g. Leak test all brazed connections in repaired area (paragraph 5.13).

5.26 LIQUID QUENCH SERVICE VALVE (V3). - Continued

**FOLLOW ON PROCEDURES**

- a. Perform start up after repairs (paragraph 5.20).
- b. Install condenser fan section panel (paragraph 4.23).
- c. Connect air conditioner Input power at source.

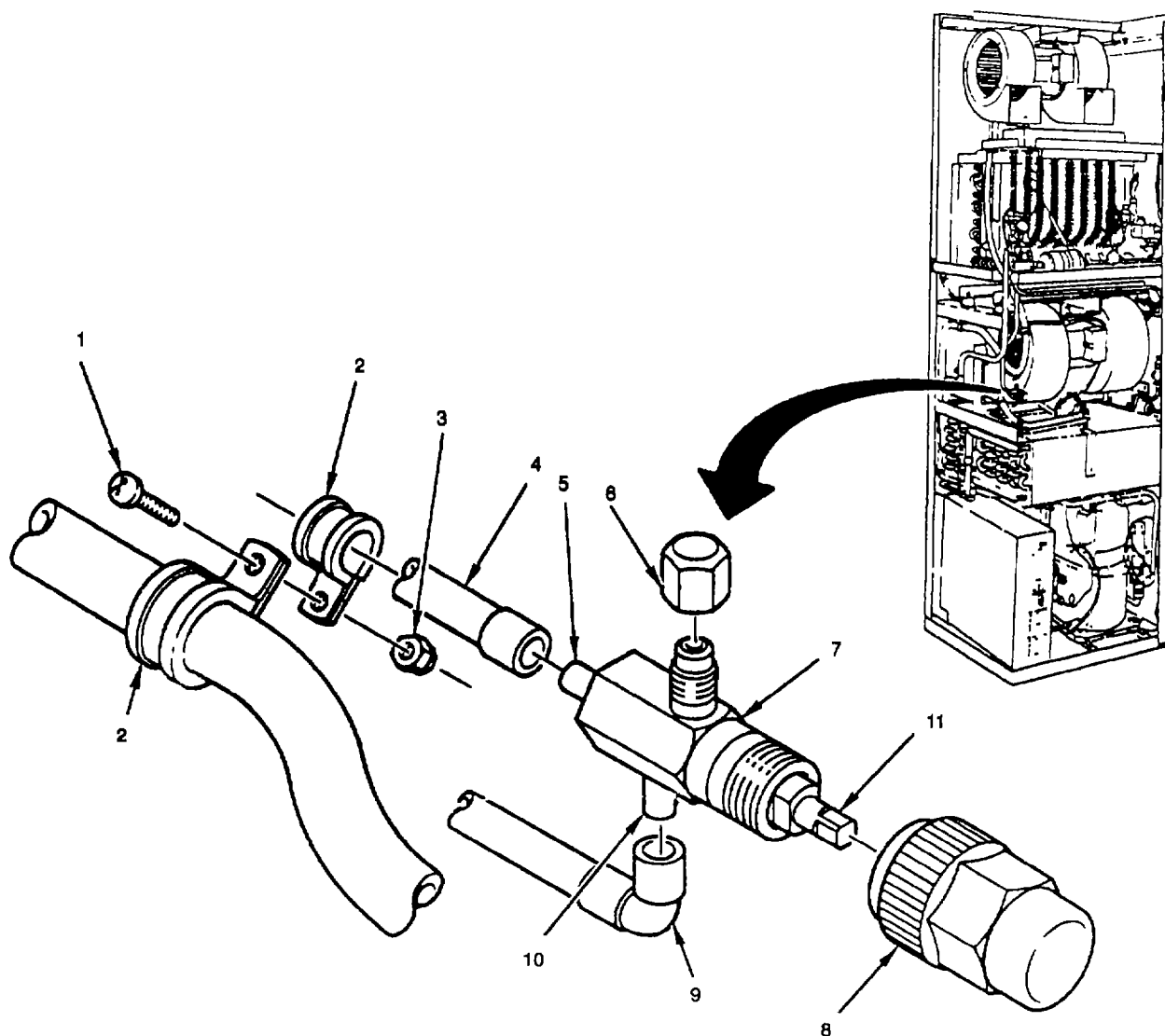


Figure 5-17. Liquid Quench Service Valve (V3)

---

5.27 RECEIVER SERVICE VALVE (V2). This task covers inspection, removal and installation.

---

#### INITIAL SETUP

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Gloves, chemical (Appendix C)  
Goggles, industrial (Appendix C)

Personnel: 1

Material:

Nitrogen, technical (Appendix E)

Equipment Conditions:

#### WARNING

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
- (2) Remove compressor section panel (paragraph 4.24).

---

#### INSPECTION

- a. Check for evidence of leaks, kinked or damaged lines, and loose or missing mounting hardware (see fig. 5-18).
- b. If a leak is suspected or indicated, test per paragraph 5.13.

#### REMOVAL

- a. Discharge refrigerant system (paragraph 5.10).
- b. Remove compressor (paragraph 5.37).
- c. Debraze tubing (1) and (2) at joints (3) and (7) (paragraph 5.12)
- d. Remove receiver service valve (6).

#### INSTALLATION

- a. Remove valve caps (4) and (5).
- b. Place receiver service valve (6) in mounting position.
- c. Braze tubing (1) and (2) at joints (3) and (7) (paragraph 5.12)
- d. Backseat (counterclockwise) receiver service valve (8).
- e. Install valve caps (4) and (5)



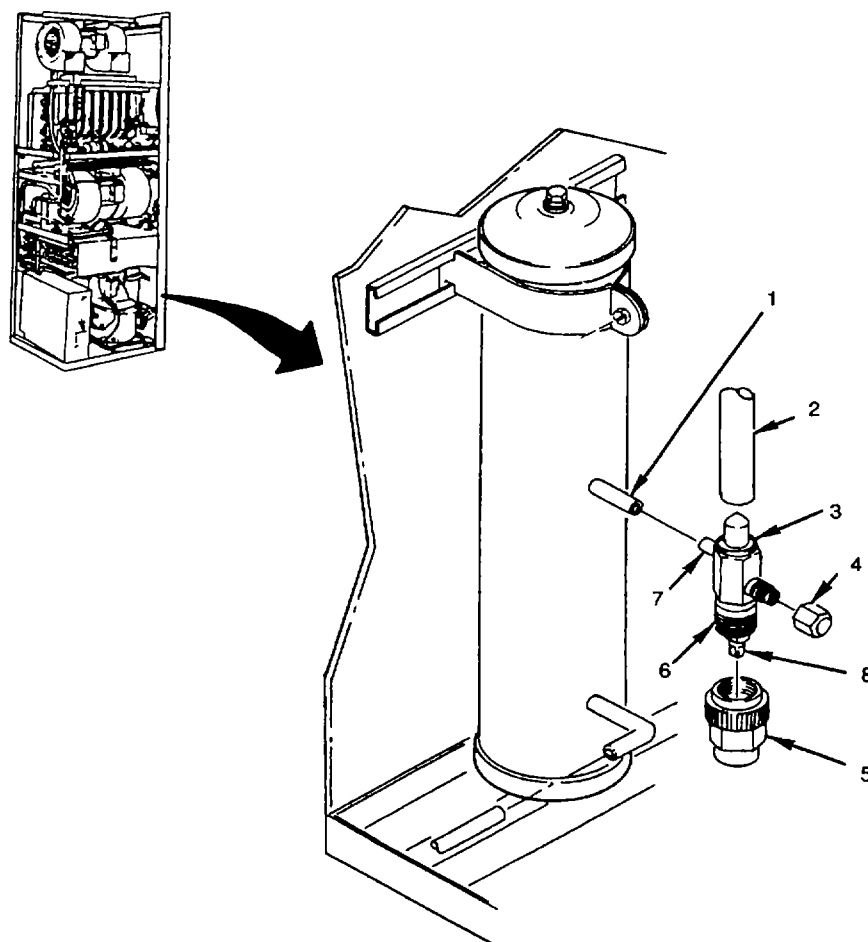
5.28 DAMPER ACTUATOR SERVICE VALVE (V1). This task covers inspection, removal and installation.

**INSTALLATION** Continued

- f. Install a new drier filter (paragraph 5.23).
- g. Leak test all brazed connections in repaired area (paragraph 5.13).

**FOLLOW ON PROCEDURES**

- a. Install compressor (paragraph 5.37).
- b. Evacuate refrigerants (paragraph 5.14).
- c. Charge refrigerant system (paragraph 5.15).
- d. Install compressor section panel (paragraph 4.24)
- e. e Connect air conditioner input power at source.



**Figure 5-18. Receiver Service Valve (V2).**

---

5.27 RECEIVER SERVICE VALVE (V2). This task covers inspection, removal and installation.

---

#### INITIAL SETUP

##### Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Gloves, chemical (Appendix C)  
Goggles, industrial (Appendix C)

Personnel: 1

##### Equipment Conditions.

- (1) Remove condenser fan section panel (paragraph 4.23), and
- (2) Pump system down (See paragraph 5.19.)

---

#### INSPECTION

- a. Inspect for evidence of leaks, damaged lines and loose or missing mounting hardware (see fig 5-19).
- b. If a leak is suspected or indicated, test per paragraph 5.13.

#### REMOVAL

#### **WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- a. Disconnect air conditioner input power at source
- b. Remove valve caps (1) and (2).
- c. Frontseat (clockwise) damper actuator service valve (3).

#### **WARNING**

Death or serious injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

- d. Loosen flarenut (7) and let gas escape.

5.28 DAMPER ACTUATOR SERVICE VALVE (V1). - Continued.

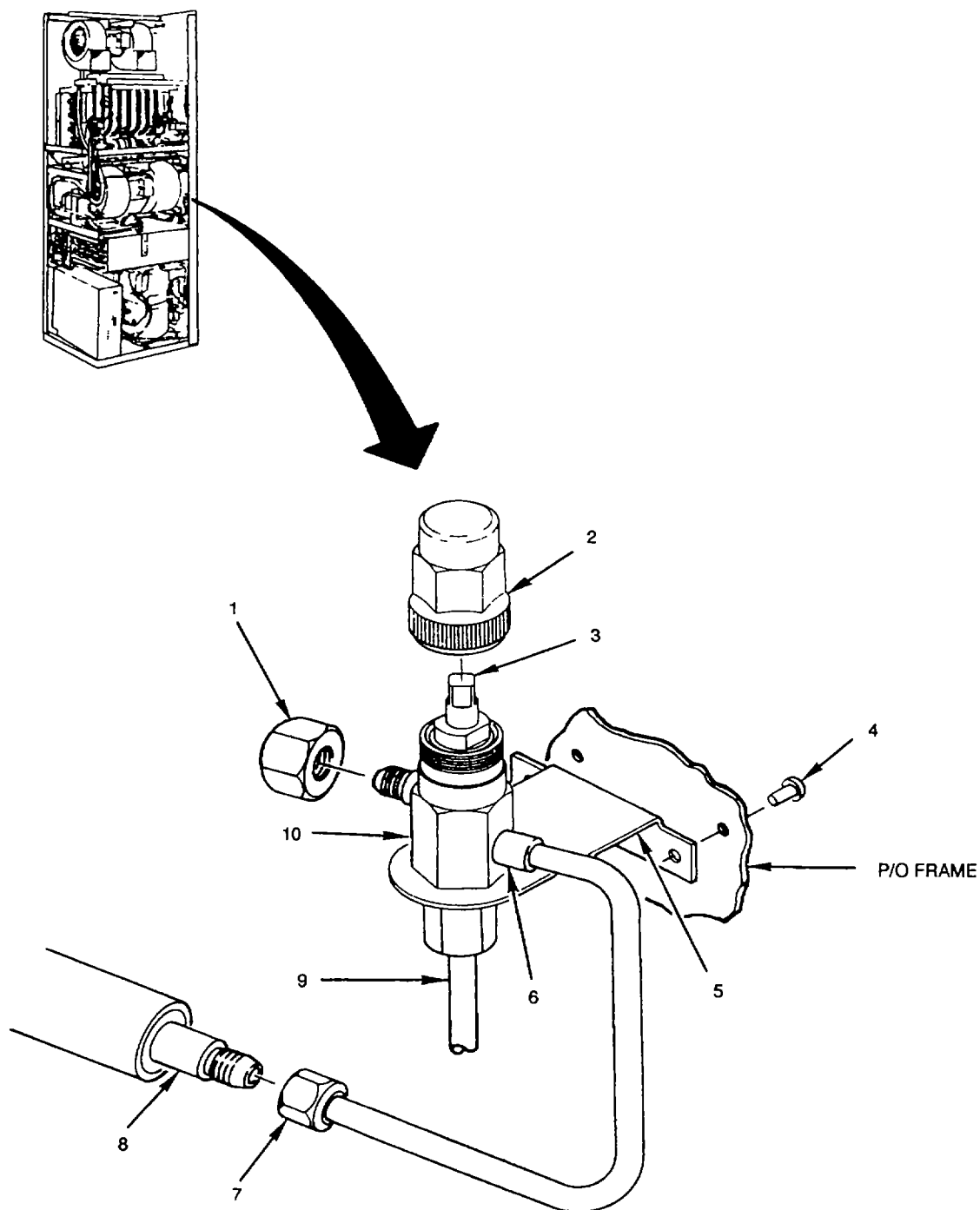


Figure 5-19. Damper Actuator Service Valve (V1)  
5-59

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5.28 DAMPER ACTUATOR SERVICE VALVE (V1). - Continued.

---

**REMOVAL** Continued

- e. Remove flarenut and line (7) from actuator (8).
- f. Debraze tubing (6) and (9) at joints (paragraph 5.12).
- g. Remove two rivets (4) and bracket (5).
- h. Debraze damper actuator service valve (10) from bracket (5) (paragraph 5.12).

**INSTALLATION**

- a. Remove valve caps (1) and (2).
- b. Braze damper actuator service valve (10) onto bracket (5) (paragraph 5.12).
- c. Install bracket (5) with two rivets (4).
- d. Braze tubing (6) and (9) at joints (paragraph 5.12).
- e. Install actuator line with flarenut (7) handtight.
- f. Crack (backseat counterclockwise, one turn) damper actuator service valve (3), let gas escape 1-3 seconds and tighten flarenut.
- g. Backseat (counterclockwise) damper actuator service valve (3).
- h. Install valve caps (1) and (2).

**FOLLOW ON PROCEDURES**

- a. Perform start up after repairs (paragraph 5.20).
- b. Leak test all newly connected joints and those in the repair area (paragraph 5.13).
- c. Connect air conditioner input power at source.
- d. Check refrigerant level and charge if necessary (paragraph 5.15).

---

5.29 SOLENOID VALVES L1 AND L2). This task covers inspection, repair/replace, removal and installation.

---

#### INITIAL SETUP

Tool:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Equipment Conditions

#### **WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source.
- (2) Remove condenser fan section panel (paragraph 4.23)
- (3) Remove return air filter (paragraph 4.26); and (4) Pump down refrigerant system (paragraph 5.19).

---

#### INSPECTION

- a. Check for damaged parts of frayed wires (see fig. 5-20).
- b. If a leak is suspected or indicated, test per paragraph 5.13.

#### REPAIR REPLACE

Repair consists of replacing plunger assembly (10), valve body (6) or solenoid valve.

#### REMOVAL

- a. Remove coil retainer (1) and nameplate (2).
- b. Remove coil (3).
- c. Unscrew tube assembly (4).
- d. Remove plunger assembly (10).
- e. Check valve body (6) for visible damage. Normally valve body replacement is unnecessary. If valve body is not replaced, skip Steps f and g
- f. Remove nut (8) at bottom of bracket (7).
- g. Debraze tubing at joints (5) and (9) (paragraph 5.12).

5.29 SOLENOID VALVES L1 AND L2).- Continued

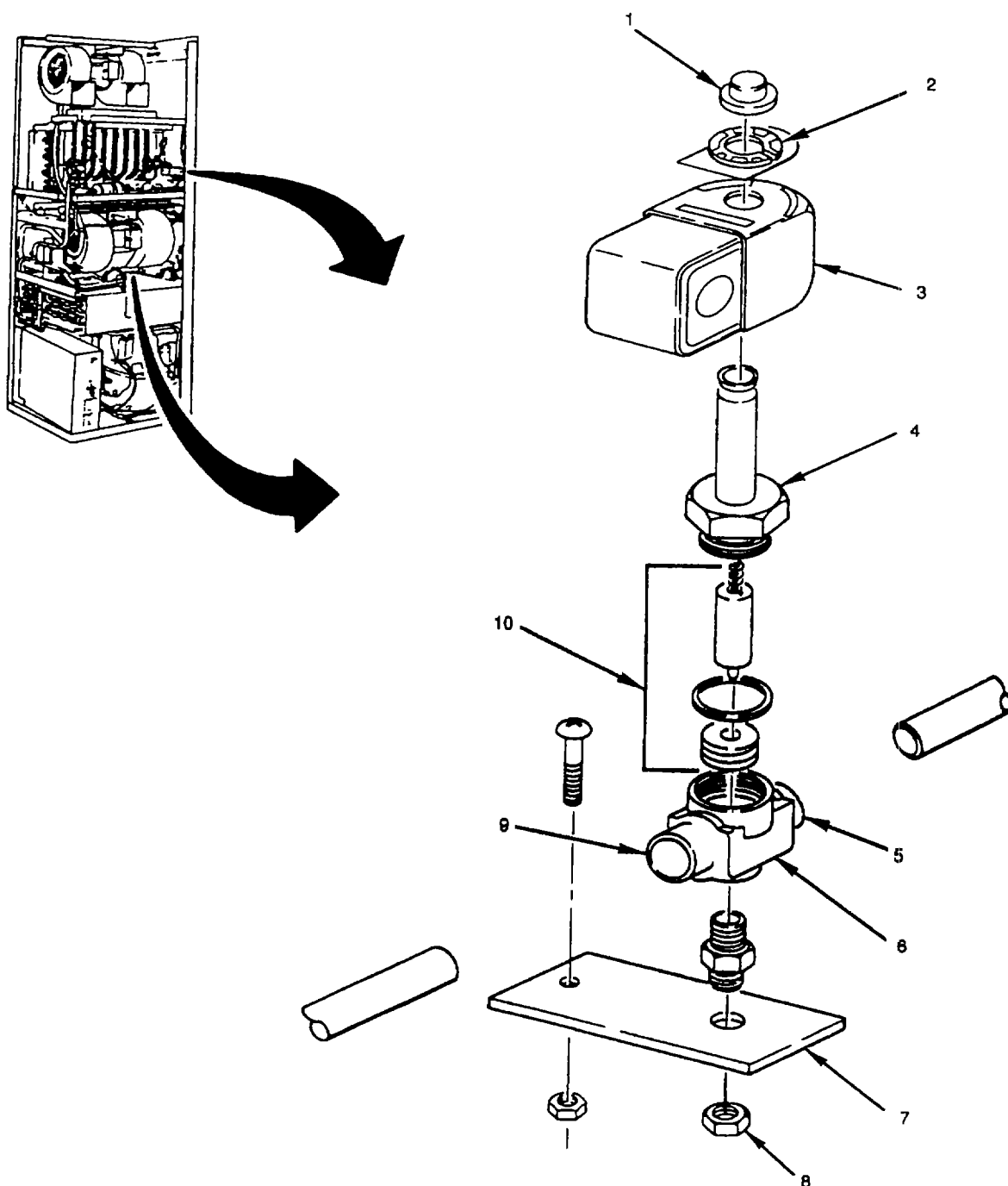


Figure 5-20. Solenoid Valves (L1 and L2)

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5.29 SOLENOID VALVES L1 AND L2.- Continued

---

**INSTALLATION**

- a. Braze tubing at joints (5) and (9) If necessary.
- b. Stall nut (8) at bottom of bracket (7).
- c. Install plunger assembly (10) into tube assembly (4).
- d. Install tube assembly (4).
- e. Install coil (3) with nameplate (2) and retainer (1).
- f. Install new drier filter (paragraph 5.23).
- g. Leak test all newly connected joints and those in the repair area (paragraph 5.13).

**FOLLOW ON PROCEDURES**

- a. Perform starting up after repairs (paragraph 5.20)
- b. Install condenser fan section panel (paragraph 4.23).
- c. Install return air filter (paragraph 4.26).
- d. Connect air conditioner input power at source.

---

5.30 EXPANSION VALVE (V5) PRIMARY.- This task covers inspection, adjustment, removal, disassembly, repair/replace, reassembly and installation.

---

#### INITIAL SETUP

##### Tools:

- Tool kit, service, refrigeration unit (Item 1, Appendix B)
- Thermometer, digital (Item 19, Appendix B)
- Thermocouple (Item 20, Appendix B)

Personnel: 1

##### Materials

- Sealant tape (Item 10, Appendix E)
- Brazing alloy, silver (Item 21, Appendix E)

##### Equipment Conditions:

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL.. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
- (2) Remove return air filter (paragraph 4.26).

#### **INSPECTION**

- a. Inspect for evidence of leaks, damaged capillary line, and loose or missing mounting hardware (see fig. 5-21).
- b. Check thermal bulb to see that it is securely clamped to the suction line.
- c. If a leak is suspected or indicated, test per paragraph 5.13.

#### **ADJUSTMENT**

##### **NOTE**

The expansion valve as supplied with unit is preset at the factory. This valve should not be adjusted unnecessarily.

- a. Perform a refrigerant pressure check on unit in accordance with paragraph 5.16. Leave service manifold attached.
- b. Attach an accurate thermocouple to an exposed surface of the suction return line adjacent to the sensing bulb



5.30 EXPANSION VALVE (V5) PRIMARY). - Continued.

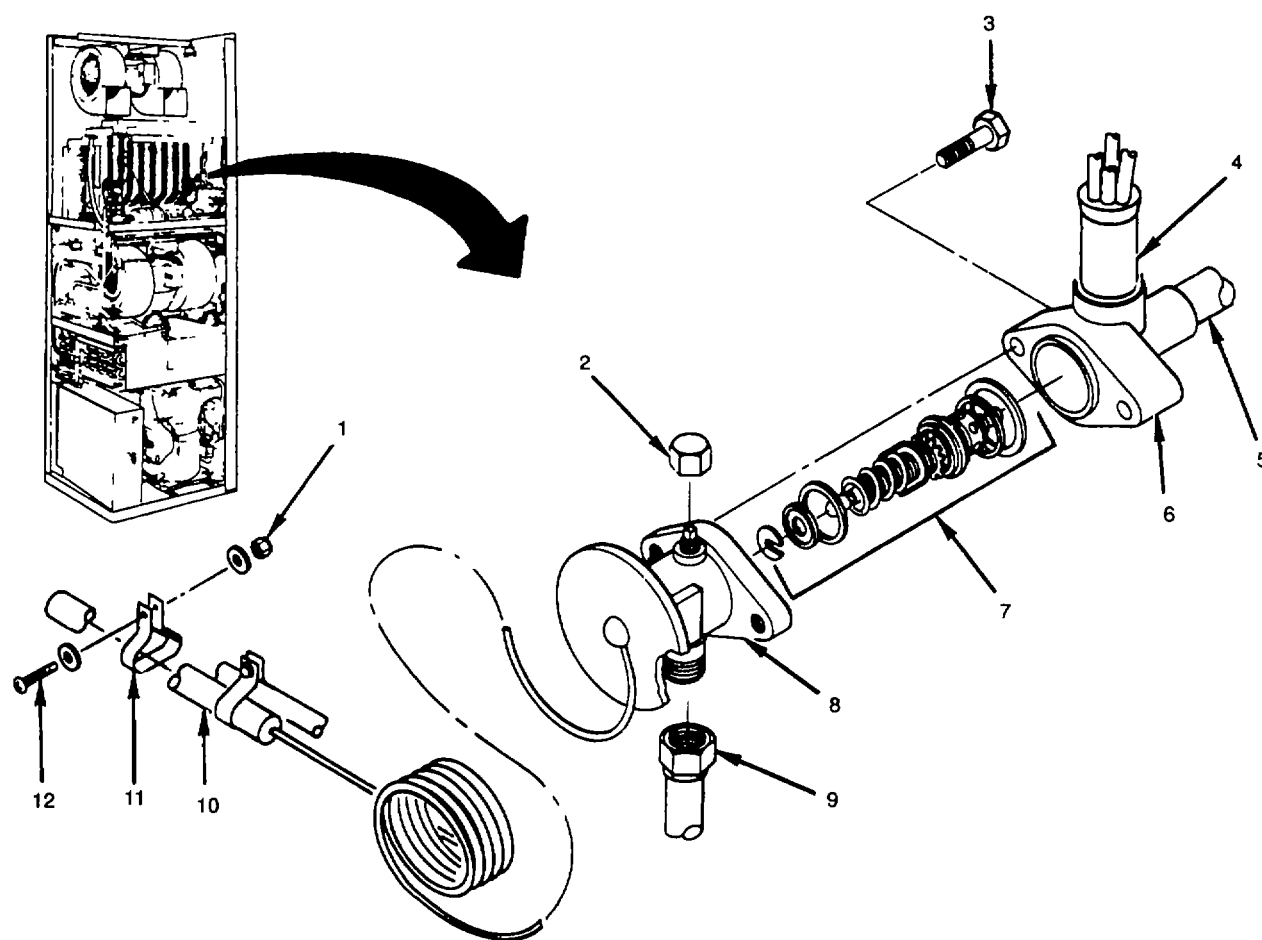


Figure 5-21. Expansion Valve (V5) (Primary)

**ADJUSTMENT** - Continued

- c. Set thermostat (S2) to lowest temperature setting.

The following test must be conducted with power on. Use extreme caution and follow steps carefully to avoid death or serious injury.

- d. Connect air conditioner input power at source.
- e. Start air conditioner In COOL mode.
- f. Allow air conditioner to run about 30 minutes.

---

5.30 EXPANSION VALVE (V5) PRIMARY. - Continued.

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**ADJUSTMENT** - Continued

- g. Check to be sure temperature in suction line has stabilized and thermocouple meter reading remains unchanged for at least 2 minutes.
- h. Note pressure on manifold gauge connected to low pressure (suction) service valve. Identify saturation temperature for pressure gauge reading (see table 5-1) and compare with thermocouple meter reading. The thermocouple meter temperature should be 8 to 15°F (4.48 to 8.4° C) higher than saturation temperature found in table 5-2.
- i. If the superheat setting is not within limits shown in Step h, adjust expansion valve as follows:
  - (1) Remove protective valve cap (2) from side of power assembly (8).

**NOTE**

Do not change more than two full turns at one time, then wait for 5 to 10 minutes for temperature to stabilize and recheck pressure and temperature before further adjustment.

- (2) Turn adjustment stem two complete turns to change superheat setting by 1°F (0.56°C). Turn clockwise to increase superheat span or counterclockwise to decrease superheat span.
  - (3) If superheat cannot be adjusted to units in Step h, replace expansion valve.
- j. When the proper setting is obtained.
  - (1) Turn MODE SELECT switch to OFF.
  - (2) Install protective seal cap (2).
  - (3) Remove thermocouple.

**REMOVAL**

- a. Pump down refrigerant system (paragraph 5.19).
- b. Disconnect air conditioner input power at source.
- c. Loosen two screws (12) and nuts (1) on sensing bulb retaining clamps (11).

---

5.30 EXPANSION VALVE (V5) PRIMARY). - Continued.

---

REMOVAL - continued

- d. Remove sensing bulb (10) from retaining clamps (11).
- e. Remove flarenut and refrigerant line (9).

**NOTE**

If expansion valve body is to be replaced, disassemble before debrazing.

If expansion valve body is not damaged and will not be removed, proceed to the disassembly procedure.

- f. Remove expansion valve body (6) by debrazing tubing (5) and distributor (4) at joints (paragraph 5.12).

DISASSEMBLY

- a. Remove two bolts (3).
- b. Remove powerhead (8) from valve body (6).
- c. Remove cage assembly (7).
- d. Examine cage assembly for damage or defects.

**REPAIR/REPLACE**

Repair consists of replacing powerhead (8), cage assembly (7), valve body (6), or expansion valve.

**REASSEMBLY**

- a. If valve body (6) was removed, braze distributor (4) and tubing (5) at joints (paragraph 5.12).
- b. Examine replacement cage assembly (7) for defects or damage before reassembly
- c. Install cage assembly (7).
- d. Install powerhead (8) on valve body (6).
- e. Install two bolts (3).

**INSTALLATION**

- a. Install expansion valve body (6) by brazing tubing (5) and distributor (4) at joints (paragraph 5.12).
- b. Install flarenut on refrigerant line (9).
- c. Install sensing bulb (10) in retaping clamps (11).
- d. Tighten two screws (12) and nuts (1) on sensing bulb retaining clamps (11).
- e. Leak test and brazed connections in repaired area (paragraph 5.13)

---

5.30 EXPANSION VALVE (V5) PRIMARY). - Continued.

---

FOLLOW ON PROCEDURES
----------------------

- a. Perform start up after repairs (paragraph 5.20).
- b. Connect air conditioner input power at source.
- c. Install return air filter (paragraph 4.26).

5.31. EXPANSION VALVE (V6) (LIQUID QUENCH). This task covers inspection, adjustment, removal, disassembly, repair/replace, reassembly and installation

#### INITIAL SETUP

Tools:

- Tool kit, service, refrigeration unit (Item 1, Appendix B)
- Thermometer, digital (Item 19, Appendix B)
- Thermocouple (Item 20, Appendix B)

Personnel: 1

Material:

- Sealant tape (Item 10, Appendix E)

Equipment Conditions:

#### WARNING

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source, and
- (2) Remove condenser fan section panel (paragraph 4.23).

#### INSPECTION

- a. Inspect for evidence of leaks, kinked, or otherwise damaged capillary line, and loose or missing mounting hardware (see fig. 5-22)
- b. Check thermal bulb to see that it is securely clamped to the suction line.
- c. If a leak is suspected or indicated, test per paragraph 5.13.

#### ADJUSTMENT

- a. Perform a refrigerant pressure check in accordance with paragraph 5.16. Leave gauges attached
- b. Attach an accurate thermocouple to an exposed surface of suction line adjacent to the sensing bulb
- c. Install condenser fan section panel (paragraph 4.23)
- d. Check that service valve and gauge connection to compressor suction service valve are open. Note pressure indicated on gauge and temperature indicated on thermometer.

5.31. EXPANSION VALVE (V6) (LIQUID QUENCH) - Continued

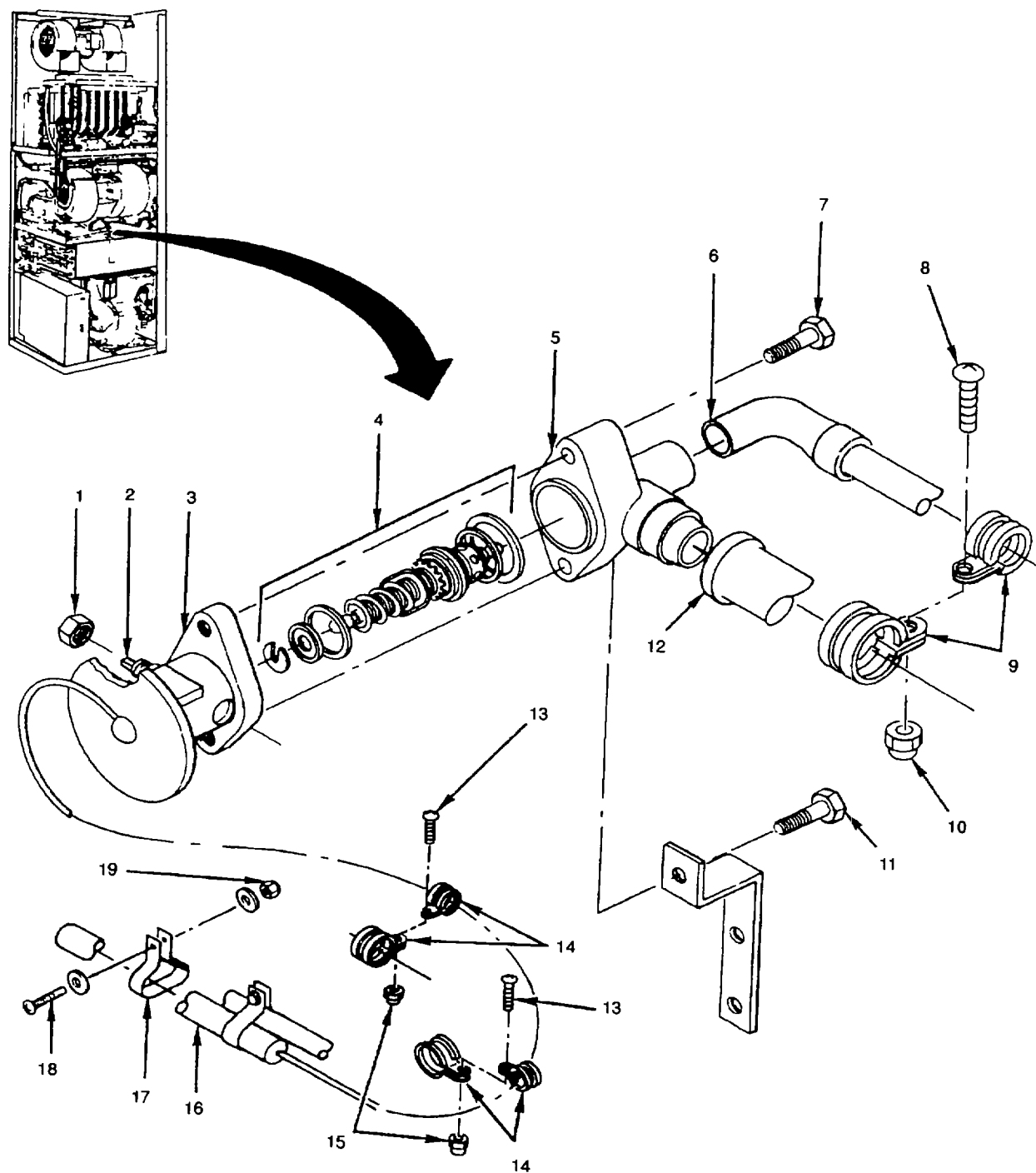


Figure 5-22. Expansion Valve (V6) (Liquid Quench)  
5-70

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5.31. EXPANSION VALVE (V6) (LIQUID QUENCH). - Continued

---

ADJUSTMENT - Continued

**WARNING**

The following test must be conducted with power on. Use extreme caution and follow steps carefully to avoid death or serious injury.

- e. Set temperature control thermostat (S2) to maximum temperature
- f. Connect air conditioner input power at source.
- g. Start air conditioner in COOL mode.
- h. Note that suction pressure drops to 58 - 2 psi (4.0 - 0.14 kg/cm<sup>2</sup>), Allow the compressor to run for at least 20 minutes.
- i. Observe that temperature indicated remains stable for a minimum of 2 minutes, then find saturation temperature for pressure indicated on gauge, using table 5-1. For example, the saturation temperature for a refrigerant pressure of 69 psig (4.85 kg/cm<sup>2</sup>) is 40 °F (4.4°C)
- j. Compare saturation temperature with indicated temperature. The indicated temperature should be 20 to 30 °F (11.2 to 16.8 °C) higher than saturation temperature.
- k. If indicated temperature is not within limits shown above, adjust the quench valve as follows
  - (1) Turn adjustment screw (2) clockwise to increase suction line pressure.
  - (2) Turn adjustment screw (2) counterclockwise to decrease suction line pressure.
- l. If indicated temperature shown in Step j cannot be stabilized by adjustment, replace quench valve
- m. Turn unit OFF,
- n. Remove thermometer.
- o. Remove service manifold from service valves.
- p. Install service valve protective cap (1)

REMOVAL

- a. Pump down refrigerant system (paragraph 5 19).

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

---

5.31. EXPANSION VALVE (V6) (LIQUID QUENCH). - Continued

---

**REMOVAL** - Continued

- b. Disconnect air conditioner input power at source.
- c. Remove screw (8), locknut (10) and two line clamps (9).
- d. Remove two screws (13), locknuts (15), and sensing bulb line clamps (14).
- e. Loosen two screws (18) and nuts (19) on sensing bulb retaining clamps (17).
- f. Remove sensing bulb (10) from retaining clamps (17).

**NOTE**

If valve body is to be replaced, disassemble before debrazing

If valve body is not damaged and will not be removed, proceed to disassembly.

- g. Remove expansion valve body (5) by debrazing tubing (6) and (12) at joints (paragraph 5.12).

**DISASSEMBLY**

- a. Remove two bolts (7) and (11).
- b. Remove powerhead (3) from expansion valve body (5).
- c. Remove cage assembly (4).
- d. Examine cage assembly for damage or defects.

**REPAIR/REPLACE**

Repair consists of replacing powerhead (3), cage assembly (4), valve body (5) or expansion valve

**REASSEMBLY**

- a. If expansion valve body (5) was removed, braze tubing (6) and (12) at Joints (paragraph 5. 12).
- b. Examine replacement cage assembly (4) for defects or damage before reassembly.
- c. Install cage assembly (4)
- d. Install powerhead (3) in valve body (5).
- e. Install two bolts (7) and (11).



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5.31. EXPANSION VALVE (V6) (LIQUID QUENCH). - Continued

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INSTALLATION

- a. Position sensing bulb (16) into retaining clamps (17).
- b. Tighten two screws (18) and nuts (19) in sensing bulb retaining clamps (17).
- c. Install two sensing bulb line clamps (14) with two screws (13) and locknuts (15).
- d. Install two line clamps (9) with screw (8) and locknut (10).

FOLLOW ON PROCEDURES

- a. Perform starting up after repairs (paragraph 5.20).
- b. Install condenser fan section panel (paragraph 4.23)

---

5.32. HOT GAS BYPASS VALVE (V). This task covers inspection, adjustment, removal, disassembly, repair/replace, reassembly and installation.

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**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Gloves, chemical (Appendix C)

Personnel: 1

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source, and
  - (2) Remove compressor section panel (paragraph 4.24).
- 

**INSPECTION**

- a. Inspect for evidence of leaks, damaged lines, and loose or missing mounting hardware (see fig. 5-23).
- b. If a leak is suspected or indicated, test per paragraph 5.13.

**ADJUSTMENT**

- a. Connect service manifold (paragraph 5.9).
- b. Set thermostat (S2) to highest temperature setting.

**WARNING**

The following test must be conducted with power on. Use extreme caution and follow steps carefully to avoid death or serious injury.

- c. Connect air conditioner input power at source. d. Start unit in COOL mode.

**NOTE**

The hot gas bypass valve is set at the factory to maintain the suction pressure at 55 to 58 psig at the compressor.

5.32. HOT GAS BYPASS VALVE (V). - Continued

ADJUSTMENT - Continued

- e. If suction line pressure of 55 to 58 psig is not present, adjust valve.
- f. Turn the adjusting stem (3) one turn to change suction by 4 psi Turn the stem clockwise to increase suction pressure or counterclockwise to decrease suction pressure
- g. If valve cannot be adjusted to maintain 55 to 58 psi suction pressure, replace valve and repeat Steps a through f.
- h. Turn unit off.

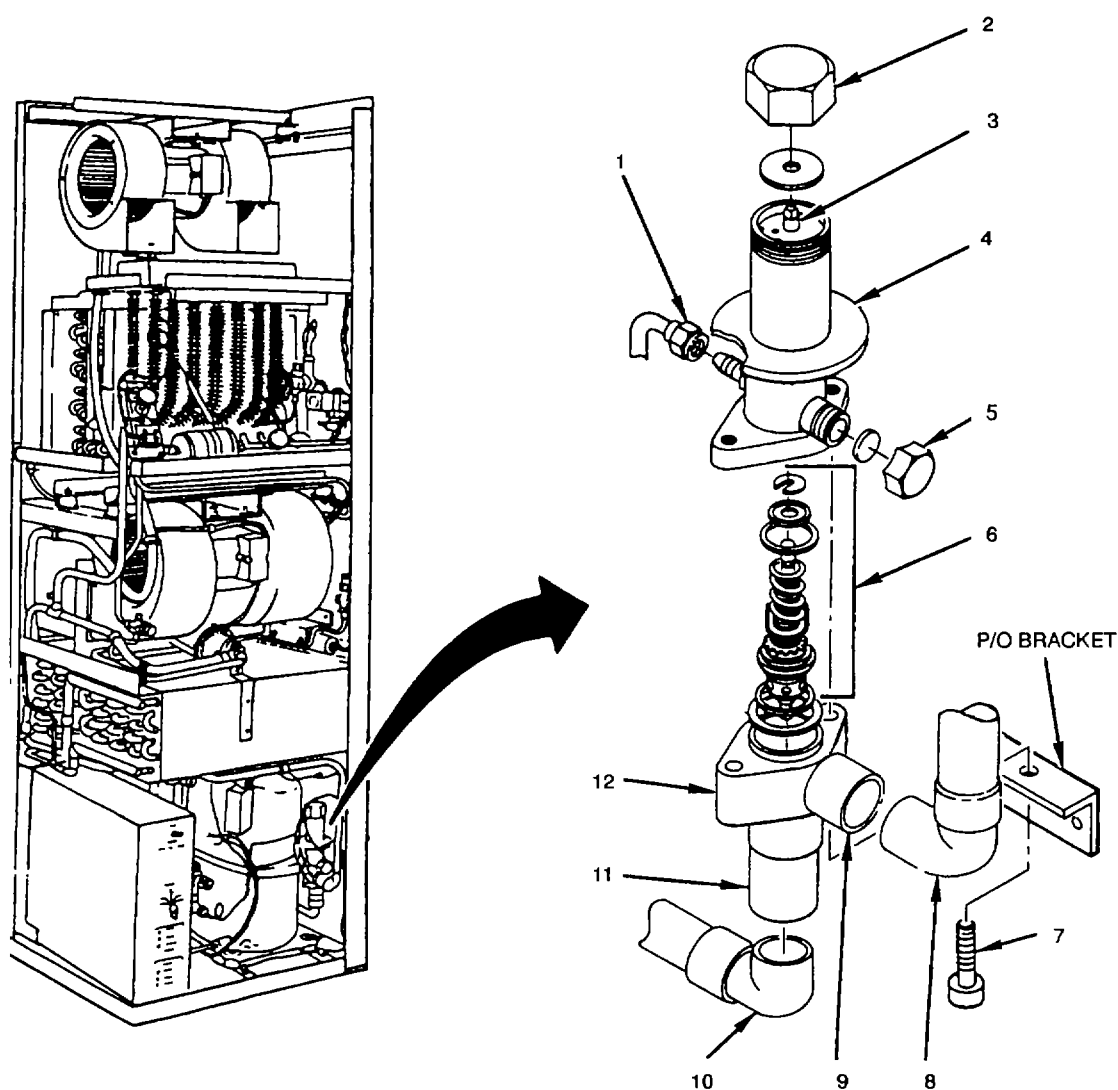


Figure 5-23. Hot Gas Bypass Valve (V4)

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5.32. HOT GAS BYPASS VALVE (V). - Continued

---

REMOVAL

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- a. Disconnect air conditioner input power at source.
- b. Discharge refrigerant system (paragraph 5.10).

**WARNING**

Death or serious injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact IS possible

- c. Loosen flarenut (1) and let gas escape.
- d. Disconnect flarenut (1).
- e. Remove valve caps (2) and (5).

**NOTE**

If hot gas bypass valve body (12) is to be replaced, DISASSEMBLE before debrazing.

If hot gas bypass valve body (12) is not damaged and will not be removed, proceed to the DISASSEMBLY procedure.

- f. If valve body (12) is to be removed, debraze tubing (8) and (10) at Joints (9) and (11) (paragraph 5.12).

DISASSEMBLY

- a. Remove two bolts (7).
- b. Remove upper body assembly (4).
- c. Remove cage assembly (6).

REPAIR/REPLACE I

Repair consists of replacing the upper body (4), cage assembly (6), valve body (12) or hot gas bypass valve.

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5.32. HOT GAS BYPASS VALVE (V). - Continued

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**REASSEMBLY** - Continued

**NOTE**

If hot gas bypass valve body (12) is not being installed, proceed to Step b.

If hot gas bypass valve body (12) is being installed, proceed to DISASSEMBLY before brazing valve body (12)

- a. If valve body (12) was removed, braze tubing (8) and (10) at joints (9) and (11) (paragraph 5.12).
- b. Examine replacement cage (6) and upper body (4) assemblies before reassembly.
- c. Install cage assembly (6) .
- d. Install upper body assembly (4)
- e. Install two bolts (7).
- f. Install valve caps (2) and (5)

**INSTALLATION**

- a. Connect flarenut (I).
- b. Leak test all newly connected joints and those in the repair area (paragraph 5.13)

**FOLLOW ON PROCEDURES**

- a. Install compressor section panel (paragraph 4.24).
- b. Charge refrigerant system (paragraph 5.15).

---

5.33. DAMPER ACTUATOR. This task covers inspection, testing, removal and installation.

---

**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Thermometer, digital (Item 19, Appendix B)  
Gloves, chemical (Appendix C)

Personnel: 1

Material:

Nitrogen, technical (Item 9, Appendix E)

Equipment Conditions:

Remove condenser fan section panel (paragraph 4.23)

**INSPECTION**

- a. Check for damaged or missing parts (see fig. 5-24). b If a leak is suspected or indicated' test per paragraph 5.13

**TESTING**

- a. Frontseat (clockwise) actuator service valve (V1) (paragraph 5.28).

**WARNING**

Death or serious Injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

- b. Slowly loosen flarenut (12) on actuator (11) to release gas.
- c. Remove flarenut (12) and tubing.
- d. Install nitrogen cylinder to manifold gauge, high side
- e. Install high side gauge manifold line to actuator (11)
- f. Slowly open high gauge valve on manifold gauge and raise pressure to 250-300 psig (9013 to 136.2 kg/cm<sup>2</sup>).
- g. Actuator damper should open to full positron.

5.33. DAMPER ACTUATOR. - Continued

TESTING - Continued

- h. If damper does not open to full position, replace actuator.

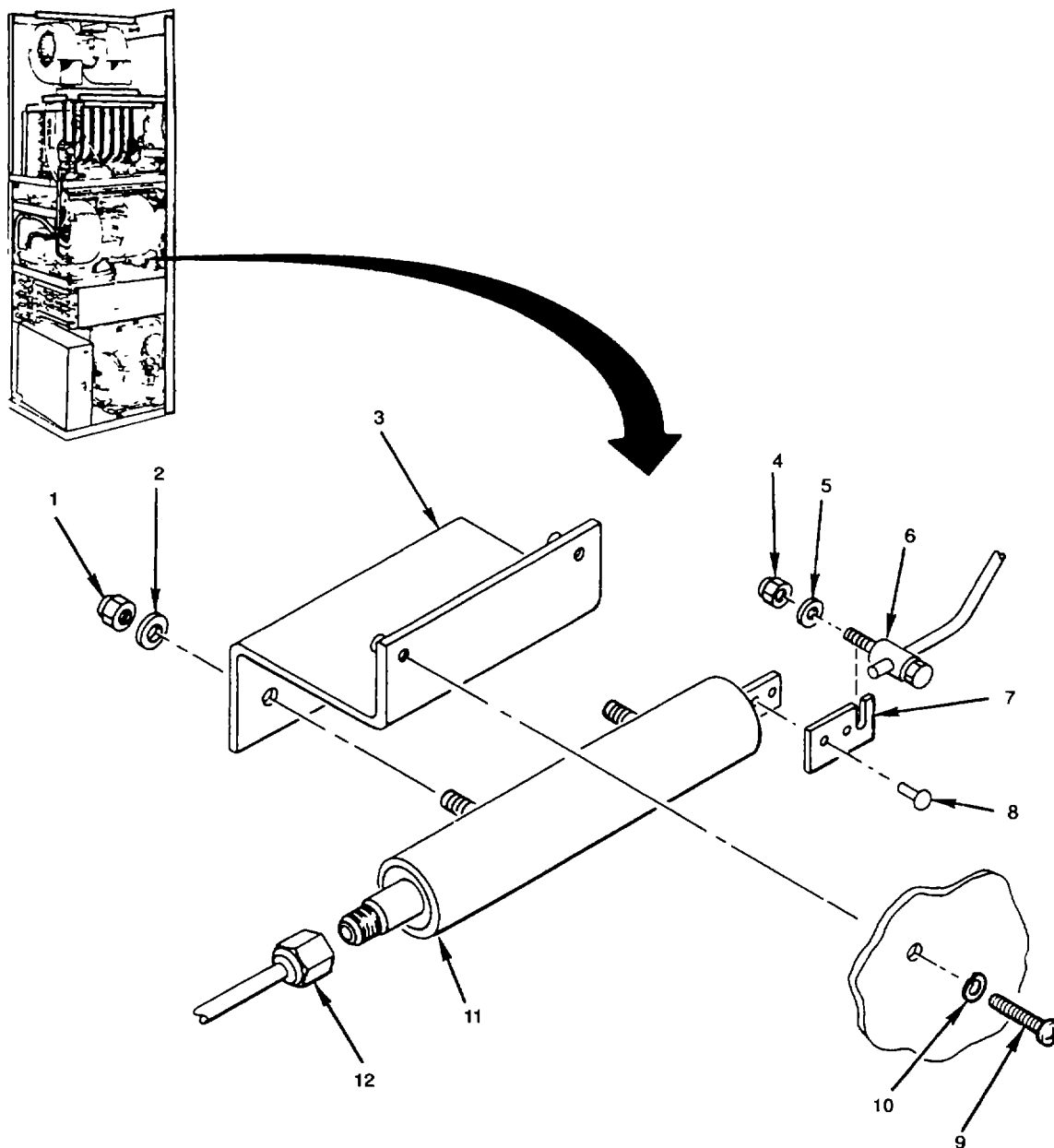


Figure 5-24. Damper Actuator

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5.33. DAMPER ACTUATOR. - Continued

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**TESTING** - continued

- i. Remove service manifold from nitrogen cylinder.
- j. Remove service manifold from actuator.
- k. Hand tighten flarenut (12) to actuator (11).
- l. Backseat (counterclockwise) actuator service valve (paragraph 5.28)
- m. Let gas escape from flarenut for 1 to 3 seconds and tighten flarenut (12).

**REMOVAL**

- a. Frontseat (clockwise) actuator service valve (paragraph 5.28).
- b. Slowly loosen flarenut (12) on actuator to release gas, then remove flarenut.
- c. Remove two locknuts (1) and flat washers (2) securing actuator to bracket (3).
- d. Remove two screws (9), lockwashers (10), and bracket (3).
- e. Remove locknut (4), flat washer (5), and actuator rod and swivel (6).
- f. Remove actuator (11).
- g. Remove two rivets (8) and actuator linkage bracket (7) from actuator (11).

**INSTALLATION**

- a. Install actuator linkage bracket (7) to actuator (11) with two rivets (8).
- b. Install actuator swivel and control rod (6) with flat washer (5) and locknut (4).
- c. Install actuator to bracket with two flat washers (2) and locknuts (1).
- d. Install bracket (3) with two screws (9) and lockwashers (10).
- e. Hand tighten flarenut (12) to actuator (11).
- f. Backseat (counterclockwise) actuator service valve (paragraph 5.28).
- g. Let gas escape from flarenut for 1 to 3 seconds and tighten flarenut (12).
- h. Adjust actuator linkage (paragraph 5.34).

**FOLLOW ON PROCEDURES**

- a. Install condenser fan section panel (paragraph 4.23)
- b. Connect air conditioner input power at source.



---

5.34 DAMPER ACTUATOR CONNECTING LINK. This task covers inspection, adjustment, removal, replace and installation.

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**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source;
  - (2) Remove condenser fan section panel (paragraph 4.23), and
  - (3) Remove condenser motor and housing assembly (paragraph 4.49).
- 

**INSPECTION**

- a. Check that connecting link rod (4) is not bent or damaged (see fig. 5-25).
- b. Check that connector swivel (9), and damper operator (2) are not damaged.
- c. Check for damaged, loose, or missing mounting hardware.

**ADJUSTMENT**

- a. Close damper with damper adjustment actuator linkage nut (5) loose.
- b. Open damper with 114- to 1/2-inch clearance from bottom of damper housing assembly.
- c. Tighten damper adjustment actuator linkage nut (5).
- d. Test damper actuator (see TEST, paragraph 5.33).

**REMOVAL**

- a. Remove damper actuator (paragraph 5.33).
- b. Loosen screw (5) on solenoid connector swivel (8).
- c. Loosen screw (3) on damper connector swivel (9).
- d. Remove control rod (4).

5.34 DAMPER ACTUATOR CONNECTING LINK. - Continued

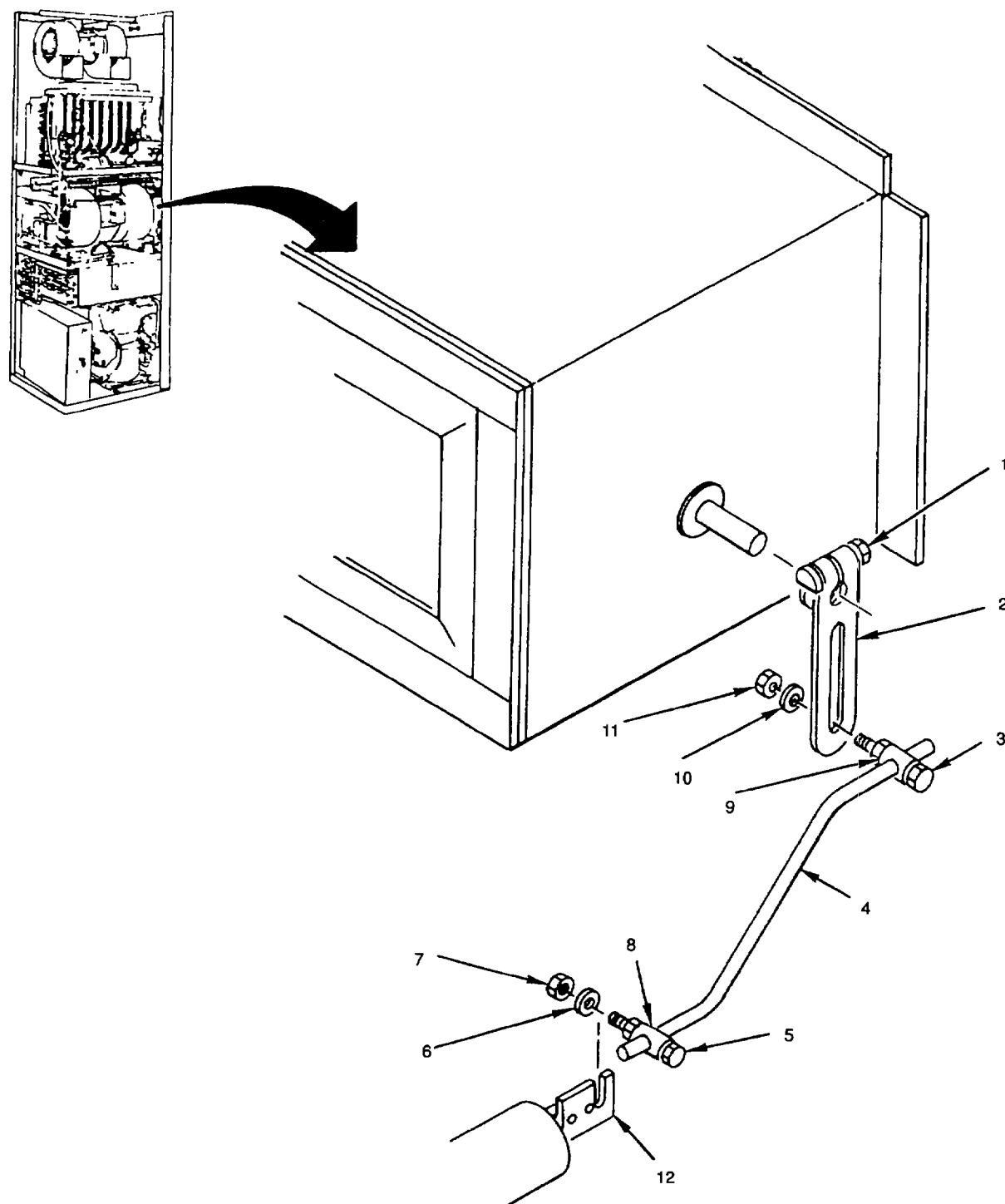


Figure 5-25. Damper Actuator Connecting Link  
5-82

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5.34 DAMPER ACTUATOR CONNECTING LINK. - Continued

---

**REMOVAL** - Continued

- e. Loosen screw (1) and remove damper operator (2).
- f. Remove locknut (7), flat washer (6). and actuator connector swivel (8).
- g. Remove locknut (11), flat washer (10), and damper operator swivel (9).

**REPAIR**

Repair consists of replacing damper operator (2), damper rod (4), and connector swivels (8) and (9).

**INSTALLATION**

- a. Install connector swivel (9) with flat washer (10) and locknut (11) to damper operator (2).
- b. install damper operator (2) and tighten bolt (1).
- c. Install control rod (4) to swivels (8) and (9).
- d. Tighten screw (5) to solenoid connector swivel (8).
- e. Tighten screw (3) to damper connector swivel (9).
- f. Install actuator connector swivel (8) with flat washer (6) and locknut (7) to damper actuator bracket (12).
- g. Install damper actuator (paragraph 5.33).
- h. Adjust damper connecting link.

**FOLLOW ON PROCEDURES**

- a. Install condenser motor and housing assembly (paragraph 4.49).
- b. Install condenser fan section panel (paragraph 4.23).
- c. Connect air conditioner input power at source.

---

5.35 DISTRIBUTOR. This task covers inspection, removal and installation.

---

**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Material:

Brazing alloy. silver, grade m (Item 21, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source; and
  - (2) Remove return air filter (paragraph 4.26).
- 

**INSPECTION**

- a. Check for signs of leakage (see fig 5-26). Leak test. If leak is suspected (paragraph 5.13).
- b. If distributor lines are damaged beyond repair, replace distributor.

**REMOVAL**

- a. Pump down refrigerant system (paragraph 5.19).
- b. Disassemble expansion valve (paragraph 5.30).
- c. Debraze distributor (1) at valve joint (3) (paragraph 5.12).

**NOTE**

Check the length of the new distributor lines before cutting distributor lines to coil.

- d. Cut distributor lines (2) to coil.
- e. Remove distributor (1).

5.35 DISTRIBUTOR. - Continued

INSTALLATION

- a. Braze distributor lines (2) to coil lines using silver solder (paragraph 5.12).
- b. Braze distributor (1) to valve joint (3) (paragraph 5.12).
- c. Reassemble expansion valve (paragraph 5.30).
- d. Leak test all newly connected joints and those in the repair area (paragraph 5.13).

FOLLOW ON PROCEDURES

- a. Perform starting up after repairs (paragraph 5.20).
- b. Install return air filter (paragraph 4.26).

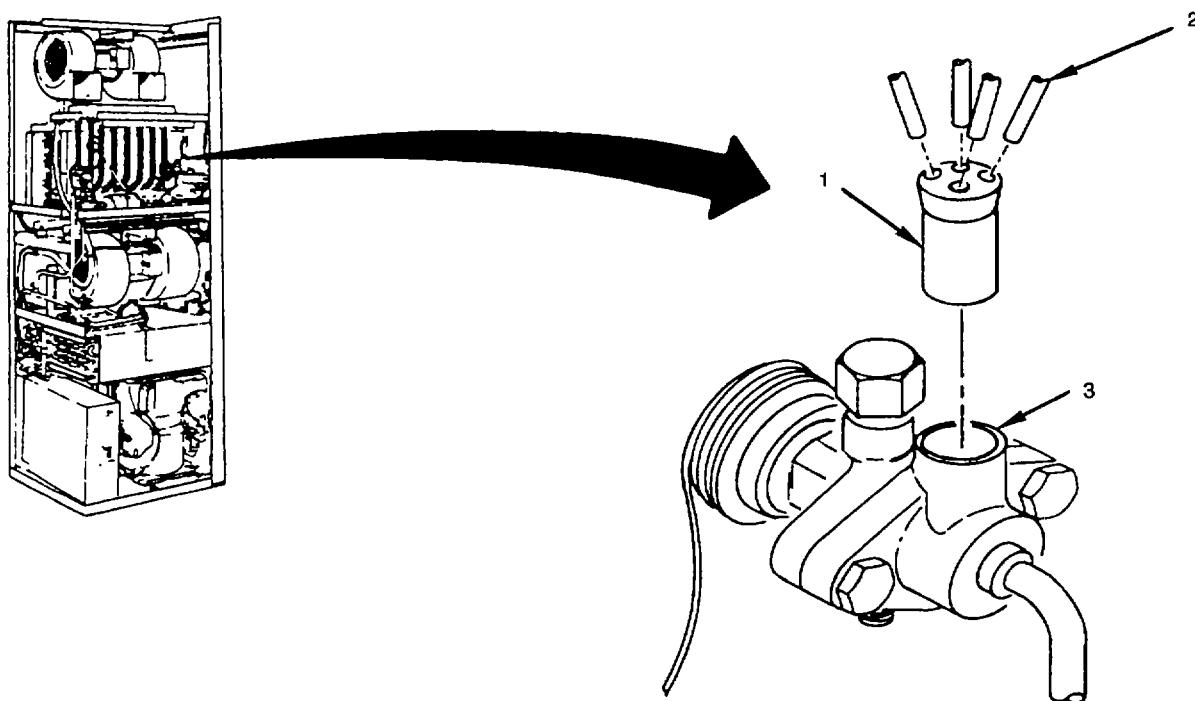


Figure 5-26. Distributor

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5.36 SERVICE VALVES (V9 AND V8) (DISCHARGE AND SUCTION). This task covers inspection, removal and installation.

---

INITIAL SETUP

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Goggles, industrial (Appendix C)

Personnel: 1

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source;
- (2) Remove compressor section panel (paragraph 4.24);
- (3) Remove control box (paragraph 4.27); and
- (4) Discharge system (paragraph 5.10).

---

INSPECTION

- a. Inspect for evidence of leaks, damaged lines and loose or missing mounting hardware (see fig. 5-27).
- b. If a leak is suspected and implicated, test per paragraph 5.13.

REMOVAL

**WARNING**

When removing suction and discharge valves, avoid coming in contact with coil to avoid injury to personnel and to reduce fin damage on the coil.

- a. Remove valve caps (3).
- b. Remove nut (1) from compressor line (4).
- c. Debraze tubing (2) at joint (paragraph S. 12).

5.36 SERVICE VALVES (V9 AND V8) (DISCHARGE AND SUCTION). - Continued

**INSTALLATION**

**NOTE**

Check to see if valve caps have been removed before brazing

- a. Position valve (1) in unit.
- b. Braze tubing (2) at joint (paragraph 5.12).
- c. Install nut (1) to compressor line (4).
- d. Install valve caps (3).
- e. Leak test all newly connected Joints and those in the repair area (paragraph 5.13).

**FOLLOW ON PROCEDURES**

- a. Charge refrigerant system (paragraph 5.15).
- b. Install control box (paragraph 4.27).
- c. Install compressor section panel (paragraph 4.24).
- d. Connect air conditioner input power at source.

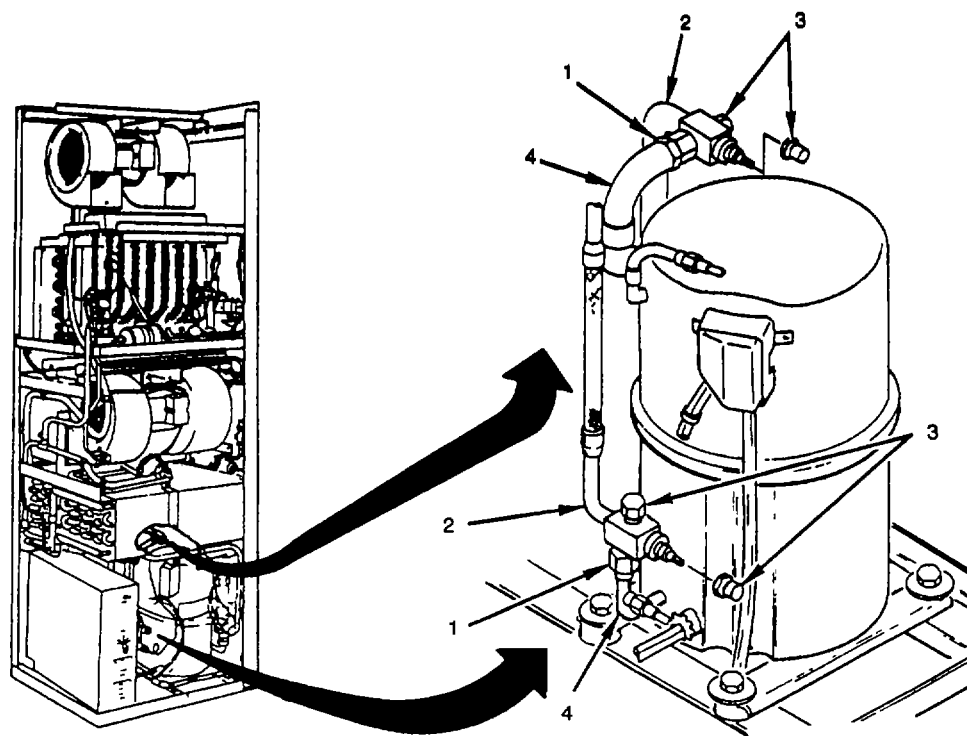


Figure 5-27. Service Valves (V9 and V8) (Discharge and Suction)

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5.37 COMPRESSOR (B2). This task covers inspection, testing, removal, compressor motor burnout inspection and installation.

---

**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Goggles, industrial (Appendix C)  
Gloves, chemical (Appendix C)

Personnel: 1

Material:

Rags (Item 7, Appendix E)  
R-11 (Item 20, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power

- (1) Disconnect air conditioner input power at source,
- (2) Remove compressor section panel (paragraph 4.24);
- (3) Remove control box (paragraph 4.27);
- (4) Remove electrical access cover (6) (see fig 5-28); and
- (5) Tag and disconnect leads

---

**NOTE**

The compressor and motor assembly are hermetically sealed in a metal canister and are repairable.

**INSPECTION**

- a. Inspect for evidence of leaks or damaged lines, and loose or missing mounting hardware.
- b. If a leak is suspected or indicated, test per paragraph 5.13.



5.37 COMPRESSOR (B2). - Continued

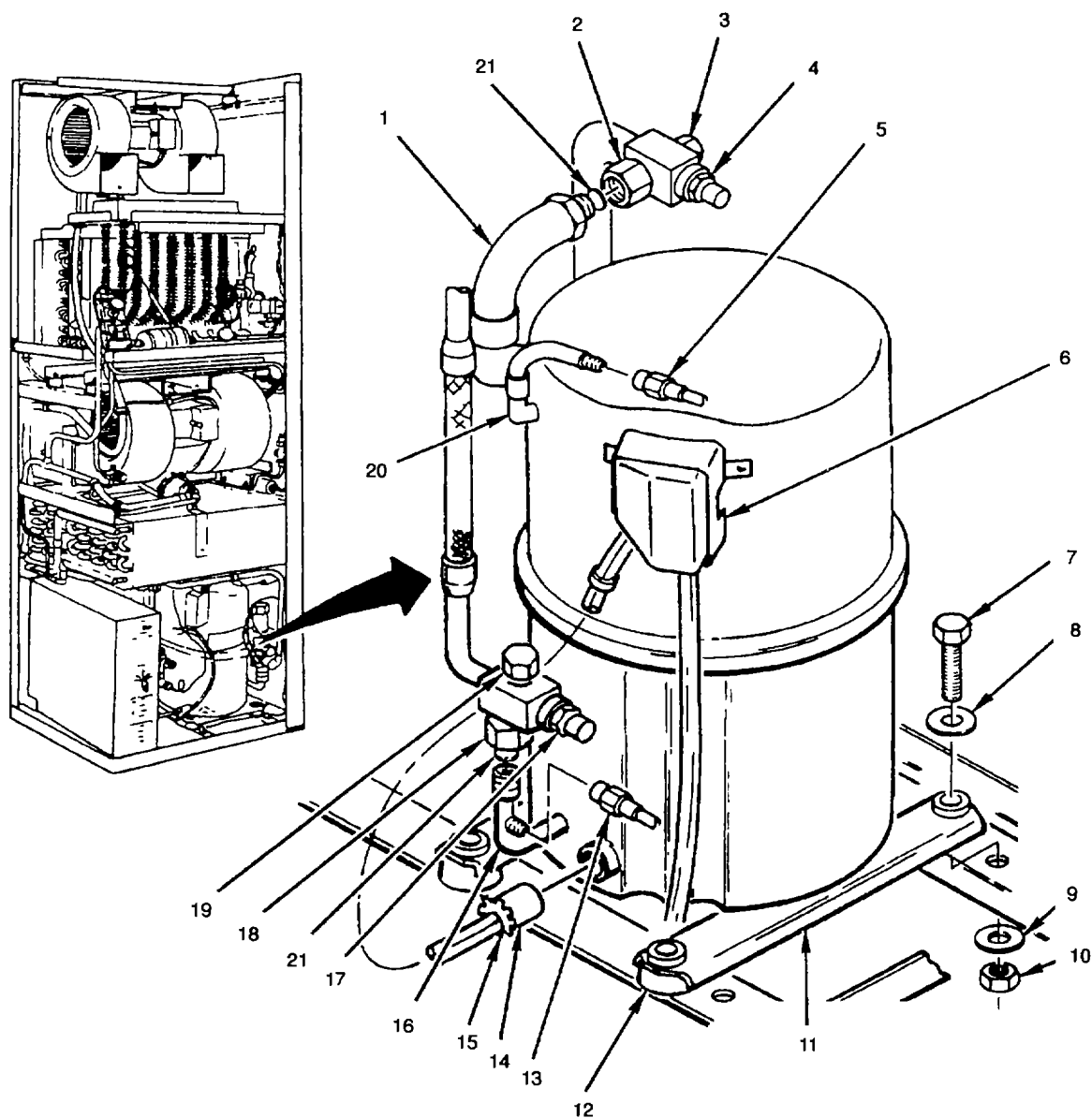


Figure 5-28. Compressor (B2) (Sheet 1 of 2)

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5.37 COMPRESSOR (B2). - Continued

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TESTING

**WARNING**

Heating element can be extremely hot. Severe burns can be caused by touching with bare skin.

- a. Allow crankcase heater (14) to cool before touching
- b. Check crankcase heater (14) (paragraph 4.57)
- c. Carefully feel lower part of compressor

- (1) If air conditioner has been connected to power source for at least 4 hours, compressor should feel warm (100 to 120° F) If not warm, test crankcase heater for current flow (paragraph 4.57).

- (2) If air conditioner has not been connected to power source for at least 4 hours, compressor temperature should be the same as ambient air temperatures.

**NOTE**

Allow compressor to cool before testing

- d. Using multimeter, test compressor motor windings

- (1) Check continuity between pins C, S. and R and the compressor body There should be no continuity. If continuity exists, replace compressor.
- (2) Test single-phase windings (C to S. S to R. and C to R). All resistances should be above zero and less than 2 ohms.
- (3) Compressor containing shorted, open or grounded winding, or open motor protector should be replaced.
- (4) If compressor windings are bad, check for compressor burnout prior to Installing a new compressor.

REMOVAL

- a. Discharge compressor (paragraph 5.17)
- b. Frontseat (clockwise) both low pressure suction service valve (4) (12-inch extension and 1/4-inch socket required) and high pressure discharge service valve (17) c lighten both compressor port caps (3) and (19).

5.37 COMPRESSOR (B2). - Continued

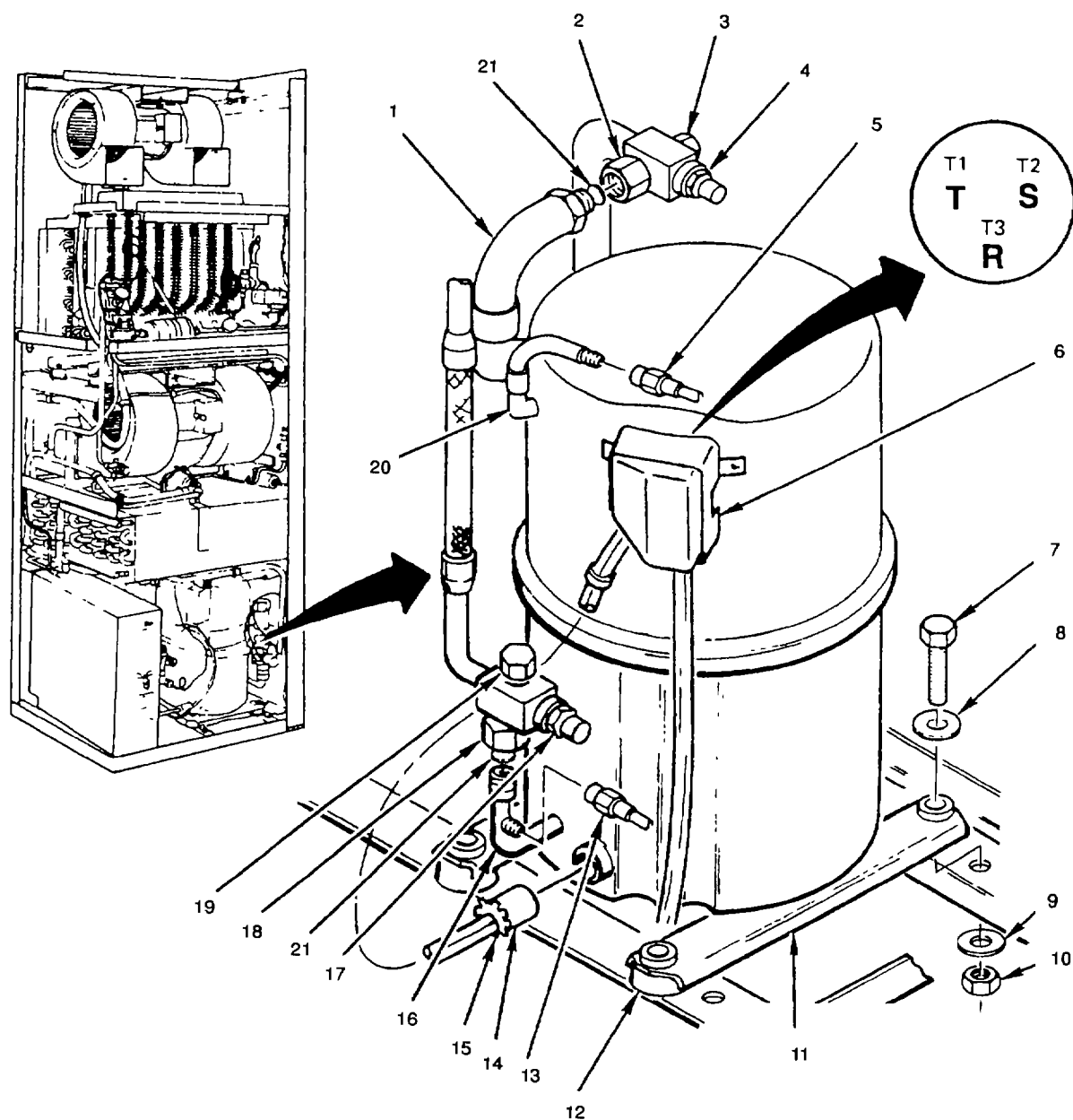


Figure 5-28. Compressor (B2) (Sheet 2 of 2)

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5.37 COMPRESSOR (B2). - Continued

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REMOVAL - continued

**WARNING**

Death or serious injury may result if personnel do not observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly poisonous and corrosive gas.

- d. Slowly loosen high refrigerant pressure switch flare nut (13) and let gas escape.
- e. Slowly loosen low refrigerant pressure switch flare nut (5) and let gas escape.
- f. Remove high refrigerant pressure switch flare nut (13).
- g. Remove low refrigerant pressure switch flare nut (5).

**WARNING**

When removing suction and discharge service valves avoid coming in contact with coil, to avoid injury to personnel and to reduce fin damage on the coil.

- h. Remove suction service valve nut (2) (two 1-11/8 inch wrenches) and move valve away from compressor.
- i. Remove discharge service valve nut (18) and move valve away from compressor.
- j. Remove four bolts (7), locknuts (10), small washers (8), and large washers (9) from mounting bracket.

**WARNING**

Compressor weighs approximately 100 lbs. Personnel injury and/or internal components can be damaged if compressor falls off of mounting bracket and shims.

- k. Pry compressor (11) up to break loose shock mounts (12).
- l. Remove compressor (11).
- m. Remove plastic gasket seal (21) on two large lines (16) and (1).
- n. Debraze tubing three places (1), (16), and (20) and note location of tubing (paragraph .

5.37 COMPRESSOR (B2). - Continued

COMPRESSOR MOTOR BURNOUT INSPECTION

**WARNING**

Avoid skin contact or inhaling fumes from any acid formed by burnout of oil and refrigerant. Wear a gas mask if area is not thoroughly ventilated. Wear protective goggles or glasses to protect eyes. Wear rubber gloves to protect hands.

- a. After removal of a bad compressor from the refrigeration system, remove all external tubing and tip the compressor toward the discharge port to drain sample of oil into a clear glass container.
- b. If the oil is clean and clear and does not have a burnt acid smell, the compressor did not fail because of motor burnout. If a burnout is not indicated, proceed to INSTALLATION.
- c. If the oil is black, contains sludge, and has a burnt acid odor, the compressor failed because of motor burnout.
- d. You must clean the entire refrigeration system after burnout has occurred, since contaminants will have been carried to many corners and restrictions in the piping and fittings. These contaminants will soon mix with new refrigerant gas and compressor oil to cause repeated burnouts.
- e. Remove the drier filter and discard (paragraph 5-23). Connect a cylinder of dry nitrogen to each drier filter flare nut connection in turn and open the cylinder shutoff valve for at least 30 seconds at 50 psig (3.5 kg/cm<sup>2</sup>) pressure.
- f. Connect the two drier filter fittings with a jumper locally manufactured from refrigerant tubing and fittings.
- g. Clean system by back flushing with liquid refrigerant, R-11, from pressurized cylinder or circulating pump and reservoir with pressure of at least 100 psig (7 kg/cm<sup>2</sup>).
- h. If pump is used, connect the discharge line of the refrigerant system to the discharge side of the pump.
- i. Connect a line containing a filter to the suction line in the unit.

**NOTE**

An unused drier filter or other suitable medium may be used as a filter.

- j. The other end of the temporary suction line should be connected to a small drum or suitable reservoir.
- k. A line should be run from the bottom of the reservoir to the inlet of the pump.

**WARNING**

Avoid skin contact or inhaling fumes from any acid formed by burnout of oil and refrigerant. Wear a gas mask if area is not thoroughly ventilated. Wear protective goggles or glasses to protect eyes. Wear rubber gloves to protect hands.

- l. Fill reservoir with fluorocarbon refrigerant, R-11, and start the pump. Continue filling the reservoir with refrigerant, R-11, until it begins to pour out of the return line. Continue flushing for at least 15 minutes.

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5.37 COMPRESSOR (B2). - Continued

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**COMPRESSOR MOTOR BURNOUT INSPECTION** - Continued

- m. Reverse the pump connections, replace the filter with a new filtering medium, and backflush the system for an additional 15 minutes
- n. Remove the pump, reservoir, and drier filter Jumper. Place an empty container below the compressor connections, and connect a cylinder of dry nitrogen to each drier filter connection in turn. Blow dry nitrogen down each leg of the system at 50 psig (3.5 kg/cm<sup>2</sup>) for at least 30 seconds.

**INSTALLATION**

**CAUTION**

Wrap compressor with cool wet rags to prevent damage to compressor motor

- a. Braze tubing three places (1, 16, and 20), removed in Step n In REMOVAL above (paragraph 5.12)
- b. Install replacement plastic gasket seals (21) on two large lines (1) and (16).
- c. Place compressor (11) in mounting position.
- d. Install four bolts (7), small washers (8), large washers (9) and locknuts (10), through mounting bracket.
- e. Tighten four bolts (7) until they start to come through locknuts (10),
- f. Install high refrigerant pressure switch flarenut (13).
- g. Install low refrigerant pressure switch flarenut (5).
- h. Install suction service valve nut (2) (use two 1 - 1/8-inch wrenches).
- i. Install discharge suction valve nut (18).
- j. Reconnect wires removed in equipment conditions and remove tags,
- k. Install electrical access cover (6).
- l. Leak test all compressor joints and surrounding joints in work area (paragraph 5.13).

**FOLLOW ON PROCEDURES**

- a. Purge compressor (paragraph 5.18).
- b. Change refrigerant system (paragraph 5.15).
- c. Install control box (paragraph 4 27).
- d. Install compressor section panel (paragraph 4.24).
- e. Connect air conditioner input power at source

---

5.38 VIBRATION ELIMINATORS (VE1 AND VE2). This task covers inspection, removal and installation.

---

**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source;
  - (2) Remove compressor section panel (paragraph 4.24); and
  - (3) Remove control box (paragraph 4.27).
- 

**INSPECTION**

- a. Inspect vibration eliminators (4) and (5) for evidence of leaks or damaged lingo (see fig, 5-29).
- b. If a leak is suspected or indicated, test per paragraph 5.13.

**REMOVAL**

- a. Discharge refrigerant system (paragraph 5.10),

**WARNING**

When removing suction and discharge vibration eliminators, avoid coming in contact with coil to avoid injury to personnel and to reduce fin damage on the coil.

- b. If suction valve vibration eliminator (5) is to be replaced, remove compressor (paragraph 5.37).
- c. Debraze at joints (2) and (6) for suction vibration eliminator (5) (paragraph 5.12)
- d. Debraze at joints (3) and (1) for discharge vibration eliminator (4) (paragraph 5.12).
- e. Remove vibration eliminator (4) or (5).

5.38 VIBRATION ELIMINATORS (VE1 AND VE2). This task covers inspection, removal and installation.

#### INSTALLATION

- a. Position vibration eliminator (4) or (5) in frame.
- b. Braze suction vibration eliminator (5) at pints (2) and (6) (paragraph 5.12).
- c. Braze discharge vibration eliminator (4) at joints (3) and (1) (paragraph 5.12).
- d. If suction valve vibration eliminator was replaced, install compressor (paragraph 5.37).

#### FOLLOW ON PROCEDURES

- a. Install electrical control box (paragraph 4.27).
- b. Charge refrigerant system (paragraph 5.15).
- c. Install compressor section panel (paragraph 4.24).
- d. Connect air conditioner input power at source.

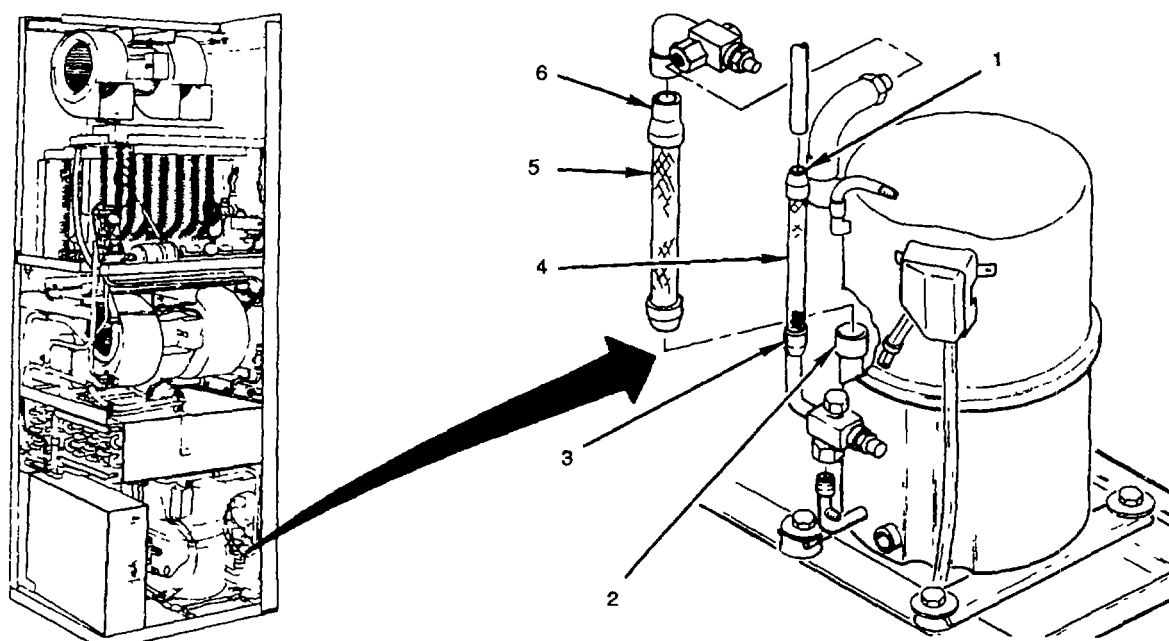


Figure 5-29. Vibration Eliminators (VE1 and VE2)



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5.39. RECEIVER. This task covers inspection, removal, repair and installation.

---

**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source;
- (2) (2) Discharge refrigerant system (paragraph 5.10); and
- (3) (3) Remove compressor (paragraph 5.37).

---

**INSPECTION**

- a. Inspect for evidence of leaks damaged lines and loose or missing mounting hardware (see fig. 5-30).
- b. If a leak is suspected or indicated test per paragraph 5.13.
- c. Check fusible plug (9) for leaks. If leaks are detected replace fusible plug.

**REMOVAL**

- a. Frontseat (clockwise) receiver service valve (5).
- b. Remove valve caps (4) and (6).
- c. Remove screw (10) nut (2) and bracket (1).
- d. Debraze tubing (3) and (7) at joints (paragraph 5.12).
- e. Remove receiver (8).

**REPAIR**

Repair consists of replacing fusible plug (9).

5.39. RECEIVER. - Continued

INSTALLATION

- a. Position receiver (8) in frame.
- b. Install bracket (1) with screw (10) and nut (2).
- c. Braze tubing (3) and (7) at joints (paragraph 5.12).
- d. Backseat (counterclockwise) receiver service valve (5).
- e. Install compressor (paragraph 5.37).
- f. Leak test all newly connected and surrounding area joints (paragraph 5.13).

FOLLOW ON PROCEDURES

- a. Charge refrigerant system (paragraph 5.15).
- b. Install compressor panel (paragraph 4.24).
- c. Connect air conditioner input power at source

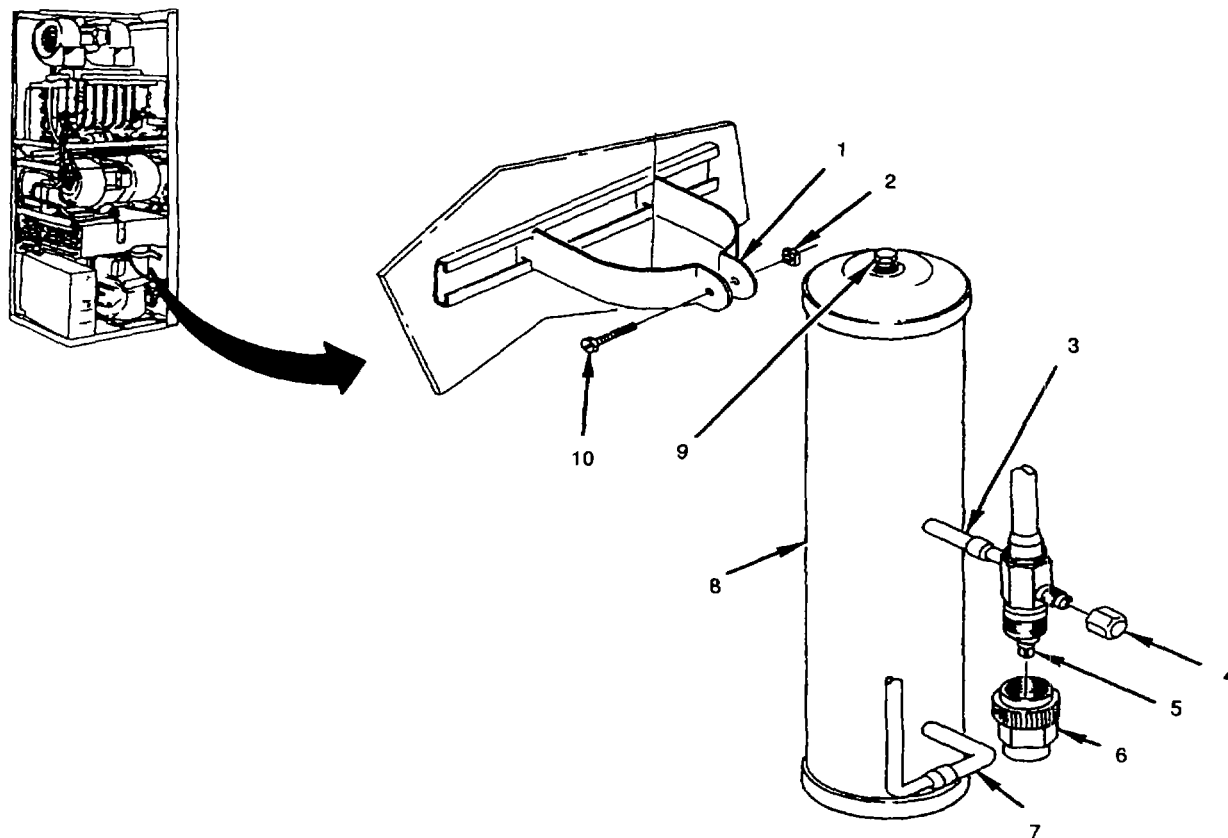


Figure 5-30. Receiver

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5.40 REFRIGERANT STRAINER (F2). This task covers inspection, removal and installation.

---

**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Equipment Conditions:

- (1) Remove compressor section panel (paragraph 4.24);
- (2) Pump down refrigerant system (paragraph 5.19); and

**WARNING**

Disconnect input power to the air conditioner before performing any Internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (3) Disconnect air conditioner input power at source

---

**INSPECTION**

- a. Inspect for evidence of leaks, kinked, or otherwise damaged line, and loose or missing mounting hardware (see fig 5-31).
- b. If a leak is suspected or indicated, test per paragraph 5.13.

**REMOVAL**

- a. Remove two flarenuts ( 1) and (4) and lines.
- b. Loosen screw (6) and locknut (5).
- c. Remove refrigerant strainer (2) from clamp (3).

**INSTALLATION**

- a. Install refrigerant strainer (2) into clamp (3).
- b. Tighten screw (6) and locknut (5).
- c. Install two flarenuts (1) and (4).
- d. Leak test all newly connected joints and those in the repair area (paragraph 5 13).

5.40 REFRIGERANT STRAINER (F2). - Continued

**FOLLOW ON PROCEDURES**

- a. Perform start up after repairs (paragraph 5.20).
- b. Connect air conditioner input power at source.

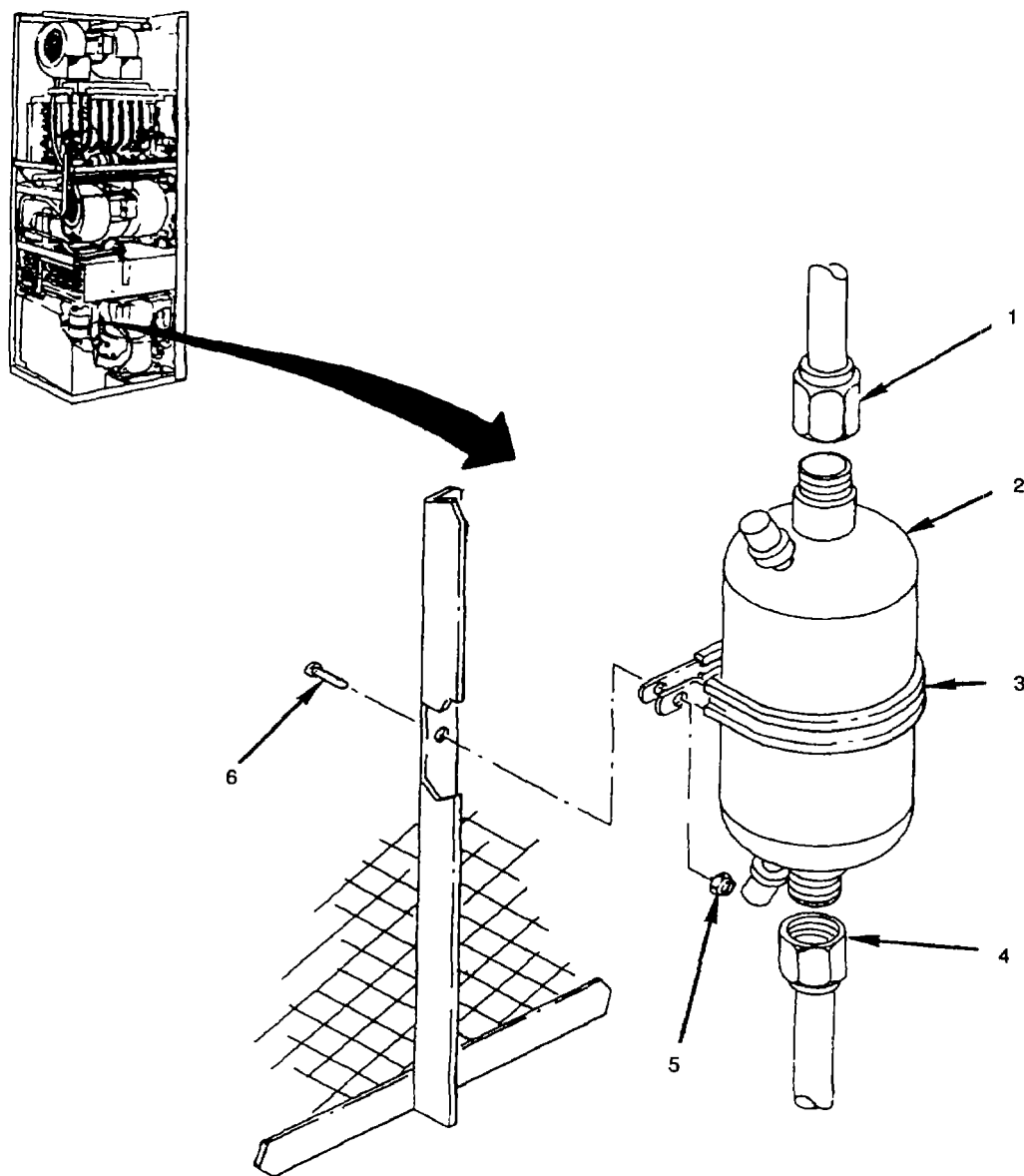


Figure 5-31. Refrigerant Strainer (F2)

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5.41 TUBING AND FITTINGS. This task covers inspect, removal and installation

---

**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source, and
- (2) Remove covers and panels as necessary to have access to repair area.

---

**NOTE**

The refrigeration system contains a number of pieces of copper tubing in a variety of material grades, sizes, lengths, and shapes, and a number of elbows, tees, and adapters in several sizes.

**INSPECTION**

Refer to leak testing (paragraph 5 13)

**REMOVAL**

- a. Discharge refrigerant system (paragraph 5.10).
- b. Purge refrigerant system (paragraph 5.11).
- c. Debraze the tube connections (paragraph 5.12).
- d. Remove part.

**INSTALLATION**

- a. Place replacement part on tube end.
- b. Braze tube connections (paragraph 5.12).
- c. Purge refrigerant system (paragraph 5 11)
- d. Replace drier filter (paragraph 5.23).

---

5.41 TUBING AND FITTINGS. - Continued

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**INSTALLATION** - Continued

- e. Leak test all newly connected joints and those in the repair area (paragraph 5.13).
- f. Evacuate refrigerant system (paragraph 5.14).
- g. Charge refrigerant system (paragraph 5.15).
- h. Install all covers and panels that were removed.

**FOLLOW ON PROCEDURE**

Connect air conditioner input power at source.

## CHAPTER 6

### GENERAL SUPPORT MAINTENANCE

#### Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

6.1 COMMON TOOLS AND EQUIPMENT. For authorized common tools and equipment refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

6.2 SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT. No special Tools are required for General Support Maintenance of the air conditioner.

6.3 REPAIR PARTS. Repair parts are listed and illustrated In the Repair Pats and Special Tools List (RPSTL), TM 9-4120-380-24P, covering Unit, Direct Support and General Support Maintenance for (his equipment.

## Section II. GENERAL SUPPORT MAINTENANCE PROCEDURES

6.4 GENERAL. The only items restricted to General Support Maintenance level by the Maintenance Allocation Chart (MAC) are to replace elements of the air conditioner housing. However, General Support Maintenance may be called upon, at times, to perform any or all of the MAC items listed for Unit and Direct Support Maintenance for rehabilitation or overhaul of an air conditioner.

### 6.5 SHEET-METAL, PARTS (CHASSIS).

6.5.1 Disassemble the air conditioner to the extent necessary to gain access to damaged area for repair.

6.5.2 Remove insulation from area to be repaired (paragraph 5-5).

### **WARNING**

Toxic fumes are emitted by burning or overheating Insulation, Heated refrigeration piping can burst with explosive force. Shield wiring and piping, and remove insulation in the area if weld repair is necessary.

6.5.3 Repair damage using standard sheet-metal repair procedures. Rivet or weld patches to inside surface when required.

6.5.4 Replace insulation (paragraph 5.5) as necessary and reassemble the air conditioner.



---

6.6 CONDENSER DUCT. This task covers removal, inspection, repair/replace, and installation.

---

**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Electric portable drill (Item 6, Appendix B)  
Twist drill set (Item 7, Appendix B)  
Blind riveter (Item 8, Appendix B)

Personnel: 1

Material:

Bulk gasket material

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source,
  - (2) Remove condenser fan section panel (paragraph 4.23);
  - (3) Remove condenser motor and housing assembly (paragraph 4.49);
  - (4) Remove damper actuator (paragraph 5.33); and
  - (5) Remove damper operator (paragraph 5.34)
-

---

6.6 CONDENSER DUCT. - Continued

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**REMOVAL**

- a. Remove six rivets (3) securing duct (4) to back of frame (see fig 6-1).
- b. Lift duct over thermostatic expansion valve and remove duct (4).

**INSPECTION**

- a. Check duct (4) for damage.
- b. Check for proper operation of damper (10) and pivot shaft (11)
- c. Check that gasket (5) is not damaged or missing rivets (7).

**REPAIR/REPLACE**

**NOTE**

Repair consists of replacing gasket, damper and/or pivot shaft, rivets, or condenser duct.

- a. Gasket.
  - (1) Remove 9 or 10 rivets (7) from bracket (6).
  - (2) Remove damaged gasket (5).
  - (3) Cut gasket (5) to fit.
  - (4) Install gasket (5) and bracket (6) with 9 or 10 rivets (7).
- b. Damper and Pivot Shaft.
  - (1) Remove two screws (1), four flat washers (9) and (12), and two self-locking nuts (8) securing damper (10) to pivot shaft (11).
  - (2) Remove pivot shaft (11).
  - (3) Remove damper (10).
  - (4) Position damper (10) in condenser duct (4).
  - (5) Install pivot shaft with two screws (1), four flat washers (9) and (12), and two locknuts (8).

6.6 CONDENSER DUCT. - Continued

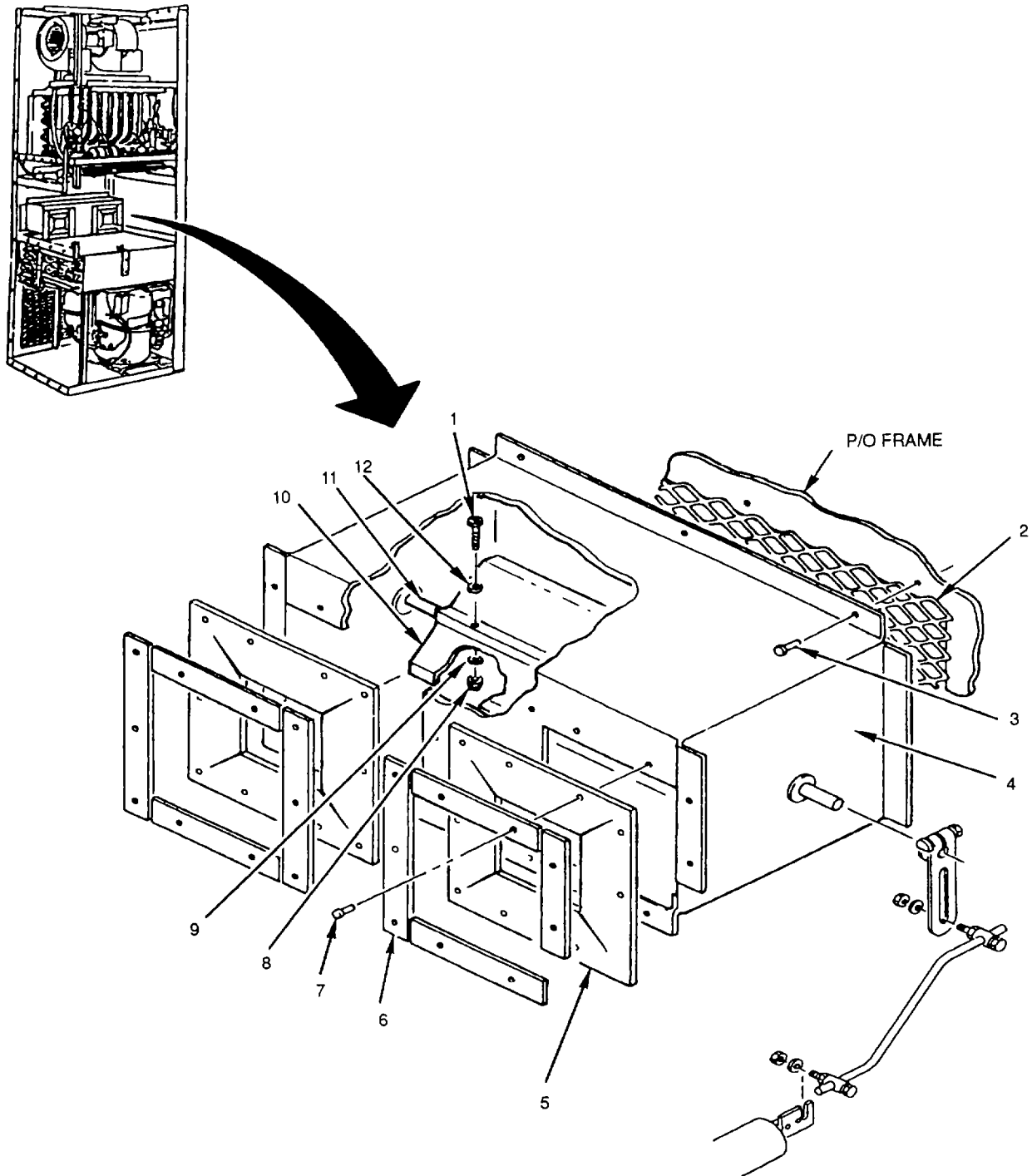


Figure 6-1. Condenser Duct

---

6.6 CONDENSER DUCT. - Continued

---

**INSTALLATION**

- a. Lift condenser duct (4) over thermostatic expansion valve and position in place.
- b. Install duct (4) with six rivets (3).

**FOLLOW ON PROCEDURES**

- a. Install damper operator (paragraph 5.34).
- b. Install damper actuator (paragraph 5.33).
- c. Install condenser motor and housing assembly (paragraph 4.49).
- d. Install condenser fan section panel (paragraph 4.23).
- e. Connect air conditioner and input power at source.

---

6.7 LEFT FRAME PANEL (CHASSIS). This task covers removal and installation.

---

**INITIAL SETUP**

Tools:

Tool kit, service, refrigeration unit (Item 1, Appendix B)  
Saw, reciprocating (Item 14, Appendix B)  
Sander, disk, electric (Item 15, Appendix B)  
Welding shop, trailer mounted (Item 16, Appendix B)  
Gloves, chemical (Appendix C)  
Goggles, industrial (Appendix C)

Personnel: 2

Materials:

Sealing compound (Item 22, Appendix E)  
Paint, white (Item 15, Appendix E)  
Primer, red epoxy (Item 13, Appendix E)  
Primer, gray epoxy (Item 14, Appendix E)

Equipment Conditions:

**WARNING**

Disconnect input power to the air conditioner before performing any internal maintenance. Voltages used can KILL. Shutting the unit off at the control panel does not disconnect unit power.

- (1) Disconnect air conditioner input power at source;
- (2) Remove panels (paragraph 4.22 through 4.24);
- (3) Remove return air filter (paragraph 4.26);
- (4) Discharge system (paragraph 5.10);
- (5) Remove control box (paragraph 4.27); and
- (6) Remove thermostat (S2) assembly (paragraph 4.54) from frame.

---

**REMOVAL**

**WARNING**

Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye contact is possible.

- a. Cut top of frame both sides (3) (see fig. 6-2).
- b. Remove rivet (12) front left bottom corner securing captive receptacle to frame.

6.7 LEFT FRAME PANEL (CHASSIS). - Continued

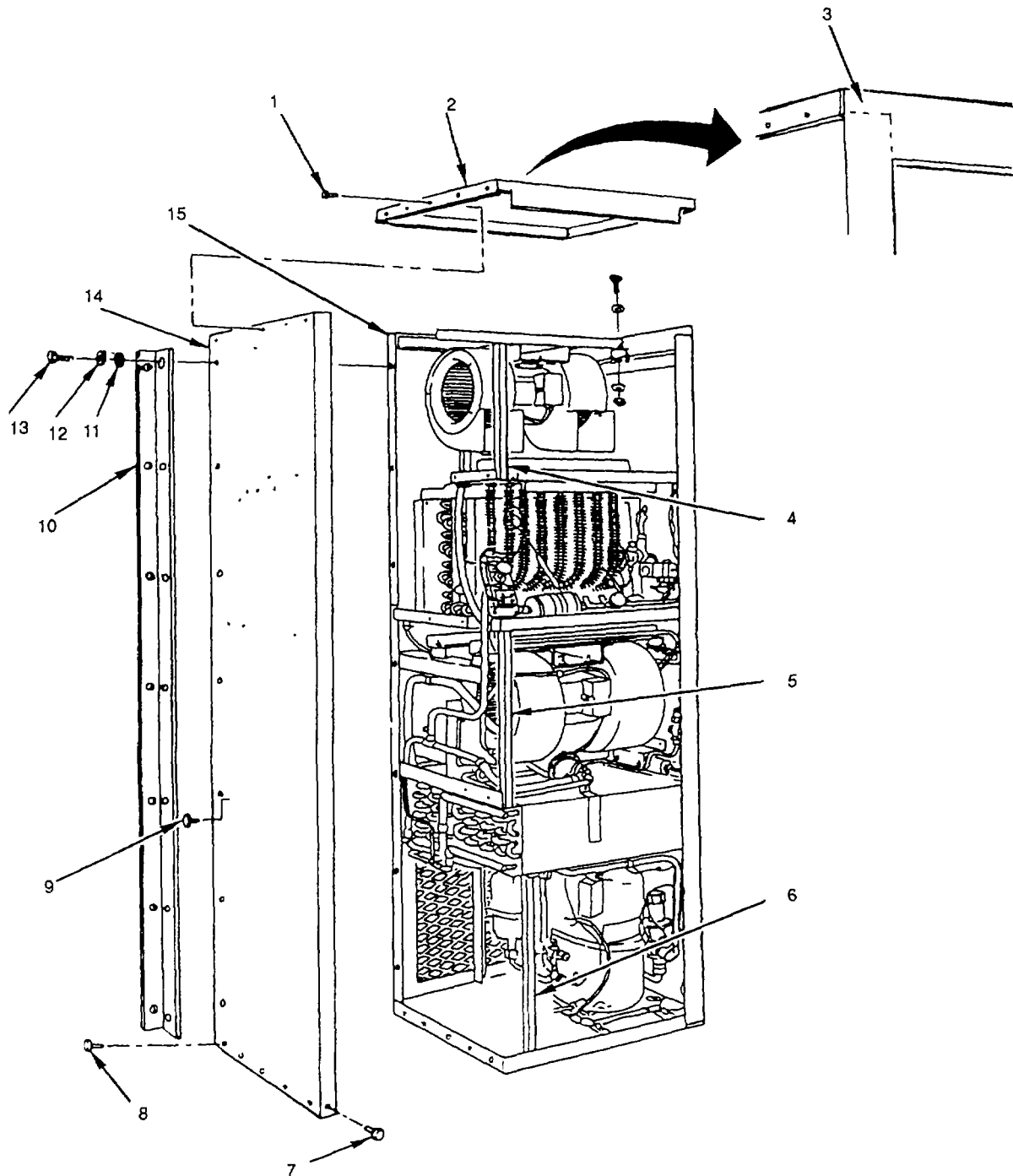


Figure 6-2. Left Frame Panel (Chassis)

---

6.7 LEFT FRAME, PANEL (CHASSIS) - Continued

---

**REMOVAL** - Continued

- c. Remove seven bolts (13), lockwashers (12), flat washers (11) and frame support (10)
- d. Remove 16 rivets (1) securing top (2) to frame (15).
- e. Remove top (2).

**NOTE**

Use 3/4 X 3/4 square tubing for support material.

- f. Place 17-1/4-inch (43.82 cm) brace (6) in compressor compartment to support condenser coil assembly.
- g. Place 15-15/16-inch (40.48 cm) brace (5) in condenser compartment to support evaporator coil assembly.
- h. Place 12-1/2-inch (31.75 cm) brace (4) in evaporator fan compartment to support evaporator fan assembly.
- i. Remove evaporator motor and housing assembly (paragraph 4.46).
- j. Remove five rivets (8) from bottom of frame.
- k. Remove 33 rivets (9) from side of frame
- l. Pry side (14) out and away from caulking
- m. Remove side frame (14).

**INSTALLATION**

- a. Apply caulking to rear frame (15).
- b. Place frame side (14) in mounting position.
- c. Install five rivets (8) at bottom of left frame panel.
- d. Install 33 rivets (9).
- e. Install evaporator motor and housing assembly (paragraph 4.46).
- f. Position top (2) onto frame sides.
- g. Install 16 rivets (1) securing top to frame.
- h. Install frame support (10) with seven bolts (13), lockwashers (12), and flat washers (11).
- i. Install rivet (7) securing captive receptacle to frame.
- j. Remove all compartment braces (4, 5, and 6).
- k. Weld top of frame to both sides (3).
- l. Grind smooth top of frame, both sides (3).
- m. Paint top of frame, both sides (3).

---

6.7 LEFT FRAME, PANEL (CHASSIS). - Continued

---

**FOLLOW ON PROCEDURES**

- a. Install S2 thermostatic switch assembly (paragraph 4.54).
- b. Install control box (paragraph 4.27).
- c. Charge system (paragraph 5.15).
- d. Leak test joints in work area (paragraph 5.13).
- e. Install return air filter and panels (See paragraphs 4.22, 4.23, 4.24, and 4.26.)
- f. Connect air conditioner input power at source.



---

6.8 CONDENSER COIL. This task covers removal, repair/replace, and installation.

---

**INITIAL SETUP**

Tool:  
Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 1

Material:  
Brazing alloy, silver, grade III (Item 21, Appendix E)

Equipment Condition:

Remove left frame panel (paragraph 6.7).

---

**REMOVAL**

- a. Remove two screws (3) from liquid quench expansion valve bracket (2) (see fig 6-3).
- b. Debraze tubing (4, 6, and 7) at joints (paragraph 5.12).

**NOTE**

Support condenser coil assembly before removing rivets  
securing assembly to frame.

- c. Remove five rivets (1) securing condenser coil assembly to frame.
- d. Remove condenser coil assembly (5).
- e. Remove service valve bracket from bottom of coil (5).

**REPAIR/REPLACE**

Repair consists of brazing (paragraph 5 12) damaged tubes or straightening damaged fins with comb or replace coil.

6.8 CONDENSER COIL - Continued

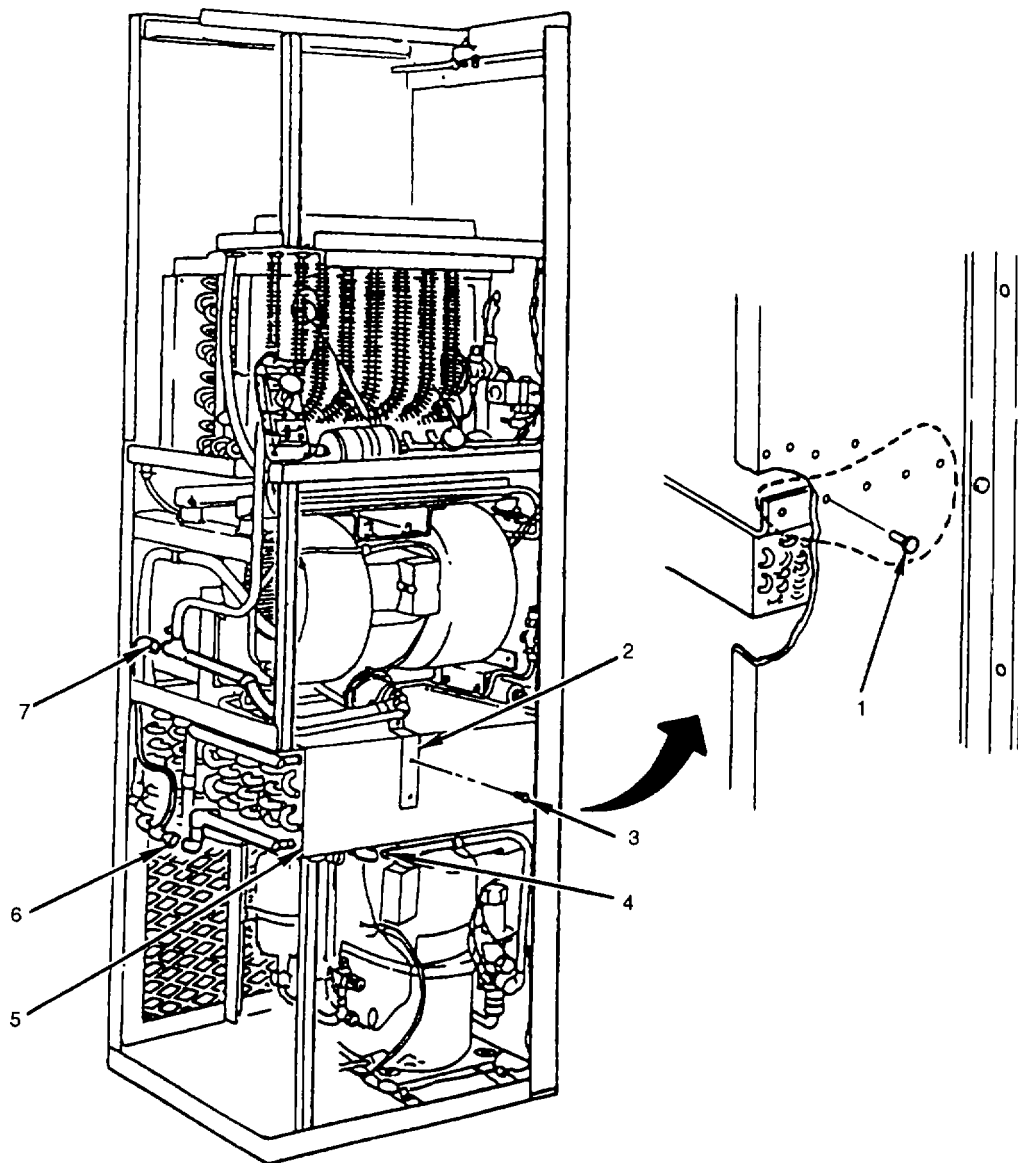


Figure 6-3. Condenser Coil

---

6.8 CONDENSER COIL - Continued

---

**INSTALLATION**

- a. If a new coil is to be installed, debraze tubing from coil (paragraph 5.12).
- b. Braze tubing to new coil (paragraph 5.12).
- c. Install service valve bracket to bottom of coil (5).

**NOTE**

Support condenser coil assembly before installing rivets  
securing coil to frame.

- d. Place and support coil (5) in mounting position.
- e. Install five rivets (1) securing condenser coil assembly to frame.
- f. Braze tubing (4), (6), and (7) at joints (paragraph 5.12).
- g. Install liquid quench bracket (2) with two screws (3).

**FOLLOW ON PROCEDURE**

Install left frame panel (paragraph 6.7).

---

6.9 EVAPORATOR COIL. This task covers removal, repair/replace, and installation.

---

**INITIAL SETUP**

Tool:

Tool kit, service, refrigeration unit (Item 1, Appendix B)

Personnel: 2

Equipment Condition:

Remove left frame panel (paragraph 6.7).

---

**REMOVAL**

- a. Remove drier filter (F1) (paragraph 5.23) (see fig 6-4).
- b. Remove nut and solenoid assembly (L1) (paragraph 5.29) from bracket.
- c. Remove liquid quench sensing bulb (paragraph 5.29) and pull down to condenser compartment (6).
- d. Remove bolt (4) securing primary expansion valve to mounting bracket (paragraph 5.30).
- e. Pull air differential hose (2) up to evaporator fan compartment (1).
- f. Tag and remove heater assembly wire leads (paragraph 4.52).
- g. Pull wiring harness (3) down to condenser compartment (6).

**NOTE**

Before removing rivets make sure evaporator assembly is supported.

- h. Debraze tubing (4 and 7) at joints.
- i. Remove five rivets (6) securing evaporator assembly to right frame.
- j. Remove evaporator coil assembly (8).
- k. Debraze distributor (9) from coil (paragraph 5.12).

6.9 EVAPORATOR COIL - Continued

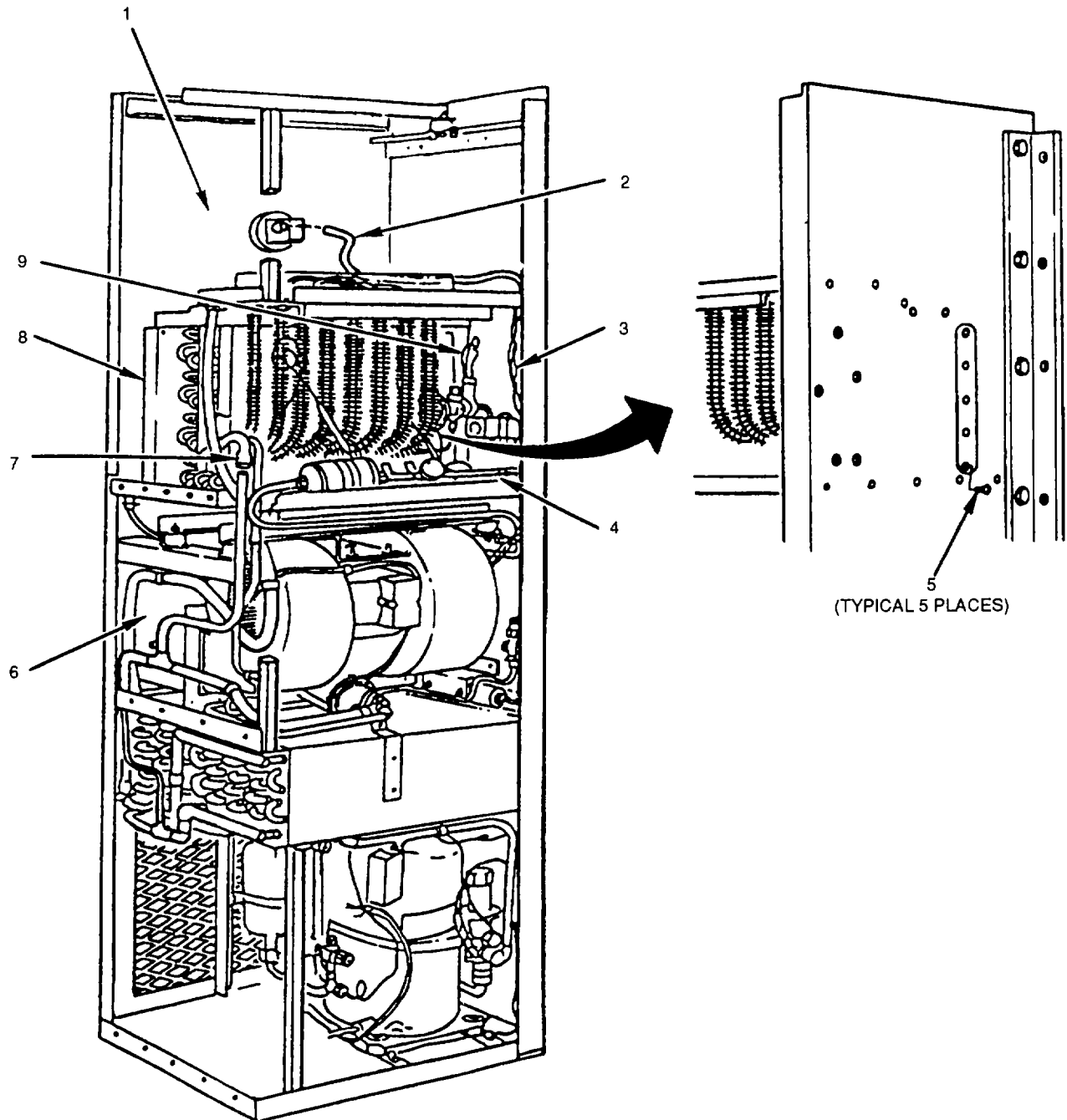


Figure 6-4. Evaporator Coil

---

6.9 EVAPORATOR COIL. - Continued

---

**REPAIR/REPLACE**

Repair consists of brazing (paragraph 5.12) damaged tubes. straightening damaged fins with fin comb or replacing coil.

**INSTALLATION**

- a. Braze distributor (9) to coil (paragraph 5.12).
- b. Place and support evaporator coil assembly (8) in mounting position.
- c. Install five rivets (5) securing evaporator assembly to right frame.
- d. Pull wiring harnesses (3) up to evaporator compartment (1).
- e. Connect wire leads tagged in removal to heater assembly.
- f. Reinstall air differential hose (2).
- g. Braze tubing (4 and 7) at joints (paragraph 5.12).
- h. Pull liquid quench sensing bulb up to evaporator compartment (1).
- i. Install liquid quench sensing bulb (paragraph 5.31).
- j. Install solenoid assembly L1 (paragraph 5.29) to bracket.
- k. Install new drier filter (paragraph 5.23).
- l. Install primary expansion valve to mounting bracket (paragraph 5.30).

**FOLLOW ON PROCEDURE**

Install left frame panel (paragraph 6.7).

## APPENDIX A

### REFERENCES

A.1 SCOPE. This appendix lists all forms, field manuals, technical manuals and miscellaneous publications referenced in this manual.

A.2 FORMS.

Recommended Changes to Publications and Blank Forms.....	DA-2028
Recommended Changes to Equipment Technical Publications .....	DA-2028-2
Product Quality Deficiency Report.....	SF-368
Packaging Improvement Report .....	DD-Form-6
Equipment Control Record .....	DA-2408-9
Report of Discrepancy.....	SF-364
Transportation Discrepancy Report .....	SF-361

A.3 DEPARTMENT OF THE ARMY PUBLICATIONS.

The Army Maintenance Management System (TAMMS) .....	DA PAM 738-750
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A.4 TECHNICAL MANUALS/OTHER.

Repair Parts and Special Tools List.....	TM 9-4120-380-24P
Destruction of Equipment to Prevent Enemy Use .....	TM 750-244-3
Painting Instructions for Field Use .....	TM 43-0139
Leak Detector, Refrigerant Gas .....	TM 9-4840-435-14
Hand Portable Fire Extinguisher (Approved for Army Use) .....	TB 5-4200-200-10
Varnish, Moisture and Fungus Resistant.....	MIL-V-173C
Administrative Storage .....	TM 740-90-1
The Air Force Suggestion Program (PA) .....	AFR 900-4

## APPENDIX B

### MAINTENANCE ALLOCATION CHART

#### Section I. INTRODUCTION

##### B.1 GENERAL.

B.1.1 This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

B.1.2 The Maintenance Allocation Chart (MAC) In Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance categories.

B.1.3 Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from Section II.

B.1.4 Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

##### B.2 MAINTENANCE FUNCTIONS. Maintenance functions will be limited to and defined as follows:

- a. Inspect. To determine the serviceability of an item by company its physical, mechanical and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).
- b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, 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, i.e., to clean (includes decontaminate when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.
- d. Adjust. To maintain or regulate. 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 or 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. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.



- h. Replace. To remove an unserviceable item and Install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the third position code of the SMR code.
- i. Repair. The application of maintenance services, including fault location/troubleshooting<sup>2</sup>, removal/installation, and disassembly/assembly<sup>3</sup> procedures, and maintenance actions<sup>4</sup> to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.
- j. Overhaul. That maintenance effort (service/actions) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an 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 equipment/components.

### B.3 EXPLANATION OF COLUMNS IN THE MAC. SECTION II.

B.3.1 Column 1, "Group Number". Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly. End item group number shall be "00."

B.3.2 Column 2, "Component/Assembly". Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

B.3.3 Column 3, "Maintenance Function". Column 3 lists the functions to be performed on the item listed in Column 2 (For a detailed explanation of these functions, see paragraph B.2).

---

<sup>1</sup>Services - Inspect, test, service, adjust, align, calibrate, and/or replace.

<sup>2</sup>Fault Locate/Troubleshoot - The process of investigating and detecting the cause of equipment malfunctioning, the act of isolating a fault within a system or unit under test (UUT).

<sup>3</sup>Disassemble/Assemble - Encompasses the step-by-step taking apart (or breakdown) of a spare/functional group coded item to the level of its least component identified as maintenance significant (i.e., assigned an SMR code) for the category of maintenance under consideration.

<sup>4</sup>Actions - Welding, grinding, riveting, straightening, facing, remachining, and/or resurfacing.

B.3.4 Column 4, "Maintenance Category". Column 4 specifies, by the listing of a work time fig in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in Column 3. This fig 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 categories, appropriate work time figs will be shown for each category. The work time fig. represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary/assembly time), troubleshooting/fault location time, and quality assurance/quality control time. In addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The designations for the various maintenance function categories are as follows:

C ..... Operator or Crew  
O ..... Unit Maintenance  
F ..... Direct Support Maintenance  
H ..... General Support Maintenance  
D ..... Depot Maintenance

B.3.5 Column 5, "Tools and Equipment". Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

B.3.6 Column 6, "Remarks". This column shall, when applicable, contain a letter code in alphabetical order which shall be keyed to the remarks contained in Section IV.

#### B.4 EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS SECTION III

B.4.1 Column 1, "Reference Code". The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

B.4.2 Column 2, "Maintenance Category". The lowest category of maintenance authorized to use the tool or test equipment.

B.4.3 Column 3, "Nomenclature". Name or identification of the tool or test equipment.

B.4.4 Column 4, "National Stock Number". The national stock number of the tool or test equipment.

B.4.5 Column 5, "Tool Number". The manufacturer's part number.

#### B.5 EXPLANATION OF COLUMNS IN REMARKS, SECTION IV.

B.5.1 Column 1, "Reference Code". The code recorded in Column 6, Section II.

B.5.2 Column 2, "Remarks". This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

**Section II. MAINTENANCE ALLOCATION CHART - Continued**

(1)  GROUP NUMBER	(2)  COMPONENT ASSEMBLY	(3)  MAINTENANCE FUNCTION	MAINTENANCE LEVEL					(5)  TOOLS AND EQUIP.	(6)  REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
01	Panels, Ducting Evaporator Duct/Panel	Inspect	0.1						A B, C, D, E, F, G  1, 2, 3, 4
		Repair		1.0					
		Replace		0.5					
	Condenser Fan Section Panel	Inspect	0.1						A E, F, G, H  1
		Repair		1.0					
		Replace		0.5					
	Compressor Section Panel	Inspect	0.1						A D, E, F, G, H, I, J  1, 2, 3, 4
		Repair		1.0					
	Condenser Duct	Replace		0.5					1
		Inspect				0.1			
		Repair				1.0			
		Replace				2.0			
02	Information Plate	Inspect	0.1						A D  1, 2, 3, 4
		Replace		1.0					
	Filters								
	Return Air Filter	Inspect	0.1						A L H  1
		Service		0.5					
		Repair		1.0					
03	Electrical Control Box Assembly	Replace		0.5					1 1 1
		Inspect							
		Test							
	Mode Select Switch	Inspect	0.1						A P  1, 7, 8
		Test		1.0					
		Replace		1.0					
	Prime Unit Select Switch	Repair		0.2					AY
		Inspect							
		Test		0.1					
		Replace		0.5					A P  1
		Test		1.0					

**Section II. MAINTENANCE ALLOCATION CHART - Continued**

(1)  GROUP NUMBER	(2)  COMPONENT ASSEMBLY	(3)  MAINTENANCE FUNCTION	MAINTENANCE LEVEL					(5)  TOOLS AND EQUIP.	(6)  REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
	Fault Reset Switch	Inspect Test Replace		0.1 0.5 1.0				1 1, 7, 8	A P
	Resistor Board	Inspect Repair Replace		0.1 1.0 1.0				1 1	A X
	Resistors	Inspect Test Replace		0.1 0.5 0.5				1	A P
	Indicator Lights Replace	Inspect Test	0.1	0.1 0.5 1.0				1 1, 7, 8	A P Q
	Contactors Test Replace	Inspect 0.5 10		0.1 1 1					A P, R
	Phase Relay	Inspect Adjust Test Replace		0.1 0.5 0.5 0.5				1 1	A S P
	Fault Relay	Inspect Test Replace		0.1 0.5 0.5				1	A P U
	Latching Relay	Inspect Test Replace		0.1 0.5 1.0				1 1	A P U, AZ
	Relay Mount- ing Plate	Inspect Repair		0.1 1.0				1, 2, 3, 4	A D, V
	Circuit Breaker	Inspect Test Replace		0.1 0.5 1.0				1 1	A P, R 1
	Slave Relays	Inspect Test Replace		0.1 0.5 0.5				1	A P U

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1)  GROUP NUMBER	(2)  COMPONENT ASSEMBLY	(3)  MAINTENANCE FUNCTION	MAINTENANCE LEVEL					(5)  TOOLS AND EQUIP.	(6)  REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
04	Time Delay Relay	Inspect		0.1				1	A P  T, W
		Test		0.5					
		Replace		0.5					
		Repair		0.7					
	Relay Sockets	Inspect		0.1				1 1	A P
		Test		0.5					
		Replace		1.0					
	Terminal Boards	Inspect		0.1				1	A Y
		Replace		1.0					
	Electrical Box	Inspect		0.1				1, 2, 3, 4 5	A D, H, M, N, O, V
		Repair		1.0					
05	Wire Harness	Inspect		0.1				1 1, 7, 8, 10, 12	A P
		Test		1.0					
		Repair		1.0					
	Evaporator Motor and Housing Assembly	Inspect		0.1				1, 2, 3, 4	A M, AB, AC
		Replace		2.0					
	Evaporator Motor	Inspect		0.1				1 1 1, 9, 10	A R Z N, AA
		Test		1.0					
		Repair		1.0					
		Replace		1.0					
	Condenser Motor and Housing Assembly	Inspect		0.1				1, 2, 3, 4	A M, AB, AC
		Replace		2.0					

**Section II. MAINTENANCE ALLOCATION CHART - Continued**

(1)  GROUP NUMBER	(2)  COMPONENT ASSEMBLY	(3)  MAINTENANCE FUNCTION	MAINTENANCE LEVEL					(5)  TOOLS AND EQUIP.	(6)  REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
06	Condenser Motor	Inspect	0.1	1.0				1 1 1, 9	A R Z AA, AD
		Test	1.0						
		Repair							
		Replace	1.0						
	Heater, Sensors								
		Inspect	0.1						A
		Test	0.5					1	P
	Heat Limit Switches	Replace	1.0					1	AE
		Inspect	0.1						A
		Test	0.5					1	P
	Thermostat Adjust Test	Replace	1.0					1, 7, 8	
		Inspect	0.1						A
		0.5						1	AF
	Air Flow Filter Switch	0.5						1	P
		Replace	1.0					1	U
		Inspect	0.1						A
		Adjust	1.0					1, 11	AG
	Heat Fault Thermostat	Test	0.5					1	P
		Replace	1.0					1	U
		Inspect	01						A
		Adjust	0.5					1	AH
	Crank Case Heater	Test	05					1	P
		Replace	1.0					1	U
		Inspect	0.1						A
	Crank Case Heater	Test	0.5					1	P
		Replace	1.0					1	AI
		Inspect	01						A
	Pressure Cutout Switches	Test	0.5					1	P
		Replace	1.0					1	AI
		Inspect		0.1					A
		Adjust		0.5					BF
	Pressure Cutout Switches	Test		0.5				1	
		Replace		2.0				1	BF

**Section II. MAINTENANCE ALLOCATION CHART - Continued**

(1)  GROUP NUMBER	(2)  COMPONENT ASSEMBLY	(3)  MAINTENANCE FUNCTION	MAINTENANCE LEVEL					(5)  TOOLS AND EQUIP.	(6)  REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
07	Piping and Fittings Refrigerant								
	Drier Filter (Dehydrator)	Inspect Replace		0.1	2.0			1	A
	Sight Refrigerant Glass	Inspect Repair Replace		0.1	0.5 2.0			1 1	A AJ AK
	Service Valves	Inspect Replace			0.1 2.0				A
	Solenoid Valves								
	Valves	Inspect Repair Replace			0.1 2.5 2.0			A 1	
	Coils	Inspect Test Replace	0.1 0.5 1.0					1 1	A P U, AM, AN, AO, AP
	Expansion Valve (Primary)	Inspect Adjust Repair Replace		0.1 0.5 1.0 2.0				1 1 1	A AR AS
	Expansion Valve (Liquid Quench)	Inspect Adjust  Repair Replace		0.1 0.5  1.0 2.0				1, 19, 20 1 1	A AR  AS
	Hot Gas Bypass Valve	Inspect Adjust Repair Replace		0.1 0.5 1.0 20				1 1 1	A AT AS
	Damper Actuator Replace	Inspect Test		01 1.0 30				1 1	A AV

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	MAINTENANCE LEVEL					(5) TOOLS AND EQUIP.	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
08	Damper	Inspect			0.1				A
	Actuator	Adjust			0.5			1	BB
	Connecting Link	Replace			3.0			1	
	Distributor	Inspect			0.1				A
		Replace			4.0			1	
	Service Valves	Inspect			0.1				A
		Replace			2.0			1	
	Compressor	Inspect			0.1				A
	Test				0.5			1	R
	Replace				5.0			1	AW
09	Vibration Eliminators	Inspect			0.1				A
		Replace			2.0			1	AQ
	Receiver	Inspect			0.1				A
		Repair			1.0			1	AU
		Replace			2.0			1	
	Refrigerant Strainer	Inspect			0.1				A
		Replace			2.0			1	
	Tubing and Fittings	Inspect			0.1				A
		Replace			8.0				
	Chassis								
09	Chassis Repair Parts	Inspect			0.1				A
		Repair				4.0		1, 2, 3, 4	
	Left Frame Panel	Remove/Install				6.0		1, 2, 3, 4 14, 15, 16	
	Coils								
	Condenser Coil	Inspect		0.1					A
		Service			0.2			13, 17	BA
		Repair				2.0		1	AX, BA
		Replace				8.0		1	



**Section II. MAINTENANCE ALLOCATION CHART - Continued**

(1)  GROUP NUMBER	(2)  COMPONENT ASSEMBLY	(3)  MAINTENANCE FUNCTION	MAINTENANCE LEVEL					(5)  TOOLS AND EQUIP.	(6)  REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
	Evaporator Coil	Inspect Service Repair Replace		0.1 0 2	2.0 8.0			13, 17 1 1	BA AX, BA
	Drain Area	Inspect Service	0.5 1.0					1 1, 17	BC BD

**Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS  
MAINTENANCE ALLOCATION CHART**

(1) REF. CODE	(2) MAINT. LEVEL	(3) NOMENCLATURE	(4) NATIONAL/NATO STOCK NUMBER	(5) TOOL NUMBER
1	O-F-H	Tool Kit, Service, Refrigeration Unit	5180-00-596-1474	
2	O-F-H	Drill, Electric, Portable	5130-00-935-7354	
3	O-F-H	Drill Set, Twist	5130-00-293-0983	
4	O-F-H	Riveter Blind Hand	5120-00-017-2849	98 (61957)
5	F	Tool Kit, Rivetnut Consisting of		(11530)
		Installation Tool	5120-01-245-7549	TA7533 (08524)
		Nose Piece	5120-00-126-2008	HN7513-6 8524)
		Die, Blind Bolt	5120-00-126-1964	HN7513-8 (08524)
		Stud, Nose Unit	5120-00-133-3830	HN7513-10 (08524)
		Nose Unit	5120-01-084-4094	HN7513-12 (08524)
		Puller Attachment	5120-00-104-2685	HP7523-6 (08524)
		Puller Attachment	5120-00-104-2626	HP7523-8 (08524)
		Puller Attachment	5120-00-104-2528	HP7523-10 (08524)
		Puller	5120-01-084-4092	HP7523-12 (08524)
6	F	Screw Driver, Flat Tip, 1/8" WD	5120-00-542-2281	
7	O	Solder Gun	3439-00-930-1638	450K4 (11103)
8	O-F-H	Heat Gun	4940-01-042-4855	
9	O-F-H	Adapter, Torque	5120-01-112-4498	FRDH181 (55719)
10	O-F-H	Crimping Tool, Pig Tail		H18 (26132)
11	O	Manometer	6685-00-273-7007	
12	O	Crimping Tool	5120-00-278-2423	47100 (00779)
13	O-F-H	Fin Comb		P12 (17529)
14	H	Saw, Reciprocating	5130-00-889-7745	
15	H	Sander, Disk, Elec.	5130-00-857-8526	
16	H	Welding Shop, Trailer Mounted	3431-01-090-1231	

**Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS**  
**MAINTENANCE ALLOCATION CHART - Continued**

(1) REF. CODE	(2) MAINT. LEVEL	(3) NOMENCLATURE	(4) NATIONAL/NATO STOCK NUMBER	(5) TOOL NUMBER
17	O	Vacuum Cleaner	7910-01-178-7953	S1015030W (29335)
18	H	Wrench, Open End	5120-01-181-5919	V03638 (55719)
19	F	Thermometer, Digital		52 (53431)
20	F	Thermocouple		80PK-1 (53431)
21	F	Regulator Assy (Nitrogen)	6680-00-503-1327	
22	F-H	Recovery and Recycling Unit, Refrigerant	4130-01-338-2707	17500B (07295)

**Section IV. REMARKS MAINTENANCE ALLOCATION CHART**

Reference Code	Remarks
A	Visual Inspection
B	Replace 1/2-inch polystyrene screen
C	Replace neoprene rubber gasket
D	Replace rivets
E	Replace 1/2-inch polyurethane foam
F	Replace 1/4 X 3/4-inch polyurethane foam gasket
G	Use adhesive compound
H	Replace quarter turn fastener, ejector spring, thermo-plastic wear washer and splitting retainer.
I	Replace gasket retainer
J	Replace vinyl covered sponge gasket
K	Replace damper and/or pivot shaft
L	Clean filter with mild detergent and water
M	Replace rivetnut
N	Replace insulator bushings
O	Replace floating locknut on control box cover
P	Test for continuity
Q	Cut leads and strip back on replacement item
R	Test for AC voltage application
S	Adjust setpoint to 185 Vac
T	Replace resistors
U	Fungus proof replacement part per MIL-V-173
V	Replace floating locknut.
W	Assemble replacement resistor with wire terminals and shrink tubing
X	Replace stand-off terminals

**Section IV. REMARKS MAINTENANCE ALLOCATION CHART - Continued**

Reference Code	Remarks
Y	Cut terminal track to required length on replacement part (TB1)
Z	Replace bearings.
AA	Perform the following alterations on replacement motor Cut leads to 5 Inches, strip and dead end wires together for 208 Vac, 3-phase operation Add corrosive prevention compound to both shafts MIL-C-85054 (as) clear
AB	Perform the following alterations to replacement evaporator (circulator) and condenser fan housing (left, right hand) Enlarge (5) 9/64-inch holes to 13/64 diameter and paint
AC	Paint replacement inlet flange
AD	Replace electrical connector
AE	Substitute cast iron hardware on replacement part with stainless steel
AF	Adjust thermostat to nominal 80 degrees F
AG	Adjust pressure to 1.15 inches WC
AH	Adjust thermostat to nominal 110 degrees F
AI	When replacing crankcase heater, perform the following alterations Cut leads to 16 inches long and strip ends back to 1/2 inch maximum Coat heating element with thermal grease
AJ	Tighten sight glass if leak is detected
AK	Cut off one swaged end (either end) of replacement sight glass to shorten overall length to 5 inches
AL	Replace gasket
AM	Replace grommet
AN	Remove one knockout from replacement item
AO	Strip and dead end wires when installing replacement part
AP	Install and crimp pig tails to wires
AQ	Replace entire assembly on failure
AR	Raise/lower superheat setting
AS	Replace cage assembly and/or power head assembly
AT	Adjust for valve response rate and/or suction pressure

**Section IV. REMARKS MAINTENANCE ALLOCATION CHART - Continued**

Reference Code	Remarks
AU	Replace fusible plug
AV	Apply gas pressure to verify actuator operation
AW	Braze valve adapter and tube fitting to replacement item
AX	Braze external tubing
AY	Replace knob
AZ	Remove cable entry panel box for access
BA	Straighten damaged fins with fin comb and vacuum
BB	Adjust linkage for damper operation
BC	Inspect drain pan for condensation drainage Inspect for rust and corrosion. Apply corrosion preventative as required
BD	Clean and vacuum drain pan and/or drain holes
BE	Drill (3) 5/32-inch holes through terminals of replacement Item
BF	Adjust low refrigerant pressure switch to close @ 20 psig $\pm$ 5 and open @ 40 psig $\pm$ 5
	Adjust high refrigerant pressure switch to close @ 450 psig $\pm$ 25 and open @ 360 psig $\pm$ 25

## APPENDIX C

### COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

#### Section I. INTRODUCTION

- C.1 SCOPE This appendix lists components of end item and basic issue Items for the air conditioner to help you inventory items required for safe and efficient operation.
- C.2 GENERAL. The components of End Item List and Basic Issue List are divided into the following sections
- Section II Components of End Item. This listing is for informational purposes only and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation of shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts.
  - 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 separately, basic issue items must be with the air conditioner during operation and whenever it is transferred between property accounts. This manual is your authority to request/requisition replacement basic issue items, based on TOE/MTOE authorization of the end item.
- C.3 EXPLANATION OF COLUMNS. The following provides an explanation of columns found in the tabular listings
- Column (1) - "National Stock Number." This column indicates the national stock number assigned to the item and will be used for requisitioning purposes.
  - Column (2) - "Description." Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the CAGEC (in parentheses) followed by the part number.
  - Column (3) - "Unit of Measure (U/M)." Indicates the measure used in performing the actual function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, m, pr).
  - Column (4) - "Quantity Authorized (Qty Auth.)." Indicates the quantity of the item authorized to be used with/on the equipment.

#### Section II. COMPONENTS OF END ITEM (NOT APPLICABLE)

**Section III. BASIC ISSUE ITEMS**

(1) National Stock Number	(2) Description, CAGEC and Part Number	(3) Usable U/M On Code	(4) Qty Auth
7240-00-943-7105	Pail, Utility (81348) L-P-65	ea	1
8415-00-266-8677	Gloves, Chemical (83148)	pr	1
4240-00-052-3776	Goggles, Industrial (58576)	ea	1



## APPENDIX D

### ADDITIONAL AUTHORIZATION LIST

#### Section I. INTRODUCTION

D.1 SCOPE. This appendix lists additional items you are authorized for the air conditioner

D.2 GENERAL. This list identifies items that do not have to accompany the air conditioner and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

D.3 EXPLANATION OF LISTINGS. National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (i.e., CTA, MTOE, TDA, or JTA) which authorized the item(s) to you.

**Section II. ADDITIONAL AUTHORIZATION LIST**

(1)	(2)	(3)	(4)
National Stock Number	Description, CAGEC, and Part Number	Usable On Code	Qty Auth.
4210-00-555-8837	Fire Extinguisher (06535) #FH900-2	ea	1

## APPENDIX E

### EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

#### Section I. INTRODUCTION

E.1 SCOPE. This appendix lists expendable supplies and materials you will need to operate and to maintain the air conditioner. This listing is for informational purposes only and is not authority for requisitioning the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (except Medical Class V, Repair Parts and Heraldic Items) or CTA 8-100, Army Medical Department Expendable/Durable Items

#### E.2 EXPLANATION OF COLUMNS IN SECTION II.

E.2.1 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 lubricating oil, Appendix E, Item 14")

E.2.2 Column (2), "Level." This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew  
O - Unit Maintenance  
F - Direct Support Maintenance  
H - General Support Maintenance

E.2.3 Column (3), "National Stock Number." This is the National Stock Number assigned to the item. Use it to requisition or request the item.

E.2.4 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 Commercial and Government Entity Code (CAGEC) in parentheses followed by the part number.

E.2.5 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.g., ea, n., pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

**Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST**

(1) ITEM NO.	(2) LEVEL	(3) National Stock Number	(4) Description, Part Number, And CAGEC	(5) U/M
1	F	8040-00-841-9773	Adhesive #520 (03938)	tube
2	F	8030-01-135-0685	Sealing Compound #242-31 (05972)	bottle
3	F	8030-01-262-9962	Corrosion Preventative #244 (04963)	gl
4	F	8030-00-275-8114	Sealing Compound #612 (04963)	rl
5	F	5970-00-241-5406	Insulating Compound 120-8 (05820)	tube
6	F	6850-00-837-9927	Monochlorodifluoromethane, Technical w/cylinder 22 lb (Refrigerant-22) BB-F-1421, Type 22 (81348)	cy
7	O	7920-00-205-1711	Rags (81348)	pg
8	F		Methyl-Ethyl Ketone (MEK)	gl
9	F	6830-00-292-0732	Nitrogen, Technical (81348)	cy
10	F		Sealant Tape #5354 (04963)	oz
11	O	8810-00-799-9830	Varnish, Moisture and Fungus Resistant, MIL-V-173 (72688)	gl
12	F	8030-01-041-1596	Corrosion Inhibiting Compound, MIL-C-85054, Type 1I (80244)	oz
13	O		Primer, Red Epoxy #9369 (08882)	gl
14	O		Primer, Gray Epoxy #9381 (08882)	gl
15	O		Paint, White Polyurethane #9492, FED STD 595A #17875	gl
16	F	3439-00-269-9610	Solder, Lead-Tin Alloy (81348)	sl
17	F	3439-01-045-7940	Flux, Solder, Liquid Rosin Base, MIL-F-14256 (81348)	qt
18	O	7930-00-764-5066	Detergent, Dishwashing, P-D-410 TY2 (80244)	oz
19	F		Grease Aeroshell 22 (54527)	qt

**Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST - Continued**

(1) ITEM NO.	(2) LEVEL	(3) National Stock Number	(4) Description, Part Number, And CAGEC	(5) U/M
20	F	6830-00-872-5120	Tnchloromonofluoromethane, Technical w/cylinder 50 lb (Refrigerant-11) BB-F-1421, Type 11 (81348)	cy
21	F	3439-00-853-9276	Brazing Alloy, Silver, QQ-B-645, Grade III	oz
22	H		Sealing Compound #116 (94836)	tu
23	O	9150-00-086-3734	Oil, Air Filter, Filter Kotee (40736)	oz

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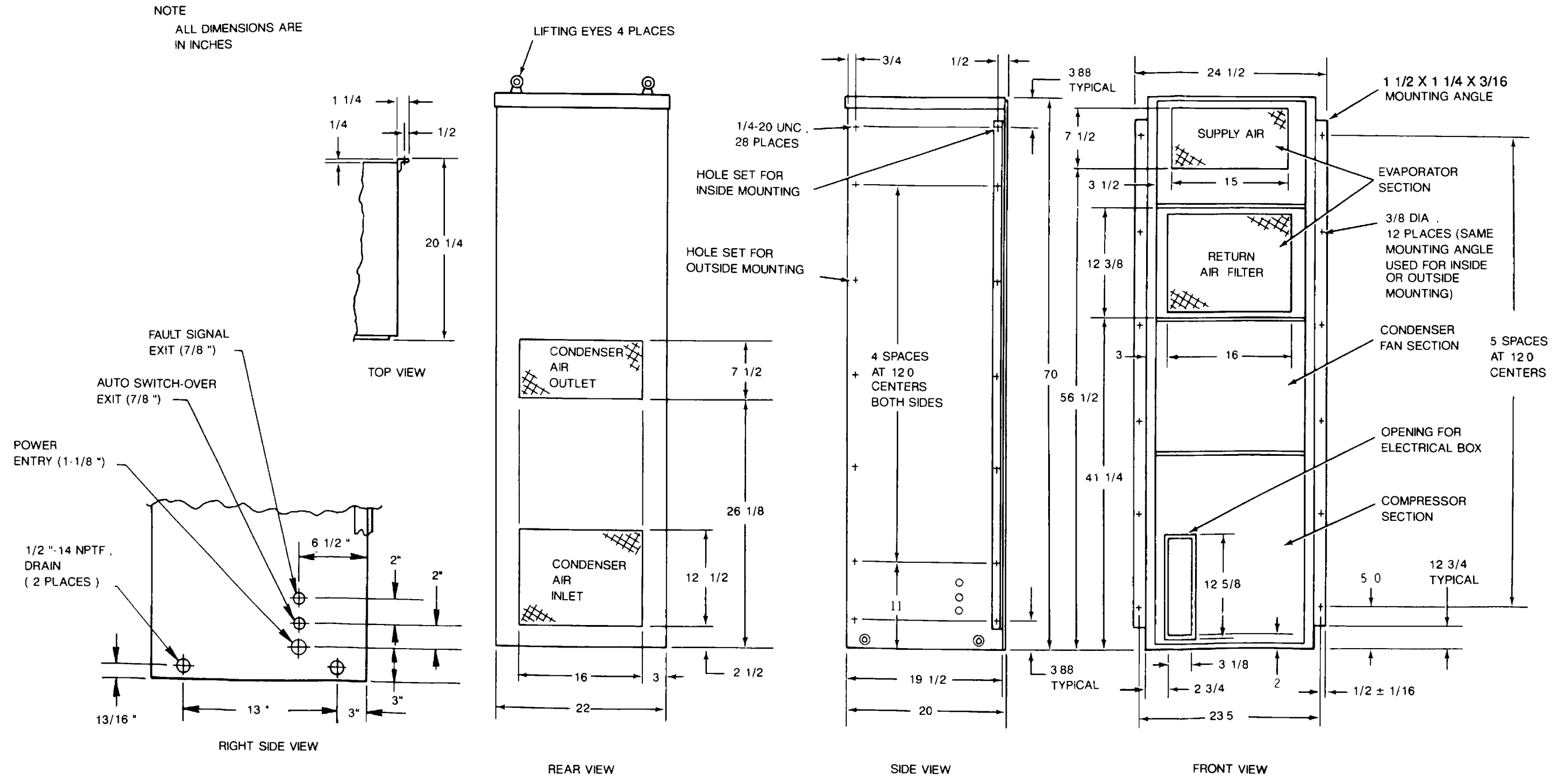


Figure FO-1. Dimensions.

FP-1 / (FP-2 blank)

REFERENCE DESIGNATOR	DESCRIPTION
B1	COMPRESSOR
B2	EVAPORATOR FAN MOTOR
B3	CONDENSER FAN MOTOR
CB1	CONTROL CIRCUIT OVERLOAD
CB2	CRANKCASE HEATER CIRCUIT BREAKER
DS1	POWER ON INDICATOR
DS2	COOL ON INDICATOR
DS3	HEAT ON INDICATOR
DS4	VENT ON INDICATOR
DS5	DIRTY FILTER INDICATOR
DS6	HIGH DISCHARGE PRESSURE INDICATOR
DS7	LOW SUCTION PRESSURE INDICATOR
HR1	1ST STAGE HEAT
HR2	2ND STAGE HEAT
HR3	CRANKCASE HEATER
K1	COMPRESSOR CONTACTOR
K2	CIRCULATING FAN MOTOR CONTACTOR
K3	CONDENSER FAN MOTOR CONTACTOR
K4	1ST STAGE HEATER CONTACTOR
K5	2ND STAGE HEATER CONTACTOR
K6	PHASE RELAY
K7	RELAY - DIRTY FILTER
K8	RELAY - HIGH HEAD PRESSURE
K9	RELAY - LOW SUCTION PRESSURE
K10	RELAY - HEAT FAULT
K11	LATCHING RELAY
K12	LOW PRESSURE FAULT SLAVE RELAY
K13	DIRTY FILTER SLAVE RELAY
K14	HIGH PRESSURE FAULT SLAVE RELAY
K15	HEAT FAULT SLAVE RELAY
L1	MAIN LIQUID SOLENOID VALVE
L2	BYPASS LIQUID SOLENOID VALVE
S1	MODE SELECT SWITCH
S2	THERMOSTAT
S3	FILTER P SWITCH
S4	LOW PRESSURE CUTOFF SWITCH
S5	HIGH PRESSURE CUTOFF SWITCH
S6	CIRCULATING CONDENSER FAN MOTOR SWITCH
S7	CONDENSER FAN MOTOR THERMAL SWITCH
S8	HEAT FAULT THERMOSTAT
S9	1ST STAGE HEAT LIMIT SWITCH
S10	2ND STAGE HEAT LIMIT SWITCH
S11	PRELIMINARY/BACK-UP SWITCH
S12	FAULT RESET SWITCH
TB1	POWER TERMINAL BLOCK
TB2	CONTROL TERMINAL BLOCK
TR1	COMPRESSOR TIMING RELAY
TR2	CONDENSER FAN TIMING RELAY

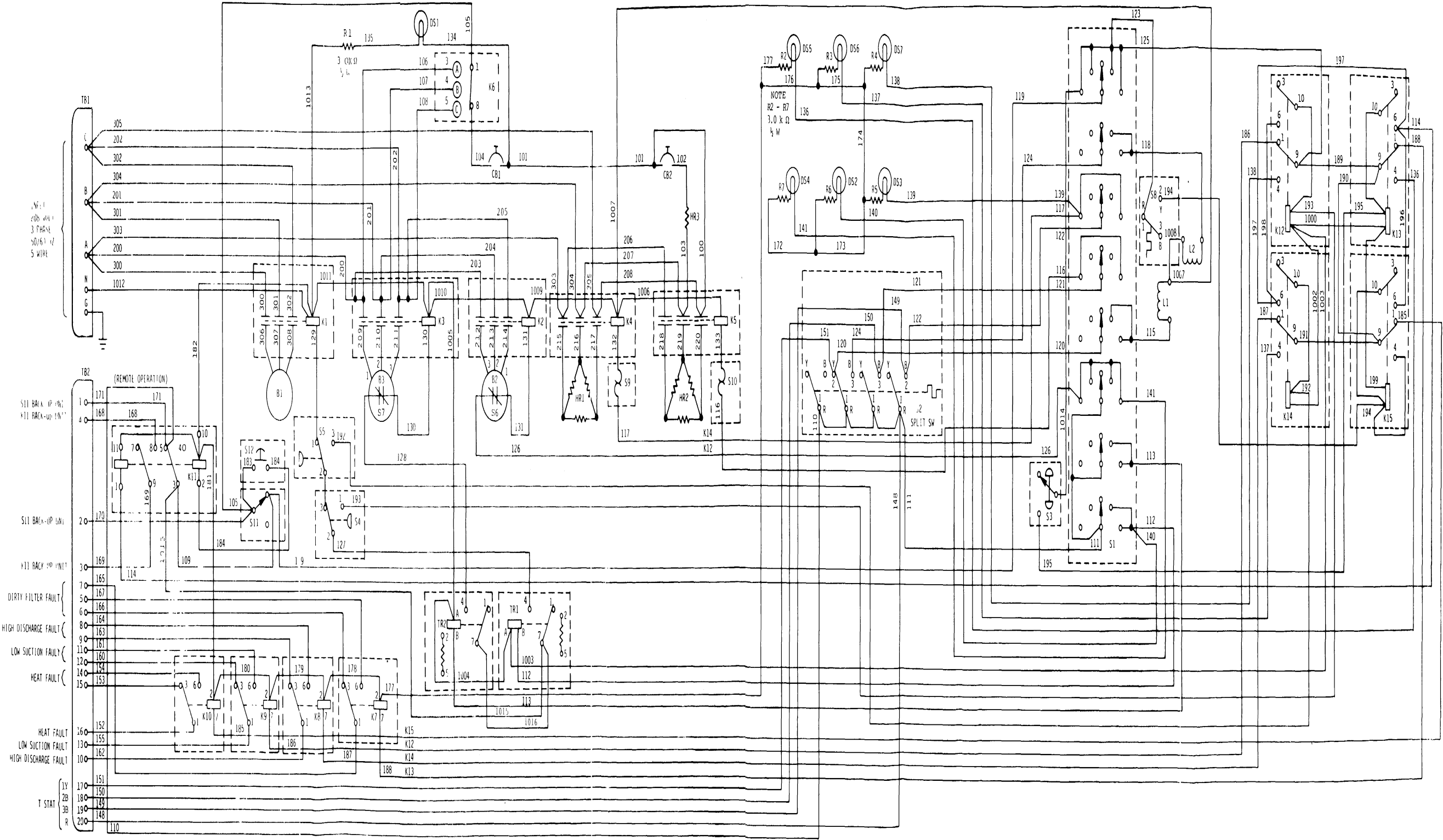
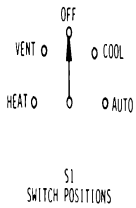


Figure FO-2. Wiring Diagram.  
FP-3 / (FP-4 blank)

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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 decigrams = .035 ounce  
 1 decagram = 10 grams = .35 ounce  
 1 hectogram = 10 decagrams = 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

<i>To change</i>	<i>To</i>	<i>Multiply by</i>	<i>To change</i>	<i>To</i>	<i>Multiply by</i>
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	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

## Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
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