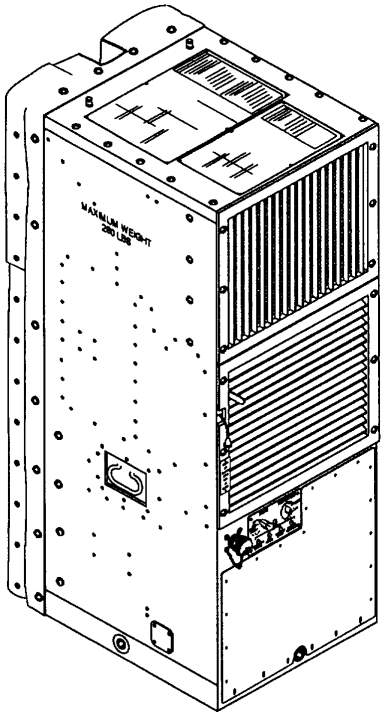
TECHNICAL MANUAL

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



AIR CONDITIONER, VERTICAL, COMPACT 18,000 BTU/HR

MODEL F18T-MPI
208 VOLT, THREE PHASE,
50/60 OR 400 HERTZ
(4120-01-325-7062)

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HEADQUARTERS, DEPARTMENT OF THE ARMY
1 FEBRUARY 1993

CHANGE

NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 30 SEPTEMBER 1996

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

AIR CONDITIONER, VERTICAL, COMPACT, MULTIPLE POWER UNIT, 18,000 BTU/HR, KECO MODEL F18T-MPI 208 VOLTS, 3 PHASE, 50/60 OR 400 HERTZ (4120-01-325-7062)

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Remove pages	Insert pages
i and ii	i and ii
F-23 and F-24	F-23 and F-24

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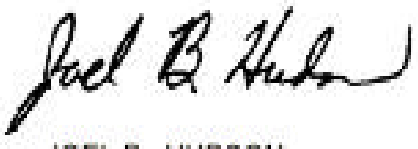

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WARNING

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

WARNING

Refrigerant under pressure is used in the operation of this equipment. Death or severe injury may result if personnel fail to observe safety precautions.

Never use a heating torch on any part that contains refrigerant 22. Explosive pressures can be built up.

Never pressurize refrigerant lines with oxygen. Mixing oxygen with oil will cause an explosion.

Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged from any container under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or safety glasses in any situation where skin or eye contact is possible. Avoid inhaling refrigerant gas.

Prevent contact of refrigerant gas with flame or hot metal surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

Avoid touching compressor sludge. Acid in sludge can cause burns.

Avoid inhaling fumes and contacting any acid formed by burn out 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

DO NOT LIFT without holding unit in upright position. Otherwise, unit will fall over causing injury to personnel.

Compressed air used for cleaning purposes will not exceed 30 psi (2.1 kg/cm^2).

Do not use steam to clean coil. Explosive pressures can be built up.

When using compressed air, wear safety glasses or goggles. Dirt can be blown into your eyes.

Nitrogen is an inert gas that can cause suffocation and must be discharged in a well ventilated area.

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

The pressure in a nitrogen cylinder can exceed 2000 psi. Use a nitrogen pressure regulator at all times to avoid personal injury.

Do not expose polyurethane foam to the flame of a torch or brazing temperature. Toxic gases can be formed.

For first aid procedures, refer to FM 21- 11

TECHNICAL MANUAL
NO. 9-4120-402-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 1 FEBRUARY 1993

OPERATOR'S, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL FOR AIR CONDITIONER, VERTICAL, COMPACT, MULTIPLE POWER UNIT, 18,000 BTU/HR, KECO MODEL F18T-MPI 208 VOLTS, 3 PHASE, 50/60 OR 400 HERTZ (4120-01-325-7062)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes 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, US Army Aviation and Troop Command, ATTN: AMSAT-I-MP, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. You may also submit your recommended changes by E-mail directly to <mpmt%avma28@st-louis-emh7.army.mil.>. A reply will be furnished to you. Instructions for sending an electronic 2028 may be found at the back of this manual immediately preceding the hard copy 2028.

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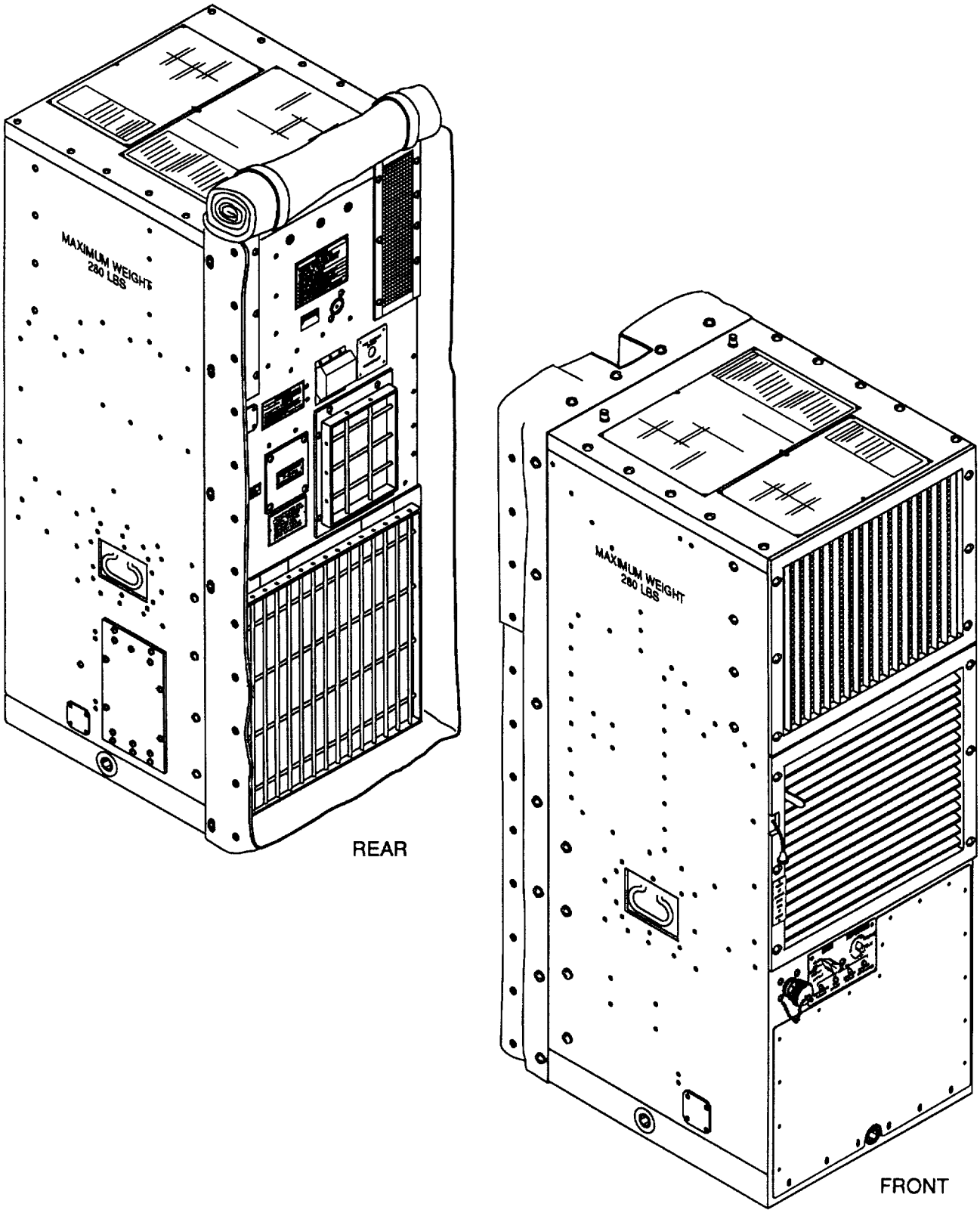

Figure 1-1. Air Conditioner

CHAPTER 1
INTRODUCTION

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Section I GENERAL INFORMATION

1-1. SCOPE.

a. Type of Manual. Operator's, Unit, Direct Support, and General Support Maintenance Manual.

b. Model Number and Equipment Name. Keco Model F18T-MPI, Vertical, Compact, Multiple Power Input, 18,000 BTU/HR, 208 Volt, 3 Phase, 50/60/400 Hertz Air Conditioner.

c. Purpose of Equipment. Cools and heats enclosed space (shelter). The unit covered by this manual is designed for cooling and heating air to a desired predetermined range and circulating the conditioned air to provide heating and cooling of equipment or personnel within the conditioned area.

1-2. MAINTENANCE FORMS AND RECORDS.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pamphlet 738-750, The Army Maintenance Management System (TAMMS).

1-3. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.

For destruction of Army materiel to prevent enemy use see TM 750-244-3.

1-4. PREPARATION FOR STORAGE OR SHIPMENT.

See Chapter 4, Section VII for administrative storage or shipment information.

1-5. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR's).

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 don't like about your equipment. Let us know why you don't like the design or performance. Put it on a SF 368 (Product Quality Deficiency Report). Mail it to us at:

Commander, U.S. Army Aviation and Troop Command
Attention: AMSAT-I-MDO
4300 Goodfellow Boulevard
St. Louis, MO 63120-1798.

We will send you a reply.

1-6. WARRANTY INFORMATION.

See Warranty Technical Bulletin TB 9-4120-402-24.

Section II EQUIPMENT DESCRIPTION

1-7. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

a. The Model F18T-MPI Air Conditioner is designed to circulate, filter, and cool or heat air in the room or enclosure in which it is installed.

b. The Model F18T-MPI has the capability of providing a maximum of 18,000 BTU/HR of cooling or 12,000 BTU/HR of heating. It is designed to automatically maintain the air in the room or enclosure at the desired temperature selected on the control panel.

c. The unit is self-contained in a single cabinet that is ideally suited for van or shelter type installations. The only external requirements are a source of 208 volt ac, 3 phase, 50/60 or 400 hertz input power, a suitable ground and an entry to a suitable drain. The drain must be lower than the base of the cabinet, in its operating location, for disposal of condensate waste water. It is designed to operate in almost any environmental condition from arctic to tropic and is fully portable for movement from one location to another.

d. The primary installation requirement is that the exhaust air from the compressor/condenser section must be vented to the outside atmosphere. This subject is fully covered in the installation instructions contained in Chapter 4, "Unit Maintenance Instructions." e. When using this equipment in a secure area, caution must be exercised in meeting the established electromagnetic radiation standards. These standards may limit the use of the equipment's remote capability and require additional shielding for the ducts.

1-8. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

Figure 1-2:

CONDITIONED AIR (EVAPORATOR) FAN (1). Draws the room or enclosure air in through the air filter and blows it out over the heaters and evaporator (cooling) coil to supply conditioned air.

HEATER ELEMENTS (2). Consists of six heating elements. The bank of heater elements warms the air from the conditioned space as needed.

MIST ELIMINATOR (3). The purpose of the mist eliminator is to trap droplets of condensed water from the evaporator coil, so that they will not be blown into the conditioned air space.

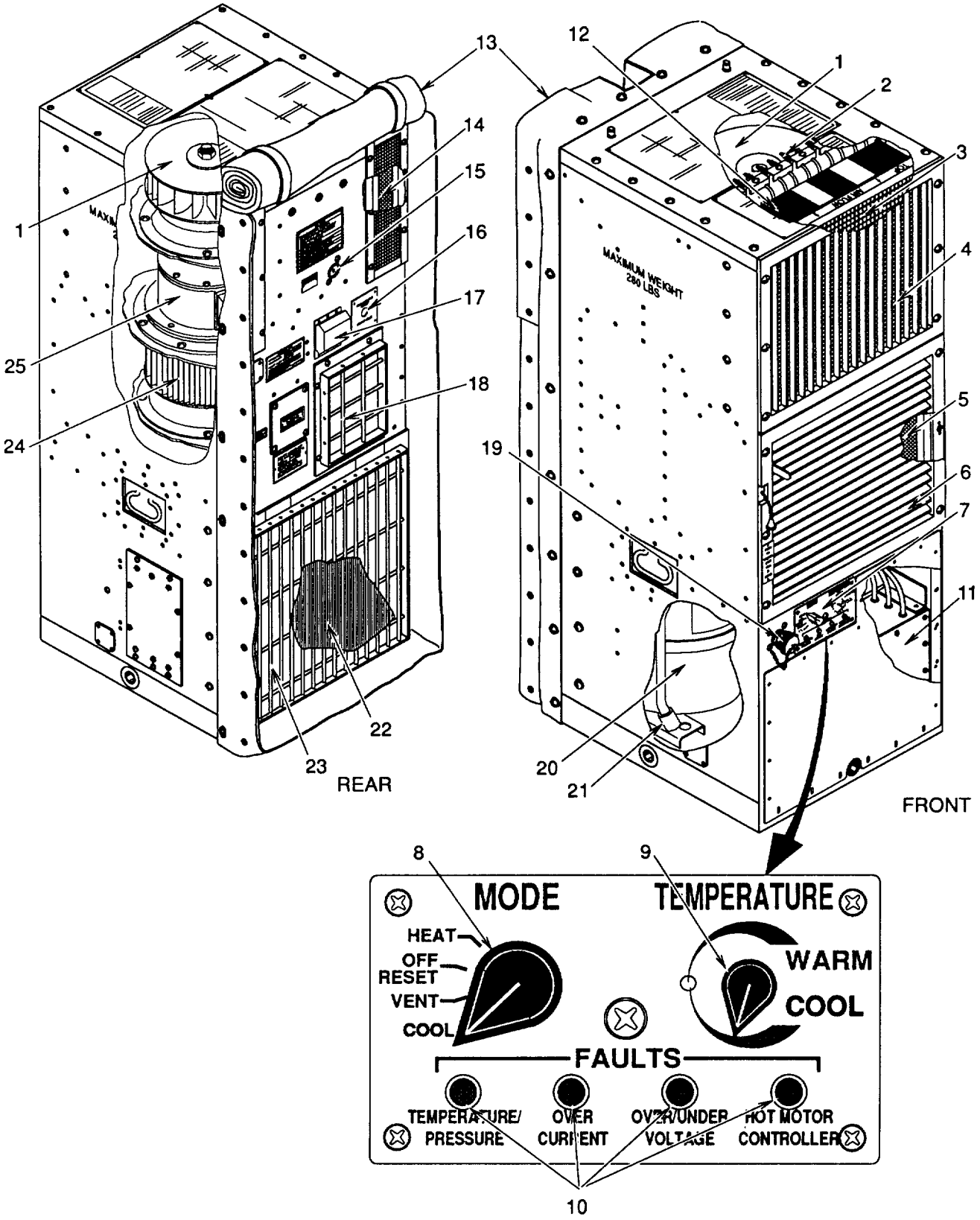


Figure 1-2. Location of Major Components

1-8. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS. - continued

CONDITIONED AIR DISCHARGE GRILLE (4). Adjustable louvers provide directional control of conditioned air.

RETURN AIR FILTER (5). Filters room or enclosure air as it is recirculated.
INTAKE (RETURN) AIR GRILLE (6). Adjustable louvers allow control of outside (fresh) and return (from room or enclosure) air.

CONTROL PANEL ASSEMBLY (7). Contains switches, controls and indicators for operating the air conditioner.

See items 8, 9 and 10 for a description of these switches controls and indicators.

ROTARY SWITCH (MODE SELECTOR) (8). Allows selection of unit operating mode.

POTENTIOMETER (TEMPERATURE CONTROL) (9). This control allows adjustment of the conditioned air temperature while operating in the cool or heat modes.

LIGHT EMITTING DIODES (FAULT LIGHTS) (10). Help to indicate problem areas if the unit fails.

CONTROL ASSEMBLY (11). Contains motor controller, logic box assembly, control voltage transformer, rectifier and control relays.

EVAPORATOR COIL (12). Multiple tube, finned coil. The coil allows the refrigerant to absorb heat from the room or enclosure air circulating through the unit.

FABRIC COVER (13). Protects back or exposed side of the unit during periods of shut down. Must be rolled up when operating in the cool mode or when fresh (outside) air is being used in any mode.

FRESH AIR FILTER AND DAMPER (14). Screens, filters and controls fresh air entering the unit.

REFRIGERANT SIGHT GLASS (15). Visually indicates the condition of the refrigerant flowing in the refrigerant liquid line during cooling cycles when operating in the COOL mode.

HIGH AND LOW REFRIGERANT PRESSURE CUTOUT SWITCHES (16). The switches are factory set to shut the compressor off if the refrigerant discharge line pressure rises to 470 to 490 psig (33.05 to 34.45 kg/cm^2) or the refrigerant suction line pressure drops to 2 to 12 psig (0.141 to 0.844 kg/cm^2).

CIRCUIT BREAKER (17). Located in the main electric line after the EMI filter. Provides circuit protection for the unit.

CONDENSER AIR OUTLET GRILLE (18). Protects personnel from injury and fan from damage.

INPUT POWER RECEPTACLE (19). Connection point for main input power cable.

COMPRESSOR (20). Consists of a reciprocating compressor driven by an electrical motor, hermetically sealed inside a steel container with a lifetime charge of oil. An external (crankcase) heater is wrapped around the lower part of the container on the Carrier compressor and inserted into a well at the lower part of the container on the Keco compressor. The purpose of the heater is to prevent possible damage to the compressor caused by liquid refrigerant accumulation in the crankcase during a period of shut down. The heater is connected directly to input power after the circuit breaker and is thermostatically controlled to prevent overheating.

CONDENSATE WATER DRIP PAN AND DRAIN TRAP (21). The drip pan is located directly below the evaporator coil and mist eliminator and is built into the casing. Its purpose is to collect condensate that drips off the evaporator coil and mist eliminator during cooling operations. Condensate water then flows through a drain tube to the drain trap located inside the lower left front corner of the cabinet. The drain trap contains a check valve that prevents air flow between the condenser and evaporator sections through the drain tube.

1-8. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS. - continued

CONDENSER COIL (22). Multiple tube, finned coil. As air is circulated over the coil it allows heat to be removed from the compressed refrigerant vapor so it will condense into a liquid.

CONDENSER COIL GUARD (23). Protects the condenser coil from damage.

CONDENSER FAN (24). This fan draws outside air over the condenser coil to remove heat from the refrigerant flowing through it.

FAN MOTOR (25). Drives both the conditioned air (evaporator) fan and the condenser fan.

1-9. DIFFERENCES BETWEEN MODELS.

There are no model differences in effect on the Keco Model F18T-MPI air conditioner.

1-10. EQUIPMENT DATA.I

AMBIENT OPERATING TEMPERATURE RANGE	
LOW	-50°F (-45°C)
HIGH	+120°F (+49°C)
PERFORMANCE	
COOLING CAPACITY	18,500 BTU/HR
HEATING CAPACITY	12,000 BTU/HR
POWER REQUIRED	
VOLTAGE	208
PHASE	3
HERTZ	50/60 or 400
FULL LOAD AMPERAGE	18
DIMENSIONS	
WIDTH	17.25 inch (43.78 cm)
DEPTH	21.60 inch (54.85 cm)
HEIGHT	45.78 inch (116.28 cm)
WEIGHT	265 pounds (120.2 kg)
REFRIGERANT	
TYPE	R-22
CHARGE	3.4 pounds (1.5 kg)

Section III TECHNICAL PRINCIPLES OF OPERATION

1-11. REFRIGERATION CYCLE.

The following information describes the function of the components in this unit, listed in the order that the refrigerant flows through the refrigeration system.

Figure 1-3:

a. The COMPRESSOR (1) takes cold, low pressure refrigerant gas and compresses it to a high temperature, high pressure gas. This gas flows through the metal tubing to the CONDENSER COIL (3A), SUBCOOLER (3B) and RECEIVER (4).

b. The CONDENSER FAN (5) draws outside ambient air through the CONDENSER COIL (3A) and SUBCOOLER (3B). The high temperature, high pressure gas from the COMPRESSOR (1) is cooled by the flow of air and condenses to a high pressure liquid.

c. The REFRIGERANT DESICCANT DEHYDRATOR (filter-drier) (14) removes any moisture (water vapor) or dirt that may be carried by the liquid refrigerant.

d. The SIGHT GLASS (8) indicates the presence of moisture and quantity of refrigerant in the system.

e. The EXPANSION VALVE (9) and DISTRIBUTOR (10) control the amount and pressure of liquid refrigerant to the EVAPORATOR COIL (11). The EXPANSION VALVE (9) senses the temperature and pressure of the refrigerant as it leaves the EVAPORATOR COIL(11). The valve constantly adjusts the flow of liquid refrigerant to the EVAPORATOR COIL (11) depending on the heat load to the unit.

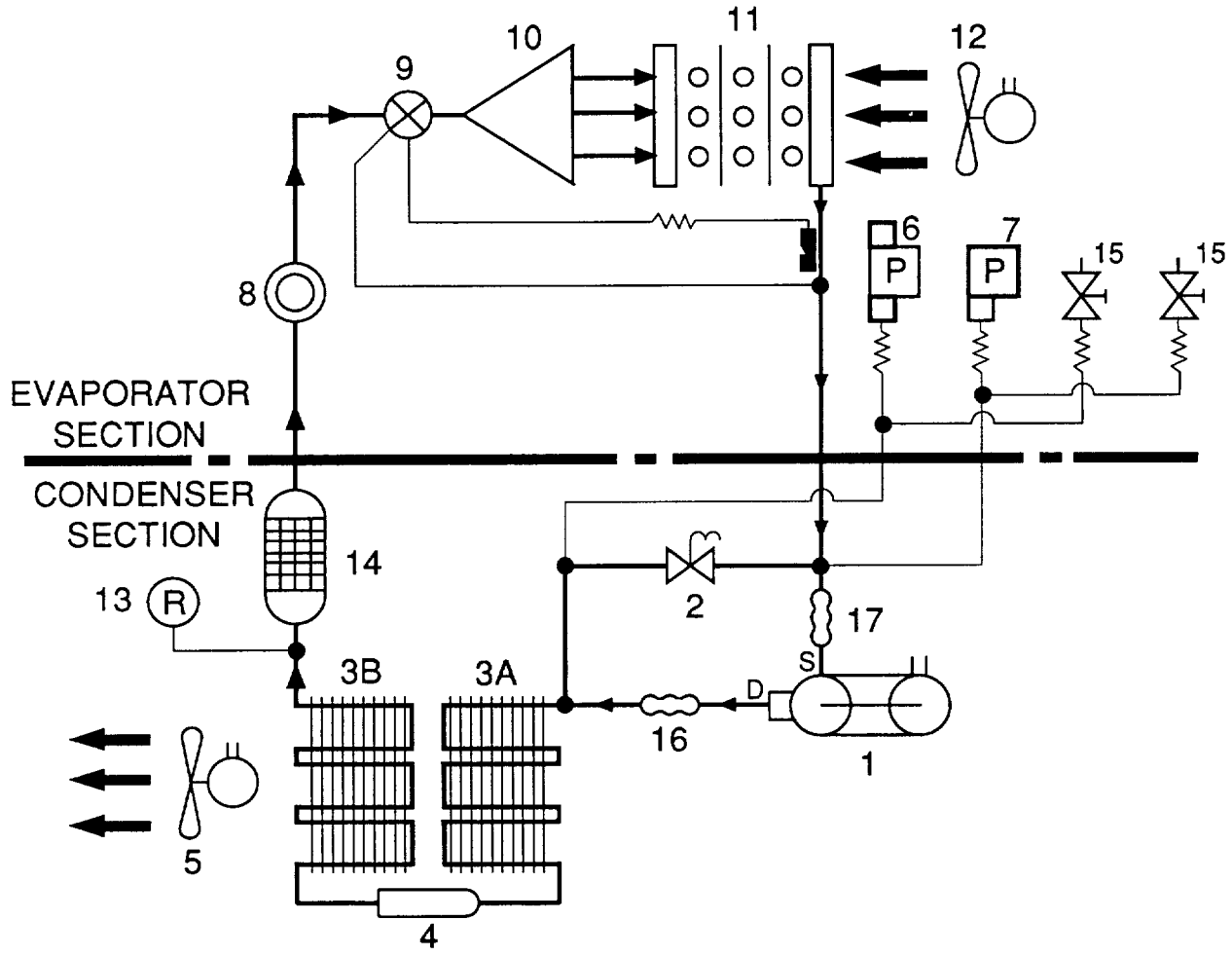
f. The liquid refrigerant leaves the EXPANSION VALVE (9) at a reduced pressure and enters the EVAPORATOR COIL (11). The reduction in pressure and the warmer air being forced across the tubes of the coil cause the refrigerant to evaporate. The EVAPORATOR FAN (12) circulates the warm air from the conditioned space through the EVAPORATOR COIL (11). The refrigerant absorbs heat when it changes from a liquid to a gas and is cooled.

g. To prevent compressor overload and damage during start-up, SOLENOID VALVE (2) opens when the compressor is not running to equalize system pressure. This valve closes at start of cooling cycle.

h. The SERVICE VALVES (15) are provided for charging, and general servicing of the high and low pressure sides of the refrigerant system.

i. The PRESSURE SWITCH (LOW) (7), the PRESSURE SWITCH (HIGH) (6) and the PRESSURE RELIEF VALVE (13) are provided to protect the unit from damage due to pressure extremes.

j. The flexible METAL HOSE ASSEMBLY (DISCHARGE) (16) and METAL HOSE ASSEMBLY (SUCTION) (17) provide vibration isolation between the compressor and other components of the refrigeration system.



COMPONENT REFERENCE LIST		
FIND NO.	QTY	DESCRIPTION
1	1	COMPRESSOR
2	1	SOLENOID VALVE
3A	1	CONDENSER COIL
3B	1	SUBCOOLER (PART OF 3A)
4	1	RECEIVER
5	1	FAN, CONDENSER
6	1	PRESSURE SWITCH (HIGH)
7	1	PRESSURE SWITCH (LOW)
8	1	SIGHT GLASS
9	1	EXPANSION VALVE
10	1	DISTRIBUTOR
11	1	EVAPORATOR COIL
12	1	FAN,EVAPORATOR
13	1	PRESSURE RELIEF VALVE
14	1	DEHYDRATOR
15	2	SERVICE VALVE
16	1	METAL HOSE ASSEMBLY (DISCHARGE)
17	1	METAL HOSE ASSEMBLY (SUCTION)

Figure 1-3. Refrigeration Schematic

1-12. HEATING.

When the ROTARY SWITCH (mode selector) is set for HEAT, all heating elements, located behind the evaporator coil are energized. These elements are protected from overheating by a thermal cutout switch. They are thermostatically controlled by the POTENTIOMETER (temperature control).

CHAPTER 2
OPERATING INSTRUCTIONS

Paragraph

Section I Description and Use of Operator's Controls and Indicators
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Operator's Controls 2-2
Indicators 2-3
Section II Operator Preventative Maintenance Checks and Services (PMCS)
General 2-4
Section III Operation Under Usual Conditions
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Initial Adjustments and Checks 2-6
General Operating Procedures 2-7
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Operation In Heat Mode 2-9
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Shutdown (Off) 2-11
Preparation for Movement 2-12
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Operation in Extreme Heat 2-15
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Operation in Dusty or Sandy Conditions 2-17
Operation in Unusually Wet Conditions 2-18
Operation in Salt Air or Sea Spray 2-19
Operation Under Emergency Conditions 2-20

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

2-1. GENERAL.

The Model F18T-MPI Air Conditioner is designed for a wide variety of installations and for operation under a wide range of climatic conditions. It can be operated on a variety of supply frequencies. It is also designed for continuous or intermittent operation as a self-contained unit or may be connected to external filtering equipment for operation under chemical-biologicalradiological (CBR) environmental conditions. Operators must be aware of any peculiarities or operational limitations for their specific installation.

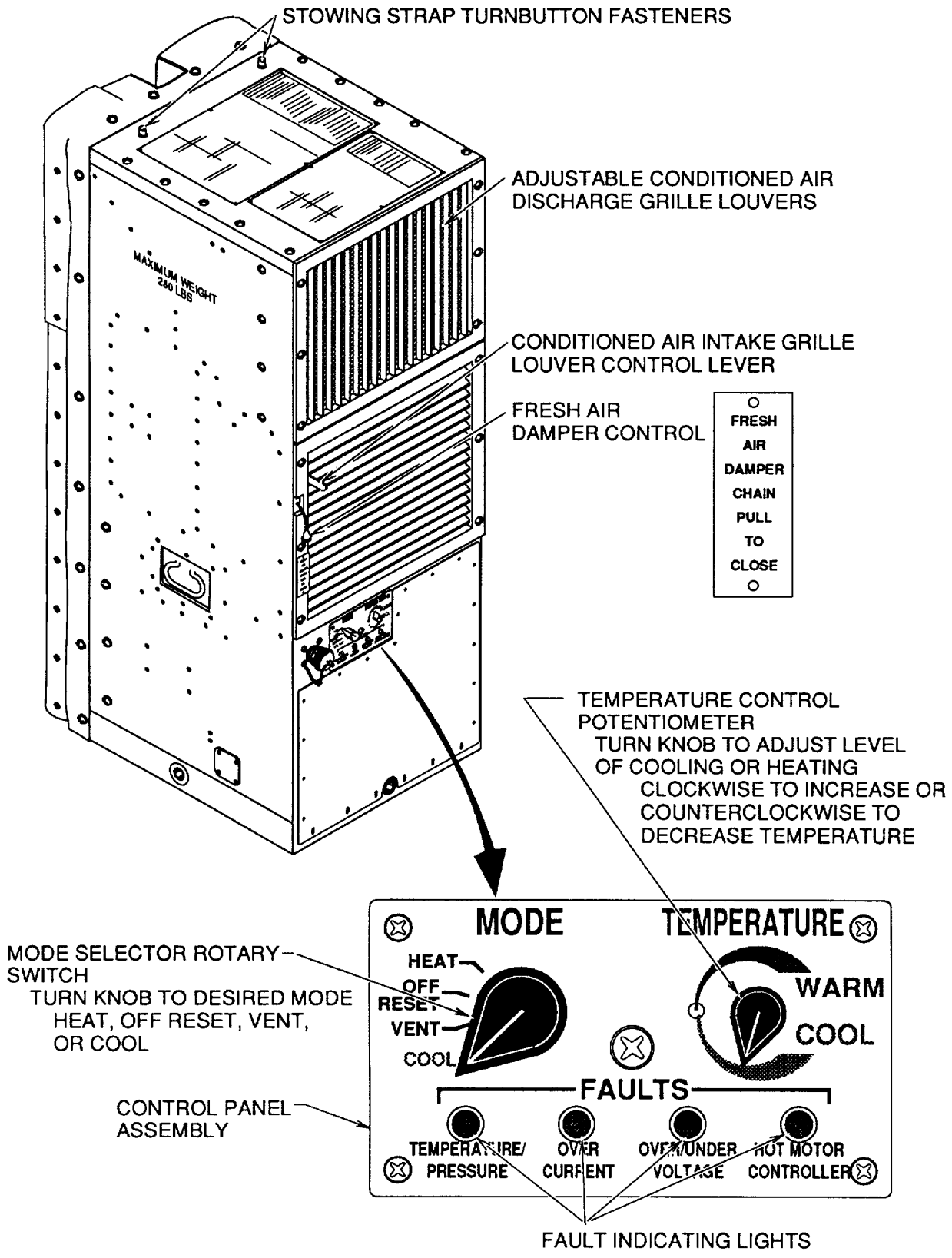


Figure 2-1. Operator's Controls Front

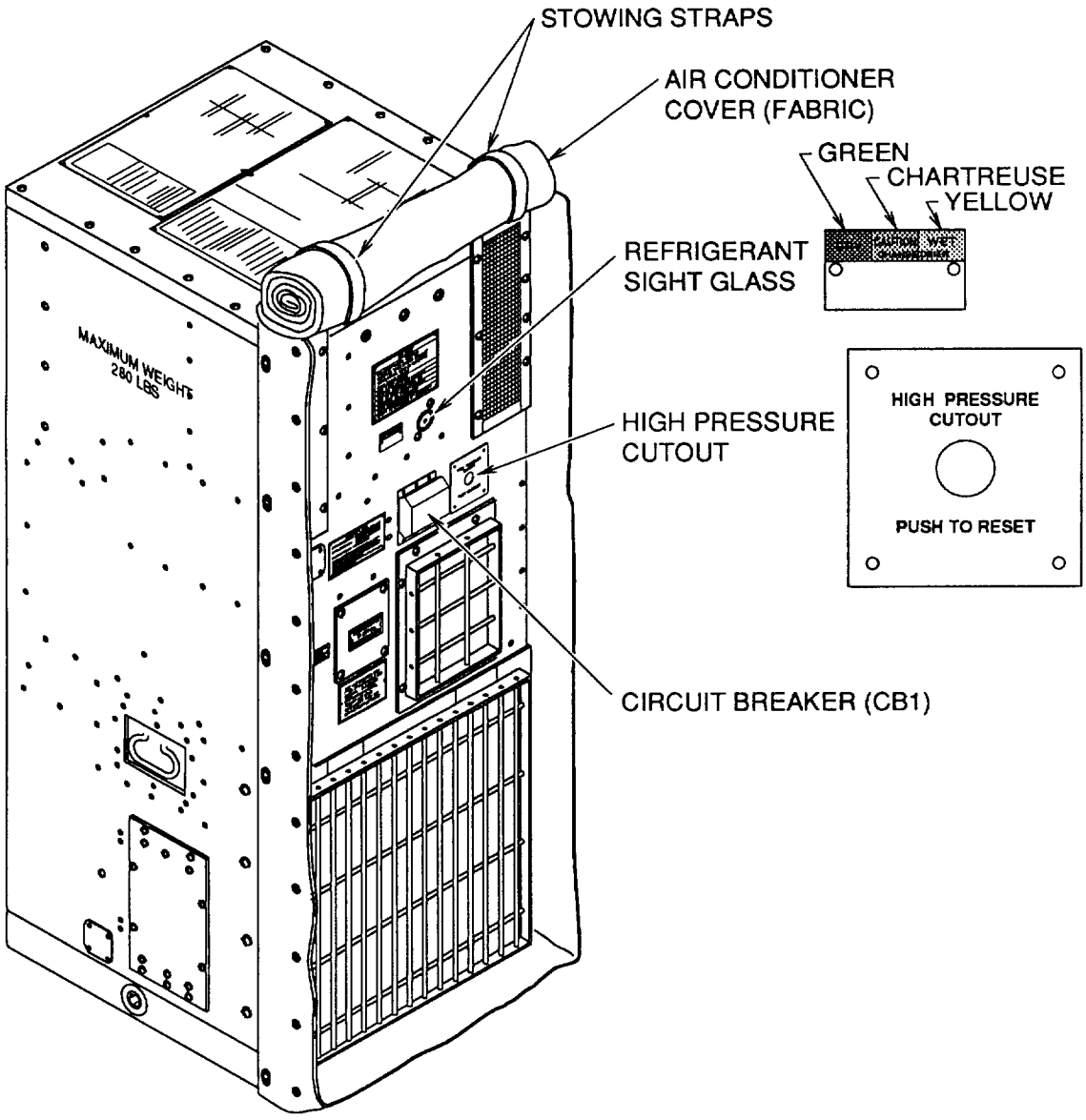


Figure 2-2. Operator's Controls Rear

2-2. OPERATOR'S CONTROLS.

All necessary operator controls are illustrated in figures 2-1 and 2-2. Usage of controls is outlined in General Operating Procedures (paragraph 2-7) and detailed in paragraph 2-8 thru 2-11.

2-3. INDICATORS

a. The TEMPERATURE PRESSURE FAULT indicator light (figure 2-1) comes on if the high pressure cutout, low pressure cutout, coil frost, or thermostatic (heater cutout) switch opens. The switches are associated with the units cooling and heating operation and can be an indication of obstructed air flow across the evaporator or condenser coil or improper refrigerant charge.

b. The OVER CURRENT FAULT indicator light (figure 2-1) comes on if the motor controller is operating with too high amp draw. This can be an indication of a component failure or wiring problem.

c. The OVER/UNDER VOLTAGE FAULT indicator light (figure 2-1) comes on if the motor controller is operating outside its voltage range. This could indicate controller failure or a problem with input power.

d. The HOT MOTOR CONTROLLER FAULT indicator light (figure 2-1) comes on if motor controller overheats.

CAUTION

Do not operate the air conditioner in the COOL mode if the refrigerant condition color indicator has turned yellow or if numerous bubbles appear in the sight glass. Equipment damage can result. COOL mode operation may be continued with the indicator color in the chartreuse band or with only an occasional bubble appearing in the window, but the sight glass should be rechecked after each four hours of operation to insure that the condition has not become worse.

e. The refrigerant sight glass (figure 2-2) has a small chamber with a glass window through which the refrigerant condition can be observed. It is installed in the liquid refrigerant line downstream from the condenser coil. Liquid refrigerant actually flows through the sight glass chamber only during cooling cycles when the air conditioner is in operation in the COOL mode. The unit must be operated approximately 15 minutes at maximum cooling prior to checking condition of refrigerant at sight glass. The sight glass is equipped with a center indicator that is moisture sensitive. Dry refrigerant is indicated by green, it turns to chartreuse when the moisture content becomes undesirable, and to yellow when the level becomes unacceptable. Excessive moisture in the refrigerant may damage or possibly destroy the compressor. If the liquid refrigerant observed in the sight glass has a milky appearance, or frequent bubbles appear, the volume of refrigerant is low and the system should be charged. Either moisture or low charge indications should be reported to supervisor.

Section II OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-4. GENERAL.

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 those functions which can be done from the outside of the cabinet. The Preventive Maintenance Checks and Services table lists the inspections and care of the air conditioner required to keep it in good operating condition.

a. Before You Operate. Always keep in mind and observe the WARNINGS and CAUTIONS contained in this technical manual and plates installed on the equipment that are associated with the functions you are about to perform. Perform your before (B) PMCS from table 2-1.

b. While You Operate. Always keep in mind and observe the WARNINGS and CAUTIONS contained in this technical manual and plates installed on the equipment that are associated with operational functions. Perform your during (D) PMCS from table 2-1.

c. After You Operate. Be sure to perform your after (A) PMCS from table 2-1.

d. If Your Equipment Fails to Operate. Troubleshoot within your capabilities and with proper equipment. Report any deficiencies using the proper forms. See DA Pamphlet 738-750.

e. Service Intervals. The interval column of the PMCS table tells when to do a certain check or service.

f. Procedure Column. The procedure column of the PMCS table tells how to do the required check and service.

g. Reporting and Correcting Deficiencies. If the air conditioner does not perform as required, refer to Chapter 3 under Troubleshooting for possible problems. Report any malfunctions or failures on DA Form 2404, or refer to DA Form 738-750.

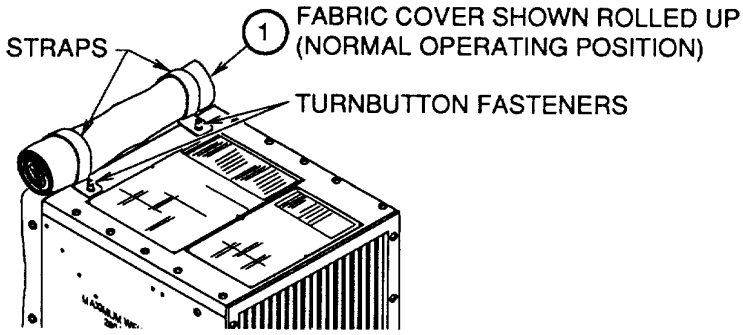
h. Equipment is Not Ready/Available If column. States that the air conditioner cannot be used under these conditions.

i. Special Instructions. Within designated intervals, 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

B - Before D - During A - After W - Weekly M - Monthly

ITEM NO.	INTERVAL					Item To Be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment Is not Ready/Available If:
	B	D	A	W	MI			
1	•					Fabric Cover	Check that cover is rolled up for normal operation. Roll down cover and check for condition of snaps, mildew, tears or worn edges.	 Cover is missing or damaged
2	•					Outside Covers and Panels	Check that panels are in place. Check panels for cracks, dents, and missing hardware.	 Panels missing or damaged that would cause operating hazard.



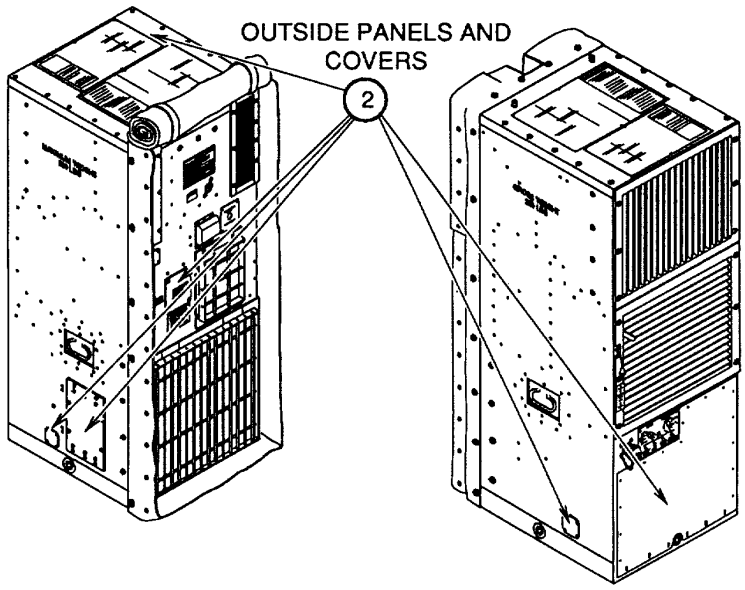
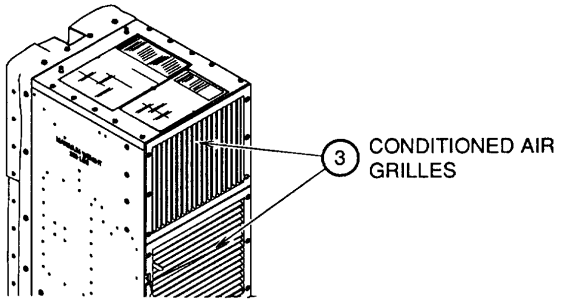


Table 2-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

B - Before D - During A - After W - Weekly M - Monthly

ITEM NO.	INTERVAL					Item To Be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment Is not Ready/Available If:
	B	D	A	W	MI			
3	•					Conditioned Air Grilles	Check for obstructions, damage, proper adjustment, loose or missing hardware. Check louvers for freedom of operation. Lubricate as required.	Louvers are damaged or missing.
4	•					Protective Grilles Screens and Guards	Check for obstructions, damage, loose or missing hardware.	Screens or guard damaged or missing.



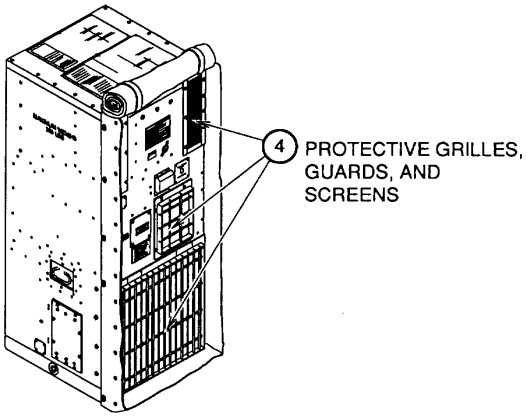


Table 2-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

B - Before D - During A - After W - Weekly M - Monthly

ITEM NO.	INTERVAL B	D	A	W	MI	Item To Be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment Is not Ready/Available If:
5	•					Information plates	Check for legibility and loose or missing hardware.	
6	•	•		•		Fresh Air Damper	Check for proper adjustment. Check for freedom of operation.	Control chain broken, missing or inoperable.

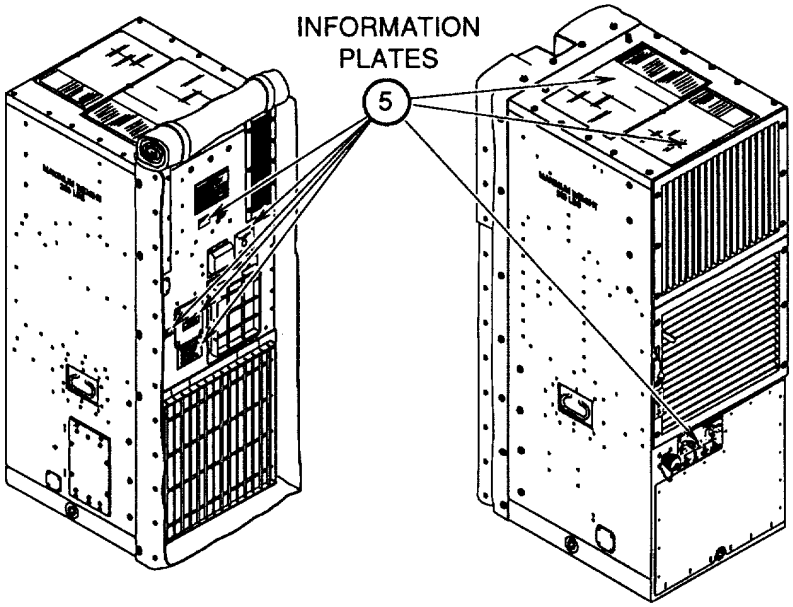
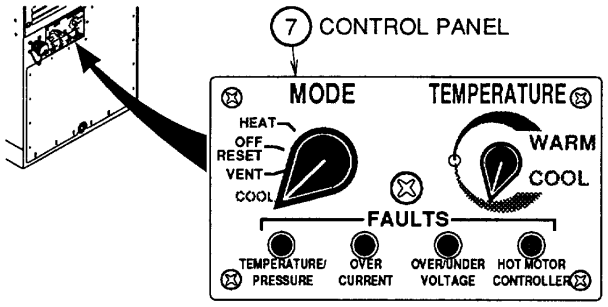


Table 2-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

B - Before D - During A - After W - Weekly M - Monthly

ITEM NO.	INTERVAL					Item To Be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment Is not Ready/Available If:
	B	D	A	W	MI			
7	•					Control Panel	Check for obvious damage and missing knobs. Check for proper operation. properly.	Control panel damaged. Unit not operating
8					•	Refrigerant Sight Glass	After 15 minutes of operation in maximum cooling, check for bubbles or milky flow indicating low refrigerant charge. Check center indicator for yellow color which indicates presence of moisture.	Bubbles, milky flow, or yellow color is observed.



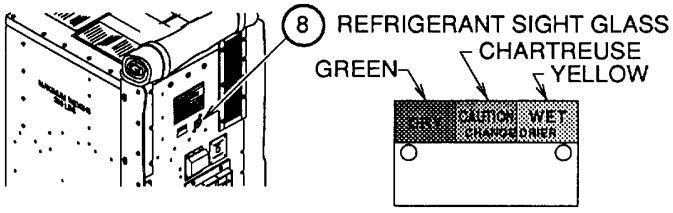
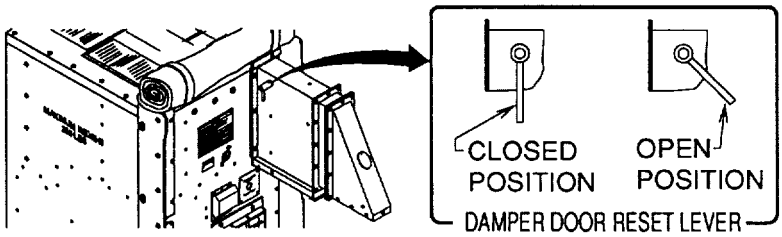


Table 2-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

B - Before D - During A - After W - Weekly M - Monthly

ITEM NO.	INTERVAL B	D	A	W	MI	Item To Be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment Is not Ready/Available If:
9	•			•		Blast Damper	**NOTE** **The following item applies only to units with accessory item blast damper.** Check that reset lever is in open position.	Lever cannot be reset.



Section III OPERATION UNDER USUAL CONDITIONS

2-5. ASSEMBLY AND PREPARATION FOR USE.

The Model F18T-MPI Air Conditioner is a completely assembled, self-contained unit as received. Services of Unit Maintenance should be used for original unpacking, installation and preparation for use. See paragraphs 4-3 through 4-6.

2-6. INITIAL ADJUSTMENTS AND CHECKS.

a. Inspect all covers, panels, grilles, and screens for loose mounting, obstructions, or shipping damage. Report any deficiencies to unit maintenance.

b. Perform the preventive maintenance checks and services listed in table 2-1.

2-7. GENERAL OPERATING PROCEDURES.

a. Check that MODE selector rotary switch is at OFF/RESET.

CAUTION

Use disconnect switch (NOT POWER CABLE) to connect power to unit. Damage to cable connector pins will result if cable is used.

b. Check to see that power cable has been connected to a source of 208 volt, 3 phase, 4 wire, 50/60 or 400 hertz power, and to the input power connector on the unit.

c. Unsnap and roll up the fabric cover on the back of the cabinet. Secure it in the stowed position with the two straps and turn button fasteners.

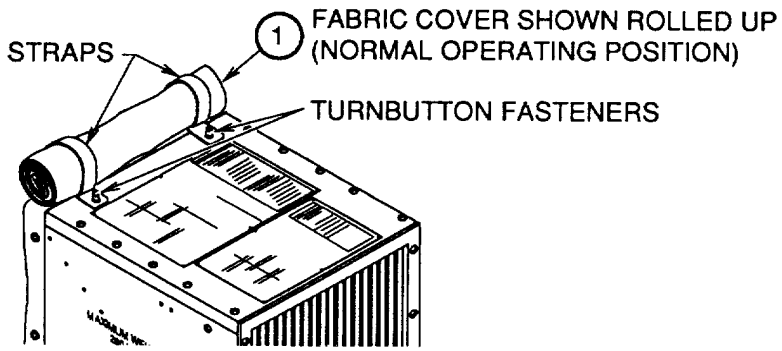


Figure 2-3. Fabric Cover

d. Check that all air inlet and outlet openings are clear and fully opened. Adjust fresh air inlet damper as desired.

e. Check that drains are either open or piped to a satisfactory location with a proper drain system.

2-7. GENERAL OPERATING PROCEDURES. - continued

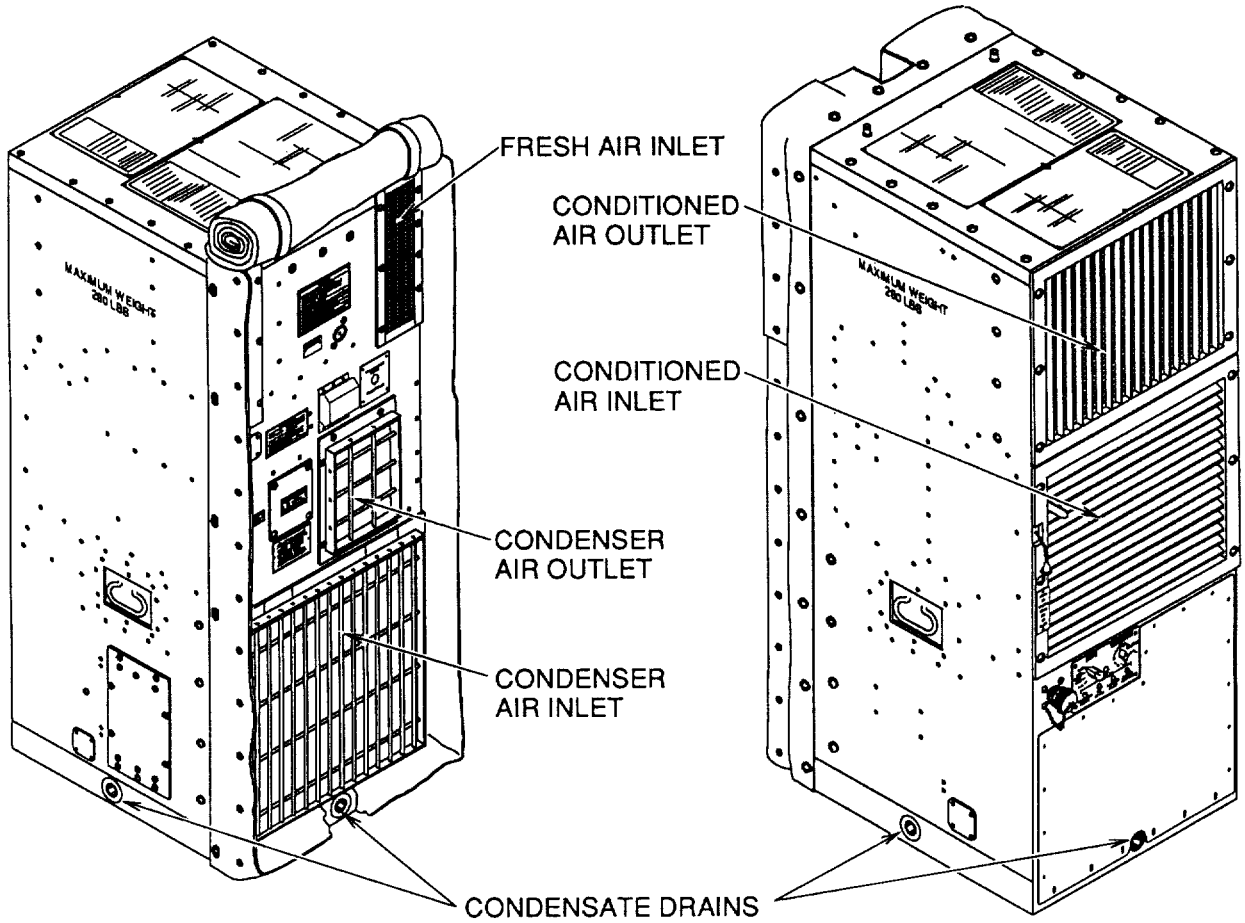


Figure 2-4. Air Openings and Drains

CAUTION

Do not perform the operational check in COOL mode until input power has been supplied to the unit for at least four hours. Liquid refrigerant tends to migrate into the compressor crankcase and cylinders during periods when the compressor heater is not operating. Under moderate climatic conditions, the compressor heater will normally "boil" all liquid refrigerant out within a four hour period. If the air conditioner has been exposed to below freezing temperatures without input power, an eight hour warm up period is recommended.

Before starting the air conditioner in COOL mode, make sure that the fabric condenser cover on the back of the condenser section is rolled up and secured and that all screens and guards are in place and unobstructed to avoid damage to equipment.

f. Table 2-2 lists the recommended control settings for the desired mode of operation. Minor adjustments may be made to get the desired mixture of recirculated and fresh air and the air flow patterns of conditioned air.

2-7. GENERAL OPERATING PROCEDURES. - continued

Table 2-2. INITIAL OPERATOR CONTROL SETTINGS

Mode	MODE Selector Rotary Switch	TEMPERATURE Control Potentiometer	Fresh Air Damper	Intake Grille	Discharge Grille	Fabric Cover
Ventilation with 100% Recirculated Air	VENT	Does not operate	Fully Closed	Fully Open	Adjust to suit	Rolled up or snapped closed
Ventilation with make-up Fresh Air	VENT	Does not operate	Partially Open	Partially Closed	Adjust to suit	Rolled up and secured *
Ventilation with 100% Fresh Air	VENT	Does not operate	Fully	Fully Closed Open	Adjust to suit	Rolled up and secured
Heating with 100% Recirculated Air	HEAT Temperature	Desired Closed	Fully Downward	Fully Open snapped	Slightly	Rolled up or closed
Heating with make-up Fresh Air	HEAT	Desired Temperature	Partially or Fully Open	Partially or Fully Closed	Slightly Downward	Rolled up and secured *
Cooling with 100% Recirculated Air	COOL	Desired Temperature	Fully Closed	Fully Open	Slightly Upward	Rolled up and secured
Cooling with make-up Fresh Air	COOL	Desired Temperature	Partially or Fully Open	Partially or Fully Closed	Slightly Upward	Rolled up and secured
Any Mode with make-up Air Through CBR Filter	Desired Mode	Desired Temperature	Fully Open	Partially or Fully Closed	Adjust to suit	Rolled up and secured

*If the unit is equipped with a blast damper, the fabric cover may be rolled down and snapped closed.

2-8. OPERATION IN VENTILATE MODE (NO HEATING OR COOLING NEEDED)

a. Turn MODE selector rotary switch to VENTilate.

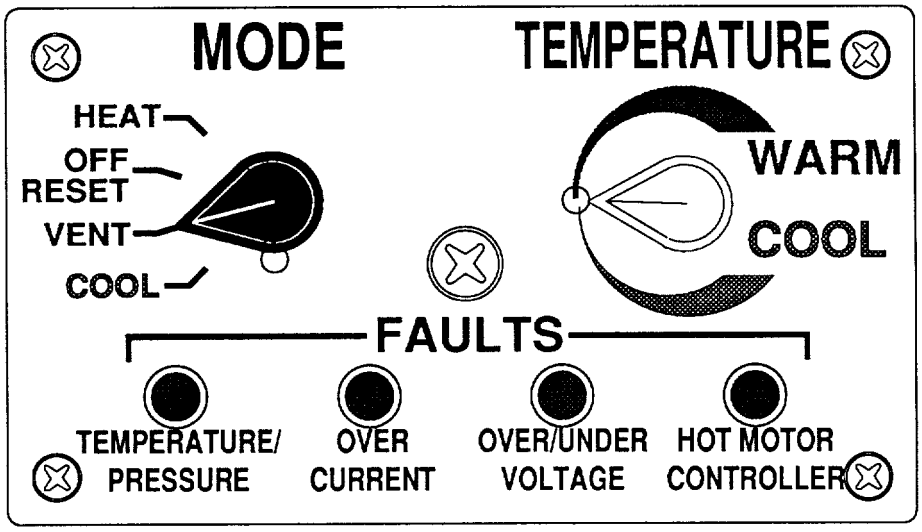


Figure 2-5. VENTilate Control Setting

b. Adjust fresh air damper to desired setting. The unit can be operated in the VENTilate mode with the fresh air damper (door) closed, open, or partially open.

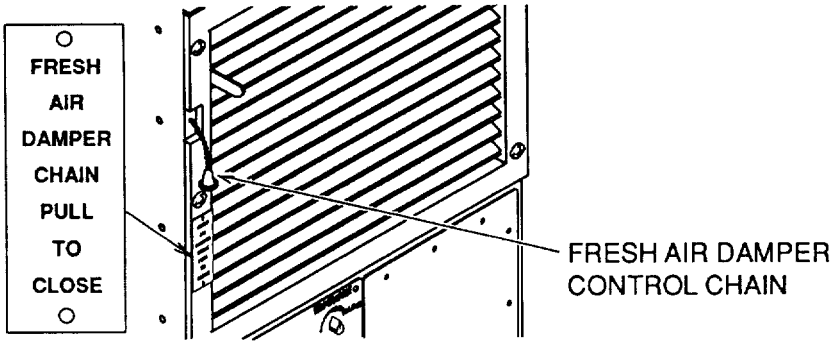


Figure 2-6. Fresh Air Damper (Door) Adjustment

NOTE

The fabric cover must be rolled up and secured if fresh air damper (door) is to be opened for make-up fresh air. When using make-up fresh air, a window, door or vent should be opened in the room or enclosure.

If the unit is equipped with a blast damper, the fabric cover may be rolled down and snapped closed during VENTilate or HEATing mode only.

2-8. OPERATION IN VENTILATE MODE (NO HEATING OR COOLING NEEDED).- continued

c. Adjust grilles to suit.

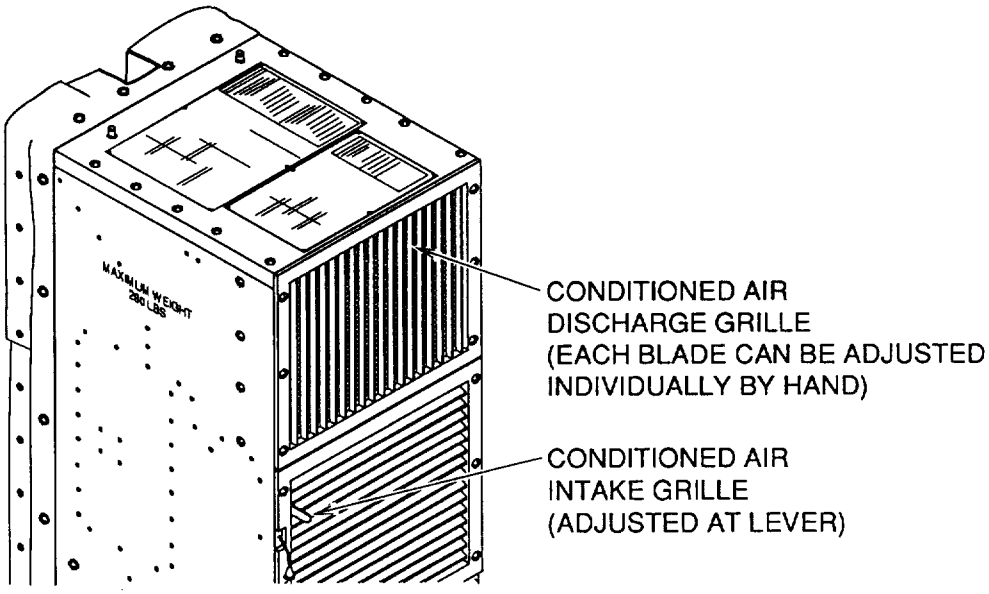


Figure 2-7. Grille Adjustment

NOTE

To pull in maximum of fresh (outside) air, close conditioned air intake grille.

2-9. OPERATION IN HEAT MODE

a. Turn MODE selector rotary switch to HEAT position.
b. Turn TEMPERATURE control potentiometer fully to the WARM position.

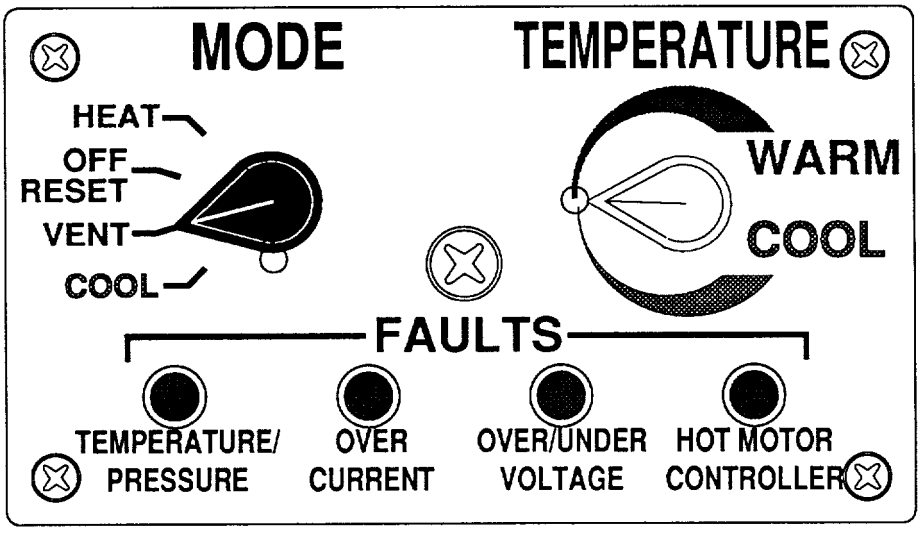


Figure 2-8. HEAT Control Setting

2-9. OPERATION IN HEAT MODE. - continued

c. When room or enclosure temperature reaches the desired level, slowly turn the TEMPERATURE control potentiometer toward COOL. Heating will stop when you reach the approximate room temperature. Further adjustment can be made by turning the TEMPERATURE control potentiometer slightly toward HEAT or COOL until desired temperature is controlled automatically.

d. Adjust fresh air damper (door) to desired setting. It is normally better to keep the fresh air damper slightly open. Damper should be closed during very cold weather.

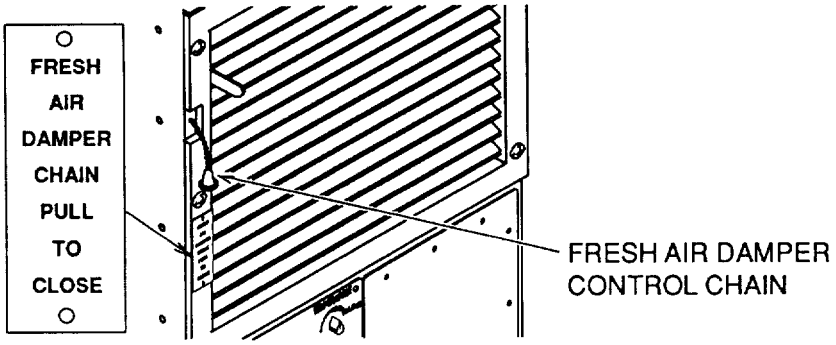


Figure 2-9. Fresh Air Damper (Door) Adjustment

e. Adjust grilles to suit. Since warm air tends to rise, it is normally better to adjust the conditioned air discharge grille slightly downward. The conditioned air intake grille should be fully open.

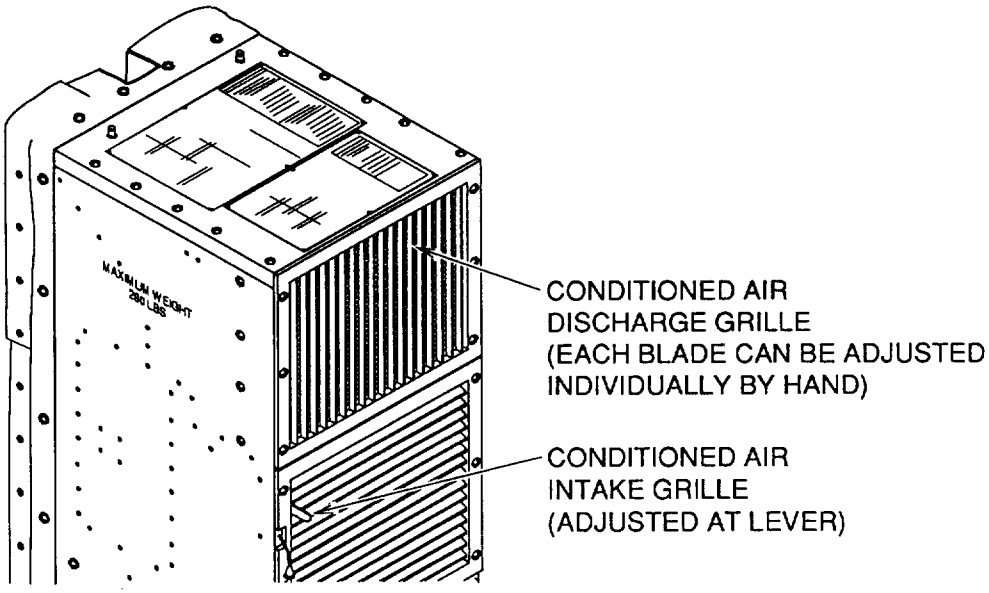


Figure 2-10. Grille Adjustment

2-9. OPERATION IN HEAT MODE. - continued

f. During periods of very cold weather, the fabric cover should be rolled down and snapped.

NOTE

Fresh (outside) air cannot be introduced with fabric cover rolled down except for units equipped with blast damper.

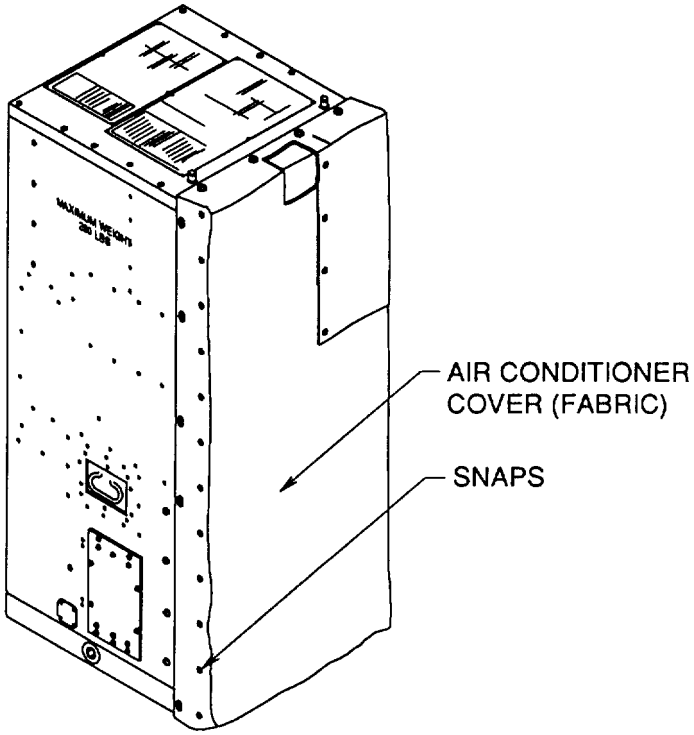


Figure 2-11. Fabric Cover

NOTE

An overheat thermostat located near the heating elements will turn them off if the temperature in the heater compartment reaches an excessive level.

2-10. OPERATION IN COOL MODE.

a. Fabric cover must be rolled up and secured with turn button fasteners.

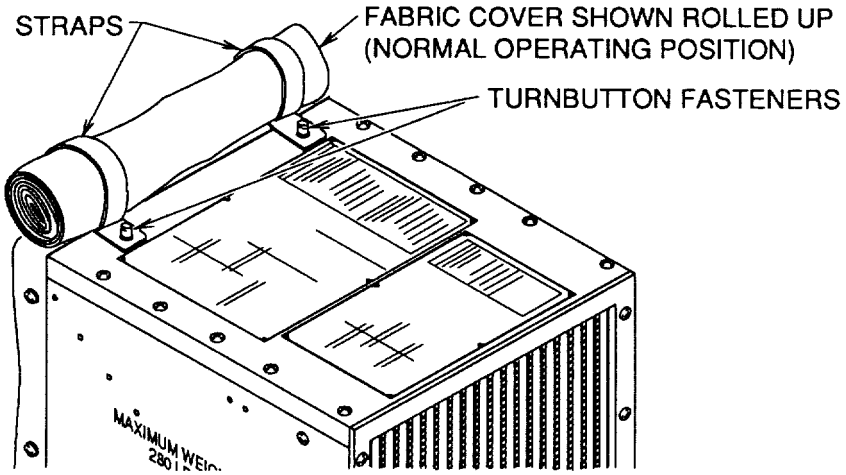


Figure 2-12. Fabric Cover

b. Turn MODE selector rotary switch to COOL.

c. Turn TEMPERATURE control potentiometer to full COOL position.

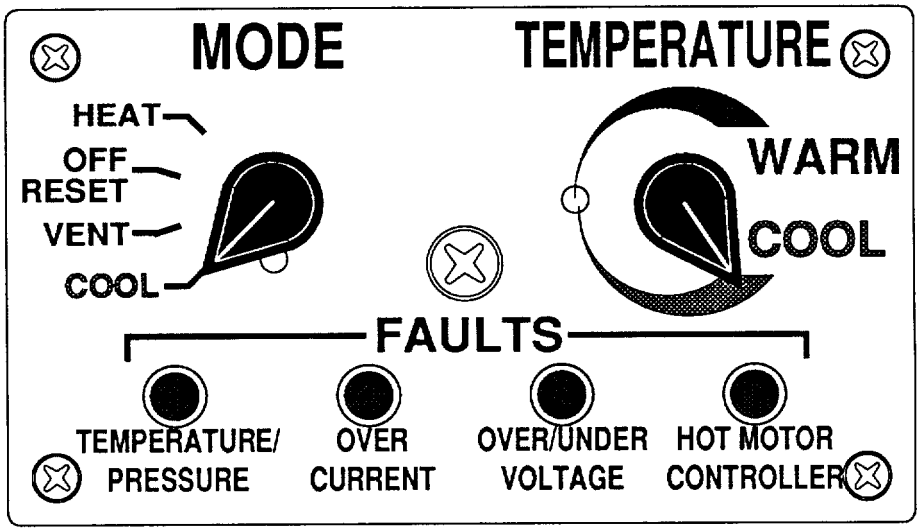


Figure 2-13. COOL Control Setting

2-10. OPERATION IN COOL MODE. - continued

d. For faster cool down at initial start-up, fresh air damper (door) should be closed. After desired cooling temperature is reached, it is normally better to keep the fresh air damper (door) slightly open. During periods of very hot outside temperatures, it should be closed to improve efficiency and conserve energy.

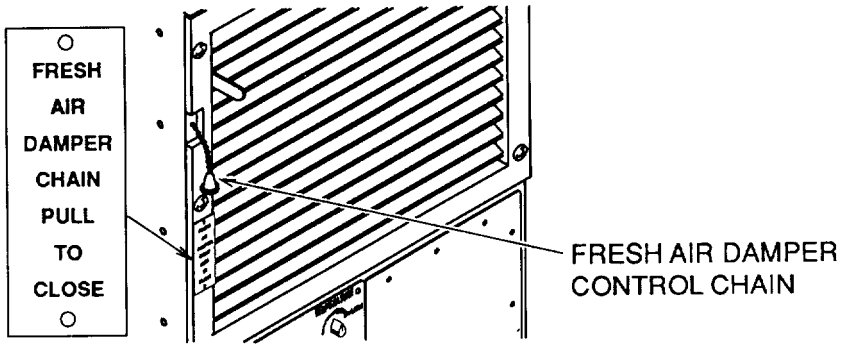


Figure 2-14. Fresh Air Damper (Door) Adjustment

e. When room or enclosure temperature reaches the desired level, slowly turn the TEMPERATURE control potentiometer toward WARM. Cooling will stop when you reach the approximate room temperature. Further adjustment can be make by turning the TEMPERATURE control potentiometer slightly toward COOL or WARM until desired temperature is controlled automatically.

f. Adjust grilles to suit. Since cold air tends to flow downward, it is normally better to adjust the conditioned air discharge grille slightly upward. The conditioned air intake grille should be fully open.

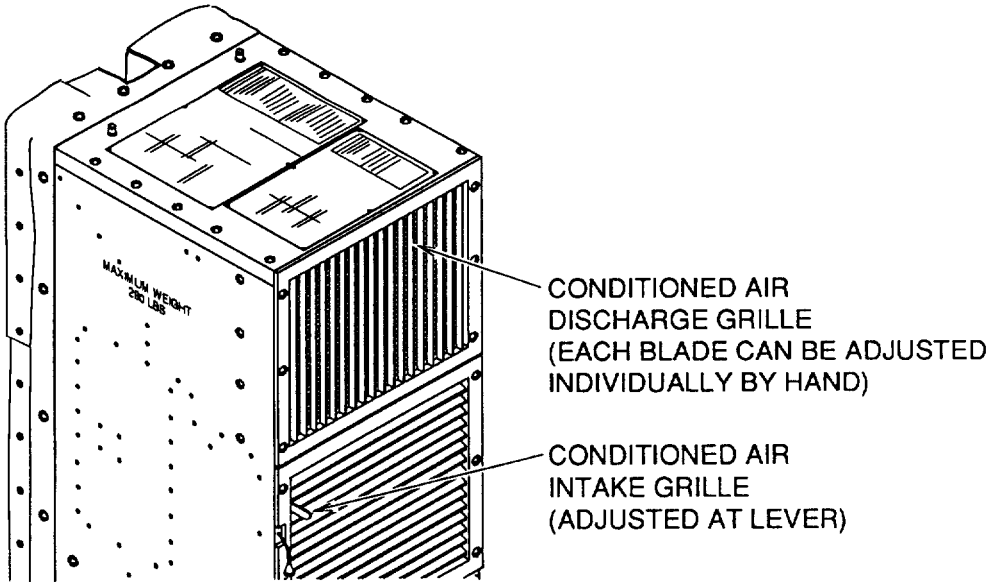


Figure 2-15. Grille Adjustment

2-11. SHUTDOWN (OFF).

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, due to warm up period of compressor heaters.

Turn the MODE selector rotary switch to OFF/RESET.

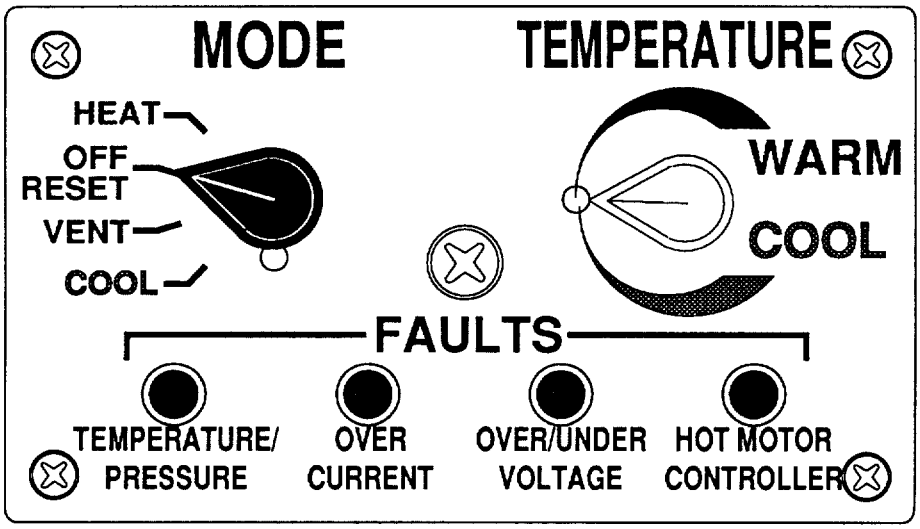


Figure 2-16. OFF/RESET Control Setting

12-12. PREPARATION FOR MOVEMENT.

When the unit is to be moved, the services of Unit Maintenance shall be employed for the necessary preparations. See Chapter 4, Section VII.

2-13. INFORMATION PLATES.

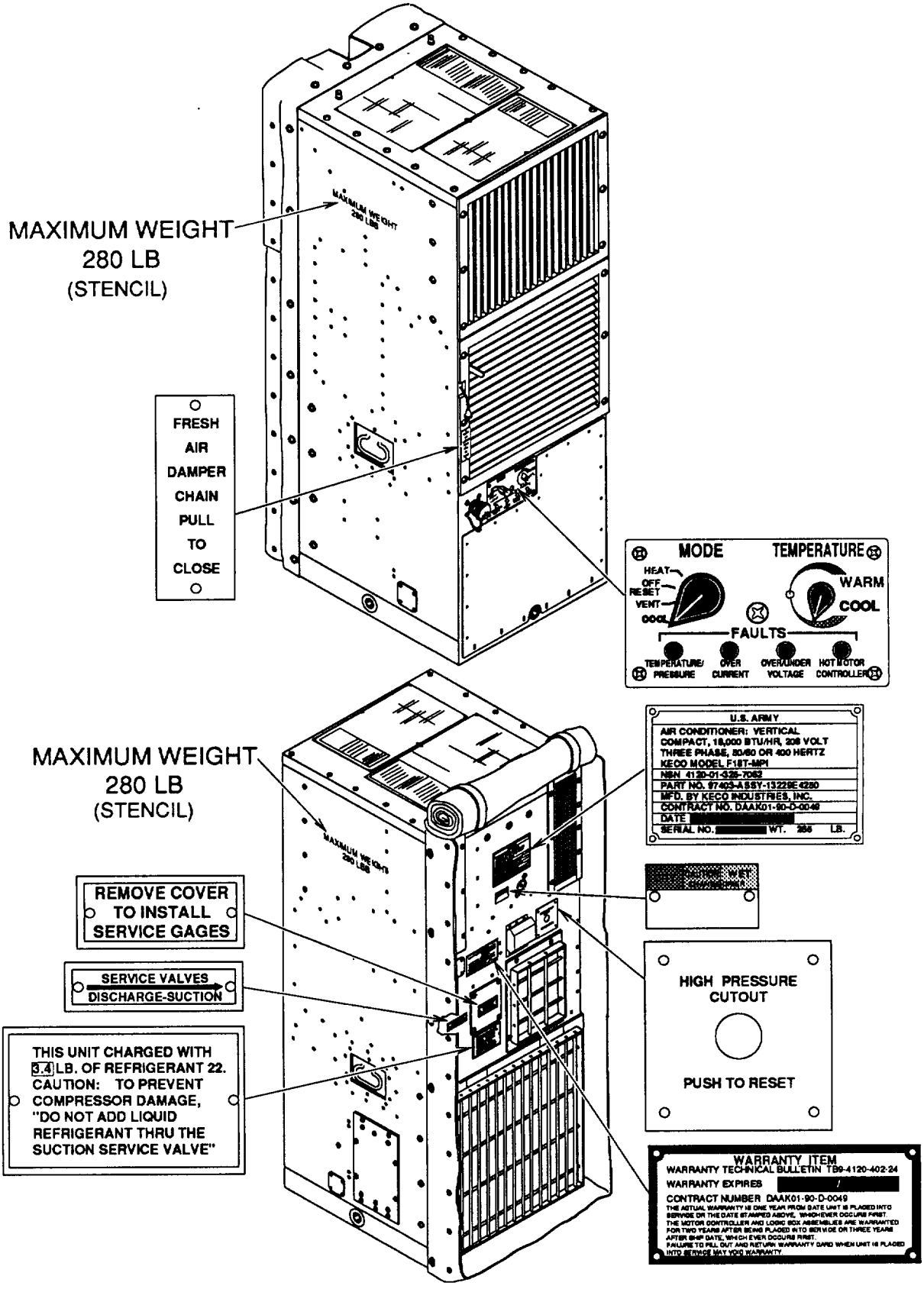


Figure 2-17. Information Plates

Section IV OPERATION UNDER UNUSUAL CONDITIONS

2-14. GENERAL.

The Model F18T-M PI 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 on the equipment.

2-15. OPERATION IN EXTREME HEAT.

The air conditioner is designed to operate in temperatures up to 120OF (490C). 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: 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. When appropriate, use shades or awnings to shut out direct rays of the sun.

c. When possible, limit the use of electric lights and other heat producing equipment.

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

e. Clean filter, mist eliminator, and coils more frequently.

2-16. OPERATION IN EXTREME COLD.

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.

The air conditioner is designed to operate in the HEAT mode at temperatures down to -50°F (-45°C) and in the COOL mode at outside temperatures down to 45°F (70°C). Extra care should be taken to minimize the heating load when operating in extremely low temperatures. Some of the steps that may be taken are:

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.

c. Limit the amount of cold, outside air introduced through the fresh air damper to that essential for ventilation.

2-16. OPERATION IN EXTREME COLD. - continued

NOTE

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

d. Before attempting to start the unit in the COOL mode or when fresh air is being used during the HEAT mode, be sure that cover is rolled up and all exposed air openings are clear of ice and snow.

e. Be sure that fresh air damper (door) is operating freely.

f. If unit is not being used or is being used in the HEAT mode without fresh air, close (roll down) and secure the fabric cover.

2-17. OPERATION INDUSTY OR SANDY CONDITIONS.

Dusty and sandy conditions can seriously reduce the efficiency of the air conditioner by clogging the air filter, mist eliminator, and coils. This will cause a restriction in the volume of airflow. Accumulation of dust or sand in the condenser coil and/or in the compressor compartment may cause overheating of the refrigeration system. Dust or sand may also clog the condensate trap and water drain lines. Some of the steps that may be taken are:

a. Frequent cleaning of filters, mist eliminator, coils and all other areas of dust and sand accumulation. In extreme conditions, daily cleaning of filters may be necessary.

b. Limit the amount of dusty or sandy outside air introduced through the fresh air damper to that essential for ventilation.

c. Roll down and secure the fabric cover on the back of the cabinet during periods of shutdown.

2-18. 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 inspection and cleaning of the mist eliminator, condensate trap, and drain lines to insure proper drainage and prevent accumulation of water inside the cabinet.

b. Roll down and secure the fabric cover on the back of the cabinet during periods of wet, windy weather when the air conditioner is not in operation.

c. Roll up and secure the fabric cover during dry weather when the air conditioner is not in operation so that the interior can dry out and condensation will not accumulate.

2-19. 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. Some of the steps that should be taken when operating in a salt air or sea spray environment are:

a. Frequent cleaning during which all exposed surfaces should be thoroughly spray rinsed or sponged with fresh water to remove salt deposits.

b. Roll down and secure the fabric cover on the back of the cabinet during all periods when the air conditioner is not in operation.

2-20. OPERATION UNDER EMERGENCY CONDITIONS.

a. CBR (chemical, biological, radiological) hazard. When operation is anticipated under potential CBR conditions, a CBR filtering unit should be connected to the fresh air intake. See specific instructions for your shelter or facility installation. Adjust the return air louvers in conjunction with the CBR filter controls to provide a higher overpressure within the room or enclosure.

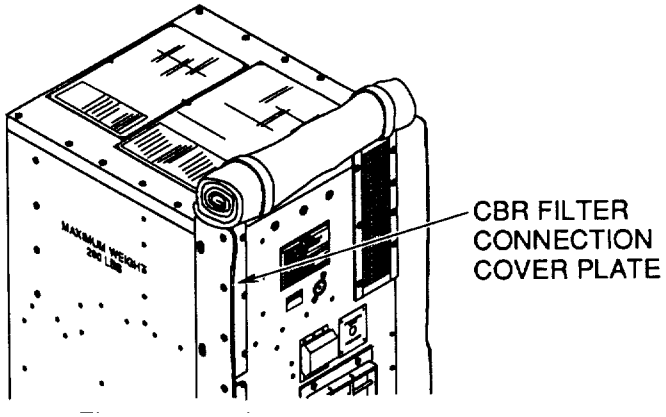


Figure 2-18. CBR Filter Connection Location

b. During periods when full electrical power is in critically short supply, if the air conditioner cannot be turned off completely, it should be operated in VENTilate mode when possible.

c. The blast damper assembly is designed to trip and close following a nuclear blast. This will prevent contaminated air from being drawn into the conditioned area through the fresh air inlet. The operator must also IMMEDIATELY close the fresh air inlet damper.

CHAPTER 3

OPERATOR'S MAINTENANCE INSTRUCTIONS

Paragraph

Section I Lubrication Instructions
General....3-1
Section II Operator Troubleshooting
Use of Troubleshooting Table....3-2
Section III Maintenance Procedures
General....3-3

Section I LUBRICATION INSTRUCTIONS

3-1. GENERAL.

The Model F18T-MPI Air Conditioner and its major components are designed so that very little lubrication is required during the serviceable lifetime. The refrigerant compressor and its drive motor are hermetically sealed in a single canister; sealed bearings are incorporated in the drive motor and the compressor is supplied with a complete charge of oil and requires no lubrication. Sealed bearings are incorporated in the evaporator and condenser fan motors. The only operator lubrication required is that necessary to relieve stiffness or binding of the louver blades in the evaporator intake and discharge grilles or the turn button fasteners associated with the fabric cover on the back of the cabinet. Sparingly apply a light machine oil and work it into the joints or pivots involved. Blot up all excess oil with a cloth or paper towel. Report stiffness or binding of all operational controls to supervisor.

Section II OPERATOR TROUBLESHOOTING

3-2. USE OF TROUBLESHOOTING TABLE.

Table 3-1 contains troubleshooting information useful to operators in diagnosing and correcting malfunctions or unsatisfactory operation of the air conditioner.

a. 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 test/inspection and corrective actions in the order listed.

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

3-2. USE OF TROUBLESHOOTING TABLE. - continued

SYMPTOM INDEX

Trouble	Malfunction No.
AIR CONDITIONER	
Air Conditioner Does Not Start In Any Mode	1
Reduced Cooling Capacity	4
Reduced Heating Capacity	5
COMPRESSOR	
Compressor Does Not Start In Cool Mode	2
Compressor Starts Normally, But High Pressure Switch Soon Trips	3

Table 3-1. OPERATOR TROUBLESHOOTING

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. AIR CONDITIONER DOES NOT START IN ANY MODE.

CAUTION

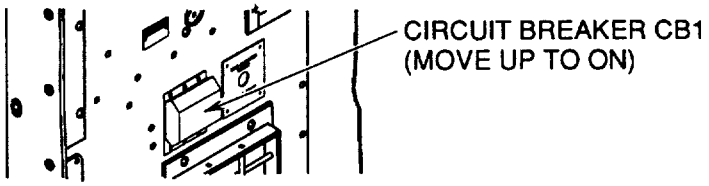
During cool weather, do not start in COOL mode for four hours. Compressor must be warm or damage can result.

Step 1. Check that input power has not been disconnected.

Connect input power.

Step 2. Check to see if CIRCUIT BREAKER has tripped.

Move up to reset circuit breaker.



NOTE

If circuit breaker continues to trip, notify supervisor.

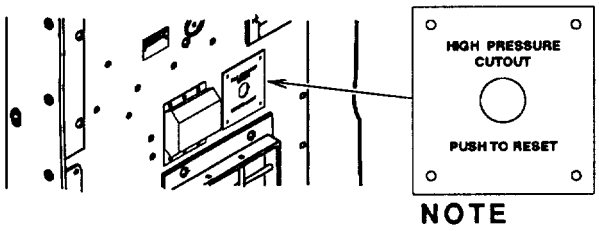
Table 3-1. Operator Troubleshooting - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. COMPRESSOR DOES NOT START IN COOL MODE.

Step 1. Check to see if HIGH PRESSURE CUTOUT switch has tripped.

PUSH and release TO RESET.

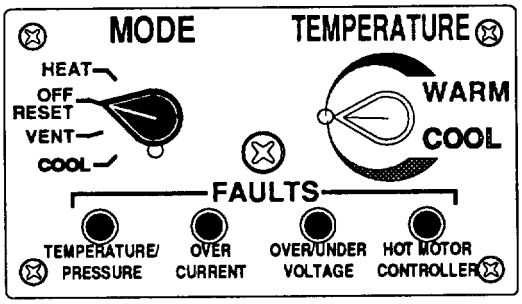


NOTE

If cutout switch continues to trip, notify supervisor.

Step 2. Check operation of MODE selector rotary switch.

Turn switch to OFF/RESET, then back to COOL.



3. COMPRESSOR STARTS NORMALLY, BUT HIGH PRESSURE CUTOUT SWITCH SOON TRIPS.

Step 1. Check to be sure fabric cover is rolled up.

Roll up and secure fabric cover.

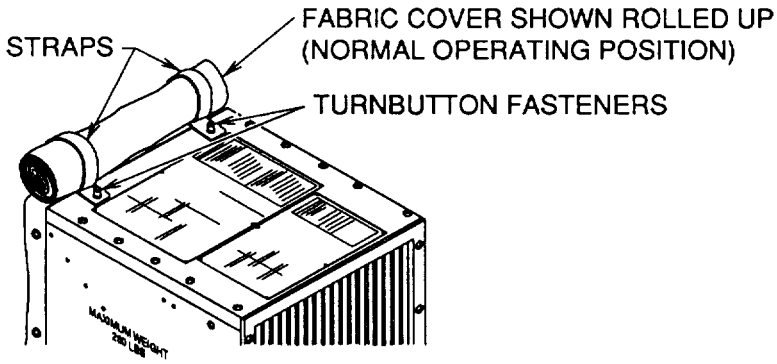


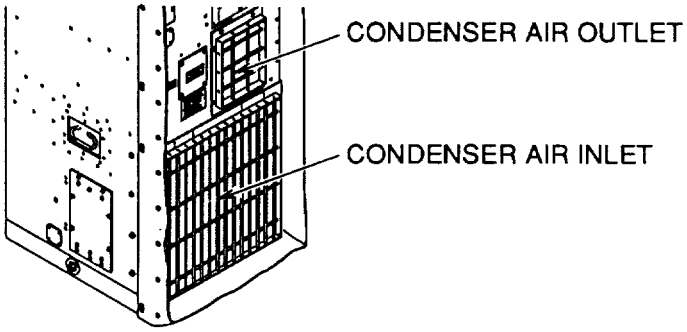
Table 3-1. Operator Troubleshooting - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. COMPRESSOR STARTS NORMALLY, BUT HIGH PRESSURE CUTOUT SWITCH SOON TRIPS. - continued

Step 2. Check to be sure condenser air inlet and outlet are not obstructed.

Remove obstructions.



Step 3. Reset (PUSH) HIGH PRESSURE CUTOUT switch and restart unit.

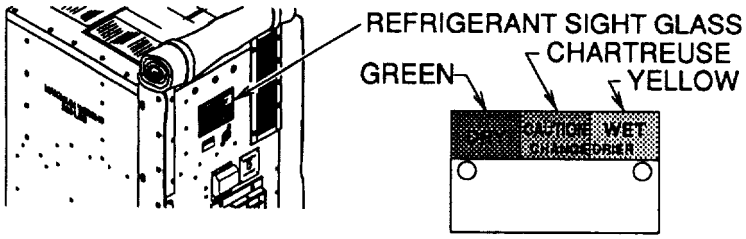
If unit does not start, notify supervisor.

Step 4. Check to be sure condenser fan is operating. (Air being discharged from condenser air outlet.)

If fan is not operating, notify supervisor.

Step 5. With unit operating in COOL mode, check condition of refrigerant in sight glass.

If indicator color is in the yellow zone or numerous bubbles appear in the window, turn selector switch to OFF/RESET and notify supervisor.



Step 6. Check to be sure that lower front panel is not loose or missing.

Lower front panel must be secure.

4. REDUCED COOLING CAPACITY.

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

Tightly close all openings.

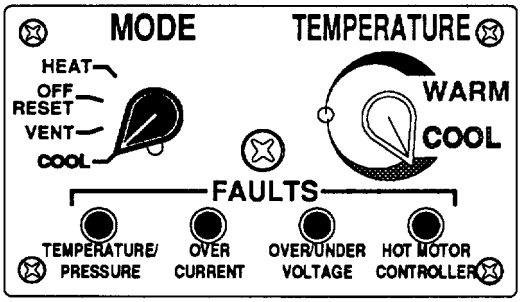
Table 3-1. Operator Troubleshooting - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

4. REDUCED COOLING CAPACITY. - continued

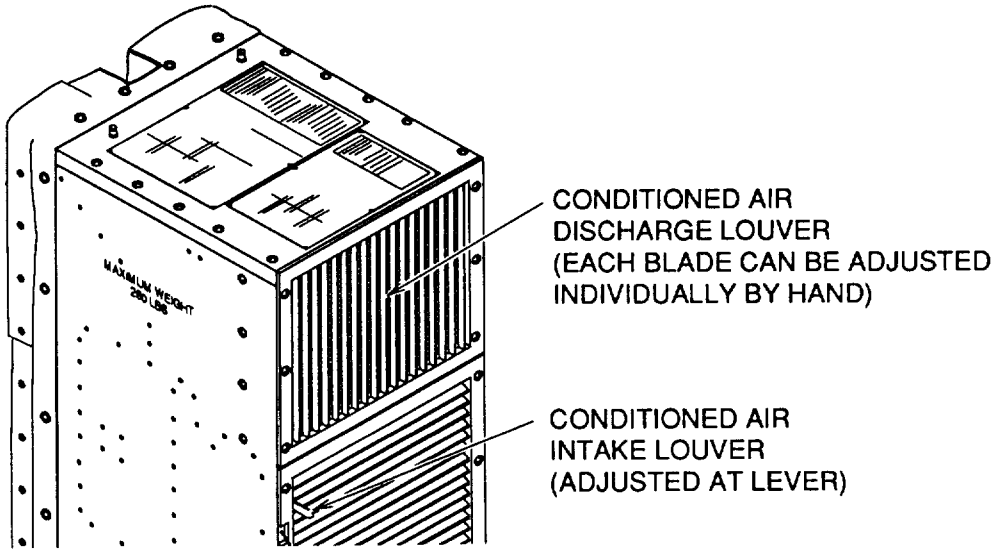
Step 2. Check operation of TEMPERATURE control potentiometer.

Set control at maximum COOL, then, if condition improves, adjust properly.



Step 3. Check that discharge and intake air grille louvers are properly adjusted. (Must be open.)

Adjust louvers properly.



Step 4. Check that excessive hot, outside air is not being introduced through fresh air damper.

Fully close damper, then, if condition improves, adjust properly.

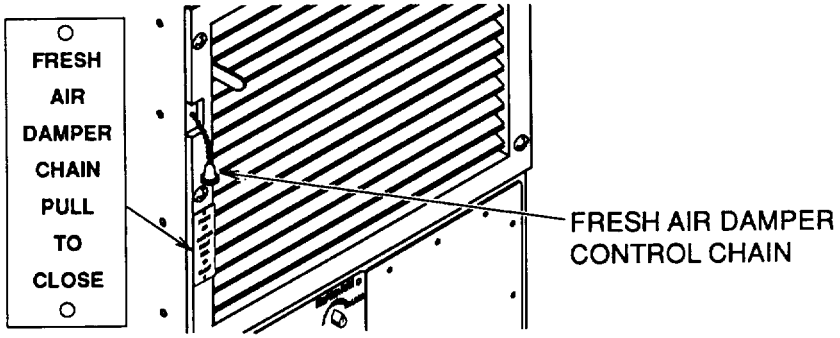
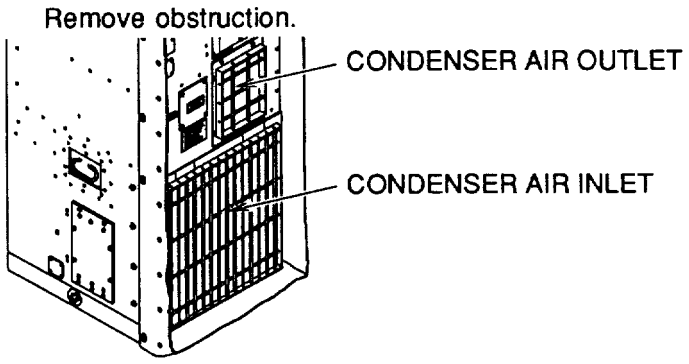


Table 3-1. Operator Troubleshooting - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

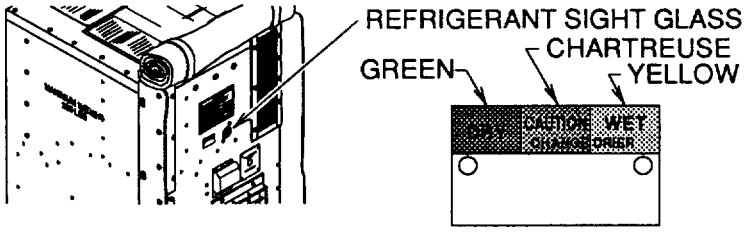
4. REDUCED COOLING CAPACITY. - continued

Step 5. Check that condenser air inlet and outlet are not obstructed.



Step 6. With unit operating in COOL mode, check condition of refrigerant in sight glass.

If indicator color is in the yellow zone or numerous bubbles appear in window, turn selector to OFF/RESET and notify supervisor.



5. REDUCED HEATING CAPACITY.

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

Tightly close all openings.

Step 2. Check operation of TEMPERATURE control potentiometer.

Set control to fully WARM then, if condition improves, adjust properly.

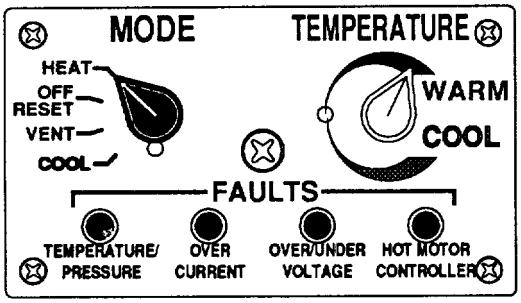


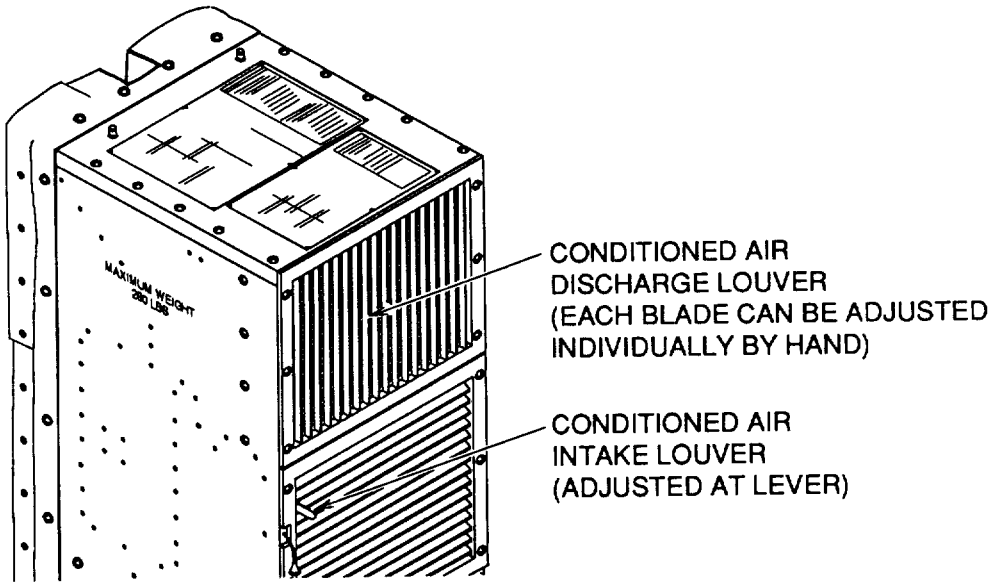
Table 3-1. Operator Troubleshooting - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

5. REDUCED HEATING CAPACITY. - continued

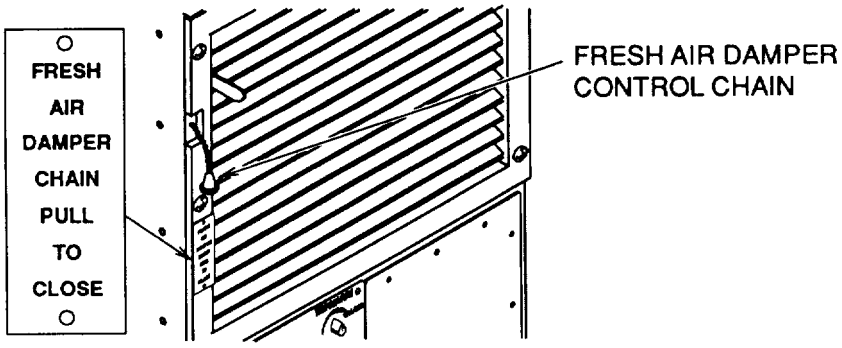
Step 3. Check that discharge and intake grille louvers are properly adjusted.

Adjust louvers properly.



Step 4. Check that excessive cold, outside air is not being introduced through fresh air damper.

Fully close damper, then, if condition improves, adjust properly.



Section III MAINTENANCE PROCEDURES

3-3. GENERAL.

Operator maintenance is limited to the adjustments performed during operational checks. See paragraph 2-6.

CHAPTER 4

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Section I LUBRICATION INSTRUCTIONS

4-1. UNIT LUBRICATION.

a. General. The refrigerant compressor and its drive motor are hermetically sealed in a canister. The compressor is supplied with a complete charge of oil and requires no lubrication. The evaporator and condenser fan motors also have permanently lubricated, sealed bearings. No lubrication of these items is required.

b. Mechanical Lubrication. The only mechanical items which may require lubrication are the conditioned air discharge and intake grille louvers and the devices which operate the fresh air damper door. These points should be checked and lubricated, as necessary, during preventive maintenance service. A few drops of light oil should be applied to pivot points, bearing surfaces, and linkages to prevent or eliminate stiffness or binding. Be sure to wipe off all excess oil with a cloth or paper towel. These items are in an area of high volume airflow and excess oil will tend to attract and accumulate dust particles from the passing air. Graphite may be used as an alternate lubricant during extreme cold weather operation.

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

4-2. GENERAL.

a. Repair parts are listed and illustrated in TM 9-41 20-402-24P. No special tools are required for maintenance of the equipment. Test, maintenance, and diagnostic equipment (TMDE), and support equipment include standard electrical test equipment found in any unit maintenance electric shop.

b. For authorized common tools and equipment refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

Section III SERVICE UPON RECEIPT OF EQUIPMENT

4-3. SITE AND SHELTER REQUIREMENTS.

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 the conditioned and positioning the air conditioner so that the front of the cabinet is inside to the room or enclosure and the back if the cabinet is outside. Alternate installations may be made with the entire cabinet either inside or outside the conditioned area. The following are minimum requirements for all installations:

a. A relatively level surface capable of bearing the weight of the air conditioner on which to set the base. To insure proper condensate drainage, the surface should be level within 5° from front to back and side to side. See figure 4-1, Sheets 1 through 6 for installation dimensions.

b. An unobstructed flow of air from outside the conditioned area to the intake and discharge of the condenser fan (back face of air conditioner).

c. An unobstructed flow of air from inside the conditioned area to the conditioned air intake and discharge openings (front face of air conditioner).

WARNING

Check that no source of dangerous or objectionable fumes is near the fresh air intake. Injury to personnel can result if dangerous fumes are pulled into intake.

d. An unobstructed flow of air from outside the conditioned area to the fresh air damper intake and/or CBR filter intake, if installed (back face of air conditioner).

e. Access to the front and back of the air conditioner for routine operation and servicing and for necessary maintenance actions.

f. Access to the top of the cabinet for removal of the top panel and sufficient headroom to allow maintenance actions and internal component removal and installation through the top panel opening.

g. A source of 208 volt, 3 phase, 50/60 or 400 hertz input power rated at 18.0 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.

h. An earth ground capable of handling 18.0 amps (10 AWG wire minimum).

i. If possible, make use of terrain features such as trees and buildings to provide a shaded location. This minimizes the cooling load on the refrigeration system.

j. If possible, avoid a location where the condenser and fresh air intakes will be laden with dust, dirt, soot, smoke or other debris.

ALL DIMENSIONS ARE IN INCHES. FOR METRIC CONVERSION SEE SHEET 4.

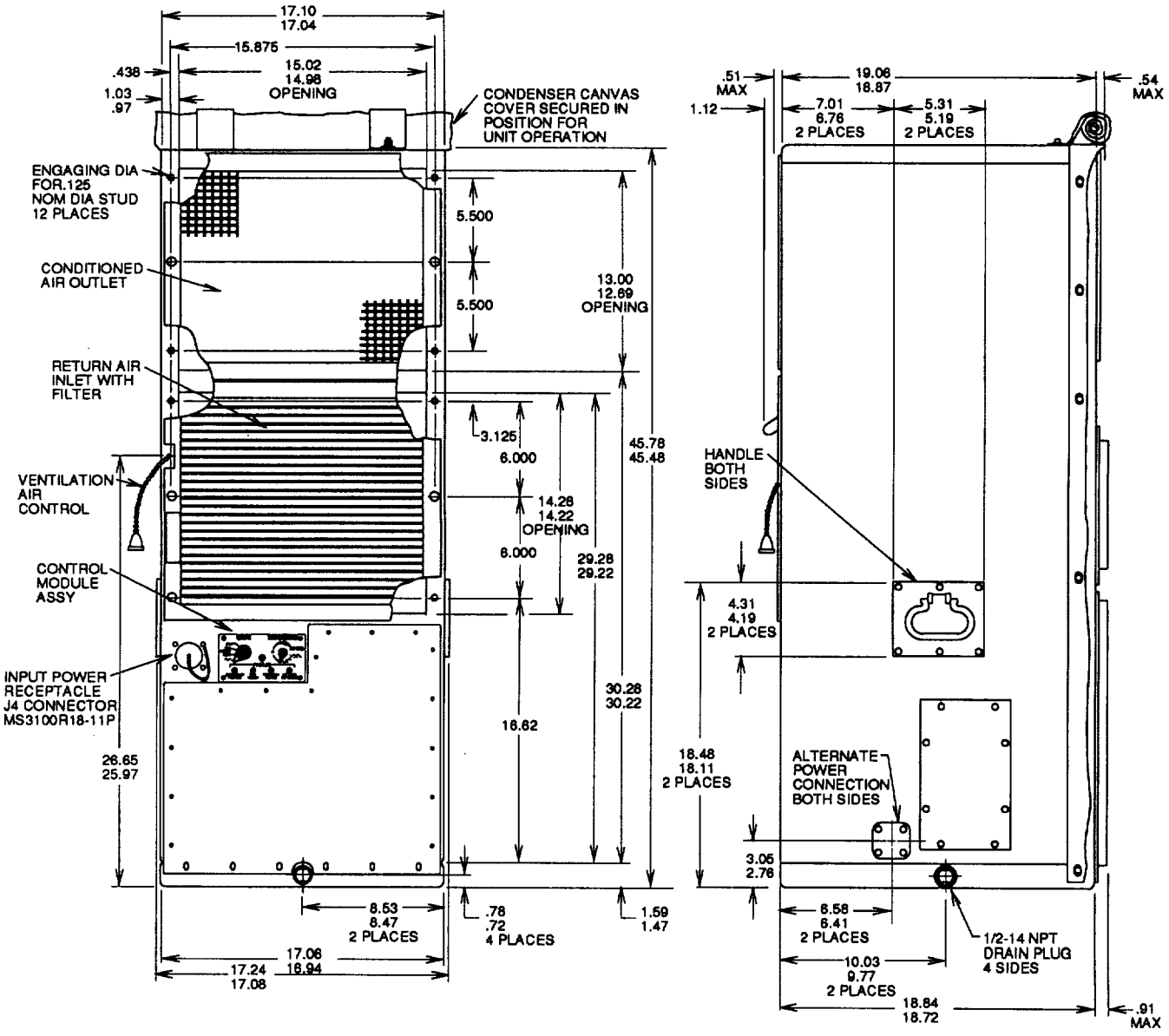
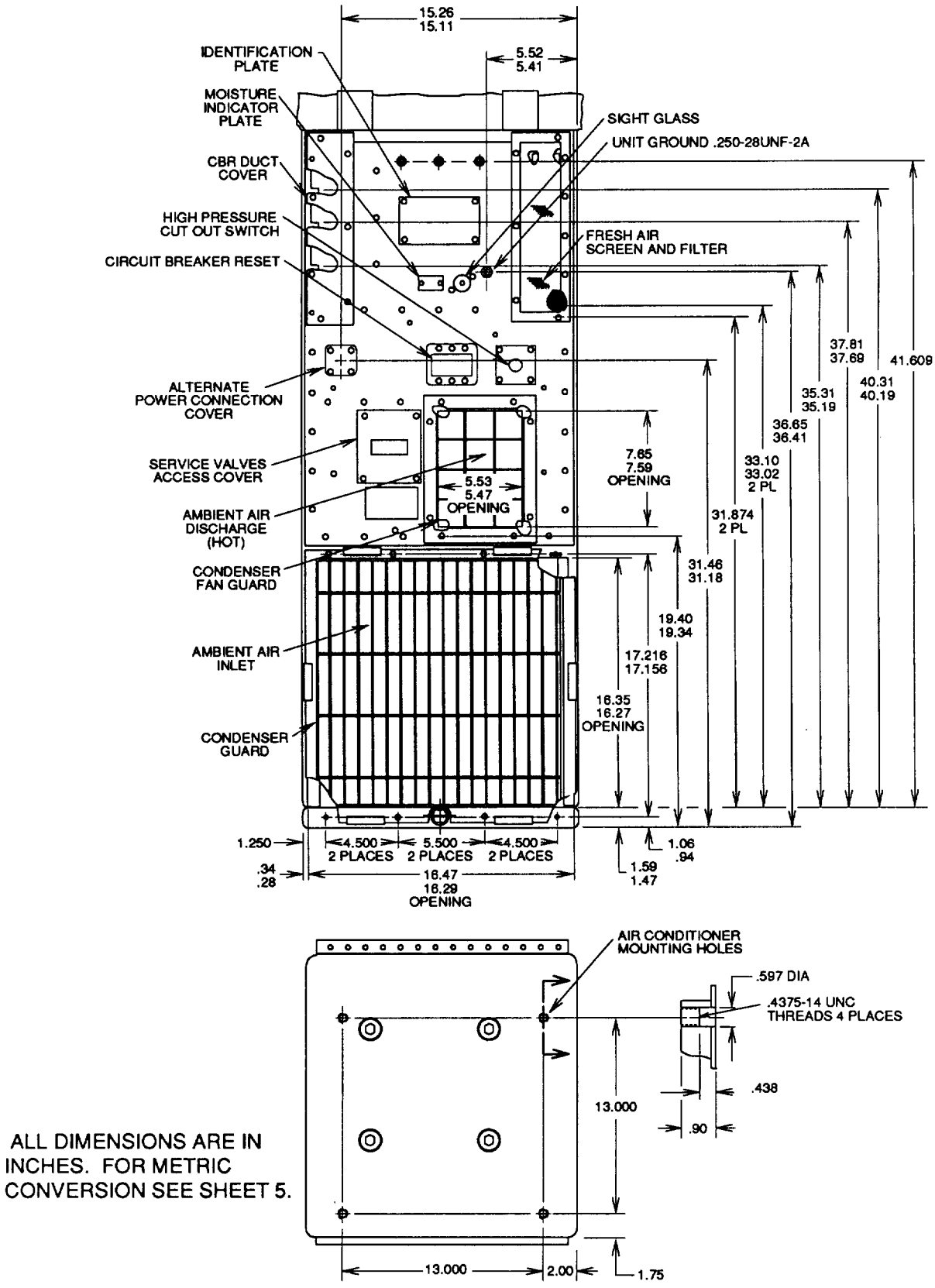


Figure 4-1. Installation Dimensions (Sheet 1 of 6)



ALL DIMENSIONS ARE IN INCHES. FOR METRIC CONVERSION SEE SHEET 5.

Figure 4-1. Installation Dimensions (Sheet 2 of 6)

ALL DIMENSIONS ARE IN INCHES. FOR METRIC CONVERSION SEE SHEET 6.

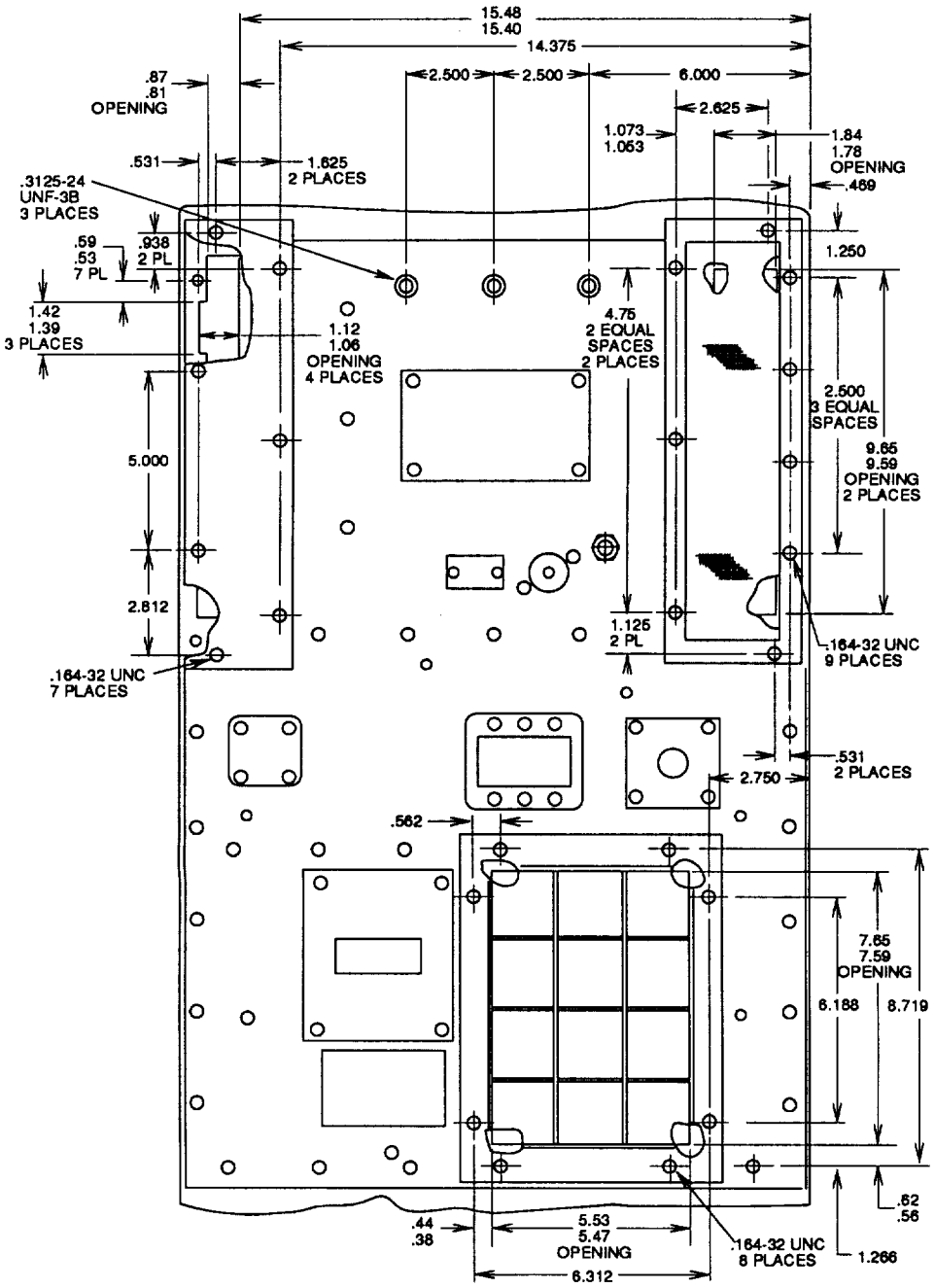


Figure 4-1. Installation Dimensions (Sheet 3 of 6)

ALL DIMENSIONS ARE IN CENTIMETERS EXCEPT FOR SCREW THREADS.
SEE SHEET 1 FOR DIMENSIONS IN INCHES.

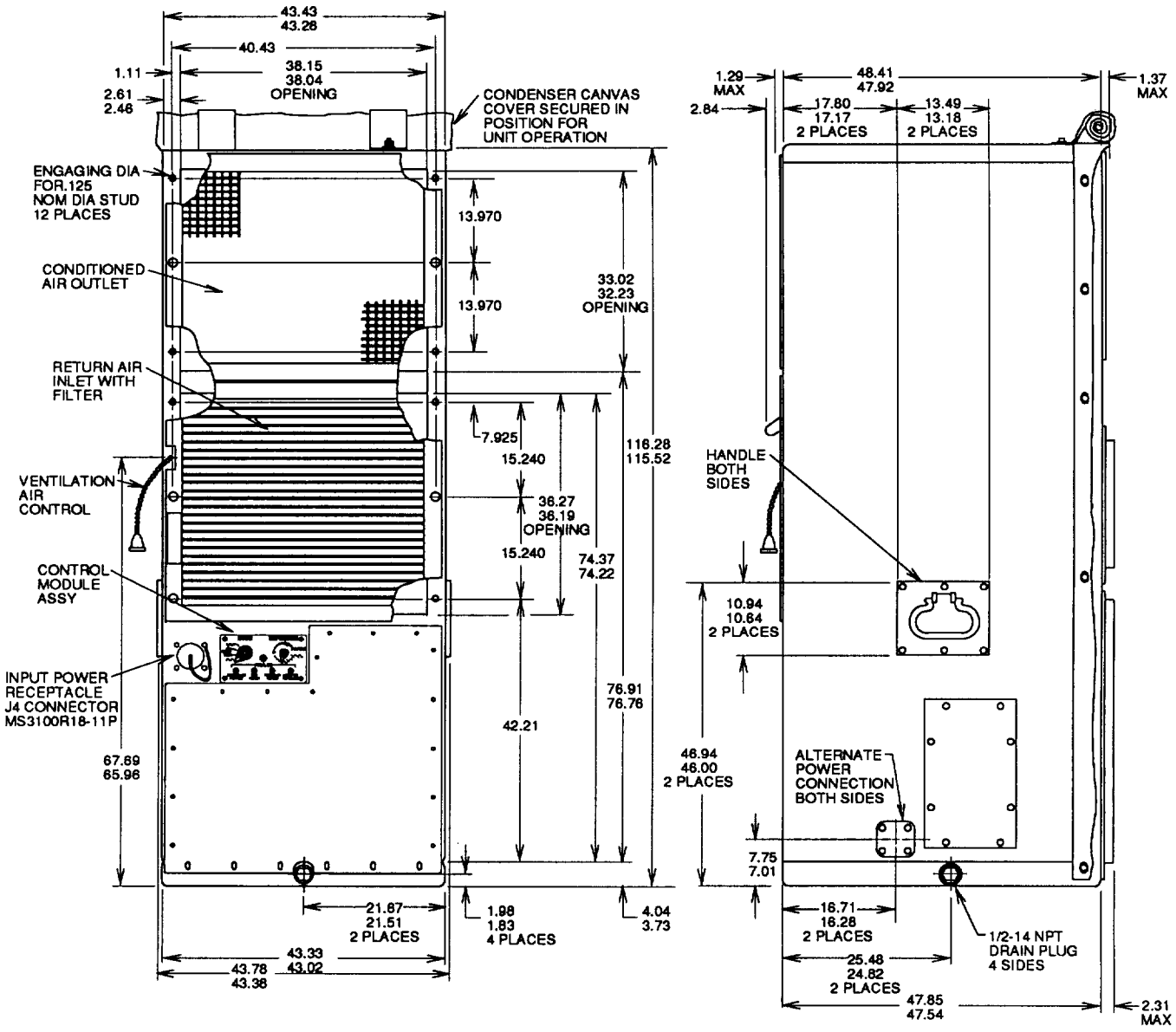
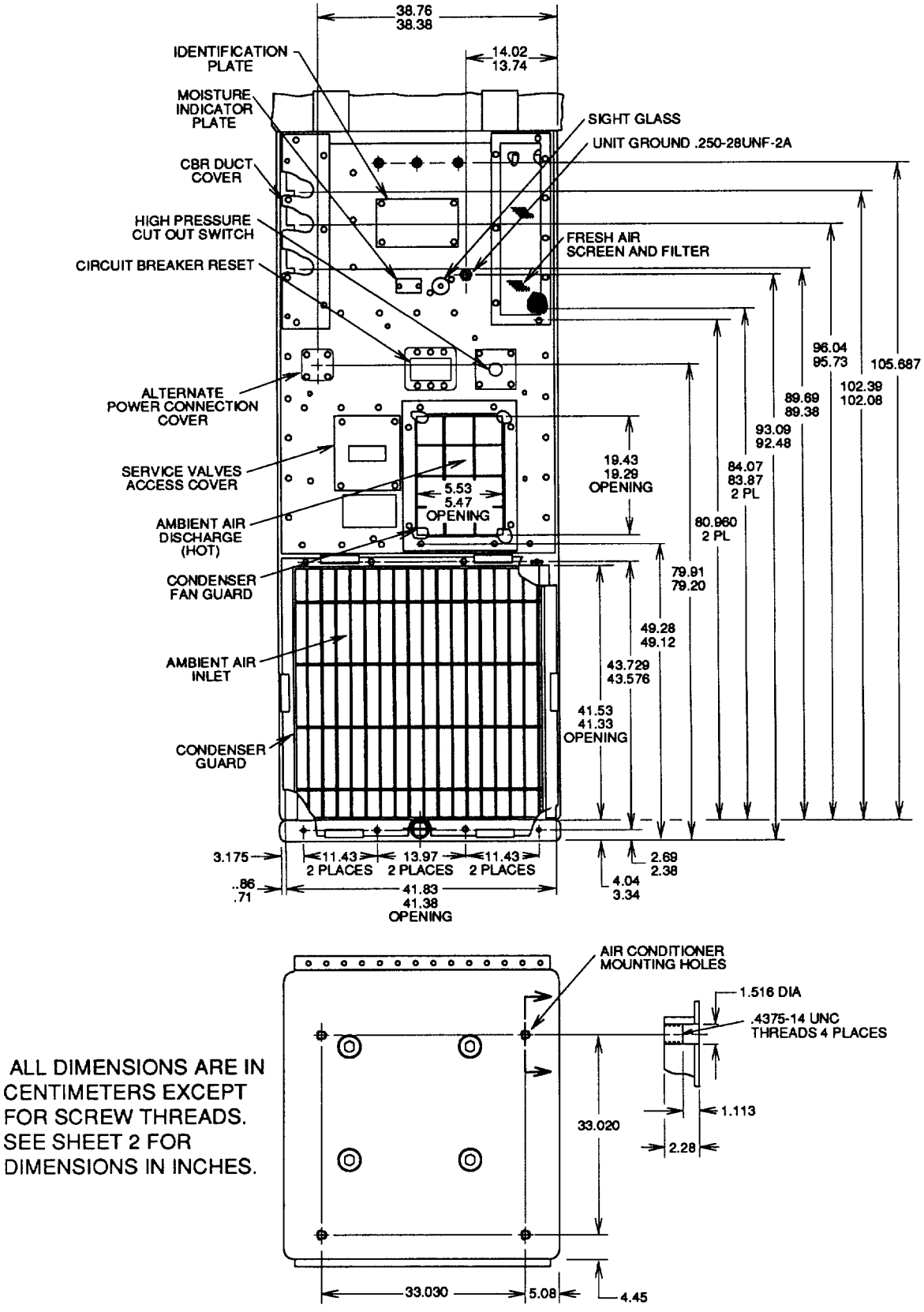


Figure 4-1. Installation Dimensions (Sheet 4 of 6)



ALL DIMENSIONS ARE IN CENTIMETERS EXCEPT FOR SCREW THREADS. SEE SHEET 2 FOR DIMENSIONS IN INCHES.

Figure 4-1. Installation Dimensions (Sheet 5 of 6)

ALL DIMENSIONS ARE IN CENTIMETERS EXCEPT FOR SCREW THREADS.
SEE SHEET 3 FOR DIMENSIONS IN INCHES.

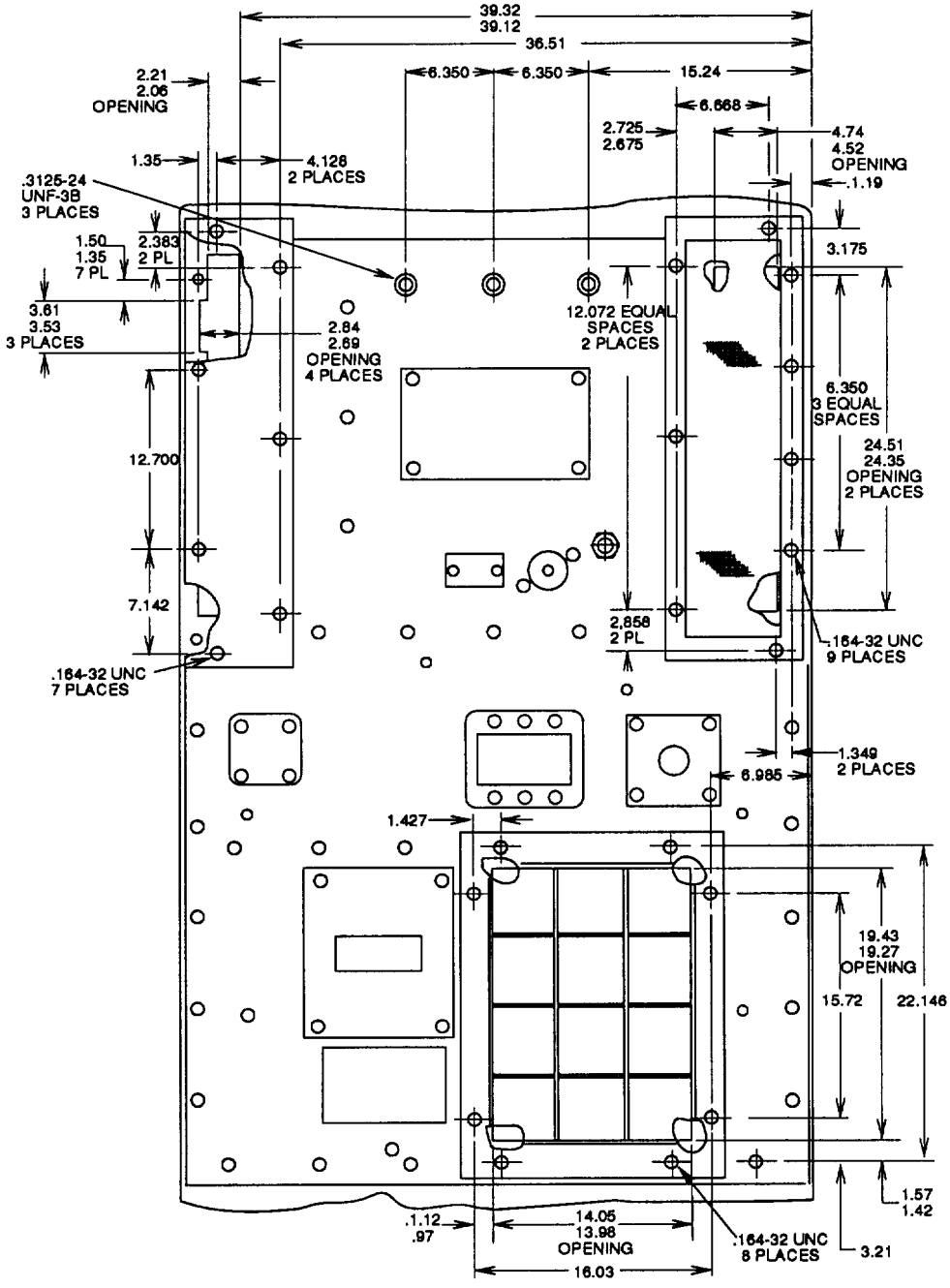


Figure 4-1. Installation Dimensions (Sheet 6 of 6)

4-4. SERVICE UPON RECEIPT OF MATERIAL.

a. 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.

(1) Remove all blocking and tiedowns that may have been used to secure the container to the carrier.

(2) Use a forklift truck or other suitable material handling equipment to remove the packaged unit from the carrier.

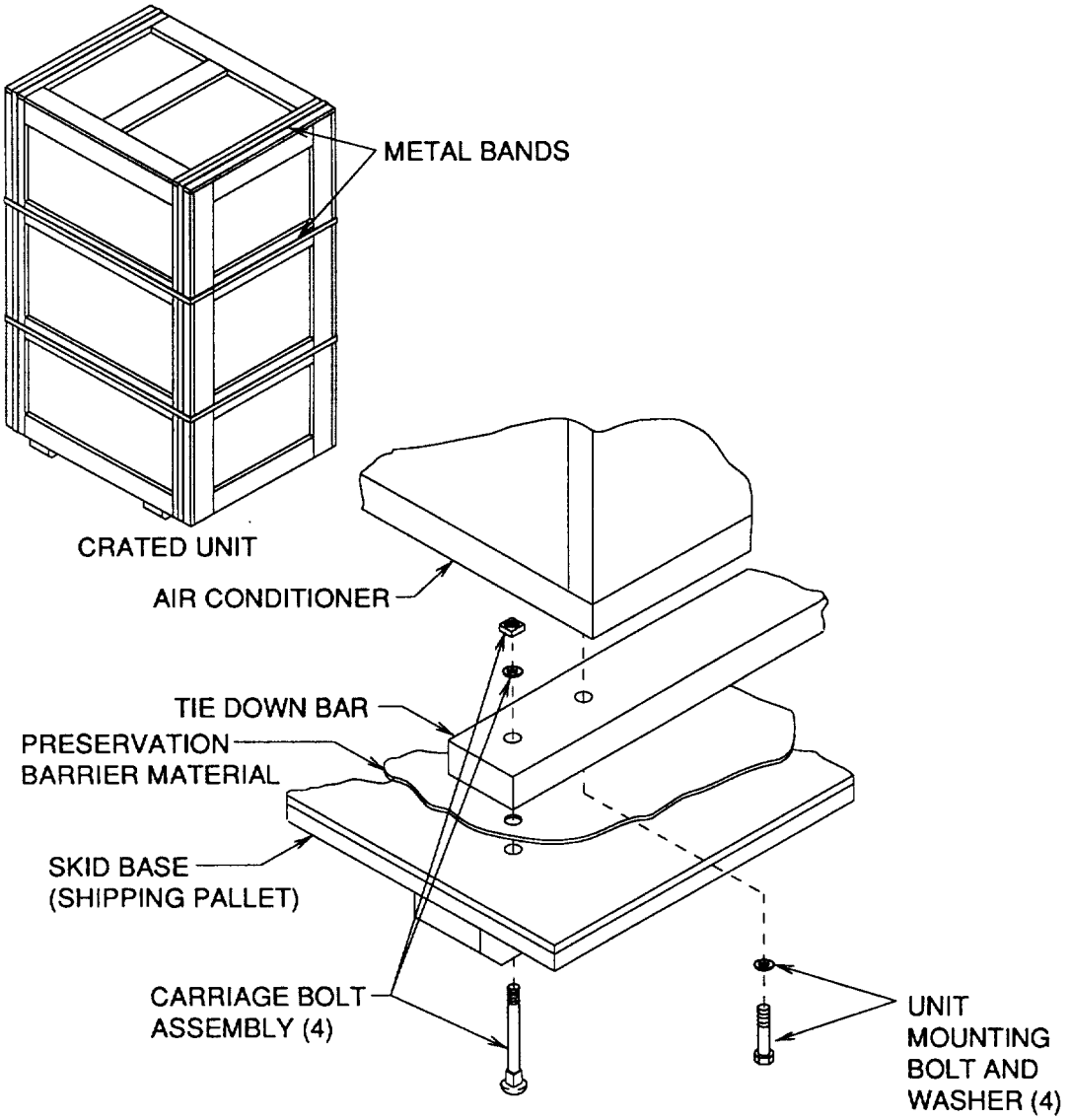


Figure 4-2. Unpacking

4-4. SERVICE UPON RECEIPT OF MATERIAL. - continued

WARNING

Do not allow unit to swing while suspended from a lifting device. Failure to observe warning may result in injury to personnel and damage to 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 borne by the base of the shipping container.

b. Unpacking. (See figure 4-2.)

(1) 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 designed to allow for reuse for mobility purposes if frequent relocation of the air conditioner is anticipated.

(2) 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.

(3) Remove the cushioning around the top of the cabinet and retain, if reuse is anticipated. Remove the preservation barrier by tearing around the bottom of the cabinet. Remove the technical publications envelope and accessory sack that are taped to the cabinet and put them in a safe place.

WARNING

DO NOT LIFT without holding unit in upright position. Otherwise, unit will fall over causing injury to personnel.

NOTE

It is recommended that the cabinet be left bolted to the shipping pallet until time to place it in the installation position. All receiving inspection actions can be conducted without removal from the pallet.

(4) Attach an overhead hoist with an appropriate sling and spreader bar to the lifting handles provided at each side of the cabinet. Raise the cabinet and remove the four carriage bolt assemblies that hold the tiedown bars to the pallet from the underside of the pallet. Remove the four bolts that hold the two tiedown bars to the unit base. Remove and retain the pallet and carriage bolt assemblies and the tiedown bars 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

The bolts used to anchor the cabinet base to the tiedown bars may be used to anchor it in place in the installed location if the installation method allows for anchoring from beneath.

4-4. SERVICE UPON RECEIPT OF MATERIAL. - continued

c. Receiving Inspection.

(1) Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report damage on DD Form 6, Packaging Improvement Report.

(2) Check the equipment against the packing slip to see if shipment is complete. Report all discrepancies in accordance with instructions of DA Pamphlet 738-750 (The Army Maintenance Management System).

(3) Check to see whether the equipment has been modified.

4-5. INSTALLATION INSTRUCTIONS.

a. Air Conditioner Preparation For Installation.

(1) Only one input power connector is provided on the air conditioner and must be relocated for alternate locations.

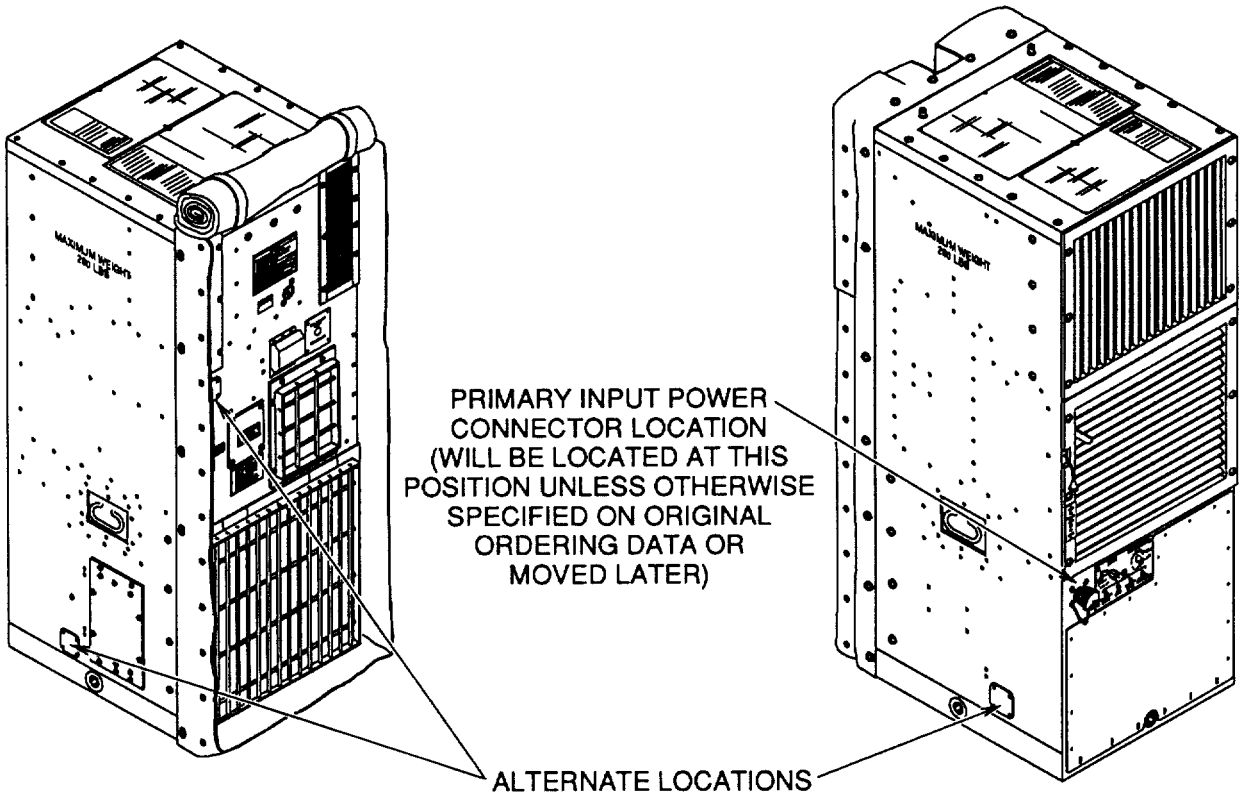


Figure 4-3. Alternate Input Power Connector Locations

(a) Air conditioners are shipped from the factory ready to use the primary input power connector location (front of unit).

4-5. INSTALLATION INSTRUCTIONS. - continued

(b) If the alternate connector location to be used is on either side of the unit, determine which side best suits your installation and proceed as follows:

1 Remove lower front cover panel from air conditioner. (See paragraph 4-20.)

2 Remove conditioned air intake grille and filter. (See paragraph 4-23.)

3 Remove control assembly. (See paragraph 4-34.)

4 Remove connector J4, hardware, and gasket from control assembly. (See paragraph 4-35.)

5 Remove cover plate and hardware from alternate location and reinstall on control assembly.

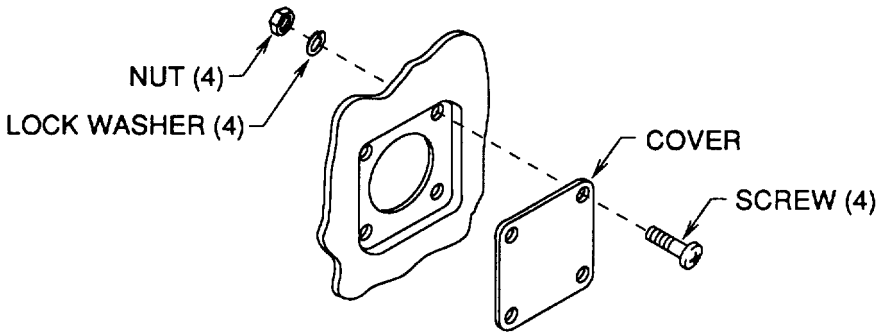


Figure 4-4. Cover Plate Removal/Installation

6 Install connector J4 in alternate location using hardware and gasket removed in step 4 above.

7 Install control assembly. (See paragraph 4-34.)

8 Install conditioned air intake filter and grille. (See paragraph 4-23.)

9 Install lower front cover panel. (See paragraph 4-20.)

(c) If the alternate connector location to be used is on the rear side of the unit, proceed as follows:

1 Remove lower front cover panel from air conditioner. (See paragraph 4-20.)

2 Remove conditioned air intake grille and filter. (See paragraph 4-23.)

3 Remove control assembly. (See paragraph 4-34.)

4 Remove connector J4, hardware, and gasket from control enclosure assembly. (See paragraph 4-35.)

5 Remove cover plate and hardware from alternate location and reinstall on control enclosure assembly.

6 Fabricate new, extended wiring harness. (See appendix F, figure F-48.) Run braided wire bundle through back of control enclosure assembly and out slotted hole in top prior to soldering connector J4 to wires. Connectors from short (existing) harness can be used if in good condition.

4-5. INSTALLATION INSTRUCTIONS. - continued

7 Install connector J4 in alternate location using hardware and gasket removed in step 4 above.

8 Install control assembly. (See paragraph 4-34.)

9 Install conditioned air intake filter and grille. (See paragraph 4-23.)

10 Install lower front cover panel. (See paragraph 4-20.)

(2) If it is desirable to mount the control module in a remote (mounted elsewhere in the conditioned space) location, the following steps must be taken.

(a) Loosen captive mounting screw and pulling screw, remove control panel.

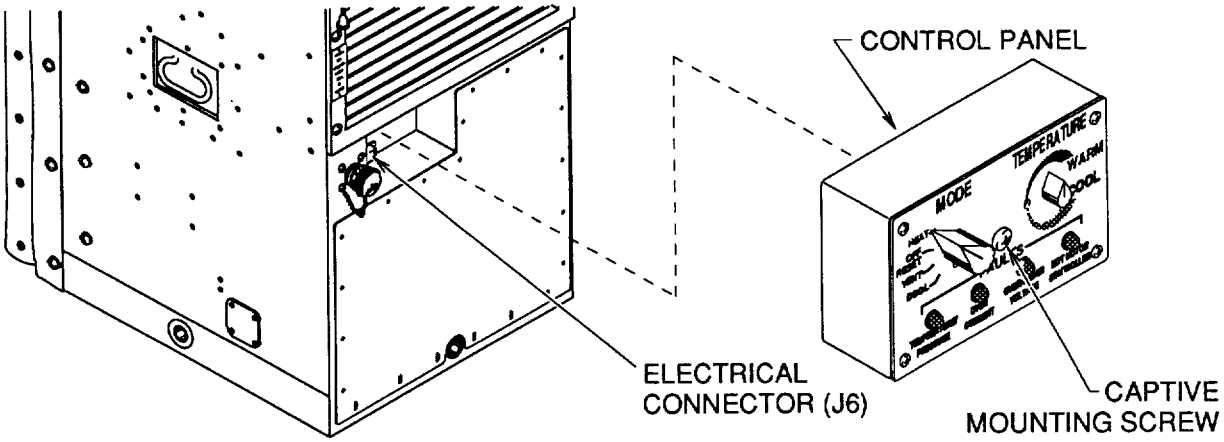


Figure 4-5. Control Panel Removal

(b) Fabricate interconnecting remote control cable to desired length. (See Appendix F, figure F-49.)

(c) Secure control panel at new location and connect remote control cable between connector (J6) and control panel.

(3) Some installations require removal of the condenser side fabric cover. This generally applies only when the air conditioner is positioned inside with condenser and fresh air openings ducted to the outside.

NOTE

If air conditioner is to be installed with condenser side (rear) exposed, the fabric cover should be left in place if possible.

(a) Using screwdriver, remove fourteen screws, four packing with retainer, four lock washers, and fourteen flat washers. (See figure 4-6.)

(b) Carefully remove the fabric cover. Store the cover in a safe place for future use.

4-5. INSTALLATION INSTRUCTIONS. - continued

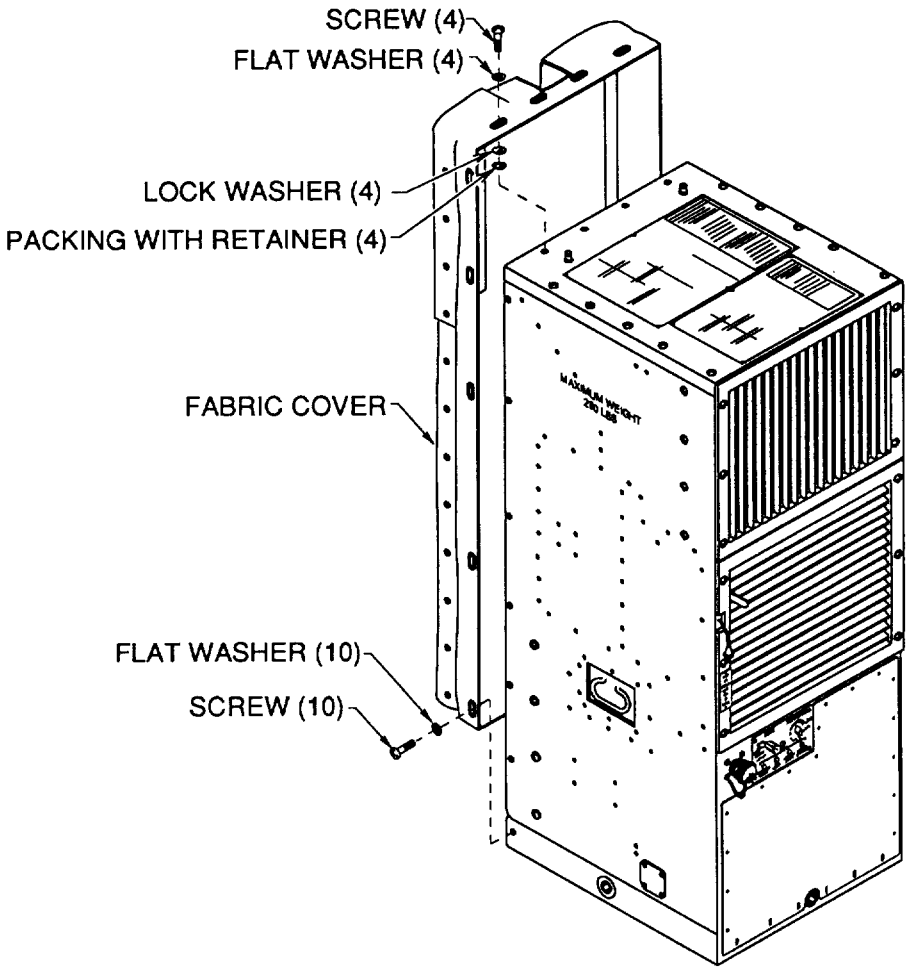


Figure 4-6. Fabric Cover Removal

(4) The blast damper, when supplied, is designed to close and keep contaminated air from being drawn in through the fresh air intake after a distant nuclear blast shock wave. It will also close if wind gusts go above 79 mph. When installations using blast dampers have more than one air conditioner, fresh air covers should be installed on units not equipped with blast dampers. For inspection, testing, adjustment, disassembly, repair, and reassembly, notify supervisor. (See paragraph 5-34.)

(a) Installation - blast damper

1 Using screwdriver, remove five pan head screws and flat washers and four flat head screws from fresh air (inlet) screen. (See figure 4-8.)

2 Remove fresh air inlet screen. Store in safe place.

3 Remove fresh air filter. Store in safe place.

4 Using screwdriver, install blast damper assembly using same hardware that was removed from fresh air (inlet) screen.

4-5. INSTALLATION INSTRUCTIONS. - continued

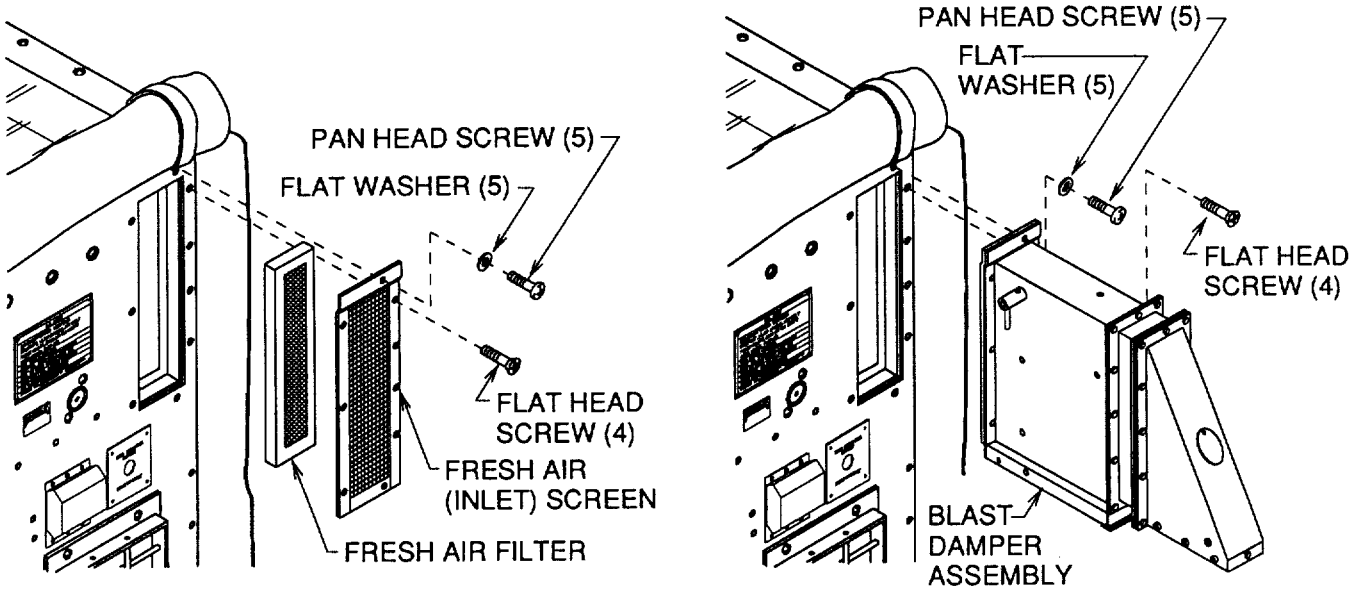


Figure 4-7. Blast Damper

(b) Installation - fresh air cover(s)

1 Using screwdriver, remove five pan head screws and flat washers and four flat head screws from fresh air (inlet) screen.

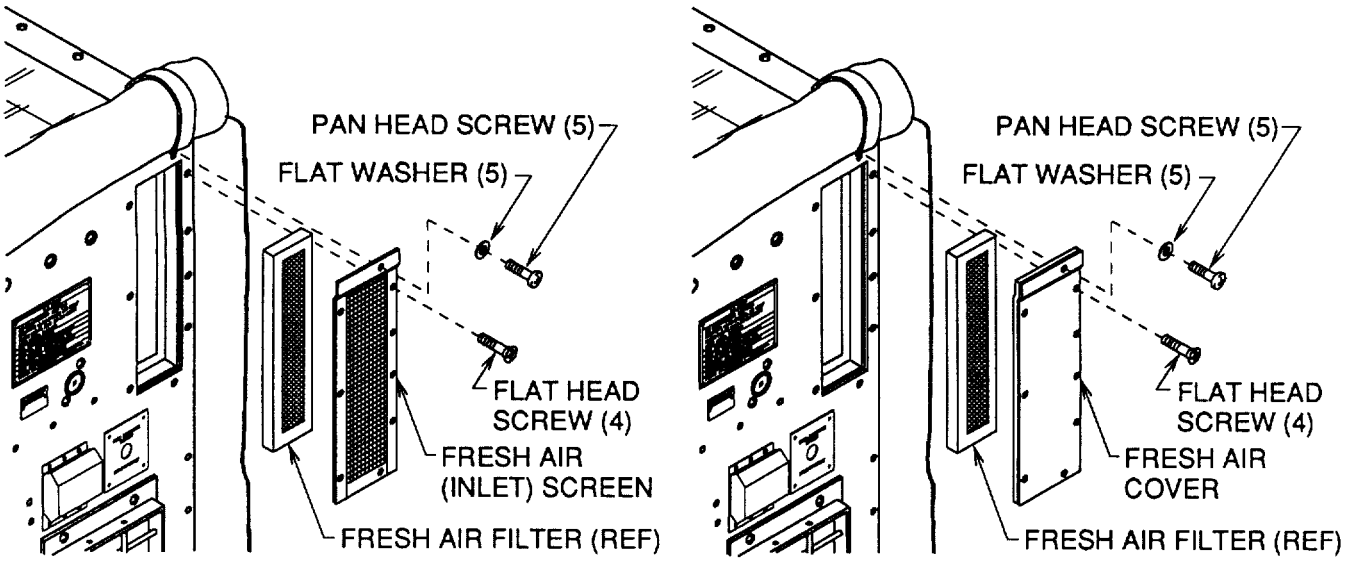


Figure 4-8. Fresh Air Cover

2 Remove fresh air inlet screen. Store in safe place.

3 Using screwdriver, install fresh air covers using hardware that was removed from fresh air (inlet) screen.

4-5. INSTALLATION INSTRUCTIONS. - continued

(c) Maintenance of blast damper assembly.

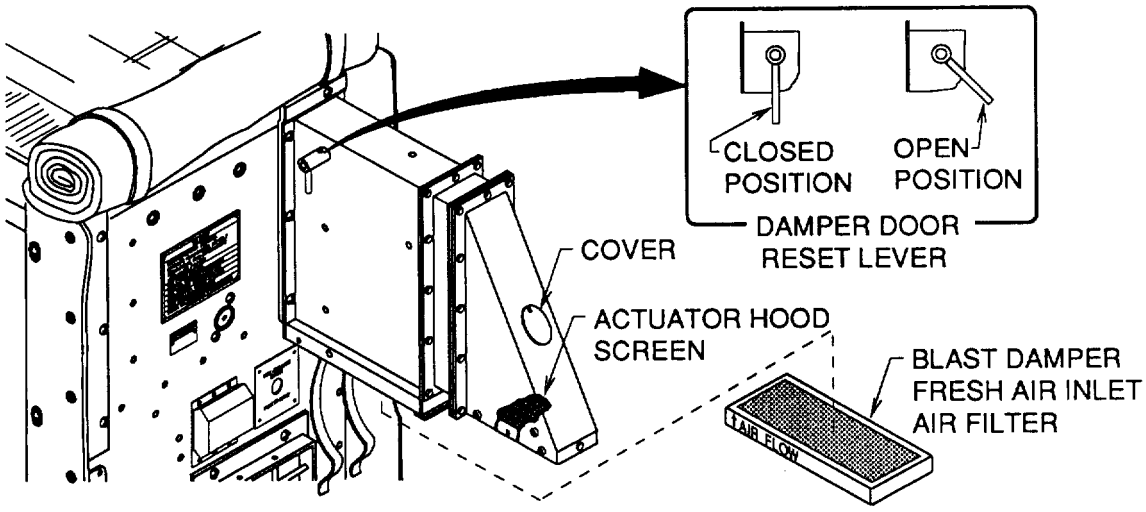


Figure 4-9. Blast Damper Maintenance Items

1 Release air filter retainer spring clips and remove air filter.

2 Check filter for punctures, cuts, and damaged edges that would allow passage of unfiltered air.

3 Check filter for packed or mashed areas that would block air flow.

4 Replace air filter if found bad.

5 Check air filter for accumulated dirt.

6 Wash filter in a mild detergent and water solution.

7 Rinse thoroughly in clear water.

8 Shake out excess water prior to installation.

9 Slip air filter into place. (Be sure that air flow arrow is pointing up.)

10 Secure filter with filter retainer spring clips.

11 Check that actuator hood screen is in place and in good condition.

12 Check that screen is clean and free of all blockages.

13 If dirty clean with a stiff brush.

14 Check that circular swing type cover on actuator hood is closed.

15 Check that damper door reset lever is in open position.

(5) No other preparation is necessary if the air conditioner is to be installed by the typical exterior wall opening method and operated as a self-contained unit.

4-5. INSTALLATION INSTRUCTIONS. - continued

b. Installation Instructions. Appropriate alterations to the facility to accommodate the selected method of installation must be completed before actual installation of the air conditioner.

(1) Attach an overhead hoist through a sling and spreader bar to the lifting handles on each side of the cabinet.

(2) Move air conditioner into position and aline mounting holes.

(3) Secure unit with appropriate mounting hardware.

Base .4375-14 UNC (4 holes)

Rear.3125-24 UNF (3 holes)

(4) Seal all openings around cutouts for air conditioner, air and water tight. Use gasket, caulking, or other suitable material.

(5) The air conditioner is provided with four drain holes in base. (See figure 4-1.) Remove plugs from all drains possible for most complete drainage of condensate water. If water from these drains will be objectionable or create a hazard, external overboard drains can be connected. Use standard 1/2-14 NPT male pipe fittings to connect base drains. Any type of hose or tubing may be used as a drain line. 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 at the same height, or lower than the base to ensure gravity drainage.

(6) Install a 10 AWG minimum ground wire between air conditioner cabinet and an adequate earth ground using ground stud on back of unit.

(7) Fabricate a power cable. (See paragraph 4-6.)

WARNING

The following test must be conducted with the power on. To avoid injury, exercise extreme caution.

CAUTION

Do not connect P4 connector to air conditioner before making following checks or unit may be damaged.

(8) Connect power cable to a 208 volt, 3 phase, 50/60/400 hertz power source.

(a) Apply power to power cable.

(b) Use a multimeter set to AC voltage range of at least 250 volts for following tests.

(c) Measure voltage between pin D of connector P4 and a good chassis ground. Voltage must be zero (0). If more than zero voltage is observed, disconnect cable and check power source. Correct problem at power source or at cable connection as indicated.

(d) With zero voltage on pin D or P4 connector, check voltages between remaining pins as shown on table 4-1.

4-5. INSTALLATION INSTRUCTIONS. - continued

NOTE

Voltages should be approximately as shown. If voltages are not within ten volts of those indicated on chart, disconnect power. Locate and correct problem.

Table 4-1. Connector (P4)

Measure from Pin	To Pin			
	A	B	C	D
A	N/A	208	208	120
B	208	N/A	208	120
C	208	208	N/A	120
D	120	120	120	N/A

(e) Check that MODE selector rotary switch is OFF.

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

(f) Disconnect power to cable.

(g) Connect cable connector P4 to connector J4 on air conditioner.

(h) Check that air conditioner MODE selector rotary switch is OFF.

(i) Connect power to air conditioner.

NOTE

For more information on air conditioner installations, refer to MIL-HDBK-116 Environmental Control of Small Shelters.

The following steps require two people. One must be at control panel. The other must be in position at rear of air conditioner to see condenser fan rotation. (Condenser fan can be seen through condenser air outlet grille, figure 1-2, item 18.)

(j) The person at control panel should turn MODE selector rotary switch to VENTilate and immediately back to OFF/RESET.

(k) The person at rear of unit should watch condenser fan to determine direction of rotation. Fan blades must turn toward grille.

(l) If fan blades turn away from grille, unit power cable is not connected properly. Exchange wires connected to pins A and B at power source connection and repeat steps (i) and (j) above.

(m) Check unit operation in accordance with Table 4-2, Unit Preventive Maintenance Checks and Services (PMCS) Quarterly Schedule, item 23.

(9) See air conditioner wiring diagram, figure 4-10, and electrical schematic, figure 4-11, for additional wiring information.

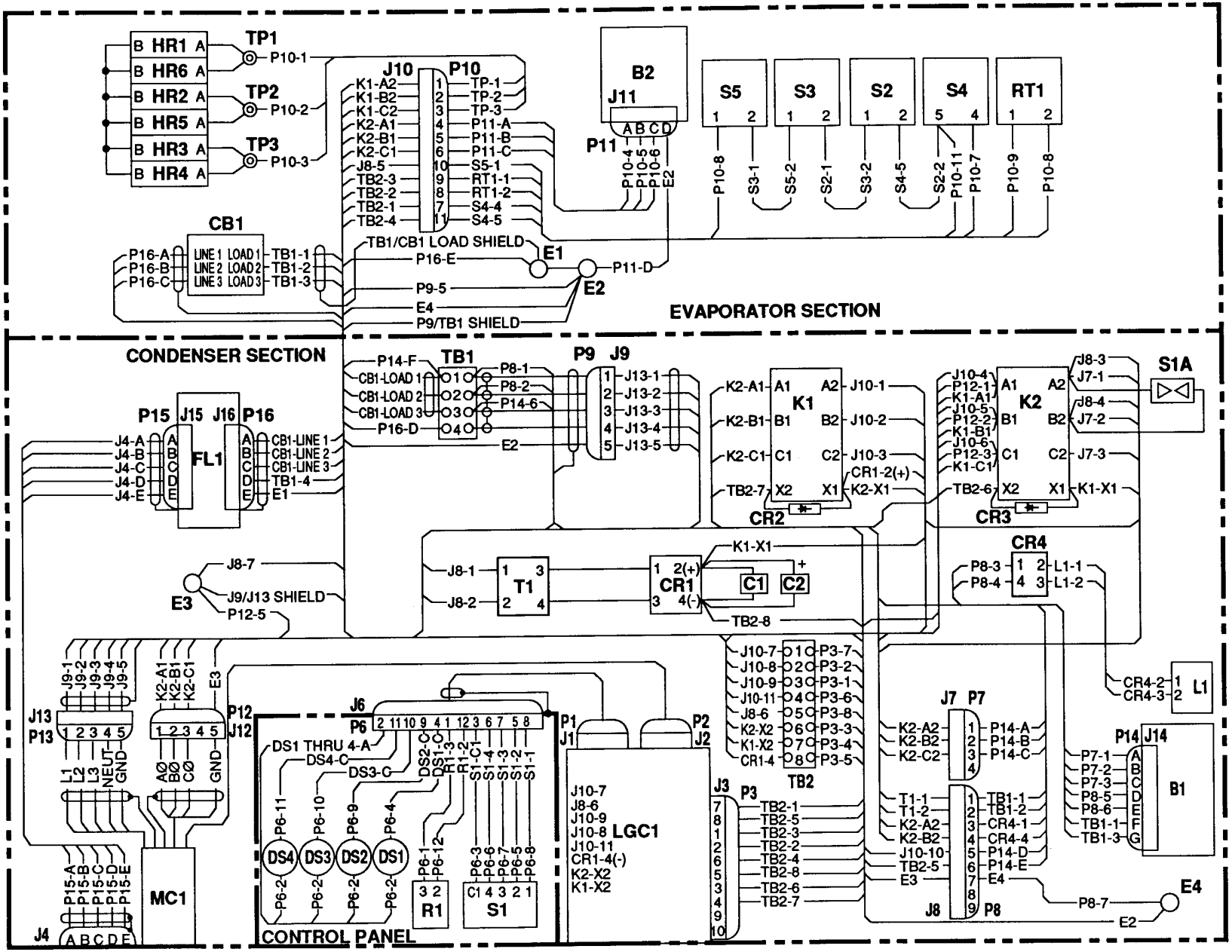
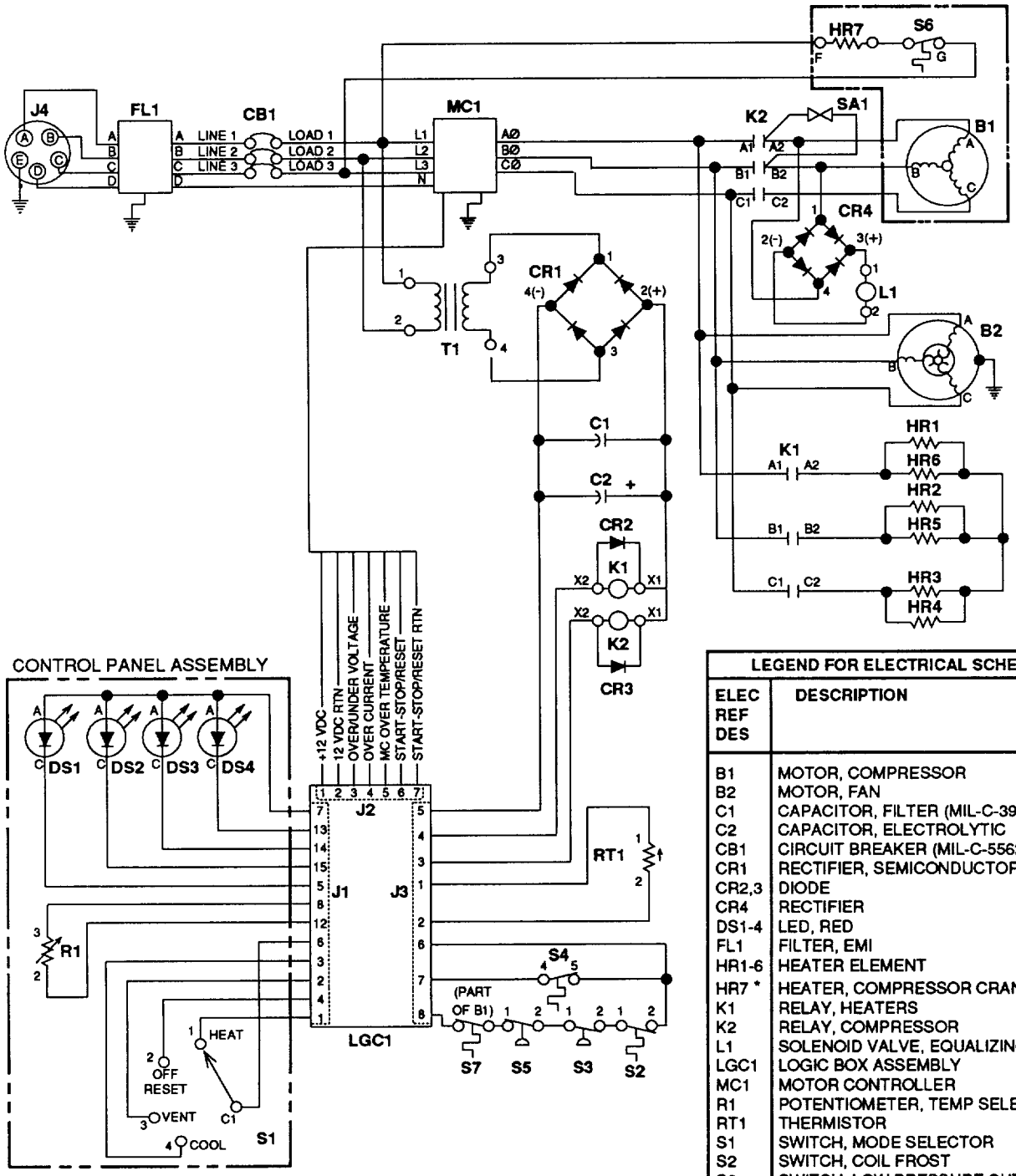


Figure 4-10. Wiring Diagram (Sheet 1 of 2)

LEGEND FOR WIRING DIAGRAM	
ELECTRICAL REFERENCE DESIGNATION	**DESCRIPTION**
B1	MOTOR, COMPRESSOR
B2	MOTOR, FAN
C1	CAPACITOR, FILTER (MIL-C-39014/5)
C2	CAPACITOR, ELECTROLYTIC
CB1	CIRCUIT BREAKER (MIL-C-55629/5)
CR1	RECTIFIER, SEMICONDUCTOR DEVICE
CR23	DIODE
CR4	RECTIFIER
DS1-4	LED,RED
E1	TERMINAL, UNIT GND
E2	TERMINAL STUD,INTERMEDIATE GND
E3	TERMINAL SCREW,ENCLOSURE GND
E4	TERMINAL SCREW, CONDENSER GND
FL1	FILTER, EMI
HR1-6	HEATER ELEMENT
J1	CONNECTOR, LOGIC-CONTROL
J2	CONNECTOR, CONTROL
J3	CONNECTOR, A/C INTERFACE
J4	CONNECTOR, POWER INPUT
J6	CONNECTOR, CONTROL PANEL (MIL-C-24308/2)
J7	CONNECTOR
J8	CONNECTOR
J9	CONNECTOR
J10	CONNECTOR
J11	CONNECTOR, FAN MOTOR
J12	CONNECTOR, MOTOR CONTROLLER, POWER OUTPUT
J13	CONNECTOR, MOTOR CONTROLLER, POWER INPUT
J14	CONNECTOR, COMPRESSOR
J15	CONNECTOR, EMI FILTER, INPUT
J16	CONNECTOR, EMI FILTER, OUTPUT
K1	RELAY, HEATERS
K2	RELAY, COMPRESSOR
L1	SOLENOID VALVE, EQUALIZING
LGC1	LOGIC BOX ASSEMBLY
MC1	MOTOR CONTROLLER
P1	CONNECTOR, LOGIC-CONTROL (MIL-C-24308/2)
P2	CONNECTOR, CONTROL (MIL-C-24308/2)
P3	CONNECTOR, A/C INTERFACE
P6	CONNECTOR, CONTROL PANEL (MIL-C24308/4)
P7	CONNECTOR
P8	CONNECTOR
P9	CONNECTOR
P10	CONNECTOR
P11	CONNECTOR, FAN MOTOR
P12	CONNECTOR, MOTOR CONTROLLER, POWER OUTPUT
P13	CONNECTOR, MOTOR CONTROLLER, POWER INPUT
P14	CONNECTOR, COMPRESSOR
P15	CONNECTOR, EMI FILTER, INPUT
P16	CONNECTOR, EMI FILTER, OUTPUT
R1	POTENTIOMETER, TEMP SELECT
RT1	THERMISTOR
S1	SWITCH, MODE SELECTOR
S2	SWITCH, COIL FROST
S3	SWITCH, LOW PRESSURE CUTOUT
S4	SWITCH, HEATER CUTOUT
S5	SWITCH, HIGH PRESSURE CUTOUT
SA1	ARRESTOR, SURGE
T1	TRANSFORMER
TP1-TP3	TERMINAL POST (MIL-1-23264/1)
TB1	TERMINAL BOARD (MIL-T-55164/3)
TB2	TERMINAL BOARD

Figure 4-10. Wiring Diagram (Sheet 2 of 2)



LEGEND FOR ELECTRICAL SCHEMATIC	
ELEC REF DES	DESCRIPTION
B1	MOTOR, COMPRESSOR
B2	MOTOR, FAN
C1	CAPACITOR, FILTER (MIL-C-39014/5)
C2	CAPACITOR, ELECTROLYTIC
CB1	CIRCUIT BREAKER (MIL-C-55629/5)
CR1	RECTIFIER, SEMICONDUCTOR DEVICE
CR2,3	DIODE
CR4	RECTIFIER
DS1-4	LED, RED
FL1	FILTER, EMI
HR1-6	HEATER ELEMENT
HR7 *	HEATER, COMPRESSOR CRANKCASE
K1	RELAY, HEATERS
K2	RELAY, COMPRESSOR
L1	SOLENOID VALVE, EQUALIZING
LGC1	LOGIC BOX ASSEMBLY
MC1	MOTOR CONTROLLER
R1	POTENTIOMETER, TEMP SELECT
RT1	THERMISTOR
S1	SWITCH, MODE SELECTOR
S2	SWITCH, COIL FROST
S3	SWITCH, LOW PRESSURE CUTOUT
S4	SWITCH, THERMOSTATIC, HEATER
S5	SWITCH, HIGH PRESSURE CUTOUT
S6 *	SWITCH, CRANKCASE HEATER
S7 *	SWITCH, OVERLOAD, COMPRESSOR
S8 **	SWITCH, OVERLOAD, FAN MOTOR
SA1	ARRESTOR, SURGE
T1	TRANSFORMER

* SUPPLIED WITH COMPRESSOR

** SUPPLIED WITH FAN MOTOR

Figure 4-11. Electrical Schematic

4-6. INPUT POWER CABLE.

a. Determine length.

b. Fabricate input power cable. (See appendix F, figure F-50.)

Section IV UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-7. INTRODUCTION, INSPECTION, AND SERVICE.

a. Systematic, periodic, preventive maintenance checks and services (PMCS) are essential to insure that the air conditioner is ready for operation in any mode 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 training 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.

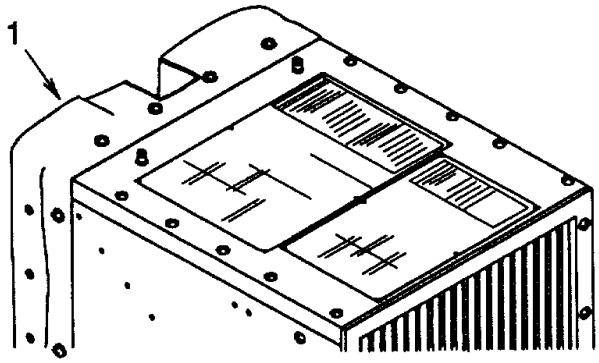
c. Table 4-2 lists the unit preventive maintenance checks and services that should be performed at quarterly (or otherwise established) intervals. The PMCS items in the table have been arranged and numbered in a logical sequence to provide for greater personnel efficiency and least amount of required maintenance downtime. The paragraph reference column on the right side of the table provides the paragraph number where detailed, step-by-step disassembly/reassembly maintenance procedures may be found. The item number column will be used as a source of item numbers for the TM Number Column on DA Form 2404.

WARNING

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

Table 4-2. Unit Preventive Maintenance Checks and Services (PMCS)
Quarterly Schedule

Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
1	Fabric Cover	a. Roll down the cover (1) and inspect for tears, cracks, or any other sign of damage or deterioration. b. If the necessity of washing is indicated, use fresh water with a small amount of a mild detergent. c. Reroll and secure the cover in the stowed position. If the cover (1) was washed, be sure it is thoroughly dry before rerolling.	4-10



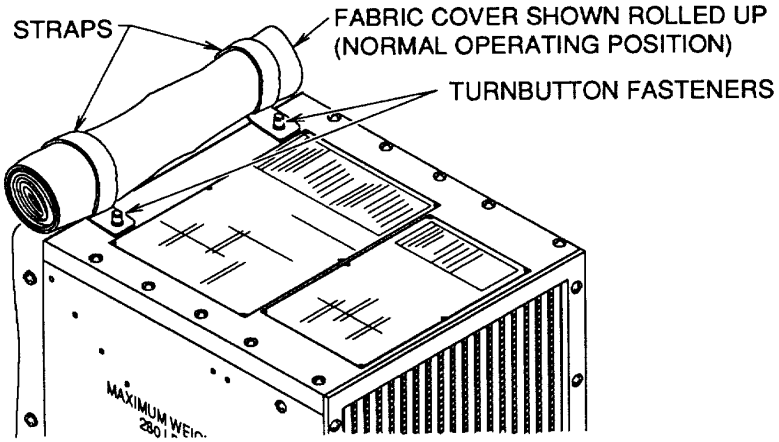


Table 4-2. Unit Preventive Maintenance Checks and Services (PMCS)
Quarterly Schedule - continued

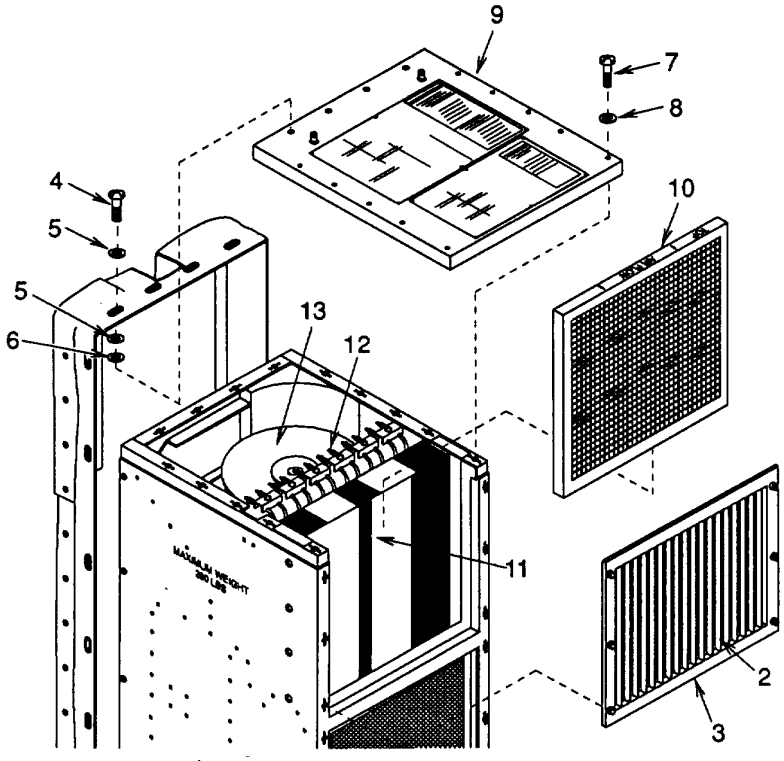
Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
2	Conditioned Air Discharge Grille	a. Check operation of louvers (2) for stiffness or binding. b. Remove, clean, inspect, repair, and lubricate grille (3) as necessary.	4-14
			
3	Mist Eliminator	a. Remove screws (4), flat washers (5), and packing with retainers (6) from upper portion of fabric cover to gain access to top panel. b. Remove screws (7) and packing with retainers (8) from top panels (9). c. Remove, clean, and inspect the top panel (9). d. Remove, clean, inspect, and service the mist eliminator (10). e. Replace the mist eliminator (10) if it is damaged.	4-25
4	Evaporator Coil	a. Clean evaporator coil (11). b. Inspect coil for obvious damage and all mounting hardware for tightness and security.	4-50

Table 4-2. Unit Preventive Maintenance Checks and Services (PMCS)
Quarterly Schedule - continued

Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
5	Heating Elements	a. Wipe or vacuum any remaining dust or dirt from the heating elements (12), the treater thermostat, and all other components and surfaces in the area. **NOTE** **Use a clean, dry cloth (or one slightly moistened with water) for all wiping operations. NEVER use an oily or greasy cloth. Any oily residue left on any surface will attract and accumulate much more dust and dirt than dry surfaces.** b. Inspect heater elements (12) and thermostat for obvious damage, and all mounting hardware for tightness and security. c. Inspect wiring harness for damage or chafing and all electrical connections for tightness.	4-44
6	Evaporator Fan	a. Wipe or vacuum all dust or dirt from the fan (13) and all other components and surfaces in the area. b. Inspect the fan (13) for damage or bent blades and all mounting hardware for tightness and security. c. Check that fan (13) spins freely. d. Generally inspect refrigeration system components in the upper section for condition.	4-46

Table 4-2. Unit Preventive Maintenance Checks and Services (PMCS)
Quarterly Schedule - continued

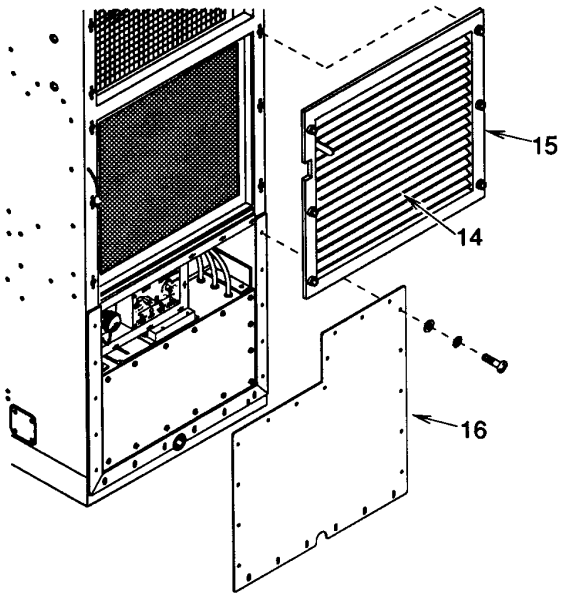
Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
7	Conditioned Air Intake Grille	a. Check operation of louvers (14) for stiffness or binding. b. Remove, clean, inspect, repair, and lubricate grille (15) as necessary. 	4-15
8	Lower Front Cover	Remove, clean, and inspect the lower front cover (16).	4-20

Table 4-2. Unit Preventive Maintenance Checks and Services (PMCS)
Quarterly Schedule - continued

Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
9	Condensate Drip Pan, Drain Tubes, and Drain Traps	a. Wipe any dust or dirt out of the condensate drip pan (17) b. Pour about one cup of clean fresh water into the condensate drip pan (17) and watch for it to flow through the drain traps (18) at the bottom end of the drain tubes. c. If the water does not flow through the traps, or if the discharged water has a muddy appearance, remove the cotter pin (19), spring (20), and ball (21) from the bottom end of the drain tubes and thoroughly flush the tubes. If the tubes are clogged, insert a flexible wire from either the top or bottom end and agitate until the clog is removed. Pour additional water in the drip pan until an unrestricted flow of clean water is achieved. Check that ball (21) and spring (20) are clean and in good condition. Reinstall the ball (21), spring (20), and cotter pin (19) in drain traps.	4-51

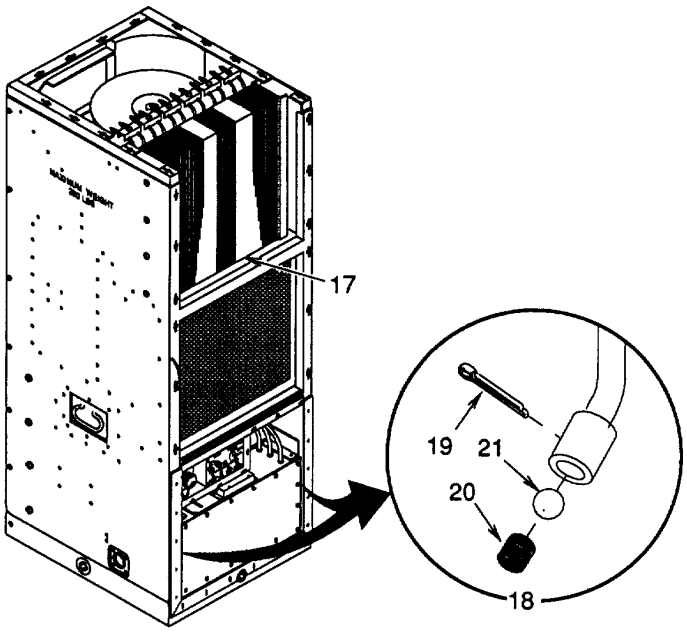
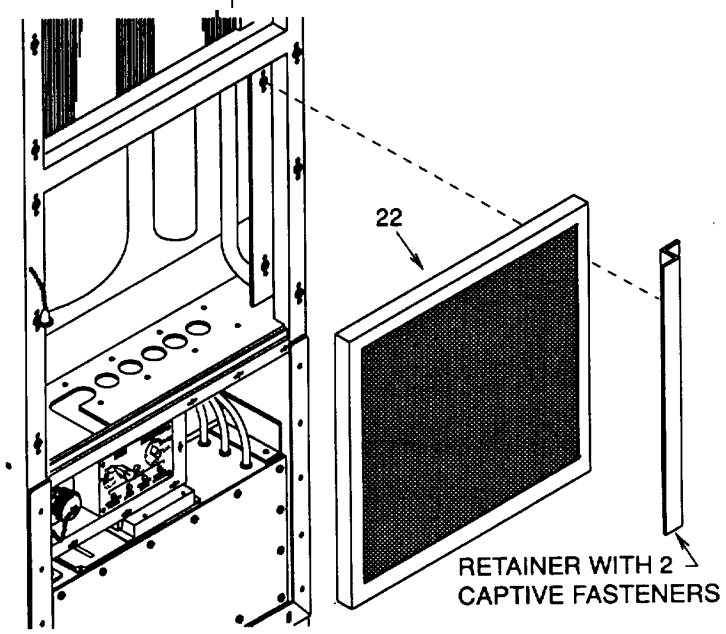


Table 4-2. Unit Preventive Maintenance Checks and Services (PMCS)
Quarterly Schedule - continued

Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
10	Conditioned Air Filter	a. Remove, clean, and inspect filter (22). b. Discard filter and obtain replacement, if damaged.	4-23
11	Fresh Air Filter (On units equipped with accessory blast damper, see item 21.)	a. Remove, clean, and inspect filter (23). b. Discard filter and obtain replacement, if damaged.	4-24



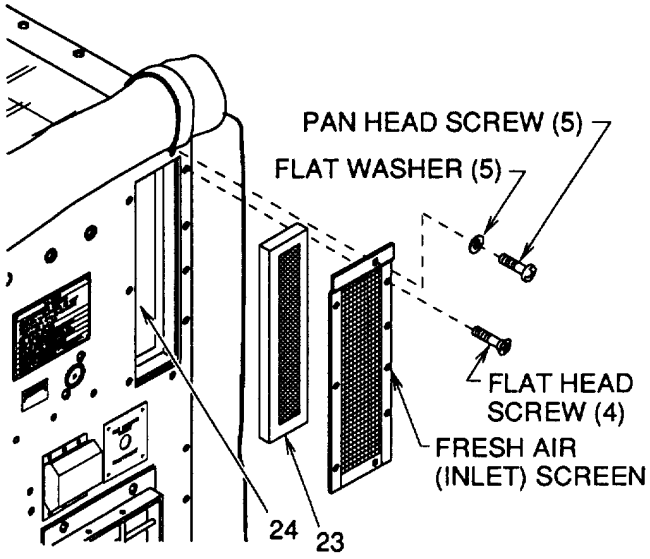


Table 4-2. Unit Preventive Maintenance Checks and Services (PMCS)
Quarterly Schedule - continued

Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
12	Fresh Air Damper	a. Wipe or vacuum all dust or dirt from the fresh air damper door and its operating mechanism, and all other surfaces in the area. b. Inspect components for condition, and all mounting hardware for tightness and security c. Check operation of door (24) and mechanism for stiffness and binding; lubricate as necessary. Be sure to wipe off all excess lubricant. d. Check to be sure the damper door (24) seats properly to form a seal when in the closed position.	
13	Control Panel	a. Check operation of controls for stiffness or binding. b. Inspect wiring harness for damage or chafing, and all electrical connections for tightness. c. Check all mounting hardware for tightness and security.	4-27

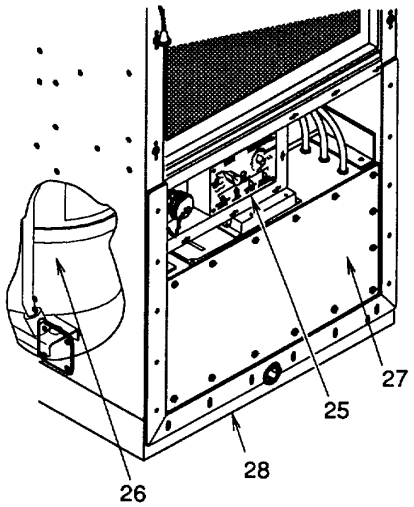


Table 4-2. Unit Preventive Maintenance Checks and Services (PMCS)
Quarterly Schedule - continued

Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
14	Compressor	a. Wipe or vacuum all dust or dirt from the compressor canister, and all other remaining components and surfaces in the lower section of the cabinet.	
		b. Inspect the compressor crankcase heating element and associated thermostat for condition.	
		c. Inspect wiring harness for damage or chafing, and all electrical connections for tightness.	
		d. Check all compressor mounting hardware for tightness and security.	
		e. Check all remaining refrigeration system components in the lower section of the cabinet for general condition.	
15	Control Assembly	Inspect all remaining wiring harnesses in the lower section of the cabinet for damage or chafing, and all electrical connections for tightness.	4-34
1 6	Bottom Panel	a. Wipe or vacuum all dust, dirt, sand, or other foreign matter from surfaces and water passages in the bottom panel assembly.	
		b. Check that water flows freely through the installed condensate drain(s).	4-51

Table 4-2. Unit Preventive Maintenance Checks and Services (PMCS)

Quarterly Schedule - continued

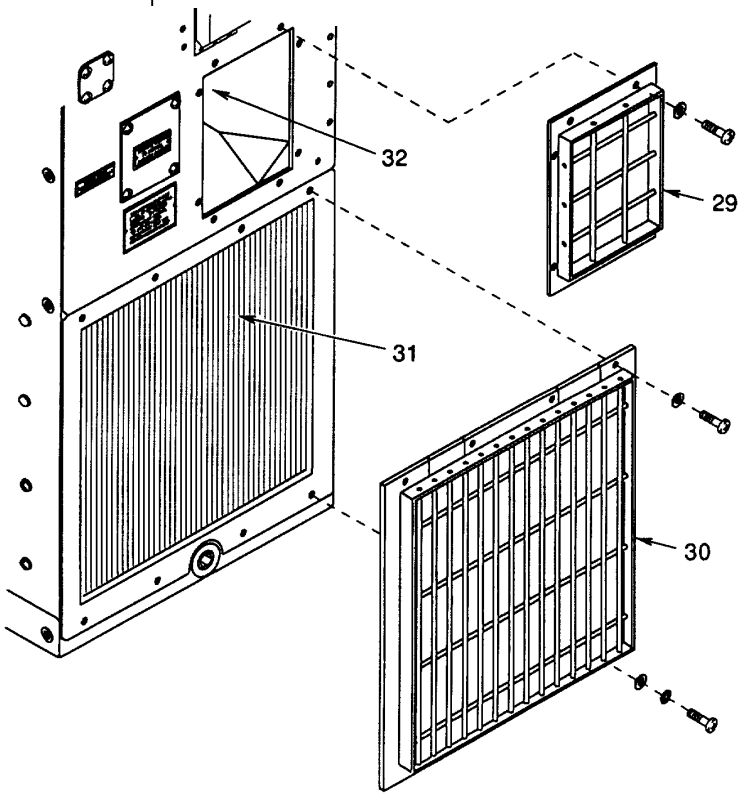
Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
17	Condenser (Fan) Guard	Remove, clean, and inspect.	4-16
			
18	Condenser Coil Guard	Remove, clean, and inspect.	4-17
19	Condenser Coil	a. Clean condenser coil. b. Inspect coil for obvious damage, and all mounting hardware for tightness and security.	4-48

Table 4-2. Unit Preventive Maintenance Checks and Services (PMCS)
Quarterly Schedule - continued

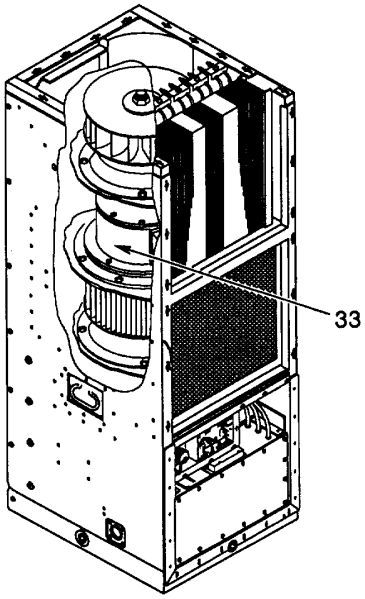
Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
20	Condenser Fan and Evaporator/Condenser Fan Drive Motor	a. Wipe or vacuum all dust and dirt from fan (32) and motor (33), and all other components and surfaces in the immediate area. b. Inspect the fan for damage or bent blades, the motor for signs of overheating, and all mounting hardware for tightness and security. c. Inspect the wiring harness for damage or chafing, and all electrical connections for tightness. 	4-47

Table 4-2. Unit Preventive Maintenance Checks and Services (PMCS)
Quarterly Schedule - continued

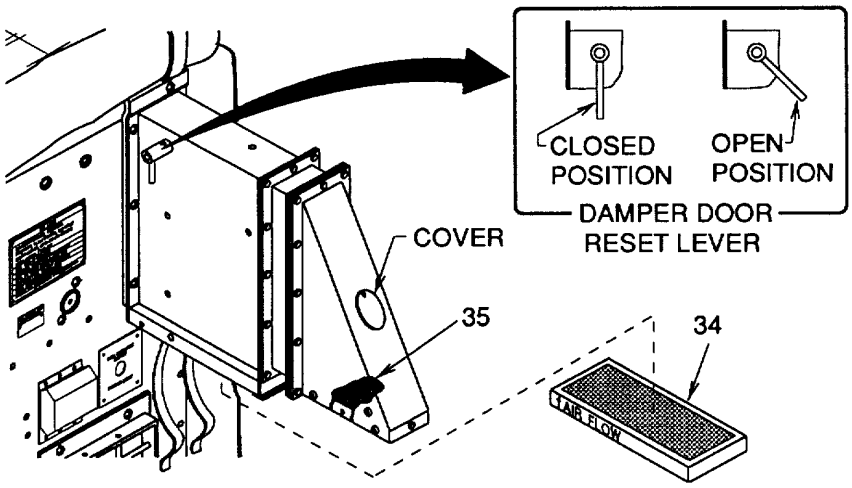
Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
		NOTE **Items 21 and 22 apply only to units with accessory item blast damper**	
21	Blast Damper Fresh Air Filter and Actuator Hood Screen	a. Remove, clean, inspect, and service filter (34). b. Discard filter and obtain replacement, if damaged. c. Clean actuator hood screen (35). 	
22	Blast Damper Door	Check that damper door is in the open position. REINSTALL THE FOLLOWING ITEMS: • Condenser Coil Guard • Condenser Outlet Guard • Fresh Air Filter and Screen • Conditioned Air Filter and Retainer • Lower Front Cover • Conditioned Air Intake Grille • Mist Eliminator • Top Panel • Conditioned Air Outlet Grille • Fabric Cover (Partial) Check to be sure that all items are back in place and secure.	

Table 4-2. Unit Preventive Maintenance Checks and Services (PMCS)
Quarterly Schedule - continued

Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
		CAUTION **Use suitable disconnect to isolate power source when connecting input power cable. Do not connect power cable to unit or power source if voltage is present.**	
23	Operation Checks	a. Be sure the MODE selector rotary switch is in the OFF/RESET position and reconnect input power. **CAUTION** **Do not check operation in COOL mode until after input power has been reconnected for a sufficient time to eliminate any danger of liquid refrigerant accumulation in the compressor. Except in extremely cold conditions, if input power has been disconnected for a period of less than six hours, an equal warm-up period should be allowed. If the disconnected period has been more than six hours, a full six hour warm-up period is necessary.** b. Check that the fabric cover is rolled up and secured. c. Adjust conditioned air intake and outlet louvers to the full open position. d. Adjust fresh air damper to full closed position. e. Turn MODE selector rotary switch to VENTilate. After a short delay (approximately five seconds), the fan should start. f. Use a paper streamer or smoke and note amount of air being discharged from conditioned air outlet grille. g. Open fresh air damper fully. h. Close conditioned air intake grille louvers fully. i. Again check air flow as in step f. above. Air flow should be approximately the same. j. Fully open louvers in conditioned air intake grille and fully close fresh air damper.	

Table 4-2. Unit Preventive Maintenance Checks and Services (PMCS)
Quarterly Schedule - continued

Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
		k. Turn potentiometer TEMPERATURE control knob to fully WARM (clockwise) position and then turn mode selector switch to HEAT. After a short delay (approximately five seconds) the fan should start. Place your hand in air flow from the conditioned air outlet grille and feel for a temperature rise. Next, turn potentiometer TEMPERATURE control knob to fully COOL (counterclockwise) position. Feel that discharge air temperature drops to ambient level.	
		l. Turn potentiometer TEMPERATURE control knob to fully WARM (clockwise) position, then turn MODE selector rotary switch to COOL. After a short delay (approximately five seconds) the fan should start. Hold your hand in air flow from conditioned air outlet grille; there should be no change in temperature. Now turn potentiometer TEMPERATURE control knob to fully COOL (counterclockwise) position. The fan will stop, after a short delay (approximately five seconds) the fan and compressor should start. Feel outlet air temperature begin to drop. Leave controls in present position and perform next check.	
		m. After 15 minutes of operation check the sight glass and compare refrigerant condition with the color coded information plate provided.	2-3
		n. Turn MODE selector rotary switch to OFF/RESET and observe that all air conditioner functions cease.	
		o. Set-up the air conditioner for the desired operational mode.	
		p. Record performance of quarterly PMCS, including all corrective actions taken. **NOTE** **The potentiometer temperature control has an effective functional range between 65°F and 80°F (18°C and 27°C). In extreme conditions when ambient air temperature is outside this range, operation in either HEAT or COOL mode will vary from that described above.**	

Section V UNIT TROUBLESHOOTING

4-8. USE OF TROUBLESHOOTING TABLE.

Table 4-3 contains troubleshooting information useful to unit maintenance technicians in diagnosing and correcting malfunctions or unsatisfactory operation of the air conditioner.

a. 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 test/inspection and corrective actions in the order listed.

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

SYMPTOM INDEX

Trouble	Malfunction No.
AIR CONDITIONER	
Does Not Start In Any Mode	1
Reduced Cooling Capacity	5
Reduced Heating Capacity	6
No Heat In Heat Mode	7
Excessively Noisy Operation	9
EVAPORATOR	
Fan Motor (B2) Does Not Operate	8
CONDENSER	
Fan Motor (B2) Does Not Operate	8
COMPRESSOR	
Fan Runs But Compressor Does Not Start	2
Compressor Starts Normally, But Soon Stops	3
Compressor Starts Normally, But High Pressure Cutout Switch Trips	4

Table 4-3. UNIT TROUBLESHOOTING

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. AIR CONDITIONER DOES NOT START IN ANY MODE.

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

If input power has been disconnected for an unknown period of time, do not start in COOL MODE until power has been reconnected for a minimum of four hours.

Step 1. Check to see if input power has been disconnected.

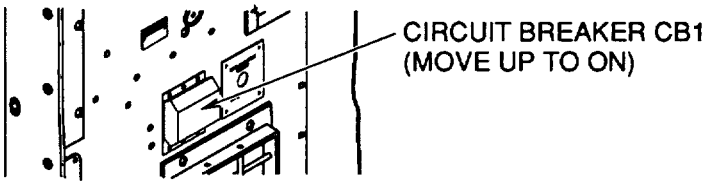
Connect input power.

Step 2. Make sure that power is 208 volt, 3 phase, 50/60 or 400 hertz.

Connect correct input power.

Step 3. Check to see if circuit breaker is tripped.

Reset to ON position.



WARNING

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

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit.
Damage to cable connector pins will result if cable is used.

Step 4. Check for loose or damaged electrical connectors or damaged wires in wiring harnesses. (See paragraph 4-26.)

Tighten or replace connectors, or repair damaged wires.

Table 4-3. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. AIR CONDITIONER DOES NOT START IN ANY MODE. - continued

Step 5. Check operation of the circuit breaker. (See paragraph 4-43.)

Replace circuit breaker if defective.

Step 6. Check operation of control power transformer. (See paragraph 4-39.)

Replace transformer if defective.

Step 7. Check operation of EMI filter and dc rectifiers assemblies. (See paragraph 4-38 and 4-42.)

Replace filter or rectifier if defective.

Step 8. Check for loose or damaged electrical connectors or damaged wires in wiring harnesses. (See paragraph 4-26.)

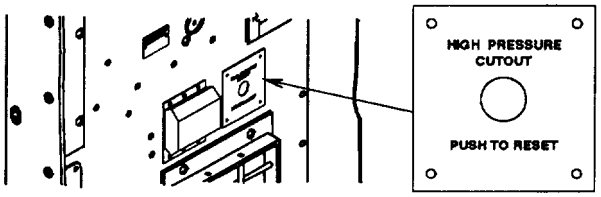
Tighten or replace connectors, or repair damaged wires.

Step 9. Check operation of the MODE selector rotary switch. (See paragraph 4-30.)

Replace switch if defective.

Step 10. Check that HIGH and LOW PRESSURE CUTOUT switches are not tripped.

PUSH TO RESET switch. If unit does not start, notify supervisor.



Step 11. Check logic box and motor controller assemblies. (See paragraph 4-36 and 4-37.)

Replace logic box or motor controller assembly if defective.

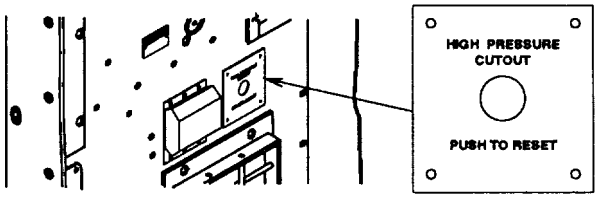
Table 4-3. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. FAN RUNS, BUT COMPRESSOR DOES NOT START.

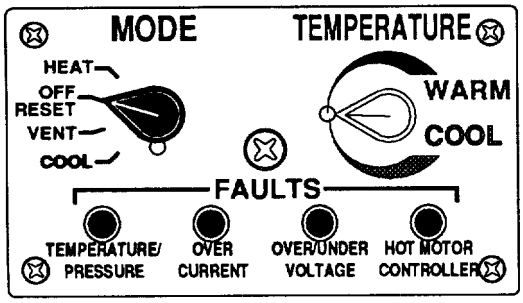
Step 1. Check to see if HIGH PRESSURE CUTOUT switch has tripped.

PUSH and release TO RESET.



Step 2. Check operation of MODE selector rotary switch.

Turn switch to OFF/RESET, then turn to COOL.



WARNING

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

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit.
Damage to cable connector pins will result if cable is used.

Step 3. Check for loose or damaged electrical connectors, or damaged wires in wiring harnesses.

Tighten or replaceconnectors, or repair or replace damaged wires.

Table 4-3. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. FAN RUNS, BUT COMPRESSOR DOES NOT START. - continued

Step 4. Check operation of compressor motor relay.

Test relay. (See paragraph 4-40.) Replace relay if defective.

Step 5. Check operation of coil frost switch.

Test switch. (See paragraph 4-33.) Replace switch if defective.

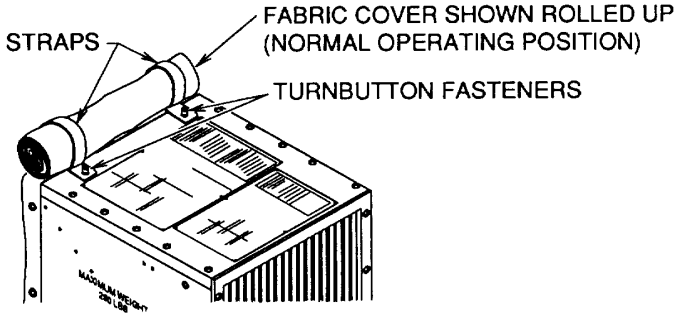
Step 6. Check operation of compressor.

If compressor is not operating, notify supervisor.

3. COMPRESSOR STARTS NORMALLY, BUT SOON STOPS.

Step 1. Check to be sure fabric cover is rolled up.

Roll up and secure fabric cover.



Step 2. Check to be sure there is no restriction to air flow through condenser section.

Clean all obstructions from condenser inlet, outlet, and condenser coil.

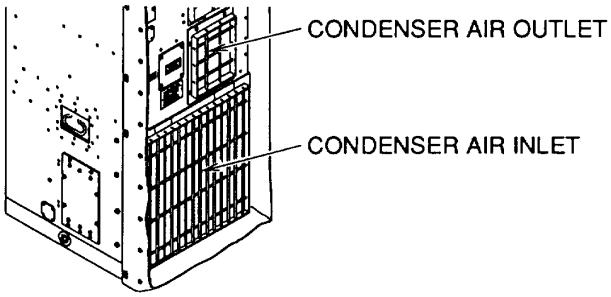


Table 4-3. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. COMPRESSOR STARTS NORMALLY, BUT SOON STOPS. - continued

Step 3. Check to be sure condenser fan is operating (air being discharged from condenser air outlet).

Replace evaporator and condenser fan motor or condenser fan if defective. (See paragraph 4-47.)

NOTE

Condenser fan and conditioned air (evaporator) fan are both driven by the same motor. If one fan is operating and the other is not, check for loose fan on motor shaft. If both fans are not operating, check for loose electrical connections, defective motor controller (paragraph 4-37), or defective motor (paragraph 4-47).

Step 4. If compressor stops again soon after restart in COOL mode, do not attempt another restart.

Notify supervisor.

4. COMPRESSOR STARTS NORMALLY, BUT HIGH PRESSURE CUTOUT SWITCH TRIPS.

Step 1. Check to be sure fabric cover is rolled up.

Roll up and secure fabric cover.

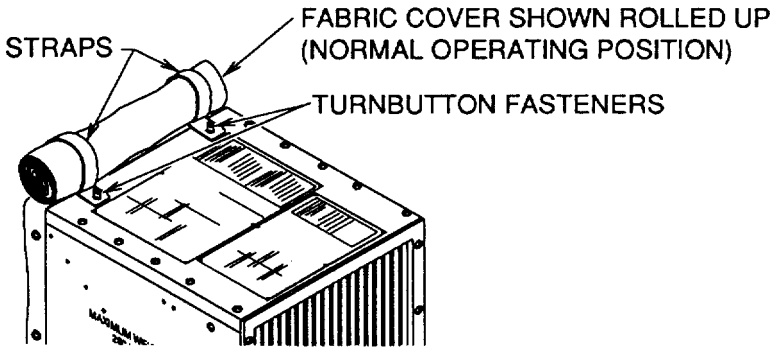


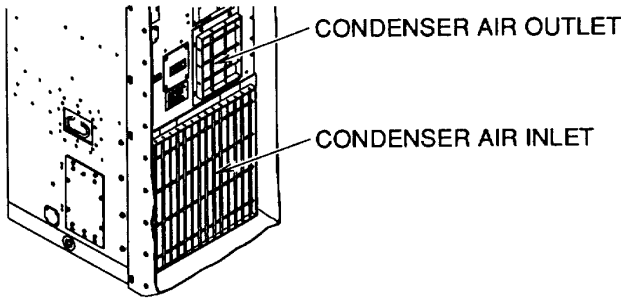
Table 4-3. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

4. COMPRESSOR STARTS NORMALLY, BUT HIGH PRESSURE CUTOUT SWITCH TRIPS. - continued

Step 2. Check to be sure there is no restriction to air flow through condenser section.

Clean all obstructions from condenser inlet, outlet, and condenser coil.



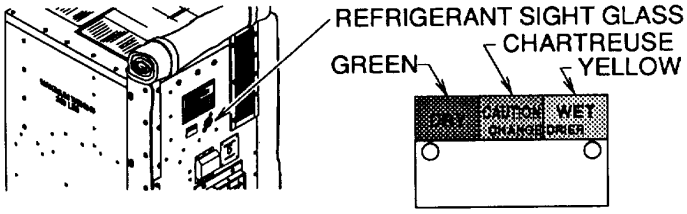
Step 3. Check to be sure that condenser fan is operating (Air being discharged from condenser air outlet).

NOTE

Condenser fan and conditioned air (evaporator) fan are both driven by the same motor. If one fan is operating and the other is not, check for loose fan on motor shaft. If both fans are not operating, check for loose electrical connections, defective motor controller (paragraph 4-37), or defective motor (paragraph 4-47).

Step 4. With unit operating in COOL mode, check condition of refrigerant in sight glass.

If indicator color is in the yellow zone or numerous bubbles appear in the window, turn selector rotary switch to OFF/RESET and notify supervisor.



Step 5. Reset (PUSH) HIGH PRESSURE CUTOUT switch and restart unit.

If unit does not start, notify supervisor.

Table 4-3. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

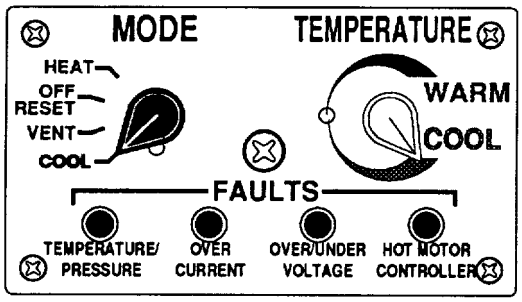
5. REDUCED COOLING CAPACITY.

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 position of potentiometer TEMPERATURE control.

Set control at maximum COOL; then, if condition improves, adjust properly.



Step 3. Check thatthe louvers in the conditioned air intake and discharge grilles are properly adjusted. (Must be open.)

Adjust louvers properly.

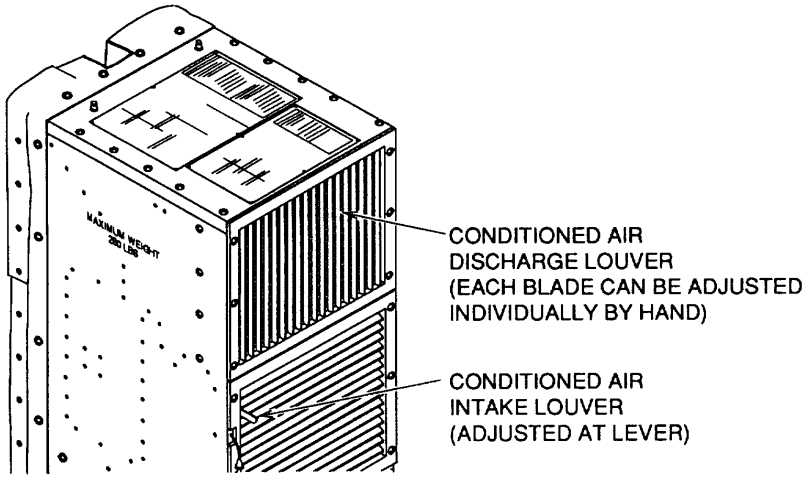


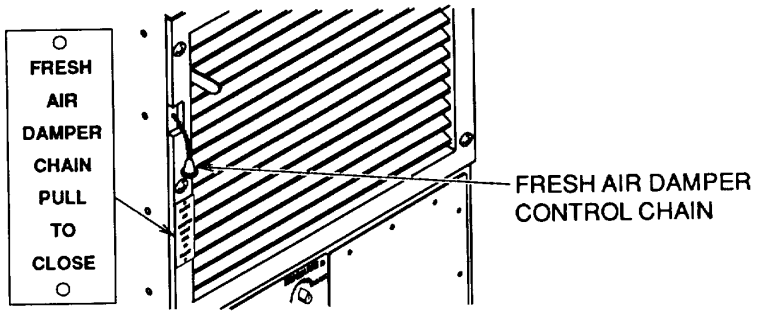
Table 4-3. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

5. REDUCED COOLING CAPACITY. - continued

Step 4. Check to be sure that excessive hot, outside air is not being introduced through the fresh air damper.

Fully close damper; then, if condition improves, adjust properly.



Step 5. Check to be sure condenser air intake and discharge are not obstructed.

Remove obstructions.

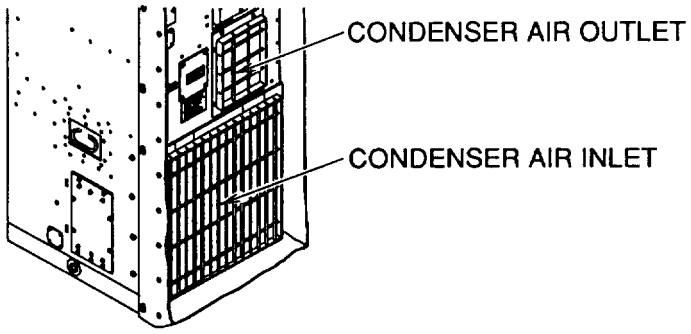
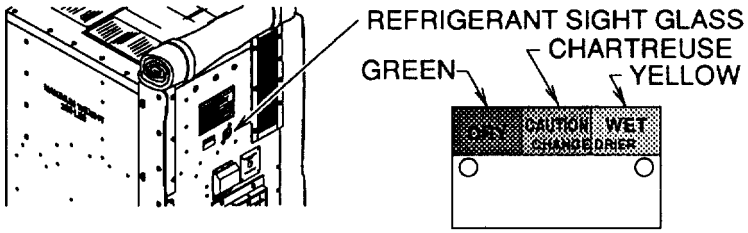


Table 4-3. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

5. REDUCED COOLING CAPACITY. - continued

Step 6. With unit operating in COOL mode, check condition of refrigerant in sight glass.



(1) If color is yellow or a light hue of chartreuse, or if numerous bubbles appear, turn air conditioner OFF/RESET, and notify supervisor.
(2) If color is green or a dark hue of chartreuse, but has a milky appearance, or more than an occasional bubble appears, thoroughly clean the condenser intake screen, condenser fan guard, condenser coil, and entire condenser section to remove all obstructions.
(3) Clean and service, or replace mist eliminator. (See paragraph 4-25.) (4) Clean evaporator coil and entire evaporator section. (See paragraph 4-50.)

Step 7. Check airflow out of conditioned air (evaporator) discharge grille. If air flow volume is low:

(1) Adjust conditioned air (evaporator) intake grille louvers.
(2) Clean and service, or replace conditioned air filter element. (See paragraph 4-23.)
(3) Clean and service, or replace mist eliminator. (See paragraph 4-25.)
(4) Clean evaporator coil and entire evaporator section. (See paragraph 4-50.)

Step 8. Check CBR filter, if installed. (See paragraph 4-11.)

Clean, replace, or adjust as indicated.

Step 9. Check operation of potentiometer TEMPERATURE control.

Test potentiometer TEMPERATURE control. (See paragraph 4-29.) Replace control if defective.

Table 4-3. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

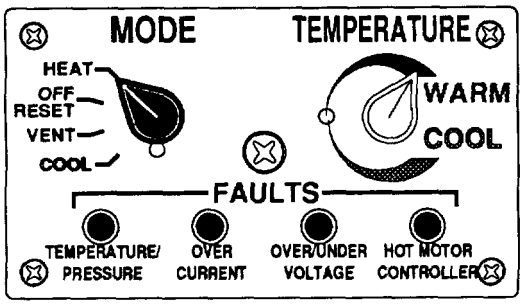
6. REDUCED HEATING CAPACITY.

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 setting of potentiometer TEMPERATURE control.

Set control to fully WARM; then, if condition improves, adjust properly.



Step 3. Check that the louvers in the conditioned air intake and discharge grilles are properly adjusted.

Adjust louvers properly.

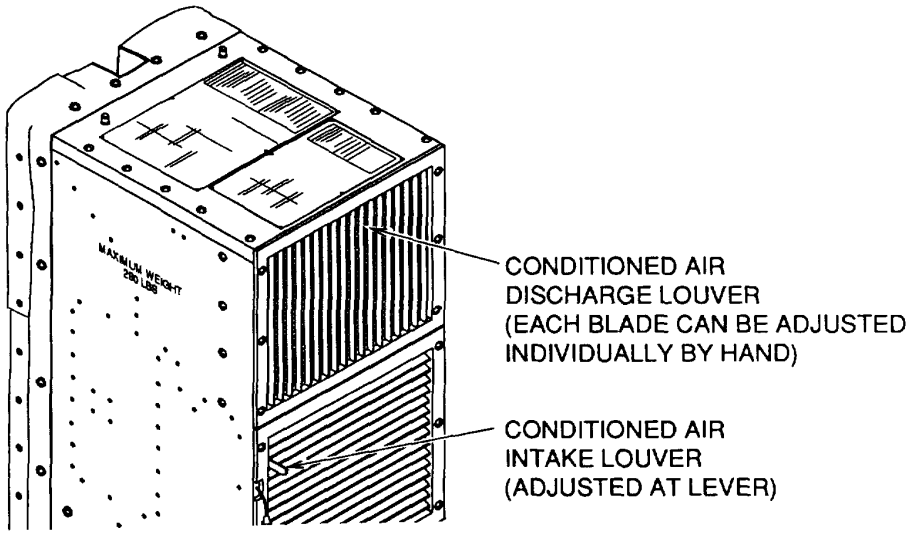


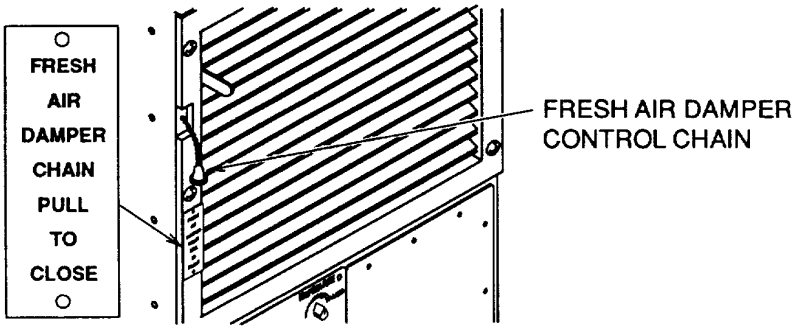
Table 4-3. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

6. REDUCED HEATING CAPACITY. - continued

Step 4. Check to be sure that excessive cold, outside air is not being introduced through the fresh air damper.

Fully close damper; then, if condition improves, adjust properly.



Step 5. Check air flow out of conditioned air (evaporator) discharge grille. If air flow volume is low:

(1) Adjust conditioned air (evaporator) intake grille louvers.
(2) Clean and service, or replace conditioned air filter element. (See paragraph 4-23.)
(3) Clean and service, or replace mist eliminator. (See paragraph 4-25.)
(4) Clean evaporator coil and entire evaporator section. (See paragraph 4-50.)

WARNING

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

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Step 6. Check for loose or damaged wires and terminals.

Tighten loose or damaged terminals. Repair or replace damaged wires. (See paragraph 4-26.)

Step 7. Check operation of heater cutout switch.

Test switch. (See paragraph 4-45.) Replace switch if defective.

Table 4-3. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

6. REDUCED HEATING CAPACITY. - continued

Step 8. Check individual heaters.

Test heaters. (See paragraph 4-44.) Replace defective heaters.

7. NO HEAT IN HEAT MODE.

WARNING

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

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Step 1. Check for loose or damaged electrical connectors, or damaged wires in wiring harnesses.

Tighten or replace loose or damaged connectors, or replace damaged wires

Step 2.. Check operation of heater relay.

Test relay. (See paragraph 4-41.) Replace relay if defective.

Step 3. Check operation of potentiometer TEMPERATURE control.

Test potentiometer TEMPERATURE control. (See paragraph 4-29.) Replace control if defective.

Step 4. Check operation of MODE selector rotary switch.

Test switch. (See paragraph 4-30.) Replace switch if defective.

Table 4-3. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

8. FAN MOTOR DOES NOT OPERATE.

WARNING

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

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Step 1. Using wiring diagram (figure 4-10), check electrical connectors P12 and J12, P10 and J10, P11 and J11, and individual wires for tightness and continuity.

Tighten, repair, or replace as indicated.

Step 2. Check operation of motor controller.

Test controller. (See paragraph 4-37.) Replace controller if defective.

Step 3. Check operation of fan motor.

Test motor. (See paragraph 4-47.) Notify supervisor if motor is defective.

Step 4. Check operation of MODE selector rotary switch.

Test switch. (See paragraph 4-30.) Replace switch if defective.

9. EXCESSIVELY NOISY OPERATION.

CAUTION

A knocking or hammering noise is usually caused by liquid refrigerant in the compressor. This can seriously damage or destroy the compressor.

NOTE

Be sure unit has been connected to input power at least four hours prior to operation.

Step 1. Listen for a knocking or hammering sound when the compressor starts.

Turn MODE selector rotaryswitch to OFF/RESET immediately. Notify supervisor.

Table 4-3. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
9. EXCESSIVELY NOISY OPERATION. - continued	
Step 2. Check fans for looseness or damage, and for rotational clearance.	
Tighten loose fans, adjust for rotational clearance, or replace fans. (See paragraph 4-46 and 4-47.)	
Step 3. Check all internal components for looseness, vibration, and security.	
Tighten, adjust, and secure as necessary.	

Section VI UNIT MAINTENANCE PROCEDURES

4-9. GENERAL.

The procedures in this section have been arranged in the order in which the items appear in the unit (O) maintenance level column on the Maintenance Allocation Chart (MAC) which is provided in Appendix B. Step-bystep procedures have been provided for all action authorized to be performed by unit maintenance in the order in which they appear on the MAC.

WARNING

Do not operate this unit with the panels, covers, screens, grilles, and guards removed or open unless the instructions tell you to. When this is necessary, do so with care to prevent personal injury.

4-10. FABRIC COVER.

This task covers: a. Inspect b. Clean c. Replace

INITIAL SETUP

Tools
Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts
Fabric Cover

Packing with Retainers (4)

Lock Washers (4)

Rags
Appendix E, item 13

Detergent
Appendix E, item 15

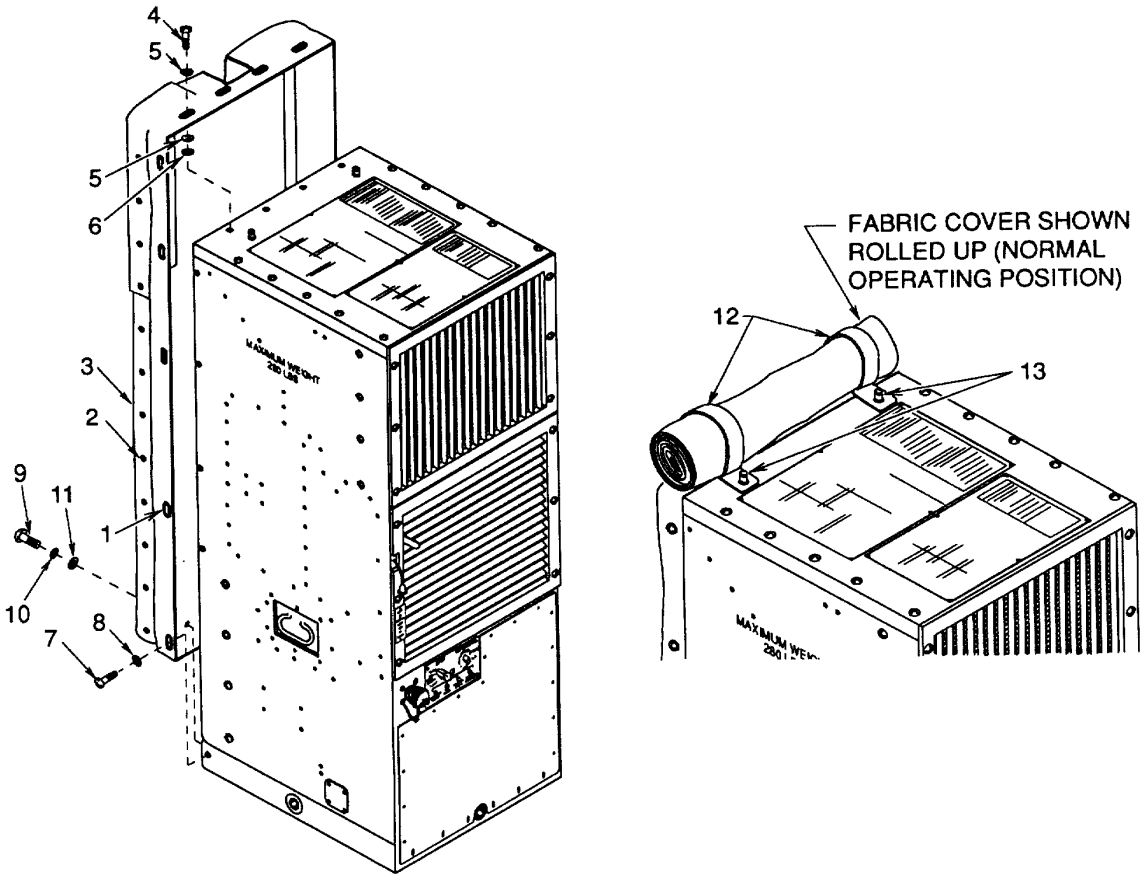


Figure 4-12. Fabric Cover

4-10. FABRIC COVER. - continued

a. Inspect.

(1) Inspect for rips, cuts, tears, or punctures in the fabric. If damaged, notify supervisor.
(2) Inspect for damaged, loose, or missing eyelets (1) and snap fasteners (2). If damaged, notify supervisor.

b. Clean.

Wash the canvas cover using a solution of fresh water and a mild detergent. A soft scrub brush may be used to remove caked deposits. Thoroughly rinse with fresh water and air dry.

c. Replace.

(1) Roll cover (3) down and secure snap fasteners (2).
(2) Remove four screws (4), eight flat washers (5), and four packing with retainers (6) from the top.
(3) Remove ten sets of screws (7) and flat washers (8) from the sides.
(4) Remove four sets of screws (9), lock washers (10), and flat washers (11).
(5) Carefully remove the fabric cover.
(6) Aline eyelets (1) to casing mounting holes.
(7) Secure top of fabric cover with four screws (4), eight flat washers (5), and four packing with retainers (6).
(8) Secure sides with ten sets of screws (7) and flat washers (8).
(9) Secure bottom with four sets of screws (9), lock washers (10), and flat washers (11).
(10) If unit is to be returned to normal operation, open the snap fasteners (2), roll up the back flap, and secure it with the stowing straps (12) and turn button fasteners (13).

4-11. CBR (CHEMICAL, BIOLOGICAL, RADIOLOGICAL) DUCT COVER.

This task covers: a. Remove b. Inspect c. Clean d. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts

CBR Duct Cover

Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

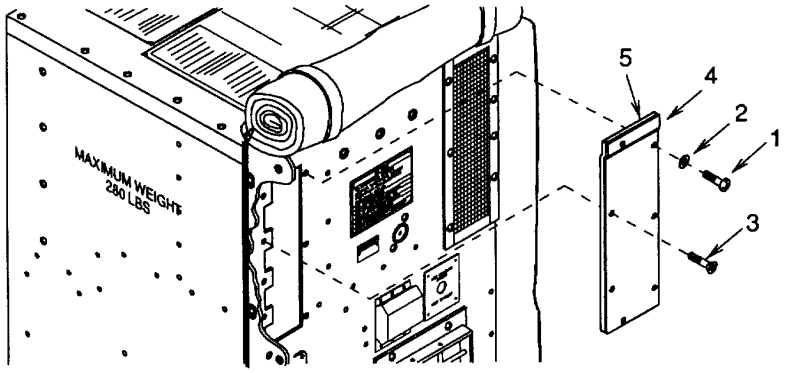


Figure 4-13. CBR Duct Cover

a. Remove.

(1) Remove five sets of screws (1), flat washers (2) and two flat head screws (3).
(2) Remove cover (4).

b. Inspect.

(1) Check that cover (4) is not bent, cracked, or punctured. If damaged, notify supervisor.
(2) Check that gasket (5) is not torn, loose, or missing. If damaged, notify supervisor.

4-11. CBR (CHEMICAL, BIOLOGICAL, RADIOLOGICAL) DUCT COVER. - continued

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

c. Clean.

Clean the panels with a cloth dampened with a detergent solution or dry cleaning solvent. Use a soft brush if necessary to dislodge caked on dirt. Dry the items thoroughly.

d. Install.

(1) Aline cover (4) mounting holes with casing fasteners.
(2) Secure cover (4) to casing with five sets of screws (1) and flat washers (2) and two flat head screws (3).

4-12. ACCESS (SERVICE VALVES) COVER.

This task covers: a. Remove b. Inspect c. Clean d. Install

INITIAL SETUP

Tools
Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts
Access Cover

Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

a. Remove.

(1) Remove four sets of screws (1) and flat washers (2).
(2) Remove cover (3).

b. Inspect.

(1) Check that cover (3) is not bent, cracked, or punctured. If damaged, notify supervisor.
(2) Check that gasket (4) is not torn, loose, or missing. If damaged, notify supervisor.
(3) Check that information plate (5) is readable and secure. If damaged, notify supervisor.

4-12. ACCESS (SERVICE VALVES) COVER. - continued

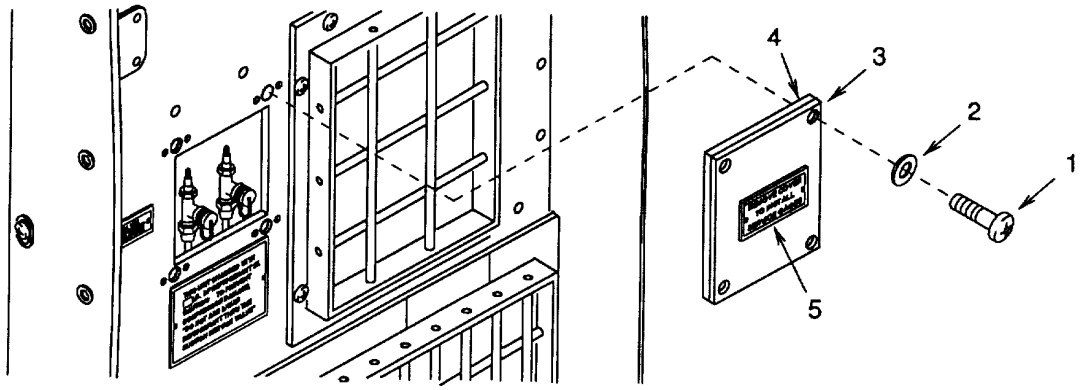


Figure 4-14. Access (Service Valves) Cover

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

c. Clean.

Clean with a cloth dampened with a detergent solution or dry cleaning solvent. Use a soft brush if necessary to dislodge caked on dirt. Dry thoroughly.

d. Install.

(1) Aline cover (3) mounting holes with casing fasteners.
(2) Secure cover (3) to casing with four sets of screws (1) and flat washers (2).

4-13. CONNECTOR COVER PLATES.

This task covers: a. Inspect b. Clean c. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1
Scrub Brush
Appendix B, item 2

Materials/Parts

Connector Cover Plate

Lock Washers (4)
Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

Equipment Conditions

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove control assembly (para 4-34).

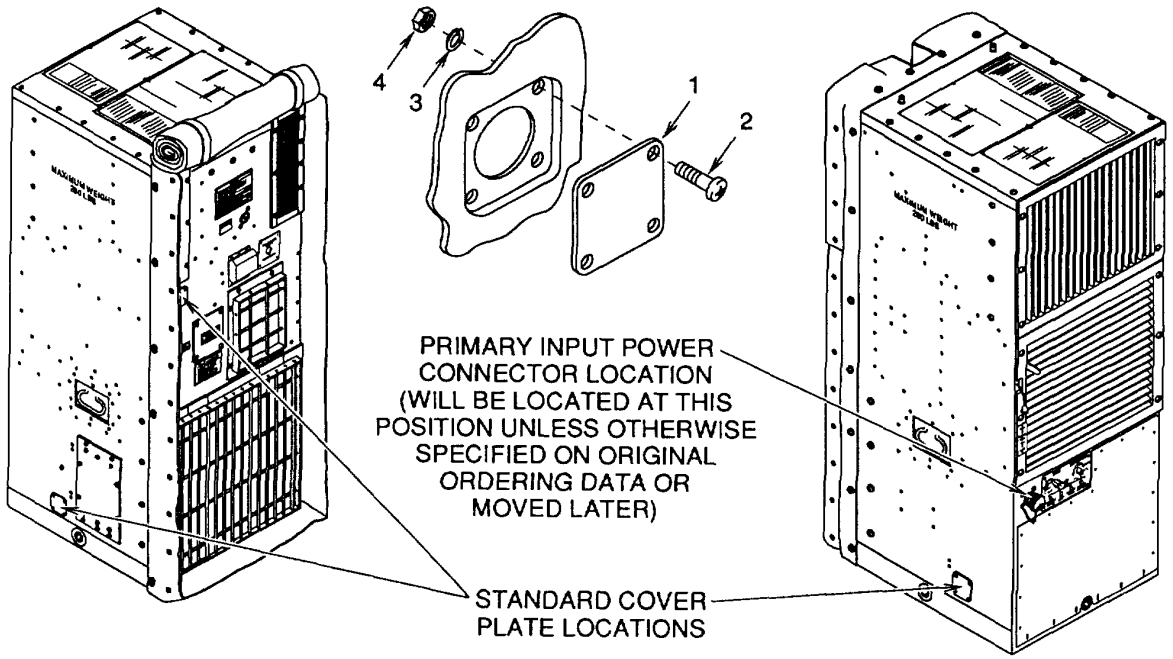


Figure 4-15. Connector Cover Plates

4-13. CONNECTOR COVER PLATES. - continued

a. Inspect.

Check that cover plate (1) is not bent, cracked, or punctured. If damaged, notify supervisor.

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

b. Clean.

Clean with a cloth dampened with a detergent solution or dry cleaning solvent. Use a soft brush if necessary to dislodge caked on dirt. Dry thoroughly.

c. Replace.

(1) Remove four sets of screws (2), lock washers (3), and nuts (4).
(2) Remove cover plate (1).
(3) Aline cover plate (1) mounting holes with casing.
(4) Secure cover plate (1) to casing with four sets of screws (2), lock washers (3), and nuts (4).

4-14. CONDITIONED AIR DISCHARGE (OUTLET) GRILLE ASSEMBLY.

This task covers: a. Remove b. Inspect c. Clean d. Install e. Adjust

INITIAL SETUP

Tools
Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts
Conditioned Air Discharge Grille Assembly

Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

a. Remove.

(1) Loosen six captive turn lock stud fasteners (1).
(2) Remove grille (2).

4-14. CONDITIONED AIR DISCHARGE (OUTLET) GRILLE ASSEMBLY. - continued

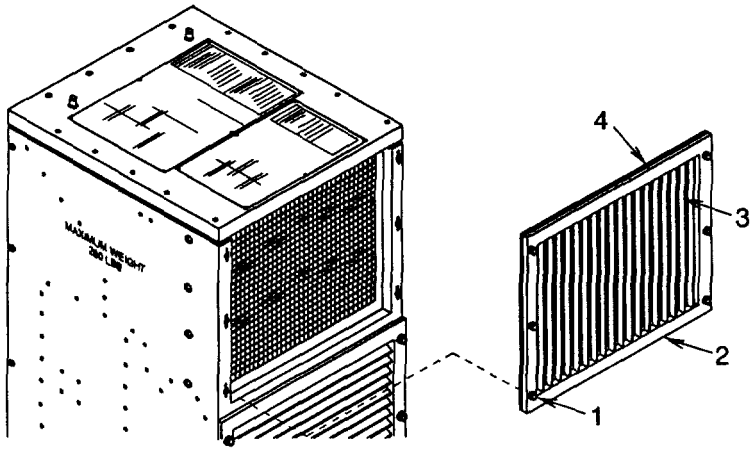


Figure 4-16. Discharge (Outlet) Grille Assembly

b. Inspect.

(1) Check that louvers (3) are not bent, cracked, or missing. Bent louvers can usually be straightened with fingers.
(2) Check that captive turn lock stud fasteners (1) are not loose or missing. If damaged, notify supervisor.
(3) Check that gasket (4) is not torn, loose, or missing. If damaged, notify supervisor.

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

c. Clean.

Wipe or vacuum all dust and dirt off louvers and inside grille. Clean with a cloth dampened with a detergent solution or dry cleaning solvent. Use a soft brush if necessary to dislodge caked on dirt. Dry thoroughly.

d. Install.

(1) Aline captive studs (1) with casing fasteners.
(2) Secure grille (2) with six captive turn lock stud fasteners (1).

e. Adjust.

Adjust louvers (3) as needed.

4-15. CONDITIONED AIR INTAKE GRILLE ASSEMBLY.

This task covers: a. Remove b. Inspect c. Clean d. Install e. Adjust

INITIAL SETUP

Tools
Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts
Conditioned Air Intake Grille Assembly

Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

a. Remove.

(1) Loosen six captive turn lock stud fasteners (1).
(2) Remove grille (2).

b. Inspect.

(1) Check that louvers (3) are not bent, cracked, or missing. Bent louvers can usually be straightened with fingers. If damaged, notify supervisor.
(2) Check that captive turn lock stud fasteners (1) are not loose or missing. If damaged, notify supervisor.
(3) Check that gasket (4) is not torn, loose, or missing. If damaged, notify supervisor.
(4) Check that information plate (5) is readable and secure. If damaged, notify supervisor.

4-15. CONDITIONED AIR INTAKE GRILLE ASSEMBLY. - continued

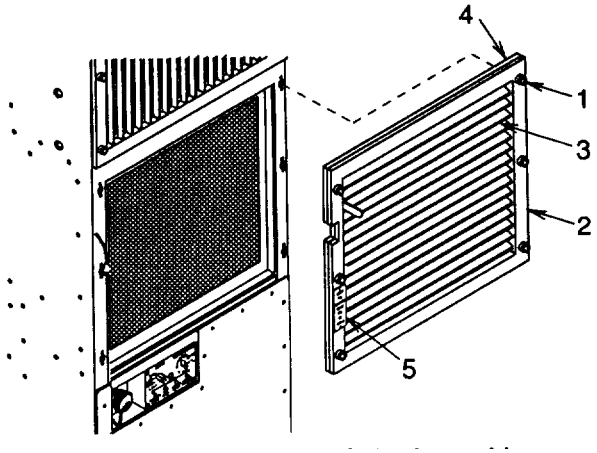


Figure 4-17. Intake Grille Assembly

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

c. Clean.

Wipe or vacuum all dust and dirt off louvers and inside grille. Clean with a cloth dampened with a detergent solution or dry cleaning solvent. Use a soft brush if necessary to dislodge caked on dirt. Dry thoroughly.

d. Install.

(1) Aline captive turn lock stud fasteners (1) with casing fasteners.
(2) Secure grille (2) with six captive turn lock stud fasteners (1).

e. Adjust.

Adjust louvers (3) as needed.

4-16. CONDENSER (FAN) GUARD.

This task covers: a. Inspect b. Clean c. Replace

INITIAL SETUP

Tools
Refrigeration Unit Service Tool Kit
Appendix B, item 1
Scrub Brush
Appendix B, item 2

Materials/Parts

Condenser Guard
Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

Equipment Conditions

CAUTION
Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

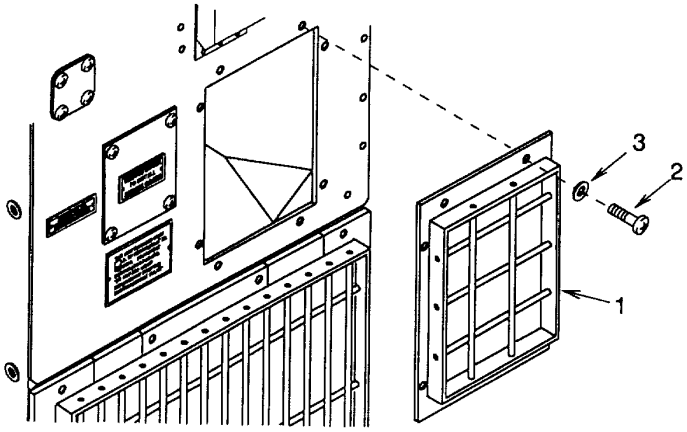


Figure 4-18. Condenser (Fan) Guard

a. Inspect.

Check that guard (1) is not bent, cracked, or broken. If damaged, notify supervisor.

4-16. CONDENSER (FAN) GUARD. - continued

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

b. Clean.

Wipe or vacuum all dust and dirt off guard. Clean with a cloth dampened with a detergent solution or dry cleaning solvent. Use a soft brush if necessary to dislodge caked on dirt. Dry thoroughly.

c. Replace.

(1) Remove eight sets of screws (2) and flat washers (3).
(2) Remove guard (1).
(3) Aline guard (1) mountingholes with casing fasteners.
(4) Secure guard (1) to casing with eight sets of screws (2) and flat washers (3)

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

4-17. CONDENSER COIL GUARD.

This task covers: a. Inspect b. Clean c. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts

Condenser Coil Guard

Lock Washers (4)

Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

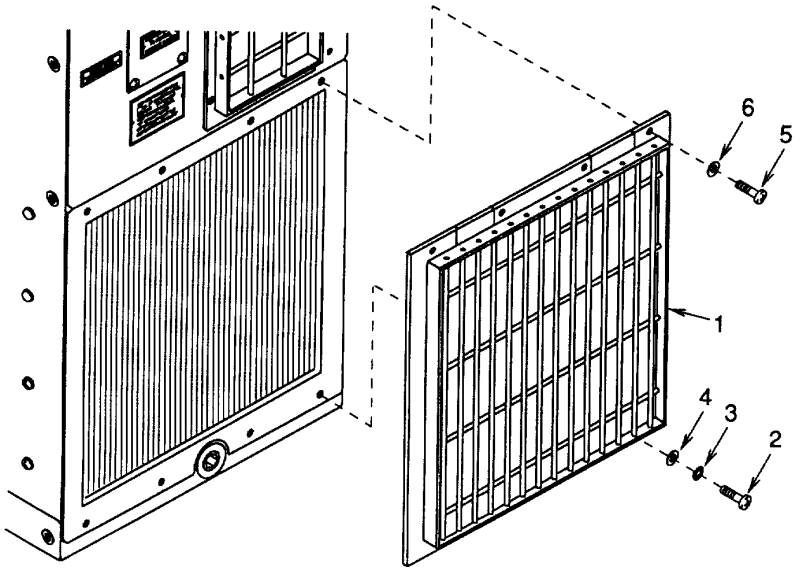


Figure 4-19. Condenser Coil Guard

4-17. CONDENSER COIL GUARD. - continued

a. Inspect.

Check that guard (1) is not bent, cracked, or broken. If damaged, notify supervisor.

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

b. Clean.

Wipe or vacuum all dust and dirt off guard. Clean with a cloth dampened with a detergent solution or dry cleaning solvent. Use a soft brush if necessary to dislodge caked on dirt. Dry thoroughly.

c. Replace.

(1) Remove four sets of screws (2), lock washers (3) and flat washers (4).from lower flange.
(2) Remove four sets of screws (5) and flat washers (6) from upper flange.
(3) Remove guard (1).
(4) Aline guard (1) mounting holes with casing fasteners.
(5) Secure guard (1) to casing with four sets of screws (5) and flat washers (6) in top flange and four sets of screws (2), lock washers (3) and flat washers (4) in bottom flange.

4-18. FRESH AIR (INLET) SCREEN OR COVER.

This task covers: a. Inspect b. Clean c. Replace

INITIAL SETUP

Tools
Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts
Fresh Air Screen or Cover

Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

NOTE

The unit may be equipped with a screen, cover, or blast damper. If a blast damper is installed, see paragraph 5-36.

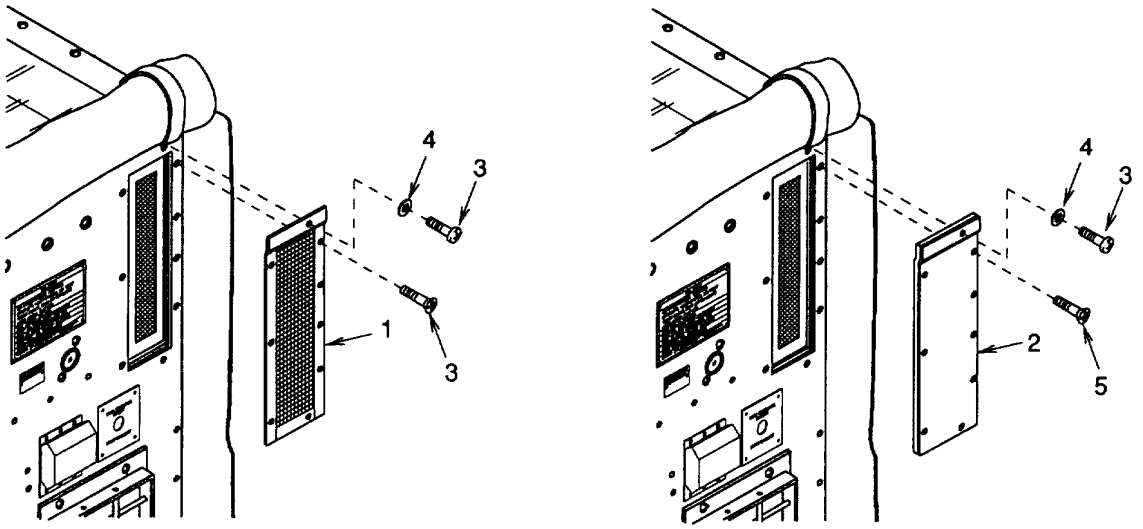


Figure 4-20. Fresh Air Cover or Fresh Air Screen

a. Inspect.

Check that screen (1) or cover (2) is not bent, cracked, or broken. If damaged, notify supervisor.

4-18. FRESH AIR (INLET) SCREEN OR COVER. - continued

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

b. Clean.

Wipe or vacuum all dust and dirt off guard. Clean with a cloth dampened with a detergent solution or dry cleaning solvent. Use a soft brush if necessary to dislodge caked on dirt. Dry thoroughly.

c. Replace.

(1) Remove five sets of pan head screws (3) and flat washers (4) and four flat head screws (5) from screen (1) or cover (2).
(2) Remove screen (1) or cover (2).
(3) Aline screen (1) or cover (2) mounting holes with casing fasteners.
(4) Secure screen (1) or cover (2) to casing with five sets of pan head screws (3) and flat washers (4) and four flat head screws (5).

4-19. TOP PANEL.

This task covers: a. Remove b. Inspect c. Clean d. Install

INITIAL SETUP

Tools
Refrigeration Unit Service Tool Kit
Appendix B, item 1
Scrub Brush
Appendix B, item 2

Materials/Parts

Top Panel

Packing With Retainers (12)

Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

Equipment Conditions

CAUTION
Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove fabric cover (para 4-10).

Remove CBR duct cover (para 4-11).

Remove conditioned air discharge grille assembly (para 4-14).

Remove fresh air screen or cover (para 4-18).

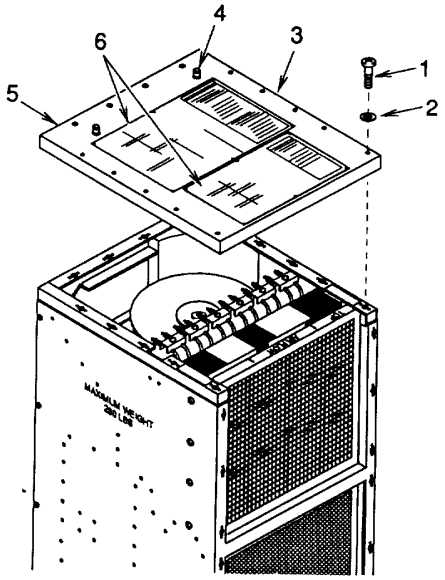


Figure 4-21. Top Panel

4-19. TOP PANEL.- continued

a. Remove.

(1) Remove twelve sets of screws (1) and packing with retainers (2).
(2) Remove panel (3).

b. Inspect.

(1) Check that panel (3) is not bent, cracked, or punctured. If damaged, notify supervisor.
(2) Check that turn button fasteners (4) are in place and in good condition. If damaged, notify supervisor.
(3) Check that gasket and insulation (5) are not tom, loose, or missing. If damaged, notify supervisor.
(4) Check that information plates (6) are readable and secure. If damaged, notify supervisor.

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

c. Clean.

Wipe or vacuum all dust and dirt off guard. Clean with a cloth dampened with a detergent solution or dry cleaning solvent. Use a soft brush if necessary to dislodge caked on dirt. Dry thoroughly.

d. Install.

(1) Aline panel (3) mounting holes with casing fasteners.
(2) Secure panel (3) to casing with twelve sets of screws (1) and packing with retainers.(2).

NOTE

FOLLOW-ON MAINTENANCE:

Install fresh air screen and cover (para 4-18).
Install conditioned air discharge grille assembly (para 4-14).
Install CBR duct cover (para 4-11).
Install fabric cover (para 4-10).

Connect power at power source.

4-20. LOWER FRONT COVER.

This task covers: a. Remove b. Clean c. Inspect d. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts

Lower Front Cover
Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

Equipment Conditions

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

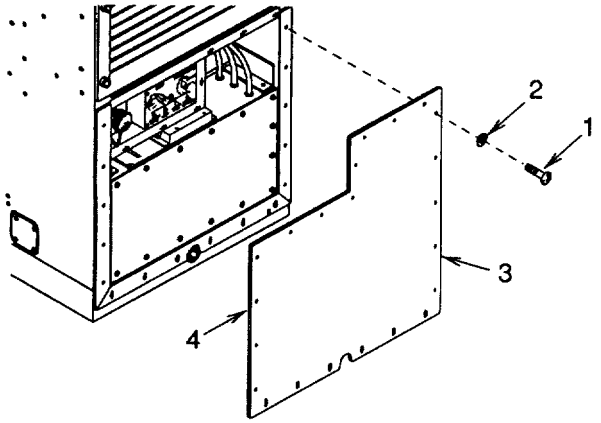


Figure 4-22. Cover (Lower) Front

a. Remove.

(1) Remove 22 sets of screws (1) and flat washers (2).
(2) Remove cover (3).

4-20. LOWER FRONT COVER.- continued

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

b. Clean.

Wipe or vacuum all dust and dirt off guard. Clean with a cloth dampened with a detergent solution or dry cleaning solvent. Use a soft brush if necessary to dislodge caked on dirt. Dry thoroughly.

c. Inspect.

(1) Check that cover (3) is not bent, cracked, or punctured. If damaged, notify supervisor.
(2) Check that gasket (4) is not torn, loose, or missing. If damaged, notify supervisor.

d. Install.

(1) Aline cover (3) mounting holes with casing fasteners.
(2) Secure cover (3) to casing with 22 sets of screws (1) and flat washers (2).

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

4-21. FILTER (RADIO. FREQUENCY) MOUNTING PLATE.

This task covers: a. Inspect b. Clean c. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1
Scrub Brush
Appendix B, item 2

Materials/Parts

Filter Mounting Plate
Lock Washers (4)
Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

Equipment Conditions

CAUTION
Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

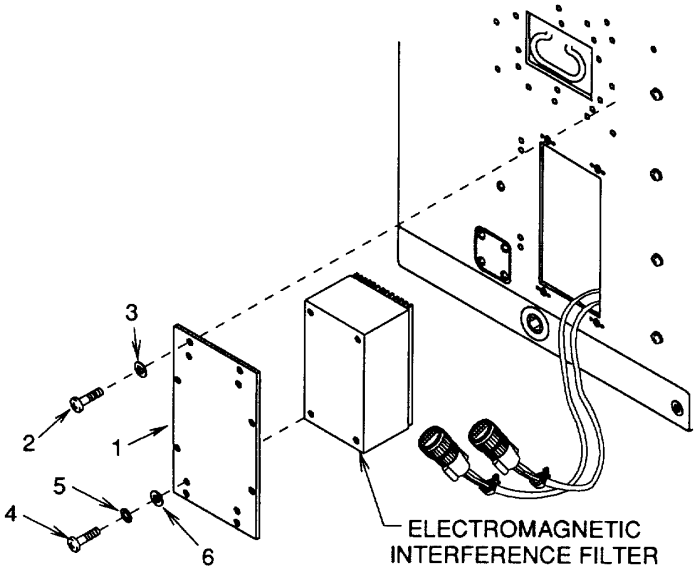


Figure 4-23. Filter Mounting Plate

4-21. FILTER (RADIO FREQUENCY) MOUNTING PLATE. - continued

a. Inspect.

Check that plate (1) is not bent, cracked, or punctured. If damaged, notify supervisor.

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

b. Clean.

Wipe or vacuum all dust and dirt off plate (1). Clean with a cloth dampened with a detergent solution or dry cleaning solvent. Use a soft brush if necessary to dislodge caked on dirt. Dry thoroughly.

c. Replace.

(1) Remove eight sets of outermost screws (2) and flat washers (3).
(2) Slip plate (1) and electromagnetic interference filter out of frame and support filter.
(3) Remove four sets of screws (4), lock washers (5) and flat washers (6).
(4) Remove mounting plate (1).
(5) Secure electromagnetic interference filter to plate (1) with four sets of screws (4), lock washers (5) and flat washers (6).
(6) Carefully slip electromagnetic interference filter into frame and secure plate (1) to casing with eight sets of screws (2) and flat washers (3).

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

4-22. REAR PANEL.

This task covers: a. Remove b. Clean c. Inspect d. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B. item 2

Materials/Parts

Rear Panel

Lock Washers (5)

Packing With Retainers (2)

Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

Equipment Conditions

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove condenser guard (para 4-16).

Remove top panel (para 4-19).

a. Remove.

(1) Remove twenty-one flat head screws (1) and twenty-four sets of pan head screws (2) and flat washers (3) from rear panel (4).
(2) Remove two sets of screws (5), lock washers (6), and flat washers (7).
(3) Reach through top and hold sight glass bracket (8) in place. Remove two sets of screws (9), lock washers (10), packing with retainers (11), and sight glass bracket (8).
(4) Remove six screws(12) and protective cover (13).
(5) Remove two sets of nuts (14), flat washers (15), and lock washers (16).
(6) Remove rear panel (4).

4-22. REAR PANEL.- continued

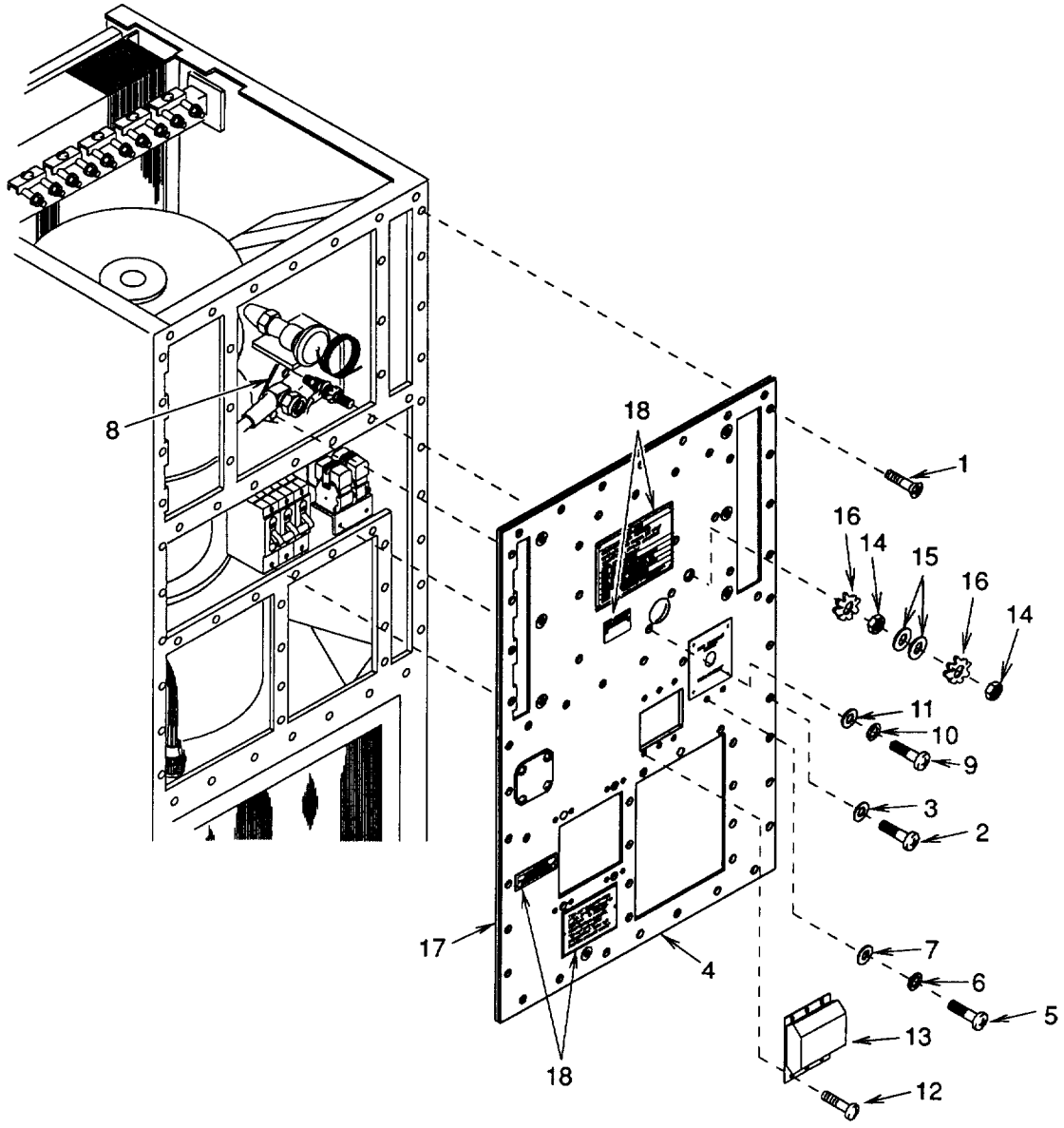


Figure 4-24. Rear Panel

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

b. Clean.

Wipe or vacuum all dust and dirt off guard. Clean with a cloth dampened with a detergent solution or dry cleaning solvent. Use a soft brush if necessary to dislodge caked on dirt. Dry thoroughly.

4-22. REAR PANEL.- continued

c. Inspect.

(1) Check that panel (4) is not bent, cracked, or punctured. If damaged, notify supervisor.

(2) Check that gasket and insulation (17) are not tom, loose, or missing. If damaged, notify supervisor.

(3) Check that information plates (18) are readable and secure. If damaged, notify supervisor.

d. Install.

(1) Secure protective cover (13) to rear panel (4) and circuit breaker with six screws (12).

(2) Secure ground lug to rear panel (4) with two sets of nuts (14), flat washers (15), and lock washers (16).

(3) Reaching through top, position sight glass bracket (8) in place. Secure sight glass bracket to rear panel, (4) with two sets of screws (9), lock washers (10) and packing with retainers (11).

(4) Secure pressure cut-out switch bracket to rear panel (4) with two sets of screws (5), lock washers (6), and flat washers (7).

(5) Secure rear panel (4) to casing with twenty-one flat head screws (1) and twenty-four sets of pan head screws (2) and flat washers (3).

NOTE

FOLLOW-ON MAINTENANCE:

Install top panel (para 4-19).

Install condenser guard (para 4-16).

Connect power at power source.

4-23. CONDITIONED AIR FILTER .

This task covers: a. Remove b. Clean c. Inspect d. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts

Conditioned Air Filter

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

Equipment Conditions

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used

Disconnect power at power source.

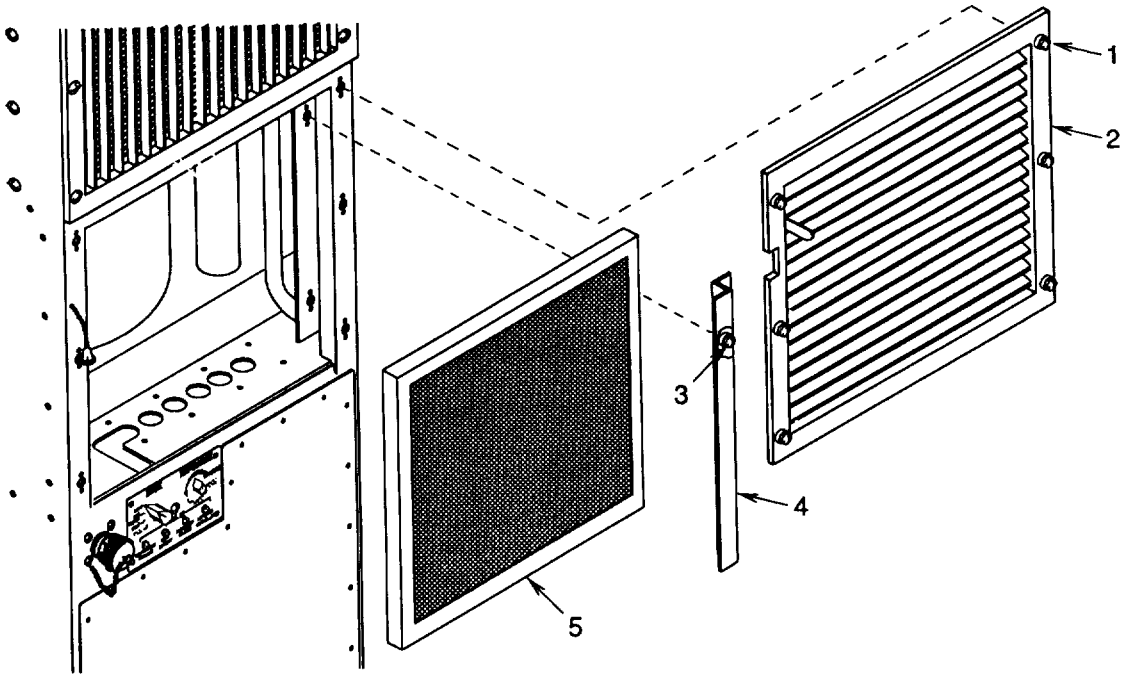


Figure 4-25. Conditioned Air Filter

4-23. CONDITIONED AIR FILTER. - continued

a. Remove.

(1) Loosen six captive turn lock stud fasteners (1) in intake grille assembly (2).

(2) Remove grille assembly (2).

(3) Loosen two captive turn lock stud fasteners (3) in filter retainer (4).

(4) Remove retainer (4) and filter (5).

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

b. Clean.

(1) Immerse filter (5) in a, mild detergent solution or dry cleaning solvent.

(2) Agitate until dirt is removed, using a soft brush if necessary to loosen caked-on dirt.

(3) Rinse in clear water or dry cleaning solvent.

(4) Drain, then hold filter horizontally and tap each edge on bench or floor to dislodge droplets.

(5) Be sure filter (5) is totally dry prior to installation.

c. Inspect.

(1) Check filter (5) for punctures, cuts, and damaged edges that would allow passage of unfiltered air.

(2) Check filter (5) for packed or mashed areas that would block air flow.

(3) Replace filter (5) if found bad.

d. Install.

(1) Place filter (5) into retainer on left side. Be sure that air flow arrows are pointing in toward unit.

(2) Secure filter (5) in place with filter retainer (4) using two captive turn lock stud fasteners (3).

(3) Secure intake grille assembly (2) to unit casing with six captive turn lock stud fasteners (1).

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

4-24. FRESH AIR FILTER.

This task covers: a. Remove b. Clean c. Inspect d. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts

Fresh Air Filter

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

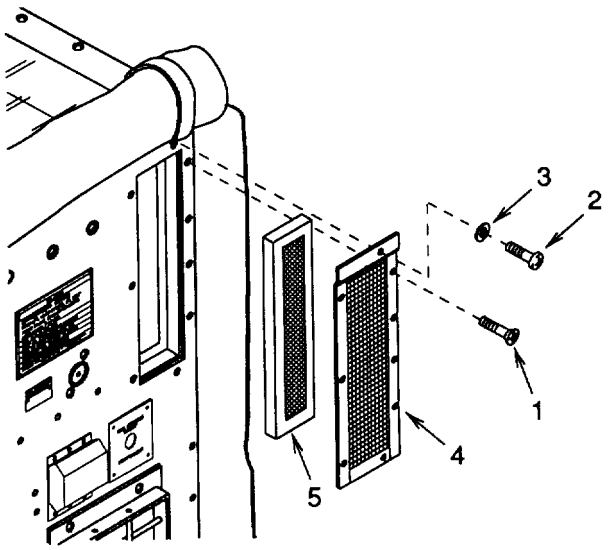


Figure 4-26. Fresh Air Filter

a. Remove.

(1) Remove two flat head screws (1) and five sets of pan head screws (2) and flat washers (3).

(2) Remove fresh air screen (4).

(3) Slip filter (5) out of unit.

4-24. FRESH AIR FILTER.- continued

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

b. Clean.

(1) Immerse filter (5) in a mild detergent solution or dry cleaning solvent.

(2) Agitate until dirt is removed, using a soft brush if necessary to loosen caked-on dirt.

(3) Rinse in clear water or dry cleaning solvent.

(4) Drain, then hold filter horizontally and tap each edge on bench or floor to dislodge droplets.

(5) Be sure filter is totally dry prior to installation.

c. Inspect.

(1) Check filter (5) for punctures, cuts, and damaged edges that would allow passage of unfiltered air.

(2) Check filter (5) for packed or mashed areas that would block air flow.

(3) Replace filter (5) if found bad.

d. Install.

(1) Place filter (5) into unit with UP marking pointing up and directional arrow pointing in toward unit.

(2) Secure fresh air screen (4) to casing with two flat head screws (1) and five sets of pan head screws (2) and flat washers (3).

4-25. MIST ELIMINATOR.

This task covers: a. Remove b. Clean c. Inspect d. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix Brush ft 2

Materials/Parts

Mist Eliminator

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

Equipment Conditions:

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.
Disconnect power at power source.
Remove top panel (para 4-19).

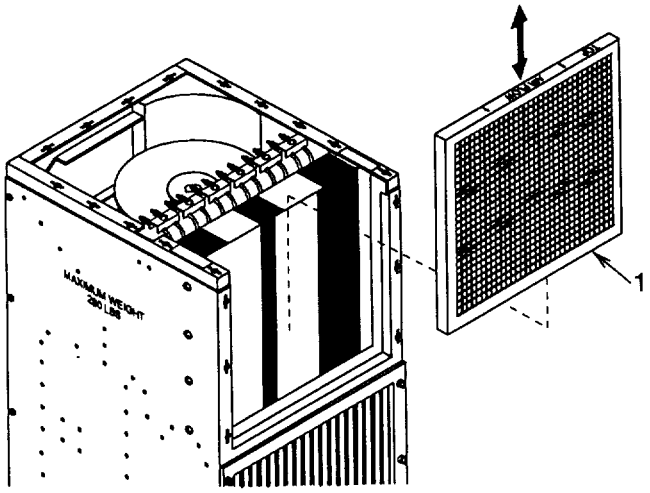


Figure 4-27. Mist Eliminator

a. Remove.

Lift mist eliminator (1) straight up and out of guides.

4-25. MIST ELIMINATOR. - continued

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

b. Clean.

(1) Immerse mist eliminator (1) in a mild detergent solution or dry cleaning solvent.

(2) Agitate until dirt is removed, using a soft brush if necessary to loosen caked-on dirt.

(3) Rinse in clear water or dry cleaning solvent.

(4) Drain, then hold mist eliminator (1) horizontally and tap each edge on bench or floor to dislodge droplets.

(5) Be sure mist eliminator (1) is totally dry prior to installation.

c. Inspect.

(1) Check mist eliminator (1) for punctures, cuts, and damaged edges that would allow air to bypass.

(2) Check mist eliminator (1) for packed or mashed areas that would block air flow.

(3) Replace mist eliminator (1) if found bad.

d. Install.

Slide mist eliminator (1) straight down into guides with UP marking pointing up and directional arrow pointing out away from unit.

NOTE

FOLLOW-ON MAINTENANCE:

Install top panel (para 4-19).

Connect power at power source.

4-26. ELECTRICAL WIRING REPAIR - GENERAL.

This task covers: Repair

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Soldering Gun Kit
Appendix B, item 2

Crimping Tool Kit
Appendix B, item 2

Heat Gun
Appendix B, item 4

Materials/Parts

Wire

Insulation Sleeving
(Heat-Shrink Tubing)

Solder
Appendix E, item 7

Flux
Appendix E, item 6

Equipment Conditions

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result 'if cable is used.

Disconnect power at power source.

Repair

(1) 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. Flux should be brushed onto the joint before soldering. Wires should always be heated to the point at which the solder will melt completely and flow into all parts of the joint. Excessive build-up of solder "gobs" on the joint should be avoided or removed.

(2) 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 length of 1 inch (2.5 cm) 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. 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 in place with moderate heat.

(3) Splicing Wires.

To repair broken or cut wires that are otherwise sound, the mating ends can be stripped and spliced. Solder and apply insulation as described above.

4-26. ELECTRICAL WIRING REPAIR - GENERAL. - continued

(4) 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 the wire, apply a one-inch (2.5 cm) piece of heat-shrink tubing (if the terminals are of the uninsulated type). Insert wire-end into the shank of the terminal. Crimp the shank and install heat-shrink tubing, if necessary.

NOTE

Preferred repair methods consist of replacing wires, terminals, connectors, etc., rather than splicing wires, bending ends to form terminals, and other make-shift procedures, although the latter may be appropriate for emergency field repairs.

(5) Determine the proper size and length of wire, or the terminal, or connector to be used for replacement by referring to Table 4-4, Wire List, and to the wiring diagram figure 4-10.

Table 4-4. WIRE LIST

Termination		Termination		AWG Wire	Length	
From	Terminal Type	To	Terminal Type	Size	IN.	CM
		WIRING HARNESS, COMPRESSOR				
	* Use (97403) 13229E4281-1 (97403) 13229E4279		Plug, Contact, Housing Pin, Universal Contact			
	** Use (97403) 13229E4181-3 (97403) 13229E4272 Pin,		Connector, Pin Housing Connector			
	*** Use (97403) 13229E4181-3 (97403) 13229E4273		Connector, Pin Housing Socket, Connector			
P7-1	*	P14-A	MS3106R20-15S	12	30.0	76.2
P7-2	*	P14-B	MS3106R20-15S	12	30.0	76.2
P7-3	*	P14-C	MS3106R20-15S	12	30.0	76.2
P8-1	**	TB1-1	MS25036-153	16	48.5	123.2
P8-2	**	TB1-2	MS25036-153	16	48.5	123.2
P8-3	**	CR4-1	13216E6191-2	16	26.0	66.1
P8-4	**	CR4-4	13216E6191-2	16	26.0	66.1
P8-5	**	P14-D	MS3106R20-15S	16	30.0	76.2
P8-6	**	P14-E	MS3106R20-15S	16	30.0	76.2
P8-7	***	E4	MS25036-154	16	28.0	71.2
P14-F	MS3106R20-15S	TB1-1	MS25036-153	16	58.5	148.6
P14-G	MS3106R20-15S	TB1-3	MS25036-153	16	59.6	151.5

Table 4-4. WIRE LIST - continued

Termination		Termination		AWG Wire	Length	
From	Terminal Type	To	Terminal Type	Size	IN.	CM
			WIRING HARNESS, CONTROL ENCLOSURE			
*USE	(97403) 13229E4265-4	Connector, Socket Housing				
	(97403) 13229E4273	Socket, Connector				
	(97403) 13229E4272	Pin, Connector				
J10-1	*	K1-A2	MS25036-108	16	20.8	52.9
J10-2	*	K1-B2	MS25036-108	16	19.9	50.6
J10-3	*	K1-C2	MS25036-108	16	19.0	48.3
J10-4	*	K2-A1	MS25036-108	16	15.6	39.6
J10-5	*	K2-B1	MS25036-108	16	15.0	38.1
J10-6	*	K2-Cl	MS25036-108	16	14.4	36.6
J10-7	*	TB2-1	MS25036-106	16	30.8	78.3
J10-8	*	TB2-2	MS25036-106	16	30.8	78.3
J10-9	*	TB2-3	MS25036-106	16	30.8	78.3
J10-10	*	J8-5	13229E4273	16	29.8	75.7
J10-11	*	TB2-4	MS25036-106	16	30.8	78.3
J8-6	13229E4273	TB2-5	MS25036-106	16	25.0	63.5
K2-X2	MS25036-153	TB2-6	MS25036-106	16	39.8	101.1
K1-X2	MS25036-153	TB2-7	MS25036-106	16	36.5	92.7
CR1-4(-)	-	TB2-8	MS25036-106	16	26.0	66.1
K1-X1	MS25036-153	CR1-2(+)	-	16	16.9	42.9
T1-3		CR1-1-		16	10.0	25.4
T1-4	-	CR1-3	-	16	10.0	25.4
K1-Al	MS25036-112	K2-A1	MS25036-112	12	5.8	14.6
K1-B1	MS25036-112	K2-B1	MS25036-112	12	6.0	15.3
K1-C1	MS25036-112	K2-Cl MS25036-112		12	6.3	16.0
K1-X1	MS25036-153	K2-X1	MS25036-153	16	5.8	14.6
			LEAD, ELECTRICAL			
El	MS25036-153	TB2-5	-	16	10.0	25.4
CR4-1	13216E6191-2	K2-A2	MS25036-108	16	29.0	73.7
CR4-4	13216E6191-2	K2-B2	MS25036-108	16	29.0	73.7
S2-2.	13216E6191-2	S6-1	MS25036-108	16	75.0	190.5
S3-2	MS25036-108	S7-2	MS25036-108	16	60.0	152.4
K1-Al	MS25036-108	TBI-1	MS25036-108	16	21.5	54.6
K1-B	MS25036-108	TB1-2	MS25036-108	16	21.5	54.6
K1-Cl	MS25036-108	TB1-3	MS25036-108	16	21.5	54.6
T1-3	-	CR1-1	-	16	14.4	36.6
T1-4	-	CR1-3	-	16	14.4	36.6
T1-1	-	TB1-2	MS25036-108	16	16.5	41.9
T1-2	-	TB1-1	-	16	17.5	44.5
CR1-2(+)	-	K1-X1	MS25036-153	16	15.5	39.4
CR1-2(+)	-	K2-X1	MS25036-153	16	32.0	81.3
CR4-2	13216E6191-2	L1-1	13216E6191-2	16	12.0	30.5
CR4-3	13216E6191-2	L1-2	13216E6191-2	16	12.0	30.5
El	MS25036-157	E2	MS25036-112	12	40.0	101.6
E2	MS25036-112	E4	MS25036-157	12	30.0	76.2
S3-1	MS25036-156	S5-2	MS25036-156	16	5.0	12.7

Table 4-4. WIRE LIST - continued

Termination		Termination		AWG Wire	Length	
From	Terminal Type	To	Terminal Type	Size	IN.	CM
		WIRING HARNESS, CB1 to TB1				
TB1-1	MS25036-156	CB1-LOAD 1	MS25036-112	12	68.7	174.3
TB1-2	MS25036-156	CB1-LOAD 2	MS25036-112	12	68.8	174.8
TB1-3	MS25036-156	CB1-LOAD 3	MS25036-112	12	69.0	175.3
TO SHIELD	-	El	MS25036-154	16	10.0	25.4
		WIRING HARNESS, TP to HEATER				
TP1	MS25036-108	HR1-A	MS25036-108	16	24.6	62.4
TP1	MS25036-108	HR6-A	MS25036-108	16	10.8	27.5
TP2	MS25036-108	HR2-A	MS25036-108	16	22.7	57.6
TP2	MS25036-108	HR5-A	MS25036-108	16	14.4	36.6
TP3	MS25036-108	HR3-A	MS25036-108	16	20.8	52.7
TP3	MS25036-108	HR4-A	MS25036-108	16	18.0	45.7
HR1-B	MS25036-112	HR2-B	MS25036-112	12	5.3	13.5
HR2-B	MS25036-112	HR3-B	MS25036-112	12	5.3	13.5
HR3-B	MS25036-112	HR4-B	MS25036-112	12	5.3	13.5
HR4-B	MS25036-112	HR5-B	MS25036-112	12	5.3	13.5
HR5-B	MS25036-112	HR6-B	MS25036-112	12	5.3	13.5
		WIRING HARNESS, J4 to P15				
J4-A	MS3100R18-11P	P15-A	13229E6718-2	12	30.0	76.2
J4-B	MS3100R18-11P	P15-B	13229E6718-2	12	30.0	76.2
J4-C	MS3100R18-11P	P15-C	13229E6718-2	12	30.0	76.2
J4-D	MS3100R18-11P	P15-D	13229E6718-2	12	30.0	76.2
J4-E	MS3100R18-11P	P15-E	13229E6718-2	12	30.0	76.2
		WIRING HARNESS J6 TO P1				
*Use (97403) 13229E4286		Cable				
J6-1	M24308/2-2	P1-8	M24308/2-2	*	8.0	20.3
J6-2	M24308/2-2	P1-7	M24308/2-2	*	8.0	20.3
J6-3	M24308/2-2	P1-6	M24308/2-2	*	8.0	20.3
J6-4	M24308/2-2	P1-5	M24308/2-2	*	8.0	20.3
J6-5	M24308/2-2	P1-4	M24308/2-2	*	8.0	20.3
J6-6	M24308/2-2	P1-3	M24308/2-2	*	8.0	20.3
J6-7	M24308/2-2	P1-2	M24308/2-2	*	8.0	20.3
J6-8	M24308/2-2	P1-1	M24308/2-2	*	8.0	20.3
J6-9	M24308/2-2	P1-15	M24308/2-2	*	8.0	20.3
J6-10	M24308/2-2	P1-14	M24308/2-2	*	8.0	20.3
J6-11	M24308/2-2	P1-13	M24308/2-2	*	8.0	20.3
J6-12	M24308/2-2	P1-12	M24308/2-2	*	8.0	20.3
SHIELD	-	GRN	MS25036-148	20	4.0	10.2

Table 4-4. WIRE LIST - continued

Termination		Termination		AWG Wire	Length	
From	Terminal Type	To	Terminal Type	Size	IN.	CM
		WIRING HARNESS, J7/J8 to K2				
* Use	(97403) 13229E4282-1		Cap, Contact Housing			
	(97403) 13229E4280		Socket, Universal Contact			
** Use	(97403) 13229E4265-3		Connector, Socket Housing			
	(97403) 13229E4273		Socket, Connector			
*** Use	(97403) 13229E4265-3		Connector, Socket Housing			
	(97403) 13229E4272		Pin, Connector			
J7-1	*	K2-A2	MS25036-112	12	17.5	44.5
J7-2	*	K2-B2	MS25036-112	12	18.1	46.0
J7-3	*	K2-C2	MS25036-112	12	18.8	47.6
J8-1	**	T1-i	16	25.3	64.2	
J8-2	**	T1-2	16	25.3	64.2	
J8-3	**	K2-A2	MS25036-108	16	17.5	44.5
J8-4	**	K2-B2	MS25036-108	16	18.1	46.0
J8-7	***	E3	MS25036-108	16	21.3	54.0
		WIRING HARNESS, J11				
J11-A	MS3102R20-15P	B1-TI	(00779) 42563-2	14	10.0	25.4
J11-B	MS3102R20-15P	B1-T2	(00779) 42563-2	14	10.0	25.4
J11-C	MS3102R20-15P	B1-T3	(00779) 42563-2	14	10.0	25.4
J11-D	MS3102R20-15P	J4-E	-	20	10.0	25.4
J11-E	MS3102R20-15P	J4-D	-	20	10.0	25.4
J11-F	MS3102R20-15P	HR7				
J11-G	MS3102R20-15P	S9				
		WIRING HARNESS, J13 to J9				
* Use	(97403) 13229E7260-2 Receptacle					
	(97403) 13229E7263 Contact, Female					
J13-1	*	J9-1	13229E4279	10	16.0	40.7
J13-2	*	J9-2	13229E4279	10	16.0	40.7
J13-3	*	J9-3	13229E4279	10	16.0	40.7
J13-4	*	J9-4	13229E4279	10	16.0	40.7
J13-5	*	J9-5	13229E4280	10	16.0	40.7
SHIELD	-	E3	MS25036-108	20	2.0	5.1

Table 4-4. WIRE LIST - continued

Termination		Termination		AWG Wire	Length	
From	Terminal Type	To	Terminal Type	Size	IN.	CM
		WIRING HARNESS, P3				
P3-7	13229E4183	TB2-1	MS25036-145	24	15.0	38.1
P3-2	13229E4183	TB2-2	MS25036-145	24	15.0	38.1
P3-1	13229E4183	TB2-3	MS25036-145	24	15.0	38.1
P3-6	13229E4183	TB2-4	MS25036-145	24	15.0	38.1
P3-8	13229E4183	TB2-5	MS25036-145	24	15.0	38.1
P3-3	13229E4183	TB2-6	MS25036-145	24	15.0	38.1
P3-4	13229E4183	TB2-7	MS25036-145	24	15.0	38.1
P3-5	13229E4183	TB2-8	MS25036-145	24	15.0	38.1
		WIRING HARNESS CONTROL PANEL (P6)				
P6-1	M24308/4-303	R1-3	-	22	8.0	20.3
P6-2	M24308/4-303	DS1-4-A	-	22	4.2	10.7
P6-3	M24308/4-303	S1-Cl	-	22	6.0	15.3
P6-4	M24308/4-303	DS1-C	-	22	4.8	12.2
P6-5	M24308/4-303	S1-2	-	22	6.0	15.3
P6-6	M24308/4-303	S1-4	-	22	6.0	15.3
P6-7	M24308/4-303	S1-3	-	22	6.0	15.3
P6-8	M24308/4-303	S1-1	-	22	6.0	15.3
P6-9	M24308/4-303	DS2-C	-	22	5.2	13.2
P6-10	M24308/4-303	DS3-C	-	22	4.2	10.7
P6-11	M24308/4-303	DS4-C	-	22	6.2	15.8
P6-12	M24308/4-303	R1-2	-	22	8.0	20.3
		WIRING HARNESS, P9 to TB1/E2				
*Use	(97403) 13229E4281-3	Plug, Contact, Housing				
	(97403) 13229E4280	Socket, Universal Contact				
** Use	(97403) 13229E4281-3	Plug, Contact Housing				
	(97403) 13229E4279	Pin, Universal Contact				
P9-1	*	TB1-1	MS25036-156	12	31.5	80.0
P9-2	*	TB1-2	MS25036-156	12	32.1	81.5
P9-3	*	TB1-3	MS25036-156	12	32.6	82.9
P9-4	*	TB1-4	MS25036-156	12	33.2	84.3
P9-5	**	E2	MS25036-112	12	10.0	25.4
SHIELD	E2	MS25036-103	20	10.0	25.4	

Table 4-4. WIRE LIST - continued

Termination		Termination		AWG Wire	Length	
From	Terminal Type	To	Terminal Type	Size	IN.	CM
		WIRING HARNESS, CONTROL CIRCUIT, P10				
* Use	(97403) 13229E4181-4	Connector, Pin Housing				
	(97403) 13229E4272	Pin, Connector				
** Use	(97403) 13229E4181-4	Connector, Pin Housing				
	(97403) 13229E4273	Socket, Connector				
TP1	MS25036-108	P10-1	*	16	55.0	139.7
TP2	MS25036-108	P10-2	*	16	53.0	134.6
TP3	MS25036-108	P10-3	*	16	51.0	129.6
P11-A	MS3106R16S-8S	P10-4	*	16	50.0	127.0
P11-B	MS3106R16S-8S	P10-5	*	16	50.0	127.0
P11-C	MS3106R16S-8S	P10-6	*	16	50.0	127.0
P11-D	MS3106R16S-8S	E2	MS25036-108	16	48.0	121.9
S4-4	P10-7	*		16	52.5	133.4
S5-1	MS25036-153	P10-10	*	16	45.0	114.3
RT1-1	Solder	P10-9	*	16	10.0	25.4
RT1-2	Solder	P10-8	*	16	10.0	25.4
S4-5	P10-11	**		16	52.5	133.4
S3-2	MS25036-153	S2-1	13216E6191-3	16	48.5	123.2
S2-2	13216E6191-2	S4-5	-	16	8.5	21.6
		WIRING HARNESS, P12 to K2				
* Use	(97403) 13229E7259-2	Plug				
	(97403) 13229E7262	Contact, Male				
P12-1	*	K2-A1	MS25036-112	10	4.8	12.1
P12-2	*	K2-B1	MS25036-112	10	5.4	13.7
P12-3	*	K2-C1	MS25036-112	10	6.0	15.2
P12-5	*	E3	MS25036-112	10	3.0	7.6
		WIRING HARNESS, P16 to CB1/E1				
P16-A	13229E6718-1	CB1-LINE 1	MS25036-112	12	41.5	105.4
P16-B	13229E6718-1	CB1-LINE 2	MS25036-112	12	42.3	107.3
P16-C	13229E6718-1	CB1-LINE3	MS25036-112	12	43.0	109.2
P16-D	13229E6718-1	TB1-4	MS25036-156	12	7.0	17.8
P16-E	13229E6718-1	El	MS25036-157	12	50.0	127.0

4-27. CONTROL PANEL.

This task covers: a. Remove b. Inspect c. Repair d. Install e. Adjust

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Control Panel

Equipment Conditions

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

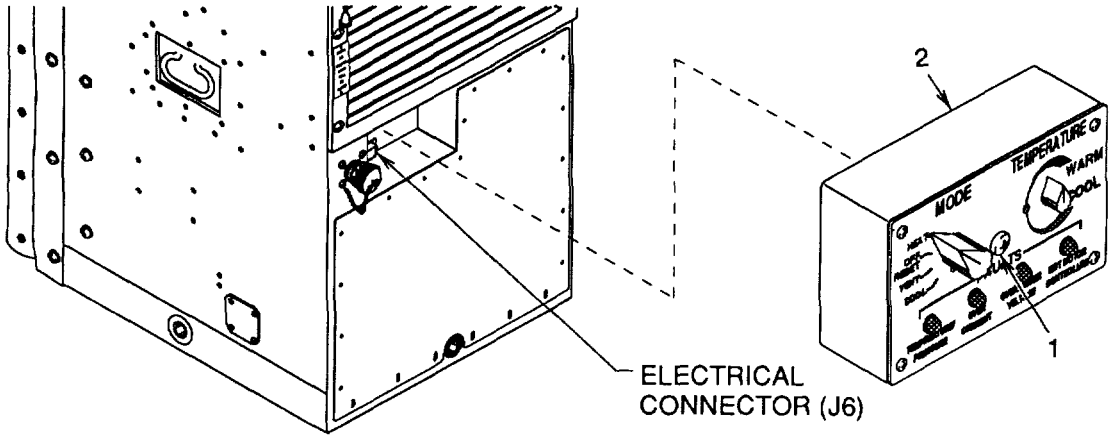


Figure 4-28. Control Panel

NOTE

The control panel is normally located in the front of the unit. If it is remote mounted, see facility or shelter manual.

a. Remove.

Loosen captive mounting screw (1) and carefully work control panel (2) from unit.

b. Inspect.
If the control panel is damaged beyond repair, replace it with a new control panel.

c. Repair.

See paragraphs 4-28 through 4-31 for individual components.

4-27. CONTROL PANEL. - continued

d. Install.

Carefully work control panel (2) into unit and tighten captive mounting screw (1).

e. Adjust.

Set controls for desired mode of operation.

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

4-28. WIRING HARNESS, CONTROL PANEL.

This task covers: a. Inspect b. Test c. Repair d. Replace

INITIAL SETUP

Tools
Refrigeration Unit Service Tool Kit
Appendix B, item 1

Soldering Gun Kit
Appendix B, item 2

Heat Gun
Appendix B, item 4

Materials/Parts

Wire

Control Panel Wiring Harness

Lock Washers (6)

Insulation Sleeving
(Heat-Shrink Tubing)

Soldier
Appendix E, item 7

Equipment Conditions:

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove control panel (para 4-27).

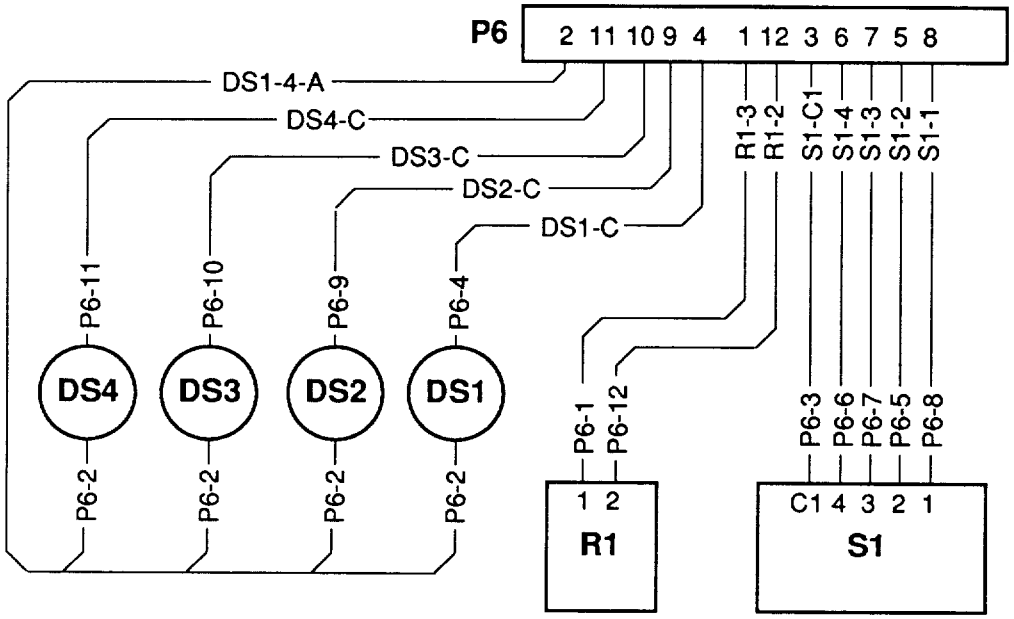
---

a. Inspect.

(1) Remove four sets of screws (1), lock washers (2), and flat washers (3) securing control panel (4) to control box (5).

(2) Carefully pull control panel (4) away from control box (5) as far as harness (9) will allow.

4-28. WIRING HARNESS, CONTROL PANEL. - continued



CONTROL PANEL WIRING DIAGRAM

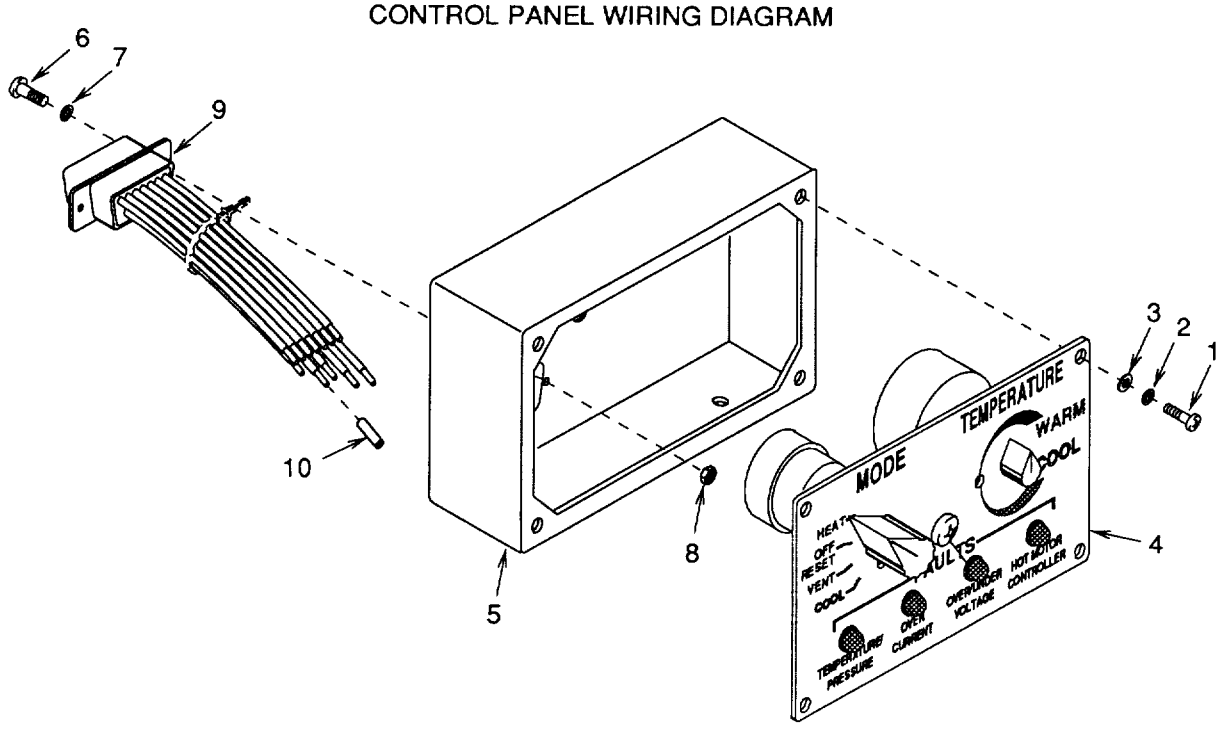


Figure 4-29. Wiring Harness, Control Panel

4-28. WIRING HARNESS, CONTROL PANEL.-continued

(3) Check connector P6 for general condition and loose, broken, or missing contact pins. Replace connector P6 if damaged.

(4) Check individual wires for loose solder connections, cut or frayed insulation, and cut or broken wires. Replace any individual damaged wires.

b. Test.

See wiring diagram and continuity test individual wires. Repair or replace wires with no continuity.

c. Repair.

(1) See paragraph 4-26 for general wire repair instructions.

(2) See Table 4-4 Wire List for wire lengths and terminal information when individual wires are replaced.

d. Replace.

(1) Remove two sets of screws (6), lock washers (7), and nuts (8) from connector P6.

(2) If wires are to be replaced on connector P6, release and remove contact pins.

(3) Tag and unsolder leads from switches and light emitting diodes. Remove harness (9).

(4) Cut heat shrink tubing (10) to approximately three-quarter inch (1.9 cm) long.

(5) Slip heat shrinkable tubing (10) over leads.

(6) Solder leads in place or reconnect terminals using tags and wiring diagram.

(7) Slip heat shrinkable tubing (10) over solder connection and shrink in place.

(8) Remove tags.

(9) Secure connector P6 to box with two sets of screws (6), lock washers (7), and nuts (8).

(10) Secure control panel (4) to box (5) using four sets of screws (1), lock washers (2), and flat washers (3).

NOTE

FOLLOW-ON MAINTENANCE:

Install control panel (para 4-27).

Connect power at power source.

4-29. POTENTIOMETER (TEMPERATURE CONTROL) (R1).

This task covers: a. Inspect b. Test c. Replace d. Adjust

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1 CAT

Soldering Gun Kit
Appendix B, item 2

Heat Gun
Appendix B, item 4

Materials/Parts

Potentiometer

Lock Washers (4)

Insulation Sleeving
(Heat-Shrink Tubing)

Solder
Appendix E, item 7

Equipment Conditions:

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove control panel (para 4-27).

a. Inspect.

(1) Remove four sets of screws (1), lock washers (2), and flat washers (3) securing control panel (4) to control box (5).

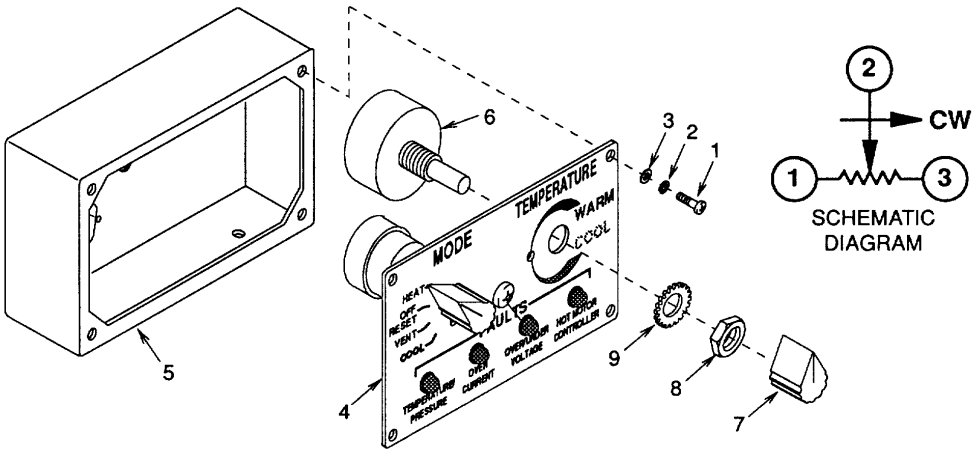


Figure 4-30. Potentiometer (TEMPERATURE Control) (R1)

4-29. POTENTIOMETER (TEMPERATURE CONTROL) (R1).-continued

(2) Carefully pull control panel (4) away from control box (5) as far as harness will allow.

(3) Check potentiometer TEMPERATURE control (6) for general condition and loose, broken, or missing terminals. Replace potentiometer if damaged.

b. Test

(1) Using schematic diagram, check resistance across potentiometer TEMPERATURE control (6) terminals. Resistance across terminals 2 and 3 should be 0 to 60 ohms when turned fully clockwise WARM and 4500 to 5500 ohms when turned fully counterclockwise COOL.

(2) Replace potentiometer TEMPERATURE control (6) if it tests defective.

c. Replace.

(1) Loosen two setscrews holding knob (7) to potentiometer TEMPERATURE control (6). Remove knob.

(2) Remove nut (8), lock washer (9), and potentiometer TEMPERATURE control (6).

(3) Tag and unsolder leads from potentiometer TEMPERATURE control (6) terminals. Remove potentiometer TEMPERATURE control (6).

(4) Cut heat shrink tubing to approximately three-quarter inch (1.9 cm) long.

(5) Slip heat shrinkable tubing over leads.

(6) Solder leads in place on potentiometer TEMPERATURE control (6) terminals using tags and wiring diagram figure 4-10. (See paragraph 4-26.)

(7) Slip heat shrinkable tubing over solder connection and shrink in place.

(8) Remove tags.

(9) Install potentiometer TEMPERATURE control (6) into control panel (4) and secure with lock washer (9) and nut (8).

(10) Adjust potentiometer TEMPERATURE control (6) shaft to midway point and install knob (7) pointing midway on TEMPERATURE scale. Secure knob to shaft with two setscrews.

(11) Secure control panel (4) to box (5) using four sets of screws (1), lock washers (2), and flat washers (3).

d. Adjust.

Adjust potentiometer TEMPERATURE control (6) to desired setting.

NOTE

FOLLOW-ON MAINTENANCE:

Install control panel (para 4-27).

Connect power at power source.

4-30. MODE SELECTOR ROTARY SWITCH (S1).

This task covers: a. Inspect b. Test c. Replace d. Adjust

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Soldering Gun Kit
Appendix B, item 2

Heat Gun
Appendix B, item 4

Materials/Parts

Mode Selector Rotary Switch

Lock Washers (4)
Solder
Appendix E, item 7
Insulation Sleeving
(Heat-Shrink Tubing)

Equipment Conditions:

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove control panel (para 4-27).

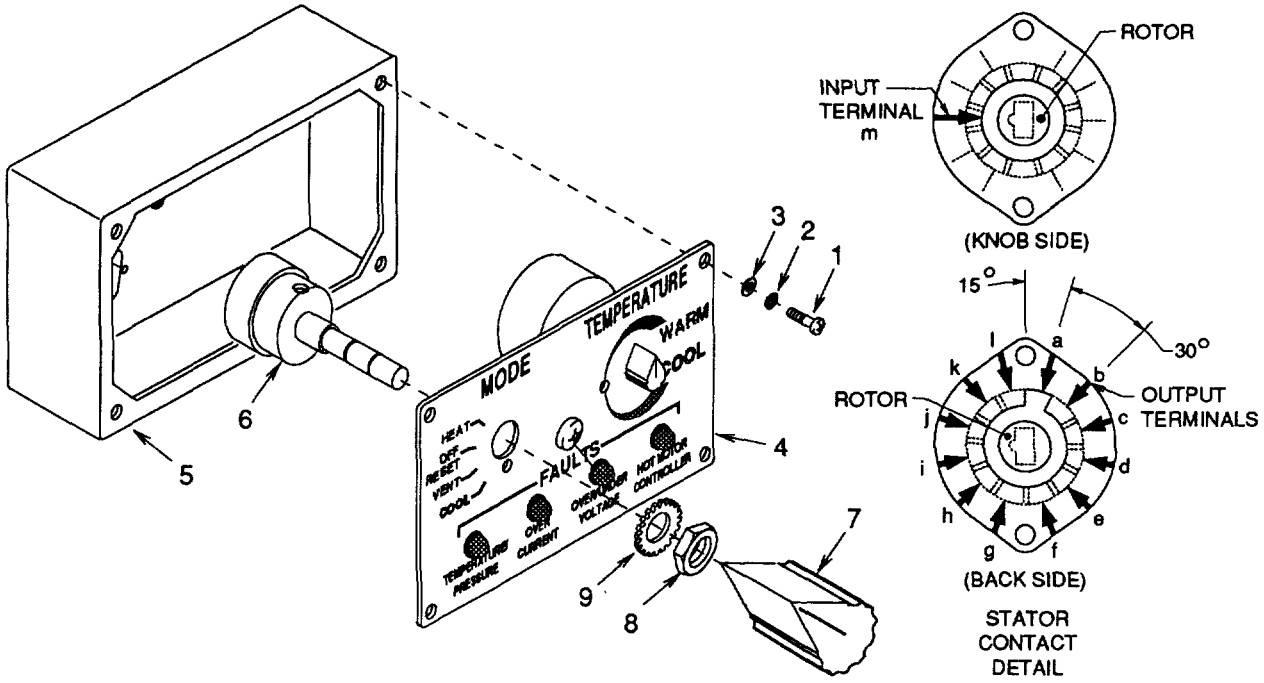


Figure 4-31. MODE Selector Rotary Switch (S1)

4-30. MODE SELECTOR ROTARY SWITCH (S1). - continued

a. Inspect.

(1) Remove four sets of screws (1), lock washers (2), and flat washers (3) securing control panel (4) to control box (5).

(2) Carefully pull control panel (4) away from control box (5) as far as harness will allow.

(3) Check MODE selector rotary switch (6) for general condition and loose, broken, or missing terminals. Replace MODE selector rotary switch if damaged.

b. Test.

(1) Using stator contact detail diagram, check continuity across MODE selector rotary switch (6) terminals.

(a) In OFF/RESET position continuity should be indicated between input terminal (m) and output terminal(b).

(b) In VENT position continuity should be indicated between input terminal (m) and output terminal (c).

(c) In COOL position continuity should be indicated between input terminal (m) and output terminal (d).

(d) In HEAT position continuity should be indicated between input terminal (m) and output terminal (a).

(2) Replace MODE selector rotary switch (6) if it tests defective.

c. Replace.

(1) Loosen two setscrews holding knob (7) to MODE selector rotary switch (6). Remove knob.

(2) Remove nut (8) and lock washer (9) from MODE selector rotary switch (6) and pull out of control panel (4).

(3) Tag and unsolder leads from MODE selector rotary switch (6) terminals. (See paragraph 4-26.) Remove MODE selector rotary switch.

(4) Cut heat shrink tubing to approximately three-quarter inch (1.9 cm) long.

(5) Slip heat shrinkable tubing over leads.

(6) Solder leads in place on MODE selector rotary switch (6) terminals using tags and wiring diagram figure 4-10. (See paragraph 4-26.)

(7) Slip heat shrinkable tubing over solder connection and shrink in place.

(8) Remove tags.

(9) Install MODE selector rotary switch (6) into control panel (4) and secure with lock washer (9) and nut (8).

(10) Adjust MODE selector rotary switch (6) shaft to fully clockwise position and install knob (7) pointing toward HEAT. Secure knob to shaft with setscrews.

(11) Secure control panel (4) to box (5) using four sets of screws (1), lock washers (2), and flat washers (3).

d. Adjust.

Adjust MODE selector rotary switch to desired setting.

4-30. MODE SELECTOR ROTARY SWITCH (S1). -continued

NOTE

FOLLOW-ON MAINTENANCE:

Install control panel (para 4-27).

Connect power at power source.

4-31. FAULT INDICATOR, LIGHT EMITTING DIODE (DS1, DS2, DS3, AND DS4).

This task covers: a. Inspect b. Test c. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Light Emitting Diode

Lock Washers (4)

Equipment Conditions:

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove control panel (para 4-27).

a. Inspect.

(1) Remove four sets of screws (1), lock washers (2), and flat washers (3) securing control panel (4) to control box (5).

(2) Carefully pull control panel (4) away from control box (5) as far as harness will allow.

(3) Check light emitting diodes (6) for loose or broken wire leads. Replace if damaged.

b. Test.

(1) Using a multimeter set to test diodes, connect red lead to connector P6 pin number 2 and black lead in turn to pins number 4, 9, 10, and 11 (DS1, DS2, DS3, and DS4). The multimeter should indicate between 1 and 2 volt drop on each pin

(2) Reverse the leads from step (1) above and repeat check. The multimeter should give no indication on any pin.

(3) Replace any light emitting diode (6) that tests defective.

4-31. FAULT INDICATOR, LIGHT EMITTING DIODE (DS1, DS2, DS3, AND DS4). - continued

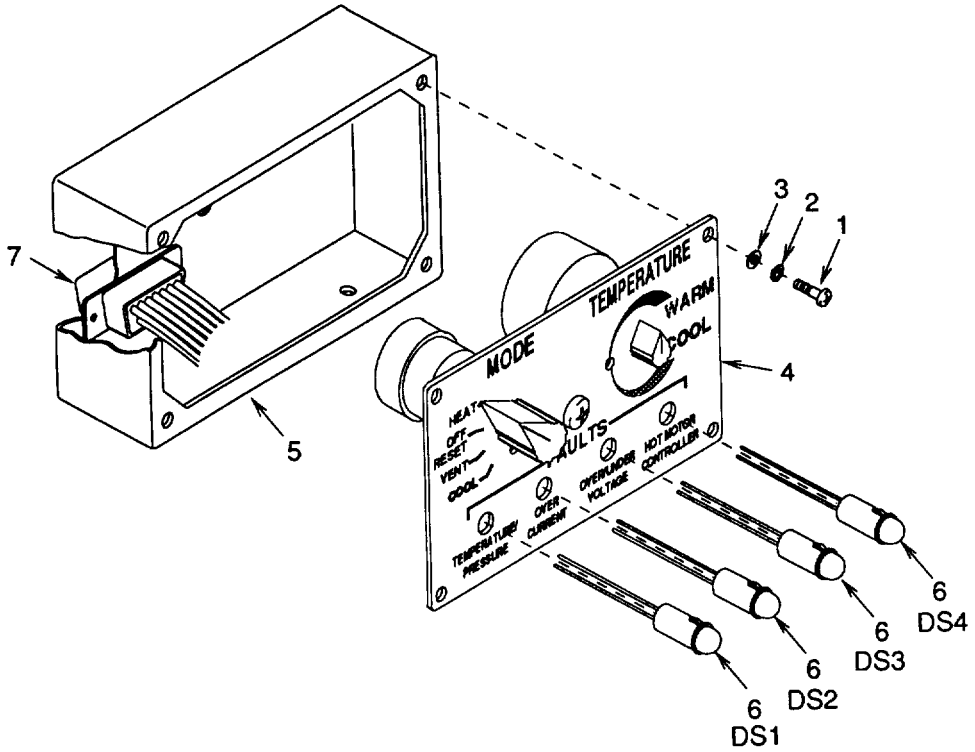


Figure 4-32. Light Emitting Diodes (DS1, DS2, DS3, & DS4)

c. Replace.

(1) Tag lead and release and remove contact pin from connector (7).

(2) Tag leads and cut cap splice off wire bundle.

(3) Carefully push light emitting diode (6) out of control panel (4).

(4) Carefully push light emitting diode (6) into control panel (4).

(5) Crimp new connector P6 pin onto black light emitting diode (6) lead and insert into connector (7).

(6) Strip red leads and bundle using cap splice.

(7) Remove tags.

(8) Secure control panel (4) to box (5) using four sets of screws (1), lock washers (2), and flat washers (3).

NOTE

FOLLOW-ON MAINTENANCE:

Install control panel (para 4-27).

Connect power at power source.

4-32. ELECTROMAGNETIC INTERFERENCE FILTER (FL1).

This task covers: a. Inspect b. Test c. Replace

INITIAL SETUP

Tools
Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Electromagnetic Interference Filter

Lock Washers (12)

Equipment Conditions

CAUTION
Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

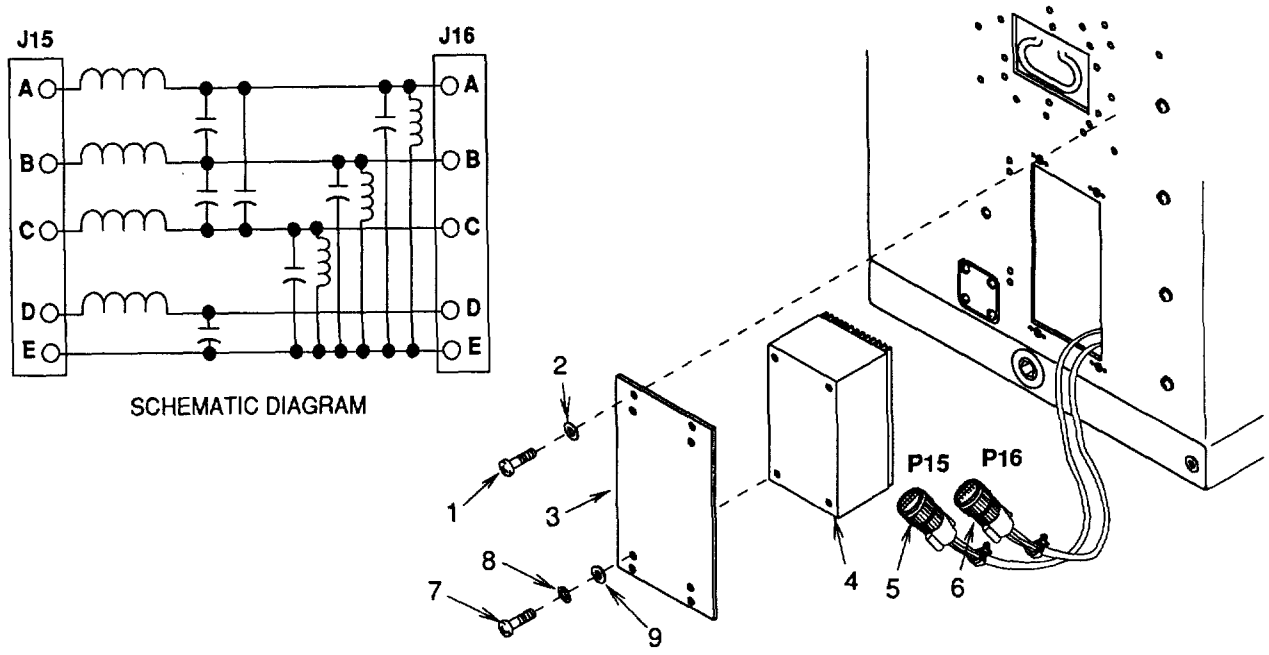


Figure 4-33. Electromagnetic Interference Filter (FL1)

a. Inspect.

(1) Remove four sets of outermost screws (1) and flat washers (2).

(2) Slip mounting plate (3) and electromagnetic interference filter (4) out of frame and support filter.

4-32. ELECTROMAGNETIC INTERFERENCE FILTER (FL1). -continued

WARNING

Capacitors can retain a high electrical charge. Touching the terminals of a charged capacitor can result in severe electrical shock and skin burns. Always ground the terminals of a capacitor as soon as they are exposed.

(3) Disconnect the P15 (5) and P16 (6) plugs from the electromagnetic interference filter (4).

(4) Discharge filter capacitors at connector J15.

(5) Check electromagnetic interference filter (4) for dents, punctures, and evidence of overheating.

(6) Check connectors J15 and J16 for loose, missing, or broken contacts.

(7) Replace filter (4) if badly dented, punctured, burnt, or connectors have loose, missing, or broken contacts.

b. Test.

(1) Check continuity between J16 contacts A, B, C, D, and E to filter case. If continuity is indicated, replace filter.

(2) Check continuity as shown in table 4-5. If electromagnetic interference filter (4) does not meet continuity requirements, replace it.

NOTE

Continuity testing does not necessarily predict the behavior of capacitors under load. If the filter still does not operate properly after passing the continuity test, substitute a filter known to be good.

Table 4-5. Electromagnetic Interference Filter (FL1) Test Points.

From receptacle J15, pin	To receptacle J16, pin	Indication
A	A	Continuity
A	B	None
A	C	None
A	D	None
A	E	None
B	B	Continuity
B	C	None
B	D	None
B	E	None
C	C	Continuity
C	D	None
C	E	None
D	D	Continuity
D	E	None
E	E	Continuity

4-32. ELECTROMAGNETIC INTERFERENCE FILTER (FL1). - continued

c. Replace.

(1) Remove four sets of screws (7), lock washers (8) and flat washers (9).

(2) Separate electromagnetic interference filter (4) and mounting plate (3).

(3) Secure electromagnetic interference filter (4) to mounting plate (3) with four sets of screws (7), lock washers (8), and flat washers (9).

(4) Connect the P15 (5) and P16 (6) plugs to the electromagnetic interference filter (4).

(5) Carefully slip electromagnetic interference filter (4) into frame and secure plate (3) to casing with four sets of screws (1) and flat washers (2).

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

4-33. COIL FROST SWITCH (S2).

This task covers: a. Inspect b. Test c. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Coil Frost Switch

Lock Washers (2)

Equipment Conditions:

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove top panel (para 4-19).

a. Inspect.

Check coil frost switch (1) for general condition and loose, broken, or missing terminals. Replace switch if damaged.

b. Test.

(1) Tag and disconnect wire leads from coil frost switch (1).

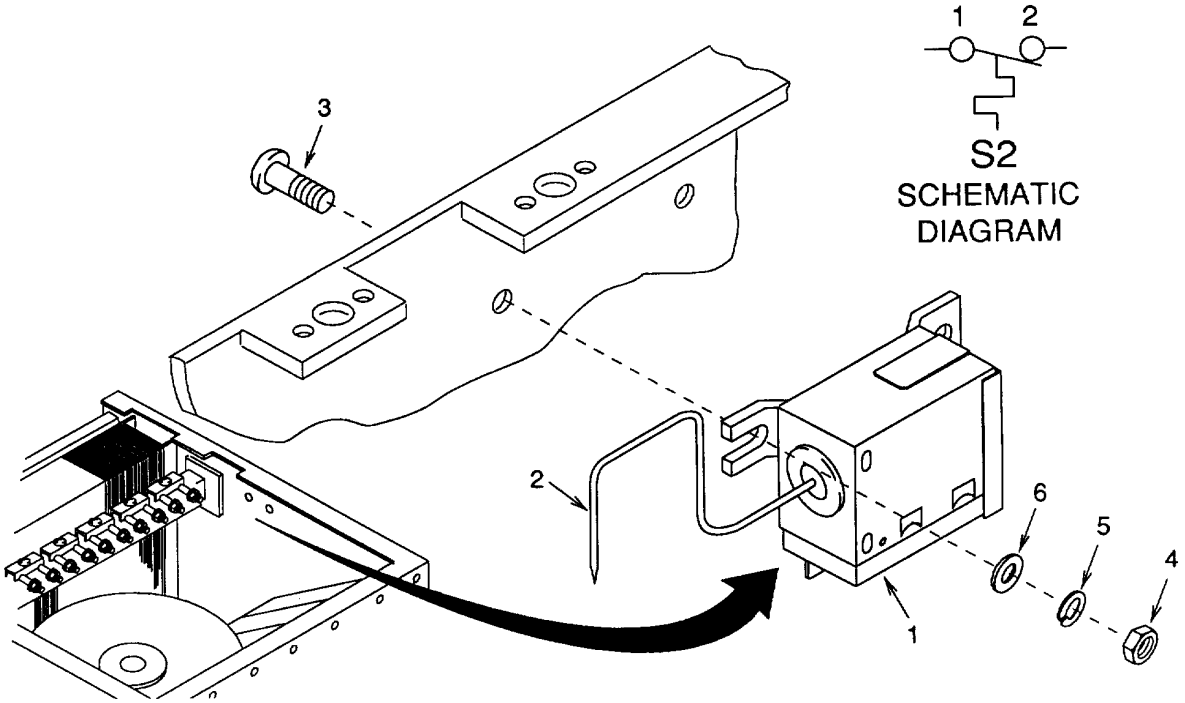


Figure 4-34. Coil Frost Switch (S2)

4-33. COIL FROST SWITCH (S2). - continued

CAUTION

Be careful not to kink capillary line temperature sensor.

(2) Carefully pull capillary line temperature sensor (2) from evaporator coil.

(3) Remove two sets of screws (3), nuts (4), lock washers (5), flat washers (6), and coil frost switch (1).

(4) Place the capillary line temperature sensor (2) in a temperature controlled bath, 470 to 520F (80 to 110C) and set multimeter to measure continuity. Place multimeter leads on terminals 1 and 2 of the coil frost switch (1). A closed circuit (continuity) should be indicated.

(5) Place the capillary line temperature sensor (2) in a temperature controlled bath, 240 to 29OF (-4° to -20°C) and set multimeter to measure continuity. Place multimeter leads on terminals 1 and 2 of the coil frost switch (1). An open circuit (no continuity) should be indicated.

(6) Replace coil frost switch (1) if it tests defective or is damaged.

c. Replace.

(1) Tag and disconnect wire leads from coil frost switch (1).

CAUTION

Be careful not to kink capillary line temperature sensor.

(2) Carefully pull capillary line temperature sensor (2) from evaporator coil.

(3) Remove two sets of screws (3), nuts (4), lock washers (5), flat washers (6), and coil frost switch (1).

CAUTION

Be careful not to kink capillary line temperature sensor.

(4) Carefully shape' the new capillary line temperature sensor (2) to match the old capillary line temperature sensor.

(5) Secure new coil frost switch (1) to casing with two sets of screws (3), flat washers (6), lock washers (5), and nuts (4).

(6) Carefully insert capillary line temperature sensor (2) into evaporator coil.

(7) Connect wire leads to coil frost switch (1) using tags and wiring diagram figure 4-10. Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:

Install top panel (para 4-19).

Connect power at power source.

4-34. CONTROL ASSEMBLY

This task covers: a. Remove b. Inspect c. Repair d. Replace e. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Control Assembly

Lock Washers (12)

Equipment Conditions:

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove lower front cover (para 4-20).

Remove conditioned air filter (para 4-23).

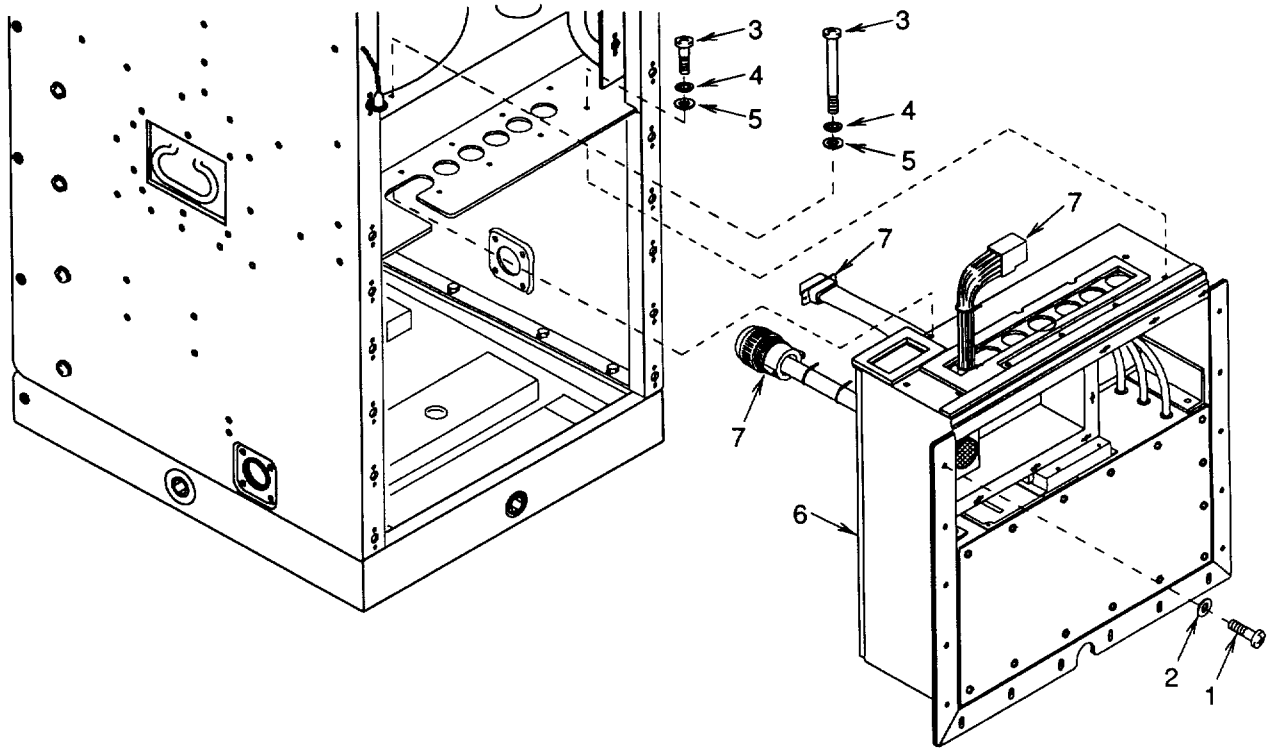


Figure 4-35. Control Assembly Removal/Installation

4-34. CONTROL ASSEMBLY. - continued

a. Remove.

(1) Disconnect power cable from control assembly if attached.

(2) Remove screw (1) and flat washer (2).

(3) Remove 12 sets of screws (3), lock washers (4), and flat washers (5).

(4) Carefully pull control assembly (6) from unit as far as wiring harnesses will allow.

(5) Tag and disconnect wiring harness connectors (7) from unit.

b. Inspect.

Check control assembly (6) for dents, punctures, or any other damage.

c. Repair.

See paragraphs 4-35 through 4-41 for individual components.

d. Replace.

Replace enclosure (6) if damaged and any damaged components.

e. Install.

(1) Connect wiring harness connectors (7) to unit using tags and wiring diagram figure 4-10. Remove tags.

(2) Carefully install control assembly (6) into unit.

(3) Secure control assembly (6) with 12 sets of screws (3), lock washers (4), and flat washers (5).

(4) Install screw (1) and flat washer (2).

(5) Connect power cable to control assembly if disconnected.

NOTE

FOLLOW-ON MAINTENANCE:

Install lower front cover (para 4-20).

Install conditioned air filter (para 4-23).

Connect power at power source.

4-35. CONTROL ASSEMBLY WIRING HARNESSES.

This task covers: a. Inspect b. Test c. Repair d. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Wiring Harness

Lock Washers (6)

Equipment Conditions:

CAUTION
Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove control assembly (para 4-34).

a. Inspect.

(1) Inspect connectors for loose, damaged or missing pins. Replace if defective.

(2) Check individual wires for loose solder connections, loose terminal lugs, cut or frayed insulation, cut or broken wires.

b. TEST.

See wiring diagram figure 4-10. Continuity test individual wires. Replace or repair wires with no continuity.

c. Repair.

(1) See paragraph 4-26 for general wire repair instructions.

(2) See Table 4-3 Wire List for wire lengths and terminal information when individual wires are replaced.

(3) Replace individual wires, terminals, or connectors if defective.

d. Replace.

NOTE

Remove motor controller assembly (MC1) and logic box assembly (LGC1) as needed for accessibility.

(1) Tag and disconnect individual wires and connectors from unit components.

(2) Remove four sets of screws (1), nuts (2), lock washers (3), and flat washers (4), cap (5), and gasket (6) from connector J4.

(3) Remove two sets of screws (7) nuts (8), lock washers (9), and flat washers (10) from connector J6.

4-35. CONTROL ASSEMBLY WIRING HARNESSES. - continued

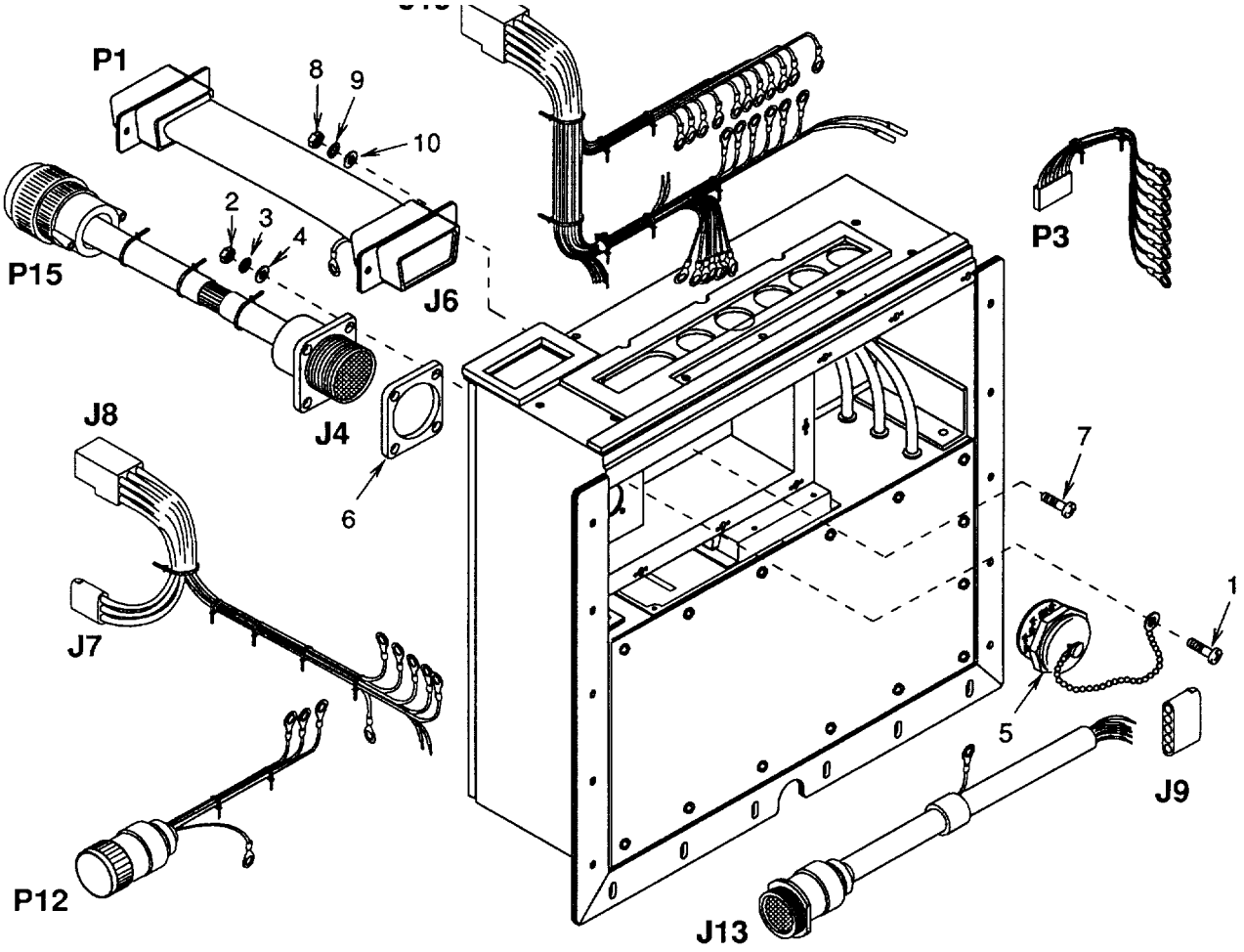


Figure 4-36. Control Assembly Wiring Harnesses

(4) Install connector J6 with two sets of screws (7), nuts (8), lock washers (9), and flat washers (10).

(5) Install connector J4, gasket (6), and cap (5) with four sets of screws (1), nuts (2), lock washers (3), and flat washers (4).

(6) Using tags and wiring diagram figure 4-10, connect the wire leads and connectors to unit components. Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:

Install control assembly (para 4-34).

Connect power at power source.

4-36. LOGIC BOX ASSEMBLY (LGC1).

This task covers: a. Remove b. Inspect c. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Logic Box Assembly

Lock Washers (2)

Equipment Conditions

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove control assembly (para 4-34).

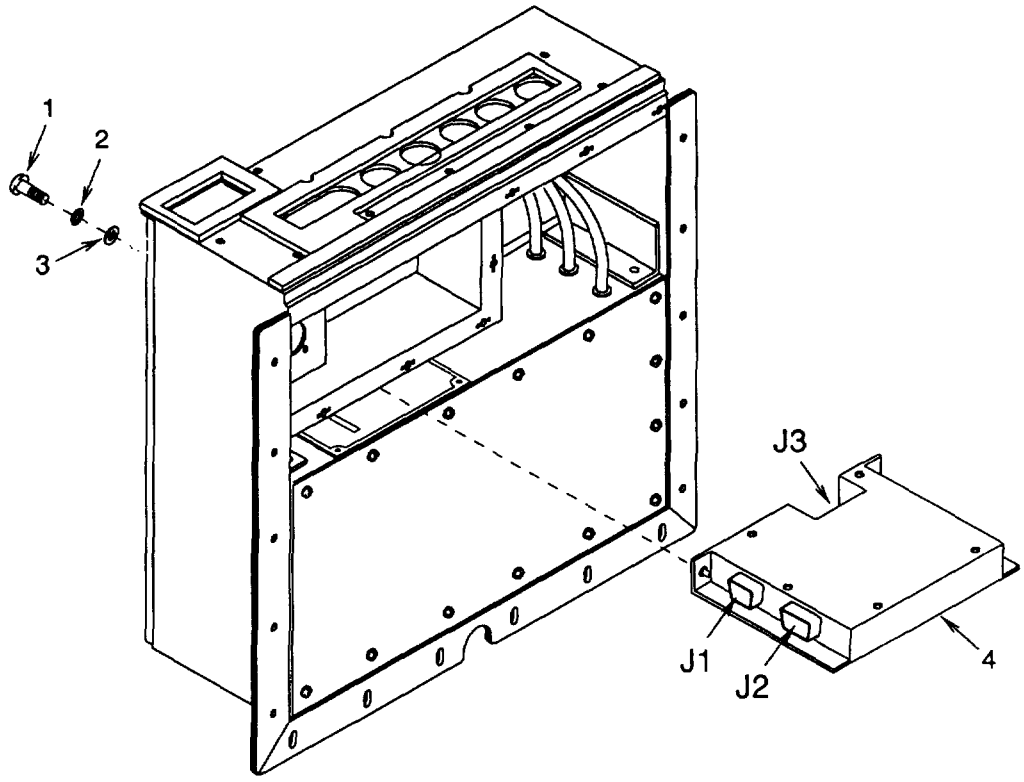


Figure 4-37. Logic Box Assembly (LGC1)

4-36. LOGIC BOX ASSEMBLY (LGC1). - continued

a. Remove.

(1) Remove two sets of screws (1), lock washers (2),and flat washers (3).

(2) Remove logic box assembly (4) from control assembly.

(3) Tag and disconnect wiring harness plugs from connectors J1, J2, and J3.

b. Inspect.

(1) Check for dents, punctures, or cracked welds. Replace logic box assembly (4) if damaged.

(2) Check connectors J1, J2, and J3 for general condition and loose, broken, or missing contact pins. Replace logic box assembly (4) if any connectors are damaged.

c. Install.

(1) Connect wiring harness plugs to connectors J1, J2, and J3. Remove tags.

(2) Install logic box assembly (4) into control assembly and secure with two sets of screws (1), lock washers (2), and flat washers (3).

NOTE

FOLLOW-ON MAINTENANCE:

Install control assembly (para 4-34).

Connect power at power source.

4-37. MOTOR CONTROLLER ASSEMBLY (MC1).

This task covers: a. Remove b. Inspect c. Test d. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Motor Controller Assembly

Lock Washers (4)

Equipment Conditions:

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove control assembly (para 4-34).

Remove logic box assembly (para 4-36).

a. Remove.

(1) Remove four sets of screws (1), lock washers (2), and flat washers (3).

(2) Remove motor controller assembly (4) from control assembly.

(3) Tag and disconnect wiring harness connectors P2, J12, and P13.

b. Inspect.

(1) Check for dents, punctures, or cracked welds. Replace motor controller assembly (4) if damaged.

(2) Check connectors P2, J12, and P13 for general condition and loose, broken, or missing contact pins. Replace motor controller assembly (4) if any connectors are damaged.

c. Test.

(1) No test can be done to check the operation of the motor controller assembly (4). If the motor controller assembly fails, the unit will not run in any mode and no indicator lights will be on.

(2) If a failure is suspected, replace motor controller assembly (4) with one known to be good. d. Install.

(1) Connect wiring harness connectors P2, J12, and P13. Remove tags.

(2) Install motor controller assembly (4) into control assembly and secure with four sets of screws (1), lock washers (2), and flat washers (3).

4-37. MOTOR CONTROLLER ASSEMBLY (MC1). - continued

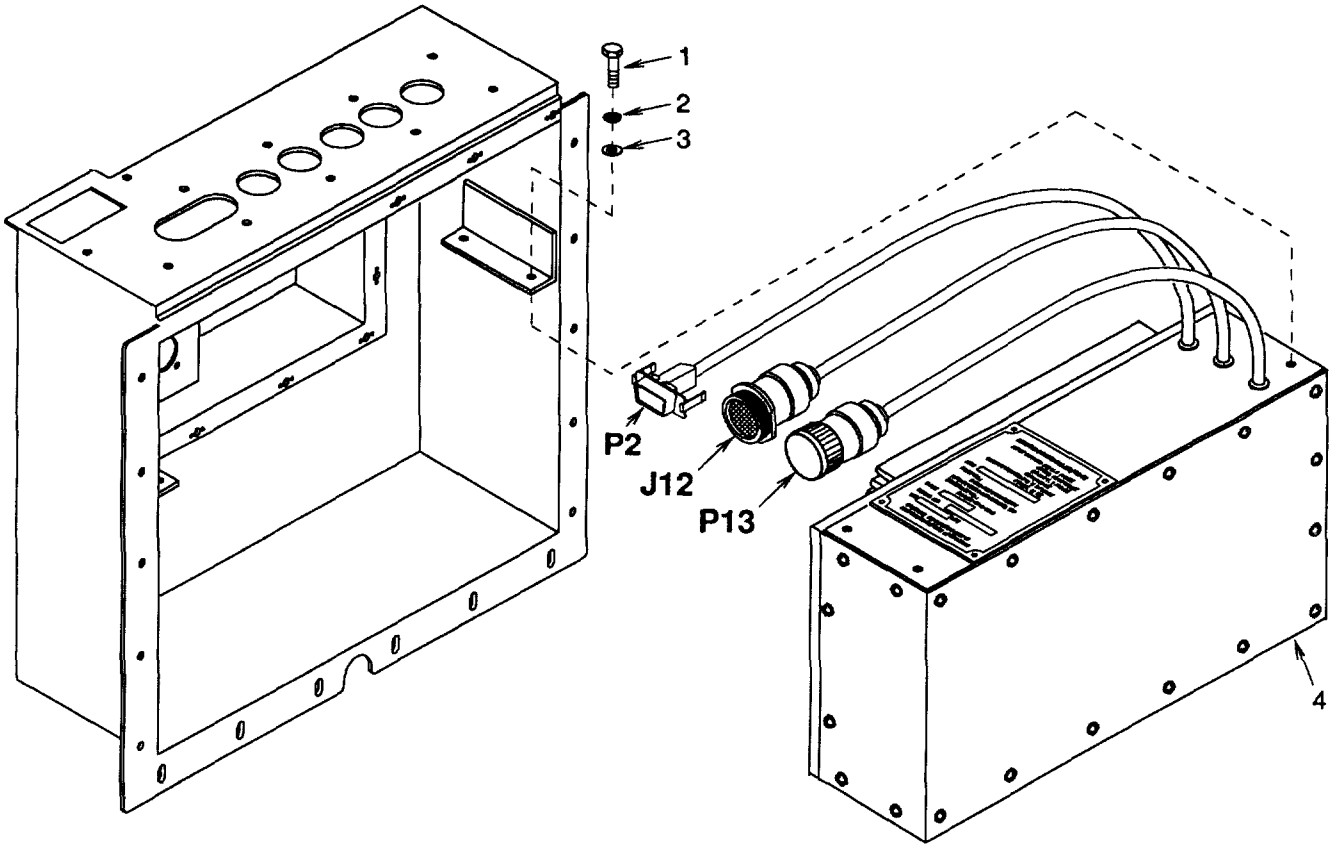


Figure 4-38. Motor Controller Assembly (MC1)

NOTE

FOLLOW-ON MAINTENANCE:

Install logic box assembly (LGC1) (para 4-36).

Install control assembly (para 4-34).

Connect power at power source.

4-38. RECTIFIER (CR1) AND CAPACITORS (C1 AND C2).

This task covers: a. Remove b. Inspect c. Test d. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Soldering Gun Kit
Appendix B, item 2

Heat Gun
Appendix B, item 4

Materials/Parts

Rectifier

Capacitor

Lock Washer

Insulation Sleeving
(Heat-Shrink Tubing)

Solder
Appendix E, item 7

Flux
Appendix E, item 6

Equipment Conditions

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove control assembly (para 4-34).

Remove logic box assembly (para 4-36).

Remove motor controller assembly (para 4-37).

a. Remove.

(1) Using a tool with an insulated handle, short across capacitor terminals to discharge them.

(2) Remove screw (1), lock washer (2), and flat washer (3).

(3) Pull rectifier (4) out of control assembly as far as wire leads will allow.

(4) Tag and unsolder wire leads and capacitors (5) and (6) from rectifier (4) terminals. (See paragraph 4-26.)

b. Inspect.

Check rectifier (4) and capacitors (5) and (6) for general condition and broken or missing terminals or leads. Replace if damaged.

4-38. RECTIFIER (CR1) AND CAPACITORS (C1 AND C2). - continued

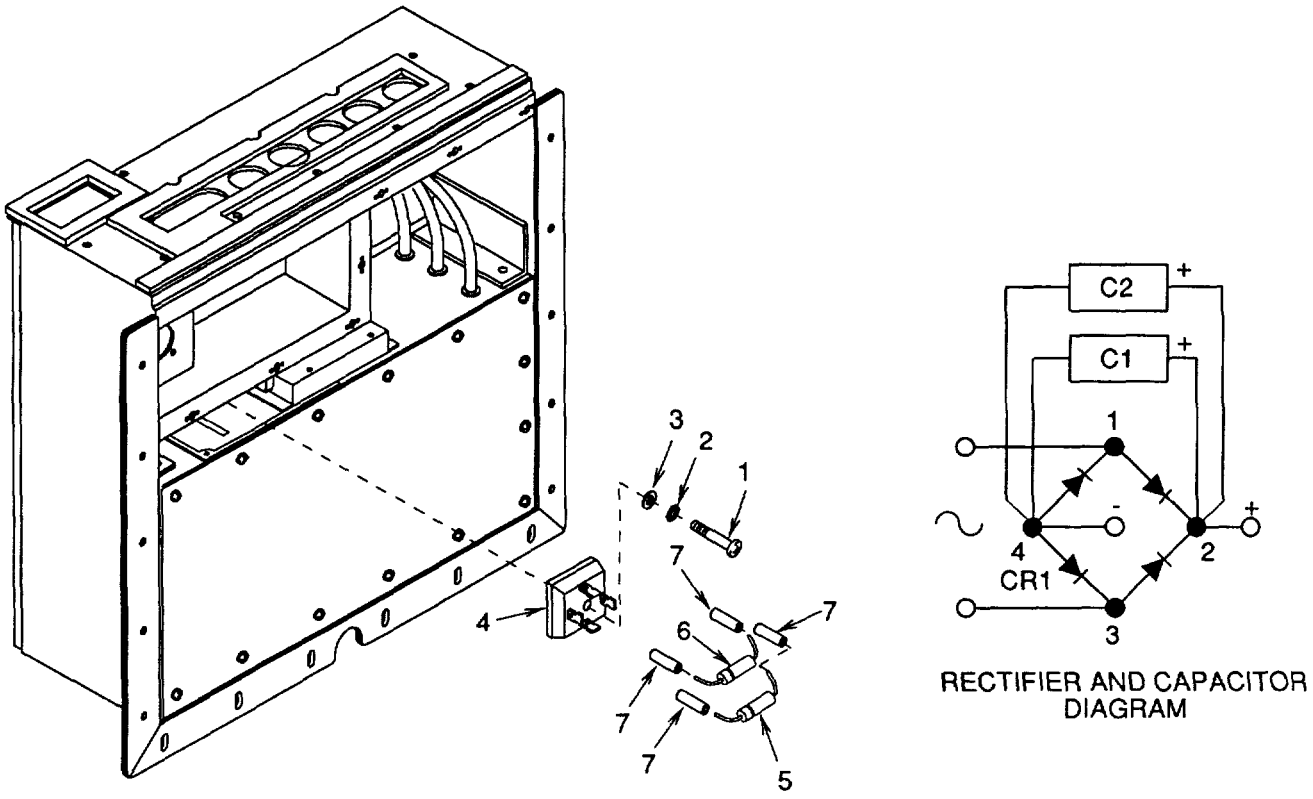


Figure 4-39. Rectifier (CR1) and Capacitors (C1 and C2)

c. Test.

(1) Rectifier (CR1).

(a) Using a multimeter on high ohms setting connect negative (-) lead to terminal 2 and positive (+) lead to terminal 1 or 3. A low resistance reading should be indicated.

(b) Connect positive lead to terminal 2 and negative lead to terminal 1 or 3. An open circuit should be indicated.

(c) Connect positive lead to terminal 4 and negative lead to terminal 1 or 3. A short circuit should be indicated.

(d) Connect negative lead to terminal 4 and positive lead to terminal 1 or 3. An open circuit should be indicated.

NOTE

The ohmmeter test does not show the behavior of a capacitor under load. Such testing requires special equipment which is not economically practical for testing small capacitors. If breakdown under load is suspected, replace the capacitor.

14-38. RECTIFIER (CR1) AND CAPACITORS (C1 AND C2). - continued

(2) Capacitors (C1) and (C2).

(a) Using a multimeter set to read high resistance, place positive lead to positive terminal and negative lead to negative terminal of capacitor.

(b) If capacitor is good, multimeter needle should move rapidly to top of scale then slowly return to zero. The capacitor is internally short circuited if needle moves to top of scale and stays there. The capacitor has an open circuit if the needle does not move.

NOTE

Replace rectifier (CR1) and capacitors (C1) and (C2) if any one component is defective.

d. Install.

(1) Slip heat shrink tubing (7) over capacitor (5) and (6) leads. Heat to shrink in place.

(2) Solder wire and capacitor leads in place using tags and wiring diagram. Remove tags. (See paragraph 4-26.)

(3) Secure in place using screw (1), lock washer (2), and flat washer (3).

NOTE

FOLLOW-ON MAINTENANCE:

Install motor controller assembly (para 4-37).

Install logic box assembly (para 4-36).

Install control assembly (para 4-34).

Connect power at power source.

4-39. TRANSFORMER (T1).

This task covers: **a. Remove** **b. Inspect** **c. Test** **d. Install**

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Soldering Gun Kit
Appendix B, item 2

Heat Gun
Appendix B, item 4

Materials/Parts

Transformer

Lock Washers (8)

Insulation Sleeving
(Heat-Shrink Tubing)

Solder
Appendix E, item 7
Flux

Appendix E, item 6

Equipment Conditions:

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used

Disconnect power at power source.

Remove control assembly (para 4-34).

Remove logic box assembly (para 4-36).

Remove motor controller assembly (para 4-37).

a. Remove

(1) Tag and unsolder wire leads. (See para 4-26.)

(2) Remove four screws (1), four nuts (2), eight lock washers (3), and four flat washers (4). Pull transformer (5) from unit.

b. Inspect.

Check transformer (5) for signs of damage or overheating. Replace if damaged.

c. Test.

(1) Check for continuity across the primary winding pin 1 to pin 2 and across the secondary winding pin 3 to pin 4. If either winding is open, replace transformer.

(2) Check for shorts between one terminal of each winding and transformer case and also between one primary terminal and one secondary terminal using an insulation tester, Megohmmeter or multimeter on high ohms setting. Replace transformer if a short is indicated.

(3) Apply 208.0 volts AC +20.8 input to terminals 1 and 2. Voltage at transformer output terminals 3 and 4 should be 23.5 volts AC +0.7. Remove power from transformer. Replace if defective.

4-39. TRANSFORMER (T1). -continued

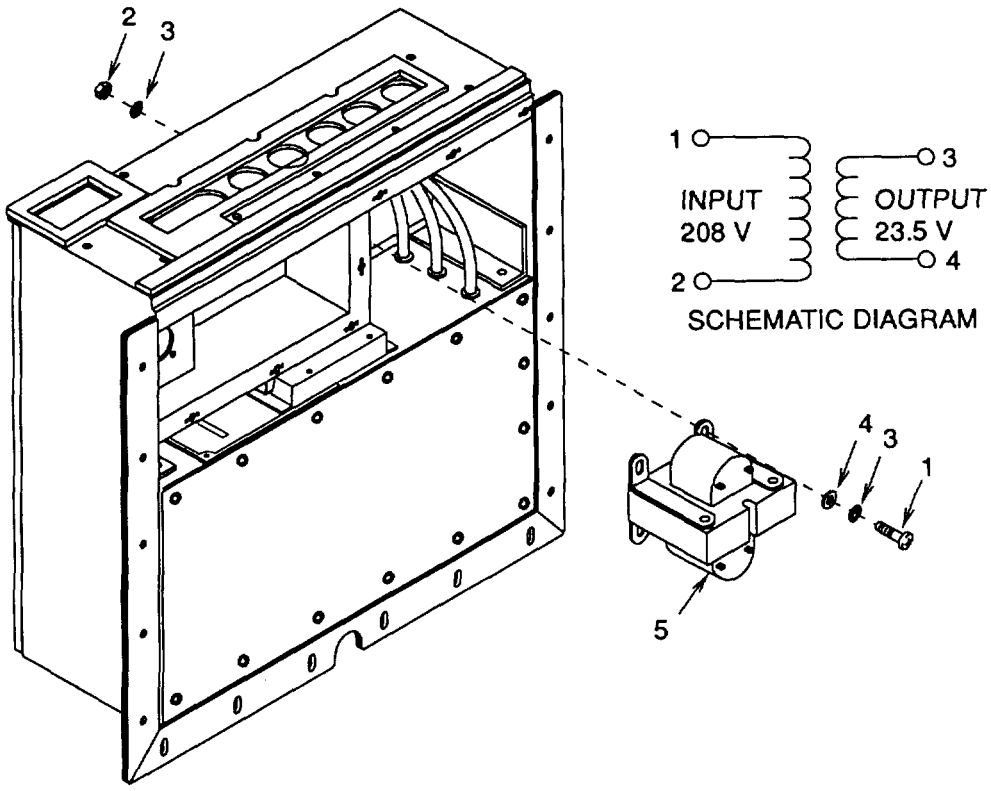


Figure 4-40. Transformer (T1)

d. Install.

(1) Attach transformer (5) to unit with four screws (1), eight lock washers (3), four flat washers (4), and four nuts (2).

(2) See wiring diagram figure 4-10 and tags and solder all wire leads. Remove tags. (See paragraph 4-26.)

NOTE

FOLLOW-ON MAINTENANCE:

Install motor controller assembly (para 4-37).

Install logic box assembly (para 4-36).

Install control assembly (para 4-34).

Connect power at power source.

14-40. COMPRESSOR START RELAY (K2), DIODE (CR3), AND SURGE ARRESTOR (SA1).

This task covers: **a. Remove** **b. Inspect** **c. Test** **d. Install**

INITIAL SETUP

Tools
Refrigeration Unit Service Tool Kit
Appendix B, item 1

Power Supply
Appendix B, item 6

Heat Gun
Appendix B, item 4

Crimping Tool Kit
Appendix B, item 2

Materials/Parts

Compressor Start Relay

Diode

Surge Arrestor

Lock Washers (7)

Lug Terminals (4)

Insulation Sleeving

(Heat-Shrink Tubing)

Insulation Tubing

Equipment Conditions:

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove control assembly (para 4-34).

Remove logic box assembly (para 4-36).

Remove motor controller assembly (para 4-37).

a. Remove.

(1) Tag and disconnect wire leads from ground E3.

(2) Remove three sets of screws (1), lock washers (2), and flat washers (3). Carefully pull relay bracket (4) and relays from control assembly as far as wire leads will allow.

NOTE

Terminal protective cover must be removed to access wire terminals.

(3) Tag and disconnect wire leads, diode assembly, and surge arrestor assembly from relay (5).

(4) Remove four sets of screws (6), lock washers (7), flat washers (8), and relay (5).

4-40. COMPRESSOR START RELAY (K2), DIODE (CR3), AND SURGE ARRESTOR (SA1). -continued

b. Inspect.

Check general condition of relay (5), diode (9), and surge arrestor (10) and that terminals are not broken or missing. Replace if damaged..

c. Test.

(1) Compressor start relay (5).

(a) Apply 28VDC to terminals X1 (positive) and X2 (negative).

(b) Check continuity across terminals Al and A2; B1 and B2, and C1 and C2. The multimeter must show that contacts are closed (continuity).

(c) Remove power. Multimeter must show that contacts are open (no continuity).

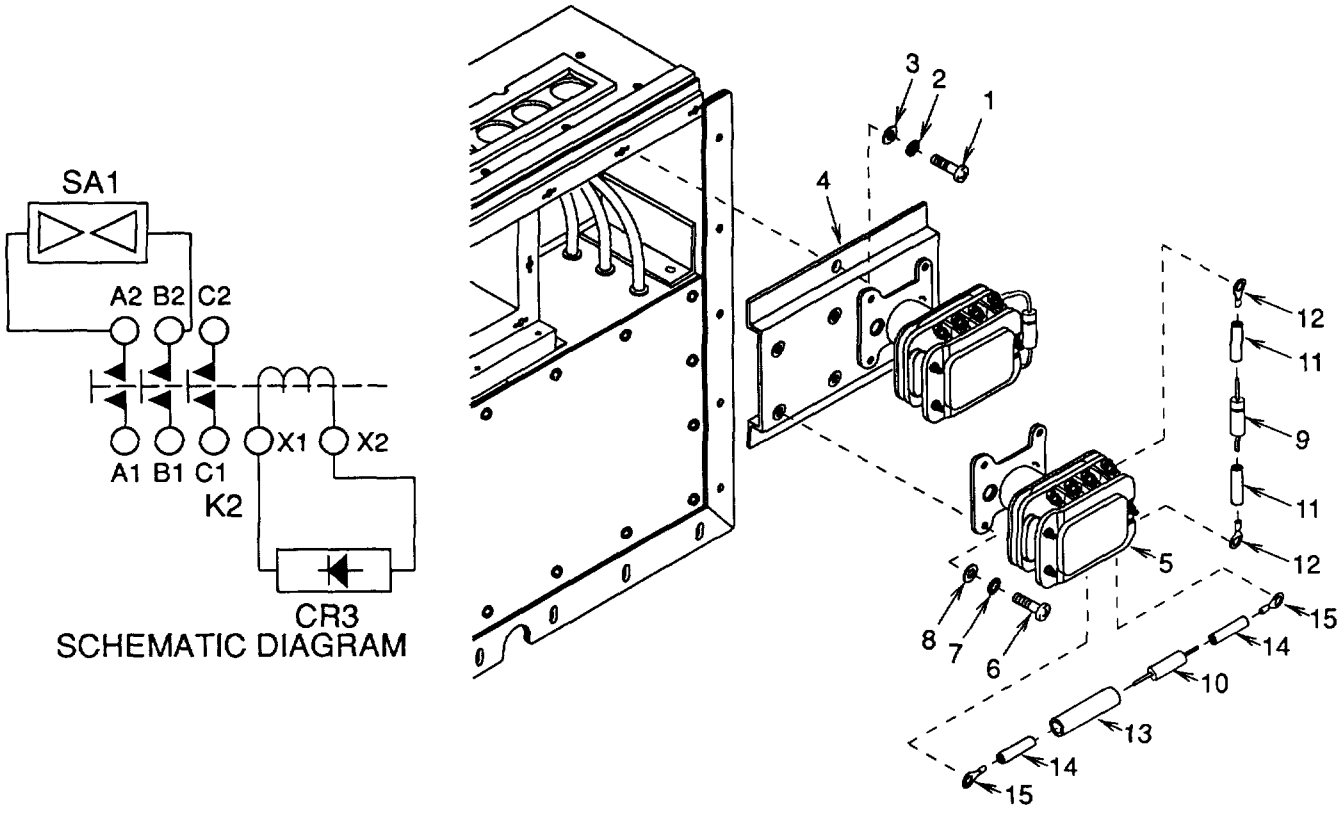


Figure 4-41. Compressor Start Relay (K2), Diode (CR3), and Surge Arrestor (SA1)

4-40. COMPRESSOR START RELAY (K2), DIODE (CR3), AND SURGE ARRESTOR (SA1). - continued

(2) Diode (9).

(a) Using a multimeter set to test diodes, connect black lead to band end of diode and red lead to opposite end. The multimeter should indicate between 0.5 and 1.75 volt drop.

(b) Reverse the leads from step (a) above and check. The multimeter should give no indication.

(3) Surge arrestor (10).

Check continuity across leads. The multimeter should indicate an open circuit.

d. Replace.

(1) Replace relay (5) if defective.

(2) Replace diode (9) if defective.

(a) Cut insulation sleeving (11) to 3/4 inch (1.9 cm) long.

(b) Slip insulation sleeving (11) over leads.

(c) Crimp lug terminals (12) onto lead ends.

(3) Replace surge arrestor (10) if defective.

(a) Cut insulation sleeving (13) and insulation tubing (14) to approximately 1 inch (2.5 cm) long each.

(b) Slip insulation sleeving (13) over arrestor (10) body and insulation tubing (14) over leads. Heat to shrink insulation sleeving (13) in place.

(c) Crimp lug terminals (15) onto lead ends.

e. Install.

(1) Mount relay (5) to bracket (4) using four sets of screws (6), lock washers (7), and flat washers (8).

(2) Using wiring diagram figure 4-10 and tags, connect leads, diode assembly, and surge arrestor assembly to relay (5). Band end of diode connects to terminal X1. Remove tags.

(3) Carefully position relay bracket (4) and relays (5) in control assembly and secure with three sets of screws (1), lock washers (2), and flat washers (3).

(4) Using wiring diagram figure 4-10 and tags, connect wire leads to ground E3. Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:

Install motor controller assembly (para 4-37).

Install logic box assembly (para 4-36).

Install control assembly (para 4-34).

Connect power at power source.

4-41. HEATER RELAY (K1) AND DIODE (CR2).

This task covers:	a. Remove	b. Inspect	c. Test	d. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Power Supply
Appendix B, item 6

Heat Gun
Appendix B, item 4

Crimping Tool Kit
Appendix B, item 2

Materials/Parts

Heater Relay

Diode

Lock Washers (7)

Lug Terminals (2)

Insulation Sleeving
(Heat-Shrink Tubing)

Equipment Conditions:

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove control assembly (para 4-34).

Remove logic box assembly (para 4-36).

Remove motor controller assembly (para 4-37).

a. Remove.

(1) Tag and disconnect wire leads from ground E3.

(2) Remove three sets of screws (1), lock washers (2), and flat washers (3). Carefully pull relay bracket (4) and relays from control assembly as far as wire leads will allow.

NOTE
Terminal protective cover must be removed to access wire terminals.

(3) Tag and disconnect wire leads and diode assembly from relay (5).

(4) Remove four sets of screws (6), lock washers (7), flat washers (8), and relay (5).

b. Inspect.

Check general condition of relay and diode and that terminals are not broken or missing. Replace if damaged.

4-41. HEATER RELAY (K1) AND DIODE (CR2). - continued

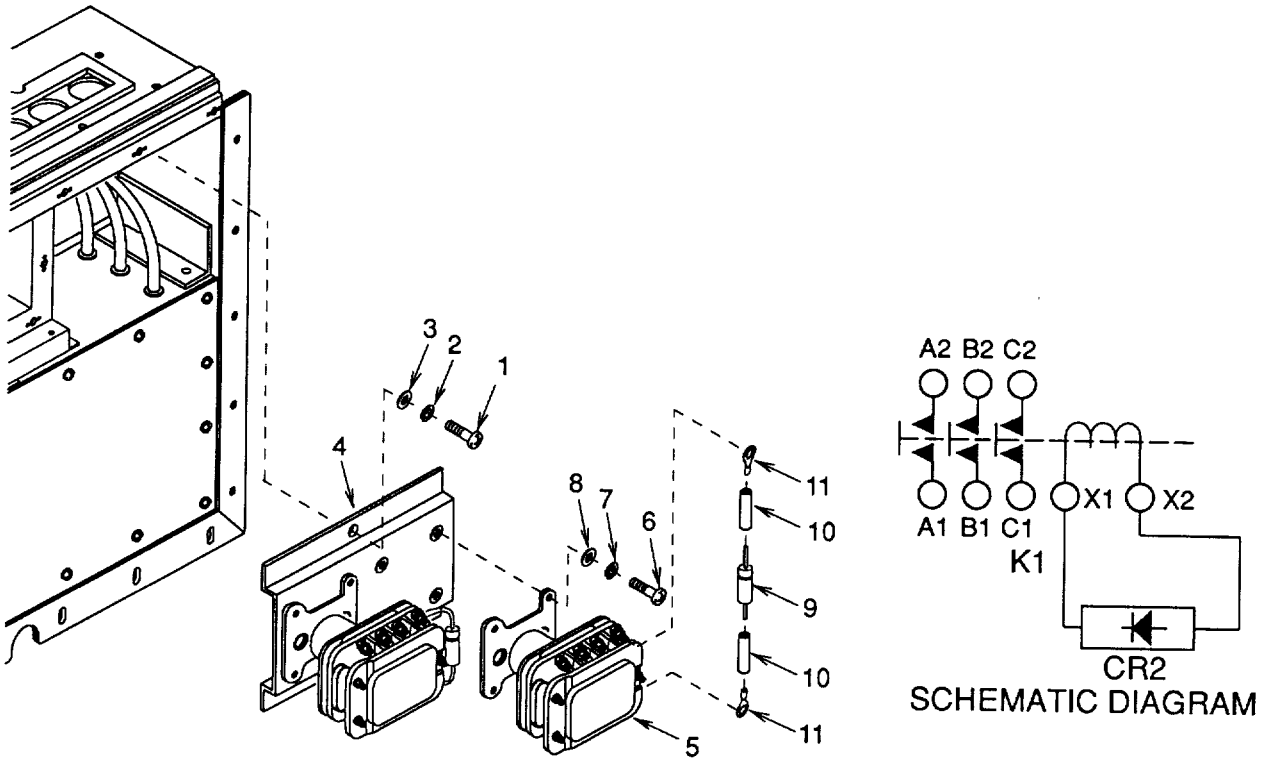


Figure 4-42. Heater Relay (K1) and Diode (CR2)

c. Test.

(1) Compressor start relay (5).

(a) Apply 28VDC to terminals X1 (positive) and X2 (negative).

(b) Check continuity across terminals Al and A2; B1 and B2, and C1 and C2. The multimeter must show that contacts are closed (continuity).

(c) Remove power. Multimeter must show that contacts are open (no continuity).

(2) Diode (9).

(a) Using a multimeter set to test diodes, connect black lead to band end of diode and red lead to opposite end. The multimeter should indicate between 0.5 and 1.75 volt drop.

(b) Reverse the leads from step (a) above and check. The multimeter should give no indication.

4-41. HEATER RELAY (K1) AND DIODE (CR2). - continued

d. Replace.

(1) Replace relay (5) if defective.

(2) Replace diode (9) if defective.

(a) Cut heat shrink tubing (10) to approximately three-quarter inch (1.9 cm) long.

(b) Slip heat shrink tubing over leads.

(c) Crimp terminals (11) onto lead ends.

e. Install.

(1) Mount relay (5) to bracket (4) using four sets of screws (6), lock washers (7), and flat washers (8).

(2) Using wiring diagram figure 4-10 and tags, connect leads and diode assembly to relay (5). Band end of diode connects to terminal X1. Remove tags.

(3) Carefully position relay bracket (4) and relays in control assembly and secure with three sets of screws (1), lock washers (2), and flat washers (3).

(4) Using wiring diagram figure 4-10 and tags, connect leads to ground E3. Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:

Install motor controller assembly (para 4-37).

Install logic box assembly (para 4-36).

Install control assembly (para 4-34).

Connect power at power source.

4-42. RECTIFIER (CR4).

This task covers: **a. Inspect** **b. Test** **c. Replace**

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Rectifier

Equipment Conditions

--

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove control assembly (para 4-34).

a. Inspect.

Check rectifier (1) for general condition and broken or missing terminals or leads. Replace if damaged.

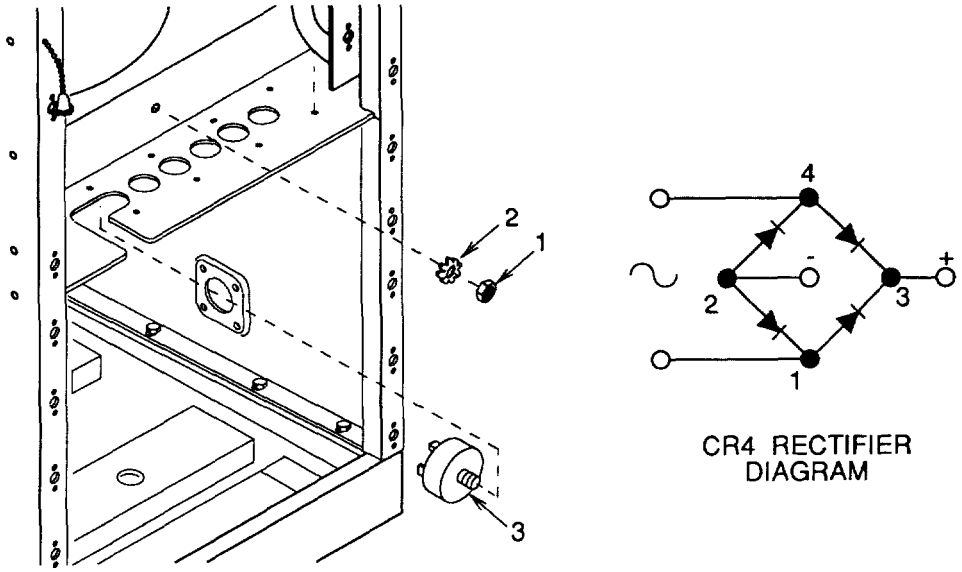


Figure 4-43. Rectifier (CR4)

4-42. RECTIFIER (CR4). - continued

b. Test.

(1) Remove nut (2) and lock washer (3). Pull rectifier (1) out of unit as far as wire leads will allow.

(2) Tag and disconnect wire leads from rectifier (1) terminals.

(3) Using a multimeter on high ohms setting connect negative (-) lead to terminal 2 and positive (+) lead to terminal 1 or 3. A low resistance reading should be indicated.

(4) Connect positive lead to terminal 2 and negative lead to terminal 1 or 3. An open circuit should be indicated.

(5) Connect positive lead to terminal 4 and negative lead to terminal 1 or 3. A short circuit should be indicated.

(6) Connect negative lead to terminal 4 and positive lead to terminal 1 or 3. An open circuit should be indicated.

(7) Replace defective rectifier.

(8) Connect wire leads to rectifier (1) using tags and wiring diagram figure 4-10. Remove tags.

(9) Install rectifier (1) to unit using lock washer (3) and nut (2).

c. Replace.

(1) Remove nut (2) and lock washer (3). Pull rectifier (1) out of unit as far as wire leads will allow.

(2) Tag and disconnect wire leads from rectifier (1) terminals.

(3) Connect wire leads to new rectifier (1) using tags and wiring diagram figure 4-10. Remove tags.

(4) Install new rectifier (1) to unit using lock washer (3) and nut (2).

NOTE

FOLLOW-ON MAINTENANCE:

Install control assembly (para 4-34).

Connect power at power source.

4-43. CIRCUIT BREAKER (CB1).

This task covers: a. Remove b. Inspect c. Test d. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Circuit Breaker

Equipment Conditions

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Loosen rear panel (para 4-22).

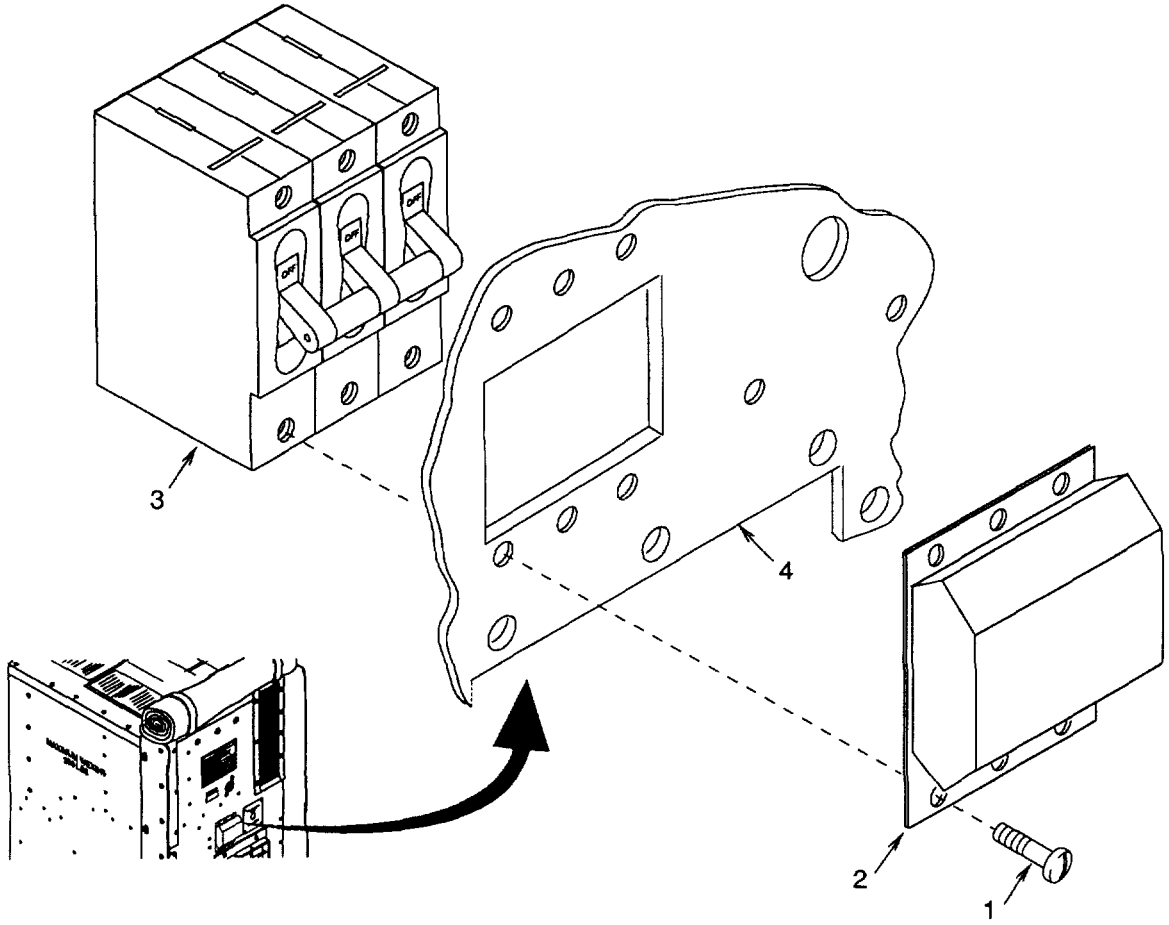


Figure 4-44. Circuit Breaker (CB1)

4-43. CIRCUIT BREAKER (CB1). - continued

a. Remove.

(1) Remove six screws (1) and protective cover (2) from circuit breaker (3) and rear panel (4).

(2) Tag and disconnect wire leads from circuit breaker (3).

b. Inspect.

Check general condition of circuit breaker and that terminals are not broken, loose, or missing. Replace if damaged.

c. Test.

(1) With circuit breaker in ON position, check continuity across terminals LINE and LOAD of each pole. The multimeter must show that contacts are closed (continuity).

(2) With circuit breaker in OFF position, check continuity across terminals LINE and LOAD of each pole. The multimeter must show that contacts are open (no continuity).

(3) Replace circuit breaker if it tests defective.

d. Install.

(1) Attach circuit breaker (3) and protective cover (2) onto rear panel (4) using six screws (1).

(2) Using tags and wiring diagram figure 4-10 connect wire leads to circuit breaker (3). Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:

Attach rear panel (para 4-22).

Connect power at power source.

4-44. ELECTRIC HEATER ELEMENTS (HR1 THROUGH HR6).

This task covers: a. Inspect b. Test c. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Electric Heater Element

Lock Washers (4)

Equipment Conditions

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove top panel (para 4-19).

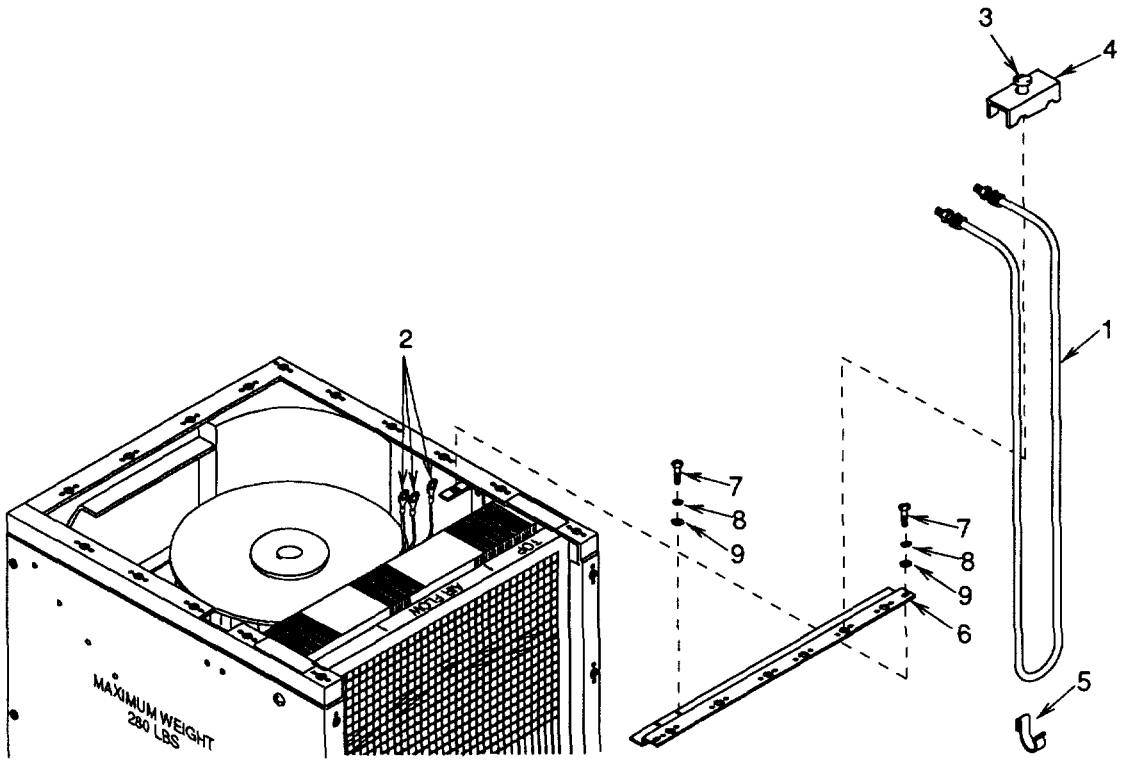


Figure 4-45. Electric Heater Elements (HR1 through HR6)

a. Inspect

Check heater elements (1) for obvious damage, deformation, cracked or broken sheath, burnt spots, and loose, broken, or damaged leads (2) or terminal. Replace if damaged

4-44. ELECTRIC HEATER ELEMENTS (HR1 THROUGH HR6). - continued

b. Test.

(1) Tag and disconnect wire leads (2) from heater (1) being tested.

(2) Using multimeter, check continuity between the two terminal studs of heater (1). Replace heater if no continuity is indicated.

(3) Using tags and wiring diagram figure 4-10 connect wire leads (2) to heater (1). Remove tags.

c. Replace.

(1) Tag and disconnect wire leads (2) from heater (1) being removed.

(2) Loosen captive screw (3) and remove clamp (4).

(3) Pull heater (1) free from lower mounting clip (5) and remove heater (1).

(4) Insert heater (1) into lower mounting clip (5).

(5) Secure top of heater (1) to heater support (6) with clamp (4). Tighten captive screw (3).

(6) Using tags and wiring diagram figure 4-10 connect wire leads (2) to heater (1). Remove tags.

(7) Heater support (6) replacement.

(a) Remove all six heaters (1).

(b) Remove four sets of screws (7), lock washers (8), and flat washers (9). Remove heater support (6).

(c) Secure heater support (6) to unit and thermostat bracket with four sets of screws (7), lock washers (8), and flat washers (9).

(d) Install heaters (1).

(8) Lower mounting clip (5) replacement.

(a) Remove heater (1).

(b) Remove clip (5) from unit.

(c) Install clip (5) into unit.

NOTE

FOLLOW-ON MAINTENANCE:

Attach top panel (para 4-19).

Connect power at power source.

4-45. HEATER CUTOUT (THERMOSTAT) SWITCH (S4).

This task covers: a. Inspect b. Test c. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1
Soldering Gun Kit
Appendix B, item 2

Heat Gun
Appendix B, item 4

Materials/Parts

Heater Cutout Switch

Lock Washers (2)

Solder
Appendix E, item 7

Insulation Sleeving
(Heat-Shrink Tubing)

Equipment Conditions

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove top panel (para 4-19).

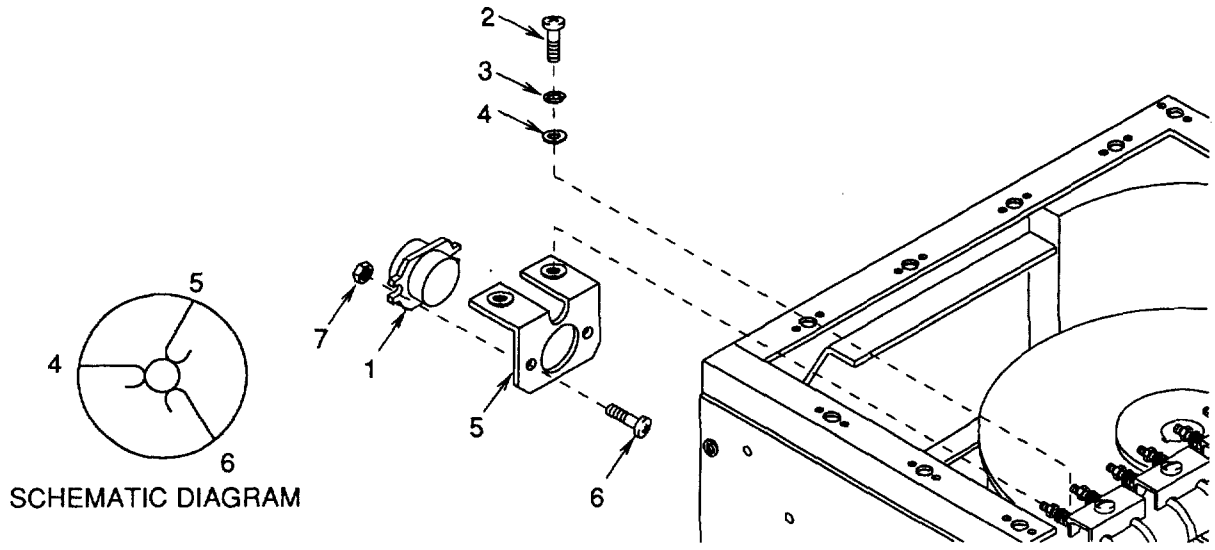


Figure 4-46. Heater Cutout (Thermostat) Switch (S4)

a. Inspect.

Check general condition of heater cutout (thermostat) switch (1). Check that terminals are not damaged or missing. Replace switch if damaged.

4-45. HEATER CUTOUT (THERMOSTAT) SWITCH (S4). - continued

b. Test.

(1) Tag and unsolder wire leads from heater cutout (thermostat) switch (1).

(2) With heater cutout (thermostat) switch (1) at room temperature, use a multimeter to check continuity between terminals (4 and 5). If no continuity is indicated, replace the switch.

NOTE

For full operational test of switch, use an external heat source. Switch should open (no continuity) between terminals (4 and 5) at temperature increase of between 1850 and 203°F (850 to 950C) and close again at temperature decrease of between 1260F and 158°F (520C and 700C).

(3) Cut heat shrink tubing to approximately three-quarter inch (1.9 cm) long.

(4) Slip heat shrink tubing on ends of wires to be soldered.

(5) See wiring diagram figure 4-10 and tags and solder all wire leads. Remove tags. (See paragraph 4-26.)

(6) Slip heat shrink tubing in place over solder connections and shrink tubing. (See paragraph 4-26.)

c. Replace.

(1) Remove two sets of screws (2), lock washers (3), and flat washers (4).

(2) Carefully pull thermostat bracket (5) far enough out to remove two sets of screws (6) and self-locking nuts (7). Remove thermostat bracket.

(3) Tag and unsolder wire leads from heater cutout (thermostat) switch (1).

(4) Cut heat shrink tubing to approximately three-quarter inch (1.9 cm) long.

(5) Slip heat shrink tubing on ends of wires to be soldered.

(6) See wiring diagram figure 4-10 and tags and solder all wire leads. Remove tags. (See paragraph 4-26.)

(7) Slip heat shrink tubing in place over solder connections and shrink in place. (See paragraph 4-26.)

(8) Secure heater cutout (thermostat) switch (1) to thermostat bracket (5) with two sets of screws (6) and locking nuts (7).

(9) Secure thermostat bracket (5) to heater support with two sets of screws (2), lock washers (3), and flat washers (4).

NOTE

FOLLOW-ON MAINTENANCE:

Attach top panel (para 4-19).

Connect power at power source.

14-46. EVAPORATOR FAN.

This task covers: a. Remove b. Clean c. Inspect d. Replace e. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1
Scrub Brush
Appendix B, item 2

Materials/Parts

Evaporator Fan
Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

Equipment Conditions

CAUTION
Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.
Remove electric heater elements and support (para 4-44).

a. Remove.

(1) Remove lock nut (1) from end of motor shaft (2). Carefully pull evaporator fan (3) up and off of motor shaft.

(2) Remove shaft key (4) and shims (5) (if applicable) or tape in place so that they will not be lost.

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

b. Clean.

Wipe or vacuum all dust and dirt off guard. Clean with a cloth dampened with a detergent solution or dry cleaning solvent. Use a soft scrub brush if necessary to dislodge caked on dirt. Dry thoroughly.

c. Inspect.

(1) Check evaporator fan (3) for dents, chips, tears, and bent, loose, or missing fan blades. Check that hub is securely attached. Replace if damaged.

(2) Check inlet bell (6) for dents, tears, or any distortion that would cause interference with fan. Replace if damaged.

4-46. EVAPORATOR FAN. - continued

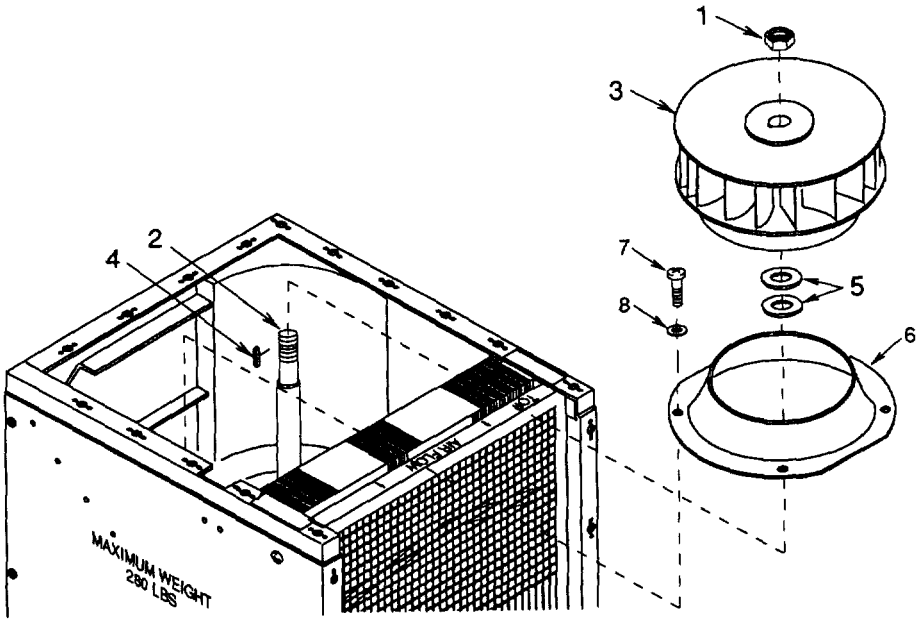


Figure 4-47. Evaporator Fan and Inlet Bell

d. Replace.

Evaporator fan inlet bell.

(a) Remove four sets of screws (7) and flat washers (8). Lift inlet bell (6) up and out of unit.

(b) Place inlet bell (6) in unit. Secure with four screws (7) and flat washers (8).

4-46. EVAPORATOR FAN. - continued

e. Install.

(1) Install shaft key (4) and shims (5) (if removed) or carefully remove tape.

(2) Aline key way to shaft key and carefully push evaporator fan (3) down onto motor shaft (2).

(3) Using shims (5) (as required) between fan (3) and shoulder on motor shaft, position fan on shaft so that there is 0.03 to 0.06 inch (0.07 to 0.15 cm) clearance between the fan (3) and the inlet bell (6). Secure with lock nut (1).

(4) Spin fan (3) by hand and check clearance. Adjust if needed.

NOTE

FOLLOW-ON MAINTENANCE:

Install electric heater elements and support (para 4-44).

Connect power at power source.

4-47. EVAPORATOR AND CONDENSER FAN MOTOR (B2) AND CONDENSER FAN.

This task covers: a. Test b. Inspect c. Remove d. Clean e. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1
Scrub Brush
Appendix B, item 2
Damage to cable connector pins will
Socket Head Key
Appendix B, item 13

Materials/Parts

Evaporator and Condenser Fan Motor

Condenser Fan

Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

Equipment Conditions:

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. result if cable is used.

Disconnect power at power source.

Remove rear panel (para 4-22).

Remove conditioned air filter (para 4-23).

Remove evaporator fan (para 4-46).

Personnel Required

Two

a. Test

(1) Check motor rotational freedom by spinning fan. If there is any stiffness or binding, notify supervisor.

(2) Check motor bearings for shaft end play. If there is excessive end play, notify supervisor.

(3) Check motor windings as follows: (a) Disconnect motor cable from connector (1).

(b) Using multimeter set on lowest OHMS scale, check continuity between pins A and B, A and C, and B and C in motor connector (1). If there is no continuity between any pair of pins, the motor winding is open. Replace motor.

(c) Using multimeter set on highest OHMS scale, check continuity between pins A, B, and C in motor connector (1) and motor housing. A reading of less than 500,000 ohms indicates insulation failure. Replace motor.

NOTE

If all of the above tests are satisfactory, but the motor will still not operate properly, notify supervisor.

4-47. EVAPORATOR AND CONDENSER FAN MOTOR (B2) AND CONDENSER FAN. - continued

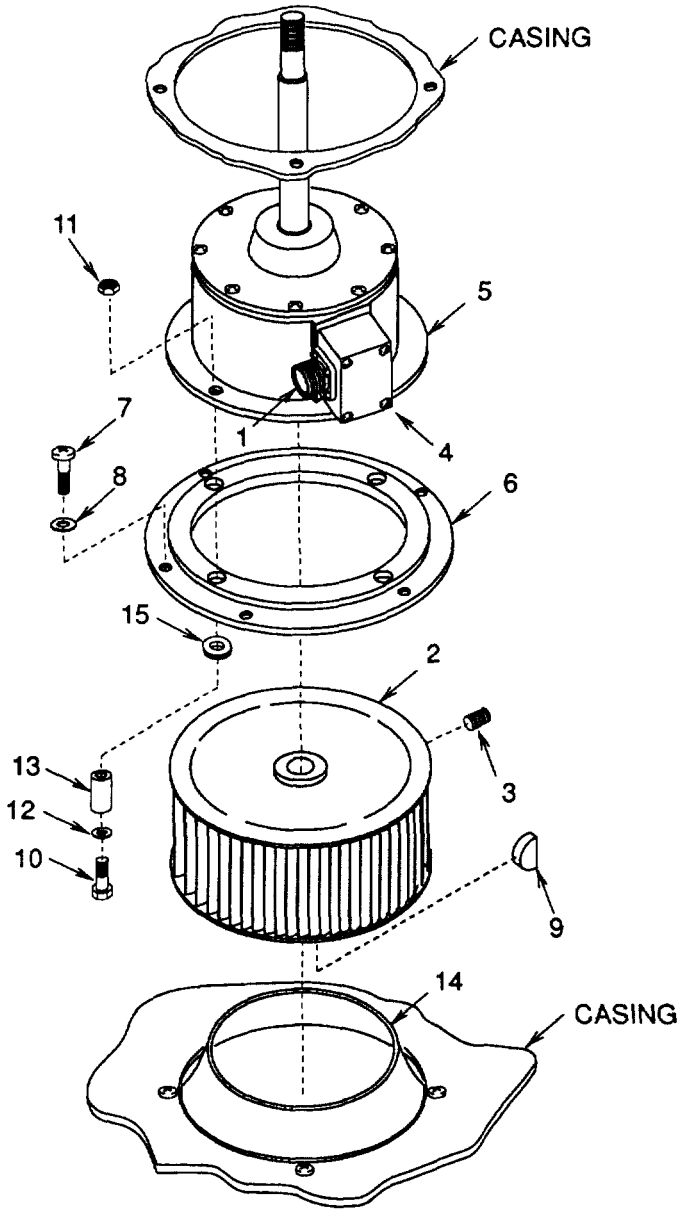


Figure 4-48. Evaporator and Condenser Fan Motor and Condenser Fan

4-47. EVAPORATOR AND CONDENSER FAN MOTOR (B2) AND CONDENSER FAN. - continued

b. Inspect.

(1) Check fan for dents, bent or loose fan blades, and that hub is securely attached. Replace if damaged.

(2) Check inlet bell for dents or any distortion that would cause interference with fan. Replace if damaged.

c. Remove

(1) Looking into condenser discharge opening, rotate fan (2) and locate the two setscrew access notches through fan blades.

(2) Loosen two setscrews (3) until they are flush with outside of hub.

(3) Note position of motor junction box (4) for reassembly.

(4) Mark motor (5) and motor mounting plate (6) for alinement at reassembly.

CAUTION

Take care that hardware does not drop down into unit causing damage to equipment.

(5) Remove six sets of screws (7) and flat washers (8) from motor mounting plate (6).

NOTE

The following steps require two people.

(6) Lift motor (5) high enough to gain access to mounting plate (6) hardware (7) Carefully slip fan (2) down and off of motor shaft being careful not to lose woodruff key (9).

(8) Remove four sets of cap screws (10), nuts (11), flat washers (12), and spacers (13).

(9) Carefully lift motor (5) up and out of unit.

(10) Slide motor mounting plate (6) out rear opening.

CAUTION

The condenser fan is easily damaged. Use care when removing fan not to damage fan or tubing insulation.

(11) Lift fan (2) up and out of unit.

4-47. EVAPORATOR AND CONDENSER FAN MOTOR (B2) AND CONDENSER FAN.I - continued

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

d. Clean.

(1) Use a clean dry. cloth and a soft scrub brush to remove dirt from motor (5).

(2) Clean fan (2) and inlet bell (14) with a cloth dampened with a detergent solution or dry cleaning solvent. Use a soft scrub brush if necessary to dislodge caked on dirt. Dry thoroughly.

e. Install.

CAUTION

The condenser fan is easily damaged. Use care when removing fan not to damage fan or tubing insulation.

(1) Insert condenser fan (2) into housing. Open end of fan must face down.

(2) Insert motor mounting plate (6) into position with the insulation side facing up.

NOTE

The following steps require two people.

(3) Lower motor (5) into unit. Take care that fan (2) is not damaged.

(4) Hold motor (5) high enough to allow reassembly to motor mounting plate (6).

(5) Be sure four grommets (15) are in place on motor mounting plate (6).

(6) Aline marks on motor (5) and motor mounting plate (6) made at disassembly. Secure with four sets of cap screws (10), flat washers (12), spacers (13), and nuts (11).

(7) Slip fan (2) onto motor (5) shaft. Aline key way to woodruff key (9). Position motor (5) on fan housing.

(8) Position motor junction box (4) as noted during disassembly.

(9) Secure motor mounting plate (6) to casing using six sets of screws (7) and flat washers (8).

(10) Looking into condenser discharge opening, rotate fan (2) and locate the two setscrew access notches through fan blades.

(11) Position fan (2) on shaft so that there is 0.03 to 0.06 inch (0.07 to 0.15 cm) clearance between the fan and the inlet bell (14).

4-47. EVAPORATOR AND CONDENSER FAN MOTOR (B2) AND CONDENSER FAN. - continued

(12) Tighten two setscrews (3).

(13) Spin fan (2) by hand and check clearance. Adjust if needed.

NOTE

FOLLOW-ON MAINTENANCE:

Install evaporator fan (para 4-46).

Install conditioned air filter (para 4-23).

Attach rear panel (para 4-22).

Connect power at power source.

4-48. CONDENSER COIL CLEANING.

This task covers: a. Clean b. Inspect

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1
Scrub Brush
Appendix B, item 2

Safety Glasses
Appendix B, item 2

Equipment Conditions:

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove condenser coil guard (para 4-17).

Remove electromagnetic interference filter (para 4-32).

Remove control assembly (para 4-34).

WARNING

Injury to personnel can result if compressed air used for cleaning purposes exceeds 30 psi (2.1 kg/cm2). When using compressed air, wear safety glasses or goggles. Dirt can be blown into your eyes.

CAUTION

Equipment damage can result if steam is used to clean coil.

a. Clean.

Clean coil with a soft scrub brush, vacuum cleaner and brush attachment, or use compressed air at 30 psi or less from the inside of the unit to blow the dirt out. Take care to avoid fin damage.

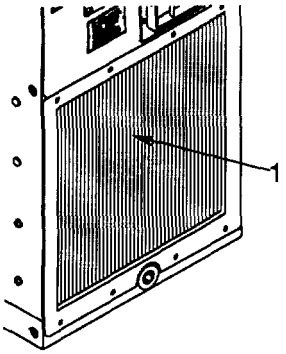


Figure 4-49. Condenser Coil

4-48. CONDENSER COIL CLEANING. - continued

b. Inspect.

(1) Check condenser coil (1) fins for dents, bent edges, or any condition that would block or distort air flow. Straighten all damaged fins.

(2) Should a leak or major damage be evident, notify supervisor.

NOTE

FOLLOW-ON MAINTENANCE:

Install control assembly (para 4-34).

Install electromagnetic interference filter (para 4-32).

Attach condenser coil guard (para 4-17).

Connect power at power source.

4-49. SOLENOID VALVE (L1) COIL.

This task covers: a. Test b. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Power Supply
Appendix B, item 6

Materials/Parts

Solenoid Valve Coil

Equipment Condition

Remove control assembly (para 4-34).

a. Test.

(1) Tag and disconnect wire leads from the solenoid valve coil (1).

(2) Using a multimeter set to measure resistance, check for continuity between solenoid valve coil (1) terminals 1 and 2. If continuity is not found, the coil is open and must be replaced.

(3) Check for continuity between each solenoid valve (1) terminal 1 and 2 and coil casing. If continuity is found the coil is shorted and must be replaced.

(4) If continuity checks are satisfactory, apply 28 volts dc across solenoid valve coil (1) terminals 1 and 2. Listen for a sharp click when the valve changes position. If a click is not heard, internal valve problems are indicated and the entire valve should be replaced. Notify supervisor.

4-49. SOLENOID VALVE (LI) COIL. - continued

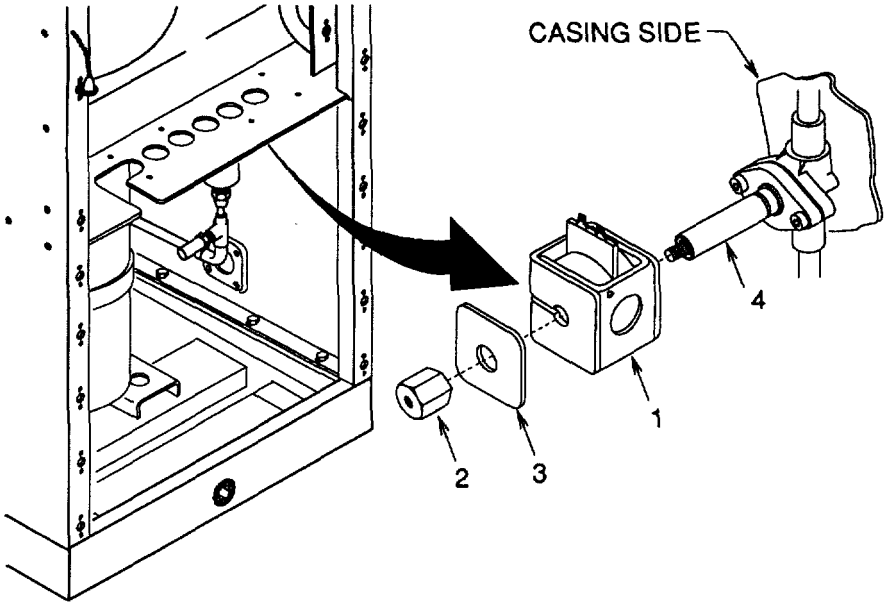


Figure 4-50. Solenoid Valve (L1) Coil

(5) If all checks are satisfactory, connect wire leads to solenoid valve coil (1) using tags and wiring diagram figure 4-10. Remove tags.

WARNING

Do not attempt any disassembly of the solenoid valve other than coil removal with a refrigerant charge in the system. Refrigerant will be sprayed out dangerously if the screws that attach the tube and plunger assembly to the valve body are loosened.

NOTE

The only authorized repair to solenoid valve is coil replacement. The coil can be replaced without opening the refrigeration pressure system.

b. Replace.

(1) Tag and disconnect wire leads from the solenoid valve coil (1).

(2) Remove nut (2), data plate (3), and coil (1).

(3) Place new coil (1) and data plate (3) onto valve body (4) and secure with nut (2).

(4) Connect wire leads to solenoid valve coil (1) using tags and wiring diagram figure 4-10. Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:

Install control assembly (para 4-34)

4-50. EVAPORATOR COIL CLEANING.

This task covers: a. Clean b. Inspect

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Safety Glasses
Appendix B, item 2

Equipment Conditions

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove mist eliminator (para 4-25).

Remove evaporator fan (para 4-46).

WARNING

Injury to personnel can result if compressed air used for cleaning purposes exceeds 30 psi (2.1 kg/cm2). When using compressed air, wear safety glasses or goggles. Dirt can be blown into your eyes.

CAUTION

Equipment damage can result if steam is used to clean coil.

a. Clean.

Clean coil with a soft scrub brush, vacuum cleaner and brush attachment, or use compressed air at 30 psi or less from the inside of the unit to blow the dirt out. Take care to avoid fin damage.

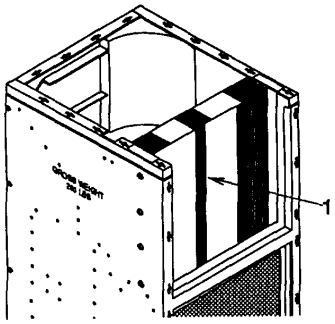


Figure 4-51. Evaporator Coil

4-50. EVAPORATOR COIL CLEANING. - continued

b. Inspect.

(1) Check evaporator coil (1) fins for dents, bent edges, or any condition that would block or distort air flow. Straighten all damaged fins.

(2) Should a leak or major damage be evident, notify supervisor.

NOTE

FOLLOW-ON MAINTENANCE:

Install evaporator fan (para 4-46).

Install mist eliminator (para 4-25).

Connect power at power source.

4-51. CONDENSATE DRAIN TRAPS.

This task covers: a. Remove b. Clean c. Inspect d. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Cotter Pins (2)

Adhesive Sealant
Appendix E, item 19

Equipment Conditions

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

Remove mist eliminator (para 4-25).

Remove control assembly (para 4-34).

a. Remove.

(1) Carefully disengage drains (1) and (2) from spring tension clips on casing sides.

(2) With slight back and forth twisting motion, pull drains (1) and (2) from unit drain tubes.

(3) While holding hand under drain, remove cotter pin (3), spring (4), and ball (5).

4-51. CONDENSATE DRAIN TRAPS. - continued

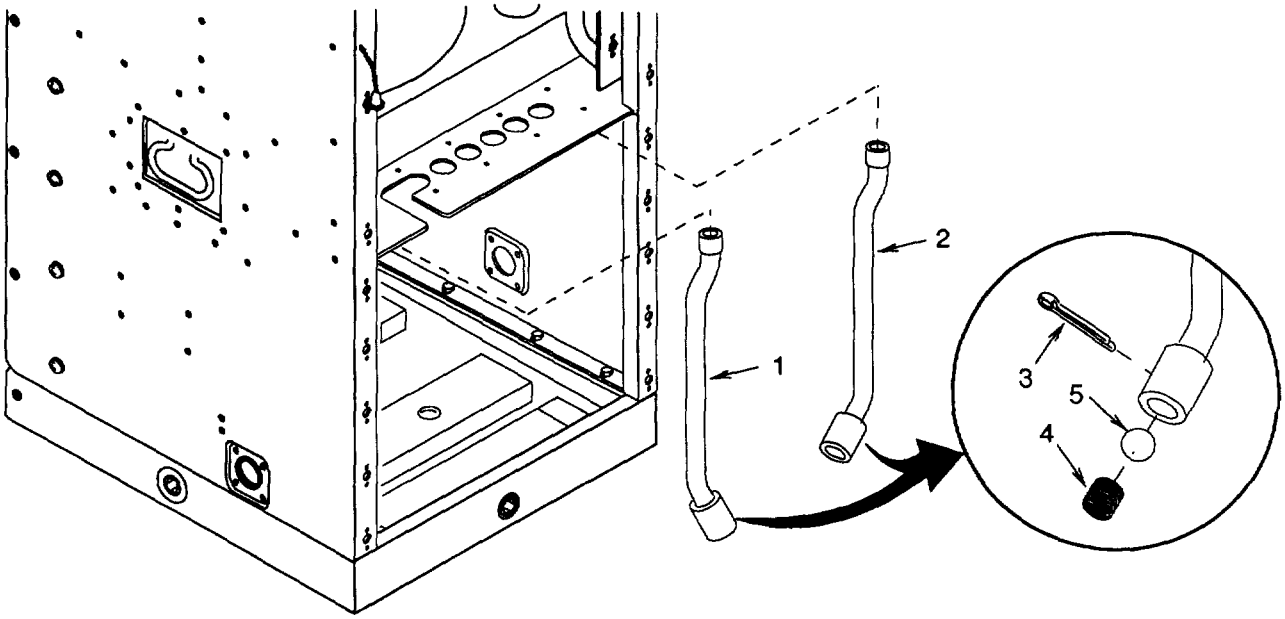


Figure 4-52. Condensate Drain Traps

b. Clean.

(1) Pour some clean fresh water into condensate drip pan.

(2) If water does not flow out of the ends of the drain tubes or has a muddy appearance, insert a flexible wire up the drain tube. Agitate until clog and accumulated debris is loose.

(3) Pour additional water in the drip pan until clean water pours from the ends of the drain tubes.

(4) Flush drains (1) and (2) with clean fresh water until clean. Insert a flexible wire through drain if needed to remove clog. Be sure ball seats (end of drains where balls are inserted) are clean.

(5) Clean the springs (4) and balls (5).

(6) Clean any adhesive-sealant that may still be on ends of unit drain tubes and drains (1) and (2).

c. Inspect.

(1) Check cotter pins (3), springs (4), balls (5), and drains (1) and (2) for nicks, dents, and wear.

(2) Replace springs (4) if they are worn or no longer applying pressure to balls (5).

(3) Replace balls (5) if they are nicked or have any damage that would keep them from sealing property.

(4) Replace drains (1) and (2) if they are damaged or ball seats (end of drains where balls are inserted) are nicked or have any damage that would keep them from sealing properly.

4-51. CONDENSATE DRAIN TRAPS. - continued

d. Install.

(1) Insert balls (5) and springs (4) into drains (1) and (2). Be sure balls are above springs.

(2) Depress springs (4) with a screwdriver far enough to install cotter pins (3).

(3) Secure cotter pins (3).

(4) Check to be sure which side drains (1) and (2) go on.

(5) Apply a bead of adhesive sealant around ends of unit drain tubes.

(6) Slip drains (1) and (2) onto unit drain tubes and push into spring tension clips on casing sides to secure.

NOTE

FOLLOW-ON MAINTENANCE:

Install control assembly (para 4-34).

Install mist eliminator (para 4-25).

Connect power at power source.

SECTION VII PREPARATION FOR STORAGE OR SHIPMENT

4-52. PREPARATION FOR STORAGE.

Before placing equipment in administrative storage, current maintenance services and Equipment Serviceable Criteria (ESC) evaluations should be completed, shortcomings and deficiencies should be corrected, and all Modification Work Orders (MWO's) should be applied.

a. 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.

b. Administrative Storage of Equipment. 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.

(1) Unroll fabric cover.

(2) Snap cover in place.

c. Intermediate Storage- 46 to 180 days. No special handling is required other than protection from damage and the elements.

(1) Unroll fabric cover.

(2) Snap cover in place.

(3) Place air conditioner in a dry, covered area.

d. Long Term or Flyable Storage. There is no time limit for this type of storage.

(1) Unroll fabric cover.

(2) Snap cover in place.

(3) Bolt unit to a skid base, preferably the original used to ship unit if it is still available and in good condition.

(4) Wrap unit with two layers of heavy plastic sheet or barrier paper.

(5) Tape and strap wrapping in place.

(6) Mark air conditioner per standard Army procedures.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Paragraph

Section I Repair Parts, Special Tools, Test, Measurement, and Diagnostic Equipment (TMDE), and Support Equipment
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- Use of Troubleshooting Table 5-2

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Section I REPAIR PARTS, SPECIAL TOOLS, TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE), AND SUPPORT EQUIPMENT

5-1. GENERAL.

a. Repair parts are listed and illustrated in TM 9-4120-402-24P. No special tools are required for direct support maintenance of the air conditioner except those listed in c. and d. below. Test, maintenance and diagnostic equipment (TMDE), and support equipment include standard electrical test equipment, and standard pressure and vacuum gages, vacuum pumps, and servicing manifolds found in any direct support maintenance refrigeration shop.

b. For authorized common tools and equipment refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

c. When testing the logic box assembly installed in this air conditioner, a special test fixture is required. (See paragraph 5-8 for use of this test fixture.)

Description	National Stock Number
Logic Box Test Fixture .....(94833)	111K8002-1

NOTE

The following reference applies only when the accessory item blast damper is installed on the air conditioner.

d. When the accessory item blast damper is installed on the air conditioner, a special adjusting tool is required. (See paragraph 5-36 for use of this adjusting tool.)

Description	National Stock Number
Spring Balance Assembly.....(97403)	13226E0900

Section II DIRECT SUPPORT TROUBLESHOOTING

5-2. USE OF TROUBLESHOOTING TABLE.

a. The troubleshooting table (table 5-1) lists the most common malfunctions which you may find during the operation or maintenance of the air conditioner. You should perform the tests/inspections and corrective actions in the order listed.

b. For a specific malfunction, perform the troubleshooting procedures listed in table 4-3 before performing the procedures listed in table 5-1.

c. This manual cannot list all malfunctions which may occur. However, all tests or inspections and corrective actions are listed for most common malfunctions.

d. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

WARNING

Disconnect power from the air conditioner before doing any maintenance work to the electrical system. High voltage in air conditioner can kill.

Refrigerant under pressure is used in the operation of this equipment.

Death or severe injury may result if personnel fail to observe safety precautions.

Never use a heating torch on any part that contains refrigerant 22.

Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas.

Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged from any container under pressure. Sudden and irreversible tissue damage can result from freezing. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact is possible.

Prevent contact of refrigerant gas with flame or hot metal surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

Never pressurize lines with oxygen, mixture with oil will cause an explosion.

SYMPTOM INDEX

Trouble	Malfunction No.
AIR CONDITIONER	
Insufficient Cooling Action	3
Air Conditioner Noisy During Operation	7
Unit Operates Continuously On Cooling Cycle	5
COMPRESSOR	
Compressor Will Not Start	1
Compressor Short Cycles	2
REFRIGERANT SYSTEM	
Refrigerant System Continuously Losing Refrigerant	4
Sight Glass Appears Yellow Instead of Green	6

Table 5-1. DIRECT SUPPORT TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. **COMPRESSOR WILL NOT START**.

Step 1. Check that the LOW and HIGH PRESSURE CUTOUT switches are not tripped.

Press and release the HIGH PRESSURE CUTOUT switch to RESET. If switch does not remain in, check and replace switch if defective. (See paragraph 5-25.) Check and replace low pressure cutout switch if defective. (See paragraph 5-26.)

Step 2. Check compressor motor windings. (See paragraph 5-32.)

Replace compressor if windings are defective.

2. COMPRESSOR SHORT CYCLES.

WARNING

Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged from any container under pressure. Sudden and irreversible tissue damage can result from freezing. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact is possible.

Prevent contact of refrigerant gas with flame or hot metal surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

Step 1. Check head pressure (high pressure side). (See paragraph 5-20.)

a. If pressure is too high, check HIGH PRESSURE CUTOUT switch and replace if defective. (See paragraph 5-25.)

b. If pressure is excessive and sight glass is clear, release excess refrigerant. (See paragraph 5-11.) Release pressure until requirements of paragraph 5-20 are met.

Table 5-1. DIRECT SUPPORT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. COMPRESSOR SHORT CYCLES. - continued

Step 2. Check low pressure cutout switch. (See paragraph 5-26.)

Replace low pressure cutout switch if defective.

Step 3. Check suction pressure (low pressure side). (See paragraph 5-20.)

Add refrigerant if low. (See paragraph 5-17.)

Step 4. Check solenoid valve. (See paragraph 5-28.)

Repair or replace if defective.

3. INSUFFICIENT COOLING ACTION.

Step 1. Check control settings. (See paragraph 2-2.)

a. Move MODE selector rotary switch to COOL.

b. Move potentiometer TEMPERATURE control to COOL. If normal cooling does not resume in 15 minutes, go to Step 2.

Step 2.. Check air movement.

a. Remove any obstructions to air flow (evaporator and condenser sides).

b. Remove, clean, and/or replace air filter. (See paragraph 4-23.)

c. Remove, clean, and/or replace mist eliminator. (See paragraph 4-25.)

d. Clean evaporator coil. (See paragraph 4-50.)

NOTE

Frost on the evaporator coil is usually caused by an obstruction to air flow or dirty coils, filter, or mist eliminator.

Step 3. Check to make sure evaporator and condenser fans are tight on motor shaft. (See paragraph 4-46 and 4-47.)

Tighten if loose.

Step 4. Check area near condenser coil guard and fresh air intake for heat source over 120F (400C).

Remove heat source.

Table 5-1. DIRECT SUPPORT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. INSUFFICIENT COOLING ACTION. - continued

Step 5. Check sight glass after operating unit for 15 minutes with potentiometer TEMPERATURE control in maximum COOL position. Center should be bubble free and green.

If charge is low, add refrigerant. (See paragraph 5-17.) Bubbles may also be caused by clogged refrigerant desiccant dehydrator. (See paragraph 5-21.)

WARNING

Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged from any container under pressure. Sudden and irreversible tissue damage can result from freezing. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact is possible.

Prevent contact of refrigerant gas with flame or hot metal surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

Step 6. Check for refrigerant leaks. (See paragraph 5-15.)

Repair or change defective part.

WARNING

Disconnect power from the air conditioner before doing any maintenance work to the electrical system. High voltage in air conditioner can kill.

Step 7. Check solenoid valve. (See paragraph 5-28.)

Repair or replace if defective.

Step 8. Check expansion valve for proper operation. (See paragraph 5-30.)

Replace if defective.

Table 5-1. DIRECT SUPPORT TROUBLESHOOTING - continued.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

4. REFRIGERANT SYSTEM CONTINUOUSLY LOSING REFRIGERANT.

WARNING

Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged from any container under pressure. Sudden and irreversible tissue damage can result from freezing. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact is possible.

Prevent contact of refrigerant gas with flame or hot metal surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

Step 1. Check refrigerant tubing and components for leaks using a leak detector. (See paragraph 5-15.)

Repair or replace as required.

Step 2. Check pressure relief valve. (See paragraph 5-22.)

Replace if defective.

5. AIR CONDITIONER OPERATES CONTINUOUSLY ON COOLING CYCLE.

Step 1. Check position of potentiometer TEMPERATURE control. (See paragraph 2-7.)

Move control to WARM.

WARNING

Disconnect power from the air conditioner before doing any maintenance work to the electrical system. High voltage in air conditioner can kill.

Step 2. Check potentiometer TEMPERATURE control. (See paragraph 4-29.) Replace if defective.

WARNING

Disconnect power from the air conditioner before doing any maintenance work to the electrical system. High voltage in air conditioner can kill.

Step 3. Check solenoid valve. (See paragraph 5-28.)

Replace if defective.

Table 5-1. DIRECT SUPPORT TROUBLESHOOTING - continued.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

6. SIGHT GLASS APPEARS YELLOW INSTEAD OF GREEN.

WARNING

Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged from any container under pressure. Sudden and irreversible tissue damage can result from freezing. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact is possible.

Prevent contact of refrigerant gas with flame or hot metal surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

Step 1. Yellow appearance of sight glass is caused by contamination in the refrigerant.

a. Release refrigerant. (See paragraph 5-11.)
b. Remove refrigerant desiccant dehydrator. (See paragraph 5-21.)
c. Purge system. (See paragraph 5-12.)
d. Install new refrigerant desiccant dehydrator. (See paragraph 5-21.)
e. Leak test system. (See paragraph 5-15.)
f. Evacuate system. (See paragraph 5-16.)
g. Recharge with refrigerant. (See paragraph 5-17.)

Step 2. Check for yellow in sight glass after allowing compressor to run for at least 1 hour.

Repeat corrective action in Step 1 above if sight glass is still yellow.

7. AIR CONDITIONER NOISY DURING OPERATION.

Step 1. Check expansion valve. (See paragraph 5-30.)

Replace if defective.

Step 2. Check compressor for internal noise and loose mounting. (See paragraph 5-32.)

a. Repair loose mounting.
b. Replace compressor if defective.

Section III MAINTENANCE PROCEDURES

5-3. GENERAL.

The procedures in this section have been arranged in the order in which the items appear in the direct support (F) maintenance level column on the Maintenance Allocation Chart (MAC) which is provided in Appendix B. Step-by-step procedures have been provided for all action authorized to be performed by direct support maintenance in the order in which they appear on the MAC. Actions authorized to be performed by unit and general support maintenance have been duly noted; step-by-step procedures for these actions may be found in Chapters 4 and 6 respectively.

5-4. FABRIC COVER.

This task covers: a. Repair b. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Fabric Cover

Equipment Condition

Remove fabric cover (para 4-10).

NOTE

For removal, inspection, lubrication, cleaning and installation, see paragraph 4-10.

a. Repair.

Minor rips, cuts, tears, or punctures may be repaired by applying a patch to the inside surface.

b. Replace.

For damage of greater extent, or missing eyelets or snap fasteners, replace the entire cover.

5-5. OUTSIDE COVERS AND PANELS.

This task covers: a. Repair b. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Gloves
Appendix B, item 2

Brush
Appendix B, item 2

Materials/Parts

Adhesive
Appendix E, item 2

Adhesive Remover
Appendix E, item 16

Gasket
Appendix F

NOTE

The only authorized repairs are replacement of gaskets.

a. Repair.

(1) Use only gaskets, insulation, or name plates identified in TM 9-4120-402-24P.
(2) Remove as much old gasket or insulation material as possible by pulling or scraping it away from the metal surface.

WARNING

Adhesive remover is flammable and the vapors can be explosive. Keep away from sparks or flame.

Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well ventilated area and wear gloves.

(3) Soften and remove old adhesive and gasket residue, using adhesive remover and a stiff brush.
(4) See Appendix F to identify and fabricate gasket or insulation to be replaced using material specified.
(5) Coat mating surfaces of metal and gasket with adhesive. Let both surfaces air dry until adhesive is tacky but will not stick to fingers.
(6) Starting with an end, carefully attach gasket to the metal. Press into firm contact all over.
(7) Minor dents and bent edges can be straightened using common sheet metal repair procedures.
(8) Should touch up or refinishing be necessary, see TM 43-0139.

b. Replace.

Replace panels that are badly dented, bent, or punctured.

5-6. SCREENS, GUARDS, AND GRILLES.

This task covers: a. Repair b. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Brush
Appendix B, item 2

Gloves
Appendix B, item 2

Materials/Parts

Adhesive
Appendix E, item 2

Adhesive Remover
Appendix E, item 16

Gasket
Appendix F

NOTE

The only authorized repairs are replacement of gaskets.

a. Repair.

(1) Remove as much old gasket material as possible by pulling or scraping it away from the metal surface.

WARNING

Adhesive remover is flammable and the vapors can be explosive. Keep away from sparks or flame.

Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well ventilated area and wear gloves.

(2) Soften and remove old adhesive and gasket residue, using adhesive remover and a stiff brush.
(3) Coat mating surfaces of metal and gasket with adhesive. Let both surfaces air dry until adhesive is tacky but will not stick to fingers.
(4) See Appendix F to identify and fabricate gasket to be replaced using material specified.
(5) Starting with an end, carefully attach gasket to metal. Press into firm contact all over.
(6) Minor dents and bent edges can be straightened using common sheet metal repair procedures.
(7) Straighten slightly bent grille blades by hand.
(8) Should touch up or refinishing be necessary, see TM 43-0139.

b. Replace.

Replace screens, guards, or grilles that are badly dented or bent or screens that are punctured or torn.

5-7. INFORMATION PLATES.

This task covers: Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Rivet Gun
Appendix B, item 11

Materials/Parts

Rivets

Equipment Condition

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

NOTE

See figure 2-17 for location and information contained on Warning and instruction plates.

Replace.

(1) Remove old plate by drilling rivets out. Use a drill stop or similar tool to avoid damage to internal parts.
(2) Install new plate with proper size rivets.

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

5-8. LOGIC BOX ASSEMBLY (LGC1).

This task covers: Test

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1
Logic Box Test Fixture
Appendix B, item 14

Materials/Parts

Logic Box Assembly

Equipment Conditions:

CAUTION
Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power from power source.

Remove logic box assembly (para 4-36).

Test.

NOTE

If a complete test fixture is unavailable, see appendix F, figure F-51 for a schematic and parts list to fabricate one.

(1) If a complete test fixture is being used, connect it to a standard convenience outlet and be sure the POWER switch is in the OFF position. (See figure 5-1.) If a test fixture was fabricated per schematic (appendix F, figure F-51), connect the power supply to appropriate power source and adjust output to 12±0.5 volts dc. Be sure it is turned off and connected to the test fixture where indicated.

(2) Connect a multimeter set to measure dc voltage to the test fixture TEST POINT (positive lead to TP1 and negative lead to TP2). Connect P1, P2, and P3 to J1, J2, and J3 respectively on the logic box assembly being tested.

NOTE

If the logic box assembly fails any of the following tests, the entire assembly must be replaced. Do not continue testing beyond a failure point.

5-8. LOGIC BOX ASSEMBLY (LGC1). - continued

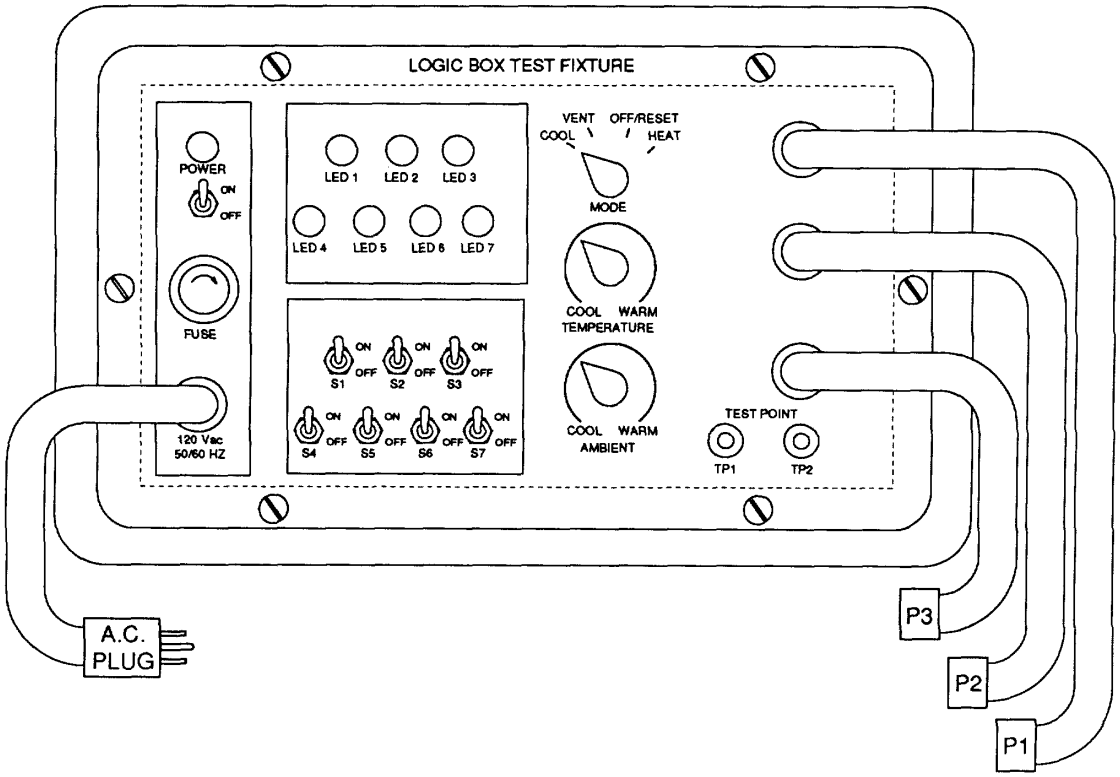

Figure 5-1. Logic Box Test Fixture.

(3) Heat mode test.

(a) Set TEMPERATURE control to WARM position and AMBIENT control to COOL position, MODE switch to HEAT and switches S1 through S6 to OFF position (contacts closed) and switch S7 to ON position (contacts open), then turn test fixture power on. After a 2-second delay LEDs 1 and 7 shall illuminate and multimeter shall read 6.3 vdc or higher.

(b) Set TEMPERATURE control to COOL position. LED 1 shall turn off. LED 7 shall remain illuminated.

(c) Rotate TEMPERATURE control slowly towards WARM position until LED 1 illuminates. Slowly rotate AMBIENT control toward WARM position until LED 1 turns off. LED 7 shall remain illuminated.

5-8. LOGIC BOX ASSEMBLY (LGC1). - continued

(d) Rotate TEMPERATURE control towards WARM until LED 1 illuminates again. Place S3 in the ON position (contacts open). This step should have no effect on operation. LEDs 1 and 7 shall remain illuminated.

(e) Rotate AMBIENT control to COOL position and place S3 in the OFF position. Place S1 in the ON position. LEDs 1 and 7 shall turn off and in 10 seconds LED 3 shall illuminate.

(f) Reset logic by turning rotary MODE switch to OFF/RESET position. Place S1 in the OFF position. Move TEMPERATURE control to WARM position. Set MODE switch to HEAT. LEDs 1 and 7 shall illuminate following a 2-second delay.

(g) Place S1 in the ON position for 2 seconds then place S1 in the OFF position. LEDs 1 and 7 shall turn off for 10 seconds then shall illuminate.

(h) Place S2 in the ON position for 2 seconds then turn S2 OFF again. LED 1 shall turn off. After 10 seconds LED 7 shall turn off for 2 seconds. Then both LEDs turn on again.

(i) Place S2 in the ON position. LED 1 shall turn off and LED 7 shall remain illuminated. LED 3 shall illuminate after 10 seconds.

(j) Reset Logic by turning rotary MODE switch to OFF/RESET position. Place S2 in the OFF position. Maintain TEMPERATURE control in WARM position. Set MODE switch to HEAT. LEDs 1 and 7 shall illuminate after a 2-second delay.

(k) Place S4 in the ON position. The following routine shall occur:

1 LED 1 shall turn off and LED 7 shall remain illuminated.

2 For the next 8 seconds: LED 4 illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 4 and 7 turn off.

4 For the next 2 seconds: LED 4 shall continue to be off. LED 7 shall illuminate.

(l) Steps 2 through 4 shall repeat twice. Then LED 4 illuminates and LED 7 remains illuminated. End of routine.

(m) Place S4 in the OFF position. Reset previous fault condition by turning the MODE switch to OFF/RESET position and then back to HEAT position again. Still maintaining TEMPERATURE control to WARM position wait 10 seconds and place S5 in the ON position. The following routine shall occur:

1 LED 1 shall turn off and LED 7 shall remain illuminated.

2 For the next 8 seconds: LED 5 illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 5 and 7 turn off.

4 For the next 2 seconds: LED 5 shall continue to be off. LED 7 shall illuminate.

(n) Steps 2 through 4 shall repeat twice. Then LED 5 illuminates and LED 7 remains illuminated. End of routine.

5-8. LOGIC BOX ASSEMBLY (LGC1). - continued

(o) Place S5 in the OFF position. Reset previous fault condition by turning the MODE switch to OFF/RESET position and then back to HEAT position. Place S4 in the ON position for 2 seconds and then turn S4 OFF. The following routine shall occur:

1 LED 1 shall turn off and LED 7 shall remain illuminated.

2 For the next 8 seconds: LED 4 illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 4 and 7 turn off.

4 LED 7 illuminates for 2 seconds and then turns off for 2 seconds.

5 LEDs 1 and 7 shall illuminate. End of routine.

(p) Place S5 in the ON position for 2 seconds then place S5 in the OFF position. The following routine shall occur:

1 LED 1 shall turn off and LED 7 shall remain illuminated.

2 For the next 8 seconds: LED 5 Illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 5 and 7 turn off.

4 LED 7 illuminates for 2 seconds and then turns off for 2 seconds.

5 LEDs 1 and 7 shall illuminate. End of routine.

(q) Place S6 in the ON position for 2 seconds then place S6 in the OFF position. The following routine shall occur:

1 LED 1 shall turn off and LED 7 shall remain illuminated.

2 For the next 8 seconds: LED 6 illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 6 and 7 turn off.

4 LED 7 illuminates for 2 seconds and then turns off for 2 seconds.

5 LEDs 1 and 7 shall illuminate. End of routine.

(r) Place S2 and S4 in the ON position making certain that S2 is completed before S4. LED 1 turns off and LED 7 remains illuminated. In 10 seconds LEDs 3 and 4 shall illuminate and LED 7 remains illuminated.

(s) Reset by placing S2 and S4 in the OFF position and turning the MODE switch to OFF/RESET and back to HEAT. Place S2 and then S5 in the ON position making certain S2 is completed before S5. LED 1 turns off and LED 7 remains illuminated. In 10 seconds LEDs 3 and 5 shall illuminate and LED 7 remains illuminated.

(t) Reset by placing S2 and S5 in the OFF position and turning the MODE switch to OFF/RESET and back to HEAT. Place S2 and then S6 in the ON position immediately after. LED 1 turns off and LED 7 remains illuminated. In 10 seconds LEDs 3 and 6 shall illuminate and LED 7 remains illuminated.

5-8. LOGIC BOX ASSEMBLY (LGC1). - continued

(u) Reset by placing S2 and S6 in the OFF position and turning the MODE switch to OFF/RESET and back to HEAT. Place S7 in the OFF position, then place S4, S5, and S6 in the ON position. Next, place S1 in the ON position, followed immediately by S7. LEDs 1 and 7 shall turn off. In 10 seconds LED 3 illuminates and LED 7 stays off. S4, S5, and S6 should have no effect

(v) Reset by placing switches S1 through S7 in the OFF position and setting MODE switch to OFF/RESET and back to HEAT. Place S4, S5 and S6 in the ON position, followed by S7. The following routine shall occur:

1 LED 1 shall turn off and LED 7 shall remain illuminated.

2 For the next 8 seconds: LEDs 4, 5, and 6 shall illuminate. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 4, 5, 6, and 7 turn off,

4 For the next 2 seconds: LEDs 4, 5, and 6 shall continue to be off. LED 7 shall illuminate.

5 Steps 2 through 4 shall repeat twice. Then LEDs 4, 5, and 6 illuminate and LED 7 remains illuminated. End of routine.

(w) Reset by placing switches S1 through S7 in the OFF position and setting MODE switch to OFF/RESET and back to HEAT. Place S4, S5, and S6 in the ON position followed immediately by S7, then S2. If LEDs 4, 5, and 6 are illuminated they shall turn off and in 10 seconds LEDs 3, 4, 5, and 6 illuminate and LED 7 remains illuminated.

(x) Reset by turning MODE switch to OFF/RESET however, keep S2, S4, S5, S6 and S7 in the ON position. Then turn MODE switch to HEAT. LED 1 shall not illuminate. LED 7 shall illuminate. In 10 seconds LEDs 3, 4, 5, and 6 illuminate and LED 7 remains illuminated.

(4) Vent mode test.

(a) Reset by turning MODE switch to OFF/RESET and placing switches S1 through S6 in the OFF position. Then turn MODE switch to VENT position. In 2 seconds LED 7 shall illuminate.

(b) Rotate TEMPERATURE control from WARM to COOL position and back to WARM. LED 7 remains illuminated. Temperature setting should have no effect.

(c) Turn test fixture power off and then back on again. In 2 seconds LED 7 shall illuminate.

(d) Place S4 in the ON position. The following routine shall occur.

1 LED 7 shall remain illuminated.

2 For the next 8 seconds: LED 4 illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 4 and 7 turn off.

4 For the next 2 seconds: LED 4 shall continue to be off. LED 7 shall illuminate.

5 Steps 2 through 4 shall repeat twice. Then LED 4 illuminates and LED 7 remains illuminated. End of routine.

5-8. LOGIC BOX ASSEMBLY (LGC1). - continued

(e) Place S4 in the OFF position. Reset previous fault condition by turning the MODE switch to OFF/RESET position and then back to VENT position again. Still maintaining TEMPERATURE control set to WARM position wait 10 seconds and then place S5 in the ON position. The following routine shall occur:

1 LED 7 shall remain illuminated

2 For the next 8 seconds: LED 5 illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 5 and 7 turn off.

4 For the next 2 seconds: LED 5 shall continue to be off. LED 7 shall illuminate.

5 Steps 2 through 4 shall repeat twice. Then LED 5 illuminates and LED 7 remains illuminated. End of routine.

(f) Place S5 in the OFF position. Reset previous fault condition by turning the MODE switch to OFF/RESET position and then back to VENT position again. Still maintaining TEMPERATURE control set to WARM position wait 10 seconds and then place S6 in the ON position. The following routine shall occur:

1 LED 7 shall remain illuminated.

2 For the next 8 seconds: LED 6 illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 6 and 7 turn off.

4 For the next 2 seconds: LED 6 shall continue to be off. LED 7 shall illuminate.

5 Steps 2 through 4 shall repeat twice. Then, LED 6 illuminates and LED 7 remains illuminated. End of routine.

(g) Place S6 in the OFF position. Reset previous fault condition by turning the MODE switch to OFF/RESET position and then back to VENT position. Place S4 in the ON position for 2 seconds and then place S4 in the OFF position. The following routine shall occur:

1 LED 7 shall remain illuminated.

2 For the next 8 seconds: LED 4 illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 4 and 7 turn off.

4 LED 7 illuminates for 2 seconds and then turns off for 2 seconds.

5 LED 7 shall illuminate. End of routine.

(h) Place S5 in the ON position for 2 seconds and then place S5 in the OFF position. The following routine shall occur:

1 LED 7 shall remain illuminated.

2 For the next 8 seconds: LED 5 illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 5 and 7 turn off.

5-8. LOGIC BOX ASSEMBLY (LGC1). - continued

4 LED 7 illuminates for 2 seconds and then turns off for 2 seconds.

5 LED 7 shall illuminate. End of routine.

(i) Place S6 in the ON position for 2 seconds and then place S6 in the OFF position. The following routine shall occur:

1 LED 7 shall remain illuminated.

2 For the next 8 seconds: LED 6 illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 6 and 7 turn off.

4 LED 7 illuminates for 2 seconds and then turns off for 2 seconds.

5 LED 7 shall illuminate. End of routine.

(j) Place S1 in the ON position for 2 seconds and then place S1 in the OFF position. LED 7 shall turn off for 10 seconds and then illuminate.

(k) Place S1 in the ON position. LED 7 shall turn off and in 10 seconds LED 3 shall illuminate.

(l) Place S1 in the OFF position and reset MODE switch by turning to OFF/RESET. Turn MODE switch back to VENT position. In 2 seconds LED 7 illuminates.

(m) Place S7 in the OFF position; place S4, S5, and S6 in the ON position. Place S1 in the ON position and in 2 seconds place S7 in the ON position. LED 7 shall turn off and in 10 seconds LED 3 shall illuminate. S4, S5, and S6 have no effect.

(n) Place switches S1 through S6 in the OFF position. Reset by turning MODE switch to OFF/RESET and then back to VENT. Place S7 in the OFF position: place S4, S5, and S6 in the ON position. Place S7 in the ON position and in 1 second place S1 in the ON position. LEDs 4, 5, and 6 shall illuminate. After S1 is turned ON LEDs 4, 5, and 6 turn off. After 10 seconds LED 3 illuminates and LED 7 is off.

(o) Reset by turning MODE switch to OFF/RESET position however, do not change any other switch positions. No LEDs are illuminated but in 10 seconds LED 3 shall illuminate.

(5) Cool mode test.

(a) Place switches S1 through S6 in the OFF position and AMBIENT control to mid range. Reset by turning MODE switch to OFF/RESET position and then to COOL position. Rotate TEMPERATURE control to COOL position. After a 2-second delay LEDs 2 and 7 shall illuminate.

(b) Slowly rotate TEMPERATURE control to the WARM position until LED 2 just turns off. LED 7 shall remain illuminated.

(c) Slowly rotate AMBIENT control toward the WARM position. LED 7 shall turn off. After 2 seconds LEDs 2 and 7 shall illuminate.

5-8. LOGIC BOX ASSEMBLY (LGC1). - continued

(d) Rotate AMBIENT control to COOL position. Rotate TEMPERATURE control to COOL position. Place S4 in the ON position. The following routine shall occur:

1 LED 2 shall turn off and LED 7 shall remain illuminated.

2 For the next 8 seconds: LED 4 illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 4 and 7 turn off.

4 For the next 2 seconds: LED 4 shall continue to be off. LED 7 shall illuminate.

5 Steps 2 through 4 shall repeat twice. Then LED 4 illuminates and LED 7 remains illuminated. End of routine.

(e) Place S4 in the OFF position. Reset by turning the MODE switch to OFF/RESET position and then back to COOL position. Still maintaining TEMPERATURE control set to COOL position, wait 10 seconds and then place S5 in the ON position. The following routine shall occur:

1 LED 2 shall turn off and LED 7 shall remain illuminated

2 For the next 8 seconds: LED 5 illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 5 and 7 turn off.

4 For the next 2 seconds: LED 5 shall continue to be off. LED 7 shall illuminate.

5 Steps 2 through 4 shall repeat twice. Then LED 5 illuminates and LED 7 remains illuminated. End of routine.

(f) Place S5 in the OFF position. Reset previous fault condition by turning the MODE switch to OFF/RESET position then back to COOL position. Still maintaining TEMPERATURE control set to COOL position, wait 10 seconds and then place S6 in the ON position. The following routine shall occur:

1 LED 2 shall turn off and LED 7 shall remain illuminated.

2 For the next 8 seconds: LED 6 illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 6 and 7 turn off.

4 For the next 2 seconds: LED 6 shall continue to be off. LED 7 shall illuminate.

5 Steps 2 through 4 shall repeat twice. Then LED 6 illuminates and LED 7 remains illuminated. End of routine.

(g) Place S6 in the OFF position. Reset by turning the MODE switch to OFF/RESET position and then back to COOL position. Place S4 in the ON position for 2 seconds then place S4 in the OFF position. The following routine shall occur:

1 LED 2 shall turn off and LED 7 shall remain illuminated.

2 For the next 8 seconds: LED 4 illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 4 and 7 turn off.

5-8. LOGIC BOX ASSEMBLY (LGC1). - continued

4 LED 7 illuminates for 2 seconds and then turns off for 2 seconds.

5 LEDs 2 and 7 shall illuminate. End of routine.

(h) Place S5 in the ON position for 2 seconds and then place S5 in the OFF position. The following routine shall occur:

1 LED 2 shall turn off and LED 7 shall remain illuminated.

2 For the next 8 seconds: LED 5 illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 5 and 7 turn off.

4 LED 7 illuminates for 2 seconds and then turns off for 2 seconds.

5 LEDs 2 and 7 shall illuminate. End of routine.

(i) Place S6 in the ON position for 2 seconds and then place S6 in the OFF position. The following routine shall occur:

1 LED 2 shall turn off and LED 7 shall remain illuminated.

2 For the next 8 seconds: LED 6 illuminates. LED 7 remains illuminated.

3 For the next 2 seconds: LEDs 6 and 7 turn off.

4 LED 7 illuminates for 2 seconds and then turns off for 2 seconds.

5 LEDs 2 and 7 shall illuminate. End of routine.

(j) Place S1 in the ON position for 2 seconds and then place S1 in the OFF position. LEDs 2 and 7 shall turn off for 10 seconds then LEDs 2 and 7 shall illuminate.

(k) Place S1 in the ON position. LEDs 2 and 7 shall turn off. In 10 seconds LED 3 shall illuminate.

(l) Place S1 in the OFF position and reset MODE switch by turning to OFF/RESET. Turn MODE switch back to COOL position. In 2 seconds LEDs 2 and 7 shall illuminate.

(m) Place S1 in the ON position. LEDs 2 and 7 shall turn off. In 10 seconds LED 3 shall illuminate.

(n) Place S1 in the OFF position. LED 3 remains illuminated.

(o) Place switches S1 through S6 in the OFF position. Reset MODE switch by turning to OFF/RESET and back to COOL position. Place S4 in the ON position. After 1 second, place S1 in the ON position. LED 4 shall illuminate. After S1 is placed in the ON position, LED 4 shall turn off. In 10 seconds LED 3 shall illuminate.

(p) Reset MODE switch by turning to OFF/RESET position. Do not change any other switch positions. Turn MODE switch to COOL position. No LEDs shall illuminate. In 10 seconds LED 3 shall illuminate.

(q) Reset MODE switch by turning to OFF/RESET position. Do not change any other switch positions. Turn MODE switch to COOL position. Then immediately place S4 and S1 in the OFF position. In 10 seconds LEDs 2 and 7 shall illuminate.

5-8. LOGIC BOX ASSEMBLY (LGC1). - continued

(r) Place S2 in the ON position. LEDs 2 and 7 remain illuminated. S2 has no effect.

(s) Place S2 in the OFF position and place S3 in the ON position. Turn MODE switch to HEAT position with TEMPERATURE control set at the WARM position. After a 2-second delay LEDs 1 and 7 illuminate. S3 has no effect.

(t) Without placing S3 in the OFF position, turn MODE switch to COOL position with TEMPERATURE control set at the COOL position. LED 2 shall not illuminate but LED 7 shall illuminate. After a 10-second delay LED 3 shall illuminate.

(u) Place S3 in the OFF position. After up to a 10-second time delay LEDs 3 and 7 shall turn off. LEDs 7 and 2 shall illuminate within 4 seconds.

(v) Place switches S1 through S6 in the OFF position and reset MODE switch by turning to OFF/RESET position. Turn MODE switch to VENT position. Then place S2 and S3 in the ON position. If LED 7 is illuminated it shall turn off. After a 10 second delay LED 3 shall illuminate.

(w) Place S2 and S3 in the OFF position and reset MODE switch by turning to OFF/RESET position. Place S1 in the ON position and turn MODE switch to VENT position. No LEDs shall illuminate. After a 10 second delay, LED 3 shall illuminate.

(6) Turn test fixture power off and disconnect test equipment from logic box assembly.

NOTE

FOLLOW-ON MAINTENANCE:

Install logic box assembly (para 4-36).

5-9. EVAPORATOR AND CONDENSER FAN MOTOR (B2) REPAIR.

This task covers: Repair

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
(B2)
Appendix B, item 1

Bearing Puller
Appendix B, item 12
Soldering Gun Kit
Appendix B, item 2

Materials/Parts

Oil
Appendix E, item 17

Lock Washers

Solder
Appendix E, item 7

Equipment Condition

Remove evaporator and condenser fan motor (para 4-47).

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

NOTE

Check nameplate on motor for manufacturer and use repair instructions below which pertain to the motor in your air conditioner.

For additional information on electric motor repair refer to FM 20-31 (Electric Motor and Generator Repair).

Repair.

(1) Welco Industries motor.

(a) To replace connector (1):

1 Remove four sets of screws (2) and lock washers (3).

2 Pull terminal box (4) as far from motor as wire leads will allow.

3 Remove four screws (5).

4 Pull connector (1) as far out of terminal box as wire leads will allow.

5 Tag and unsolder wire leads from connector (1). (See paragraph 4-26.)

6 See wiring diagram figure 4-10 and tags and solder leads to new connector (1). Remove tags. (See paragraph 4-26.)

5-9. EVAPORATOR AND CONDENSER FAN MOTOR (B2) REPAIR. - continued

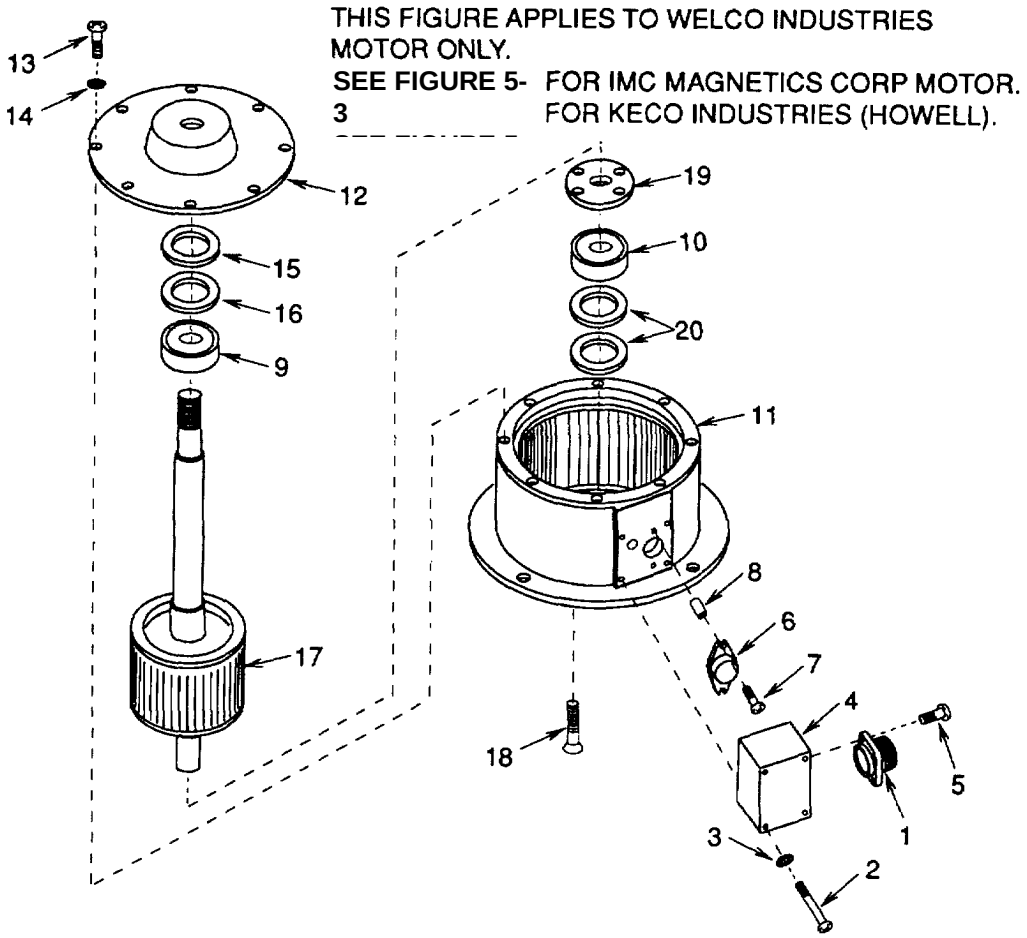

Figure 5-2. Evaporator and Condenser Fan Motor (Welco Industries Motor).

7 Secure connector (1) to terminal box (4) with four screws (5).

8 Secure terminal box (4) to motor with four sets of screws (2) and lock washers (3).

(b) To replace thermal (overload) protector (6):

1 Remove four sets of screws (2) and lock washers (3).

2 Carefully pull terminal box (4) from motor as far as wire leads will allow.

3 Tag and disconnect wire leads from thermal protector (6). (See paragraph 4-26.)

4 Remove two screws (7) and spacers (8). Remove old thermal protector (6).

5 Install new thermal protector (6) onto motor and secure with two screws (7) and spacers (8).

6 See tags and solder leads to new thermal protector (6). Remove tags. (See paragraph 4-26.)

7 Secure terminal box (4) to motor with four sets of screws (2) and lock washers (3).

5-9. EVAPORATOR AND CONDENSER FAN MOTOR (B2) REPAIR. - continued

(c) To replace ball bearings (9) and (10):

1 Match-mark motor frame/stator (11) and end bell bracket (12) to ease reassembly.

2 Remove eight sets of screws (13) and lock washers (14).

3 Carefully pull end bell bracket (12) from motor shaft.

4 Remove bearing washer (15). Inspect for excessive wear, nicks, or breakage. Replace if damaged.

5 Remove shim (16). Inspect for excessive wear, nicks, or breakage. Replace if damaged.

CAUTION

Bearings are permanently lubricated and sealed at the time of manufacture. Do not attempt to clean or relubricate them. Keep bearings in plastic bags or wrap securely in grease-proof paper until needed for reassembly.

6 Remove ball bearing (9).

7 Carefully pull rotor/shaft (17) from frame/stator (11).

8 Remove four screws (18).

9 Remove bearing retainer (19). Inspect for excessive wear, nicks, stripped threads, or breakage. Replace if damaged.

CAUTION

Bearings are permanently lubricated and sealed at the time of manufacture. Do not attempt to clean or relubricate them. Keep bearings in plastic bags or wrap securely in grease-proof paper until needed for reassembly.

10 Remove ball bearing (10).

11 Remove bearing spacer washers (20). Inspect for excessive wear, nicks, or breakage. Replace if damaged.

12 Inspect frame/stator (11) for broken or cracked flange, stripped threads, visible damage, shorted windings (para 4-47), and evidence of overheating. If frame/stator is beyond repair, replace motor.

13 Inspect rotor/shaft (17) for evidence of overheating. Replace rotor/shaft if overheating is evident.

14 Inspect rotor/shaft (17) for nicks, gouges, and deformation. Dress high metal defects in shaft with a fine file or stone. If shaft is beyond repair, replace rotor/shaft.

15 Coat shaft surfaces of rotor/shaft (17) with oil.

5-9. EVAPORATOR AND CONDENSER FAN MOTOR (B2) REPAIR. - continued

16 Coat bearing spacer washers (20), shim (16), and bearing washer (15) with oil.

17 Coat bearing cavity of frame/stator (11) and end bell bracket (12) with oil.

18 Install bearing spacer washers (20) and new ball bearing (10) into frame/stator (11).

19 Position bearing retainer (19) in place and secure with four screws (18).

20 Carefully insert rotor/shaft (17) into frame/stator (11) and slip shaft into ball bearing.

21 Slip ball bearing (9), shim (16), and bearing washer (15) onto rotor/shaft (17).

22 Carefully slip end bell bracket (12) onto rotor/shaft (17) keeping the match-marks made at time of disassembly in alignment. Secure with eight sets of screws (13) and lock washers (14). Before final tightening, check for freedom of rotation by turning shaft by hand. There should be no drag or binding. Correct as necessary and tighten screws. Check again for binding and drag.

23 Check end play of shaft. End play should be 0.002 -0.005 inch (0.051 - 0.127 mm). If end-play is not within limits, disassemble motor and add or remove bearing spacer washers (20) to adjust. Check again for binding or drag.

(2) IMC Magnetics motor.

(a) To replace connector (1):

1 Remove four sets of screws (2) and lock washers (3).

2 Pull connector (1) as far out of terminal box as wire leads will allow.

3 Tag and unsolder wire leads from connector (1). (See paragraph 4-26.)

4 See wiring diagram figure 4-10 and tags and solder leads to new connector (1). Remove tags. (See paragraph 4-26.)

5 Secure connector (1) to terminal box with four sets of screws (2) and lock washers (3).

NOTE

The thermal (overload) protector is not removable. If defective, the motor must be replaced.

(b) To replace ball bearings (4) and (5):

1 Match-mark motor frame/stator (6) and end cap (7) to ease reassembly.

2 Remove six sets of screws (8) and lock washers (9).

3 Carefully pull end cap (7) from motor shaft.

4 Remove closing shim (10), shims (11, 12, 13, and 14), and two spring wave washers (15). Inspect for excessive wear, nicks, or breakage. Replace if damaged.

5-9. EVAPORATOR AND CONDENSER FAN MOTOR (B2) REPAIR. - continued

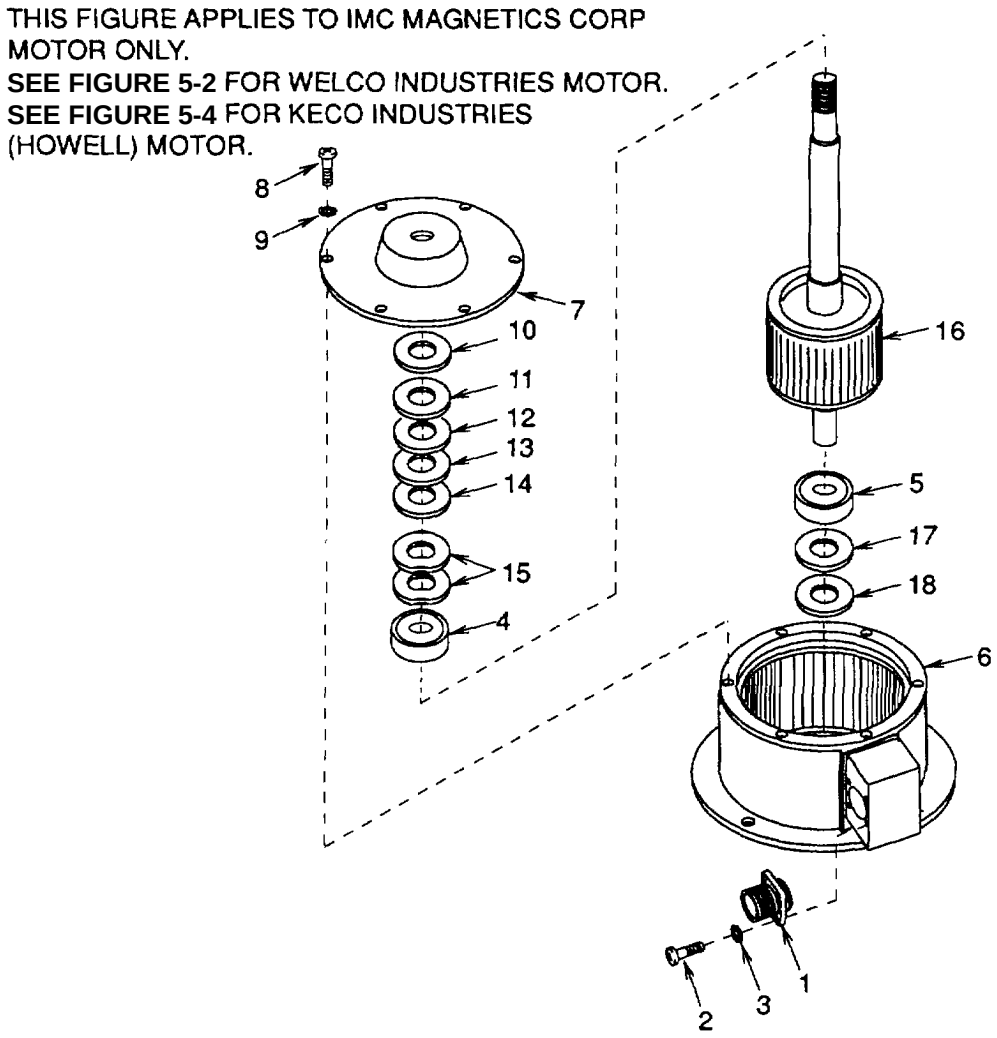

Figure 5-3. Evaporator and Condenser Fan Motor (IMC Magnetics Motor).

CAUTION

Bearings are permanently lubricated and sealed at the time of manufacture. Do not attempt to clean or relubricate them. Keep bearings in plastic bags or wrap securely in grease-proof paper until needed for reassembly.

5 Remove ball bearing (4).

6 Carefully pull rotor/shaft (16) from frame/stator (6).

5-9. EVAPORATOR AND CONDENSER FAN MOTOR (B2) REPAIR. - continued

CAUTION

Bearings are permanently lubricated and sealed at the time of manufacture. Do not attempt to clean or relubricate them. Keep bearings in plastic bags or wrap securely in grease-proof paper until needed for reassembly.

7 Remove ball bearing (5).

8 Remove shim (17) and closing shim (18). Inspect for excessive wear, nicks, or breakage. Replace if damaged.

9 Inspect frame/stator (6) for broken or cracked flange, stripped threads, visible damage, shorted windings (para 4-47), and evidence of overheating. If frame/stator is beyond repair, replace motor.

10 Inspect rotor/shaft (16) for evidence of overheating. Replace rotor/shaft if overheating is evident.

11 Inspect rotor/shaft (16) for nicks, gouges, and deformation. Dress high metal defects in shaft with a fine file or stone. If shaft is beyond repair, replace rotor/shaft.

12 Coat shaft surfaces of rotor/shaft (16) with oil (MIL-L-2104, Grade 20).

13 Coat closing shims (18 and 10), two spring wave washers (15) and shims (17, 14, 13, 12, and 11) with oil (MIL-L-2104, Grade 20).

14 Coat bearing cavity of frame/stator (6) and end cap (7) with oil (MIL-L-2104, Grade 20).

15 Install closing shim (18), shim (17), and new ball bearing (5) into frame/stator (6).

16 Carefully insert rotor/shaft (16) into frame/stator (6) and slip shaft into ball bearing.

17 Slip ball bearing (4), two spring wave washers (15), shims (14, 13, 12, and 11), and closing shim (10) onto rotor/shaft (16).

18 Carefully slip end cap (7) onto rotor/shaft (16) keeping the match-marks made at time of disassembly in alignment. Secure with six sets of screws (8) and lock washers (9). Before final tightening, check for freedom of rotation by turning shaft by hand. There should be no drag or binding. Correct as necessary and tighten screws. Check again for binding and drag.

19 Check end play of shaft. End play should be 0.002 -0.005 inch (0.051 - 0.127 mm). If end-play is not within limits, disassemble motor and add or remove shims to adjust. Check again for binding or drag.

5-9. EVAPORATOR AND CONDENSER FAN MOTOR (B2) REPAIR. - continued

(3) Keco Industries (Howell) motor.

(a) To replace connector (1):

1 Remove four screws (2) and conduit box cover (3).

2 Remove four sets of screws (4) and lock washers (5).

3 Pull connector (1) as far out of conduit box (6) as wire leads will allow.

4 Tag and unsolder wire leads from connector (1). (See paragraph 4-26.)

5 See wiring diagram figure 4-10 and tags. Solder leads to new connector (1). Remove tags. (See paragraph 4-26.)

6 Secure connector (1) to conduit box (6) with four sets of screws (4) and lock washers (5).

7 Secure conduit box cover (3) to conduit box (6) with four screws (2).

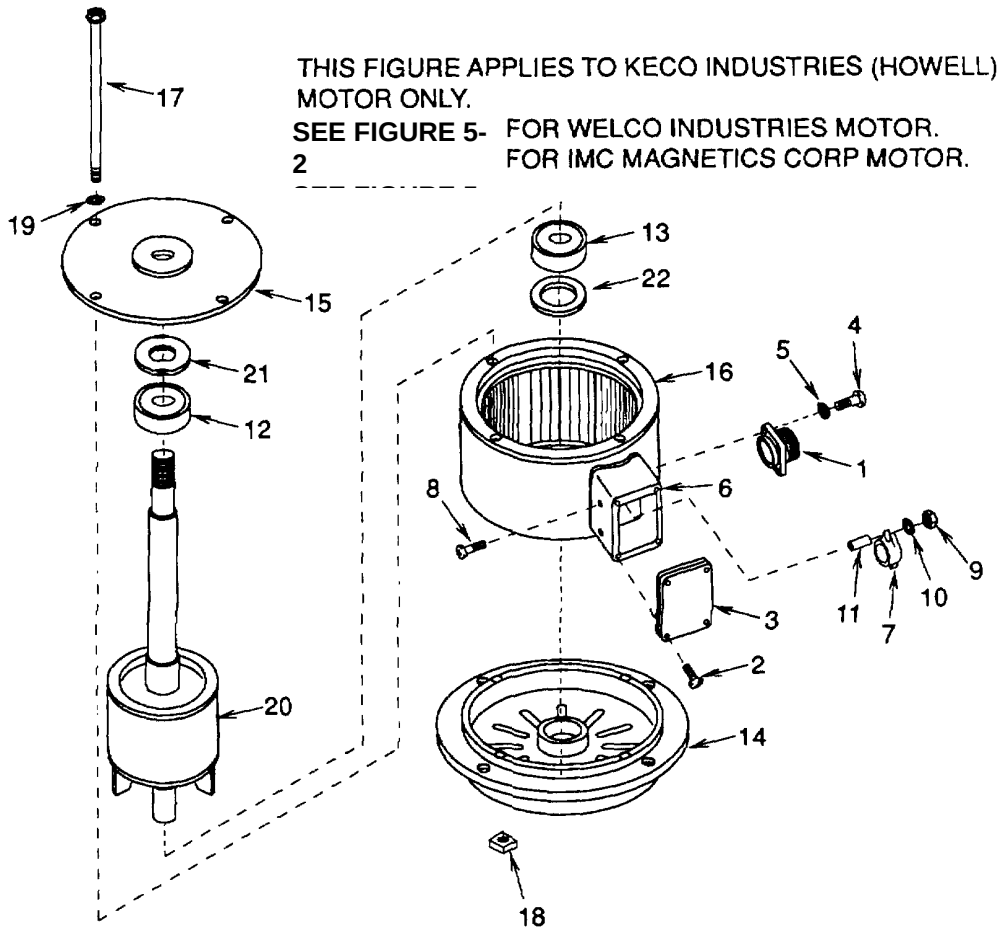

Figure 5-4. Evaporator and Condenser Fan Motor (Keco Industries (Howell) Motor).

5-9. EVAPORATOR AND CONDENSER FAN MOTOR (B2) REPAIR. - continued

(b) To replace thermal (overload) protector (7):

1 Remove four screws (2) and conduit box cover (3).

2 Remove two sets of screws (8), nuts (9), lock washers (10), and spacers (11).

3 Pull thermal (7) as far out of conduit box (6) as wire leads will allow.

4 Tag and disconnect wire leads from thermal (7). (See paragraph 4-26.)

5 See wiring diagram figure 4-10 and tags. Solder leads to new thermal (7). Remove tags. (See paragraph 4-26.)

6 Secure thermal (7) to conduit box (6) with two sets of screws (8), spacers (11), lock washers (10), and nuts (9).

7 Secure conduit box cover (3) to conduit box (6) with four screws (2).

(c) To replace bearings (12) and (13):

1 Match-mark front and rear end shields (14) and (15) to field ring/stator assembly (16). Mark field ring/stator assembly indicating end with longer shaft.

2 Remove four sets of screws (17), nuts (18), and lock washers (19).

3 Carefully tap front and rear end shields (14) and (15) away from field ring/stator assembly (16) and slide off rotor (20) shaft.

4 Remove rear spring washer (21). Inspect for excessive wear, nicks, or breakage. Replace if damaged.

5 Remove front washer (22). Inspect for excessive wear, nicks, or breakage. Replace if damaged.

6 Remove bearings (12) and (13) from rotor (20) shaft. Use bearing puller if necessary.

7 Inspect field ring/stator assembly (16) for broken or cracked weld, any visible damage, shorted windings (para 4-47). If field ring/stator assembly is damaged, replace motor.

8 Inspect front and rear end shields (14) and (15) for cracks or any visible damage. If damaged, replace.

9 Inspect rotor (20) and shaft for evidence of overheating. Replace rotor if overheating is evident.

10 Inspect rotor (20) for nicks, gouges, and deformation. Dress high metal defects in shaft with a fine file or stone. If shaft is beyond repair, replace rotor.

11 Coat bearing cavity of front and rear end shields (14) and (15) with oil.

12 Coat rear spring washer (21) and front washer (22) with oil.

5-9. EVAPORATOR AND CONDENSER FAN MOTOR (B2) REPAIR. - continued

13 Install rear spring washer (21) into rear end shield (15) and front washer (22) into front end shield (14).

14 Coat shaft surfaces of rotor (20) with oil.

CAUTION

Bearings are permanently lubricated and sealed at the time of manufacture. Do not attempt to clean or relubricate them. Keep bearings in plastic bags or wrap securely in grease-proof paper until needed for reassembly.

15 Install bearings (12) and (13) onto rotor (20) shaft.

16 Carefully insert rotor (20) into field ring/stator assembly (16). Note mark made on field ring/stator assembly for correct insertion.

17 Carefully slip front and rear end shields (14) and (15) onto rotor (20) shaft keeping the match- marks made at time of disassembly in alignment with field ring/stator assembly (16). Secure with four sets of screws (17), lock washers (19), and nuts (18). Check for freedom of rotation by turning shaft by hand. There should be no drag or binding. Correct as necessary.

18 Check end play of shaft. End play should be 0.002 -0.005 inch (0.051 - 0.127 mm). If end-play is not within limits, notify supervisor.

NOTE

FOLLOW-ON MAINTENANCE:

Install evaporator and condenser fan motor (B2) (para 4-47).

Connect power at power source.

5-10. SERVICE MANIFOLD INSTALLATION

This task covers: a. Install b. Remove

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Goggles
Appendix B, item 2

Gloves
Appendix B, item 2

Equipment Condition

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

a. Install.

(1) Remove four sets of screws (1), flat washers (2), and one access (service valves) cover (3).

(2) Check that DISCHARGE and SUCTION SERVICE VALVES are closed.

(3) Unscrew hose connection protective caps (4).

WARNING

Dangerous chemical refrigerant under pressure is used in the operation of this equipment. Use great care to avoid contact with liquid refrigerant.

Sudden and irreversible tissue damage can result from freezing. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact with refrigerant is possible.

Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas. Prevent contact of refrigerant with flame or hot surfaces.

(4) Connect the pressure gauge hose to DISCHARGE SERVICE VALVE and the blue (compound gauge) hose to SUCTION SERVICE VALVE.

(5) Check that all four service manifold valves are closed.

(6) Open DISCHARGE and SUCTION SERVICE VALVES.

(7) Loosen the pressure gauge hose at service manifold and allow refrigerant to purge for 3-5 seconds. Tighten hose.

(8) Loosen the compound gauge hose at service manifold and allow refrigerant to purge for 3-5 seconds. Tighten hose.

5-10. SERVICE MANIFOLD INSTALLATION. - continued

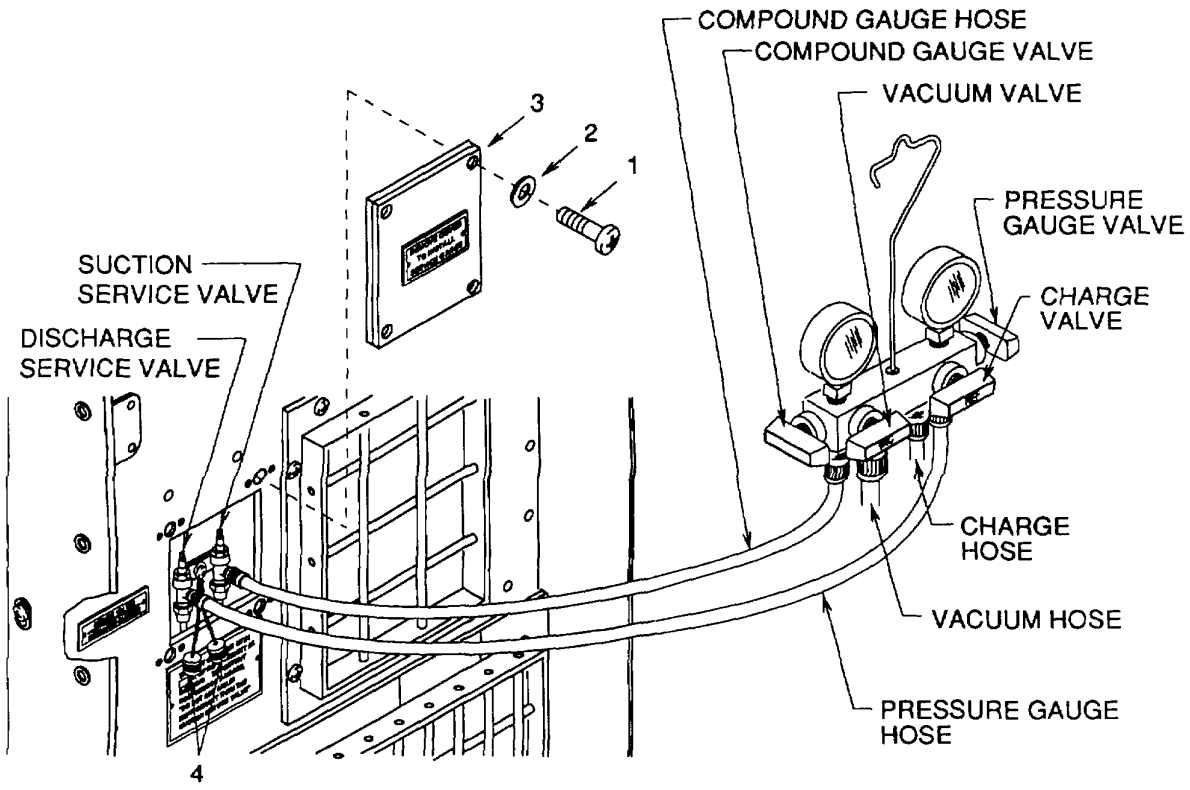

Figure 5-5. Service Manifold Installation.

b. Remove.

(1 Check that unit DISCHARGE and SUCTION SERVICE VALVES are closed.

(2) Open all four service manifold valves to bleed off pressure.

(3) Remove hoses from DISCHARGE and SUCTION SERVICE VALVES.

(4) Close service manifold valves.

(5) Install protective caps (4) onto DISCHARGE and SUCTION SERVICE VALVES.

(6) Install access (service valves) cover (3) with four sets of screws (1), and flat washers (2).

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

5-11. DISCHARGING THE REFRIGERANT SYSTEM.

This task covers: Discharge

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Goggles
Appendix B, item 1

Gloves
Appendix B, item 2

Refrigerant Recovery and Recycle Unit
Appendix B, item 9

Equipment Condition

Install service manifold (para 5-10).

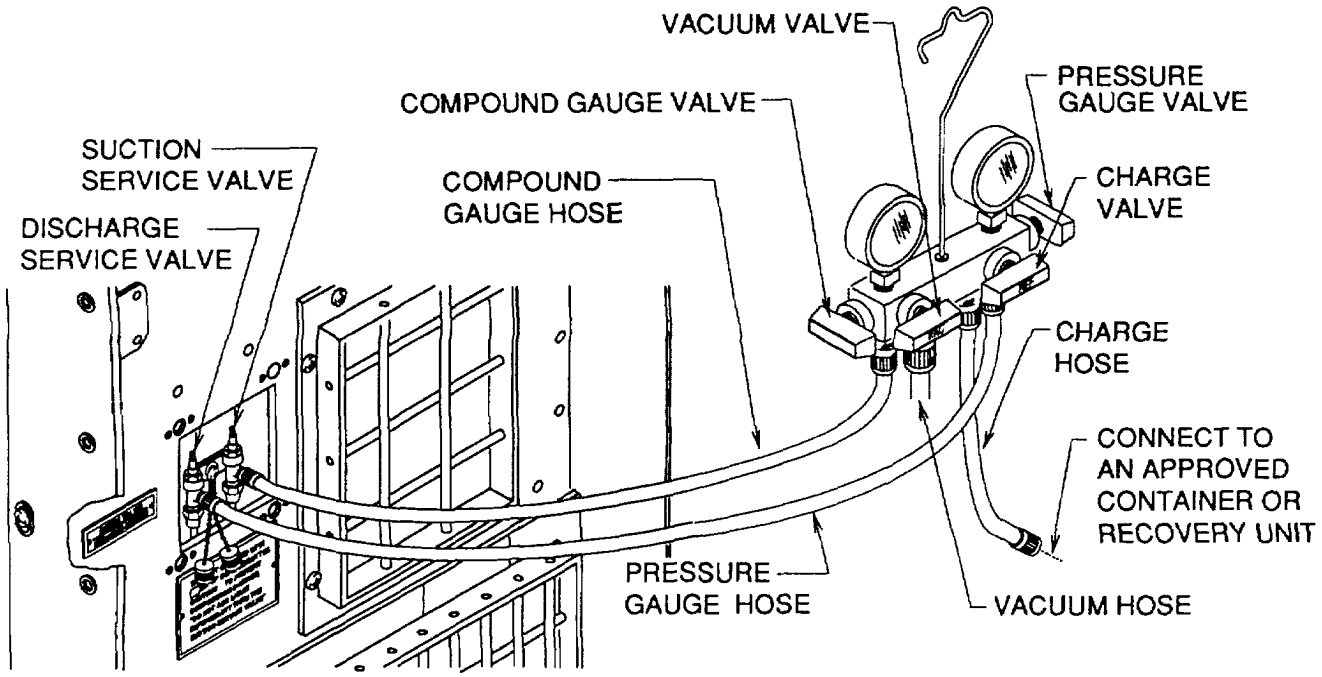

Figure 5-6. Discharging Refrigerant.

5-11. DISCHARGING THE REFRIGERANT SYSTEM. - continued

Discharge.

WARNING

Dangerous chemical refrigerant under pressure is used in the operation of this equipment. Use great care to avoid contact with liquid refrigerant.

Sudden and irreversible tissue damage can result from freezing. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact with refrigerant is possible.

Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas. Prevent contact of refrigerant with flame or hot surfaces.

NOTE

Venting chlorofluorocarbon refrigerants into the atmosphere rather than recovering them is a violation of public law and subject to severe penalties.

(1) Connect the charge hose to an approved container or refrigerant recovery unit.

CAUTION

Follow instructions for specific container or refrigerant recovery unit being used to avoid compressor oil loss. Loss of oil could result in compressor damage.

(2) Open pressure gauge and compound gauge valves.

(3) Discharge refrigerant.

NOTE

FOLLOW-ON MAINTENANCE:

Remove service manifold (para 5-10).

5-12. PURGING THE REFRIGERANT SYSTEM.

This task covers: Purge

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Goggles
Appendix B, item 2

Nitrogen Regulator
Appendix B, item 7

Materials/Parts

Nitrogen
Appendix E, item 8

Equipment Condition

Discharge refrigerant system (para 5-11).

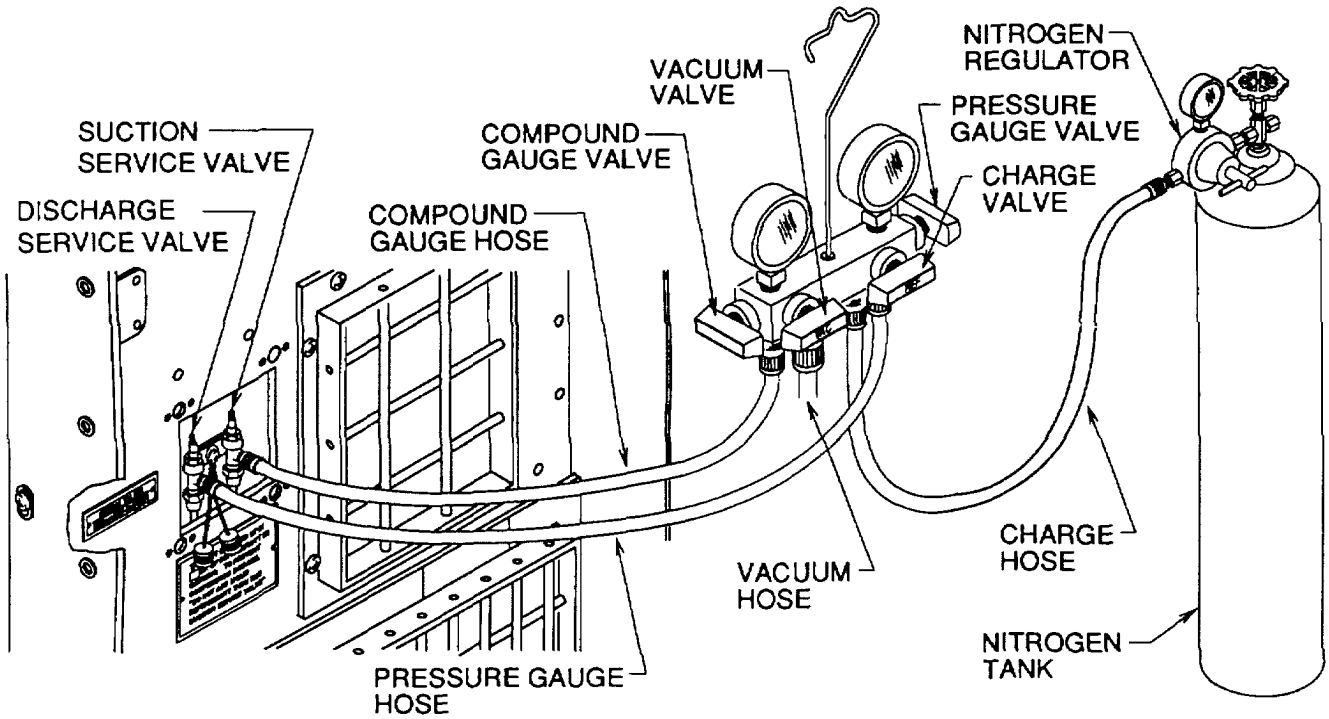

Figure 5-7. Nitrogen Tank Connection.

5-12. PURGING THE REFRIGERANT SYSTEM. - continued

Purge.

WARNING

The pressure in a nitrogen cylinder can exceed 2000 psi. A nitrogen pressure regulator should be used at all times to avoid personal injury.

Nitrogen is an inert gas that can cause suffocation and must be discharged in a well ventilated area.

(1) Connect the charge hose to a nitrogen regulator and dry nitrogen cylinder.

(2) Disconnect the compound gauge hose from the service manifold.

(3) Be sure the service manifold compound gauge and vacuum valves are closed.

(4) Be sure that unit DISCHARGE and SUCTION SERVICE VALVES are open.

(5) Open the service manifold pressure gauge and charge valves.

(6) Open the nitrogen cylinder valve and adjust the regulator so that approximately 1 - 2 cfm (0.028 - 0.057 m3/minute) of nitrogen flows through the system.

(7) Check discharge from the hose attached to the SUCTION SERVICE VALVE to be sure that no oil is being forced out of the system.

(8) When purging is completed, close nitrogen cylinder valve.

(9) Disconnect the charge hose from nitrogen regulator.

(10) Connect the compound gauge hose to service manifold.

NOTE

FOLLOW-ON MAINTENANCE:

Remove service manifold (para 5-10).

5-13. BRAZING/DEBRAZE PROCEDURES.

This task covers: Purge

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Goggles
Appendix B, item 2

Gloves
Appendix B, item 2

Brush
Appendix B, item 2

Nitrogen Regulator
Appendix B, item 7

Materials/Parts

Nitrogen
Appendix E, item 8

Brazing Alloy
Appendix E, item (9 and 10)

Brazing Flux
Appendix E, item 11

Abrasive Cloth
Appendix E, item 12

Rags
Appendix E, item 13

Equipment Condition

Discharge refrigerant system (para 5-11).

a. Debraze.

WARNING

The pressure in a nitrogen cylinder can exceed 2000 psi. A nitrogen pressure regulator should be used at all times to avoid personal injury.

Nitrogen is an inert gas that can cause suffocation and must be discharged in a well ventilated area.

(1) Purge with dry nitrogen. (See paragraph 5-12.)

WARNING

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 or brazing temperature. Work in well ventilated area.

(2) Protect insulation, wiring harnesses, and other components with appropriate heat shields.

5-13. BRAZING/DEBRAZING PROCEDURES. - continued

WARNING

Never use a heating torch on any part that contains refrigerant. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas. All refrigerant must be discharged from the system and the entire system must be purged with dry nitrogen before beginning any debrazing operation.

NOTE

It may be easier to access a component by cutting or debrazing the copper lines in accessible areas and removing part of the interconnecting tubing with the component.

(3) If debrazing a joint on a valve, disassemble the valve to the extent possible and wrap all but the joint with a wet cloth to act as a heat sink.

CAUTION

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.

(4) Apply sufficient heat uniformly around the joint to quickly melt the filler alloy. Remove heat as soon as the joint is separated.

b. Clean.

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 wire brush. Be sure no filler alloy or other debris is left inside any tubing, fitting, or component.

c. Braze.

WARNING

The pressure in a nitrogen cylinder can exceed 2000 psi. A nitrogen pressure regulator should be used at all times to avoid personal injury.

Nitrogen is an inert gas that can cause suffocation and must be discharged in a well ventilated area.

(1) Purge with dry nitrogen. (See paragraph 5-12.)

WARNING

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 or brazing temperature. Work in well ventilated area.

(2) Protect insulation, wiring harnesses, and other components with appropriate heat shields.

5-13. BRAZING/DEBRAZING PROCEDURES. - continued

WARNING

Never use a heating torch on any part that contains refrigerant. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas. All refrigerant must be discharged from the system and the entire system must be purged with dry nitrogen before beginning any debrazing operation.

NOTE

All joints, except those provided with flare fittings, are made by brazing in accordance with MIL-B-7883, except that radiographic examination is not required.

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 III brazing alloy may be substituted for Grade IV or VI for copper to copper joints; flux is not required for copper to copper joints.

(3) If brazing a joint on a valve, disassemble the valve to the extent possible and wrap all but the joint with a wet cloth to act as a heat sink.

NOTE

If interconnecting tubing was removed with a component, braze tubing to the new components before reinstallation.

(4) Position component or assembly into place.

CAUTION

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.

(5) Apply sufficient heat uniformly around the joint to quickly melt the filler alloy. Remove heat as soon as brazing is completed.

NOTE

FOLLOW-ON MAINTENANCE:

Remove service manifold (para 5-10).

5-14. FLUSHING THE REFRIGERANT SYSTEM.

This task covers: a. Flush b. Purge

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Goggles
Appendix B, item 2

Gloves
Appendix B, item 2

Diaphragm Pump
Appendix B, item 8

Nitrogen Regulator
Appendix B, item 7

Materials/Parts

Refrigerant R-114
Appendix E, item 5

Nitrogen
Appendix E, item 8

Equipment Condition

Remove Compressor (para 5-32).

a. Flush.

Flush the refrigerant system with refrigerant R-114. Procedures for flushing the system are as follows:

(a) Connect the two filter-drier fittings with a jumper, locally manufactured from refrigerant tubing and fittings.

(b) Connect a line from the discharge line in the unit to the discharge side of pump.

NOTE

The R-114 may be recirculated if run through a 10 micron filter.

An unused refrigerant desiccant dehydrator or other suitable medium may be used as a filter.

(c) Connect a line containing a filter to the suction line in the unit. The other end of the line should discharge into a small drum or suitable reservoir.

(d) Connect a line to draw from the bottom of the reservoir to the inlet of the pump.

5-14. FLUSHING THE REFRIGERANT SYSTEM. - continued

WARNING

Burns can result from contact with acid formed by burn out of oil and refrigerant. Avoid inhaling fumes and wear a gas mask if area is not thoroughly ventilated. Wear protective goggles or glasses to protect eyes. Wear gloves to protect hands.

(e) Fill reservoir with refrigerant R-114 and start pump. Keep reservoir full until refrigerant begins to pour out of the return line. Continue flushing for at least 15 minutes.

(f) Reverse the unit discharge and suction line connections, replace the filter with a new filtering medium, and flush the system for at least 15 minutes.

b. Purge.

WARNING

The pressure in a nitrogen cylinder can exceed 2000 psi. A nitrogen pressure regulator should be used at all times to avoid personal injury.

Nitrogen is an inert gas that can cause suffocation and must be discharged in a well ventilated area.

Purge the system with nitrogen at approximately 30 psig (2.11 kg/cm2) as follows:

(a) Remove the pump, reservoir, filter, and refrigerant desiccant dehydrator jumper. Place an empty container below the compressor connections, and connect the cylinder of dry nitrogen to each filter-drier connection in turn. Blow down each leg of the system for at least 30 seconds after moisture stops being discharged.

(b) Disconnect the dry nitrogen cylinder. Cap or plug open connections if compressor and filter-drier are not to be installed immediately.

NOTE

FOLLOW-ON MAINTENANCE:

Install compressor (para 5-32).

5-15. LEAK TESTING THE REFRIGERANT SYSTEM.

This task covers: Test

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Goggles
Appendix B, item 2

Gloves
Appendix B, item 2

Nitrogen Regulator
Appendix B, item 7

Materials/Parts

Nitrogen
Appendix E, item 8

Refrigerant R-22
Appendix E, item 4

Equipment Condition

Install service manifold (para 5-10).

WARNING

Never pressurize lines with oxygen, mixture with oil will cause an explosion.

The pressure in a nitrogen cylinder can exceed 2000 psi. A nitrogen pressure regulator should be used at all times to avoid personal injury.

Nitrogen is an inert gas that can cause suffocation and must be discharged in a well ventilated area.

NOTE

Either a refrigerant gas leak detector or a strong solution of liquid detergent in water can be used to test for leaks.

If an electronic refrigerant gas leak detector is available, it should be used in accordance with the procedures contained in TM 9-4940-435-14, "Leak Detector, Refrigerant Gas".

To perform leak testing by use of the electronic detector, it is necessary that the system be pressurized with a proportion of refrigerant gas.

5-15. LEAK TESTING THE REFRIGERANT SYSTEM. - continued

Test.

(1) To pressurize a system that has some refrigerant charge:

(a) Connect the charge hose to a Refrigerant-22 cylinder.

(b) Open the service manifold compound gauge, pressure gauge, and charge valves.

(c) Check that service manifold vacuum valve is closed.

(d) Open refrigerant cylinder valve and pressurize system to 100 psi (7.1 kg/cm2).

(e) Test for leaks at all points of possible leakage using an electronic refrigerant gas leak detector.

(f) If a leak is found, discharge and purge system, and repair leak. Retest for leaks. (See paragraph 5-12.)

(g) If a leak was not found, check unit charge. (See paragraph 5-17.)

(2) To pressurize a system that has been discharged and purged:

(a) Connect the charge hose to a cylinder of Refrigerant-22 set to deliver gas only.

(b) Open the service manifold compound gauge, pressure gauge, and charge valves.

(c) Check that service manifold vacuum valve is closed.

(d) Open refrigerant cylinder valve and pressurize system to 40-50 psi (2.8 - 3.5 kg/cm2).

(e) Close service manifold valves and refrigerant cylinder valve.

(f) Disconnect charge hose from the refrigerant cylinder.

(g) Connect the charge hose to a nitrogen regulator and dry nitrogen cylinder.

(h) Open the service manifold compound gauge, pressure gauge, and charge valves.

(i) Open nitrogen cylinder valve and pressurize system to 350 psi (24.7 kg/cm2).

(j) Close service manifold valves and nitrogen cylinder valve.

(k) Test for leaks at all points of possible leakage using an electronic refrigerant gas leak detector.

(l) If a leak is found, discharge and purge system, and repair leak. Retest for leaks. (See paragraph 5-12.)

(m) After performing leak tests, discharge and purge system before performing maintenance, or evacuating and charging system, as appropriate. (See paragraphs 5-11 and 5-12.)

NOTE

FOLLOW-ON MAINTENANCE:

Remove service manifold (para 5-10).

5-16. EVACUATING THE REFRIGERANT SYSTEM.

This task covers: Evacuate

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Vacuum Pump
Appendix B, item

Equipment Condition

Install service manifold (para 5-10).

Discharge the refrigerant system (para 5-11).

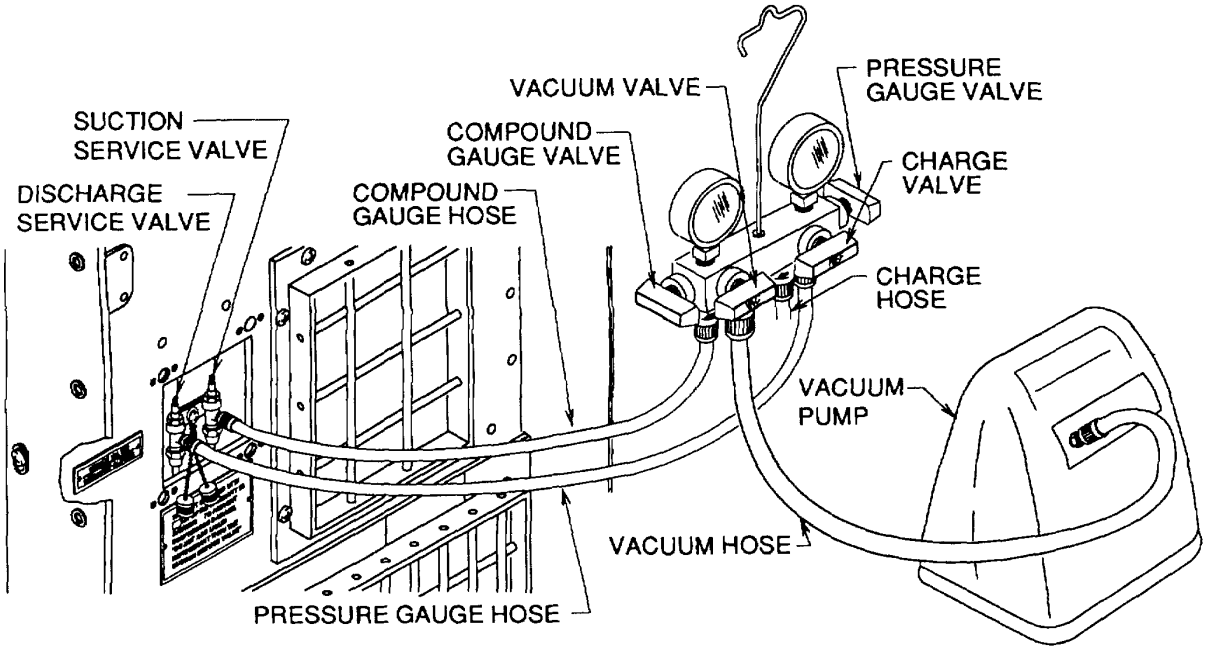

Figure 5-8. Evacuation of Refrigerant System.

Evacuate.

(1) Check that new refrigerant desiccant dehydrator was installed. If not, install one. (See paragraph 5-21.)

(2) Check that service manifold charge valve is closed.

(3) Check that unit DISCHARGE and SUCTION SERVICE VALVES are open.

(4) Connect the vacuum hose to vacuum pump.

5-16. EVACUATING THE REFRIGERANT SYSTEM. - continued

(5) Start vacuum pump.

(6) Open service manifold high pressure gauge, compound gauge, and vacuum valves.

(7) Run vacuum pump until at least 29 inches of mercury is measured on compound gauge.

NOTE

Inability to reach and hold 29 inches of mercury may indicate either a leak or a problem with the vacuum pump.

(8) Continue running vacuum pump for one more hour, while observing the gauge. If gauge needle moves back and forth, you have a leak which must be located and corrected. (See paragraph 5-15.)

(9) Close unit DISCHARGE and SUCTION SERVICE VALVES.

(10) Close service manifold high pressure gauge, compound gauge, and vacuum valves.

(11) Stop vacuum pump.

(12) Disconnect the vacuum hose from vacuum pump.

(13) Charge the refrigerant system. (See paragraph 5-17.)

5-17. CHARGING THE REFRIGERANT SYSTEM.

This task covers: a. Full Charge b. Partial Charge

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Goggles
Appendix B, item 2

Gloves
Appendix B, item 2

Materials/Parts

Refrigerant R-22
Appendix E, item 4

Equipment Condition

Evacuate the refrigerant system (paragraph 5-16).

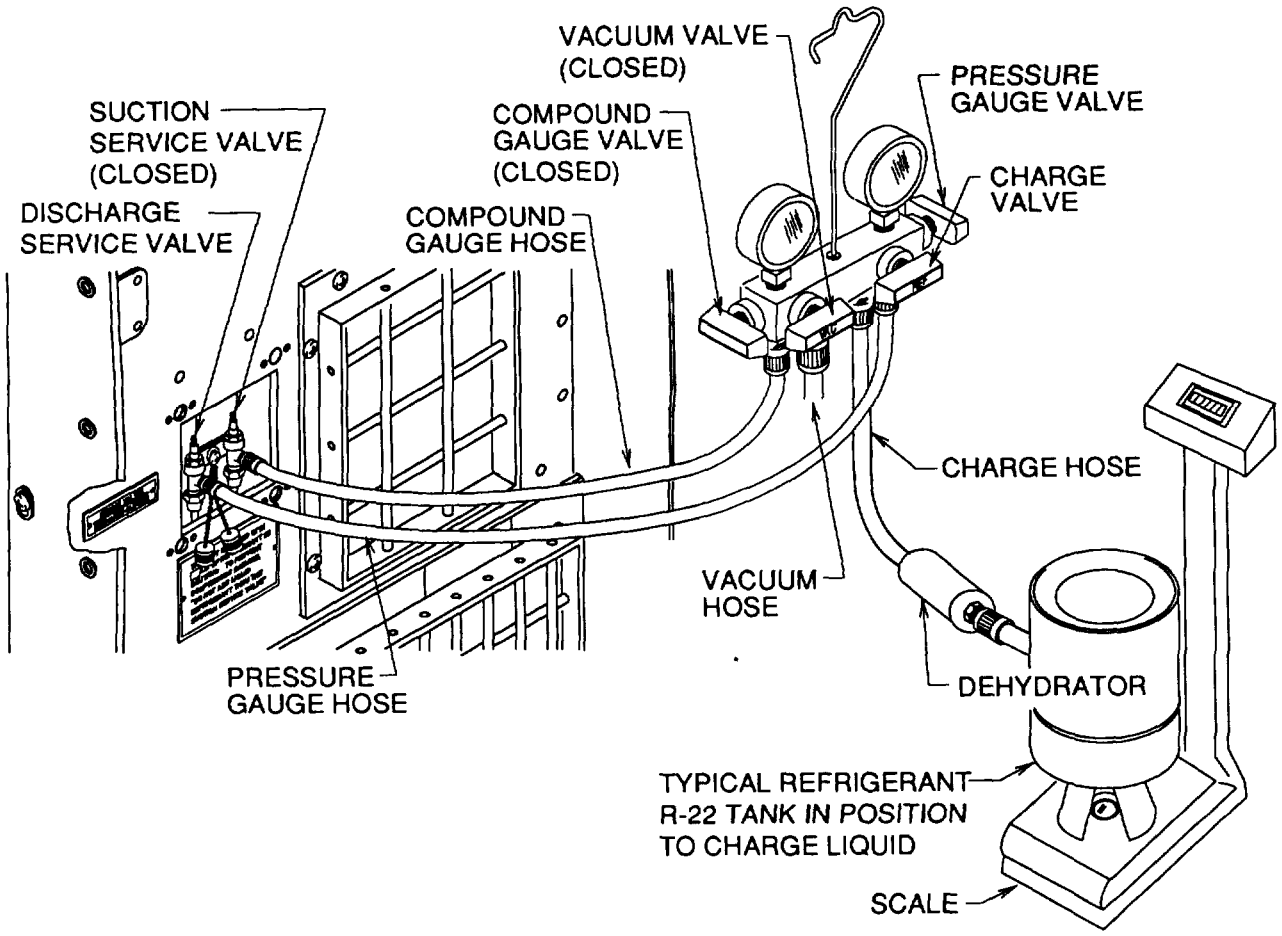

Figure 5-9. Refrigerant Charging (Total System)

5-17. CHARGING THE REFRIGERANT SYSTEM. - continued

a. Full Charge.

WARNING

Dangerous chemical refrigerant under pressure is used in the operation of this equipment. Use great care to avoid contact with liquid refrigerant.

Sudden and irreversible tissue damage can result from freezing. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact with refrigerant is possible.

Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas. Prevent contact of refrigerant with flame or hot surfaces.

CAUTION

The system must be evacuated before charging. Use only Refrigerant-22 to charge the unit.

NOTE

The charging operation should be done with all panels in place except for refrigerant charging valve access cover.

(1) Connect the charge hose to a cylinder of Refrigerant-22 set to deliver gas.

(2) Loosen hose connections on the DISCHARGE and SUCTION SERVICE VALVES slightly.

(3) Check that vacuum and charge valves are closed.

(4) Open pressure gauge and compound gauge valves.

(5) Open refrigerant cylinder valve.

(6) Open charge valve slightly to allow a small amount of refrigerant to purge air from hoses. (Tighten hose connections on the DISCHARGE and SUCTION SERVICE VALVES.) Close charge valve.

CAUTION

Never introduce liquid refrigerant into the low pressure (suction) charging valve. This can cause damage to the compressor.

(7) Close compound gauge valve.

(8) Set refrigerant cylinder to deliver liquid only.

(9) Place refrigerant cylinder on an accurate scale to measure and record weight.

(10) Open DISCHARGE and SUCTION SERVICE VALVES.

5-17. CHARGING THE REFRIGERANT SYSTEM. -continued

(11) Open charge valve. Allow liquid refrigerant to enter system until drum weight has decreased by 3.4 pounds (1.5 kg) or until system pressure has equalized.

(12) Close charge and pressure gauge valves.

NOTE

If 3.4 pounds (1.5 kg) full charge was obtained, skip steps (13) through (23).

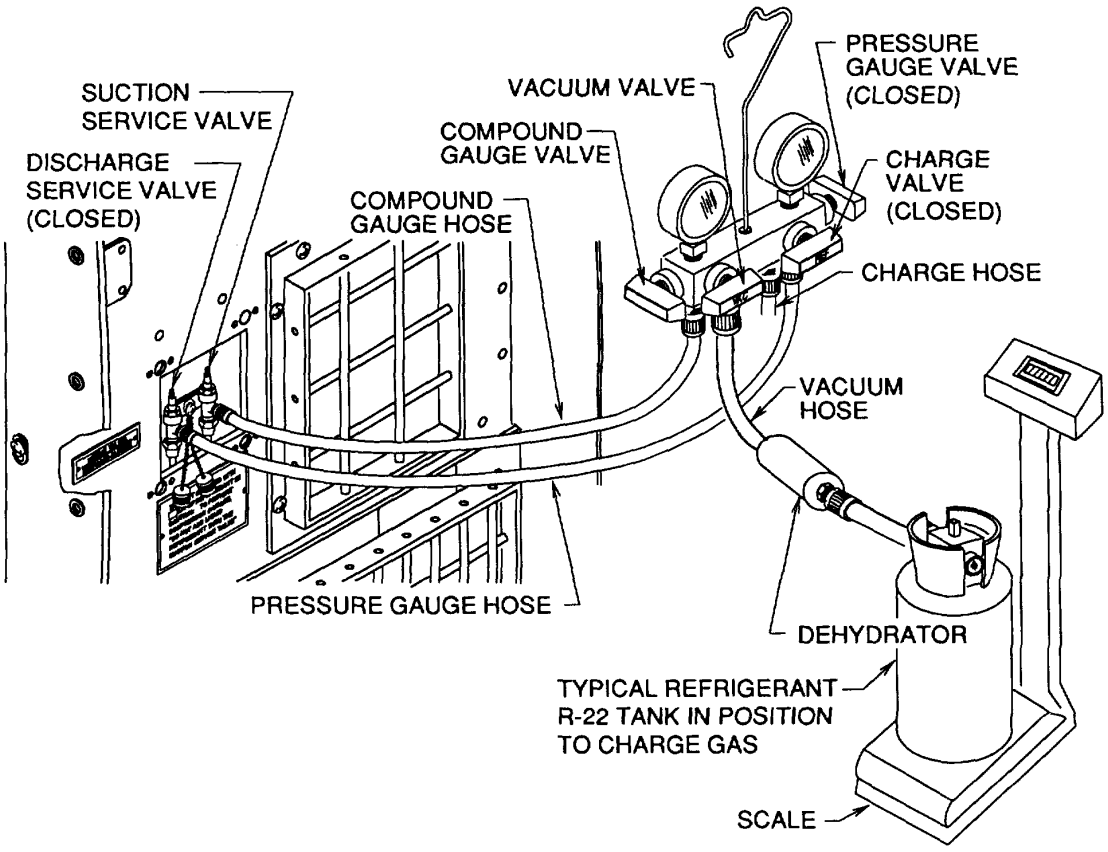

Figure 5-10. Refrigerant Charging (Partial System/Small Quantity Charge)

(13) Connect power at power source.

(14) Turn air conditioner on and operate in COOL mode with potentiometer TEMPERATURE control set at maximum COOL position.

5-17. CHARGING THE REFRIGERANT SYSTEM. - continued

CAUTION

Never introduce liquid refrigerant into the low pressure (suction) charging valve. This can cause damage to the compressor.

(15) Set refrigerant cylinder to deliver gas only.

WARNING

Never introduce high discharge pressure into a refrigerant cylinder. This can cause the cylinder to rupture and injure personnel.

(16) Check that pressure gauge valve is closed.

(17) Open compound gauge valve.

(18) Open charge valve.

(19) Monitor weight of the refrigerant drum as air conditioner compressor pulls additional refrigerant gas into system until full 3.4 pounds (1.5 kg) charge is obtained. When system is fully charged, immediately close refrigerant drum valve and air conditioner suction service valve.

(20) Run air conditioner in COOL mode (with potentiometer TEMPERATURE control in full COOL position) for 15 minutes.

(21) With unit

(a) Green center means refrigerant moisture content is acceptable. running, observe sight glass on back of condenser section. Be sure that the compressor is running.

(b) Yellow center means there is too much moisture in system. It must be discharged, evacuated, and charged again.

(22) Close compound gauge, charge, and refrigerant cylinder valves.

(23) Turn rotary MODE selector switch to OFF/RESET.

5-17. CHARGING THE REFRIGERANT SYSTEM. - continued

b. Partial Charge.

WARNING

Dangerous chemical refrigerant under pressure is used in the operation of this equipment. Use great care to avoid contact with liquid refrigerant.

Sudden and irreversible tissue damage can result from freezing. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact with refrigerant is possible.

Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas. Prevent contact of refrigerant with flame or hot surfaces.

CAUTION

Use only Refrigerant-22 to charge the unit.

NOTE

The charging operation should be done with all panels in place except for refrigerant charging valve access cover.

(1) Connect the charge hose to a cylinder of Refrigerant-22 set to deliver gas only.

(2) Loosen hose connections on the HIGH and LOW PRESSURE CHARGING VALVES slightly.

(3) Check that vacuum and charge valves are closed.

(4) Open pressure gauge and compound gauge valves.

(5) Open refrigerant cylinder valve.

(6) Open charge valve slightly to allow a small amount of refrigerant to purge air from hoses. Tighten hose connections on the DISCHARGE and SUCTION SERVICE VALVES. Close charge valve.

CAUTION

Never introduce liquid refrigerant into the low pressure (suction) charging valve. This can cause damage to the compressor.

(7) Close compound gauge valve.

(8) Connect power at power source.

5-17. CHARGING THE REFRIGERANT SYSTEM. - continued

(9) Turn air conditioner on and operate in COOL mode with potentiometer TEMPERATURE control set at maximum COOL position.

(10) With unit running, observe sight glass on back of condenser section. Be sure that the compressor is running.

(a) Green center means refrigerant moisture content is acceptable.

(b) Yellow center means there is too much moisture in system. It must be discharged, evacuated, and charged again.

(c) Milky white or bubbly liquid means system has a low charge.

(d) Clean bubble-free liquid around center means the system is fully charged.

CAUTION

Never introduce liquid refrigerant into the low pressure (suction) charging valve. This can cause damage to the compressor.

(11) If charge is low, carefully add refrigerant.

(12) Set refrigerant cylinder to deliver gas only.

WARNING

Never introduce high discharge pressure into a refrigerant cylinder. This can cause the cylinder to rupture and injure personnel.

(13) Check that pressure gauge valve is closed.

(14) Open compound gauge and charge valves.

(15) Continue to charge until sight glass remains clear and bubble-free for 15 minutes.

(16) Close compound gauge, charge, and refrigerant cylinder valves .

(17) Turn rotary MODE selector switch to OFF/RESET.

NOTE
FOLLOW-ON MAINTENANCE:

Remove service manifold (para 5-10).

5-18. REFRIGERATION SYSTEM TROUBLESHOOTING.

This task covers: Examine

INITIAL SETUP

Equipment Condition

Unit operating in full COOL.

Examine.

(1) Check sight glass condition.

(a) A bright green color indicates that the refrigerant is dry. As moisture content increases, the color will gradually change to chartreuse and finally to pure yellow. A gradual change from green into chartreuse over an extended period of time is normally an indication that the refrigerant desiccant dehydrator is becoming saturated with moisture, if so, replace. A sudden change of color is highly unlikely unless a rupture occurs allowing all refrigerant to escape.

NOTE

Be sure that the refrigeration system is under full load with the compressor running when observing the sight glass for refrigerant condition.

(b) The appearance of an occasional bubble in the sight glass can be expected, especially when operating in a high ambient temperature. A gradual increase in the number and frequency of bubbles is usually an indication that the refrigerant charge is being lost from the system through a small leak. The number and frequency of bubbles will also increase if the refrigeration system becomes overheated. The sudden appearance of numerous bubbles is usually an indication of a serious leak. Check refrigerant system for leaks. (See paragraph 4-15.)

(2) Check for decreased cooling capacity. A reduction in cooling capacity will occur as a natural result if refrigerant is lost from the system; with a total loss of cooling if all refrigerant is lost. However, in some conditions a considerable proportion of the refrigerant may be lost before the reduced cooling capacity is noticeable. Sudden or erratic reduction, or complete loss of cooling capacity is often caused by the malfunction of one of the valves in the refrigeration system. Cooling capacity will also be reduced if the refrigeration system becomes overheated. Check refrigerant system for leaks. (See paragraph 4-15.)

(3) Turn rotary MODE selector switch to OFF/RESET.

5-19. OVERHEATING CHECKS.

This task covers: Examine

INITIAL SETUP

Equipment Condition

Unit operating in full COOL.

Examine.

NOTE

Bubbles appearing in the sight glass or a reduction in cooling capacity is often caused by the refrigeration system being overheated. Adequate cooling of the hot, compressed, refrigerant vapor in the condenser is essential to the proper operation of the air conditioner. Painting coils will cause overheating and reduce cooling capacity.

The following checks should be made to ensure that overheating is not the cause of the symptoms before troubleshooting the pressurized portion of the refrigeration system:

(a) Be sure there is no external obstruction to air flow into the condenser intake screen and out of the condenser fan guard.

(b) Be sure there is no obstruction within the intake screen and fan guard.

(c) Be sure there are no obstructions or an excessive build-up of dust and dirt in the condenser coil.

(d) Turn rotary MODE selector switch to OFF/RESET.

5-20. REFRIGERANT SYSTEM PRESSURE CHECK.

This task covers: Test

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Goggles
Appendix B, item 2

Gloves
Appendix B, item 2

Equipment Condition

Install service manifold (para 5-10).

Test.

(1) Check that all four service manifold valves are closed and unit DISCHARGE and SUCTION SERVICE VALVES are open.

(2) Both gages should read the same. Check the reading with the appropriate column in table 5-2. 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; proceed directly to leak testing. (See paragraph 5-15.)

(3) Turn air conditioner on and operate in COOL mode with potentiometer TEMPERATURE control set at maximum COOL position for five minutes.

(4) With unit operating, allow gages to stabilize. Take readings of the two gages. (See table 5-3.)

(a) If discharge and suction pressures are at, or near, the same value, a pressure equalizer solenoid valve (L1) or compressor failure is indicated.

(b) If discharge pressure is low and suction pressure is normal, 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 expansion valve is indicated.

(d) If ice forms on evaporator coil, or evaporator coil does not cool during operation, failure or malfunction of evaporator expansion valve is indicated.

(e) If discharge pressure is high and suction pressure is normal, refrigerant overcharge is indicated.

(5) When pressure tests are completed, turn unit off and proceed with any maintenance action indicated.

(6) Turn rotary MODE selector switch to OFF/RESET.

NOTE
FOLLOW-ON MAINTENANCE:
Remove service manifold (para 5-10).

Table 5-2. PRESSURE-TEMPERATURE RELATIONSHIP OF SATURATED REFRIGERANT-22

Temperature		Pressure		Temperature		Pressure	
°F	°C	Psig	kqg/cm2	°F	°C	Psig	kg/cm2
10	-12.3	32.93	2.315	66	18.9	114.2	8.029
12	-11.1	34.68	2.439	68	20.0	118.3	8.318
14	-10.0	36.89	2.593				
16	- 8.9	38.96	2.739	70	21.1	122.5	8.612
18	- 7.8	41.09	2.889	72	22.2	126.8	8.915
				74	23.3	131.2	9.225
20	- 6.6	43.28	3.043	76	24.4	135.7	9.541
22	- 5.5	45.23	3.180	78	25.6	140.3	9.864
24	- 4.3	47.85	3.364				
26	- 3.4	50.24	3.532	80	26.7	145.0	10.195
28	- 2.2	52.70	3.705	82	27.8	149.8	10.522
				84	28.9	154.7	10.877
30	- 1.1	55.23	3.883	86	30.0	159.8	11.236
32	0	57.83	4.066	88	31.1	164.9	11.594
34	1.1	60.51	4.254				
36	2.2	63.27	4.448	90	32.2	170.1	11.960
38	3.3	66.11	4.648	92	33.3	175.4	12.332
				94	34.5	180.9	12.719
40	4.4	69.02	4.853	96	35.6	186.5	13.113
42	5.5	71.99	5.062	98	36.7	192.1	13.506
44	6.6	75.04	5.276				
46	7.7	78.18	5.497	100	37.8	197.9	13.914
48	8.8	81.40	5.723	102	38.9	203.8	14.329
				104	40.0	209.9	14.758
50	10.0	84.70	5.955	106	41.1	216.0	15.187
52	11.1	88.10	6.257	108	42.2	222.3	15.630
54	12.2	91.5	6.433				
56	13.3	95.1	6.686	110	43.3	228.7	16.080
58	14.5	98.8	6.947	112	44.4	235.2	16.537
				114	45.6	241.9	17.008
60	15.6	102.5	7.206	116	46.7	248.7	17.486
62	16.7	106.3	7.474	118	47.8	255.6	17.971
64	17.8	110.2	7.748				

Table 5-3. NORMAL OPERATING PRESSURES

Temperatures	Pressure Range (psig)			
Outdoor Ambient	55°F(12.8°C)	75°F(24°C)	100°F(380C)	125°F(51.7°C)
90°F(32°C) Return Air to Unit (Dry Bulb)	60-70 Suction 205-220 Discharge	62-72 Suction 225-245 Discharge	70-80 Suction 305-325 Discharge	80-95 Suction 400-425 Discharge
80°F(270C) Return Air to Unit (Dry Bulb)	60-70 Suction 185-205 Discharge	60-70 Suction 215-235 Discharge	65-75 Suction 290-310 Discharge	70-80 Suction 385-415 Discharge

5-21. REFRIGERANT DESICCANT DEHYDRATOR (FILTER-DRIER).

This task covers: a. Inspect b. Replace

INITIAL SETUP

Tools
Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts
Refrigerant Desiccant Dehydrator (Filter-Drier)

Equipment Condition
Remove control assembly (para 4-34).

Discharge refrigerant system (para 5-11).

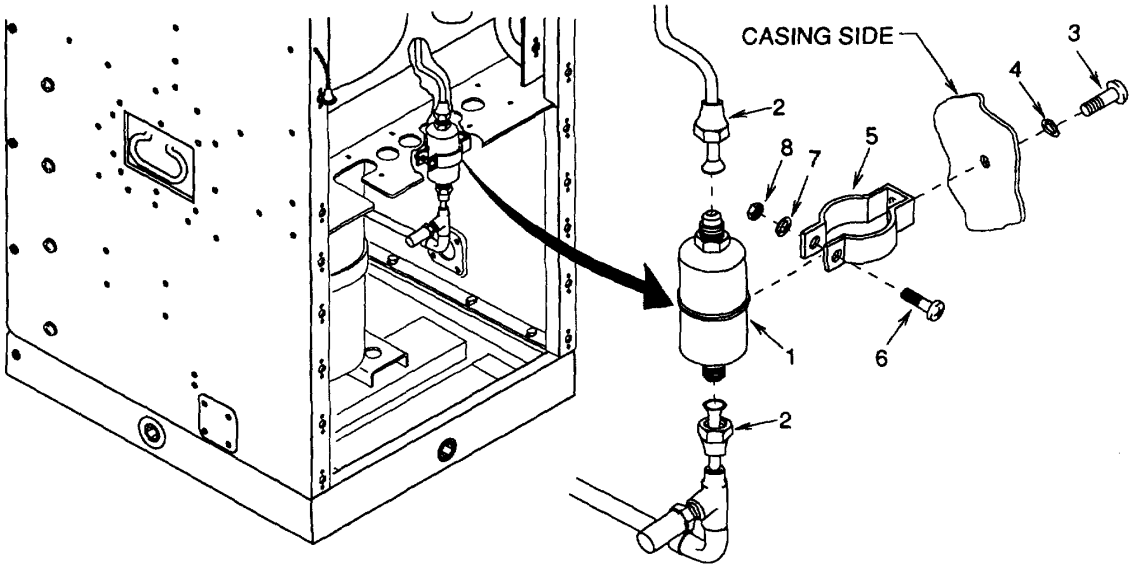

Figure 5-11. Refrigerant Desiccant Dehydrator (Filter-Drier)

a. Inspect.

Inspect refrigerant desiccant dehydrator (1) for visible signs of damage. Replace if damaged.

b. Replace.

(1) Loosen and disconnect two flare nuts (2).

(2) Remove bracket mounting screw (3) and lock washer (4). Slip refrigerant desiccant dehydrator (1) and bracket (5) from air conditioner.

(3) Remove screw (6), lock washer (7), and nut (8). Remove refrigerant desiccant dehydrator (1) from bracket (5).

5-21. REFRIGERANT DESICCANT DEHYDRATOR (FILTER-DRIER). - continued

CAUTION

Replacement refrigerant desiccant dehydrators are packaged with sealing caps on the flare fittings to prevent moisture contamination of the desiccant filtering media. Remove these caps immediately prior to installation. Never install a refrigerant desiccant dehydrator from which caps have been removed for an extended or unknown period of time.

(4) Place refrigerant desiccant dehydrator (1) in bracket (5).

(5) Loosely assemble screw (6), lock washer (7), and nut (8) to bracket (5).

(6) Slip refrigerant desiccant dehydrator (1) and bracket (5) into place in unit. Be sure flow arrow is pointing up and secure in place with screw (3) and lock washer (4).

(7) Tighten two flare nuts (2) to refrigerant desiccant dehydrator (1).

(8) Tighten screw (6) and nut (8).

NOTE

FOLLOW-ON MAINTENANCE:

Leak test refrigerant system (para 5-15).

Install control assembly (para 4-34).

Evacuate refrigerant system (para 5-16).

Charge refrigerant system (para 5-17).

5-22. PRESSURE RELIEF VALVE.

This task covers: a. Inspect b. Replace

INITIAL SETUP

Tools
Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Pressure Relief Valve

Antisieze Tape
Appendix E, item 20

Equipment Condition
Remove control assembly (para 4-34).

Remove refrigerant desiccant dehydrator (para 5-21).

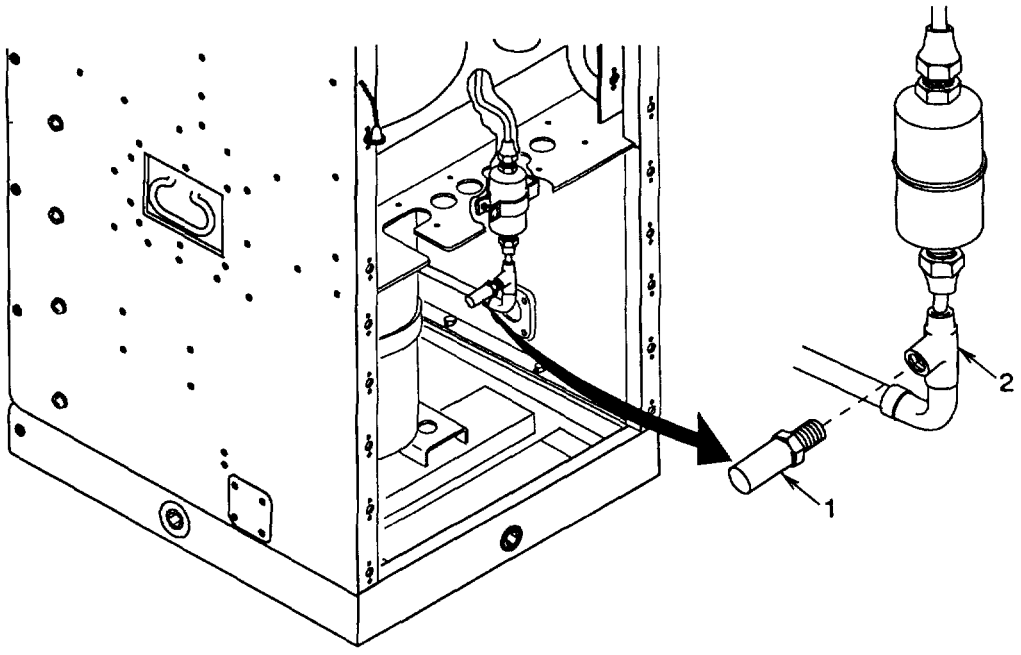

Figure 5-12. Pressure Relief Valve

5-22. PRESSURE RELIEF VALVE. - continued

a. Inspect.

Inspect pressure relief valve (1) for visible signs of damage. Replace if damaged.

b. Replace.

(1) Secure tee (2) so it does not twist and unscrew pressure relief valve (1).

(2) Apply antisieze tape to threads of pressure relief valve (1).

(3) Secure tee (2) so it does not twist and tighten pressure relief valve (1) in tee.

NOTE
FOLLOW-ON MAINTENANCE:

Install refrigerant desiccant dehydrator (para 5-21).

Install control assembly (para 4-34).

5-23. CONDENSER COIL.

This task covers: Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Gloves
Appendix B, item 2

Equipment Condition

Remove condenser coil guard (para 4-17).

Materials/Parts

Condenser Coil

Lock Washers (4)

WARNING

When handling coils, wear gloves to avoid cuts and reduce fin damage to the coil.

Replace.

(1) Remove refrigerant desiccant dehydrator and purge refrigerant system. (See paragraphs 5-11 and 5-12.)

5-23. CONDENSER COIL. - continued.

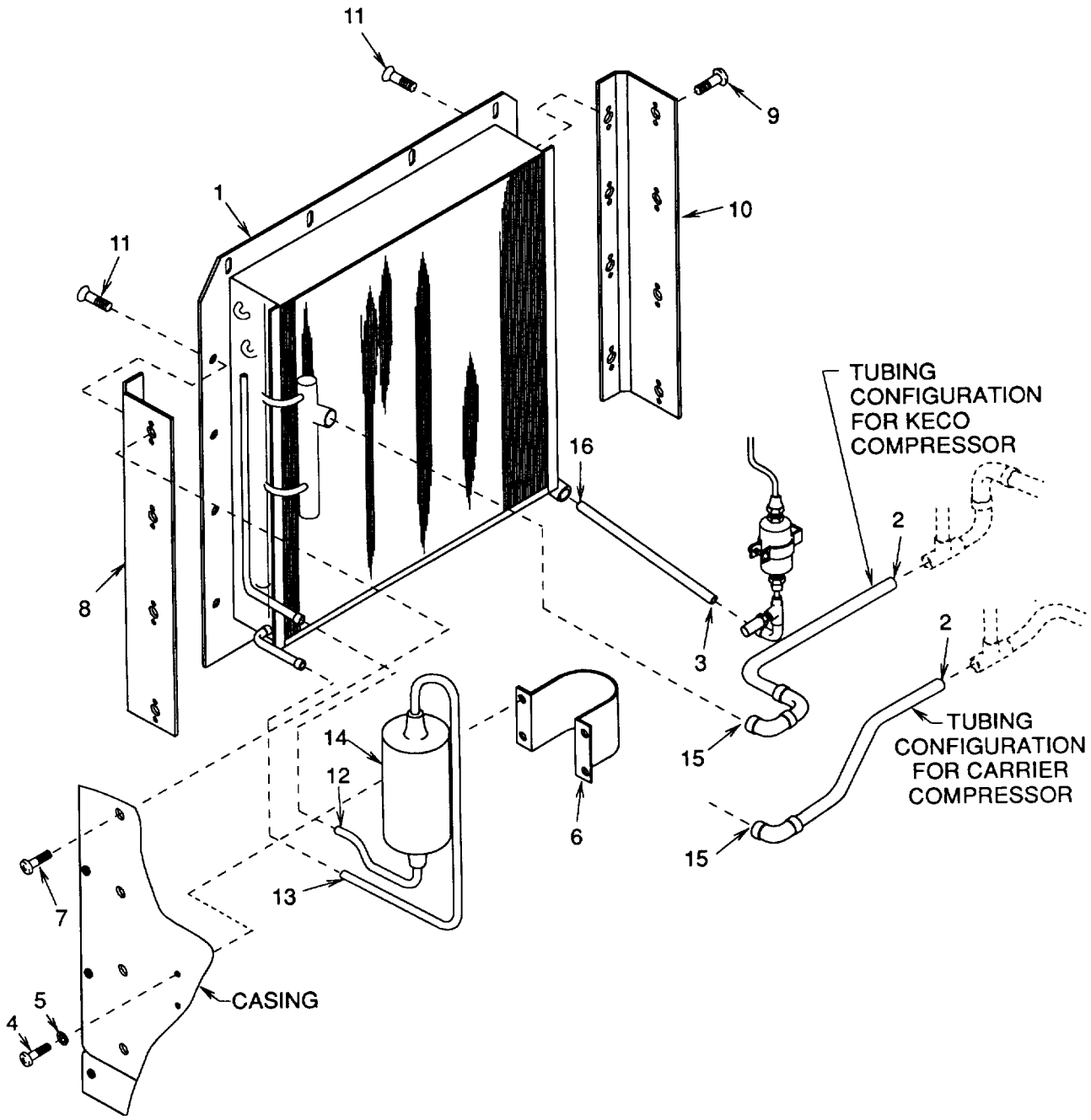

Figure 5-13. Condenser Coil

5-23. CONDENSER COIL. - continued.

(2) Debraze tube joints (2) and (3). (See paragraph 5-13.)

(3) Remove four sets of screws (4) and lock washers (5). Remove receiver bracket (6).

(4) Remove four screws (7) securing condenser coil bracket (8) to unit.

(5) Remove four screws (9) securing condenser coil bracket (10) to unit.

(6) Remove eight screws (11). Remove condenser coil brackets (8) and (10).

(7) Carefully pull coil (1) and attached tubing from unit.

(8) Debraze tubes (12) and (13) to remove receiver (14) assembly from coil (1). (See paragraph 5-13.)

(9) Debraze tube joints (15) and (16) from coil (1). (See paragraph 5-13.)

(10) Braze tube joints (15) and (16) to coil (1). (See paragraph 5-13.)

(11) Braze tubes (12) and (13) of receiver assembly (14) to coil (1). (See paragraph 5-13.)

(12) Being careful not to damage tubing, place coil (1) into unit.

(13) Position condenser coil brackets (8) and (10) in place and secure to coil with eight screws (11).

(14) Secure condenser coil brackets (8) and (10) to unit with four screws each (7) and (9).

(15) Position receiver bracket (6) in place. Secure with four sets of screws (4) and lock washers (5).

(16) Braze tube joints (2) and (3). (See paragraph 5-13.)

(17) Install new refrigerant desiccant dehydrator. (See paragraph 5-13.)

NOTE

FOLLOW-ON MAINTENANCE:

Install control assembly (para 4-34).

Install condenser coil guard (para 4-17).

5-24. RECEIVER.

This task covers: a. Inspect b. Replace

INITIAL SETUP

Tools
Refrigeration Unit Service Tool Kit
Appendix B, item 1

Equipment Condition
Remove condenser coil. (See paragraph 5-23.)

Materials/Parts

Receiver

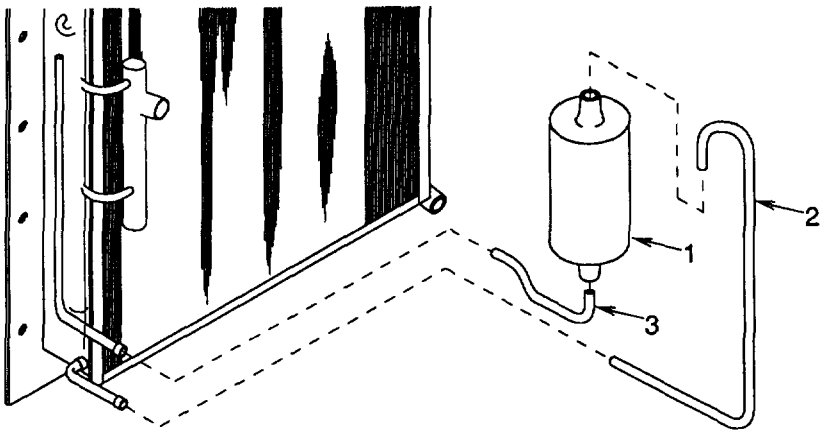

Figure 5-14. Receiver

a. Inspect.

Inspect receiver (1) for visible signs of damage. Replace if damaged.

b. Replace.

(1) Debraze tubes (2) and (3) and remove receiver (1). (See paragraph 5-13.)

(2) Place receiver (1) onto tubing ends (2) and (3) and braze. (See paragraph 5-13.)

NOTE

FOLLOW-ON MAINTENANCE:

Install condenser coil (para 5-23).

5-25. HIGH PRESSURE SWITCH (S5).

This task covers: a. Test b. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Equipment Condition

Remove rear panel (para 4-22).

Materials/Parts

High Pressure Switch (S5)

Lock Washers (2)

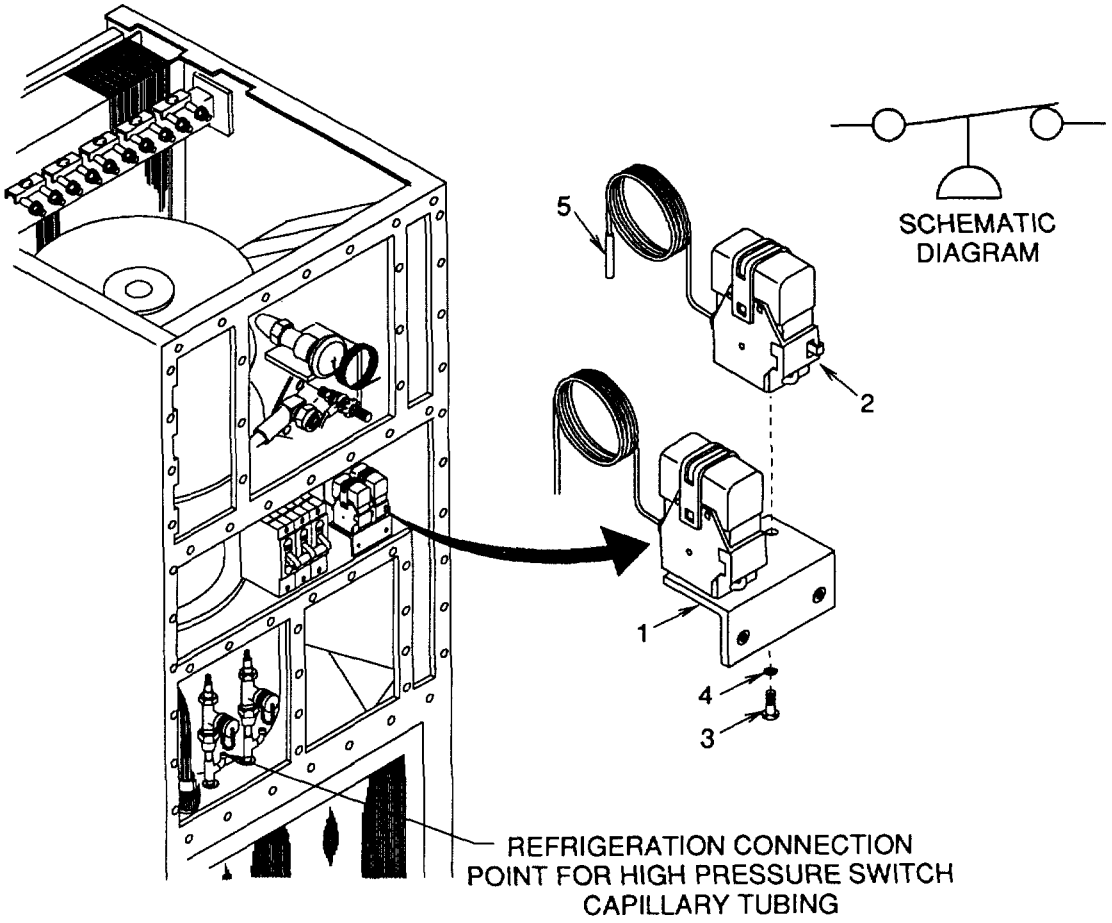

Figure 5-15. High Pressure Cutout Switch (S5)

5-25. HIGH PRESSURE SWITCH (S5). - continued.

a. Test

(1) Carefully pull pressure switch bracket (1) far enough out of unit to gain access to terminals.

(2) Remove clip-on cover from high pressure switch (2).

(3) Press and release the reset button to be sure switch is not tripped.

(4) Use a continuity tester or multimeter to check for continuity between terminals 1 and 2 on switch. If there is continuity, the switch is properly closed. If no continuity is found, switch must be replaced.

b. Replace.

(1) Tag and disconnect wire leads from high pressure switch (2).

(2) Remove two sets of screws (3) and lock washers (4).

(3) Discharge and purge the refrigerant system. (See paragraph 5-11 and 5-12.)

(4) Debraze capillary tube (5) from discharge service valve line. (See paragraph 5-13.)

(5) Remove high pressure switch (2) from unit.

(6) Carefully run high pressure switch capillary tube (5) through unit to discharge service valve line.

(7) Braze capillary tube (5) to fitting on discharge service valve line. (See paragraph 5-13.)

(8) Position high pressure switch (2) onto pressure switch bracket (1) and secure with two sets of screws (3) and lock washers (4).

(9) Using tags and wiring diagram (figure 4-10) connect wire leads to high pressure switch (2) terminal. Remove tags.

(10) Carefully coil excess capillary tubing in unit and tape in place to eliminate vibration.

(11) Carefully push pressure switch bracket (1) back into unit.

NOTE

FOLLOW-ON MAINTENANCE:

Install new refrigerant desiccant dehydrator (para 5-21).

Install rear panel (para 4-22).

5-26. LOW PRESSURE SWITCH (S3). I

This task covers: a. Test b. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Equipment Condition

Remove rear panel (para 4-22).

Materials/Parts

Low Pressure Switch (S3)

Lock Washers (2)

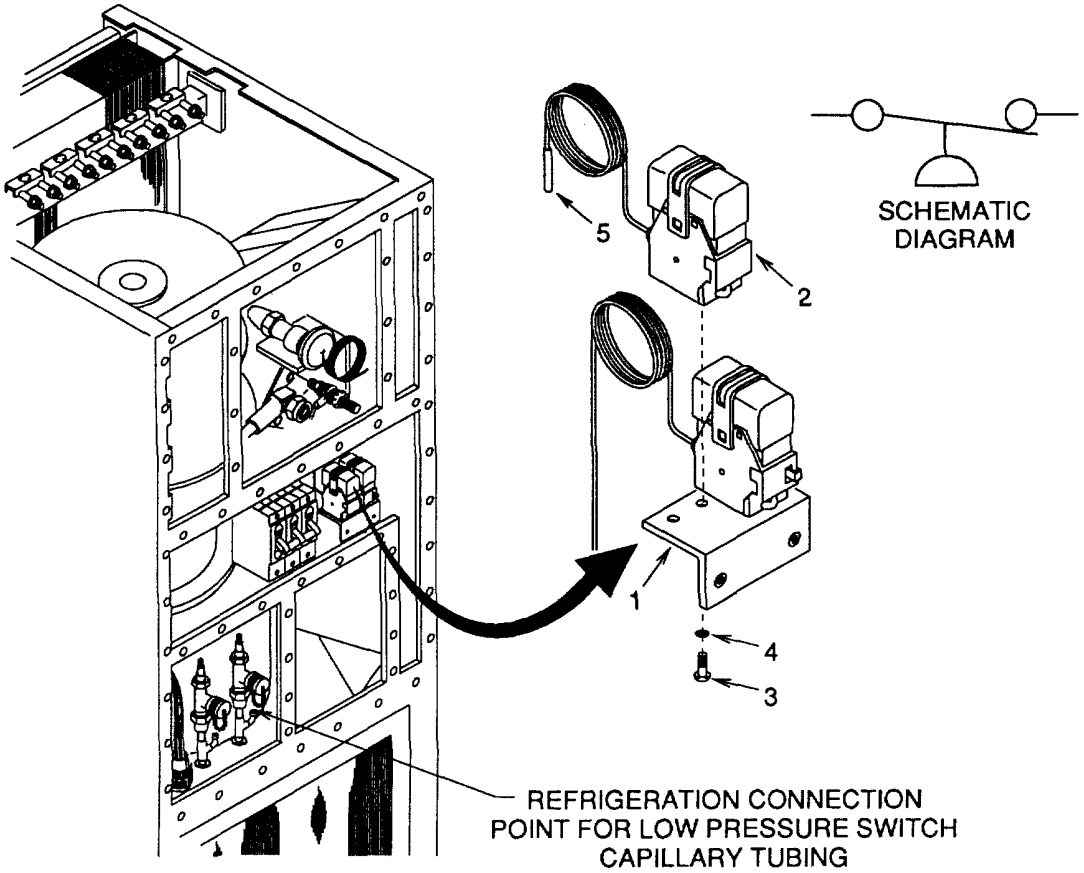

Figure 5-16. Low Pressure Cutout Switch (S3)

5-26. LOW PRESSURE SWITCH (S3). - continued.

a. Test.

(1) Carefully pull pressure switch bracket (1) far enough out of unit to gain access to terminals.

(2) Remove clip-n cover from low pressure switch (2).

(3) Use a continuity tester or multimeter to check for continuity between terminals 1 and 2 on switch. If there is continuity, the switch is properly closed. If no continuity is found, switch must be replaced.

b. Replace.

(1) Tag and disconnect wire leads from low pressure switch (2).

(2) Remove two sets of screws (3) and lock washers (4).

(3) Discharge and purge the refrigerant system. (See paragraph 5-11 and 5-12.)

(4) Debraze capillary tube (5) from suction service valve line. (See paragraph 5-13.)

(5) Remove low pressure switch (2) from unit.

(6) Carefully run low pressure switch capillary tube (5) through unit to suction service valve line.

(7) Braze capillary tube (5) to fitting on suction service valve line. (See paragraph 5-13.)

(8) Position low pressure switch (2) onto pressure switch bracket (1) and secure with two sets of screws (3) and lock washers (4).

(9) Using tags and wiring diagram (figure 4-10) connect wire leads to low pressure switch (2) terminal. Remove tags.

(10) Carefully coil excess capillary tubing in unit and tape in place to eliminate vibration.

(11) Carefully push pressure switch bracket (1) back into unit.

NOTE

FOLLOW-ON MAINTENANCE:

Install new refrigerant desiccant dehydrator (para 5-21).

Install rear panel (para 4-22).

5-27. SERVICE VALVES.

This task covers: a. Inspect b. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Service Valve

Lock Washer

Equipment Condition

Remove rear panel (para 4-22).

Remove refrigerant desiccant dehydrator (para 5-21).

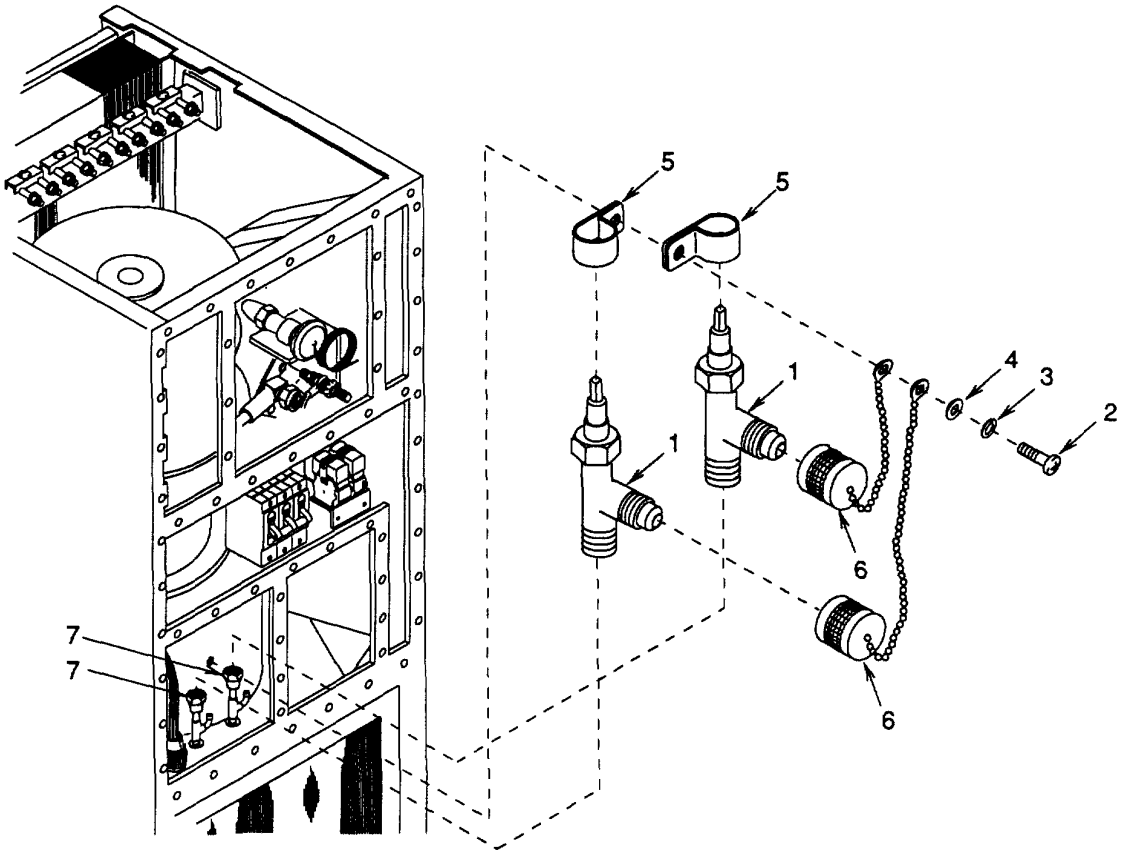

Figure 5-17. Service Valves

5-27. SERVICE VALVES. - continued

a. Inspect.

Inspect service valve(s) (1) body and threads for visible signs of damage. Replace if damaged.

b. Replace.

(1) Remove screw (2), lock washer (3), and flat washer (4).

(2) Remove clamp(s) (5) and cap(s) (6).

(3) Secure valve (1) from turning and loosen nut (7). Remove valve.

(4) Position service valve (1) in unit with threaded connection end facing out.

(5) Secure valve body to prevent it from turning and tighten nut (7).

(6) Place clamp(s) (5) onto valve(s) (1) and secure in place with cap(s) (6) chains using screw (2), lock washer (3), and flat washer (4).

NOTE

FOLLOW-ON MAINTENANCE:

Install rear panel (para 4-22).

Install new refrigerant filter-drier (para 5-21).

5-28. SOLENOID VALVE (L1).

This task covers: Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Equipment Condition

Remove control assembly (para 4-34).

Materials/Parts

Solenoid Valve (L1)

Lock Washers (2)

Replace.

(1) Remove refrigerant desiccant dehydrator. (See paragraph 5-21.)

(2) Remove nut (1). Pull data plate (2) and coil (3) off valve body stem (4).

5-28. SOLENOID VALVE (L1). - continued

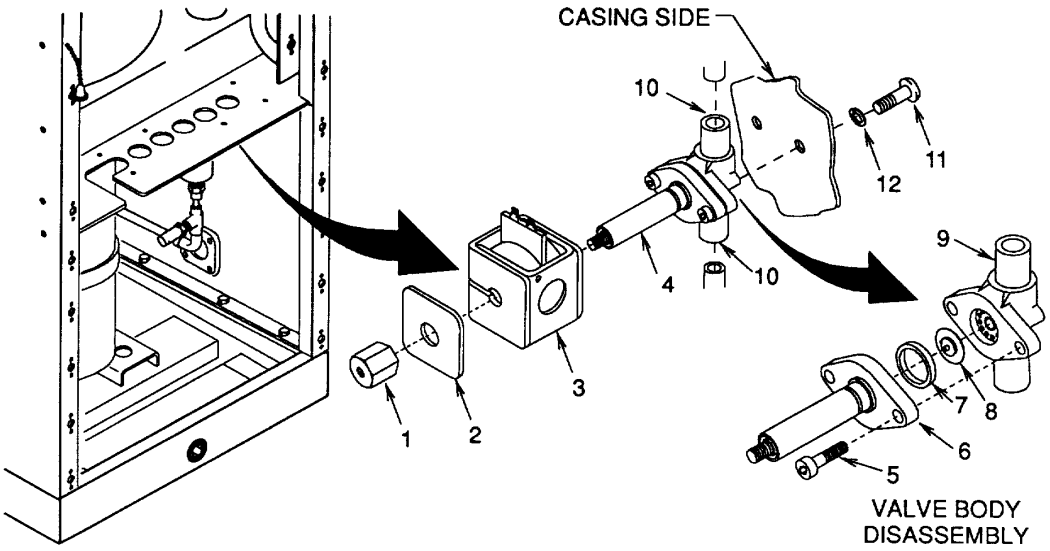

Figure 5-18. Solenoid Valve (L1)

(3) Remove two screws (5). Remove tube and plunger assembly (6), gasket (7), and diaphragm (8).

(4) Check valve body (9) for visible damage. Normally valve body replacement is unnecessary. If valve body is in good condition, skip steps (5) through (7).

(5) Purge refrigerant system. (See paragraph 5-12.)

(6) Debraze tube connections (10). (See paragraph 5-13.)

(7) Remove two screws (11) and lock washers (12). Remove valve body (9).

(8) Secure valve body to casing side with two screws (11) and lock washers (12).

(9) Braze tube connections (10). (See paragraph 5-13.)

(10) Install diaphragm (8) into valve body (9) and gasket (7) into tube and plunger assembly (6).

(11) Secure tube and plunger assembly (6) to valve body (9) with two screws (5).

(12) Slide coil (3) and data plate (2) onto valve body stem (4). Secure with nut (1).

(13) Using wiring diagram figure 4-10 and tags, connect wire leads to solenoid coil. Remove tags.

(14) Install new refrigerant desiccant dehydrator. (See paragraph 5-21.)

NOTE

FOLLOW-ON MAINTENANCE:

Install control assembly (para 4-34).

5-29. LIQUID SIGHT INDICATOR (SIGHT GLASS).

This task covers: Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Liquid Sight Indicator

Equipment Condition

Remove rear panel (para 4-22).

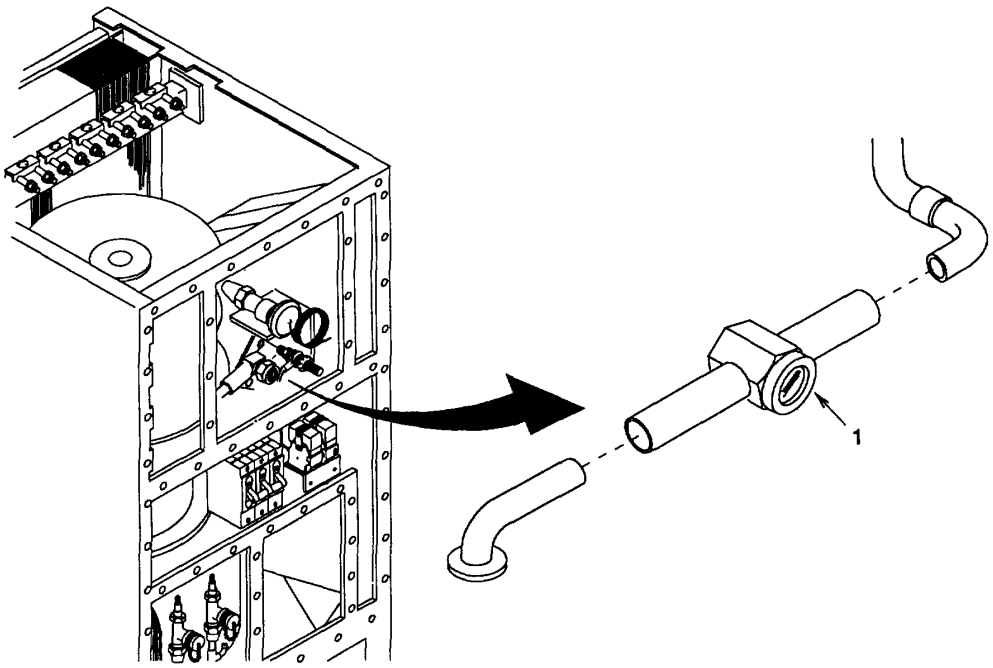

Figure 5-19. Liquid Sight Indicator (Sight Glass)

Replace.

(1) Remove refrigerant desiccant dehydrator. (See paragraph 5-21.)

(2) Debraze liquid sight indicator (1) connections from tubing. (See paragraph 5-13.)

5-29. LIQUID SIGHT INDICATOR (SIGHT GLASS). - continued

(3) Remove liquid sight indicator (1) from unit.

(4) Position liquid sight indicator (1) on tubing.

(5) Braze liquid sight indicator (1) to tubing. (See paragraph 5-13.)

(6) Install new refrigerant desiccant dehydrator. (See paragraph 5-21.)

NOTE

FOLLOW-ON MAINTENANCE:

Install rear panel (para 4-22).

5-30. EXPANSION VALVE.

This task covers: a. Test b. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Expansion Valve

Lock Washer

Insulation Tape
Appendix E, item 18

Equipment Condition

Remove rear panel (para 4-22).

---

a. Test.

(1) Remove the suction line insulation from the area of the sensing bulb. Observe location and position of bulb for reinstallation.

(2) Loosen the hardware and clamps securing the sensing bulb to the suction line.

5-30. EXPANSION VALVE. - continued

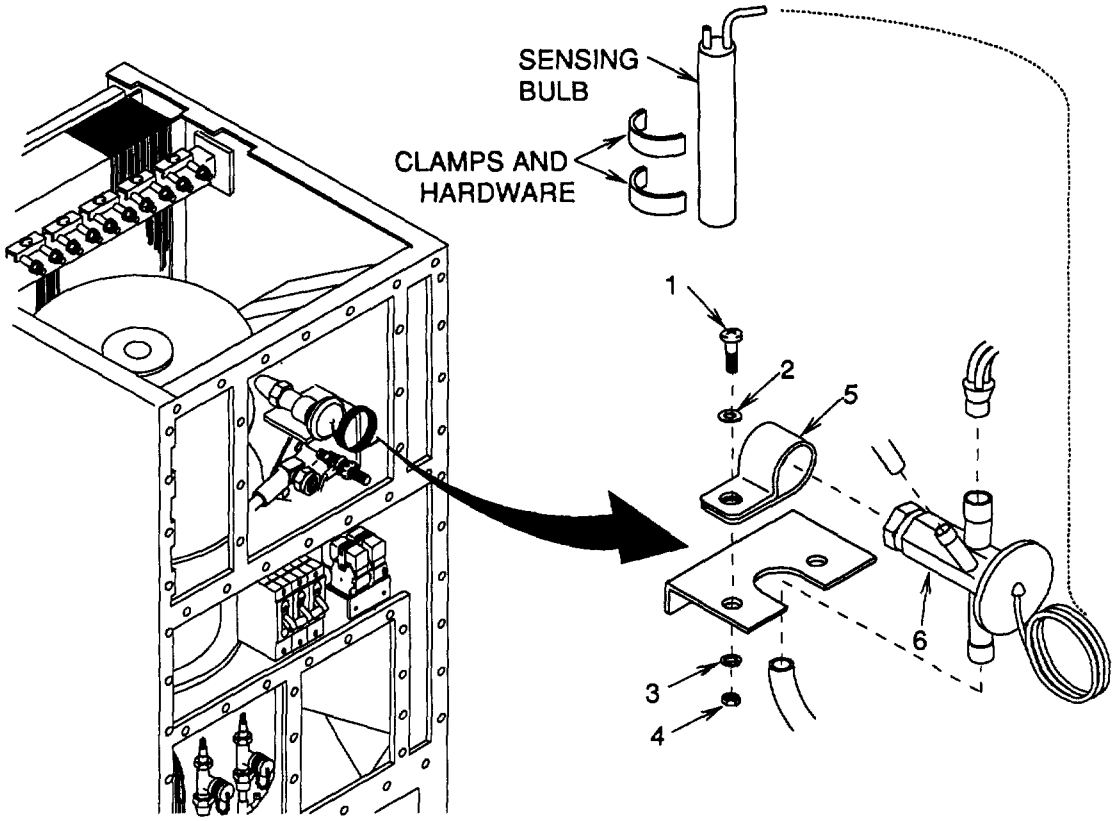

Figure 5-20. Expansion Valve

CAUTION

Use care not to damage or kink the capillary.

(3) Carefully pull sensing bulb out of clamps and place in a container of ice water to reduce the bulb temperature to near 32°F (0°C).

5-30. EXPANSION VALVE. - continued

WARNING

The following test must be conducted with power on. Exercise extreme caution.

CAUTION

Use suitable disconnect to isolate power source when connecting input power cable. Do not connect power cable to unit or power source if voltage is present.

(4) Connect power at power source.

NOTE

When performing the next step, the unit may cycle off due to the low pressure switch opening. If this happens, turn the rotary MODE selector switch to OFF/RESET.

(5) Set the potentiometer TEMPERATURE control to full COOL, place one hand on the exposed suction return line, and start the unit in COOL mode. If a drop in temperature is felt on the suction return line, the expansion valve is not closing fully and should be replaced.

CAUTION

When performing the next test, turn the air conditioner to OFF/RESET as soon as a definite drop in temperature is felt on the suction return line. If the test conditions are continued more than a few seconds, the expansion valve will fully open and an excessive flood-back of liquid refrigerant may damage or destroy the compressor.

(6) With one hand still on the suction return line, remove the sensing bulb from the container and warm it in the other hand. If a temperature drop is not felt in the suction return line by the time the sensing bulb no longer feels cold to the hand, the expansion valve is not opening and should be replaced. As soon as a temperature drop is felt, turn the air conditioner to OFF/RESET.

(7) Disconnect power at power source.

b. Replace.

(1) Unwrap insulation from suction line so that sensing bulb is exposed. Note position of sensing bulb on suction return line. Loosen hardware and clamps securing sensing bulb to suction return line. Pull bulb out of clamps.

(2) Remove screw (1), flat washer (2), lock washer (3), and nut (4). Remove clamp (5).

(3) Remove refrigerant desiccant dehydrator. (See paragraph 5-21.)

(4) Purge refrigerant system. (See paragraph 5-12.)

5-30. EXPANSION VALVE. - continued

(5) Remove any insulation from connections and debraze three connections from tubing. (See paragraph 5-13.)

(6) Remove expansion valve (6) from unit.

(7) Position tubing on expansion valve (6) connections.

(8) Protect valve (6) during brazing operations. Direct flame away from valve body and wrap valve body with wet rags.

(9) Braze tubing to connections. (See paragraph 5-13.)

(10) Install clamp (5) onto expansion valve (6) and secure to mounting bracket with screw (1), flat washer (2), lock washer (3), and nut (4).

(11) Position sensing bulb as noted during removal and secure to suction return line with clamps and hardware. Be sure sensing bulb is making good metal-to-metal contact.

(12) Replace refrigerant desiccant dehydrator. (See paragraph 5-21.)

(13) Rewrap insulation at expansion valve joints and sensing bulb.

(14) Carefully coil sensing bulb capillary line in unit and tape to prevent vibration.

NOTE

FOLLOW-ON MAINTENANCE:

Install rear panel (para 4-22).

5-31. EVAPORATOR COIL.

This task covers: Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Gloves
Appendix B, item 2

Rivet Gun
Appendix B, item 11

Materials/Parts

Evaporator Coil

Lock Washer

Rivets (16)

Equipment Condition

Remove mist eliminator (para 4-25).

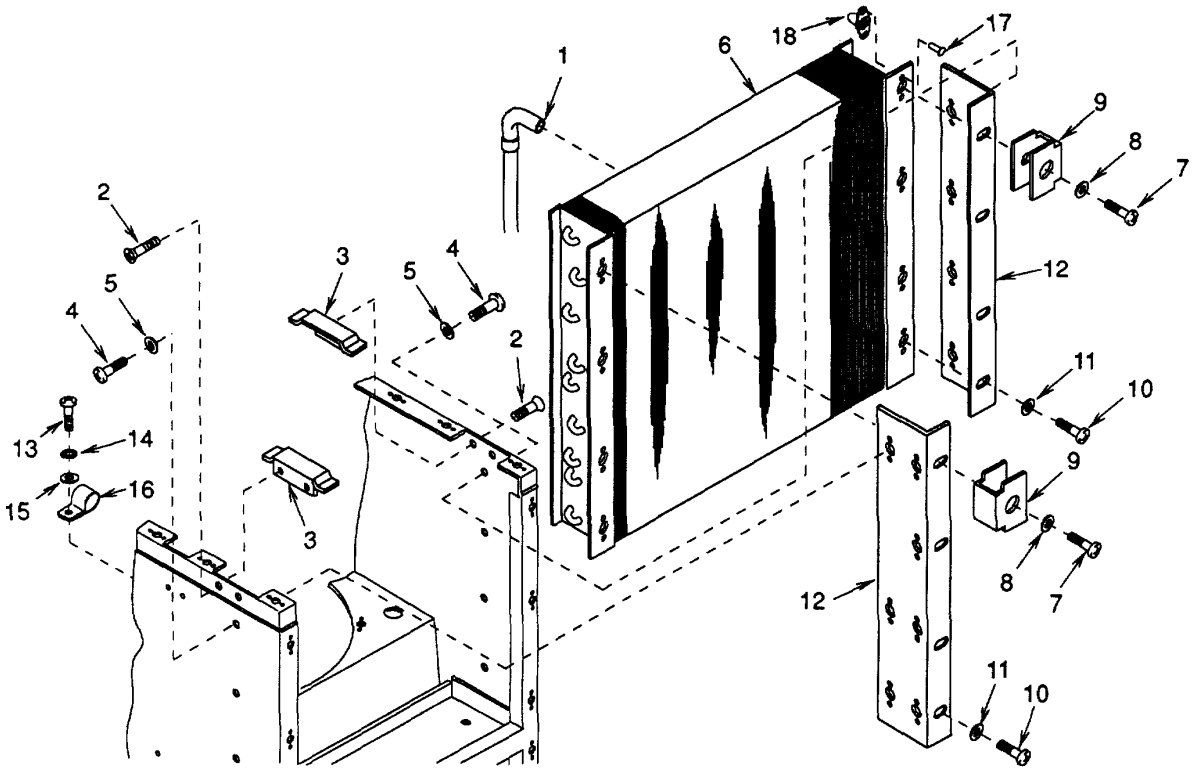

Figure 5-21. Evaporator Coil

5-31. EVAPORATOR COIL. - continued

WARNING

When handling coils, wear gloves to avoid cuts and reduce fin damage to the coil.

Replace.

(1) Remove refrigerant desiccant dehydrator and purge refrigerant system. (See paragraph 5-21 and 5-12.)

(2) Remove coil frost switch. (See paragraph 4-33.)

(3) Remove heaters and support. (See paragraph 4-44.)

(4) Remove fan motor. (See paragraph 4-47.)

CAUTION

Protect expansion valve during brazing operations. Direct flame away from valve body and wrap valve body with wet rags.

(5) Debraze tube joint (1) and distribution lines header at expansion valve. (See paragraph 5-13.)

(6) Remove four screws (2). Remove two side panel inserts (3).

(7) Remove seven sets of screws (4) and packing with retainers (5) while supporting the evaporator coil (6).

(8) Remove two sets of screws (7) and flat washers (8) that attach mist eliminator brackets (9) to coil (6). Remove mist eliminator brackets (9).

(9) Remove three sets of screws (10) and flat washers (11) from each of the evaporator coil brackets (12). Slip evaporator coil brackets (12) up and out of unit.

(10) Remove screw (13), lock washer (14), flat washer (15), and clamp (16) from distributor lines.

(11) Carefully lift coil (6) up and out of unit.

(12) Drill out rivets (17) using a drill bit slightly smaller that the diameter of the rivet. Remove plate nuts (18).

(13) Install plate nut(s) (18) on new coil (6) using rivets (17).

WARNING

When handling coils, wear gloves to avoid cuts and reduce fin damage to the coil.

(14) Carefully lower evaporator coil (6) down into unit.

5-31. EVAPORATOR COIL. - continued

(15) Slide both evaporator coil brackets (12) into place.

(16) Aline and loosely install seven sets of screws (4) and packing with retainers (5) that secure coil brackets (12) to casing sides.

(17) Aline and loosely install two sets of screws (7) and flat washers (8) that attach mist eliminator brackets (9).

(18) Aline and loosely install remaining six sets of screws (11) and flat washers (12) in lower mounting flange holes.

(19) Tighten all evaporator mounting hardware.

(20) Position the two side panel inserts (3) in place and secure with four screws (2).

(21) Secure distributor line clamp (16) in place with screw (13), lock washer (14), and flat washer (15).

CAUTION

Protect expansion valve during brazing operations. Direct flame away from valve body and wrap valve body with wet rags.

(22) Braze tube joint (1) and distribution lines header at expansion valve. (See paragraph 5-13.)

(23) Install fan motor. (See paragraph 4-47.)

(24) Install heaters and support. (See paragraph 4-44.)

(25) Install coil frost switch. (See paragraph 4-33.)

(26) Install new refrigerant desiccant dehydrator. (See paragraph 5-21.)

NOTE

FOLLOW-ON MAINTENANCE:

Install mist eliminator (para 4-25).

5-32. COMPRESSOR (B1).

This task covers: a. Test b. Remove c. Repair d. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Compressor

Two

Heater

Connector J14

Heater Thermostat

Equipment Condition

Remove control assembly (para 4-34).

Remove electromagnetic interference filter (para 4-32).

Personnel Required

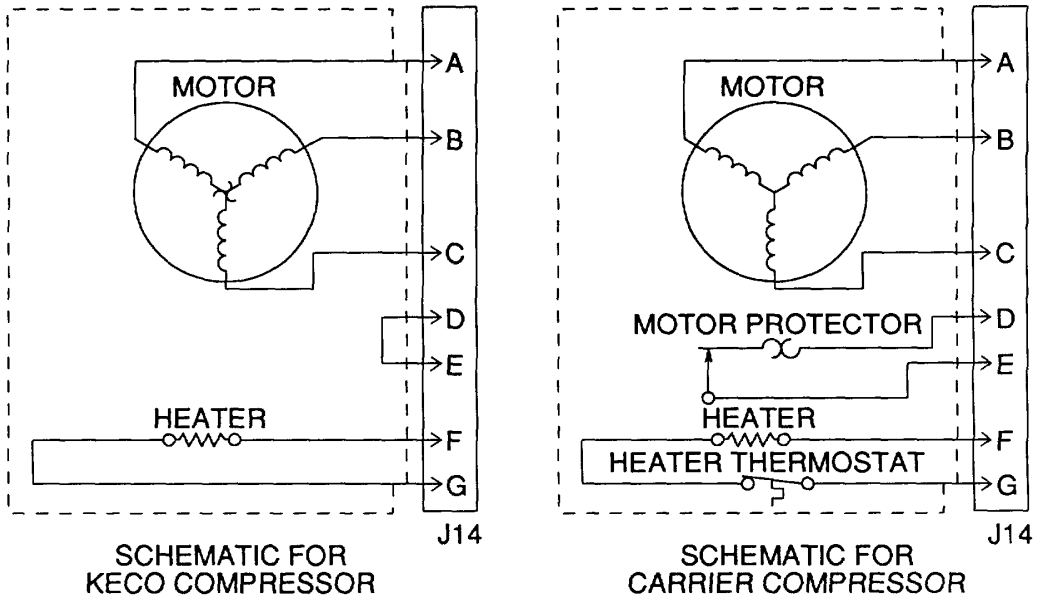

Figure 5-22. Compressor Schematic

5-32. COMPRESSOR (B1). - continued

WARNING

Severe burns can result from touching hot heating elements. Do not touch heating element.

NOTE

The following steps apply to both compressors except as noted.

a. Test.

(1) Disconnect wiring harness at compressor connector J14 (located on junction box).
(2) Carefully feel lower part of compressor.

(a) If air conditioner has been connected to power supply for at least four hours, compressor should feel warm (1000 to 120°F). If not warm, test crankcase heater for continuity.

(b) If air conditioner has not been connected to power supply for at least four hours, compressor temperature should be the same as surrounding air temperature.

(3) Using multimeter, test crankcase heater and thermostat circuit at J14 connector. Test resistance from pin F to pin G. Resistance should be 950 to 1450 ohms. Lower reading indicates short, and infinite reading indicates an open.

*(4) Using multimeter, test crankcase heater and thermostat at junction box:

(a) Remove compressor junction box cover.

(b) Open connection between thermostat lead and heater lead.

(c) Check heater continuity between open connection and J1 4-F. If open, heater should be replaced.

(d) Check thermostat continuity between open connection and J14-G. If open, thermostat should be replaced.

(5) Using multimeter, test compressor motor windings.

(a) Check continuity between pins A, B, and C, and the compressor body. No continuity should exist. If continuity exists, the compressor is bad.

(b) Test 3 phase windings at J14 A to B, B to C, and A to C. All resistance readings should be above zero and less than 2 ohms.

*(c) Test resistance between pin D and pin E. Resistance should be zero indicating motor protector is closed.

(d) Compressor containing shorted, open or grounded winding or open motor protector, should be replaced.

(e) If compressor windings are bad, check for compressor burn out prior to installing a new compressor. (See instructions in compressor removal.)

*Effective for Carrier Compressor only.

5-32. COMPRESSOR (B1). - continued

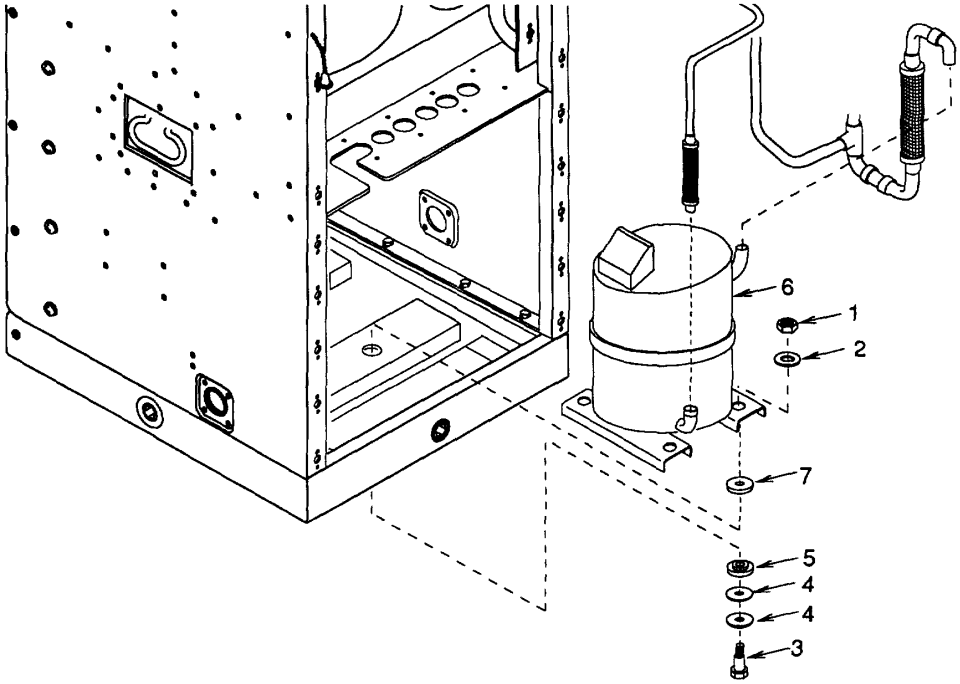

Figure 5-23. Compressor (B1) (Keco Industries, Inc.)

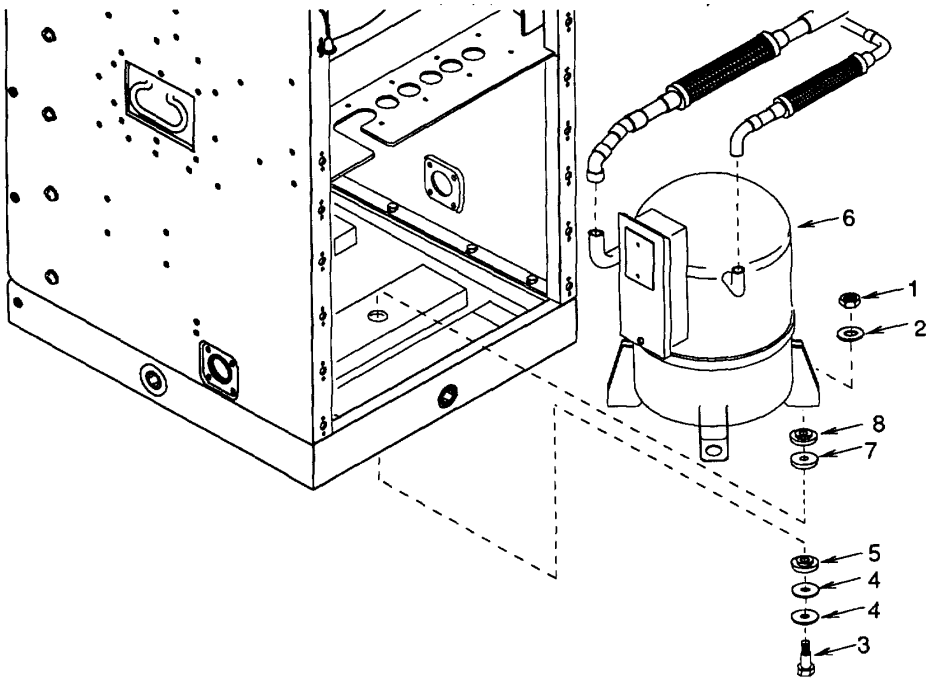

Figure 5-24. Compressor (B1) (Carrier)

5-32. COMPRESSOR (BI). - continued

b. Remove

NOTE

If compressor replacement is necessary, there are two approved compressors available. Keco compressor (94833) 120K0290-11 or Carrier compressor (97403) 1'3211E3793-4. These compressors are interchangeable, however they will require numerous refrigerant tubing changes. These refrigerant tubing changes may be avoided by ordering a replacement compressor of the same manufacturer as the original.

(1) Remove refrigerant desiccant dehydrator and purge refrigerant system. (See paragraph 5-21 and 5-12.)

(2) Check to see that wiring harness was disconnected from connector (J14) and that covers have been removed during access and testing, proceed as follows:

CAUTION

DO NOT LIFT without holding unit in upright position. Otherwise unit will fall over.

NOTE

The compressor is mounted to the cabinet base by four bolts that are inserted from the underside of the base. In order to remove the compressor, it is necessary that the entire air conditioner be raised and placed on blocks of sufficient height to allow for removal of these bolts from below the base.

(3) Attach an overhead hoist to the lifting handle on each side of the cabinet, using a sling and spreader bar.

(4) Raise the cabinet and place it on blocks at least four inches high. Be sure the blocks do not obstruct the holes in the base through which the compressor mounting shoulder screws must be removed.

(5) Unwrap the insulation from the suction tube so that the joint on the compressor is exposed.

(6) Debraze the tubing. (See paragraph 5-13.)

(7) Remove four lock nuts (1) and flat washers (2) from top of mounting feet and four shoulder bolts (3), eight flat washers (4), and four rubber washers (5) from underneath side of unit.

(8) Lever or tilt the compressor (6) and remove four rubber washers (7) from under mounting feet.

*(9) Install four bushings (8) into four rubber washers (7).

WARNING

If compressor burn out is suspected, use care when handling compressor to avoid touching compressor sludge. Acid sludge can cause burns.

To avoid injury to personnel, two people are required to lift compressor.

(10) Carefully slide compressor (6) from air conditioner.

*Effective for Carrier Compressor only.

5-32. COMPRESSOR (B1). - continued

(11) 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.

WARNING

Avoid inhaling fumes and bums from any acid formed by bum out of oil and refrigerant.

(12) If the oil is clean and clear, and does not have a burnt acid smell, the compressor did not fail because of motor burn out. If a burn out is not indicated, proceed to g.

NOTE

You must clean the entire refrigeration system after a bum out 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 burn outs.

(13) If the oil is black, contains sludge, and has a burnt acid odor, the compressor failed because of motor burn out and the system must be flushed. (See paragraph 5-14.)

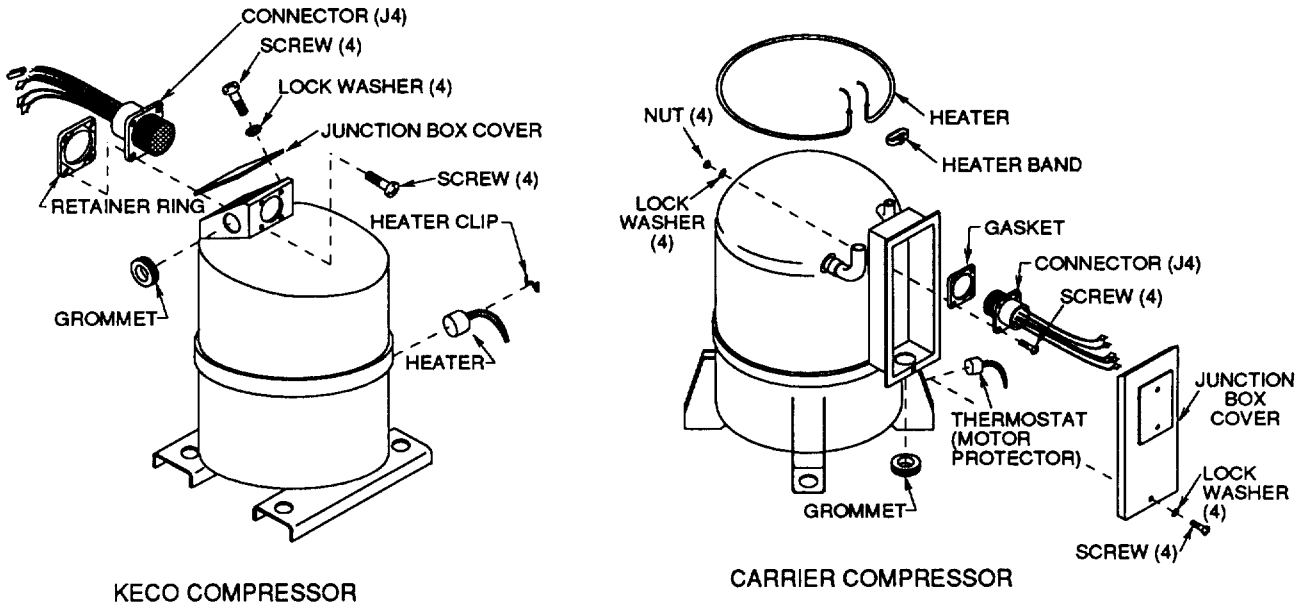

Figure 5-25. Compressor Replaceable Items

c. Repair.

(1) Heater replacement:

(a) Check to see that covers have been removed during access and testing.
(b) Tag and disconnect two heater leads from junction box terminals.

5-32. COMPRESSOR (B1). - continued

WARNING

Allow heater to cool before touching. Severe bums can result from touching hot heater.

* (c) Remove band on heater.

**(d) Remove clip from heater well.

* (e) Spread the heater ends to clear junction box.

**(f) Pull heater from well.

* (g) Lift heater up and off compressor crankcase.

(h) Install new heater as follows:

* 1 Spring heater ends apart and place heater down and around compressor in position on crankcase. Secure heater on crankcase with metal band.

** 2 Insert heater into well. Secure in well with clip.

3 Run leads through the grommet in the compressor junction box.

4 See tags on the removed heater. Connect heater leads to J14 pins F and G.

(i) If this completes the repair, install junction box cover.

(2) Connector replacement:

(a) Assuming that the covers have been removed during access and testing, proceed as follows.

(b) Remove the retaining hardware from the connector. Pull the connector out of the box to gain access to the solder connections.

(c) Tag and unsolder wire leads.

(d) Using tags and wiring diagram (figure 5-10), solder wires to new connector. Remove tags.

(e) Secure connector to the junction box with hardware removed in step (2) above.

* (3) Heater thermostat replacement:

(a) Check to see that covers have been removed during access and testing.

(b) Tag and disconnect two thermostat leads.

(c) Bend retaining tabs back.

(d) Remove thermostat.

*Effective for Carrier Compressor only.
**Effective for Keco Compressor only.

5-32. COMPRESSOR (B1). - continued

(e) Install new thermostat as follows:

1 Insert thermostat and carefully bend retaining tabs back to secure thermostat.

2 See tags on removed thermostat. Correct thermostat leads.

3 If this completes the repair, install junction box cover.

d. Install.

WARNING

To avoid injury to personnel, two people are required for following step.

CAUTION

The compressor is supplied with a complete charge of oil. Take care that oil is not lost when handling and installing compressor.

NOTE

If any refrigeration piping was disconnected with the compressor being replaced, transfer the piping to the replacement compressor before installing it in the air conditioner. Check to se that replacement compressor is equipped with a heater, if not, remove heater from old compressor or replace with new one.

(1) Lift compressor through the lower front panel opening and position it on base pan.

(2) - Lever or tilt the compressor (6) and install the four rubber washers (7) (*and four bushings (8))between the mounting feet and base pan.

(3) Install two flat washers (4) and one rubber washer (5) onto each of four shoulder bolts (3). Insert the shoulder bolts (3) from beneath the base. Secure with four flat washers (2) and four lock nuts (1).

(4) Position tubes to compressor connections and wrap wet rags around compressor at connection points.

(5) Direct flame away from compressor and braze tubing connections. (See paragraph 5-13.)

(6) Connect electrical connector plug (P14) to connector (J14) on compressor terminal box.

(7) Install new refrigerant desiccant dehydrator. (See paragraph 5-21.)

NOTE

FOLLOW-ON MAINTENANCE:

Install control assembly (para 4-34).

Install electromagnetic interference filter (para 4-32).

*Effective for Carrier Compressor only.

5-33. TUBING AND FITTINGS.

This task covers: a. Inspect b. Test c. Replace

INITIAL SETUP

Tools	Equipment Condition
Refrigeration Unit Service Tool Kit Appendix B, item 1	Remove covers and panels as necessary to gain access to repair area.

a. Inspect.

Inspect tubing and fittings for visible signs of damage. Replace if damaged.

b. Test.

Test fittings for leaks. Repair or replace as needed. (See paragraph 5-15.)

c. Replace.

(1) Remove refrigerant desiccant dehydrator. (See paragraph 5-21.)

(2) Purge refrigerant system. (See paragraph 5-12.)

(3) Debraze the tube/fitting connections and remove part from unit. (See paragraph 5-13.)

(4) Place the new part in unit on the tube/fitting ends. Braze the connections. (See paragraph 5-13.)

(5) Install new refrigerant desiccant dehydrator. (See paragraph 5-21.)

NOTE

FOLLOW-ON MAINTENANCE:

Install any panels or covers removed for access.

5-34. FRESH AIR DAMPER.

This task covers: a. Repair b. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Rivet Gun
Appendix B, item 11

Gloves
Appendix B, item 2

Brush
Appendix B. item 2

Materials/Parts

Damper Door Assembly

Rivets (4)

Gasket
Appendix F

Adhesive
Appendix E, item 2

Adhesive Remover
Appendix E, item 16

Equipment Conditions:

Remove conditioned air filter (para 4-23).

Remove fresh air filter (para 4-24).

a. Repair.

NOTE

Repair of fresh air damper assembly is limited to replacement of damaged parts.

b. Replace.

(1) Remove sleeve (1) from chain (2) and slip pendant (3) off chain.

(2) Drill out four rivets (4) using a drill bit slightly smaller than rivet body.

(3) Feed chain (2) through hole and remove damper door (5) assembly from unit.

(4) Drill out rivet (6) using a drill bit slightly smaller than rivet body. Remove chain (2) and flat washer (7).

(5) Remove spring (8) from damper door (5) and chain (2) note slack in chain for reassembly.

5-34. FRESH AIR DAMPER. - continued

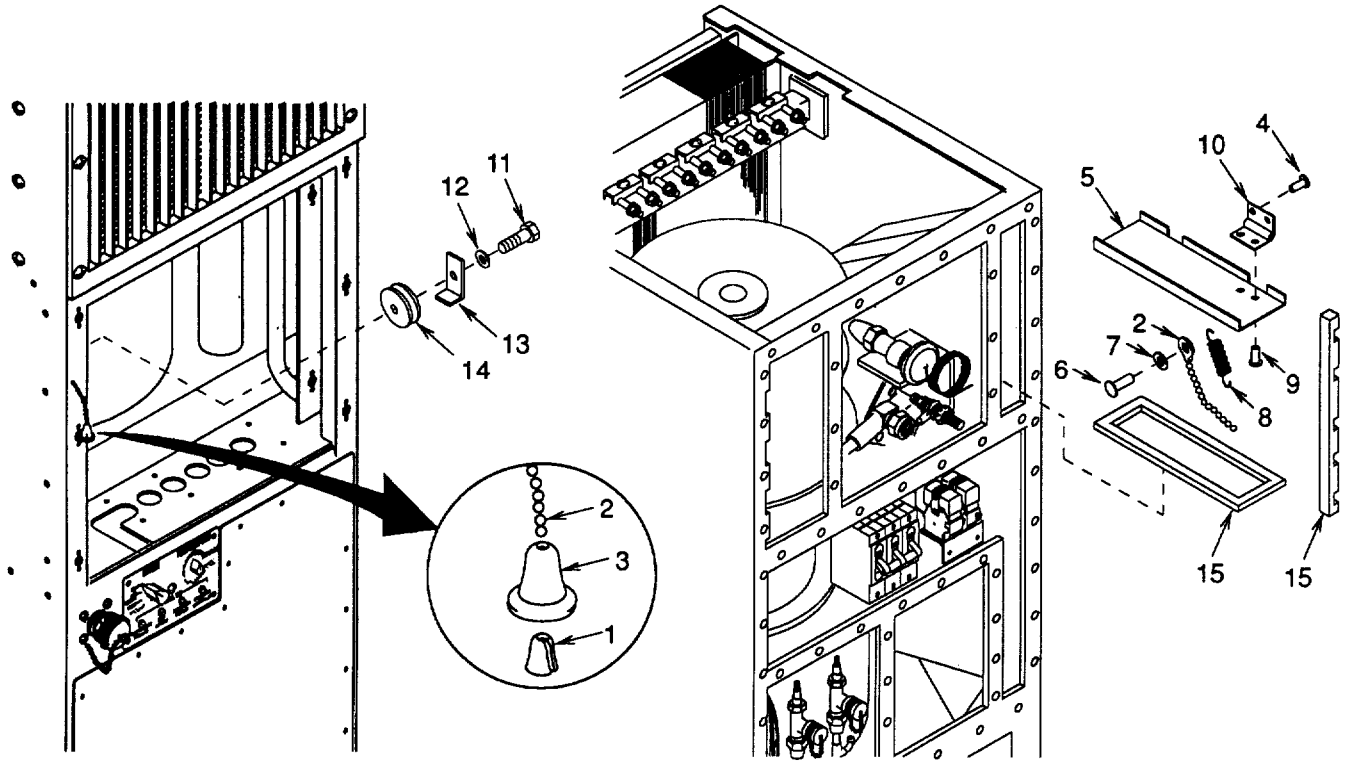

Figure 5-26. Fresh Air Damper

(6) Drill out four rivets (9) using a drill bit slightly smaller than rivet body. Remove two hinges (10).

(7) Remove screw (11), flat washer (12), retaining bracket (13), and pulley (14) from unit.

(8) To replace gasket, proceed as follows:

(a) Remove as much old gasket material (15) as possible by pulling or scraping it away from the metal surface.

WARNING

Adhesive remover is flammable and the vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well ventilated area, wear gloves, and keep away from sparks or flame.

(b) Soften and remove old adhesive and gasket residue using adhesive remover and a stiff brush.

(c) Coat the mating surfaces of the metal and new gasket material (15) with adhesive. Let both surfaces air dry until the adhesive is tacky but will not stick to fingers.

(d) Starting with an end, carefully attach the new gasket material (15) to the metal. Press into firm contact all over.

(9) Secure pulley (14) and retaining bracket (13) to unit using screw (11) and flat washer (12).

(10) Attach two hinges (10) to damper door (5) using four rivets (9).

5-34. FRESH AIR DAMPER. - continued

(11) Hook spring (8) onto damper door (5) and chain (2) leaving slack in chain as noted during disassembly.

(12) Attach chain (2) to damper door (5) using rivet (6) and flat washer (7).

(13) Feed chain (2) down through unit and position damper door (5) assembly in place.

(14) Attach damper door (5) assembly to unit using four rivets (4).

(15) Route chain (2) over pulley (14) and feed through in unit.

(16) Feed chain (2) through pendant (3) and attach sleeve (1).

NOTE

FOLLOW-ON MAINTENANCE:

Install fresh air filter (para 4-24).

Install conditioned air filter (para 4-23).

5-35. INSULATION.

This task covers: a. Inspect b. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Gloves
Appendix B, item 2

Brush
Appendix B, item 2

Equipment Conditions:

Remove covers and panels as necessary to gain access to repair area.

Materials/Parts

Insulation
Appendix F

Adhesive Remover
Appendix E, item 16

Adhesive
Appendix E, item 2

a. Inspect.

Inspect unit for damaged or missing insulation. Replace insulation as needed.

5-35. INSULATION. - continued

b. Replace.

(1) Remove as much old insulation material as possible by pulling or scraping it away from the metal surface.

WARNING

Adhesive remover is flammable and the vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well ventilated area, wear gloves, and keep away from sparks or flame.

(2) Soften and remove old adhesive and insulation residue using adhesive remover and a stiff brush.

(3) See Appendix F to identify and fabricate insulation to be replaced using material specified.

(4) Coat the mating surfaces of the metal and new insulation material with adhesive. Let both surfaces air dry until the adhesive is tacky but will not stick to fingers.

(5) Starting with an end, carefully attach the new insulation material to the metal. Press into firm contact all over.

NOTE

FOLLOW-ON MAINTENANCE:

Install any panels or covers removed for access.

5-36. BLAST DAMPER.

This task covers: a. Adjust b. Inspect c. Repair

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Spring Balance Assembly
Appendix B, item 15

Gloves
Appendix B, item 2

Brush
Appendix B, item 2

Materials/Parts

Gasket
Appendix F

Adhesive Remover
Appendix E, item 16

Adhesive
Appendix E, item 2

Equipment Conditions:

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

NOTE

This paragraph only applies to the accessory blast damper and fresh air cover when ordered with or installed on the unit. (See figure 5-27.)

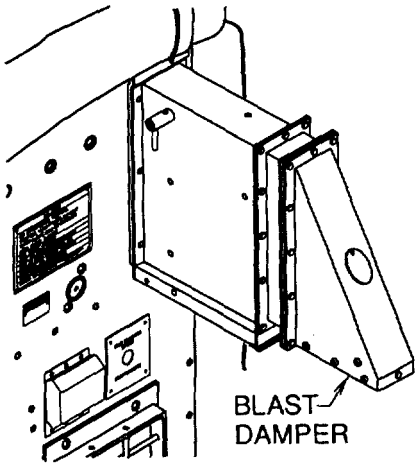

Figure 5-27. Blast Damper Installed

5-36. BLAST DAMPER. - continued

NOTE

When installations using blast dampers have more than one air conditioner, fresh air covers must be installed on units not equipped with blast dampers. (See figure 5-28.)

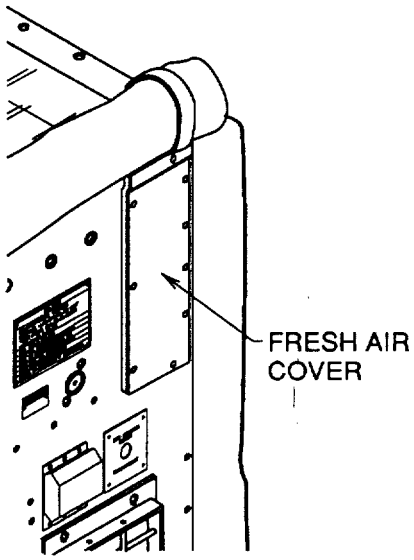

Figure 5-28. Fresh Air Cover Installed

a. Adjust.

(1) Spring balance assembly. (See figure 5-29.)

When 1.30 lbs (1 lb 5 oz) force is applied to the plunger (1), the marker (2) should be within the green color band (3). If not, adjust as follows:

Loosen setscrew (4) and slide compression bushing (5) in or out as necessary to change spring (6) tension. Tighten setscrew and check adjustment.

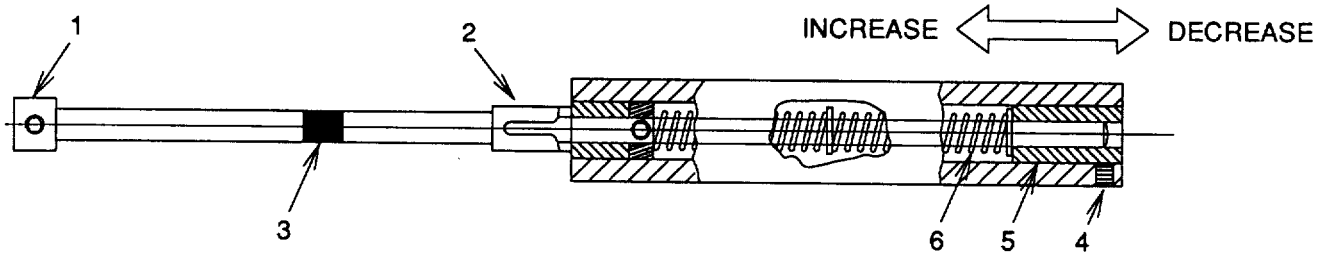

Figure 5-29. Tool Calibration

5-36. BLAST DAMPER. - continued

(2) Blast Damper. (See figure 5-30.)

NOTE

Damper door must be open for adjustment. Reset open if closed.

(a) Swing round cover (1) in actuator hood open.

(b) Using spring balance assembly (2) as shown, press tip against end of actuating pin (3) until damper door (4) springs closed. Note position of green color band to marker when damper door closes. (See figure 5-31.)

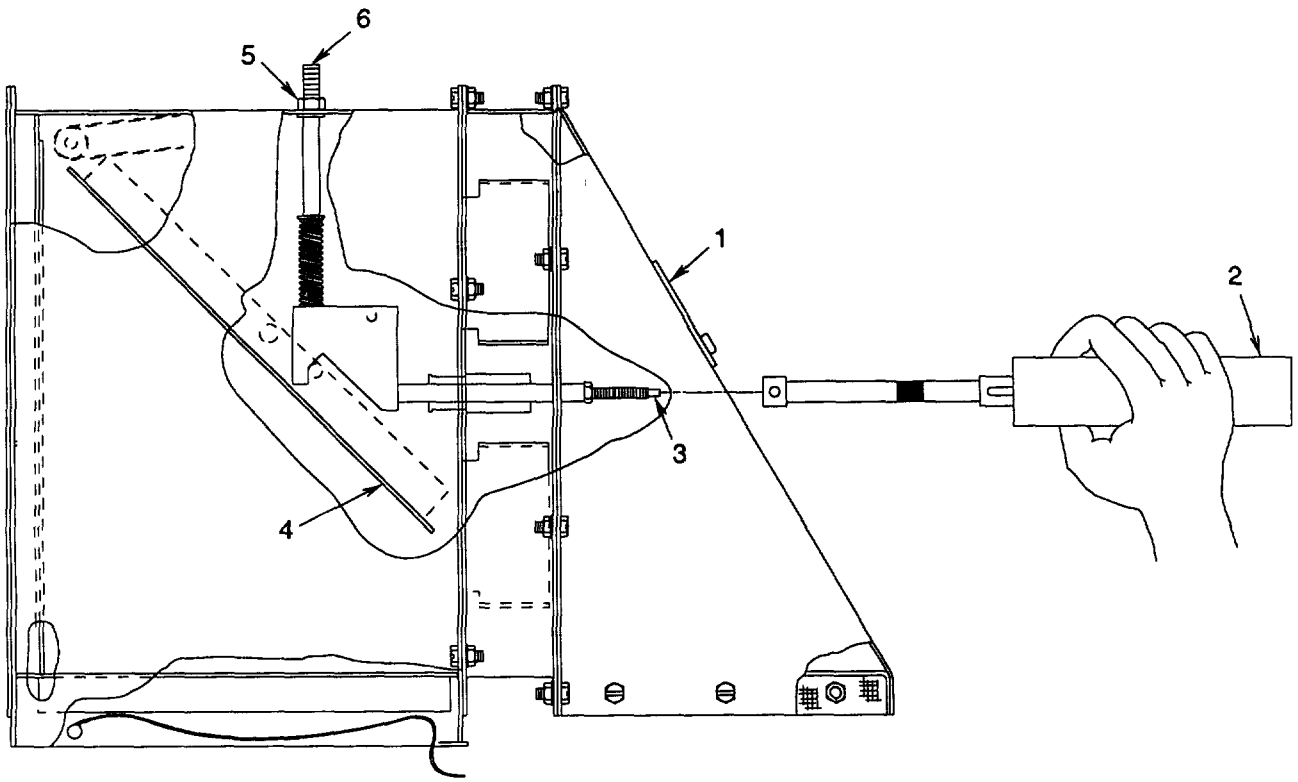

Figure 5-30. Blast Damper - Test/Adjust

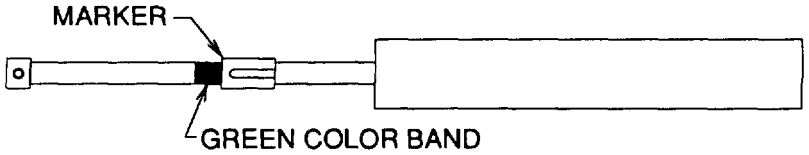

Figure 5-31. Position of Marker After Door Trips

5-36. BLAST DAMPER. - continued

(c) Reset open damper door (4).

(d) If damper door (4) did not trip with marker in green band range, adjust trip mechanism as follows:

1 Loosen nut (5) on spring adjusting screw (6).

2 If damper door (4) tripped before marker reached green color band, turn spring adjusting screw (6) in (clockwise).

3 If damper door (4) tripped after marker passed green color band or not at all, turn spring adjusting screw (6) out (counterclockwise).

4 Re-test blast damper as (b) above and reset open damper door (4). Continue adjusting and testing as necessary.

5 Tighten nut (5) on spring adjusting screw (6) when adjustment is complete.

b. Inspect.

(1) Inspect fresh air cover (1) as follows: (See figure 5-32.)

(a) Check that cover (1) is not dented, cracked, or punctured. Replace if damaged.

(b) Check that gasket (2) is not tom, loose, or missing. Replace if damaged or missing.

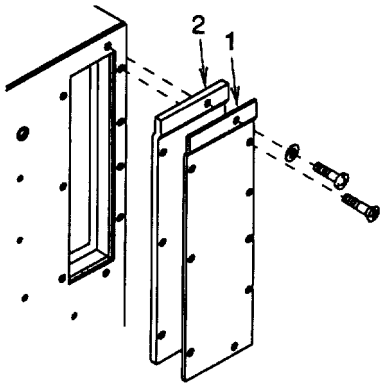

Figure 5-32. Fresh Air Cover

(2) Inspect blast damper as follows:

(a) Check that filter is clean and in place. Clean if dirty. Replace if damaged or missing.

(b) Check that screen is clean and free of all blockages. Clean if dirty or blocked.

(c) Check that damper door is in the open position. Damper door is closed if reset lever is pointing down, and open if reset lever is pointing away from unit about 45°.

(d) Check that all gaskets are not torn, loose, or missing. Replace if damaged or missing.

(e) Check that fabric panel is not torn, loose, or missing. Replace if damaged or missing.

5-36. BLAST DAMPER. - continued

c. Repair.

NOTE

Repair of fresh air cover and blast damper is limited to replacement of damaged parts only.

Gaskets.

(a) Remove as much old gasket material as possible by pulling or scraping it away from the metal surface.

WARNING

Adhesive remover is flammable and the vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well ventilated area, wear gloves, and keep away from sparks or flame.

(b) Soften and remove old adhesive and gasket residue using adhesive remover and a stiff brush.

(c) Coat the mating surfaces of the metal and new gasket material with adhesive. Let both surfaces air dry until the adhesive is tacky but will not stick to fingers.

(d) Starting with an end, carefully attach the new gasket material to the metal. Press into firm contact all over.

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

CHAPTER 6

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Paragraph

Section I Repair Parts, Special Tools, Test, Measurement, and Diagnostic Equipment (TMDE), and Support Equipment
General 6-1
Section II Authorized General Support Maintenance Actions
General 6-2
Casing 6-3

Section I REPAIR PARTS, SPECIAL TOOLS, TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE), AND SUPPORT EQUIPMENT

6-1. GENERAL.

Repair parts are listed and illustrated in TM 9-4120-402-24P. No special tools are required for general support maintenance of the air conditioner. Test, maintenance, and diagnostic equipment (TMDE), and support equipment, include standard electrical test equipment, and standard pressure and vacuum gages, vacuum pumps, and servicing manifolds found in any general support maintenance refrigeration shop.

Section II AUTHORIZED GENERAL SUPPORT MAINTENANCE ACTIONS

6-2. GENERAL.

The only items restricted to general support maintenance level by the Maintenance Allocation Chart (MAC) are the repair or replacement of insulation or lifting fittings on the housing, and replacement of the cabinet base. 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.

6-3. CASING.

This task covers: a. Inspect b. Repair

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Torch Set
Appendix B, item 2

Rivet Gun
Appendix B, item 11

Gloves
Appendix B, item 2

Brush
Appendix B, item 2

Materials/Parts

Lifting Handles (2)

Rivets (As Required)

Nut Plates (As Required)

Blind Nuts (As Required)

Insulation/Gasket
Appendix F

Adhesive
Appendix E, item 2

Adhesive Remover
Appendix E, item 16

Equipment Conditions:

CAUTION

Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

Disconnect power at power source.

---

a. Inspect.

Check casing for visible signs of damage, cracks, broken welds, or punctures. Repair as indicated.

6-3. CASING. - continued

b. Repair.

NOTE

Repairs are limited to rework of broken or cracked welds, straightening of bent or dented sheet metal and replacement of handles, gaskets, insulation, and rivnuts and some small sheet metal parts by drilling out rivets and installation of replacement parts.

Minor dents and bent edges can be straightened using common sheet metal repair procedures.

Should touch up or refinishing be necessary, see TM 43-0139.

(1) Disassemble unit as necessary and make repairs as indicated.

(2) Gasket and insulation replacement.

WARNING

Adhesive remover is flammable and the vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well ventilated area, wear gloves, and keep away from sparks or flame.

NOTE

Use only gaskets, insulation, or name plates identified in TM 9-4120-402-24P.

(a) Soften and remove old adhesive and gasket residue using adhesive remover (appendix E, item 16) and a stiff brush.

(b) See Appendix F to identify and fabricate gasket or insulation to be replaced using material specified.

(c) Coat the mating surfaces of the metal and new gasket material with adhesive (appendix E, item 2). Let both surfaces air dry until the adhesive is tacky but will not stick to fingers.

(d) Starting with an end, carefully attach the new gasket material to the metal. Press into firm contact all over.

(3) Blind nut (rivnut) replacement.

(a) Drill out old blind nut using a drill bit slightly smaller than the body of the blind nut. Remove blind nut.

(b) Install new blind nut.

(4) Nut plate replacement.

(a) Drill out rivets securing old nut plate using a drill bit slightly smaller than the rivet. Remove nut plate.

(b) Position new nut plate in place and secure using new rivets.

6-3. CASING. - continued

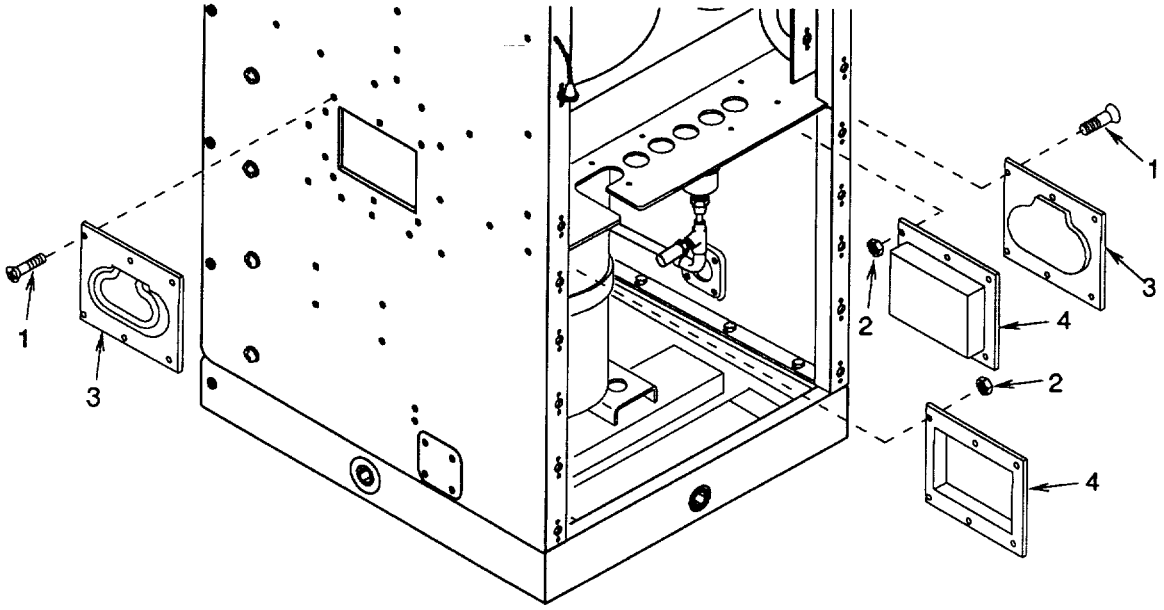

Figure 6-1. Lifting Handles

(5) Lifting handle replacement.

(a) Remove six screws (1) and nuts (2). Remove handle (3) and enclosure (4).

(b) Position enclosure (4) on the inside and handle (3) on the outside of enclosure.

(c) Aline mounting holes and secure using six screws (1) and nuts (2).

(6) Reassemble unit.

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

APPENDIX A

REFERENCES

A-1. SCOPE.

This appendix lists all forms, field manuals, and technical manuals referenced in this manual.

A-2. FORMS.

• Recommended Changes to Publications and Blank Forms	DA 2028
• Equipment Inspection and Maintenance Worksheet	DA 2404
• Packaging Improvement Report	DD Form 6
• Quality Deficiency Report	SF 368

A-3. TECHNICAL MANUALS.

• Painting Instructions for Army Material	TM 43-0139
• Unit, Direct Support, and General Support Maintenance Repair Parts and Special Tools List	TM 9-4120-402-24P
• Procedures for Destruction of Equipment to Prevent Enemy Use	TM 750-244-3
• Leak Detector, Refrigerant Gas	TM 9-4940-435-14

A-4. MISCELLANEOUS PUBLICATIONS.

• The Army Maintenance Management System (TAMMS)	DA Pamphlet 738-750
• Electric Motor and Generator Repair	FM 20-31
• First Aid For Soldiers	FM 21-11
• Brazing of Steels, Copper, Copper Alloys, Nickel Alloys, Aluminum and Aluminum Alloys	MIL-B-7883
• Environmental Control of Small Shelters	MIL-HDBK-116
• Warranty Technical Bulletin	TB 9-4120-402-24

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I INTRODUCTION

B-1. GENERAL.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance categories.

c. 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.

d. 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 comparing 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 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 (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Aline. 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 equipment 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 3d position code of the SMR code.

B-2. MAINTENANCE FUNCTIONS. - continued

i. Repair. The application of maintenance services[1], including fault location/troubleshooting[2], removal/installation, and disassembly/assembly3 procedures, and maintenance actions4 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 prescribed 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.

a. 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. Column 2. Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3. Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph B-2.)

d. Column 4. Maintenance Level. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform the maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate work time figures will be shown for each category. The work time figure 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 disassembly/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 symbol designations for the various maintenance categories are as follows.

C.....Operator or Crew
O.....Unit
F.....Direct Support Maintenance
H.....General Support Maintenance
D.....Depot Maintenance

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[1]Services - inspect, test, service, adjust, aline, calibrate, and/or replace.

[2]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).

[3]Disassembly/assemble - encompasses the step-by-step taking apart (or breakdown) of a spare/functional group coded item to the level of its least componency identified as maintenance significant (i.e., assigned an SMR code) for the category of maintenance under consideration.

[4]Actions - welding, grinding, riveting, straightening, facing, remachining, and/or resurfacing.

B-3. EXPLANATION OF COLUMNS IN THE MAC, SECTION II. - continued

e. Column 5. Tools and Fquipment. 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.

f. Column 6. Remarks. Column 6 contains a note number which shall correspond to the notes contained in Section IV.

B-4. EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION III.

a. Column 1. Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

b. Column 2. Maintenance Category. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3. Nomenclature. Name or identification of the tool or test equipment.

d. Column 4. National Stock Number. The national stock number of the tool or test equipment.

e. Column 5. Tool Number. The manufacturer's part number.

B-5. EXPLANATION OF COLUMNS IN REMARKS, SECTION IV.

a. Column 1. Reference Code. The code recorded in column 6, Section II.

b. 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

(1) GROUP NO.	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
01	COVERS, PANELS, GRILLES, SCREENS AND INFORMATION PLATES								
	Cover, Fabric	Inspect	0.1	0.1					
		Service		0.5					
		Repair			2.0				
		Replace		0.5					
	Grilles	Inspect	0.1	0.1					
		Adjust	0.1						
		Service	0.2	0.2					
		Repair			2.0				Note 2
		Replace		0.5					
	Panels	Inspect	0.1	0.1					
		Service		0.5					
		Repair			2.0				Note 1
		Replace		0.5					
	Screens/Guards	Inspect	0.1	0.1					
		Service		0.1					
		Repair			2.0				
		Replace		0.5					
	Information Plates	Inspect	0.1						
		Replace			0.3				
02	FILTERS AND MIST ELIMINATOR								
	Air Filters	Inspect		0.5					
		Service		0.5					
		Replace		0.5					
	Mist Eliminator	Inspect		0.7					
		Service		0.5					
		Replace		0.7					
03	ELECTRICAL								
	Control Panel Assembly	Inspect	0.1	0.1					
		Adjust	0.1						
		Repair		2.0					
		Replace		0.5					

MAINTENANCE ALLOCATION CHART - continued

(1) GROUP NO.	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
	Wiring Harness (Control Panel)	Inspect		0.1					
		Test		0.5					
		Repair		1.0					
		Replace		2.0					
	Potentiometer	Inspect		0.1					
		Adjust	0.1						
		Test		0.5					
		Replace		1.0					
	Switch, Rotary	Inspect		0.1					
		Adjust	0.1						
		Test		0.5					
		Replace		1.0					
	Fault Indicator (LED)	Inspect		0.1					
		Test		0.3					
		Replace		1.0					
	Wiring Harnesses (Unit)	Inspect		0.5					
		Test		1.0					
		Repair		2.0					
		Replace		4.0					
	EMI Filter	Inspect		0.1					
		Test		0.3					
		Replace		0.5					
	Coil Frost Switch	Inspect		0.1					
		Test		0.3					
		Replace		0.5					
	Control Assembly	Inspect		0.5					
		Service		0.2					
		Repair		2.0					
		Replace		1.0					
	Wiring Harnesses (Control Assembly)	Inspect		0.5					
		Test		1.0					
		Repair		1.0					
		Replace		2.0					
	Logic Box Assembly	Inspect		0.1					
		Test			1.5				
		Replace		0.2					
	Motor Controller Assembly	Inspect		0.1					
		Test		1.5					
		Replace		1.0					

MAINTENANCE ALLOCATION CHART - continued

(1) GROUP NO.	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
	Capacitors	Inspect		0.1					
		Test		0.5					
		Replace		0.5					
	Rectifier	Inspect		0.1					
		Test		0.5					
		Replace		1.0					
	Transformer	Inspect		0.1					
		Test		0.5					
		Replace		1.0					
	Relays	Inspect		0.2					
		Test		1.0					
		Replace		1.5					
	Diodes	Inspect		0.2					
		Test		0.5					
		Replace		0.5					
	Circuit Breaker	Inspect		0.1					
		Test		0.5					
		Replace		1.0					
04	HEATER, EVAPORATOR FAN, CONDENSER FAN, AND MOTOR								
	Heater Element	Inspect		0.1					
		Test		0.3					
		Replace		1.0					
	Heater Thermostat	Inspect		0.1					
		Test		0.3					
		Replace		0.5					
	Evaporator Fan	Inspect		0.1					
		Service		0.1					
		Replace		1.0					
	Motor	Inspect		0.1					
		Service		0.1					
		Test		0.2					
		Repair			2.0				
		Replace		1.0					
	Condenser Fan	Inspect		0.1					
		Service		0.2					
		Replace		2.0					

MAINTENANCE ALLOCATION CHART - continued

(1) GROUP NO.	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
05	REFRIGERATION SYSTEM								
	Dehydrator	Inspect			0.1				
		Replace			6.0				
	Pressure Relief Valve	Inspect			0.1				
		Replace			6.0				
	Condenser Coil	Inspect		0.1					
		Service		0.5					
		Replace			7.0				
	Receiver	Inspect			0.1				
		Replace			6.0				
	Pressure Switches	Test			0.5				
		Replace			6.0				
	Service Valves	Inspect			0.1				
		Replace			6.0				
	Solenoid Valve Coil	Test		0.5					
		Replace		0.5					Note 4
	Solenoid Valve	Replace			6.0				
	Liquid Sight Indicator	Inspect	0.1						
		Service	0.1						
		Replace			6.0				
	Expansion Valve	Test			1.0				
		Replace			6.0				
	Evaporator Coil	Inspect		0.1					
		Service		0.5					
		Replace			7.0				
	Compressor	Test			0.5				
		Repair			1.0				Note 3
		Replace			8.0				
	Tubing and Fittings	Inspect			0.5				
		Test			1.0				
		Replace			6.0				

MAINTENANCE ALLOCATION CHART - continued

(1) GROUP NO.	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
06	CASING AND BOTTOM PANELS								
	Condensate Traps	Inspect		0.5					
		Service		0.8					
		Replace		0.7					
	Fresh Air Damper	Adjust	0.1						
		Service		0.5					
		Repair			1.0				
		Replace			1.0				
	Casing	Inspect				0.5			
		Repair				2.0			Note 5
	Insulation	Inspect			0.5				
		Replace			1.0				
07	ACCESSORIES								
	Blast Damper	Adjust			0.5			10	
		Inspect			0.2				
		Repair			0.5				
		Replace		0.5					

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS FOR MAINTENANCE ALLOCATION CHART

(1) Tool/Test Equipment Reference Number	(2) Maintenance Category	(3) Nomenclature	(4) National/NATO Stock Number	(5) Tool Number
	NOTE			
	Standard tools and test equipment in the following kits are adequate to accomplish the maintenance functions listed in Section II:			
1	O-F-H	Tool Kit, Service, Refrigeration Unit (SC 5180-90-CL-N18)	5180-00-597-1474	
2	O-F-H	Shop Equipment, Auto Organizational #1 Common	4910-00-754-0654	
3	F-H	Pump, Vacuum	4310-00-289-5967	
4	O-F-H	Heat Gun	4940-01-042-4855	
5	O-F-H	Screwdriver, Offset, Cross Tip No. 1	5120-00-256-9014	
6	O-F-H	Power Supply, 28 Volt dc	6130-01-143-5947	
7	F-H	Nitrogen Regulator	6680-00-503-1327	
8	F-H	Pump, Diaphragm	4320-00-588-3590	
9	F-H	Recovery and Recycle Unit, Refrigerant	4130-01-338-2707	
10	O-F-H	Installation and Removal Tool, Connector Electrical Contact (M81969/1-02)		
11	F-H	Rivet Gun	5120-00-508-1588	
12	F-H	Puller, Mechanical	5120-00-378-4293	
13	O-F-H	Key, Socket Head (Hex "L" Type, 5/32", 6" Arm)	5120-01-160-1305	(74445) 58076
		SPECIAL TOOLS		
14	F-H	Logic Box Test Fixture		(94833) 111 K8002-1

Section III TOOL AND TEST EQUIPMENT REQUIREMENTS - continued

(1) Tool/Test Equipment Reference Number	(2) Maintenance Category	(3) Nomenclature	(4) National/NATO Stock Number	(5) Tool Number
	NOTE **When accessory item blast damper assembly is installed on the air conditioner, the following special test tool is required.**			
15	F-H	Spring Balance Assembly		(97403) 13226E0900

Section IV REMARKS

MAINTENANCE ALLOCATION CHART

Reference Code	Remarks
Note 1	Replace gasket and insulation only.
Note 2	Replace gasket and straighten bent blades only.
Note 3	Replace external components only
Note 4	Replace coil only.
Note 5	Replace blind nuts, plate nuts, and lifting handles only.
	Other than those items listed above, there are no supplemental instructions or explanatory remarks required for the maintenance functions listed in Section II. All functions are sufficiently defined in Section I. Active time listed for maintenance task functions are with the air conditioner in off-equipment position.

APPENDIX C

COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (811) LISTS

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 and Basic Issue Items Lists are divided into the following sections.

a. 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 or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. These are minimum essential items required to place the Air Conditioner in operation, to operate it and to perform emergency repairs. Although shipped separately packed, BII must be with the Air Conditioner during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII based on Table(s) of Organization and Equipment (TOE)/ Modification Table of Organization and Equipment (MTOE) authorization of the end item.

C-3. EXPLANATION OF COLUMNS.

The following provides an explanation of columns found in the tabular listings:

a. Column (1) Illustration Number (Illus Number). This column indicates the number of the illustration in which the item is shown.

b. Column (2) National Stock Number. Indicates the national stock number assigned to the item which will be used for requisitioning.

c. Column (3) 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 Commercial And Govemment Entity (CAGE) code (in parentheses) followed by the part number. If item needed differs for different models of this equipment, the model is shown under the "Usable On Code" heading in this column.

d. Column (4) Unit of Measure (U/M). Indicates the measure used in performing the actual operational/ maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

e. Column (5) Quantity Required (Qty Rqr). Indicates the quantity of the item authorized to be used with/on the equipment.

Section II COMPONENTS OF END ITEM

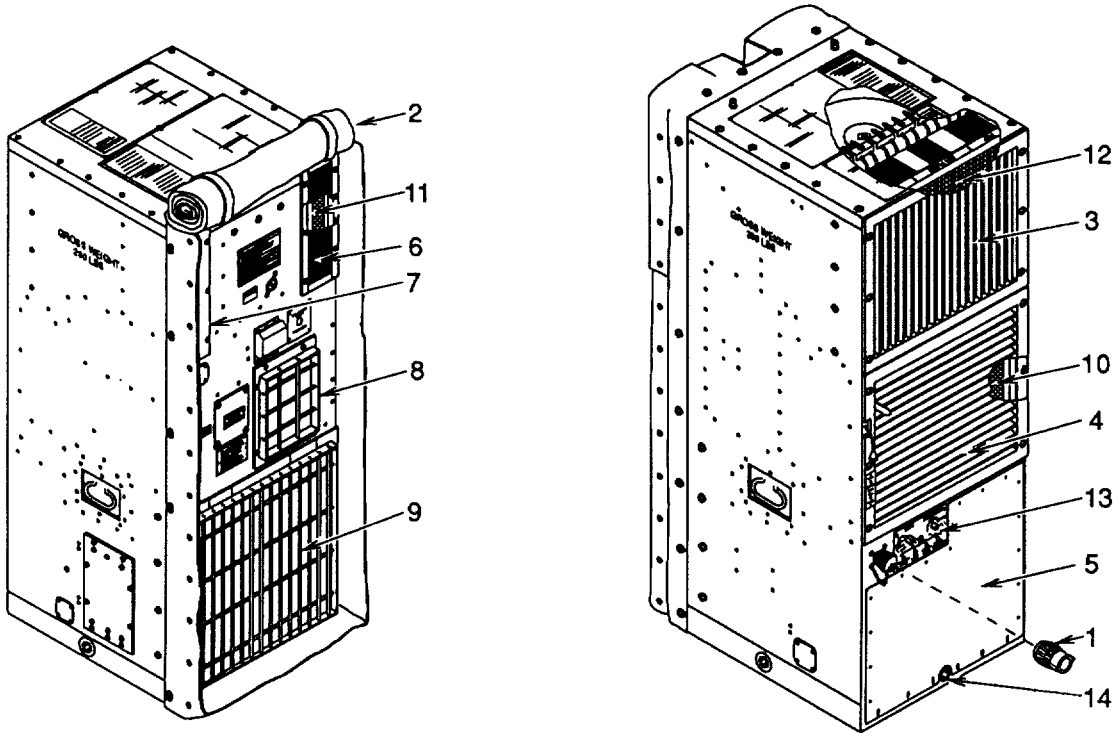


Figure C-1. Components of End Item

(1) Illus Number	(2) National Stock Number	(3) Description CAGE and Part Number Usable On Code	(4) U/M	(5) Qty Rqr
1		Connector, Plug Electrical (96906) MS3106R18-11S	EA	1
2		Cover, Air Conditioner (97403) 13222E9987	EA	1
3		Grille Assy, Discharge (97403) 13215E9857	EA	1
4		Grille Assy, Intake (97403) 13215E9854	EA	1
5		Cover, Front (97403) 13229E4247	EA	1
6		Screen, Fresh Air (97403) 13225E8027	EA	1
7		Cover, CBR Duct (97403) 13225E8008	EA	1
8		Guard, Condenser (97403) 13225E8019	EA	1
9		Guard, Condenser Coil (97403) 13215E9867	EA	1
10		Filter (97403) 13225E8026	EA	1
11		Filter, Fresh Air (97403) 13222E9999	EA	1
12		Mist Eliminator (97403) 13219E2647	EA	1
13		Control Panel Assembly (97403) 13229E4190	EA	1
14		Plug, Pipe (97403) 13211E8178	EA	4

Section III BASIC ISSUE ITEMS

(1) Illus Number	(2) National Stock Number	(3) Description CAGE and Part Number	Usable On Code	(4) U/M	(5) Qty Rqr
		Department of the Army Technical Manual; Operator's, Unit, Direct Support, and General Support Maintenance Manual TM 9-4120-402-14		EA	1
		Warranty Program for Air Conditioner, Vertical, Compact, 18,000 BTU/HR TB 9-4120-402-24		EA	1

APPENDIX D

ADDITIONAL AUTHORIZATION LIST (AAL)

Section I INTRODUCTION

D-1. SCOPE.

This appendix lists additional items you are authorized for the support of 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 authorized to you by CTA, MTOE, TDA, or JTA.

D-3. EXPLANATION OF LISTING.

National stock number, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. "USABLE ON CODE" codes are identified as follows: (Not applicable.)

Section II ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION CAGE AND PART NUMBER	USABLE ON CODE	(3) U/M	(4) QTY RQR
7520-00-559-9618	Cotton Duck Case		EA	1
7510-00-889-3494	Log Book Binder		EA	1

APPENDIX E

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (EDSML)

Section I INTRODUCTION

E-1. SCOPE.

This appendix lists expendable supplies and materials you will need to operate and maintain the Air Conditioner. These items are authorized to you by CTA 50-970, Expendable items (except Medical, Class V, Repair Parts, and Heraldic Items).

E-2. EXPLANATION OF COLUMNS.

a. Column 1, Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use coater air filter, Item 1, Appendix E").

b. 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

c. Column 3, National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column 4, Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Commercial And Government Entity (CAGE) code in parentheses, if applicable.

e. Column 5, Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, 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 Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	O	4130-00-860-0042	Coater, Air Filter, 1 pint container	ea
2	F	3040-00-664-0439	Adhesive, General Purpose, 1 pint container	ea
3	O	6850-00-264-9037	Dry Cleaning Solvent P-D-680 (81348)	gl
4	F	6850-00-837-9927	Monochlorodifluoromethane, Technical: w/cylinder 22 lb (Refrigerant-22) BB-F-1421, type 22 (81348)	cy
5	F	6830-00-782-6512	Dichlorotetrafluroethane Technical: w/cylinder (Refriqerant-114) BB-F-1421, Type 114 (81348)	cy
6	O	3439-01-045-7940	Flux, Solder, Liquid, Rosin Base MIL-F-14256	qt
7	O	5935-00-725-4153	Solder, Lead-Tin, QQ-S-571 Type SN60WRP2	
8	F	6830-00-292-0732	Nitrogen	cy
9	F		Brazing Alloy, Silver QQ-B-564, grade O, I, or II	oz

Section II EXPENDABLE SUPPLIES AND MATERIALS LIST - continued

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
10	F		Brazing Alloy, Silver QQ-B-564, grade III	oz
11	F	3439-00-640-3713	Flux, Brazing O-F-499, type B	oz
12	F	5350-00-192-5047	Abrasive Cloth	pg
13	F	7920-00-205-1711	Rags	pg
14	O		Silicone Spray, P/N AS193 (61014)	oz
15	O	7930-00-764-5066	Detergent, Dishwasher	oz
16	O	6510-01-016-8772	Adhesive Remover	oz
17	F	9150-00-189-6727	Oil, MIL-L-2104, Grade 10(81349)	qt
18	F	5640-00-580-6276	Insulation Tape	roll
19	O		Adhesive, Sealant, MIL-A-46106, Type 1	oz
20	O		Tape, antiseize, Polytetrafluroethylene,	
			MIL-T-27730, Size 1	roll

APPENDIX F

ILLUSTRATED LIST OF MANUFACTURED ITEMS

Section I INTRODUCTION

SCOPE.

a. This appendix includes complete instructions for making items authorized to be manufactured or fabricated at unit, direct support, or general support maintenance.

b. A part number index in alphanumeric order is provided for cross-referencing the part number of the item to be manufactured to the figure which covers fabrication criteria.

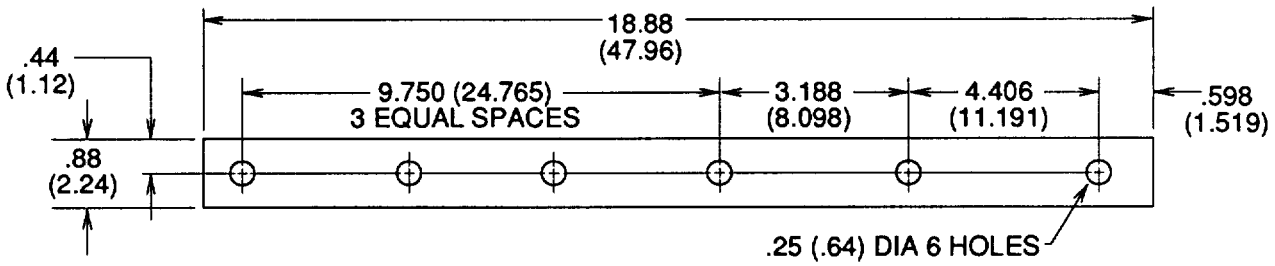
c. All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular list on the illustration.

d. All dimensions are given in inches with centimeters shown in parenthesis.

Manufactured Items Part Number Index

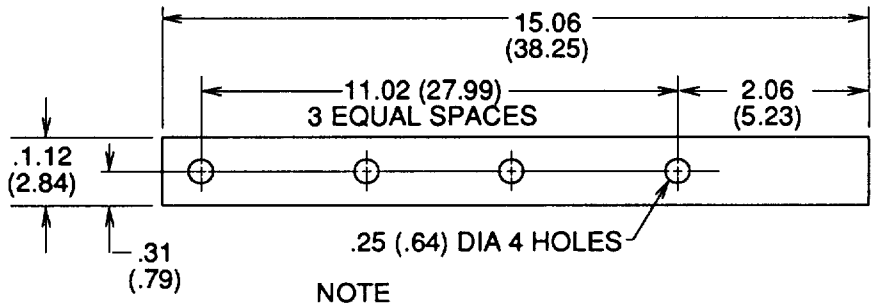
Part Number	Figure Number	Part Number	Figure Number
Extended Wiring Harness J4 to P15 Diagram	F-48	13229E4246/12	F-25
Input Power Cable Diagram	F-50	13229E4246/14	F-26
Logic Box Test Fixture Schematic	F-51	13229E4246/15	F-23
Remote Control Cable Diagram	F-49	13229E4246/17	F-4
120K0299	F-28	13229E4246/19	F-22
13211E8323	F-29	13229E4246/22	F-24
13215E9854/2	F-4	13229E4247/2	F-7
1321 5E9854/3	F-6	13229E4247/3	F-9
13215E9857/2	F-4	13229E4247/4	F-9
13215E9857/3	F-5	13229E4247/5	F-7
13222E9904/2	F-11	13229E4247/6	F-8
13222E9996/2	F-1	13229E4247/7	F-7
13222E9996/3	F-2	13229E4247/8	F-4
13222E9996/5	F-1	13229E4250/44	F-13
13222E9996/6	F-3	13229E4251/44	F-44
13225E8008/2	F-12	13229E4251/55	F-3
13225E8009/2	F-3	13229E4251/56	F-36
13225E8009/3	F-4	13229E4251/57	F-33
13225E8009/4	F-14	13229E4251/58	F-3
13225E8009/5	F-4	13229E4251/59	F-3
13225E8009/6	F-14	13229E4251/60	F-31
13225E8115/2	F-10	13229E4251/61	F-3
13226E0875	F-45	13229E4251/62	F-37
13226E0876	F-46	13229E4251/63	F-3
13226E0897	F-47	13229E4251/64	F-40
13229E4242/1 0	F-30	13229E4251/65	F-32
13229E4243/8	F-16	13229E4251/66	F-3
13229E4243/9	F-21	13229E4251/67	F-35
13229E4243/10	F-20	13229E4251/68	F-3
13229 E4243/11	F-15	13229E4251/69	F-42
13229E4243/12	F-18	13229E4251/70	F-41
13229E4243/14	F-17	13229E4251/71	F-34
13229E4243/15	F-19	13229E4251/72	F-3
13229E4246/6	F-4	13229E4251/73	F-43
13229E4246/8	F-27	13229E4251/74	F-39
		13229E4251/75	F-3
		13229E4251/76	F-38

Section II MANUFACTURED ITEMS ILLUSTRATIONS



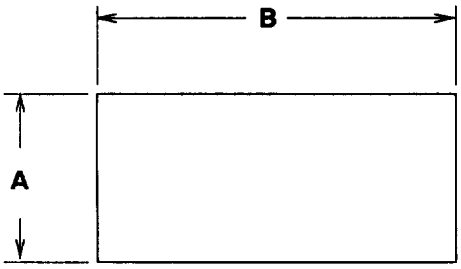
NOTE
1. FABRICATE FROM NSN 9320-01-150-4085 STOCK

Figure F-1. Gasket, Part Numbers 13222E9996/2 and 13222E9996/5



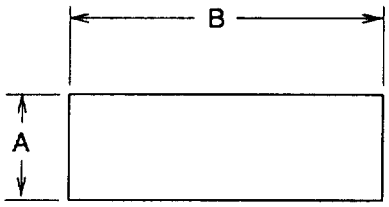
NOTE
1. FABRICATE FROM NSN 9320-01-150-4085 STOCK

Figure F-2. Gasket, Part Number 13222E9996/3



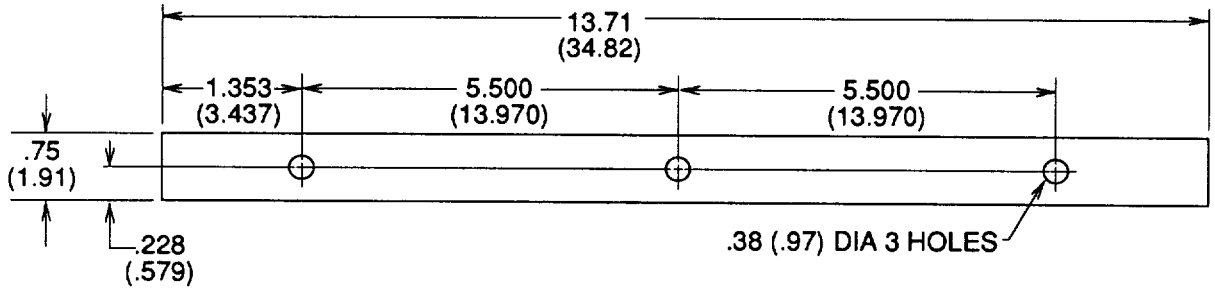
PART NUMBER	A DIM	B DIM	FABRICATE FROM
13229E4251/75	7.16 (18.19)	7.56 (19.20)	5640-01-195-6254
13229E4251/72	2.56 (6.50)	15.23 (38.68)	5640-01-195-6254
13229E4251/68	2.47 (6.27)	14.63 (37.16)	5640-01-195-6254
13229E4251/66	3.88 (9.86)	9.84 (24.99)	5640-01-195-6254
13229E4251/63	7.56 (19.20)	26.81 (68.09)	5640-01-195-6254
13229E4251/61	.50 (1.27)	16.75 (42.55)	9320-01-149-4807
13229E4251/59	.1.00 (2.54)	13.88 (35.25)	9320-01-149-4807
13229E4251/58	1.00 (2.54)	2.25 (5.72)	9320-01-149-4807
13229E4251/55	1.00 (2.54)	3.88 (9.86)	5640-01-195-6254
13225E8009/2	3.25 (8.26)	3.45 (8.76)	5640-01-195-6254
13222E9996/6	15.12 (38.40)	17.75 (45.09)	5640-01-195-6254

Figure F-3. Insulation



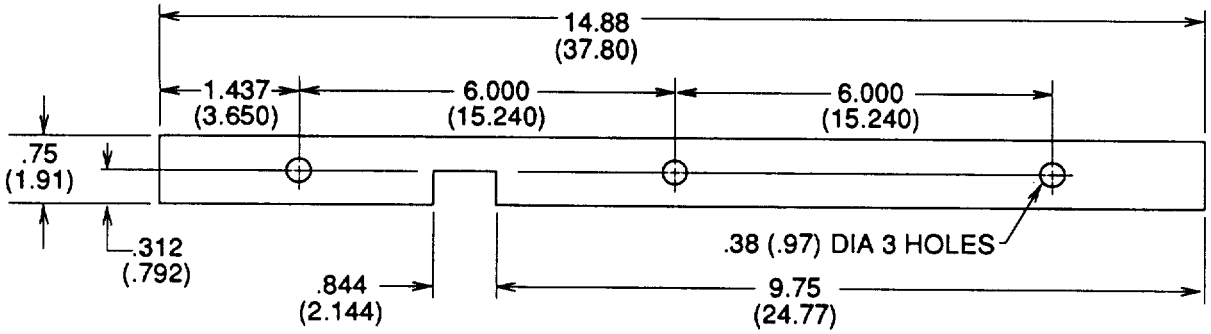
PART NUMBER	A DIM	B DIM	FABRICATE FROM
13229E4246/6	8.38 (21.28)	14.79 (37.57)	ASTM-D1056-2B45C1F2-1/8 THK CELLULAR RUBBER SHEET
13229E4246/17	.50 (1.27)	14.79 (37.57)	ASTM-D1056-2B45C1F2-1/8 THK CELLULAR RUBBER SHEET
13225E8009/5	.37 (.94)	3.45 (8.76)	9320-01-127-7855
13225E8009/3	.37 (.94)	3.45 (8.76)	9320-01-127-7855
13229E4247/8	1.00 (2.54)	1.00 (2.54)	ASTM-D1056-2B45C1F2-3/8 THK CELLULAR RUBBER SHEET
13215E9854/2	.50 (1.27)	15.00 (38.10)	9320-00-813-3127
13215E9857/2	.50 (1.27)	15.00 (38.10)	9320-00-813-3127

Figure F-4. Gasket



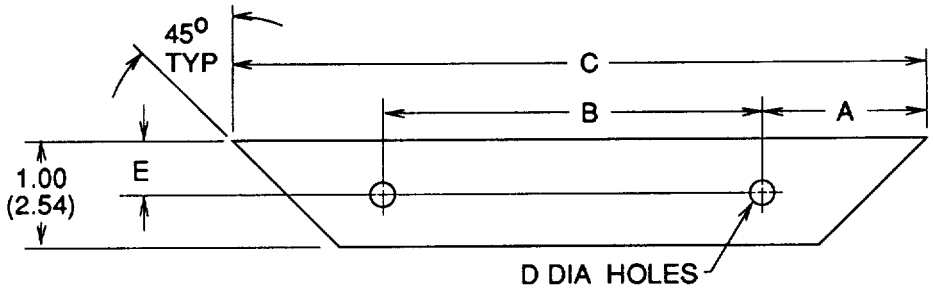
NOTE
1. FABRICATE FROM NSN 9320-00-814-4583 STOCK

Figure F-5. Gasket, Part Number 13215E9857/3



NOTE
1. FABRICATE FROM NSN 9320-00-814-4583 STOCK

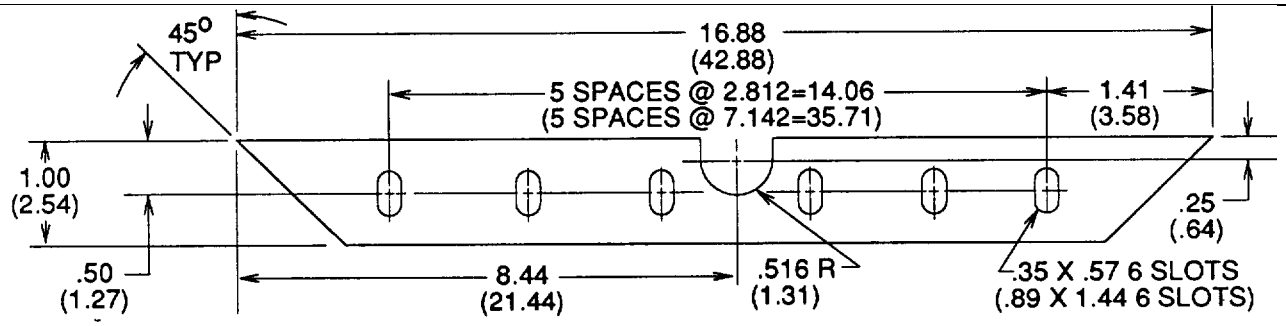
Figure F-6. Gasket, Part Number 13215E9854/3



PART NUMBER	A DIM	B DIM	C DIM	D DIM	E DIM
13229E4247/7	1.78 (4.52)	3 SPACES @ 3.00=9.00 (3 SPACES @ 7.62=22.86)	11.61 (29.49)	.31 MAX (.79 MAX)	.50 (1.27)
13229E4247/5	1.78 (4.52)	4 SPACES @ 3.00=12.00 (4 SPACES @ 7.62=30.48)	15.28 (38.81)	.31 MAX (.79 MAX)	.50 (1.27)
13229E4247/2	1.68 (4.27)	2 SPACES @ 2.69=5.38 (2 SPACES @ 6.83=13.66)	8.16 (20.73)	.31 MAX (.79 MAX)	.38 (.97)

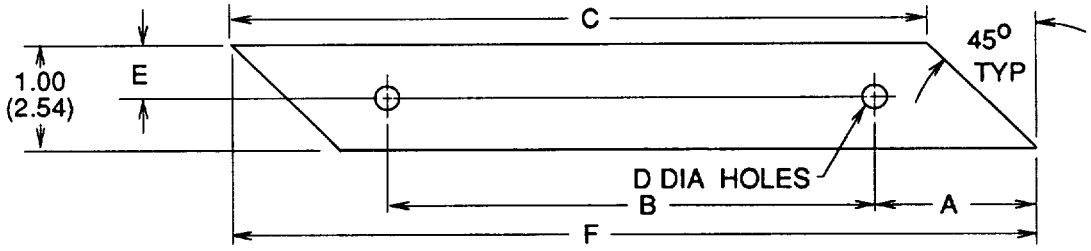
NOTE
1. FABRICATE FROM (97403) 13227E6913-26 GASKET, EMI, COMPOSITE

Figure F-7. Gasket



NOTE
1. FABRICATE FROM (97403) 13227E6913-26 GASKET, EMI, COMPOSITE

Figure F-8. Gasket, Part Number 13229E4247/6



PART NUMBER	A DIM	B DIM	C DIM	D DIM	E DIM	F DIM
13229E4247/4	.88 (2.24)	2 SPACES @ 2.75=5.50 (2 SPACES @ 6.99=13.97)	8.72 (22.15)	.31 MAX (.79 MAX)	.408 (1.036)	9.72 (24.69)
13229E4247/3	1.906 (4.84)	1 HOLE ONLY	3.67 (9.32)	.31 MAX (.79 MAX)	.595 (1.511)	4.67 (11.86)

NOTE
1. FABRICATE FROM (97403) 13227E6913-26 GASKET, EMI, COMPOSITE

Figure F-9. Gasket

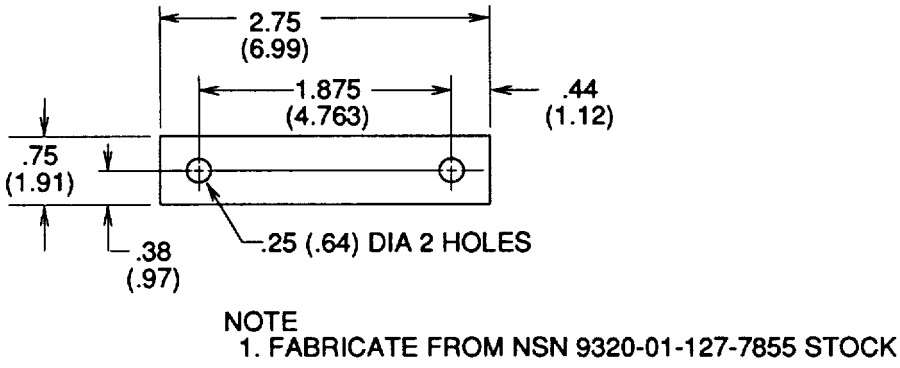


Figure F-10. Gasket, Part Number 13225E8115/2

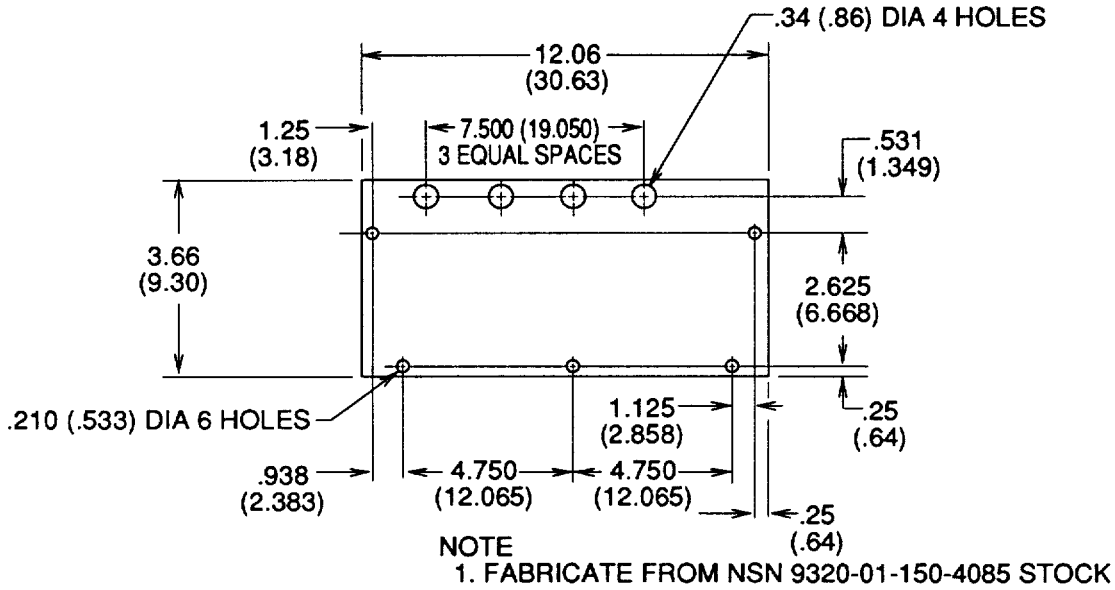


Figure F-11. Gasket, Part Number 13222E9904/2

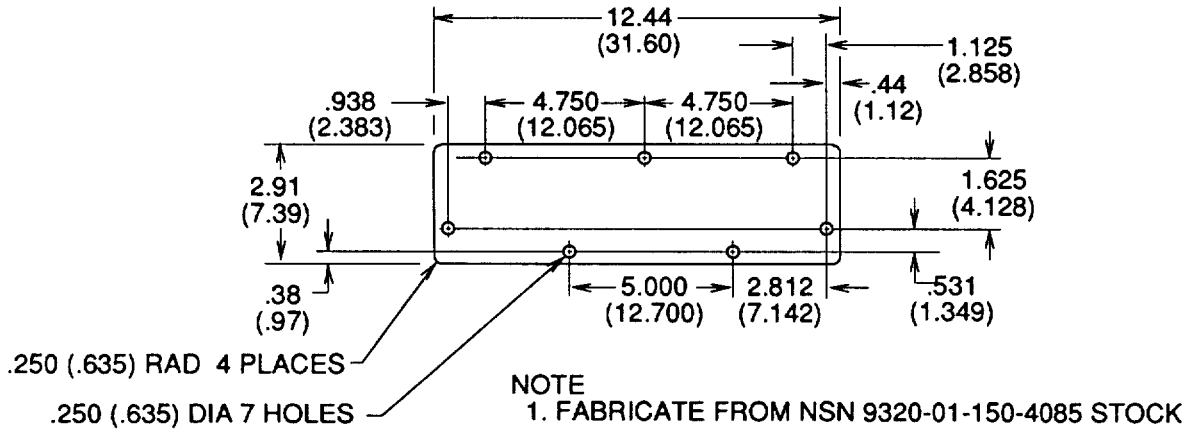
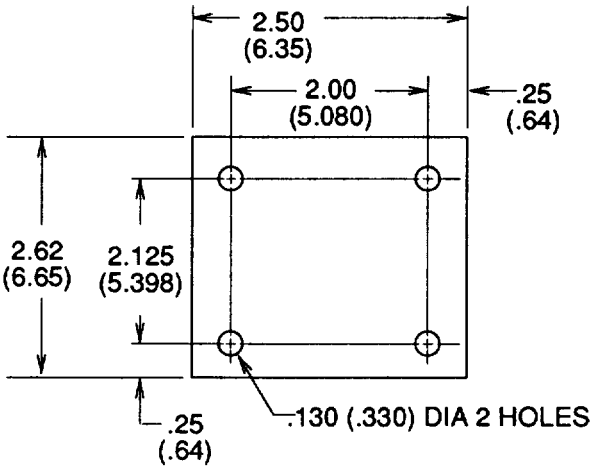
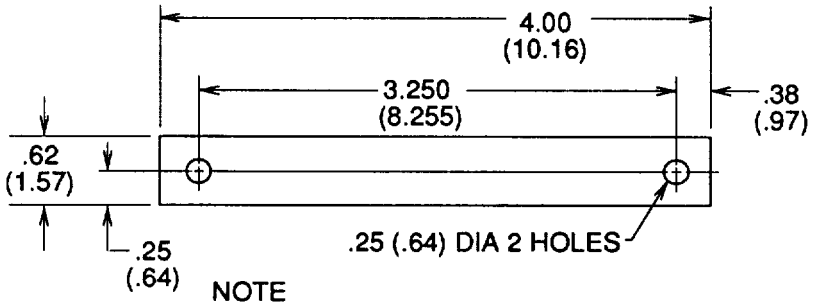


Figure F-12. Gasket, Part Number 13225E8008/2



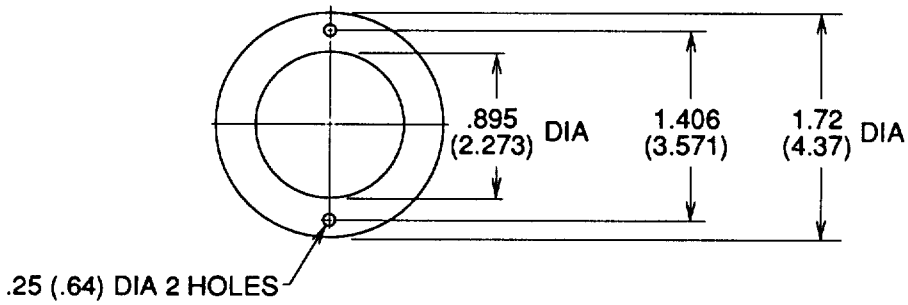
NOTE
1. FABRICATE FROM MIL-R-900 RUBBER SHEET 1/32 (.079) THICK

Figure F-13. Gasket, Part Number 13229E4250/44



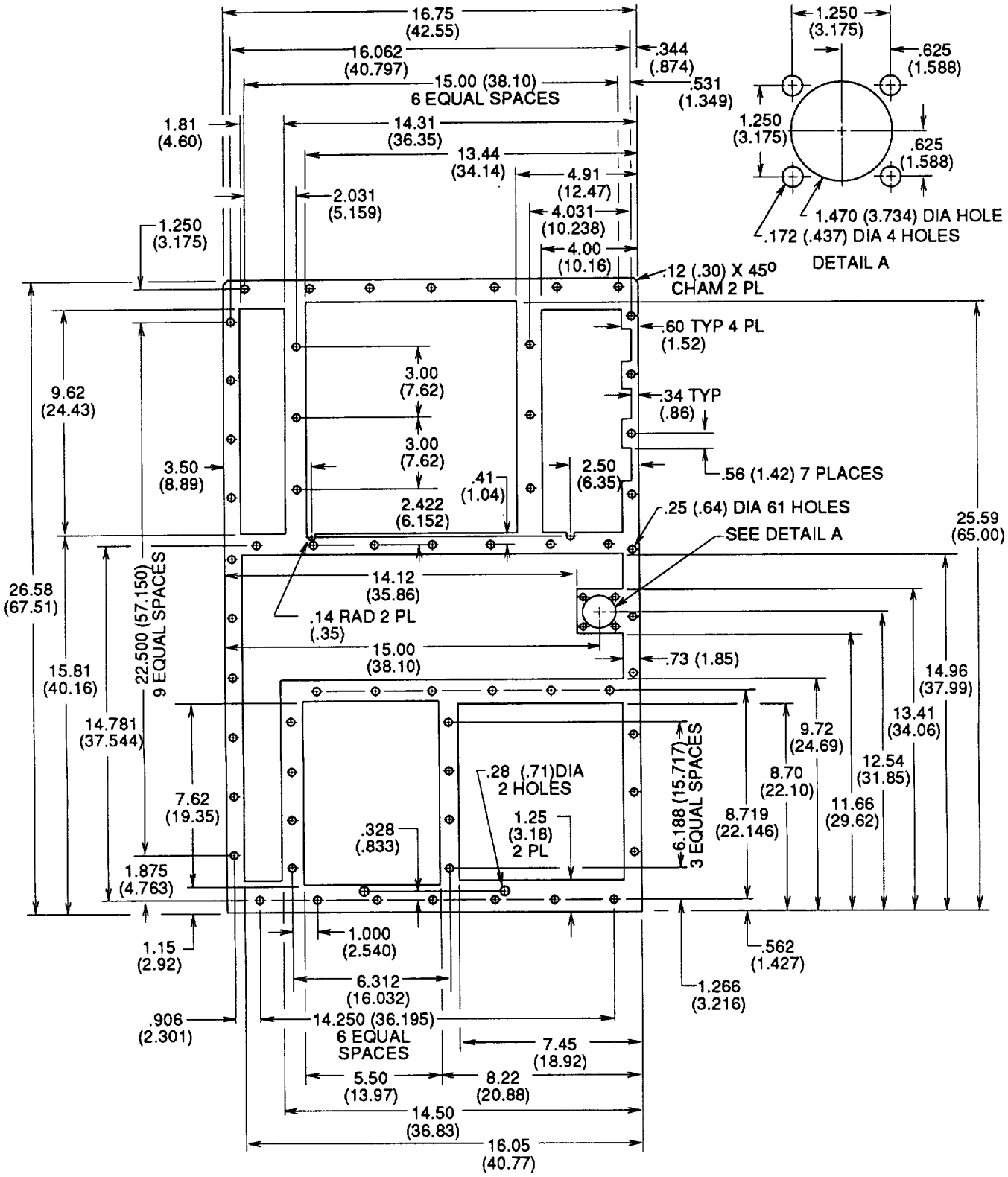
NOTE
1. FABRICATE FROM NSN 9320-01-127-7855 STOCK

Figure F-14. Gasket, Part Number 13225E8009/4 and 13225E8009/6



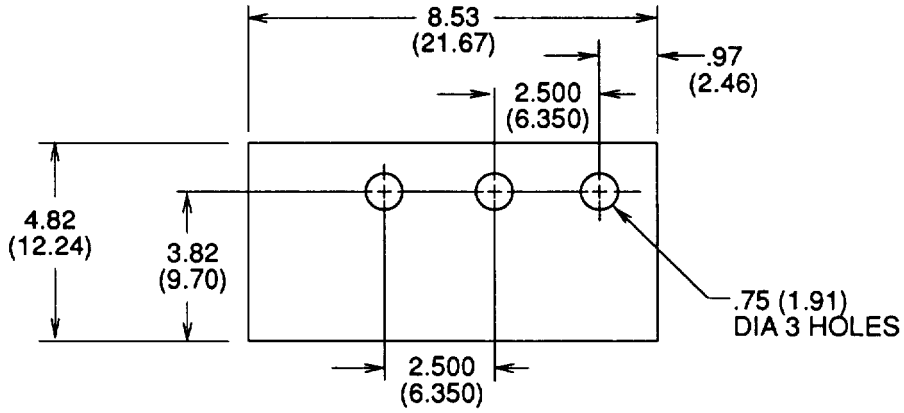
NOTE
1. FABRICATE FROM NSN 9320-01-150-4085 STOCK

Figure F-15. Gasket, Part Number 13229E4243/11



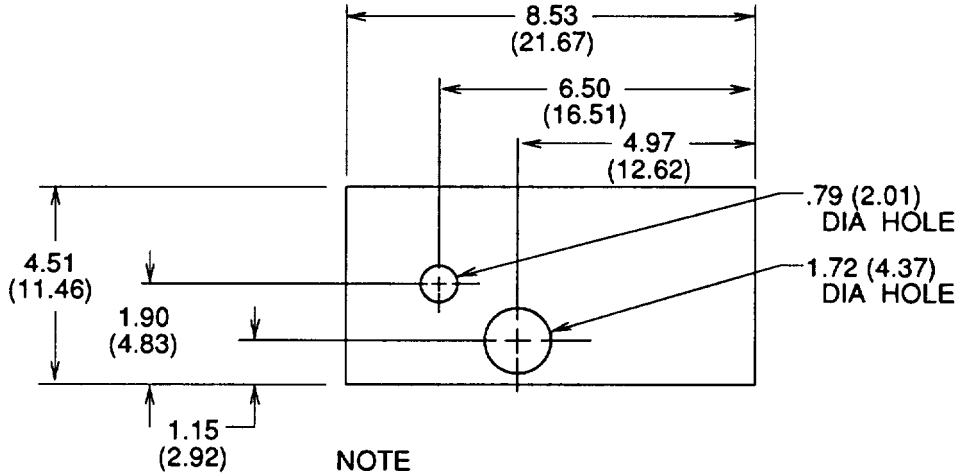
NOTE
1. FABRICATE FROM NSN 9320-01-150-4085 STOCK

Figure F-16. Gasket, Part Number 13229E4243/8



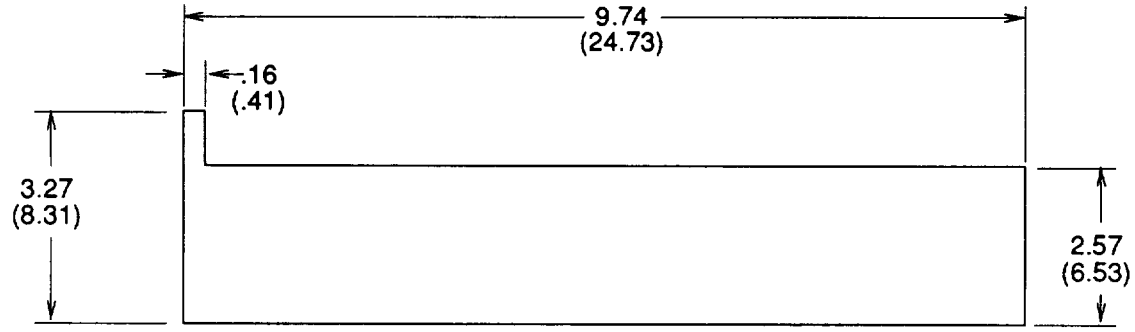
NOTE
1. FABRICATE FROM NSN 5640-01-195-6254 STOCK

Figure F-17. Insulation, Part Number 13229E4243/14



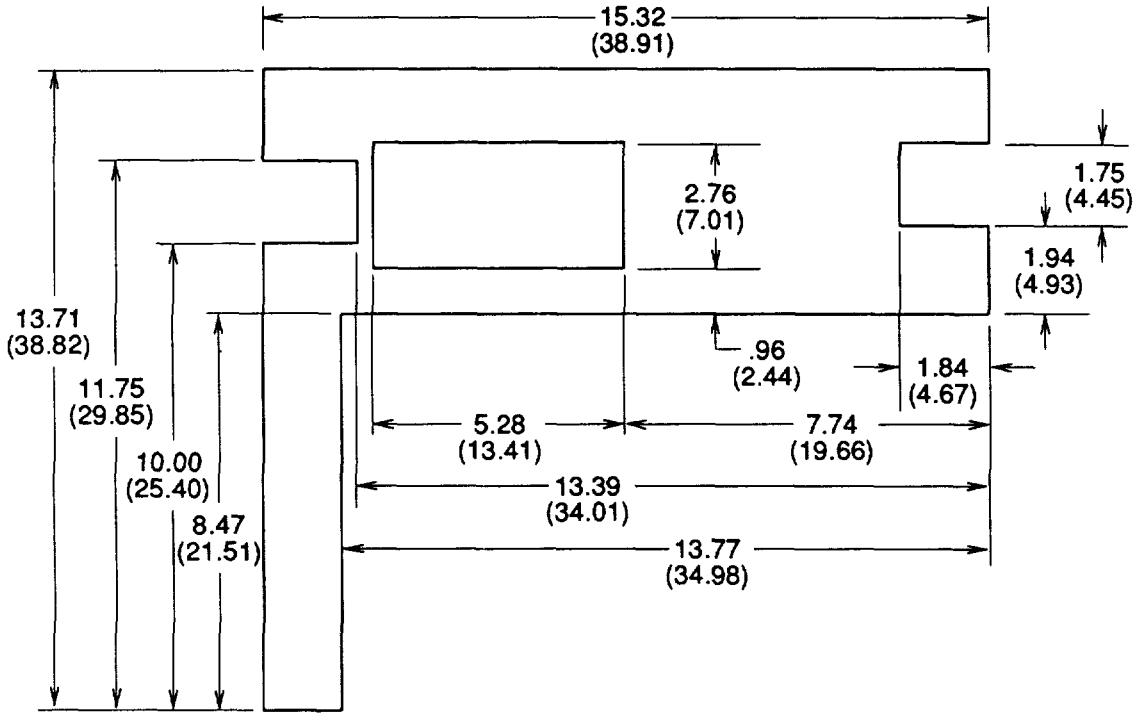
NOTE
1. FABRICATE FROM NSN 5640-01-195-6254 STOCK

Figure F-18. Insulation, Part Number 13229E4243/12



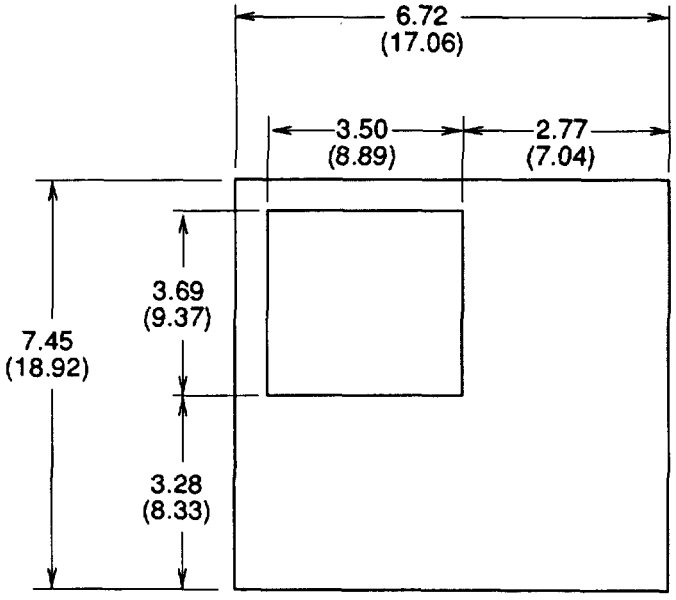
NOTE
1. FABRICATE FROM NSN 5640-01-195-6254 STOCK

Figure F-19. Insulation, Part Number 13229E4243/15



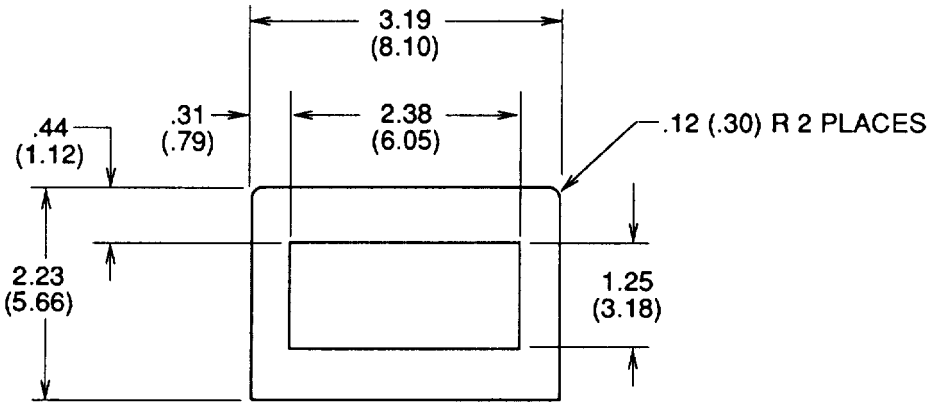
NOTE
1. FABRICATE FROM NSN 5640-01-195-6254 STOCK

Figure F-20. Insulation, Part Number 13229E4243/10



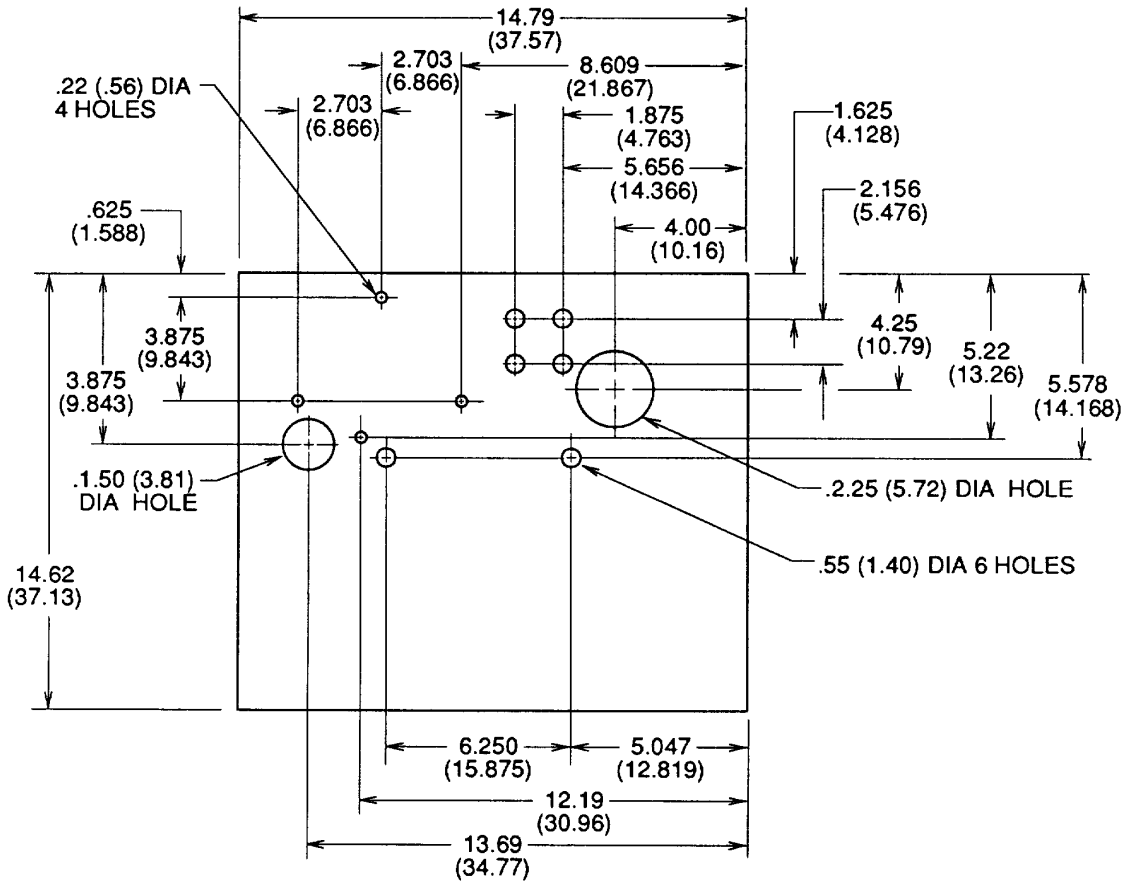
NOTE
1. FABRICATE FROM NSN 5640-01-195-6254 STOCK

Figure F-21. Insulation, Part Number 13229E4243/9



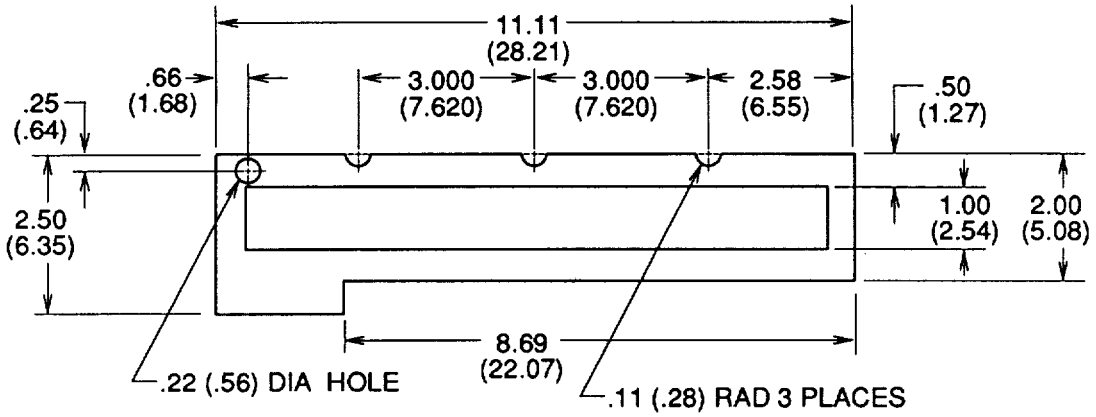
NOTE
1. FABRICATE FROM ASTM-D1056-2B45C1F2-1/8 THK CELLULAR RUBBER SHEET

Figure F-22. Insulation, Part Number 13229E4246/19



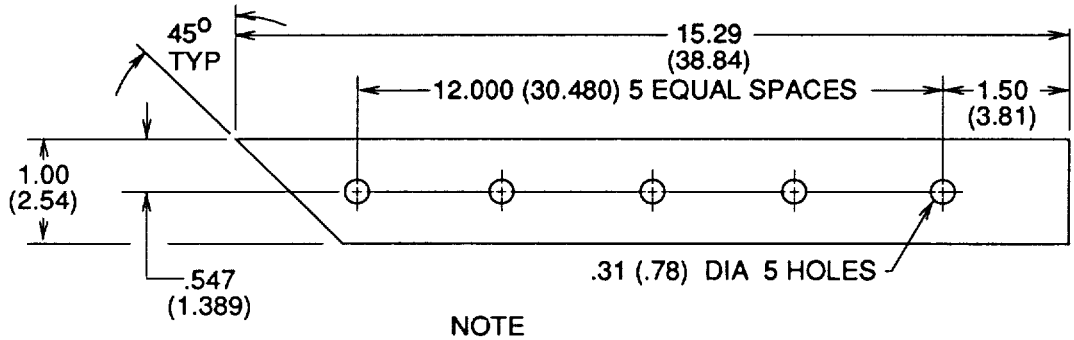
NOTE
1. FABRICATE FROM ASTM-D10562B45C1F2-1/4 THK CELLULAR RUBBER SHEET

Figure F-23. Insulation, Part Number 13229E4246/15



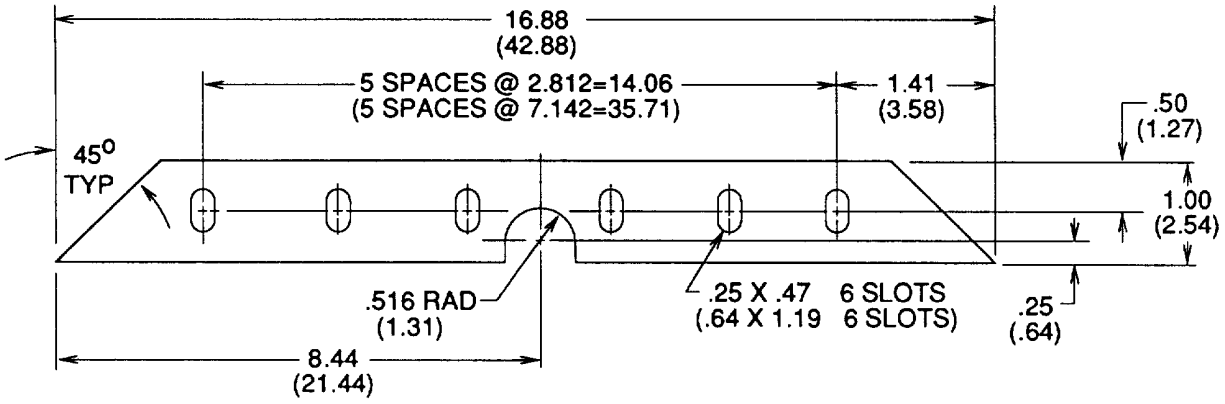
NOTE
1. FABRICATE FROM ASTM-D1056-2B45C1F2-1/8 THK CELLULAR RUBBER SHEET

Figure F-24. Gasket, Part Number 13229E4246/22



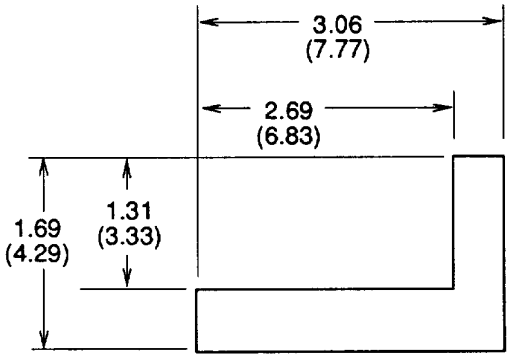
NOTE
1. FABRICATE FROM ASTM-D1056-2B45C1F2-1/8 THK CELLULAR RUBBER SHEET

Figure F-25. Gasket, Part Number 13229E4246/12



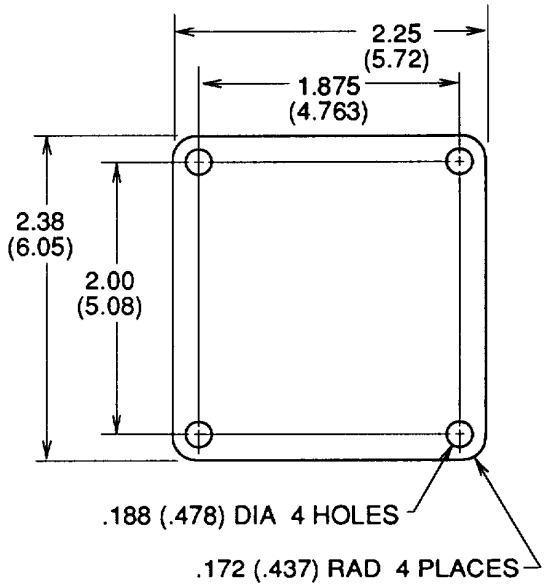
NOTE
1. FABRICATE FROM ASTM-D1056-2B45C1F2-1/8 THK CELLULAR RUBBER SHEET

Figure F-26. Gasket, Part Number 13229E4246/14



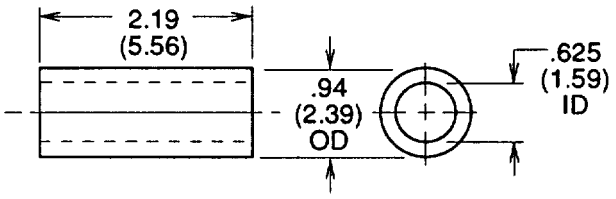
NOTE
1. FABRICATE FROM ASTM-D1056-2B45C1F2-1/8 THK CELLULAR RUBBER SHEET

Figure F-27. Gasket, Part Number 13229E4246/8



NOTE
1. FABRICATE FROM NSN 9320-01-127-7855

Figure F-28. Gasket, Part Number 132K0299



NOTE
1. FABRICATE FROM SAE20R3, CLASS R, GRADE 1A HEATER HOSE

Figure F-29. Hose, Drain, Part Number 13211E8323

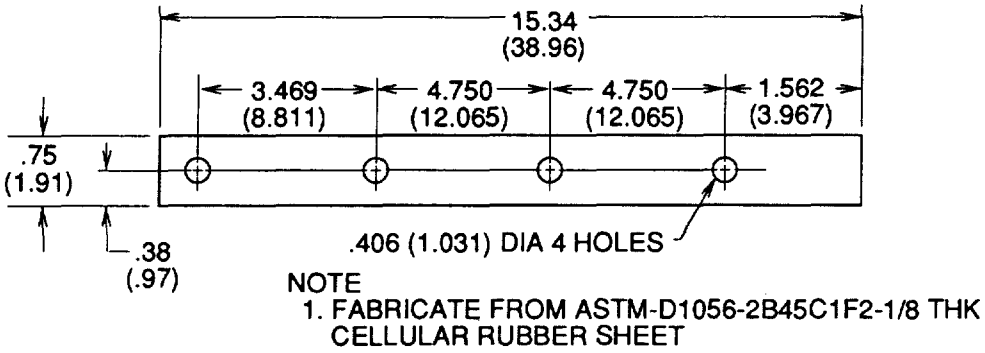


Figure F-30. Gasket, Part Number 13229E4242/10

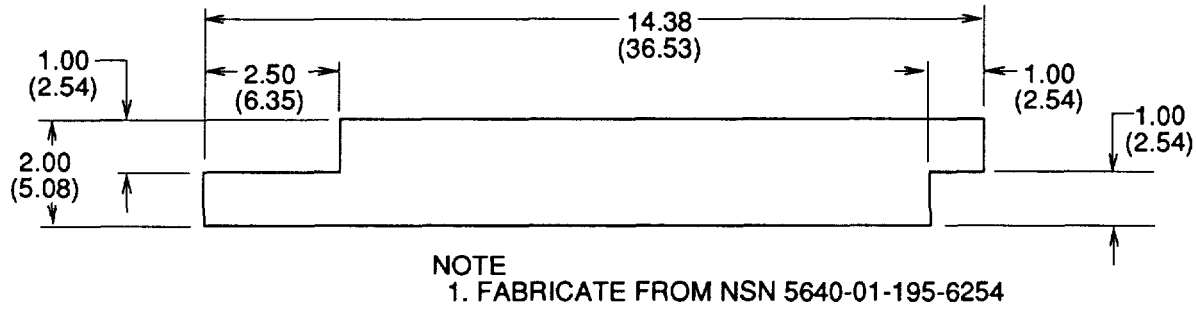


Figure F-31. Insulation, Part Number 13229E4251/60

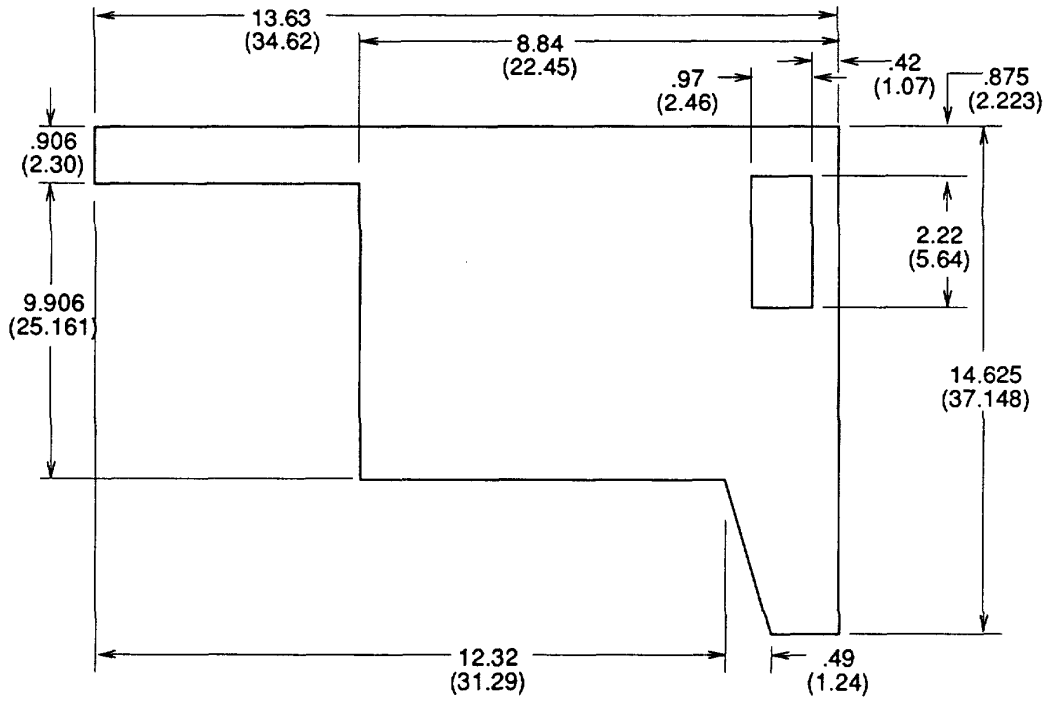


Figure F-32. Insulation, Part Number 13229E4251/65

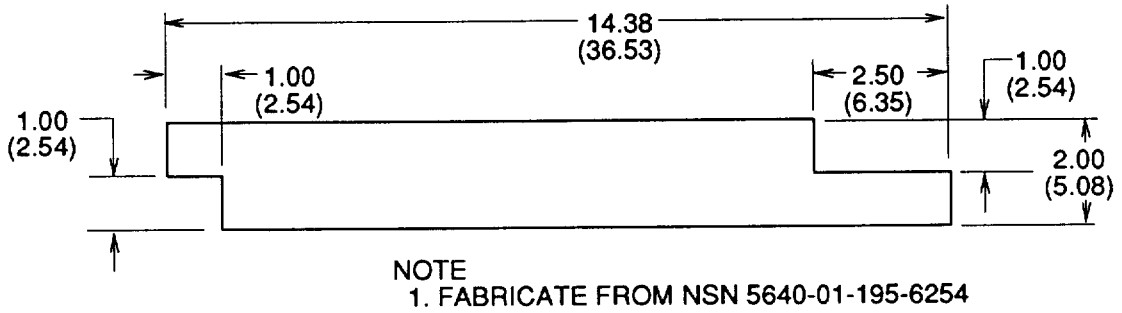


Figure F-33. Insulation, Part Number 13229E4251/57

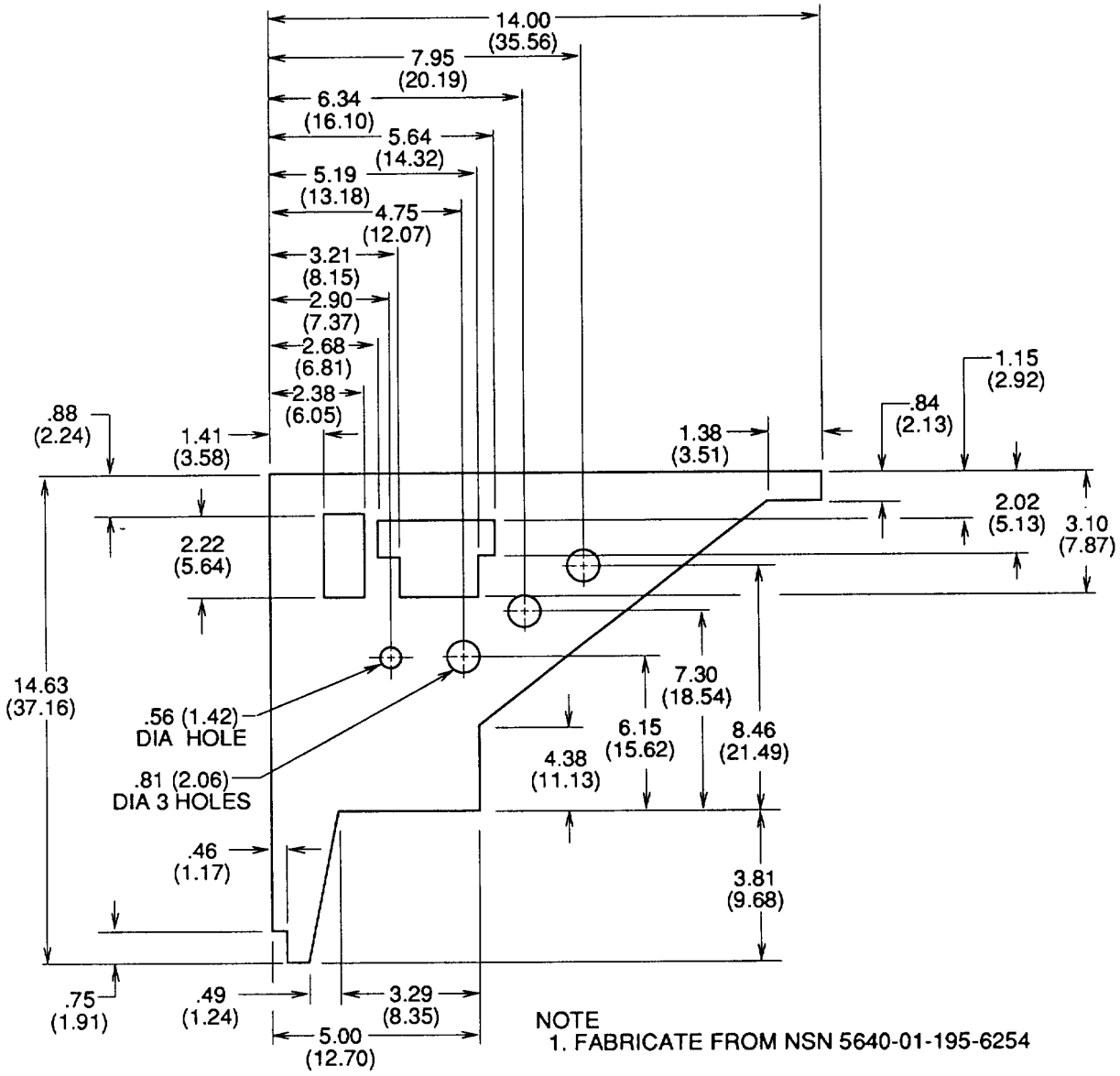
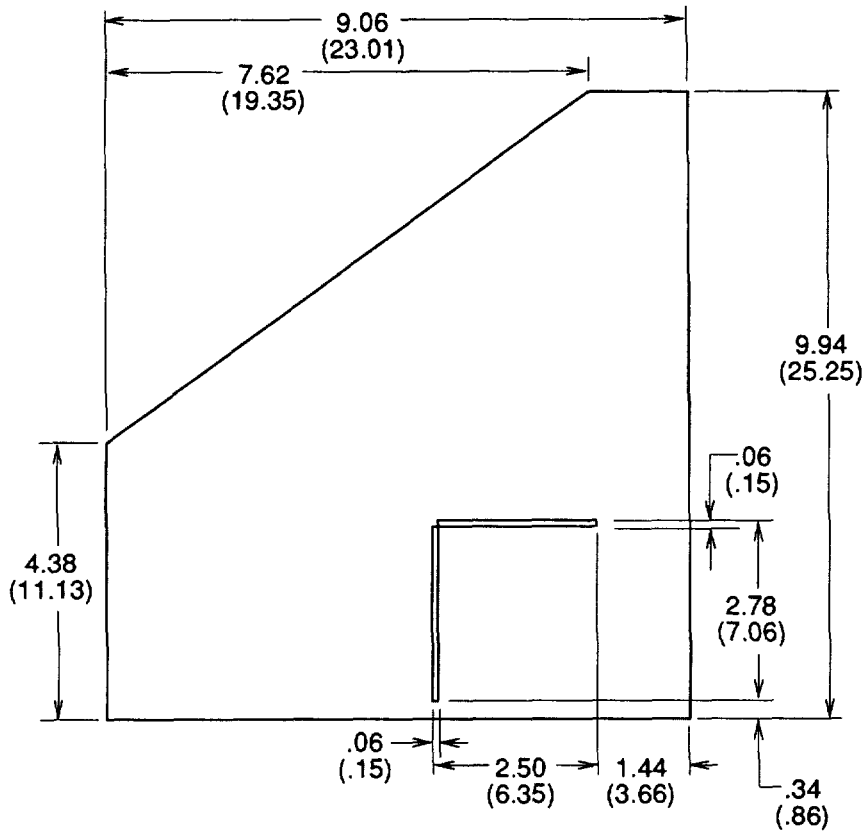
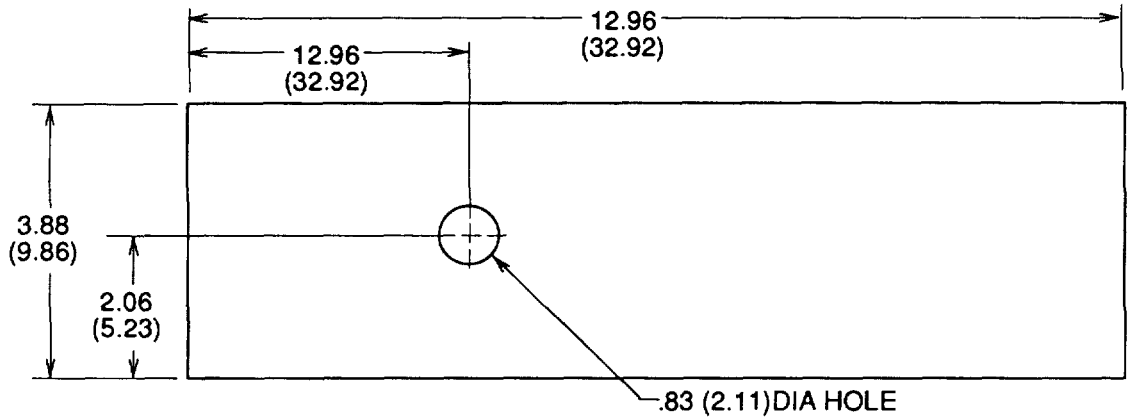


Figure F-34. Insulation, Part Number 13229E4251/71



NOTE
1. FABRICATE FROM NSN 5640-01-195-6254

Figure F-35. Insulation, Part Number 13229E4251/67



NOTE
1. FABRICATE FROM NSN 5640-01-195-6254

Figure F-36. Insulation, Part Number 13229E4251/56

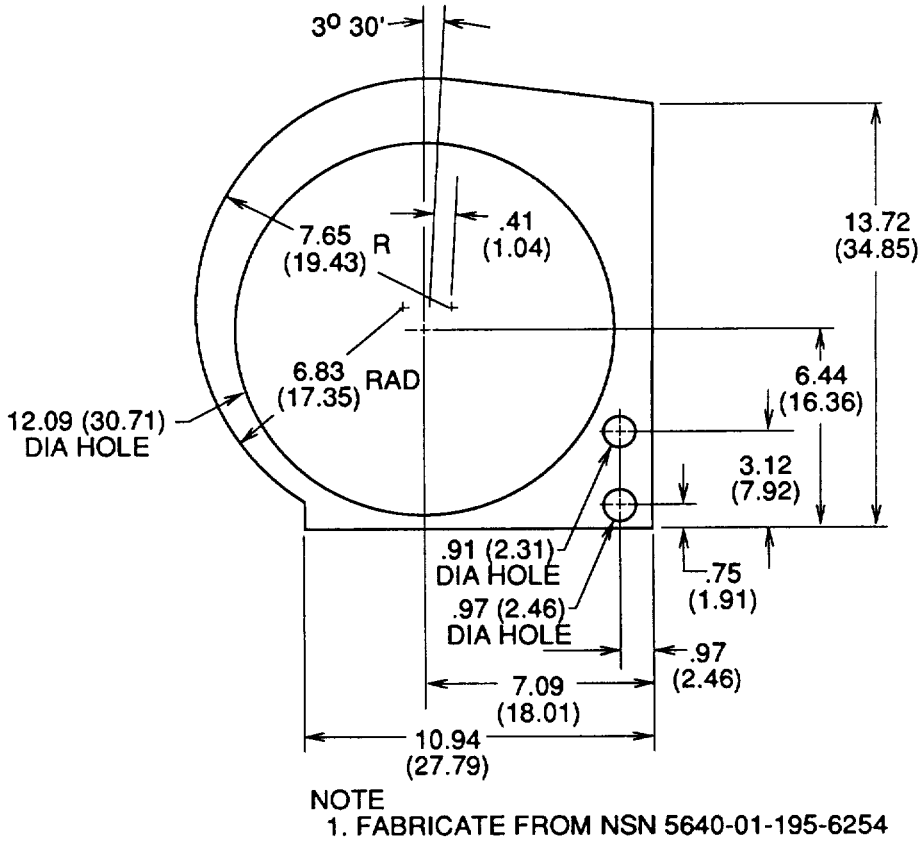


Figure F-37. Insulation, Part Number 13229E4251/62

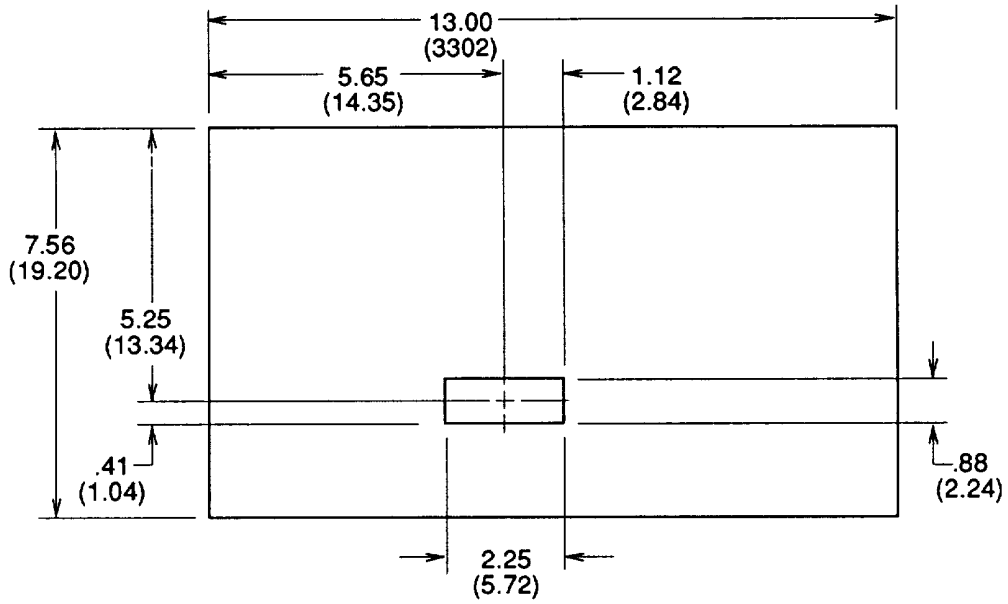


Figure F-38. Insulation, Part Number 13229E4251/76

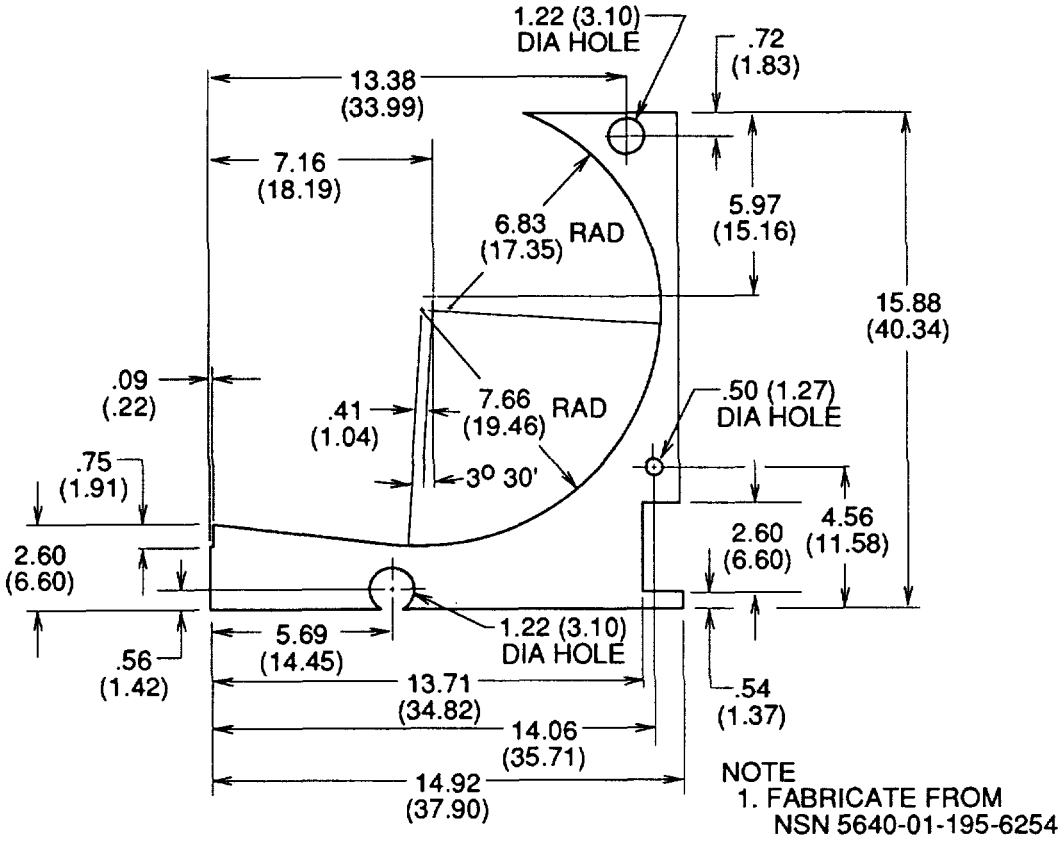


Figure F-39. Insulation, Part Number 13229E4251174

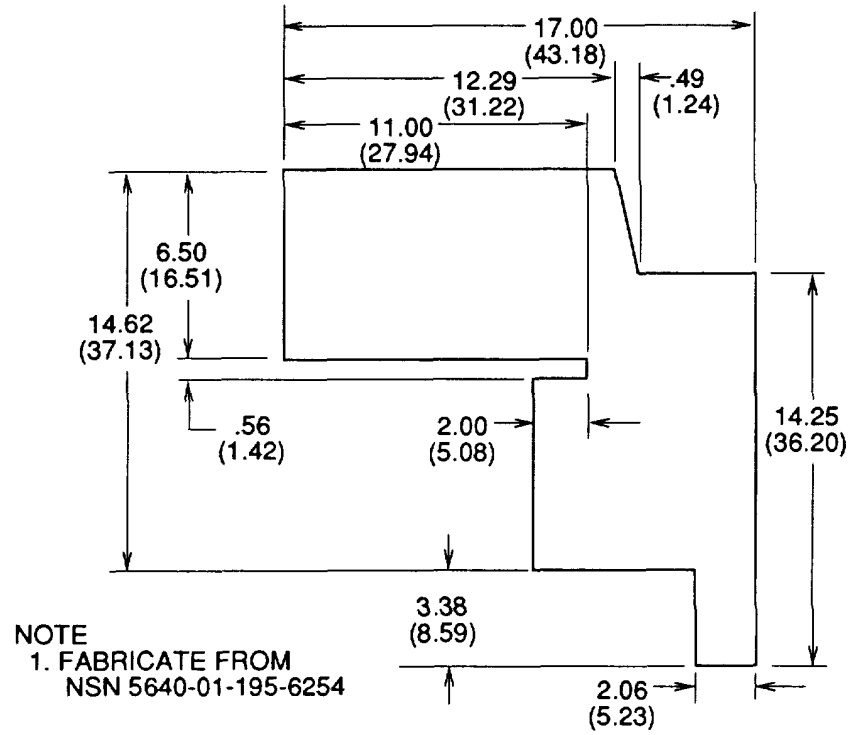
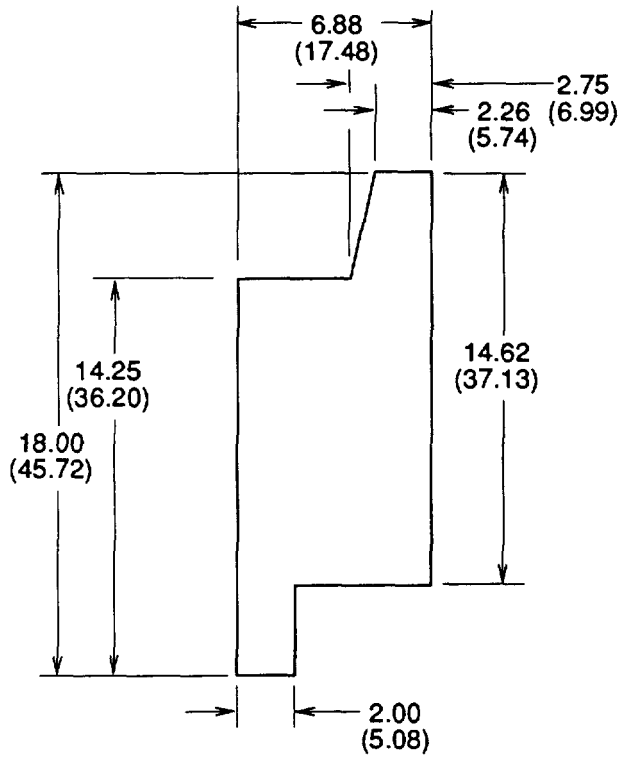
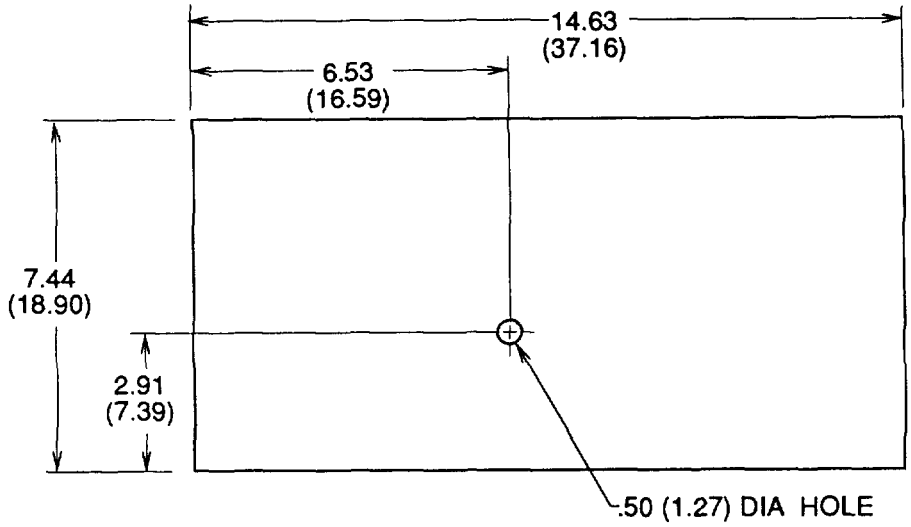


Figure F-40. Insulation, Part Number 13229E4251/64



NOTE
1. FABRICATE FROM NSN 5640-01-195-6254

Figure F-41. Insulation, Part Number 13229E4251/70



NOTE
1. FABRICATE FROM NSN 5640-01-195-6254

Figure F-42. Insulation, Part Number 13229E4251/69

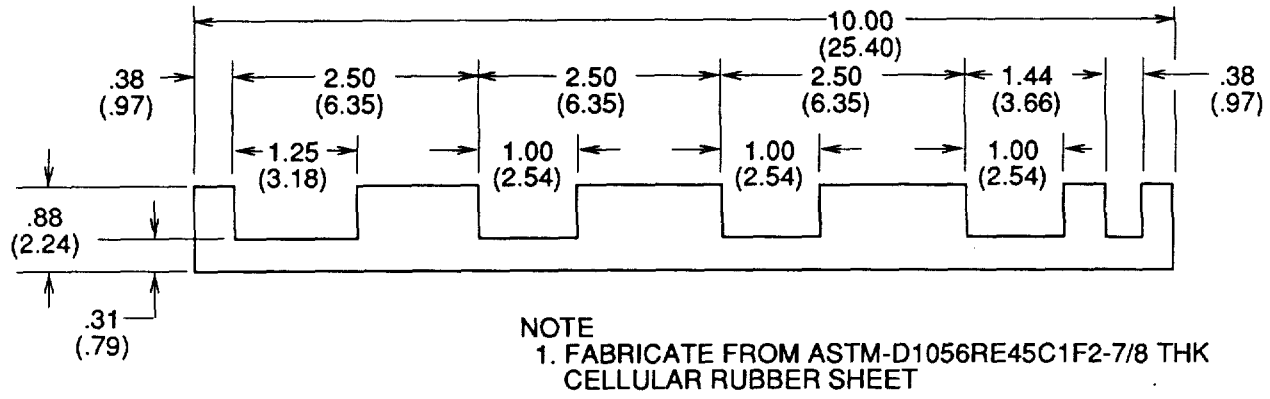


Figure F-43. Insulation, Part Number 13229E4251/73

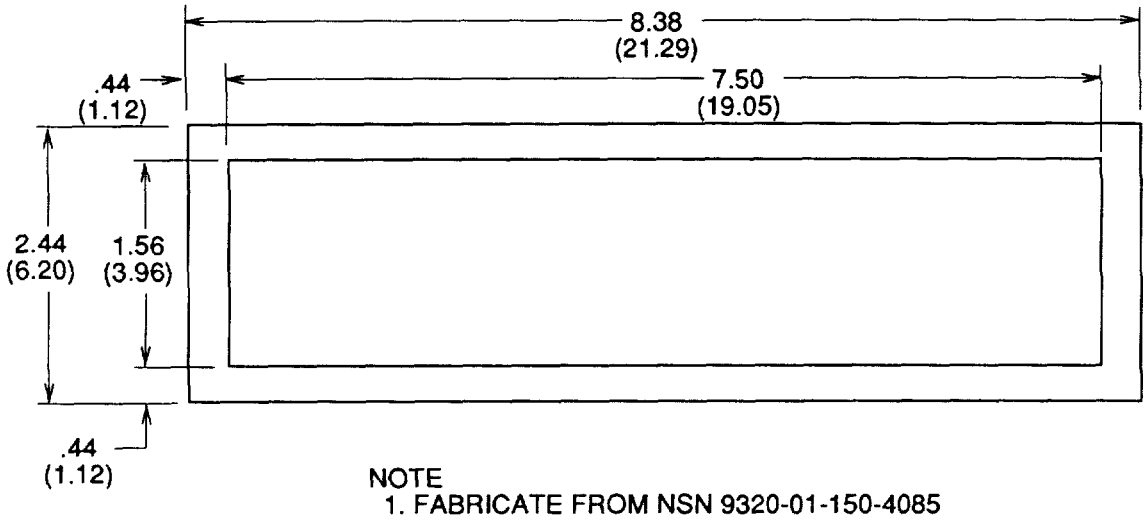


Figure F-44. Gasket, Part Number 13229E4251/44

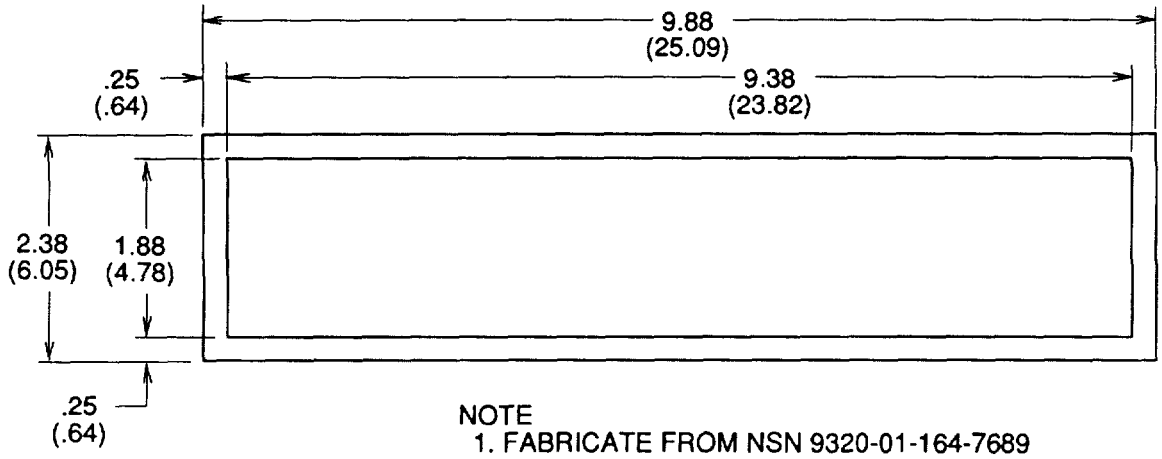


Figure F-45. Gasket, Part Number 13226E0875

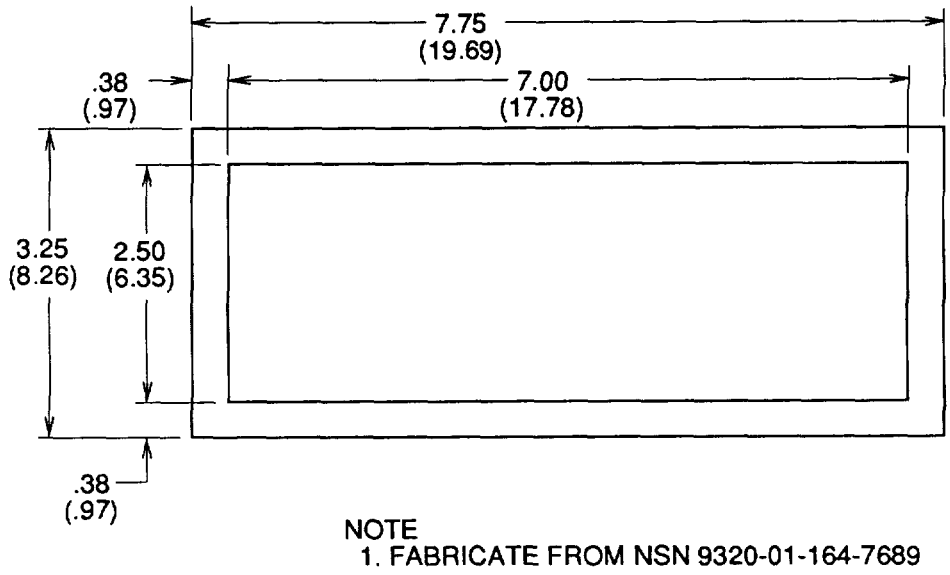


Figure F-46. Gasket, Part Number 13226E0876

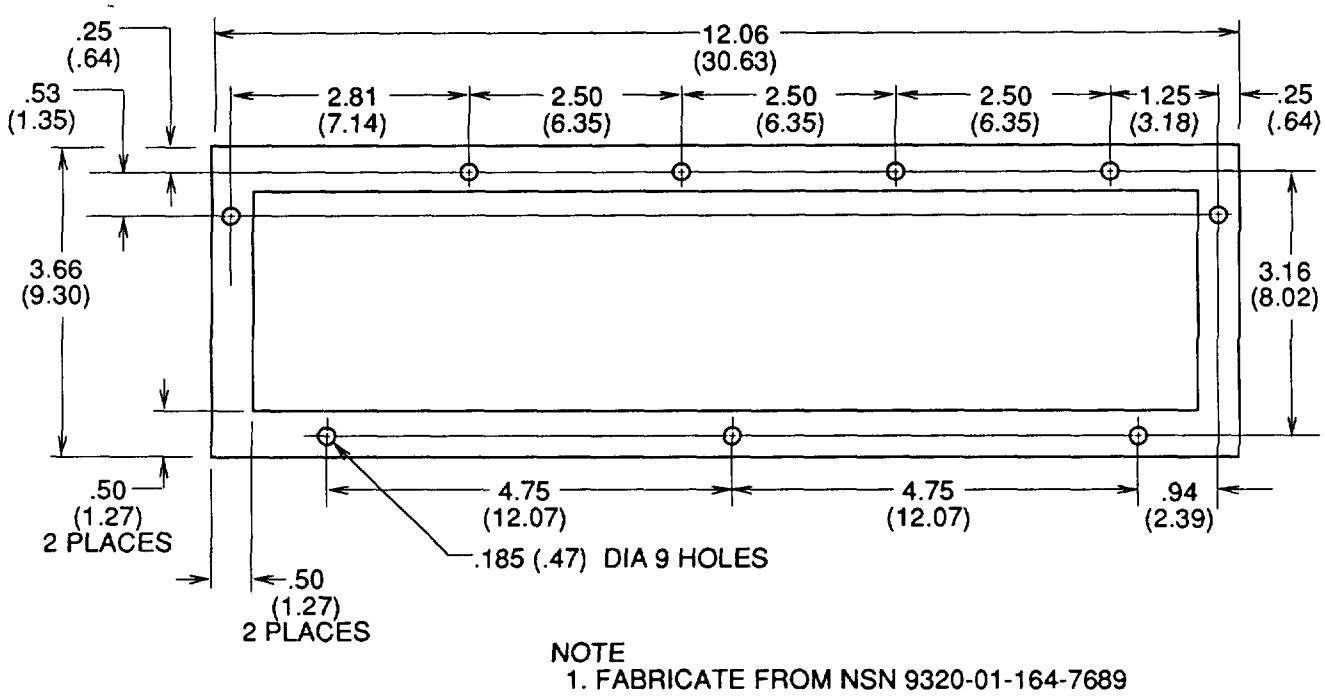


Figure F-47. Gasket, Part Number 13226E0897

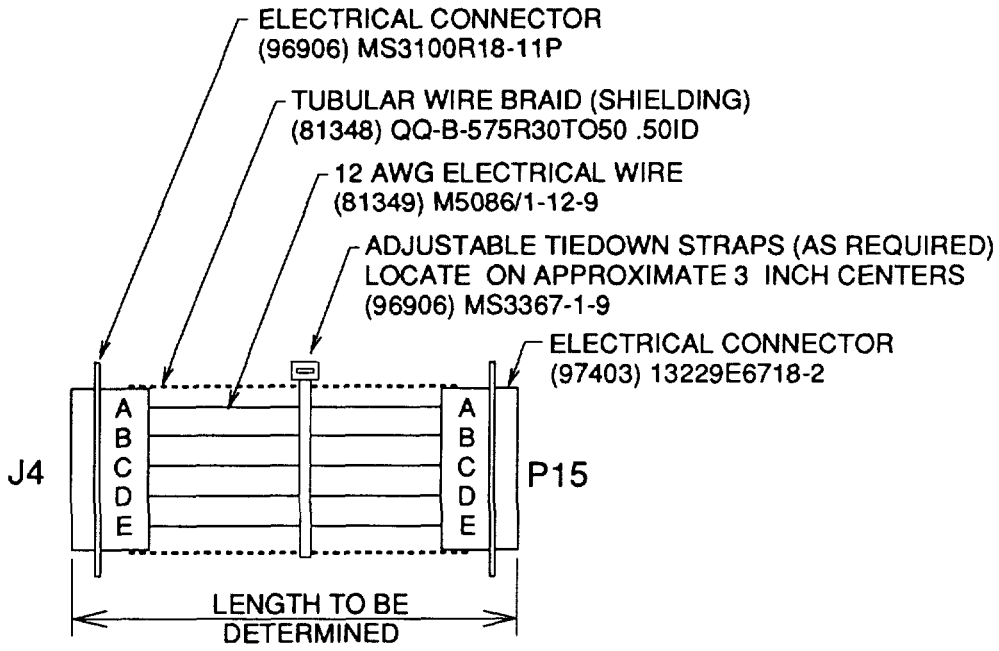


Figure F-48. Extended Wiring Harness J4 to P15 Diagram

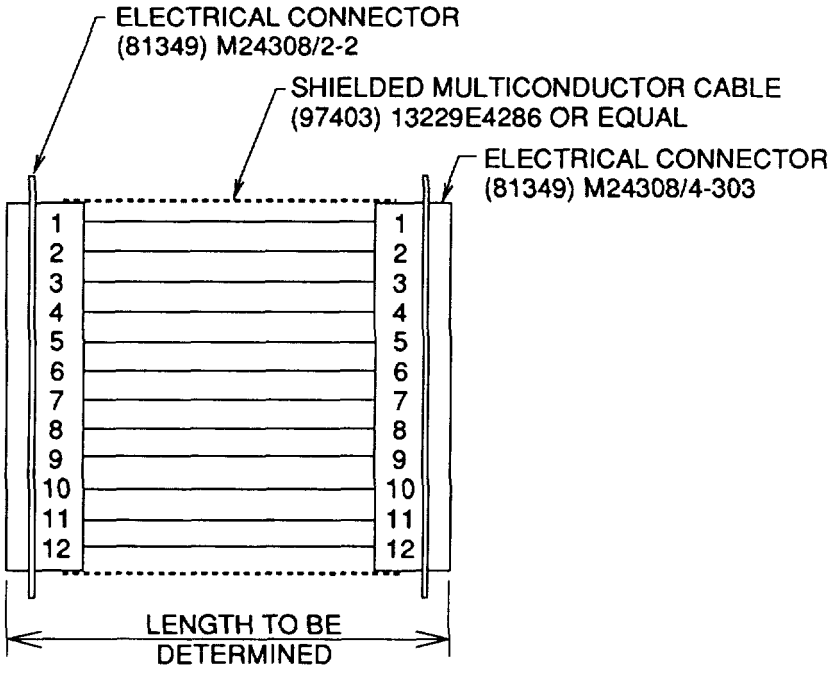


Figure F-49. Remote Control Cable Diagram

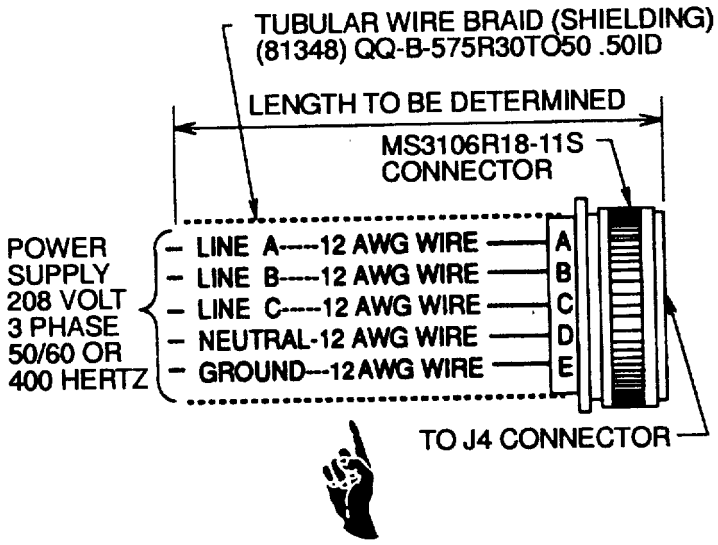
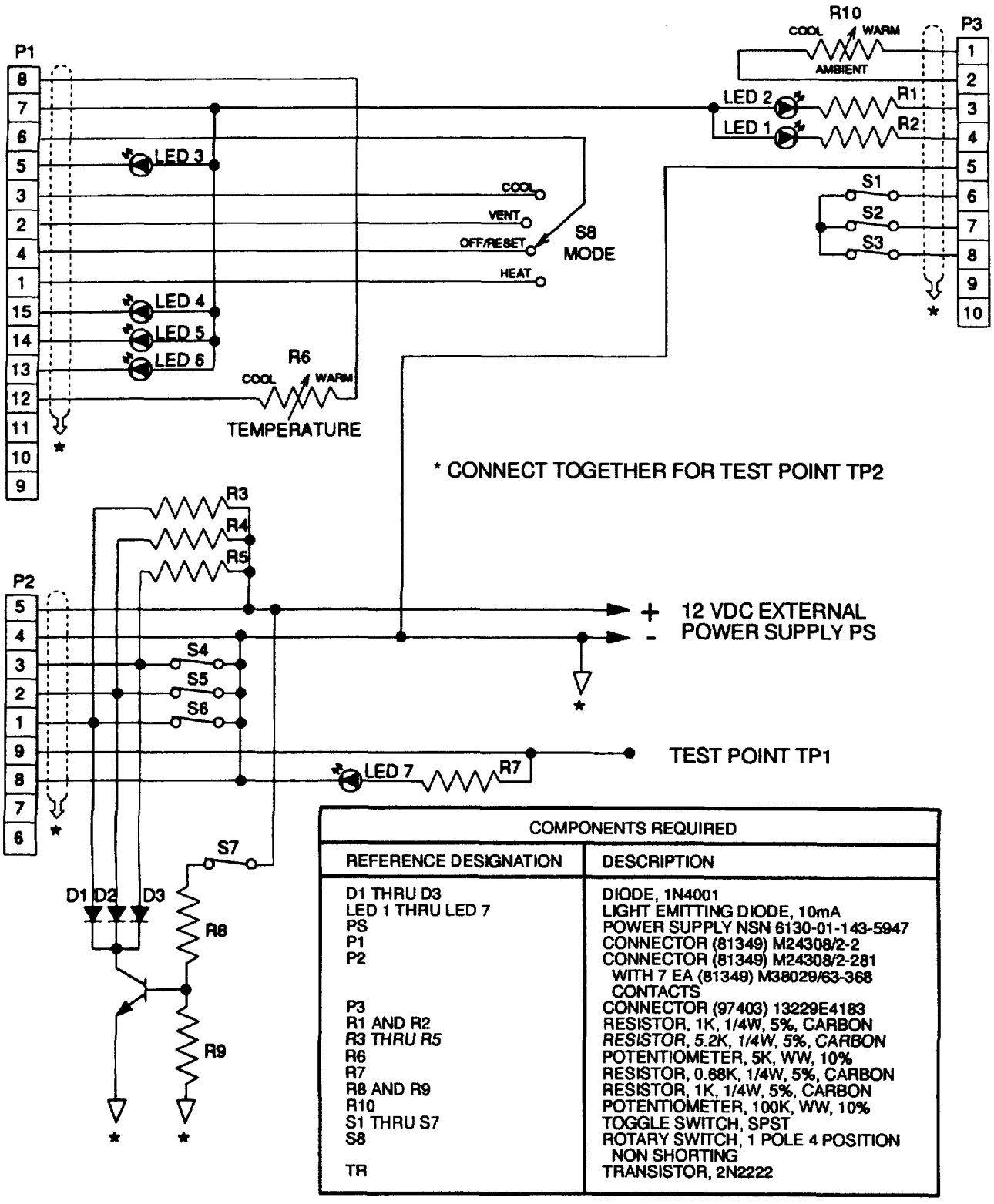


Figure F-50. Input Power Cable Diagram



COMPONENTS REQUIRED	
REFERENCE DESIGNATION	DESCRIPTION
D1 THRU D3	DIODE, 1N4001
LED 1 THRU LED 7	LIGHT EMITTING DIODE, 10mA
PS	POWER SUPPLY NSN 6130-01-143-5947
P1	CONNECTOR (81349) M24308/2-2
P2	CONNECTOR (81349) M24308/2-281 WITH 7 EA (81349) M38029/63-368 CONTACTS
P3	CONNECTOR (97403) 13229E4183
R1 AND R2	RESISTOR, 1K, 1/4W, 5%, CARBON
R3 THRU R5	*RESISTOR, 5.2K, 1/4W, 5%, CARBON*
R6	POTENTIOMETER, 5K, WW, 10%
R7	RESISTOR, 0.68K, 1/4W, 5%, CARBON
R8 AND R9	RESISTOR, 1K, 1/4W, 5%, CARBON
R10	POTENTIOMETER, 100K, WW, 10%
S1 THRU S7	TOGGLE SWITCH, SPST
S8	ROTARY SWITCH, 1 POLE 4 POSITION NON SHORTING
TR	TRANSISTOR, 2N2222

Figure F-51. Logic Box Test Fixture Schematic

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GLOSSARY

Section I ABBREVIATIONS

AAL.....Additional Authorization List
AC ..... Alternating Current
Assy.....Assembly
AWG..... American Wire Gauge
BII.....Basic Issue Items
BTU ..... British Thermal Unit
C.....Centigrade
CAGE .....Commercial And Government Entity
CBR.....Chemical-Biological-Radiological
cfm ..... Cubic Feet per Minute
cm .....Centimeter
cm^2 ..... Square Centimeter
COEI..... Components of End Item
CTA ..... Common Table of Allowances
cy.....Cylinder
DC ..... Direct Current
DIA .....Diameter
DMWR.....Depot Maintenance Work Requirements
DS ..... Direct Support
e.g .....For Example
ea .....Each
EDSML ..... Expendable/Durable Supplies and Materials
EIR ..... Equipment Improvement Recommendation
DMI.....Electromagnetic Interference
EQPT..... Equipment
ESC ..... Equipment Serviceable Criteria
F ..... Fahrenheit
FIG .....Figure
gl.....Galleon
GS ..... General Support
HR ..... Hour
ID..... Inside Diameter
in..... Inch
JTA ..... Joint Table of Allowances
kg.....Kilogram
LB ..... Pounds
LED..... Light Emitting Diode
m^3 .....Cubic Meter
MAC..... Maintenance Allocation Chart
Max..... Fahrenheit
MO.....Missouri
MPH.....Miles Per Hour
MTOE ..... Modified Table of Organization and Equipment
MWO's.....Maintenance Work Orders
NATO.....North Atlantic Treaty Organization
Nom.....Nominal
NPT .....National Taper Pipe (Thread)
NSN.....National Stock Number
oz.....Ounce
Para.....Paragraph
pg .....Page
PMCS ..... Preventive Maintenance Checks and Services

ABBREVIATIONS - continued

pr ..... Pair
psi ..... Pounds Per Square Inch
psig ..... Pounds per Square Inch Gauge
qt ..... Quart
Qty ..... Quantity
RAD ..... Radius
Ref ..... Reference
RPSTL ..... Repair Parts and Special Tools List
Rqr ..... Required
SMR ..... Source, Maintenance, and Recoverability r
St ..... Saint
TAMMS ..... The Army Maintenance Management System
TDA ..... Table of Distribution and Allowances
TM ..... Technical Manual
TMDE ..... Test Measurement and Diagnostic Equipment
TOE ..... Tables of Organization and Equipment
U/M ..... Unit of Measure
UNC ..... Unified Coarse Thread
UNF ..... Unified Fine Thread
US ..... United States
UUT ..... Unit Under Test
vde ..... Volt Direct Current

Section II DEFINITION OF UNUSUAL TERMS

NONE

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1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

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1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .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

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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
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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
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pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
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pounds	kilograms	.454	grams	ounces	.035
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