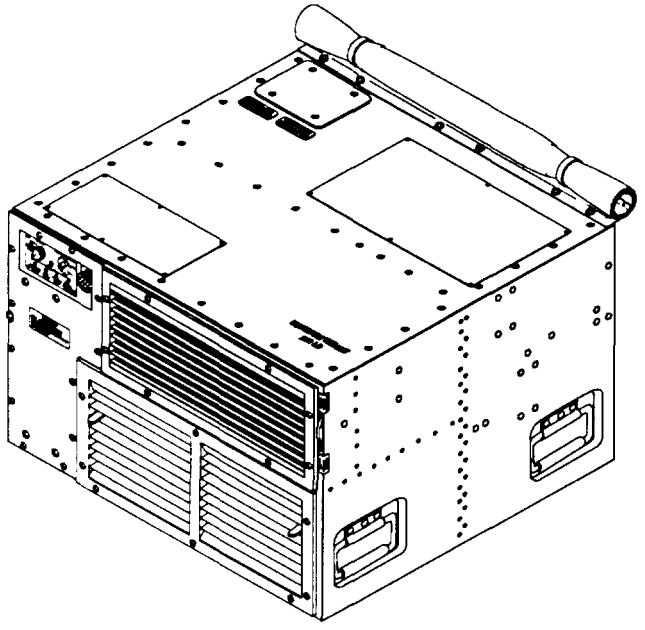
TECHNICAL MANUAL

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



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

MODEL F18H-MPI
208 VOLT, 3-PHASE,50/60/400 HZ
230 VOLT, SINGLE-PHASE, 50/60 HERTZ
NSN 4120-01-327-1316

HEADQUARTERS, DEPARTMENT OF THE ARMY
1 FEBRUARY 1993

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

Two people are required to lift unit. Personal injury can result.

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

TM 9-4120-401-14
C 2

Change
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 15 September 2000

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

Air Conditioner, Horizontal, Compact,
Multiple Power Unit, 18,000 BTU/HR,
KECO Model F18H-MPI
208 Volts, 3-Phase, 50/60/400 HERTZ
230 Volts, Single-phase, 50/60 HERTZ
(NSN 4120-01-327-1316)

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NO. 1

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

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

Air Conditioner, Horizontal, Compact, Multiple Power Unit, 18,000 BTU/HR, KECO Model F18H-MPI 208 Volts, 3-Phase, 50/60/400 HERTZ 230 Volts, Single-phase, 50/60 HERTZ (4120-01-327-1316)

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

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TM 9-4120-401-14
C1

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a/b blank	0	Glossary 1 and Glossary 2	0
A/(B blank)	2	Index 1 through Index 3	0
i	0		
ii	1		
iii through v/(vi blank)	0		
1-0	0		
1-1 through 1-10	0		
2-1 through 2-6	0		
2-7	0		
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TECHNICAL MANUAL

NO. TM 9-4120-401-14

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

TECHNICAL MANUAL

Operator's, Unit, Direct Support and General Support
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208 Volts, 3-Phase, 50/60/400 HERTZ
230 Volts, Single-phase, 50/60 HERTZ
(4120-01-327-1316)

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 these procedures, please let us know. Mail your letter or 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 Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-LEO-D-CS-CFO,Fort Monmouth,NJ07703 5006. Fax number is 732-532-1413, DSN 992-1413.

TABLE OF CONTENTS

TABLE OF CONTENTS - continued

TABLE OF CONTENTS - continued

LIST OF TABLES

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS - continued

LIST OF ILLUSTRATIONS - continued

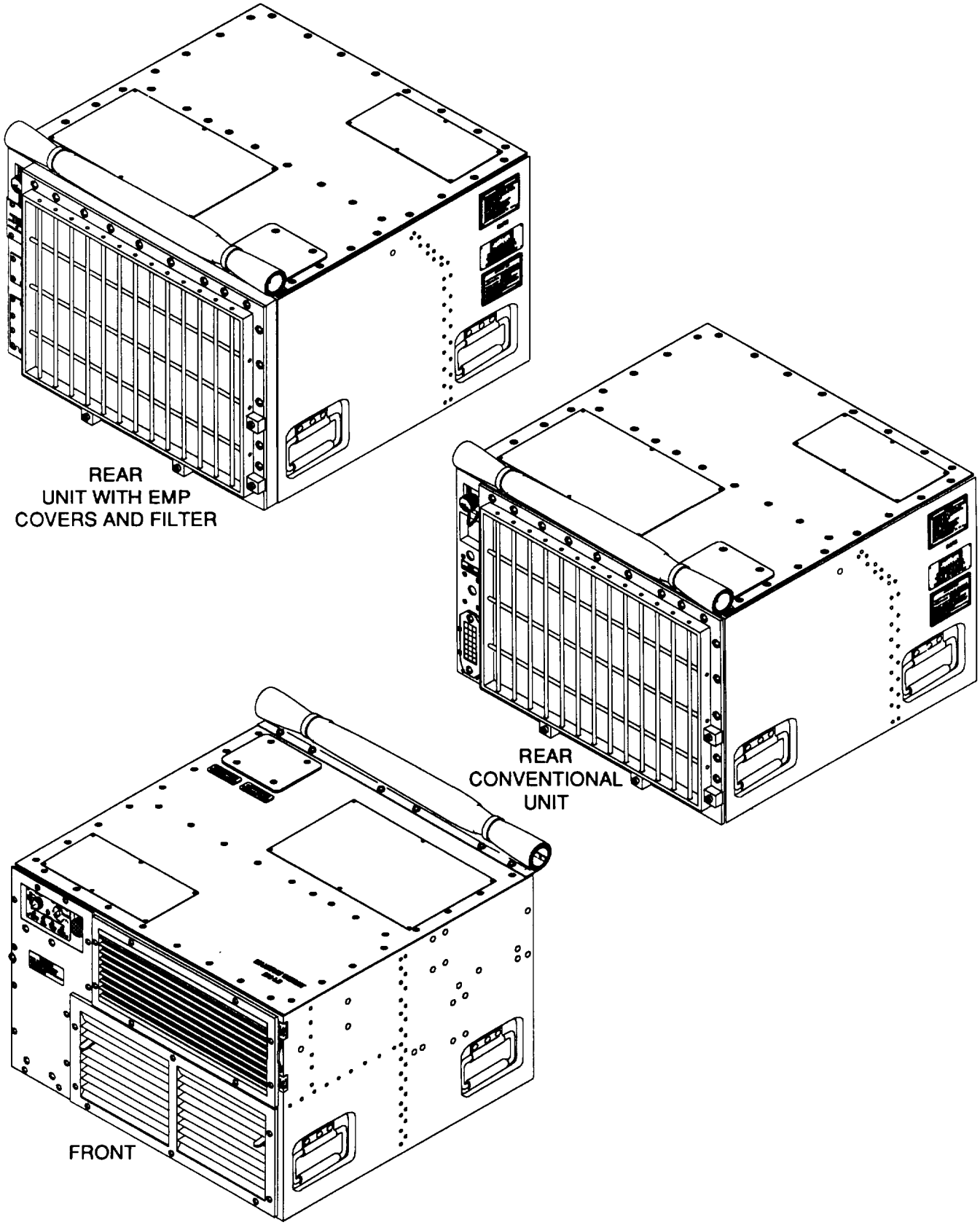


Figure 1-1. Air Conditioner

CHAPTER 1

INTRODUCTION

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 F18H-MPI, Horizontal, Compact, Multiple Power Input, 18,000 BTU/HR, 208 Volt, 3 Phase, 50/60/400 Hertz or 230 Volt, Single Phase, 50/60 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 if to us at:

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

We will send you a reply.

1-6. WARRANTY INFORMATION.]

See Warranty Technical Bulletin TB 9-4120-401-24.

Section II EQUIPMENT DESCRIPTION

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

a. The Model F18H-MPI Air Condditioner is designed to circulate, filter, and cool or heat air in the room or enclosure in which it is installed.

b. The Model F18H-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 external requirements are a source of 208 volt ac, 3 phase, 50/60/400 hertz or 230 volt ac, single phase, 50/60 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.

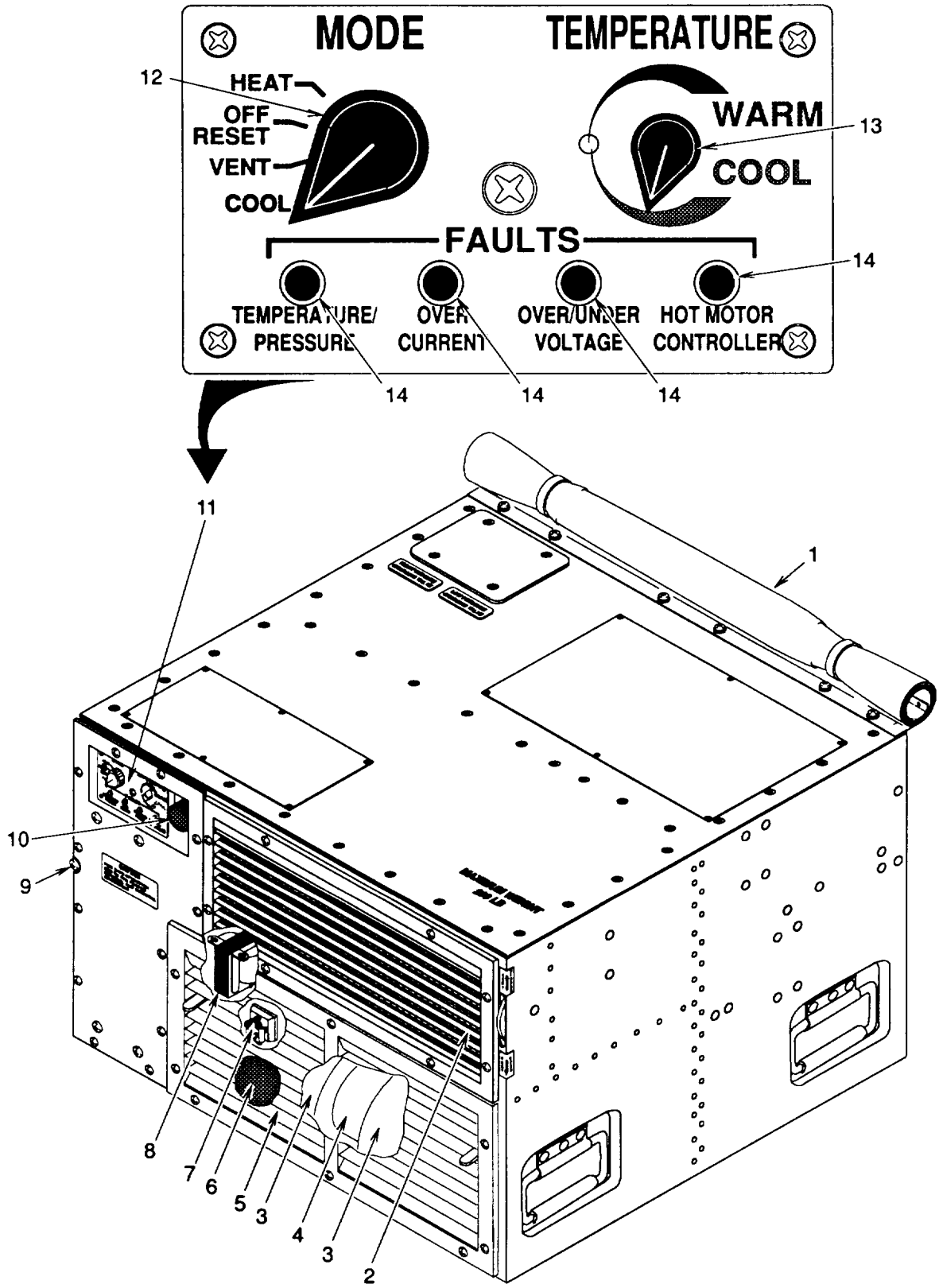


Figure 1-2. Location of Major Components (Sheet 1 of 2)

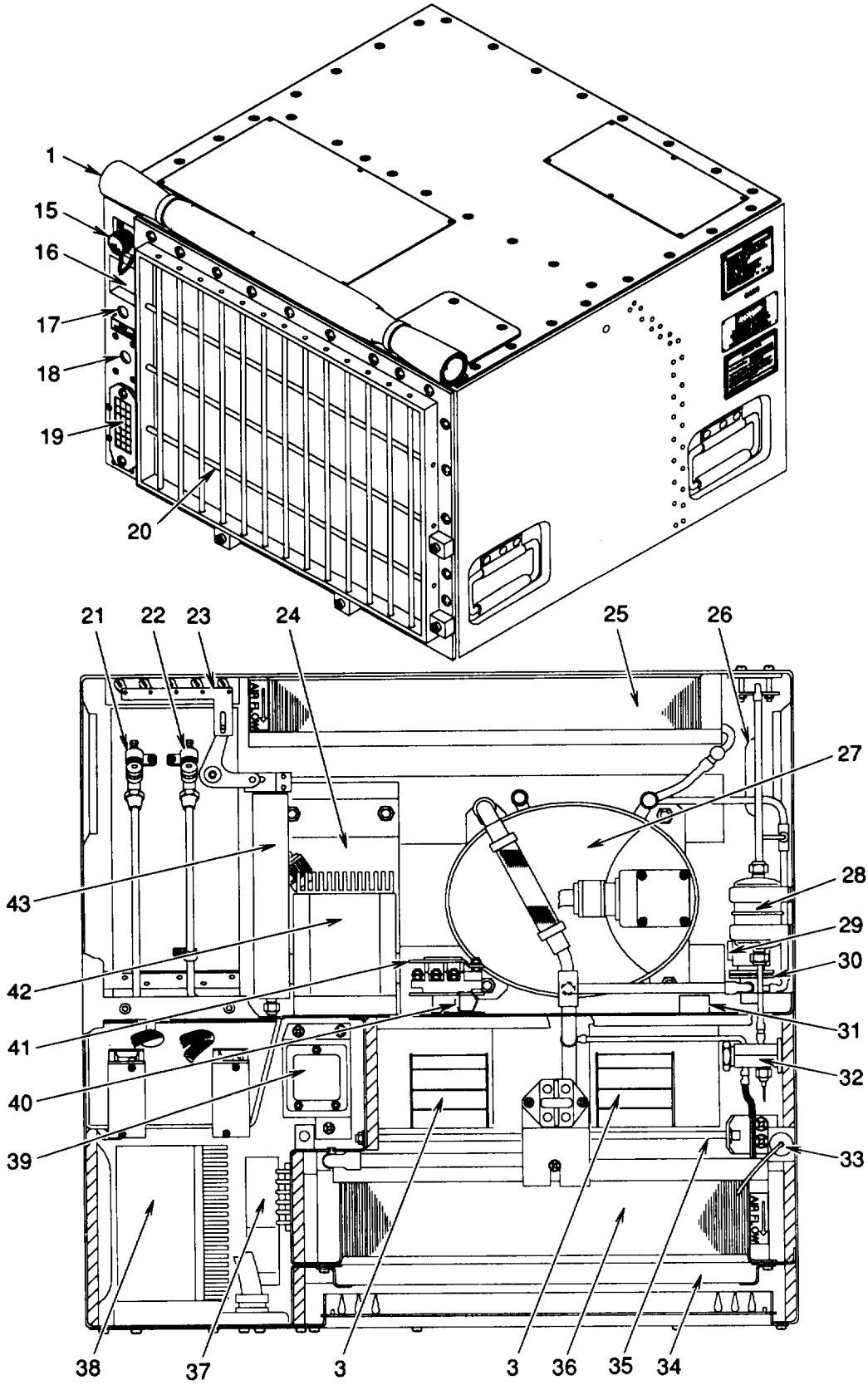


Figure 1-2. Location of Major Components (Sheet 2 of 2)

1-8. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

See figure 1-2 for location of major components.

FABRIC COVER (1). 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.

CONDITIONED AIR SUPPLY LOUVER (2). Provides directional control of conditioned air.

CONDITIONED AIR (EVAPORATOR) FANS (3). Draw the room or enclosure air in through the air filter and blow it out over the heaters and evaporator (cooling) coil to supply conditioned air.

CONDITIONED AIR FAN MOTOR (4). Drives the conditioned air fans.

RETURN AIR LOUVER WITH FILTER CLAMPS (5). The recirculated air from the room or enclosure is drawn in through this louver. The conditioned air filter, item 6, is mounted on clips on the inside of this louver.

CONDITIONED AIR FILTER (6). Filters room or enclosure air as it is recirculated.

RECTIFIER (7). Converts the transformer, item 8, output voltage from ac to dc for use in the control circuits.

TRANSFORMER (8). Reduces main line voltage down to control circuit voltage level.

GROUND CONNECTION POINT (9). Shelter or van electrical ground connection point.

INPUT POWER RECEPTACLE (PRIMARY LOCATION) (10). Connection point for main input power cable. See item 15 for alternate receptacle.

CONTROL PANEL ASSEMBLY (11). Contains switches, controls and indicators for operating the air conditioner. See items 12, 13 and 14 for a description of these switches controls and indicators.

ROTARY SWITCH (MODE SELECTOR) (12). Allows selection of unit operating mode.

POTENTIOMETER (TEMPERATURE CONTROL) (13). This control allows adjustment of the conditioned air temperature while operating in the cool or heat modes.

LIGHT EMITTING DIODES (FAULT LIGHTS) (14). Help to indicate problem areas if the unit fails.

INPUT POWER RECEPTACLE (ALTERNATE LOCATION) (15). The main power cable may be connected here. See item 10 for primary location. See installation instructions for switch-over instructions if this power receptacle is used.

CIRCUIT BREAKER (16). Located in the main electric line after the EMI filter. Provides circuit protection for the unit.

REFRIGERANT SIGHT GLASS (17). Visually indicates the condition of the refrigerant flowing in the refrigerant lines during cooling cycles when operating in the COOL mode.

HIGH REFRIGERANT PRESSURE CUTOUT SWITCH (18). This switch is factory set to shut the compressor off if the refrigerant discharge line pressure rises to 470 to 490 psig (33.04 to 34.45 kg/cm^2).

FRESH AIR VENTILATION GUARD (19). Screens and filters fresh air entering the unit.

CONDENSER GUARD (20). Protects the condenser from damage.

CHARGING VALVE, REFRIGERANT DISCHARGE LINE (HIGH PRESSURE) (21). Provides a connection point for charging and checking discharge line pressure.

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

CHARGING VALVE, REFRIGERANT SUCTION LINE (LOW PRESSURE) (22). Provides a connection point for charging and checking suction line pressure.

CONDENSER DISCHARGE AIR LOUVER ASSEMBLY (23). This louver assembly is automatically controlled by the actuating cylinder, item 43.

CONDENSER FAN AND MOTOR (24). This fan and motor draws outside air over the condenser coil to remove heat from the refrigerant passing through the tubes of the condenser coil.

CONDENSER COIL (25). Made up of interconnected parallel copper tubes retained in a series of multiple, closely spaced aluminum fins. This coil serves as a heat exchanger to remove the heat from the compressed refrigerant vapor so that it will condense into a liquid.

RECEIVER (26). The receiver acts as a storage tank for the liquid refrigerant.

COMPRESSOR (27). 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 attached to the lower part of the container. 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 and is thermostatically controlled to prevent overheating.

DEHYDRATOR, DESICCANT, REFRIGERANT (FILTER-DRIER) (28). Removes moisture and contaminants from the refrigerant.

LOW REFRIGERANT PRESSURE CUTOUT SWITCH (29). This switch is facto set to shut the compressor off if the refrigerant suction line pressure drops to 2 to 12 psig (0.141 to 0.844 kg/cm^2).

SOLENOID VALVE, PRESSURE EQUALIZING (30). This valve is normally open when the compressor is NOT running to equalize the pressure at the suction and discharge sides of the compressor. It closes when the compressor starts.

RECTIFIER (31). Converts the relay, item 41, load side ac voltage to dc for use by solenoid valve, item 30.

EXPANSION VALVE (32). Meters refrigerant flow to the evaporator during cooling cycles when operating in the COOL mode.

COIL FROST SWITCH (33). Thermostatic switch that opens compressor circuit if evaporator coil begins to ice.

MIST ELIMINATOR (34). The purpose of the mist eliminator is to trap droplets of condensed water from the evaporator, so that they will not be blown into the air conditioned space.

HEATING ELEMENTS (35). Consists of two banks of heating elements that warm the air fmm the conditioned space as needed.

EVAPORATOR COIL (36). Similar in construction to the multiple tube, finned condenser coil. This coil serves as a heat exchanger for the refrigerant to absorb heat from the room or enclosure air circulated through the evaporator section.

LOGIC BOX ASSEMBLY (37). Electronic device that monitors unit sensors and control settings to operate the unit and drive status (fault lights).

MOTOR CONTROLLER (38). Electronic device that conditions and regulates motor and heater supply power according to signals sent from logic box assembly, item 37.

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

RELAY (39). Controls power to heating elements, item 35, and is activated by logic box assembly, item 37.

RELIEF VALVE (40). This safety valve opens when the refrigerant discharge line pressure rises above 540 psig (37.97 kg/cm^2).

RELAY (41). Controls power to compressor, item 27, and is activated by logic box assembly, item 37.

ELECTROMAGNETIC INTERFERENCE FILTER (42). Reduces the radiated and conducted electromagnetic interference created by the air conditioner electrical components to an acceptable level.

ACTUATING CYLINDER (43). This hydraulic cylinder operates discharge louver assembly. It will start to open the louver assembly at 150 to 180 psig (10.55 to 12.66 kg/cm2) and fully open louver assembly at 220 to 260 psig (15.74 to 18.28 kg/cm2) compressor discharge pressure to allow unit operation when outside temperature is low.

1-9. DIFFERENCES BETWEEN MODELS.

There are no model differences in effect on the Keco Model F18H-MPI air conditioner.

1-10. EQUIPMENT DATA.

AMBIENT OPERATING TEMPERATURE RANGE

LOW	-50°F(-45°C)
HIGH	+120°F (+49°C)

PERFORMANCE

COOLING CAPACITY	18,500 BTU/HR
HEATING CAPACITY	13,400 BTu/HR

POWER REQUIRED

VOLTAGE	208	230
PHASE	3	1
HERTZ	50/60/400	50/60
FULL LOAD AMPERAGE	18	30

DIMENSIONS

WIDTH	30.00 inch (76.20 cm)
DEPTH	28.89 inch (73.38 cm)
HEIGHT	20.10 inch (51.04 cm)
WEIGHT	282 pounds (127.9 kg)

REFRIGERANT

TYPE	R-22
CHARGE	3.4 pounds (1.5 kg)

Section III TECHNICAL PRINCIPLES OF OPERATION

1-11. REFRIGERATION CYCLE.

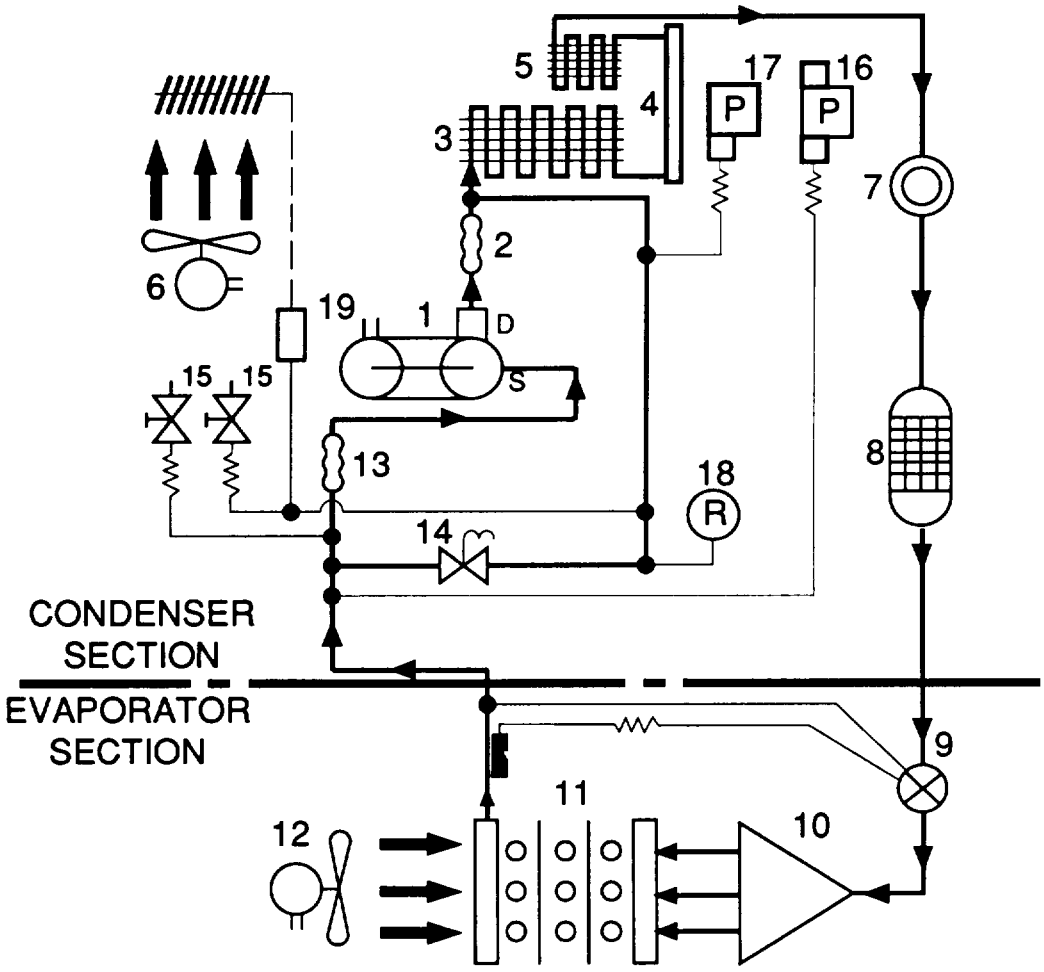
The following information describes the function of the components in this unit, listed in the order that the refrigerant flows through the refrigeration system. (See figure 1-3.)

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 HOSE ASSEMBLY (DISCHARGE) (2) and metal tubing to the CONDENSER COIL (3), RECEIVER (4), and SUBCOOLER (5).

b. The CONDENSER FAN (6) draws outside ambient air through the CONDENSER COIL (3) and SUBCOOLER (5). 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 SIGHT GLASS (7) indicates the presence of moisture and quantity of refrigerant in the system.

d. The REFRIGERANT DESICCANT DEHYDRATOR (filter-drier) (8) removes any moisture (water vapor) or dirt that may be carried by the liquid refrigerant.



COMPONENT REFERENCE LIST		
FIND NO.	QTY	DESCRIPTION
1	1	COMPRESSOR
2	1	METAL HOSE ASSEMBLY (DISCHARGE)
3	1	CONDENSER COIL
4	1	RECEIVER
5	1	SUBCOOLER
6	1	MOTOR, CONDENSER FAN
7	1	SIGHT GLASS
8	1	REFRIGERANT DESICCANT DEHYDRATOR
9	1	EXPANSION VALVE
10	1	DISTRIBUTOR
11	1	EVAPORATOR COIL
12	1	MOTOR, EVAPORATOR FAN
13	1	METAL HOSE ASSEMBLY (SUCTION)
14	1	SOLENOID VALVE
15	2	SERVICE VALVE
16	1	PRESSURE SWITCH (LOW)
17	1	PRESSURE SWITCH (HIGH)
18	1	PRESSURE RELIEF VALVE
19	1	LINEAR ACTUATOR CYLINDER

Figure 1-3. Refrigeration Schematic

1-11. REFRIGERATION CYCLE. - continued

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. The cold, low pressure refrigerant gas flows through the METAL HOSE ASSEMBLY (SUCTION) (13). The gas is then drawn into the COMPRESSOR (1).

h. To prevent compressor overload and damage during start-up, SOLENOID VALVE (14) opens when the compressor is not running to equalize system pressure. This valve closes at start of cooling cycle.

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

j. The PRESSURE SWITCH (LOW) (16), the PRESSURE SWITCH (HIGH) (17) and the PRESSURE RELIEF VALVE (18) are provided to protect the unit from damage due to pressure extremes.

k. The flexible METAL HOSE ASSEMBLY (DISCHARGE) (2) and METAL HOSE ASSEMBLY (SUCTION) (13) provide vibration isolation between the compressor and other components of the refrigeration system.

l. The LINEAR ACTUATOR CYLINDER (19) adjusts condenser discharge air dampers to regulate system discharge pressure.

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

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

2-1. GENERAL.

The Model F18H-MPl 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 designedfor continuous or intermittent operation as a self-contained unit or maybe connected to external filtering equipment for operation under chemical-biological-radiological (CBR) environmental conditions. Operators must be aware of any peculiarities or operational limitations for their specific installation.

2-2. OPERATOR'S CONTROLS.

All necessary operator controls are illustrated in figure 2-1. 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 heater thermostatic switch opens. The switches are associated with the units cooling and heating operation and can be an indication of obstructed airflow 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 bean 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 color has reached the yellow band or if numerous bubbles appear in the sight glass. Equipment damage can result. COOL mode operation may be continued with the refrigerant 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 2-1) 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 direct support maintenance for appropriate refrigeration system action.

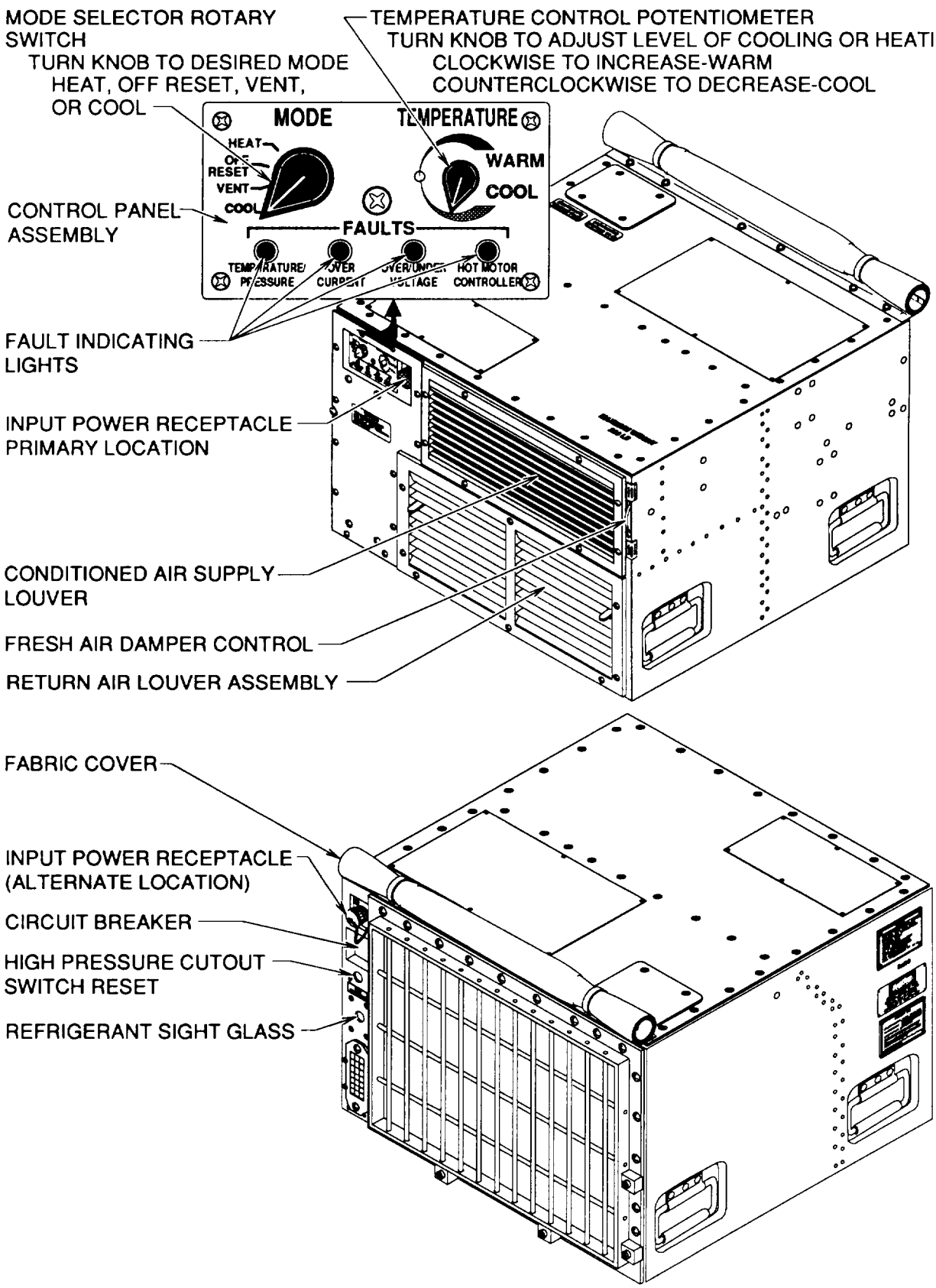


Figure 2-1. Operator's Controls and Indicators

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 accomplished 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 Degiciencies. 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 Pamphlet 738-750.

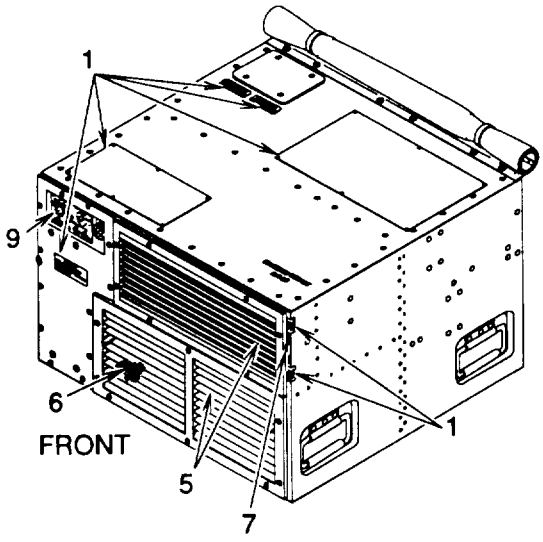
h. Equipment is Not Ready/Available If column. States that the air conditioner cannot be used under these conditions.

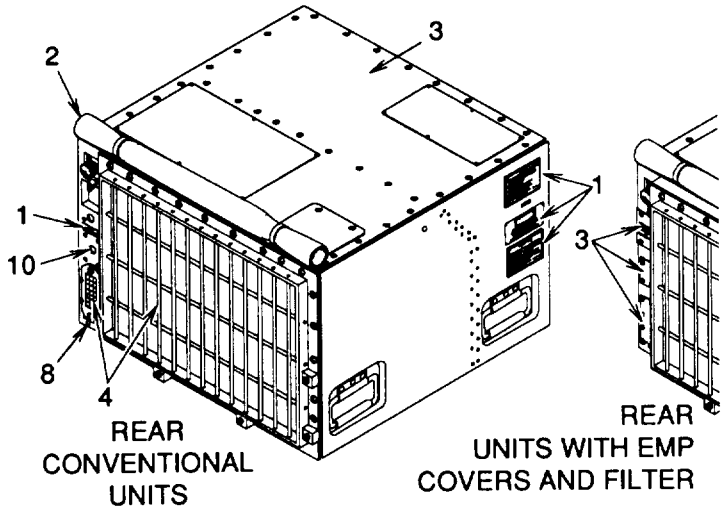
i. Special Instructions. Within designated intervals, these checks are to be performed in the order listed. If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when 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	M			
1	•					Information plates	Check for legibility and loose or missing hardware.	





2	•					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
3	•					Panels and Covers	Check for cracks, dents, or missing hardware.	Panels and cover missing or damaged.
4	•					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 - continued

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	M			
5	•					Louvers	Check for obstructions, damage, proper adjustment, loose or missing hardware. Check louvers for freedom of operations. Lubricate as required.	Louvers are damaged or missing.
6	•					Fresh Air Damper	Check for proper adjustment.	
					•		Check for freedom of operation.	Control wheel missing or inoperable.
7		•				Condensate Drain	No water dripping anywhere except drain.	Water is leaking in an area that would cause damage or be a hazard.
8	•					Control Panel Assembly	Check for obvious damage, secure mounting, and missing knobs.	Control panel damaged.
							Check for proper operation in accordance with paragraph 2-6.	Unit not operating properly.
9		•				Refrigerant Sight Glass	After 15 minutes of operation in maximum cooling, check for bubbles or milky flow indicating low refrigerant charge. Check for yellow color which indicates presence of moisture.	Bubbles, milky flow, or yellow color is observed.

Section Ill OPERATION UNDER USUAL CONDITIONS

2-5. ASSEMBLY AND PREPARATION FOR USE.

The Model F18H-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 4-5.

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 supervisor.

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

2-7. GENERAL OPERATING PROCEDURES.

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

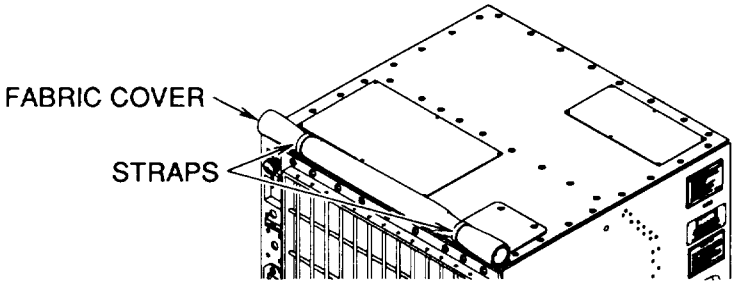


Figure 2-2. Fabric Cover

b. Check that MODE selector rotaty switch is at OFF/RESET.

CAUTION

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

c. Check to see that power cable has been connected to a source of 208 volt, 3–phase, 50/60/400 hertz or 230 volt, single phase, 50/60 hertz power, and to the input power connector on the unit.

CAUTION

Do not operate the unit until input power has been supplied for at least 20 minutes. The motor controller voltage threshold circuit will drift during cold start operation and may indicate an over/under voltage fault.

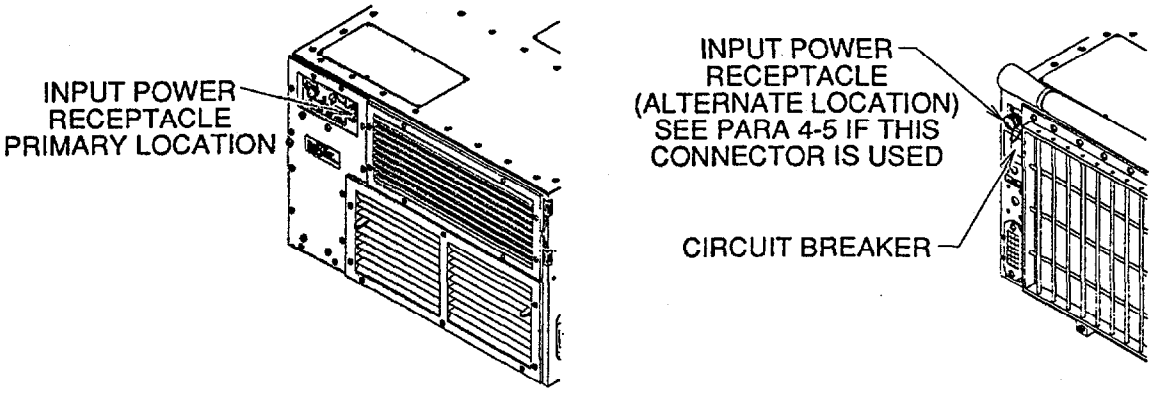


Figure *2–3.* Power Connectors and Circuit Breaker.

d. Check to see that unit circuit breaker is on.

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

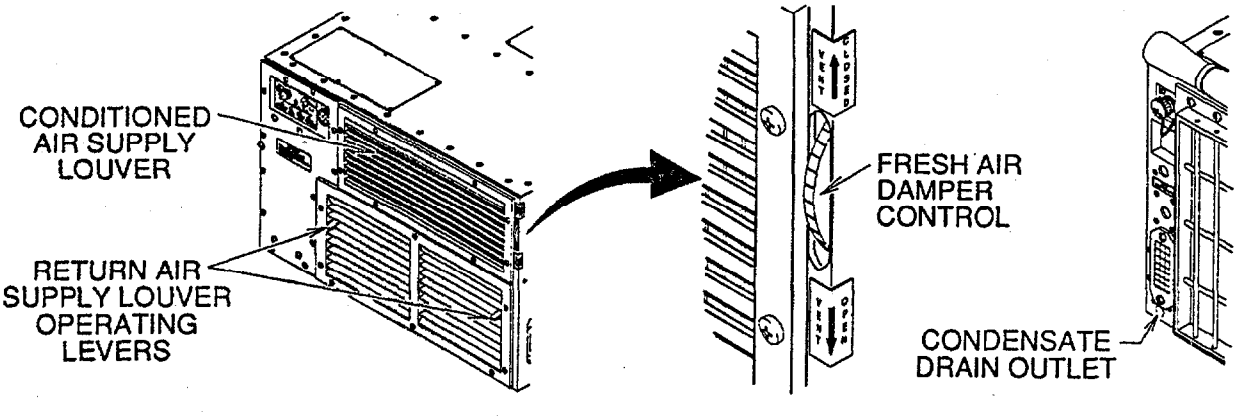


Figure *2–4.* Conditioned Air Louvers, Fresh Air Damper, and Drain.

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

g. The Air Conditioner should be checked for operation in all modes after installation is completed and when it is placed back in operation after an extended shut down period.

CAUTION

Do not perform the operational check in COOL mode until input power has been supplied to the unit in accordance with the following:

Ambient (Outside) Temperature	Minimum Input Power Time
60 Degrees F	20 Minutes
40 Degrees F	One (1) Hour
20 Degrees F	Two (2) Hours
Below 20 Degrees F	Four (4) Hours

Liquid refrigerant tends to migrate into the compressor and mix with the lubricating oil. Since the refrigerant is heavier than the oil, it displaces the lubricating oil from the bottom of the compressor well. The above sliding timetable for power input to Air Conditioner is required to boil the liquid refrigerant out of the lubricating oil at the bottom of the compressor well. This action is needed to prevent "slugging" of the compressor when the Air Conditioner is started in COOL mode and to prevent premature failure of the compressor.

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. This action is needed to avoid damage to the equipment.

h. 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.

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 Open	Fully Closed	Adjust to suit	Rolled up and secured
Heating with 100% Recirculated Air	HEAT	Desired Temperature	Fully Closed	Fully Open	Slightly Downward	Rolled up or snapped 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

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

a. Turn MODE selector rotary switch to VENTilate.

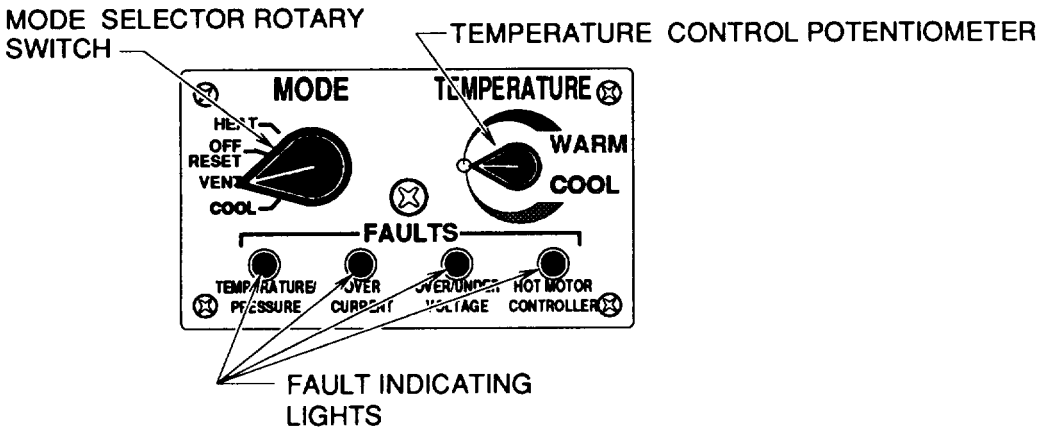


Figure 2-5. Control Panel.

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.

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.

NOTE

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

c. Adjust louvers to suit.

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.

NOTE

Fresh (outside) air cannot be introduced with fabric rover rolled down.

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

c. When room or enclosure temperature reaches the desired level, slowly turn t he 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.

2-9. OPERATION IN HEAT MODE. - contlnued

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

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

2-10. OPERATION IN COOL MODE.

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

b. Turn MODE selector rotary switch to COOL.

c. Turn TEMPERATURE control potentiometer to full COOL position.

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.

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 made by turning the TEMPERATURE control potentiometer slighly toward COOL or WARM until desired temperature is controlled automatically.

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

2-11. SHUTDOWN (OFF).

Turn the MODE selector rotary switch to OFF/RESET.

NOTE

Do not disconnector 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.

2-12. INFORMATION PLATES.

A number of information plates are provided on the exterior of the air conditioner cabinet. These plates are located on, or adjacent to, the applicable control or device.

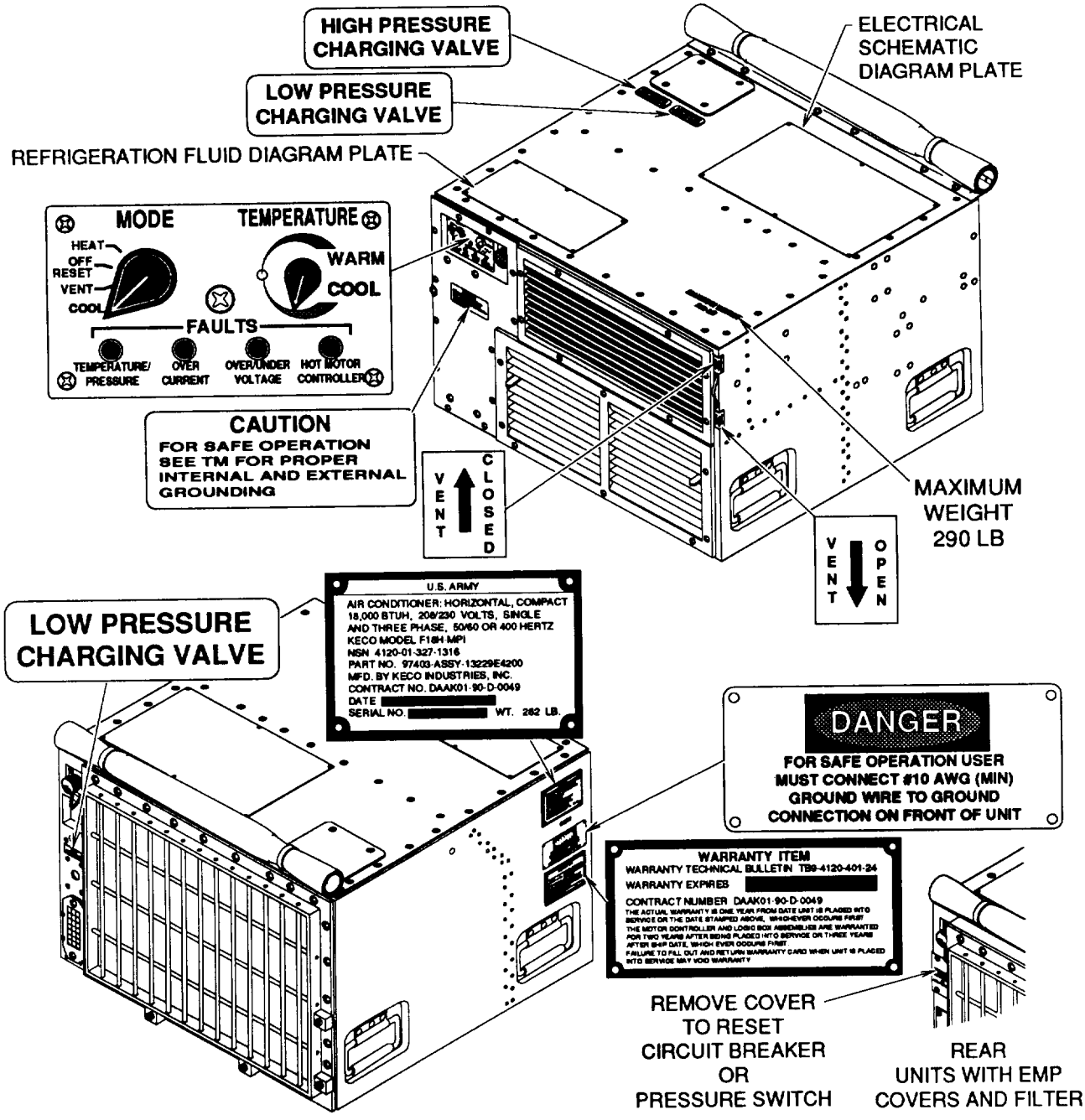


Figure 2-6. Instruction Plates, Stencil Marking Information, and Locations

2-13. PREPARATION FOR MOVEMENT.

When the unit is to be moved, the services of unit maintenance shall be employed for the necessary preparations.

Section IV OPERATION UNDER UNUSUAL CONDITIONS

2-14. GENERAL.

The Model F18H–MPI 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 120°F (49°C). Extra care should be taken to minimize the cooling load when operating in extremely high temperatures. Some of the steps that may be taken are:

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.

NOTE

These additional steps may be taken when operating the air conditioner if the shelter has been closed for an extended period in 90 °F or higher temperatures and/or when direct sun has been hitting the shelter and the air conditioner has been off:

f. Open the shelter's door and leave it open if the outside environmental conditions do not adversely affect the equipment in the shelter or the mission requirement.

g. Operate the air conditioner in the vent mode for approximately 5 minutes to remove high temperature air from the shelter. Then switch the air conditioner to the COOL mode. Close the shelter door, if it was left open during the vent mode.

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 0°F (–18°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 IN DUSTY 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 fitters, 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. 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.

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 only when possible.

CHAPTER 3

OPERATOR'S MAINTENANCE INSTRUCTIONS

Section I LUBRICATION INSTRUCTIONS

3-1. GENERAL.

The Model F18H-MPI Air Conditioner and its major components are designed so that very little lubrication is required during 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 louvers. 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 unit maintenance for appropriate action.

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.

SYMPTOM INDEX

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.

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. If circuit breaker continues to trip, notify supervisor.

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, 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.

Table 3-1. OPERATOR TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

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.

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 panels are not loose or missing.

Panels 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.

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 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.

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

Remove obstruction.

Table 3-1. OPERATOR TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
4. REDUCED COOLING CAPACITY. - continued
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.
Step 3. Check that discharge and intake 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 paragraphs 2-6 and 2-7.

CHAPTER 4

UNIT MAINTENANCE INSTRUCTIONS

Paragraph

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 supply and return louvers, the condenser air discharge louver and control linkages 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 9-4120-401-24P. No special tools are required for maintenance of the equipment. Test, maintenance, and diagnostic equipment (TM DE), 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 be conditioned and positioning the air conditioner so that the front of the cabinet is inside the room or enclosure and the back of 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, 2 and 3 for mounting 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 supply and discharge openings (front face of air conditioner).

WARNING

Check that no source of dangerous or objectionable fumes is near the fresh air intake which could cause harm to personnel.

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 and sufficient headroom to allow removal of the top panel is necessary, if the unit is to be serviced when installed.

g. A source of 208 volt, 3 phase, 50/60/400 hertz input power rated at 18.0 amps or 230 volt, single phase, 50/60 hertz input power rated at 30.0 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 or 30.00 amps as applicable (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.

NOTE

Dimensions on figure 4-1 are given in inches with centimeters shown in parenthesis.

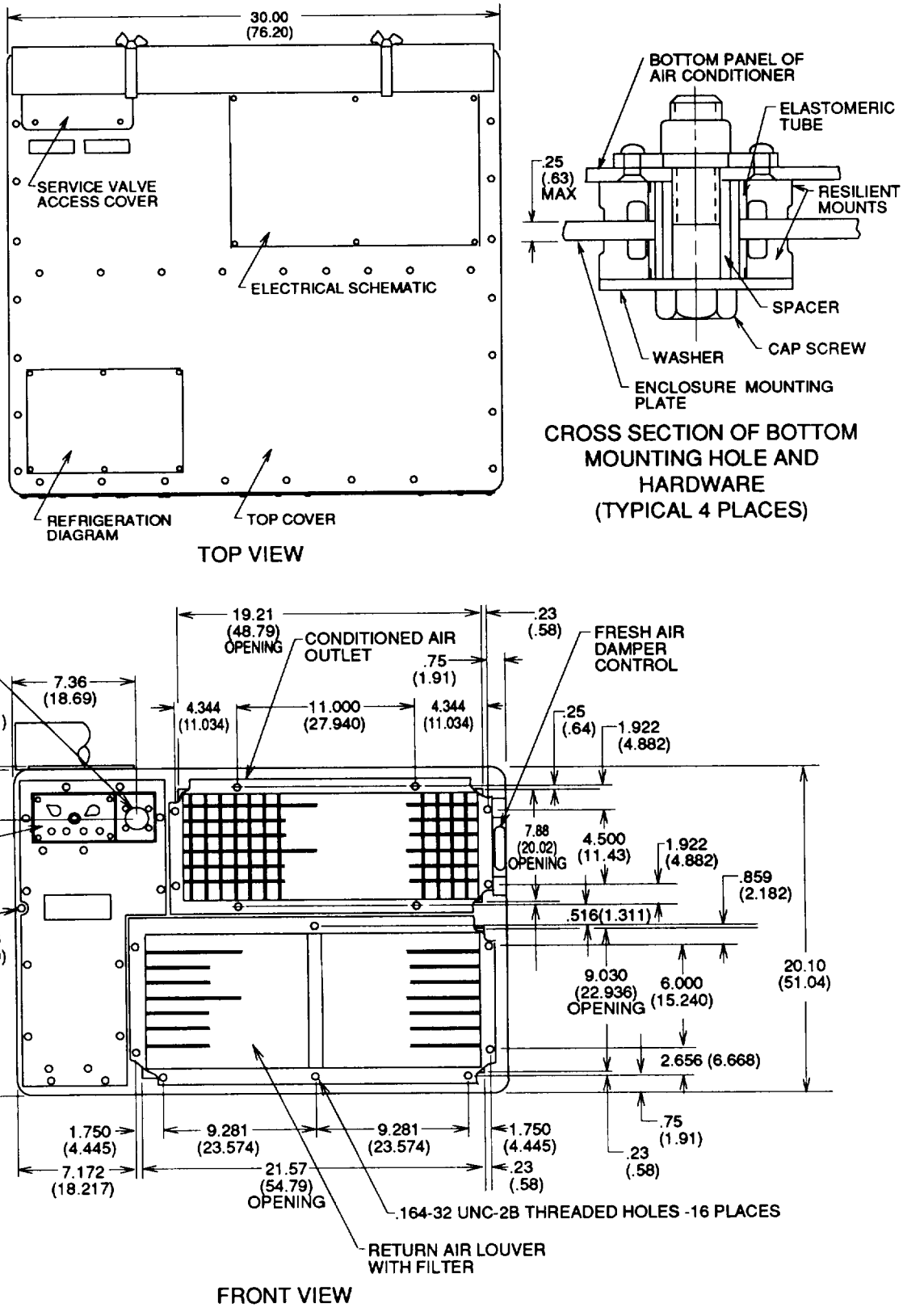


Figure 4-1. Installation Dimensions (Sheet 1 of 3)

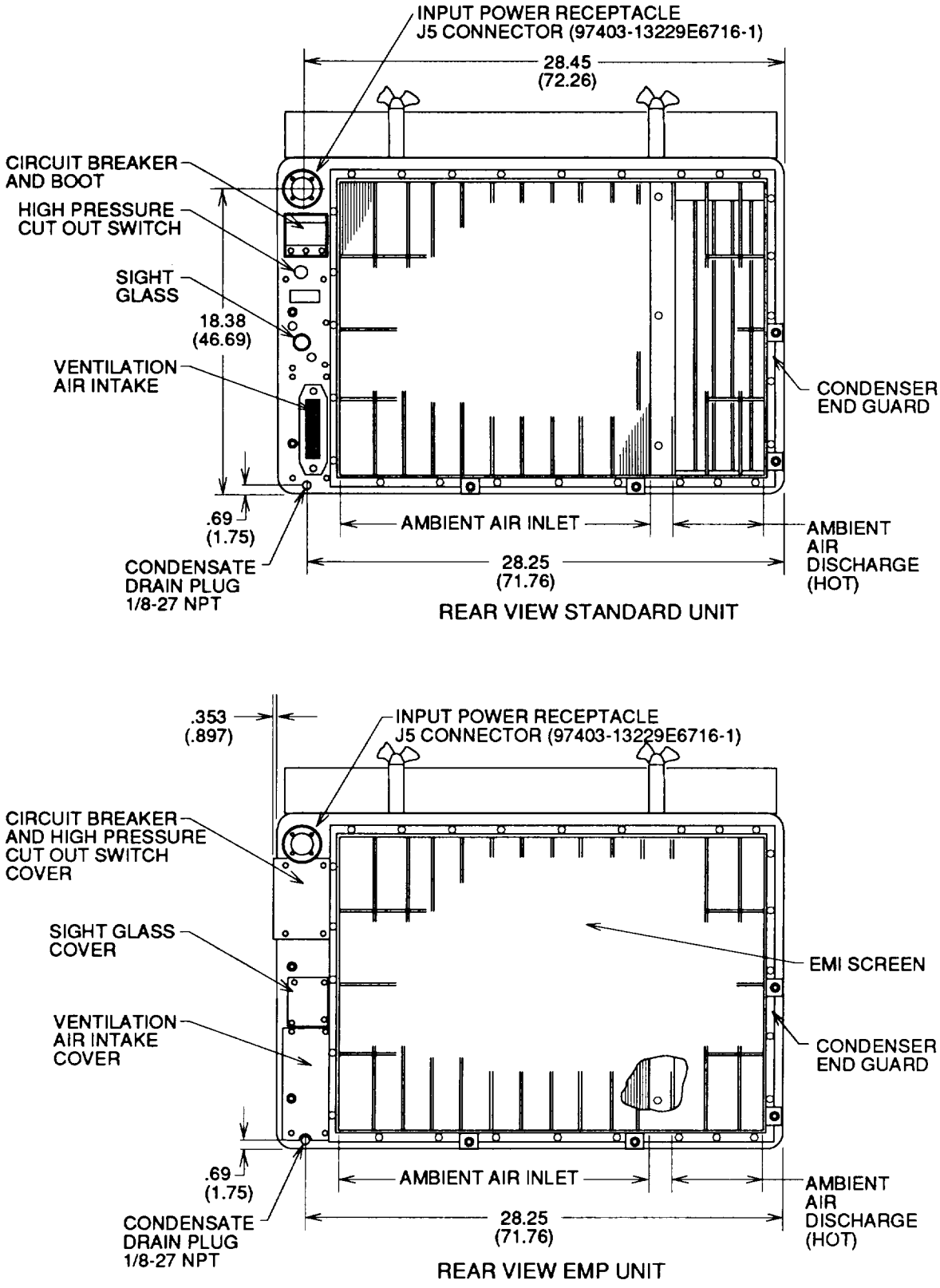


Figure 4-1. Installation Dimensions (Sheet 2 of 3)

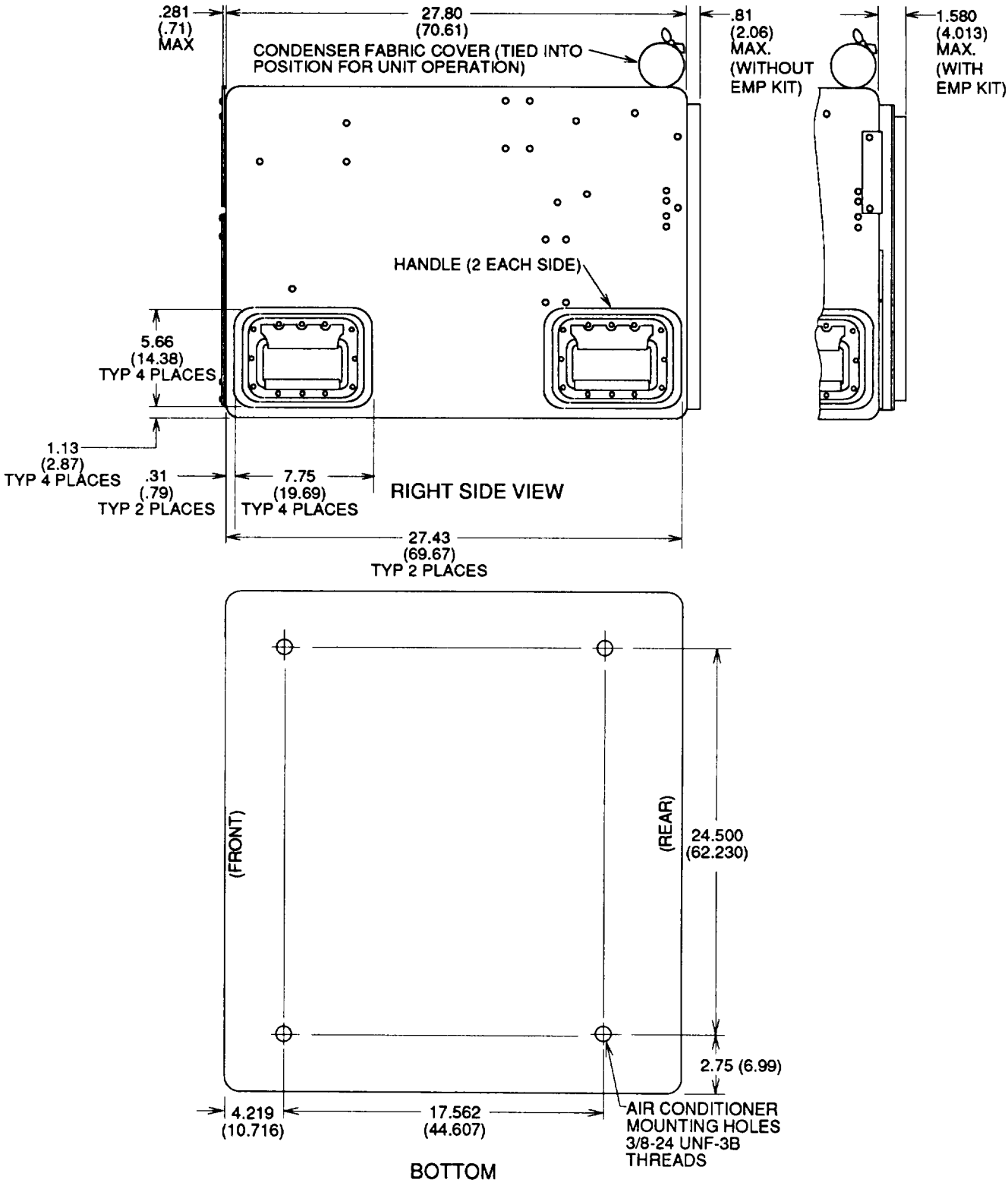


Figure 4-1. Installation Dimensions (Sheet 3 of 3)

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.

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.

(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.

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.

c. Receiving Inspection. Perform receiving inspection of the air conditioner in the following manner:

(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.

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

WARNING

The unit weight (less shipping pallet) is 282 pounds (127.9 kg). When lifting or moving the unit on the shipping pallet, a forklift may be used. To avoid injury when lifting the unit into position, use four people, one at each lifting handle.

(4) Tilt the unit and pallet or raise the unit using a forklift. Remove the four bolts from the bottom of the pallet. Using four people (one at each lifting handle), carefully lift the unit from the shipping pallet.

4-5. INSTALLATION INSTRUCTIONS.

a. Air Conditioner Preparation For Installation.

(1) Two input power connectors are provided on the air conditioner. Connector J4 is located on the front of the air conditioner beside the control panel assembly. Connector J5 is located on the rear of the air conditioner in the upper left corner. Determine which connector best suits your installation. If power source is inside conditioned area, use J4. If power source is outside conditioned area, use J5.

(a) Air conditioners are shipped from the factory wired for the use of the J4 power connector. If this connector is used no change is necessary.

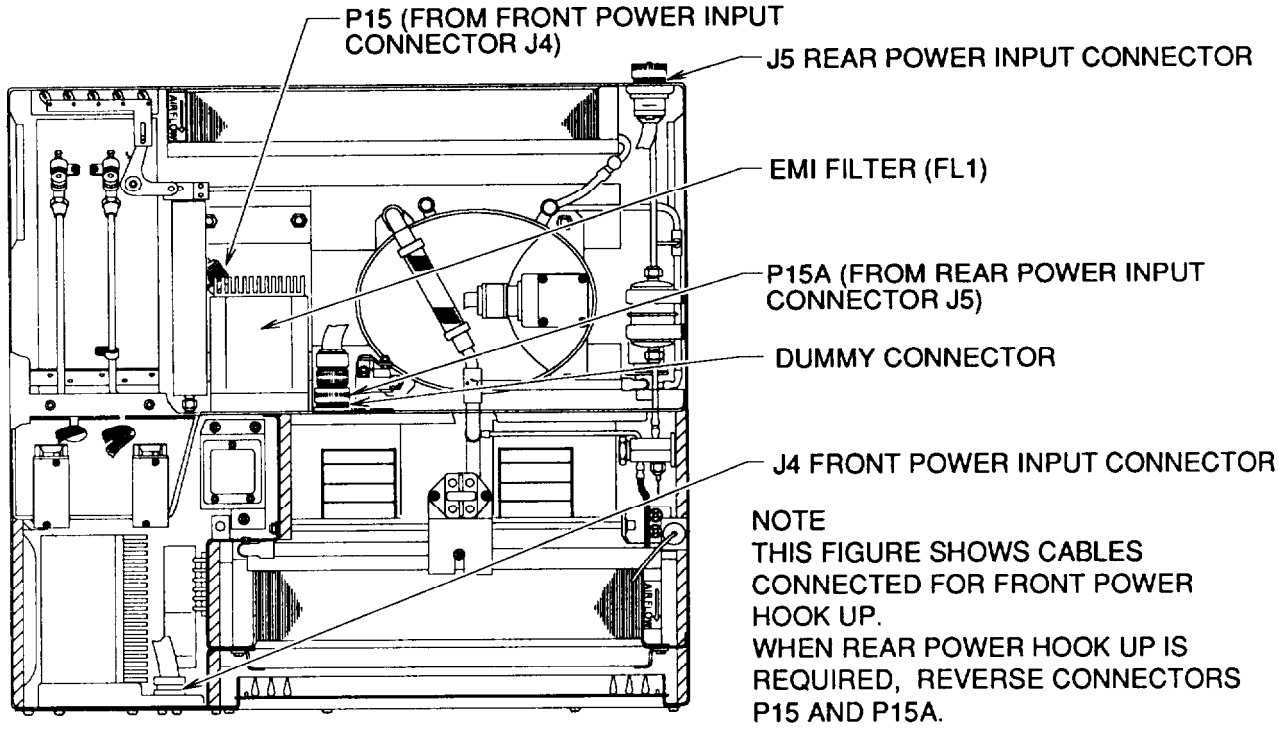


Figure 4-2. Cable Connection Changes for J4/J5 (Front/Rear) Power Input Connectors

4-5. INSTALLATION INSTRUCTIONS. - continued

(b) If the J5 connector is to be used, proceed as follows:

1 Remove top panel from air conditioner.

2 Disconnect connector P15 from EMI filter connector J15.

3 Disconnect connector P15A from dummy connector on bulkhead.

4 Connect connector P15 on dummy connector on bulkhead.

5 Connect connector P15A to EMI filter connector J15.

6 Install top panel onto air conditioner.

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

(a) Loosen captive mounting screw. Remove control panel by pulling screw.

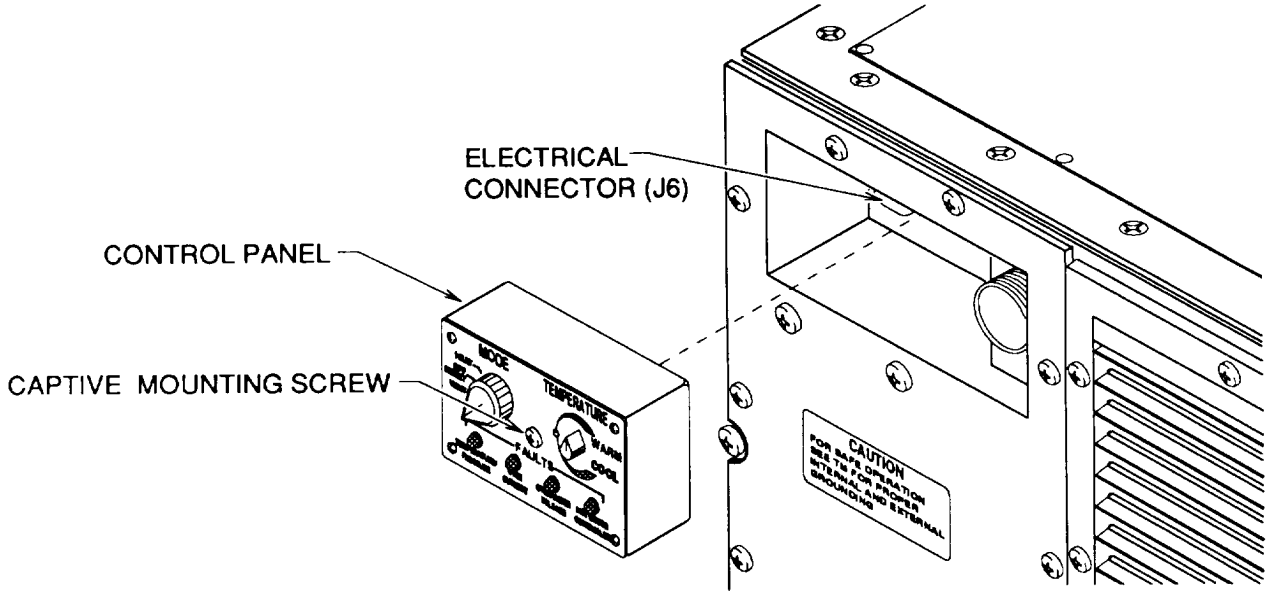


Figure 4-3. Control Panel Removal

(b) Fabricate interconnecting remote control cable to desired length. (See appendix F, figure F-46.)

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

4-5. INSTALLATION INSTRUCTIONS. - continued

(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 six screws (1), lock washers (2), and flat washers (3). (See figure 4-4.)

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

(c) Reinstall six screws (1), lock washers (2), and flat washers (3).

(4) 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.

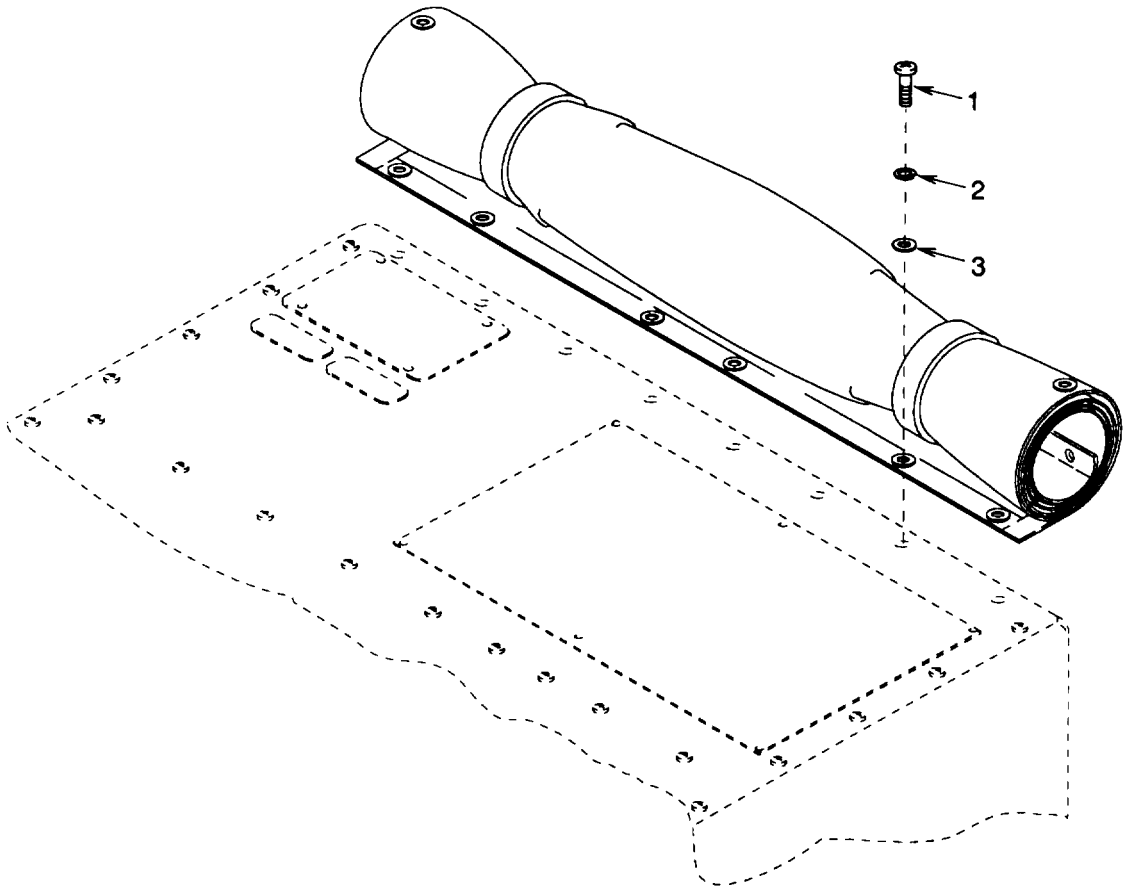


Figure 4-4. Fabric Cover

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) The following information describes a typical through the wall type installation. You may want to alter these instructions to suit your specific application.

(a) Determine best Iocation.

(b) Make cutout in wall slightly larger than overall dimension of air conditioner.

(c) Fabricate a mounting platform or braces. Provide mounting holes to match holes in bottom of air conditioned. See figure 4-1, sheet 3.

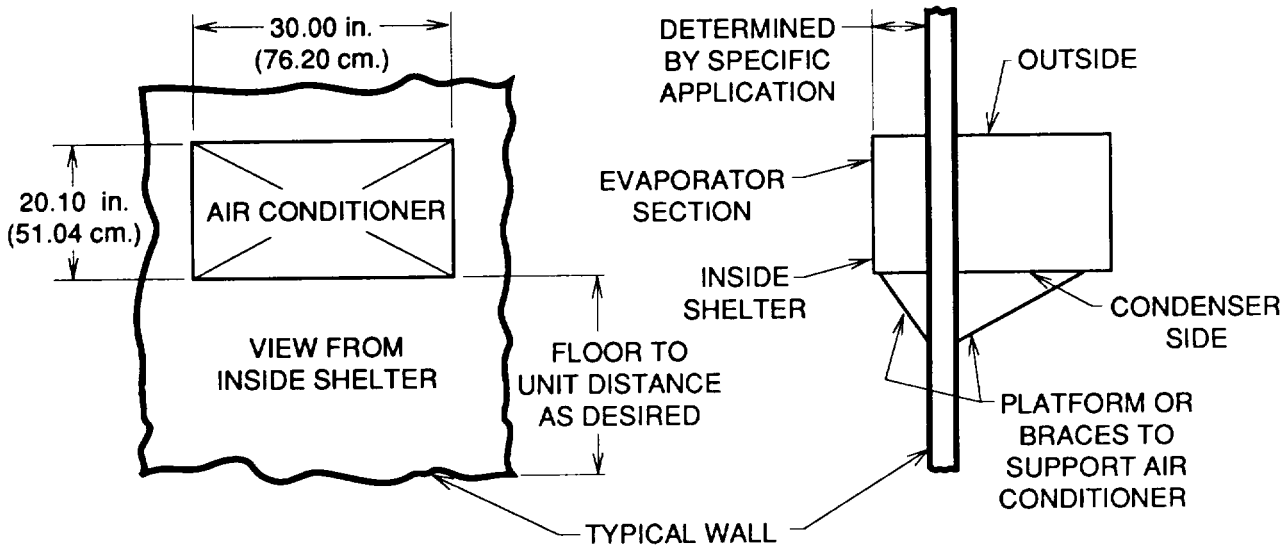


Figure 4-5. Typical Through the Wall Installation

WARNING

Two people are required to lift unit. Personal injury can result.

(2) Lift air conditioner into position. Use adequate equipment or four people to lift the unit into position.

(3) Secure unit to mounting platform or braces with four sets of mounting hardware provided with unit. See figure 4-1, sheet 1, for cross section view of bottom mounting holes and hardware.

WARNING

Death on contact may result if personnel fail to observe safety precautions.

For safe operation, connect a 10 AWG (minimum) ground wire to the air conditioner external ground. Make sure that shelter is properly grounded.

(4) Connect a 10 AWG (minimum) ground wire from shelter ground to air conditioner external ground. The air conditioner external ground connection point is located on front left side of control module. (See figure 4-1, sheet 1.)

4-5. INSTALLATION INSTRUCTIONS. - continued

(5) Fill in and seal area around the air conditioner to prevent loss of conditioned air. Flexible plastic foam and pressure sensitive tape may be used.

(6) Fabricate an input power cable using the connector supplied with the air conditioner. (See appendix F, figure F-47.) If connecting to J5 unit connector, reconnect P15A connector in accordance with paragraph 4-5, a.

(7) Remove the condensate drain plug from lower left rear corner of the unit. If air conditioner is mounted in a location where water pouring from this drain will be objectionable or create a hazard, connect a drain line at this point. The fitting used must have a male 1/8 -27 NPT connection to unit. Hose, rigid pipe or tubing can be used to direct drain water to a more desirable disposal location.

(8) Connect power cable to a 208 volt, 3-phase, 50/60/400 hertz or 230 volt, single-phase, 50/60 hertz input power source.

(9) Run operational checks in accordance with paragraph 2-6.

NOTE

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

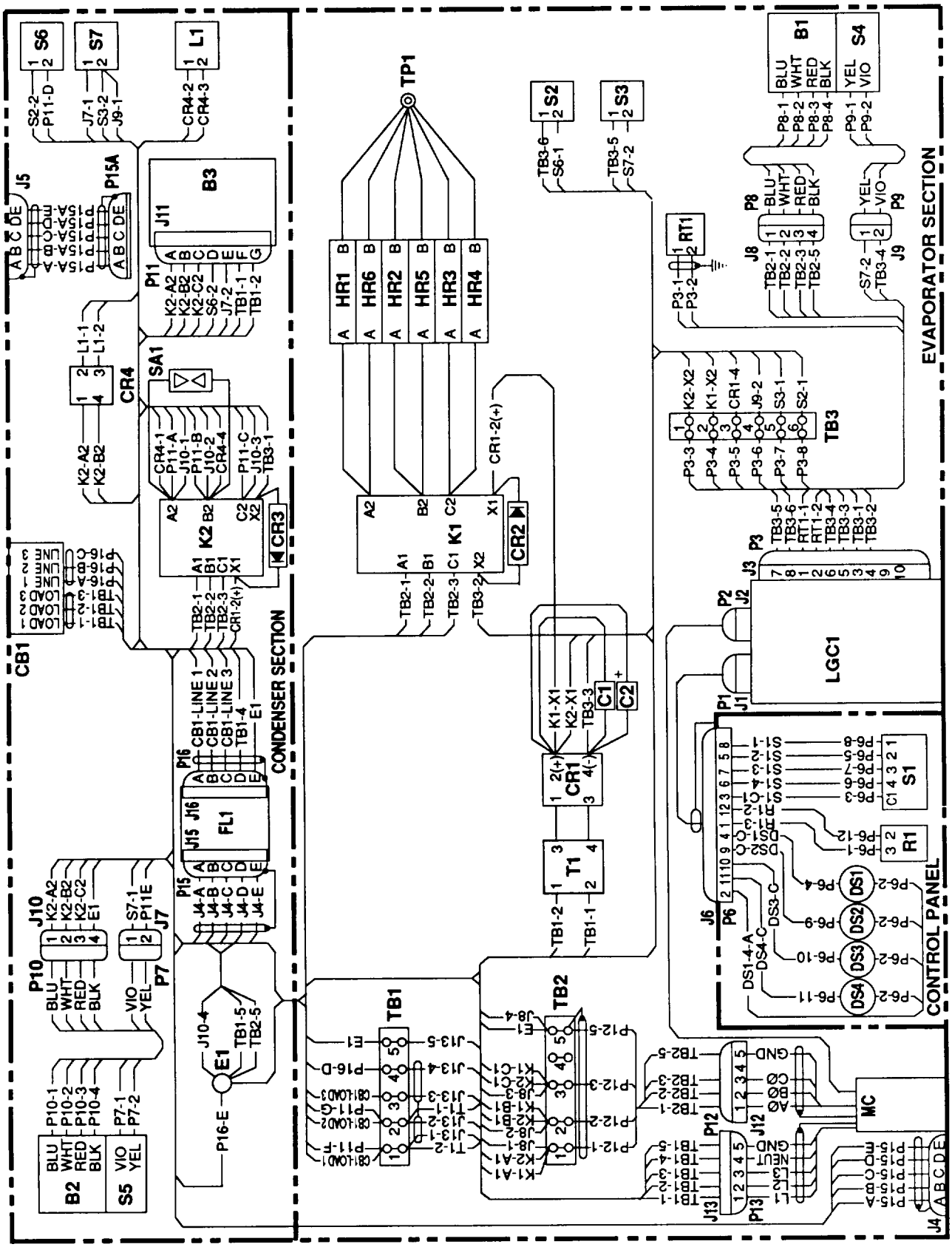
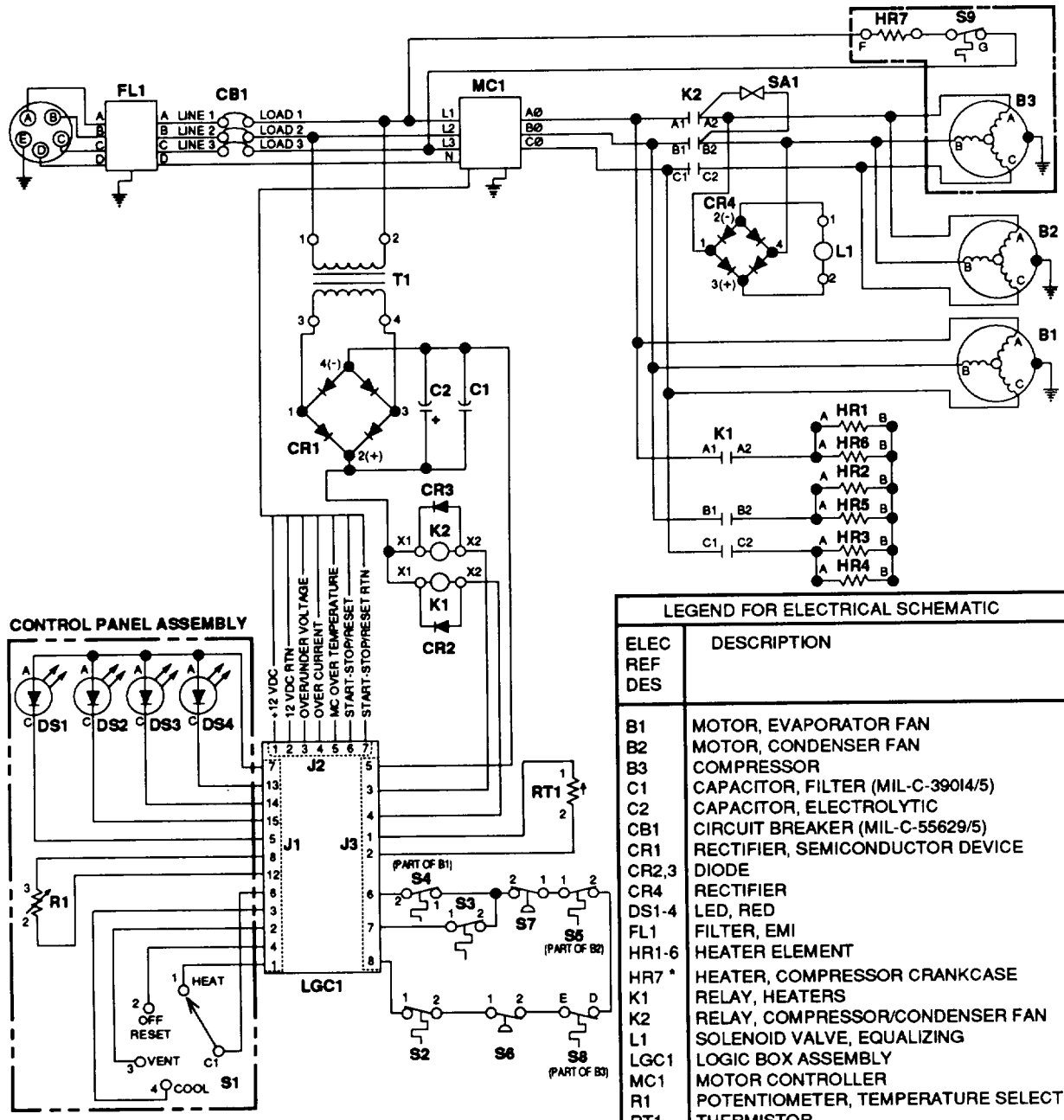


Figure 4-6. Wiring Diagram (Sheet 1 of 2)

LEGEND FOR WIRING DIAGRAM	
ELECTRICAL REFERENCE DESIGNATION	DESCRIPTION
B1	MOTOR, EVAPORATOR FAN
B2	MOTOR, CONDENSER FAN
B3	COMPRESSOR
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
E1	TERMINAL, GROUND
FL1	FILTER, EMI
HR1-6	HEATER ELEMENT
J1	CONNECTOR, LOGIC-CONTROL
J2	CONNECTOR, CONTROL
J3	CONNECTOR, A/C INTERFACE
J4	CONNECTOR, POWER INPUT
J5	CONNECTOR, POWER INPUT
J6	CONNECTOR, CONTROL PANEL (MIL-C-24308/2)
J7	CONNECTOR, CONDENSER MOTOR-THERMAL SWITCH
J8	CONNECTOR, EVAPORATOR MOTOR-POWER
J9	CONNECTOR, EVAPORATOR MOTOR-THERMAL SWITCH
J10	CONNECTOR, CONDENSER MOTOR-POWER
J11	CONNECTOR, COMPRESSOR
J12	CONNECTOR, MOTOR CONTROLLER, POWER OUTPUT
J13	CONNECTOR, MOTOR CONTROLLER, POWER INPUT
J15	CONNECTOR, EMI FILTER, INPUT
J16	CONNECTOR, EMI FILTER, OUTPUT
K1	RELAY, HEATERS
K2	RELAY, COMPRESSOR/CONDENSER FAN
L1	SOLENOID VALVE, EQUALIZING
LGC1	LOGIC BOX ASSEMBLY
MC1	MOTOR CONTROLLER
P1	CONNECTOR, LOGIC-CONTROL (MIL-C-24308/2)
P2	CONNECTOR, LOGIC-MOTOR CONTROLLER (MIL-C-24308/2)
P3	CONNECTOR, LOGIC-RECT/PRESSURE SWITCH
P6	CONNECTOR, CONTROL PANEL (MIL-C24308/4)
P7	CONNECTOR, CONDENSER MOTOR-THERMAL SWITCH
P8	CONNECTOR, EVAPORATOR MOTOR-POWER
P9	CONNECTOR, EVAPORATOR MOTOR-THERMAL SWITCH
P10	CONNECTOR, CONDENSER MOTOR-POWER
P11	CONNECTOR, COMPRESSOR
P12	CONNECTOR, MOTOR CONTROLLER, POWER OUTPUT
P13	CONNECTOR, MOTOR CONTROLLER, POWER INPUT
P15, P15A	CONNECTOR, EMI FILTER, INPUT
P16	CONNECTOR, EMI FILTER, OUTPUT
R1	POTENTIOMETER, TEMPERATURE SELECT
RT1	THERMISTOR
S1	SWITCH, MODE SELECTOR
S2	SWITCH, COIL FROST
S3	SWITCH, HEATER THERMOSTAT
S4	SWITCH, OVERLOAD, EVAPORATOR FAN MOTOR
S5	SWITCH, OVERLOAD, CONDENSER FAN MOTOR
S6	SWITCH, HIGH PRESSURE CUTOUT
S7	SWITCH, LOW PRESSURE CUTOUT
SA1	ARRESTOR, SURGE
T1	TRANSFORMER
TB1	TERMINAL BOARD
TB2	TERMINAL BOARD
TB3	TERMINAL BOARD
TP1	TERMINAL POST (MIL-I-23264/1)

Figure 4-6. Wiring Diagram (Sheet 2 of 2)



LEGEND FOR ELECTRICAL SCHEMATIC	
ELEC REF DES	DESCRIPTION
B1	MOTOR, EVAPORATOR FAN
B2	MOTOR, CONDENSER FAN
B3	COMPRESSOR
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/CONDENSER FAN
L1	SOLENOID VALVE, EQUALIZING
LGC1	LOGIC BOX ASSEMBLY
MC1	MOTOR CONTROLLER
R1	POTENTIOMETER, TEMPERATURE SELECT
RT1	THERMISTOR
S1	SWITCH, MODE SELECTOR
S2	SWITCH, COIL FROST
S3	SWITCH, HEATER THERMOSTAT
S4**	SWITCH, OVERLOAD, EVAPORATOR FAN MOTOR
S5***	SWITCH, OVERLOAD, CONDENSER FAN MOTOR
S6	SWITCH, HIGH PRESSURE CUTOUT
S7	SWITCH, LOW PRESSURE CUTOUT
S8 *	SWITCH, OVERLOAD, COMPRESSOR
S9 *	SWITCH, CRANKCASE HEATER
SA1	ARRESTOR, SURGE
T1	TRANSFORMER

* SUPPLIED WITH COMPRESSOR
** SUPPLIED WITH EVAPORATOR FAN MOTOR
*** SUPPLIED WITH CONDENSER FAN MOTOR

Figure 4-7. Electrical Schematic

Section IV UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-6. GENERAL.

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).

4-7. INSPECTION AND SERVICE.

a. 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.

b. Table 4-1 lists the unit preventive maintenance checks and services that should be performed at quarterly (or otherwise established) intervals. The PMCS items in the table have been arranged and numbered in a logical sequence to provide for greater personnel efficiency and least amount of required maintenance downtime. 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 4-1. Unit Preventive Maintenance Checks and Services (PMCS) Quarterly Schedule

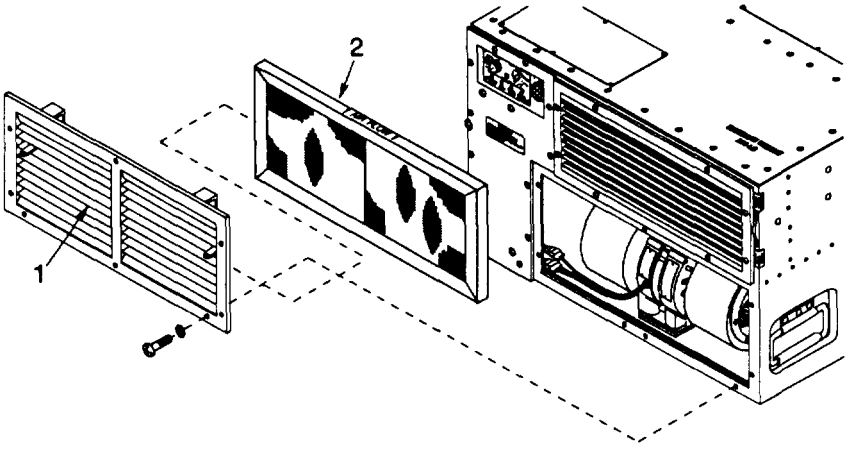
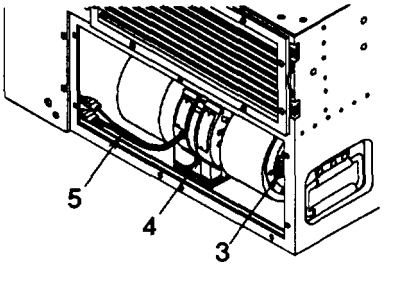
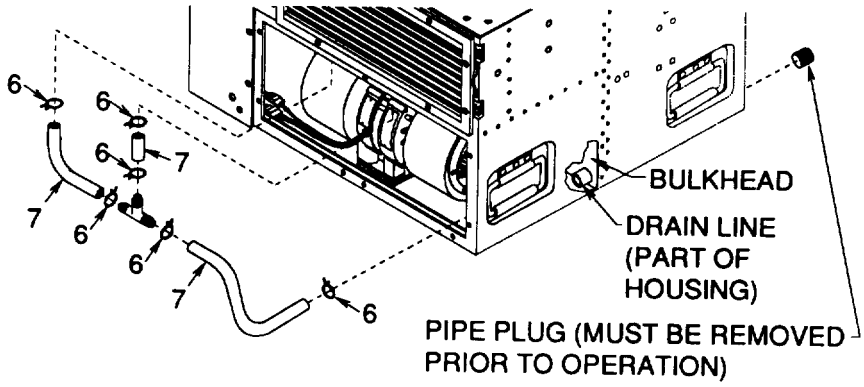
Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
1	Return Air Louver	a. Check operation of louvers (1) for stiffness or binding. b. Remove, clean, inspect, repair, and lubricate as necessary. c. Set aside for the present and reinstall after item 4.	4-18
			
2	Conditioned Air Filter	a. Remove, clean, inspect, and service filter (2). b. Discard filter (2) and obtain replacement, if damaged. c. Place filter aside for the present and reinstall after item 4.	4-18
3	Conditioned Air (Evaporator) Fan and Motor	a. Wipe all dust or dirt from fan (3), motor (4), and all other components and surfaces in the area. b.Inspect fan (3) for damaged or bent blades, the motor (4) for signs of overheating, and all mounting hardware for tightness and security. c.Inspect wiring harness (5) for damage or chafing and all electrical connections for tightness.	4-43
			

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

Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
4	Condensate Drain Tubing	a. Check for loose connections, missing clamps (6), indications of water leaks, and damaged or missing tubing (7). b. Repair or replace as indicated. c. Install filter and return air louver.	4-23
5	Fabnc Cover	a. Remove fabric cover. b. Unroll cover (8) and inspect for tears, cracks, or any other sign of damage or deterioration. c. If washing is necessary, use fresh water with a small amount of mild detergent. d. Set aside for the present and reinstall after item 9 then reroll and secure cover in the stowed position. If cover was washed, be sure it is thoroughly dry before rerolling.	4-10



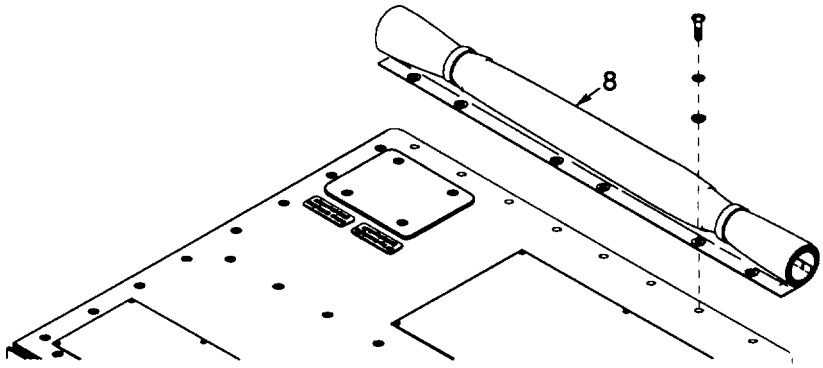


Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS) Quarterly Schedule - continued

Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
6	conditioned Air Supply Louver	a. Check operation of louvers (9) for stiffness or binding. b. Remove, clean, inspect, repair, and lubricate as necessary. c. Set aside for the present and reinstall after item 9.	4-19
7	Mist Eliminator	a. Remove, clean, and inspect top panel (10). Set aside for present and reinstall after item 8. b. Remove, clean, inspect, and service mist eliminator (11). c. Replace mist eliminator (11) if it is damaged. d. Set aside for the present and reinstall after item 9.	4-20

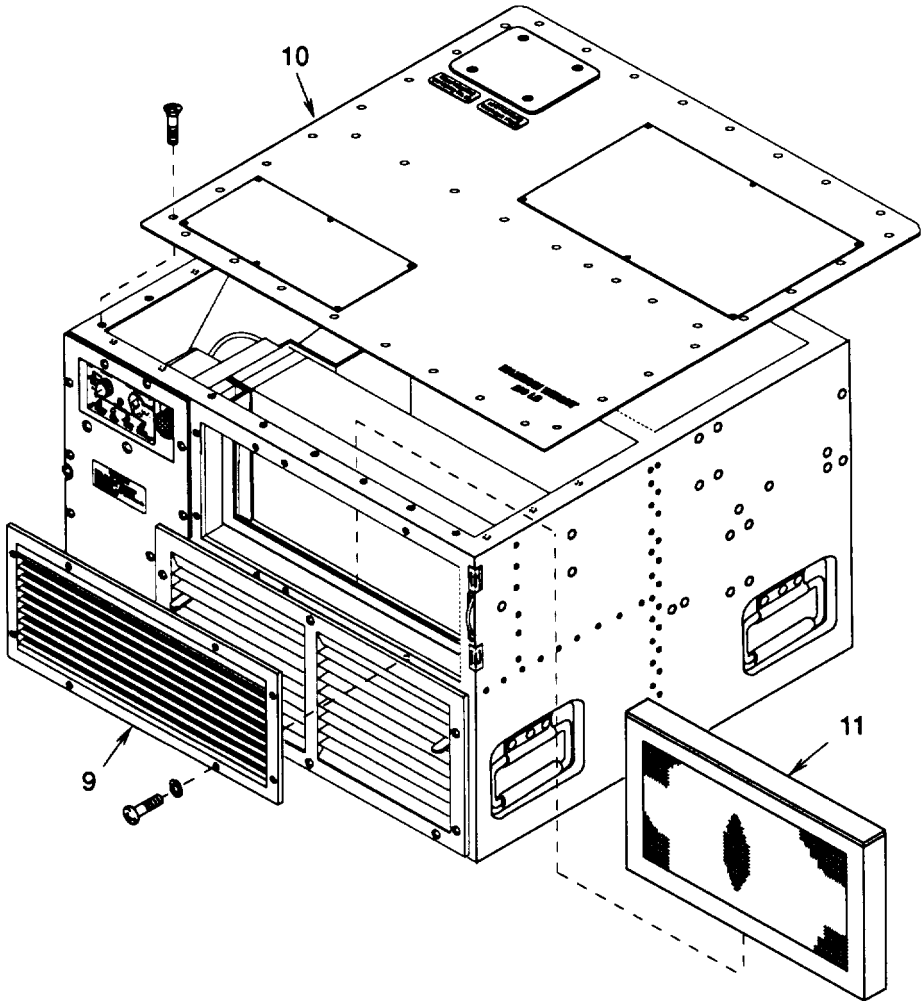


Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS) Quarterly Schedule - continued

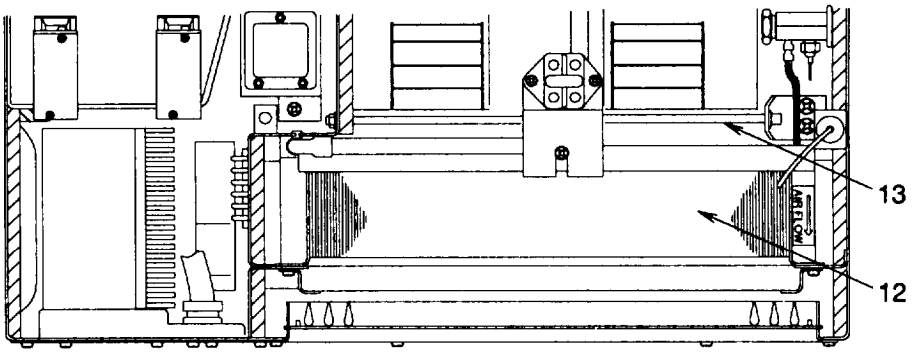
Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
		WARNING To avoid injury, compressed air used for cleaning purposes must not exceed 30 psi (2.1 kg/cm2).	
8	Evaporator Coil	a. Blow accumulated dust and dirt out of air passages in evaporator coil (12) using compressed air. Blow from front to back in opposite direction from operational airflow b. Inspect coil (12) for obvious damage and all mounting hardware for tightness and security. Straighten any bent fins.	4-47
			
9	Heating Elements	a. Wipe any remaining dust or dirt from heating elements (13), heater 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, oily residue left on any surface will attract and accumulate much more dust and dirt than dry surfaces. b. Inspect heating elements (13) 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. d. Install mist eliminator and conditioned air supply louver.	4-45

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

Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
10	Fresh Air Ventilation Guard Not applicable to units quipped with EMP items.)	a. Remove, clean, and inspect ventilation guard (14). b. Discard and obtain replacement, if damaged. c. Reinstall.	4-16
11	Condenser Air Inlet Guard	a. Remove, clean, and inspect, inlet guard (15), as necessary. b. Place guard (15) aside for the present and reinstall after item 16.	4-17
12	Condenser Air Inlet EMI Screen Applicable only to units equipped with EM P items.)	a. Remove, clean, and inspect, inlet guard (15), as necessary. b. Place screen (16) aside for the present and reinstall after item 16.	4-17

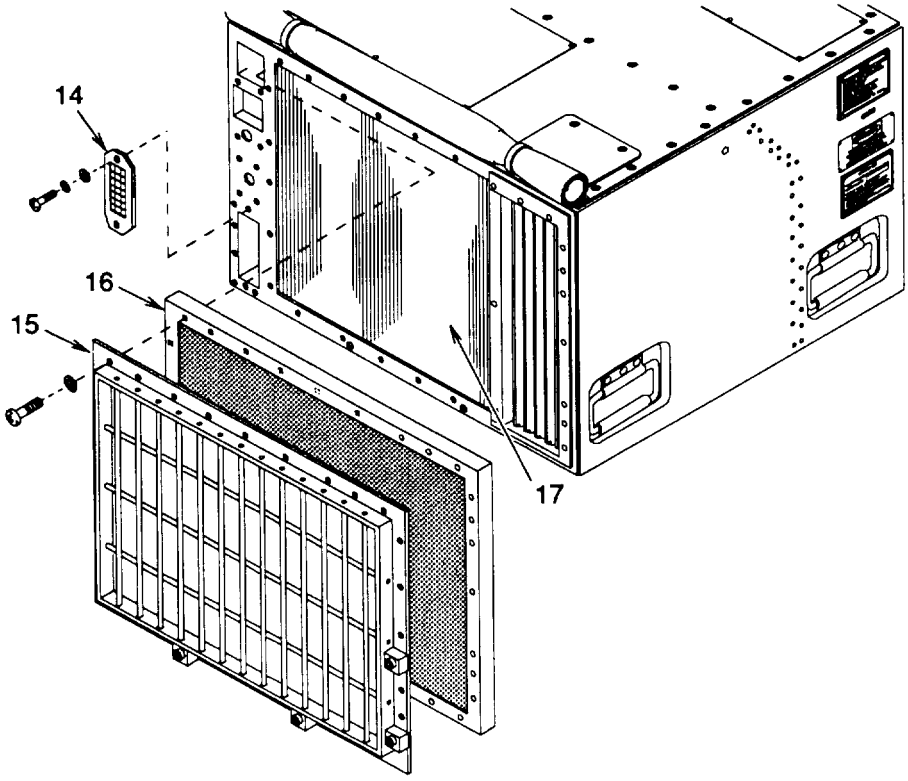


Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS) Quarterly Schedule - continued

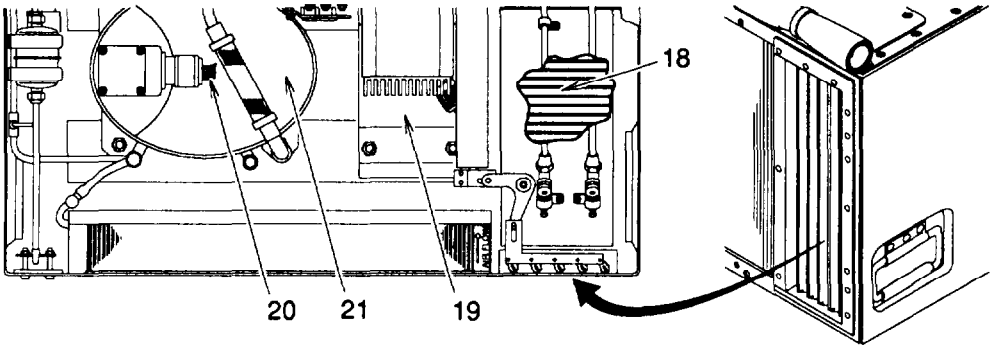
Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
		WARNING To avoid injury, compressed air used for cleaning purposes must not exceed 30 psi (2.1 kg/cm^2).	
13	Condenser Coil	a. Blow accumulated dust and dirt out of air passages in condenser coil (17) using compressed air. Blow from inside for reverse airflow direction. b. Inspect coil (17) for obvious damage and all mounting hardware for tightness and security. Straighten any bent fins.	4-49
14	Condenser Fan and Motor	a. Wipe dust and dirt from fan (18) and motor (19) and all other components and surfaces in the area. b. Inspect fan (18) for damage or bent blades, motor (19) for signs of overheating, and all mounting hardware for tightness and security. c. Inspect wiring harness (20) for damage or chafing and all electrical connections for tightness.	4-46
			
15	Compressor	a. Wipe dust or dirt from the compressor (21) canister and remaining components and surfaces in the lower section of the cabinet. b. Inspect compressor crankcase heater element for signs of overheating or deterioration. c. Inspect wiring harness for damage or chafing and all electrical connections for tightness. d. Check all mounting hardware for damage or chafing.	

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

Item Number	Item to be Inspected/Serviced	Procedures	Paragraph Reference
16	Condenser Discharge Air Louver and Actuator	a. Check all mounting hardware and linkage connections for tightness. b. Clean and lubricate as necessary. c. Install condenser air inlet guard and top panel.	4-21
17	Panels, Nameplates and Housing	a. Wipe all surfaces clean. b. Check that ail warning and instruction plates are in place and legible. c. Replace missing or illegible plates. d. Check that all panels are in place, that there is no missing or loose hardware and no dents, breaks, or damage that would be a hazard or interfere with unit operation.	4-11 thru 4-15
		CAUTION Do not check operation in COOL mode until input power has been reconnected for a sufficient time to eliminate any danger of liquid refrigerant accumulation in the compressor. Under moderate conditions, if input power has been disconnected, a four hour warm-up period should be allowed. If the air conditioner has been exposed to below freezing temperatures without input power, an eight hour warm up period is recommended.	
18	Operational Checks	a. Be sure MODE SELECTOR switch is in the OFF position and reconnect input power. b. Perform functional check of air conditioner in all operational modes in accordance with the instructions in paragraph 2-6. c. Set-up air conditioner for desired operational mode. d Record performance of quarterly PMCS, including all corrective actions taken.	

Section V UNIT TROUBLESHOOTING

4-8. USE OF TROUBLESHOOTING TABLE.

Table 4-2 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 your supervisor.

SYMPTOM INDEX

Table 4-2. UNIT TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. AIR CONDITIONER DOES NOT START IN ANY MODE.

Use disconnect switch (NOT POWER CABLE) to connect 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 six hours.

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

Connect input power.

Table 4-2. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

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

Step 2. Make sure that correct power is supplied to unit. (See paragraph 4-3.)

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 4-33.)

Tighten or replace connectors, or repair damaged wires.

Step 5. Check operation of the circuit breaker. (See paragraph 4-42.)

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 rectifier assemblies. (See paragraph 4-30 and 4-38.)

Replace filter or rectifier if defective.

Step 8. Check for loose or damaged electrical connectors or damaged wires in wiring harnesses. (See paragraph 4-33.)

Tighten or replace connectors, or repair damaged wires.

Step 9. Check operation of the MODE selector rotary switch. (See paragraph 4-28.)

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.

Table 4-2. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. FANS RUN, 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. (See paragraph 4-33.)

Tighten or replace connectors, or repair or replace damaged wires.

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 4-36.) Replace switch if defective.

Step 6. Check operation of compressor.

If 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.

Table 4-2. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. COMPRESSOR STARTS NORMALLY, BUT SOON STOPS. - 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 condenser fan is operating (air being discharged from condenser air outlet).

Replace motor if defective. (See paragraph 4-46.)

Step 4. Check for loose or damaged electrical connectors or damaged wires in wiring harnesses. (See paragraph 4-33.)

Tighten or replace connectors, or repair damaged wires.

Step 5. 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.

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 condenser fan is operating (air being discharged from condenser air outlet).

Replace motor if defective. (See paragraph 4-46.)

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.

Step 6. Check that condenser air outlet louvers are not stuck or jammed in closed position.

Free louvers if possible and notify supervisor if actuating cylinder is not working properly.

Table 4-2. 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 that the louvers in the conditioned air intake and discharge grilles are properly adjusted. (Must be open.).

Adjust louvers properly,

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.

Step 6. With unit operating in COOL mode, check rendition 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 4-20.)

(4) Clean evaporator coil and entire evaporator section. (See paragraph 4-47.)

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 4-18.)

(3) Clean and service, or replace mist eliminator. (See paragraph 4-20.)

(4) Clean evaporator coil and entire evaporator section. (See paragraph 4-47.)

Step 8. Check EMI screen, if installed. (See paragraph 4-17.)

Clean or replace as indicated.

Table 4-2. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

5. REDUCED COOLING CAPACITY. - continued

Step 9. Check operation of potentiometer TEMPERATURE control.

Test potentiometer TEMPERATURE control. (See paragraph 4-27.) Replace control if defective.

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.

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

(1) Adjust conditioned air (evaporator) intake grille louvers.

(2) Clean and service, or replace conditioned air filter element. (See paragraph 4-18.)

(3) Clean and service, or replace mist eliminator. (See paragraph 4-20.)

(4) Clean evaporator coil and entire evaporator section. (See paragraph 4-47.)

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

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 4-24.)

Table 4-2. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

6. REDUCED HEATING CAPACITY. - continued

Step 7. Check operation of heater cutout switch.

Test switch. (See paragraph 4-44.) Replace switch if defective.

Step 8. Check individual heaters.

Test heaters. (See paragraph 4-45.) 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 4-27.) Replace control if defective.

Step 4. Check operation of MODE selector rotary switch.

Test switch. (See paragraph 4-28.) Replace switch if defective.

Table 4-2. UNIT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

8. EVAPORATOR OR CONDENSER 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 4-6), check electrical connectors and individual wires for tightness and continuity.

Tighten, repair, or replace as indicated.

Step 2. Check operation of motor controller.

Test controller, (See paragraph 4-31.) Replace controller if defective.

Step 3. Check operation of fan motor.

Test motor. (See paragraph 4-43 or 4-46.) Notify supervisor if motor is defective.

Step 4. Check operation of MODE selector rotary switch.

Test switch. (See paragraph 4-28.) 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. Check fans for looseness or damage, and for rotational clearance.

Tighten loose fans, adjust for rotational clearance, or replace fans. (See paragraph 4-43 and 4-46.)

Step 2. 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-by-step 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. Remove b. Clean c. Install

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Material/Parts

Look washers (6)

Detergent
Appendix E, item 15

a. Removal.

(1) Unsnap seven snap fasteners (1).

(2) Remove six sets of screws (2), lock washers (3), and flat washers (4). Lift fabric cover (5) from unit.

b. Clean.

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

c. Install.

(1) Secure fabric cover (5) to the unit with six sets of screws (2), lock washers (3), and flat washers (4).

(2) If unit is to be put back into service, roll cover up and tie in place.

(3) If unit is to be stored or shut down for an extended period, roll cover down and secure snaps (1).

4-10. FABRIC COVER. - continued

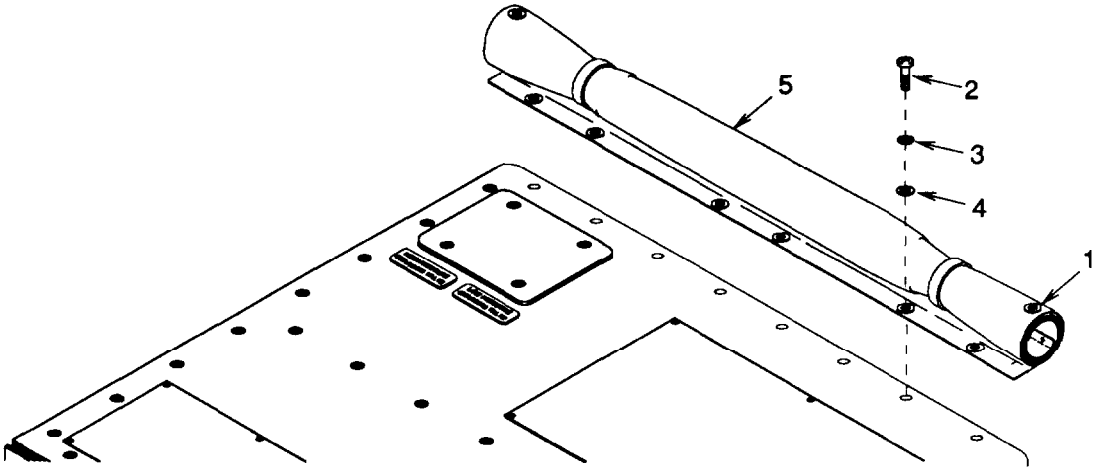


Figure 4-8. Fabric Cover

4-11. TOP PANELS.

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts

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).

a. Removal.

(1) Remove 35 screws (1) and top panel (2).

(2) Remove four screws (3) and access panel (4).

4-11. TOP PANELS. - continued

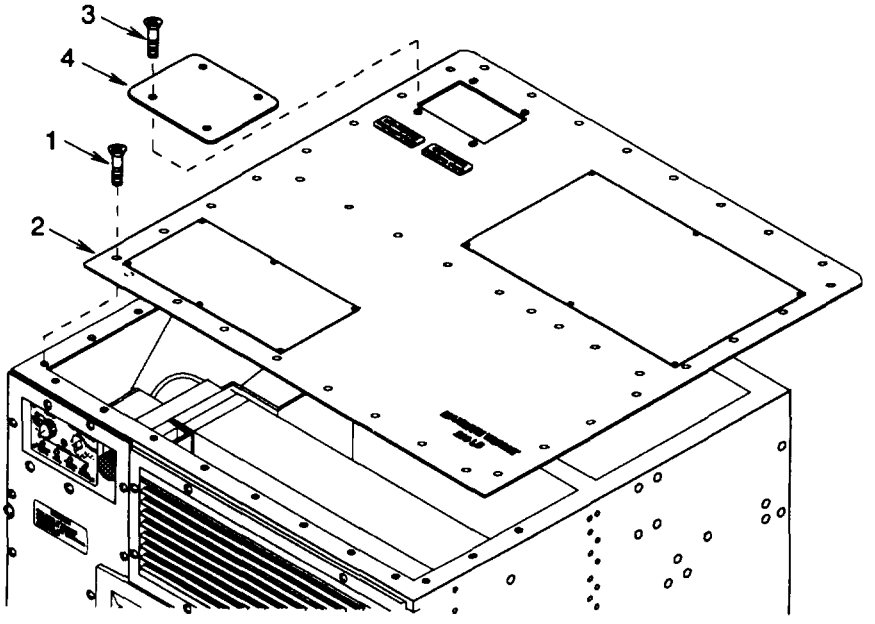


Figure 4-9. Top Panels

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

c. Install.

(1) Secure access panel (4) to top panel (2) with four screws (3).

(2) Install top panel (2) with 35 screws (1).

NOTE

FOLLOW-ON MAINTENANCE:

Install fabric cover (para 4-10).

Connect power at power source.

4-12. ELECTRICAL ACCESS PANEL.

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts

Lock washers (13)

Lock washers (4)

Lock washers (2)

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,

Disconnect power cable from unit.

a. Removal.

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

(2) Remove 13 sets of screws (3) and lock washers (4) and four sets of screws (5), lock washers (6), and flat washers (7).

(3) Carefully pull access panel (8) from unit as far as wiring harnesses will allow.

(4) Remove two sets of screws (9), nuts (10), flat washers (11), and lock washers (12) holding connector (13) to access panel (8).

(5) Remove four sets of screws (14), nuts (15), and lock washers (16) holding connector (17) and rubber gasket (18) to access panel (8).

4-12. ELECTRICAL ACCESS PANEL. - continued

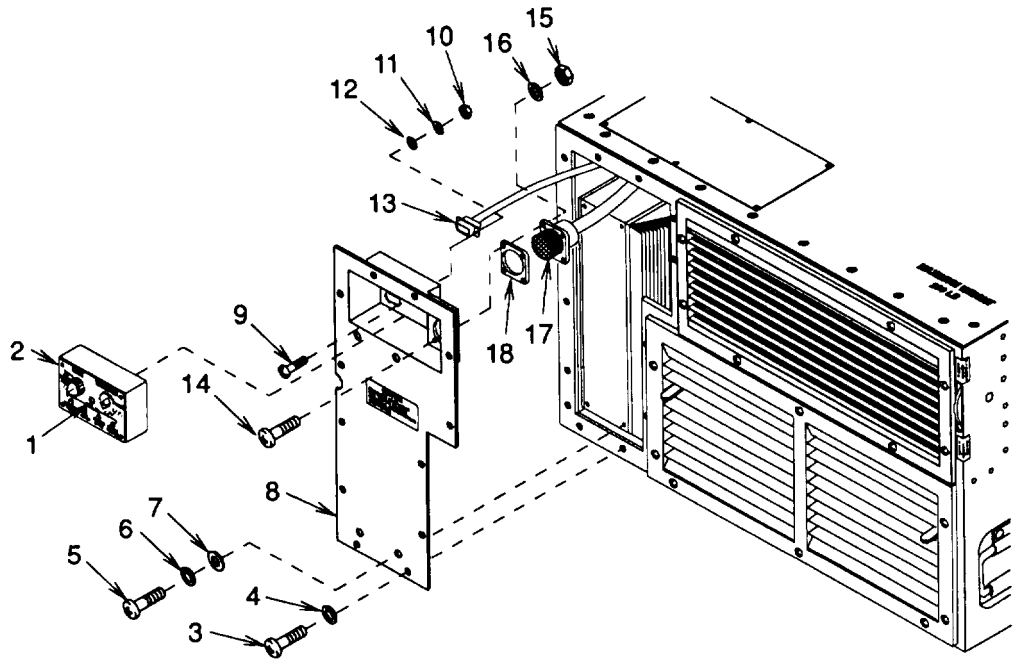


Figure 4-10. Electrical Access Panel

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.

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

c. Install.

(1) Position rubber gasket (18) and connector (17) onto access panel (8) and secure with four sets of screws (14), lock washers (16), and nuts (15).

(2) Position connector (13) onto access panel (8) and secure with two sets of screws (9), lock washers (12), flat washers (11), and nuts (10).

(3) Position access panel (8) onto unit and align mounting holes. Secure with four sets of screws (5), lock washers (6) and flat washers (7) and 13 sets of screws (3) and lock washers (4).

(4) Carefully work control panel (2) onto unit and tighten captive mounting screw (1) to secure in place.

4-12. ELECTRICAL ACCESS PANEL. - continued

NOTE

FOLLOW-ON MAINTENANCE:

Connect power cable to unit.

Connect power at power source.

4-13. CIRCUIT BREAKER AND PRESSURE SWITCH COVER (EMP EQUIPPED UNITS ONLY).

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts

Lock Washers (6)

Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

a. Remove.

Remove six sets of screws (1), lock washers (2), and flat washers (3). Remove cover (4).

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 the cover with a rag dampened with a detergent solution or dry cleaning solvent. Use a soft brush if necessary to dislodge caked on dirt. Dry the item thoroughly.

4-13. CIRCUIT BREAKER AND PRESSURE SWITCH COVER (EMP EQUIPPED UNITS ONLY). - continued

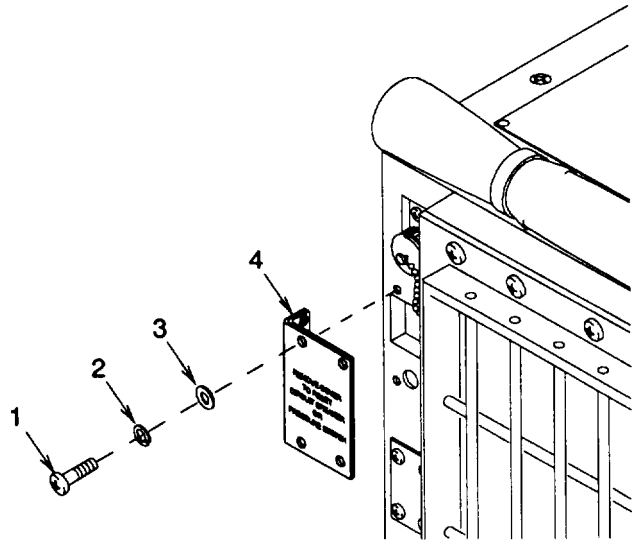


Figure 4-11. Circuit Breaker and Pressure Switch Cover

c. Install.

Position cover (4) onto unit and align the mounting holes. Secure with six sets of screws (1). lock washers (2), and flat washers (3).

4-14. SIGHT GLASS COVER (EMP EQUIPPED UNITS ONLY).

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts

Lock Washers (4)

Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

a. Remove.

Remove four sets of screws (1), lock washers (2), and flat washers (3). Remove cover (4).

4-14. SIGHT GLASS COVER (EMP EQUIPPED UNITS ONLY). - continued]

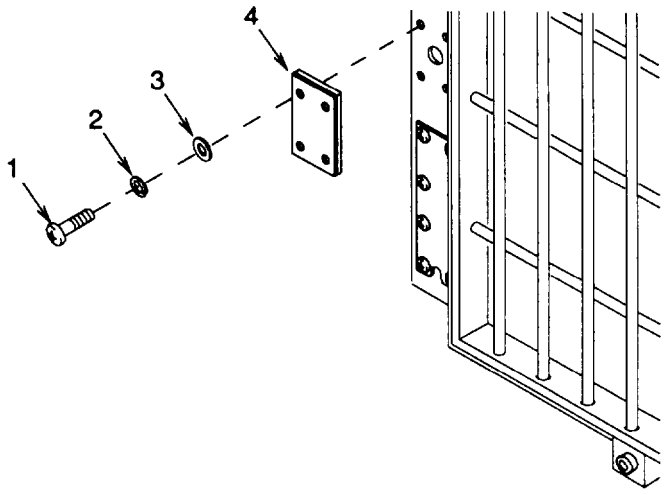


Figure 4-12. Sight Glass Cover

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.

b. Clean.

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

c. Install.

Position cover (4) onto unit and align the mounting holes. Secure with four sets of screws (1). lock washers (2), and flat washers (3).

4-15. VENTILATION COVER (EMP EQUIPPED UNITS ONLY).

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts

Lock Washers (4)

Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

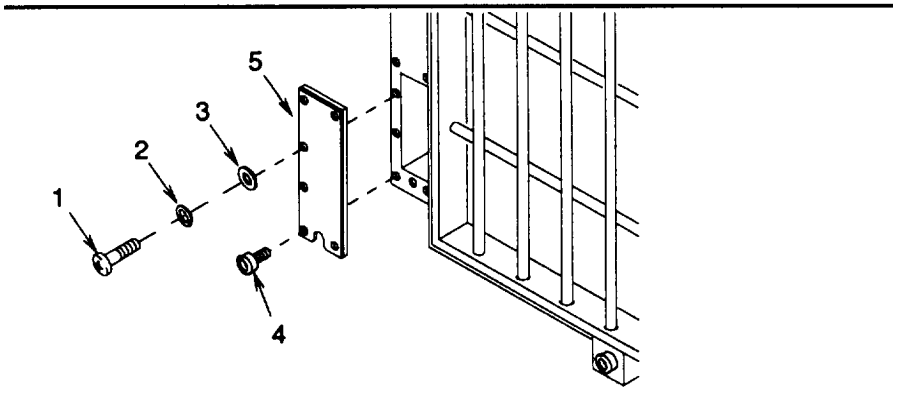


Figure 4-13. Ventilation Cover

a. Remove.

Remove four sets of screws (1), lock washers (2), flat washers (3), and two snap fastener studs (4). Remove cover (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.

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

c. Install.

Position cover (5) onto unit and align the mounting holes. Secure with four sets of screws (1), lock washers (2), flat washers (3), and two snap fastener studs (4).

4-16. VENTILATION GUARD (FRESH AIR) (NOT USED ON EMP EQUIPPED UNITS).

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts

Lock Washers (2)

Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

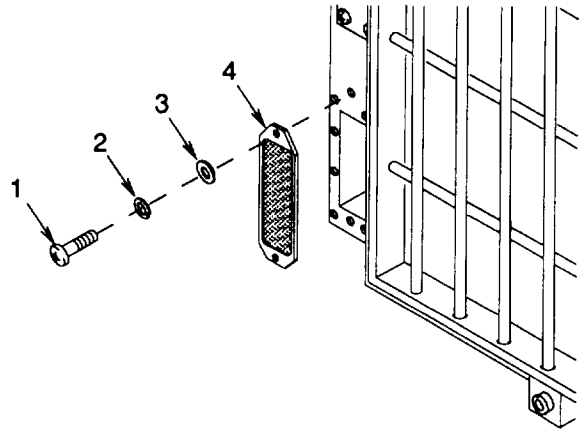


Figure 4-14. Ventilation Guard

WARNING

When the unit is to be operated in a nuclear/biological/chemical (NBC) environment the fresh air opening must be sealed or connected to an appropriate NBC filtering device.

a. Remove.

Remove two sets of screws (1), lock washers (2) and flat washers (3). Remove ventilation guard (4).

4-16. VENTILATION GUARD (FRESH AIR) (NOT USED ON EMP EQUIPPED UNITS) - 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 brush the dirt from the screen. If the screen is extremely dirty, clean with a detergent solution or dry cleaning solvent.

c. Replace.

Replace ventilation guard (4) if badly dented or bent or if wire screen is tom.

d. Install.

Position ventilation guard (4) against unit and aline mounting holes. Secure in place with two sets of screws (1), lock washers (2), and flat washers (3).

4-17. CONDENSER END GUARD AND EMI SCREEN.

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts

Lock Washers (27)

Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

a. Remove.

(1) Remove 27 sets of screws (1) and lock washers (2). Remove guard (3) and EMI screen (4) (EMP equipped units only).

(2) Remove four snap fastener studs (5) from guard (3).

4-17. CONDENSER END GUARD AND EMI SCREEN. - continued

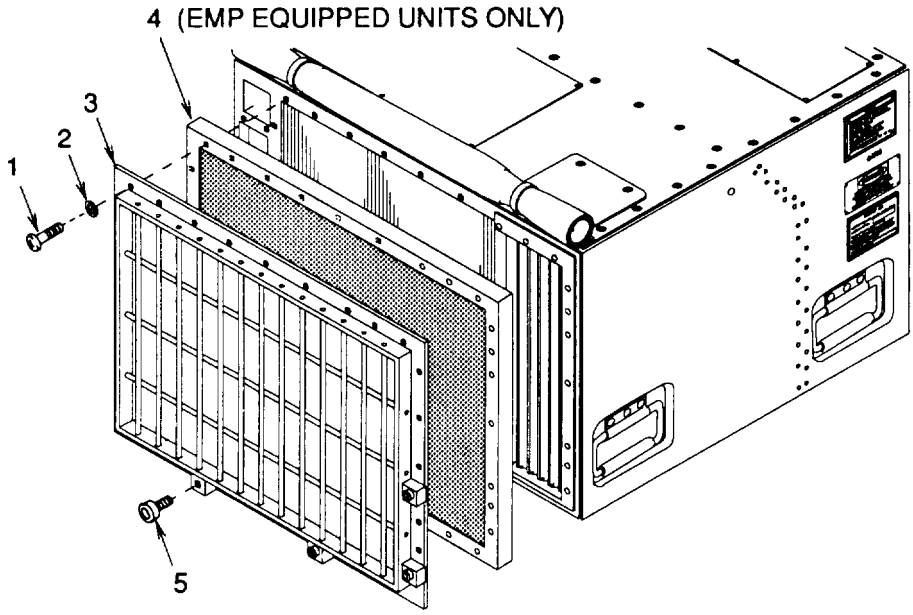


Figure 4-15. Condenser End Guard and EMI Screen

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 brush the dirt from the guard and screen. If the item is extremely dirty, clean with a detergent solution or dry cleaning solvent.

c. Replace.

Replace guard (3) or EMI screen (4) (EMP equipped units only) if badly dented or bent or if EMI screen is torn.

d. Install.

(1) Position EMI screen (4) (EMP equipped units only) and guard (3) against unit and aline mounting holes. Secure in place with 27 sets of screws (1) and lock washers (2).

(2) Install four snap fastener studs (5) into guard (3).

4-18. RETURN AIR LOUVER AND AIR FILTER.

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
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.

Materials/Parts

Air Filter

Lock Washers (8)

Rags
Appendix E, item 13

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

Air Filter Coater
Appendix E, item 1

a. Remove.

(1) Remove eight sets of screws (1) and lock washers (2). Remove louver (3).

(2) Remove filter (4) from clips on back of louver (3).

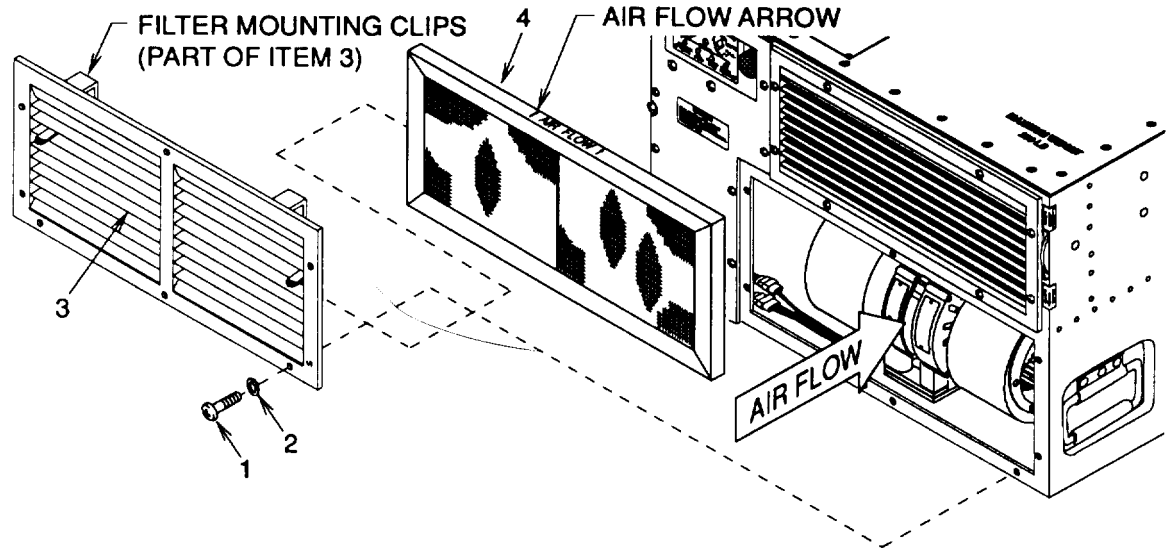


Figure 4-16. Return Air Louver and Air Filter

4-18. RETURN AIR LOUVER AND 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) Usually it is only necessary to wipe or brush the dirt from the louver (3). If the louver is extremely dirty, it can be washed following the same procedure as the filter (4).

(2) Immerse fitter (4) in mild detergent solution or dry cleaning solvent.

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

(4) Rinse in clear water.

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

(6) Be sure filter (4) is totally dry prior to installation.

c. Inspect.

(1) Check louver (3) for bent, missing, or damaged blades. Notify supervisor if louver is damaged.

(2) Check filter (4) for punctures, cuts, and damaged edges that would allow passage of unfiltered air.

(3) Check fitter (4) for packed or mashed areas that would block airflow.

(4) Replace filter (4) if damaged.

d. Replace.

Replace louver (3) if badly dented, bent, or damaged.

e. Install.

(1) Sparingly apply air filter coater to filter.

(2) Place fitter (4) in retainer clips with air fbw arrows pointing away from louver (3).

(3) Position louver (3) on unit and aline mounting holes. Secure in place with eight sets of screws (1) and lock washers (2).

f. adjust.

Adjust louver (3) blades to desired msition.

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

4-19. SUPPLY AIR LOUVER.

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts

Lock washers (8)

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.

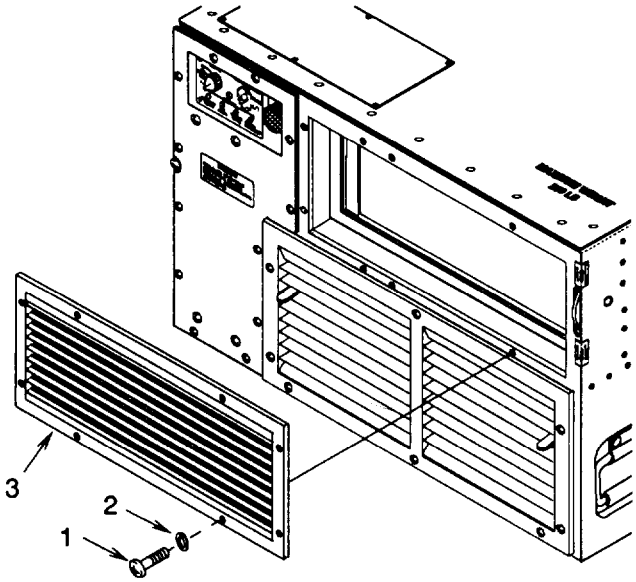


Figure 4-17. Supply Air Louver

a. Remove.

Remove eight sets of screws (1) and lock washers (2). Remove louver (3).

4-19. SUPPLY AIR LOUVER. - 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) Usually it is only necessary to wipe or brush the dirt from the louver (3).

(2) If the louver (3) is extremely dirty, immerse in mild detergent solution or dry cleaning solvent.

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

(4) Rinse in clear water.

(5) Be sure louver (3) is totally dry prior to installation.

c. Inspect.

Check louver (3) for bent, missing, or damaged blades. Notify supervisor if damaged.

d. Replace.

Replace louver (3) if badly dented, bent, or damaged.

e. Install.

Position louver (3) on unit and aline mounting holes. Secure in place with eight sets of screws (1) and lock washers (2).

f Adjust.

Adjust louver (3) blades to desired position.

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

4-20. 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 B, item 2

Materials/Parts

Mist Eliminator

Dry Cleaning Solvent
Appendix E, item 3

Detergent
Appendix E, item 15

Equipment Conditions:

Remove top panel (para 4-11).

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. Remove.

Pull mist eliminator (1) up and out of mounting frame.

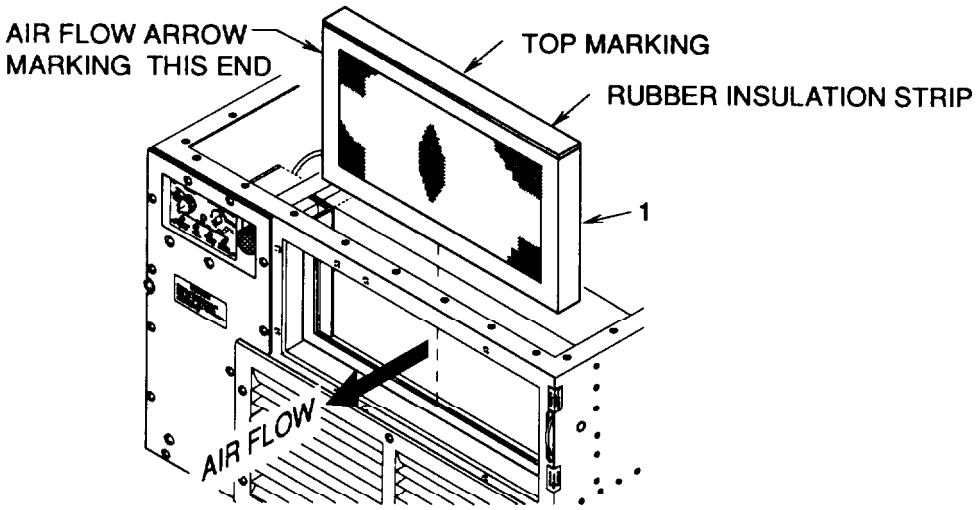


Figure 4-18. Mist Eliminator

4-20. 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 detergent solution or dry cleaning solvent.

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

(3) Rinse in clean water.

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

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.

(1) TOP marking must be up and airflow arrows, located on side or bottom, must point outward away from coil.

(2) Slide mist eliminator (1) down into mounting frames observing air flow arrows and TOP marking.

NOTE

FOLLOW-ON MAINTENANCE:

Install top panel (para 4-11).

Connect power at power source.

4-21. CONDENSER AIR DISCHARGE LOUVER AND LINKAGE.

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Rivet Gun
Appendix B, item 11

Scrub Brush
Appendix B, item 2

Materials/Parts

Lock Washer

Lock Washers (4)

Cotter Pins (5)

Rivets (5)

Rags
Appendix E, item 13

Detergent
Appendix E, item 15

Equipment Conditions:

Remove top panel (para 4-11).

Remove condenser end guard and EMI screen (para 4-17).

Personnel Required

Two

a. Clean.

(1) Clean the louver assembly with a soft brush or wash with water and a mild detergent solution.

(2) Clean linkage assembly with a soft brush and damp rag.

b. Inspect.

(1) Check louver assembly for bent blades, missing or damaged gaskets, and missing hardware or bearings.

(2) Check connecting linkage and pivot arm assembly for looseness or binding.

4-21. CONDENSER AIR DISCHARGE LOUVER AND LINKAGE. - continued

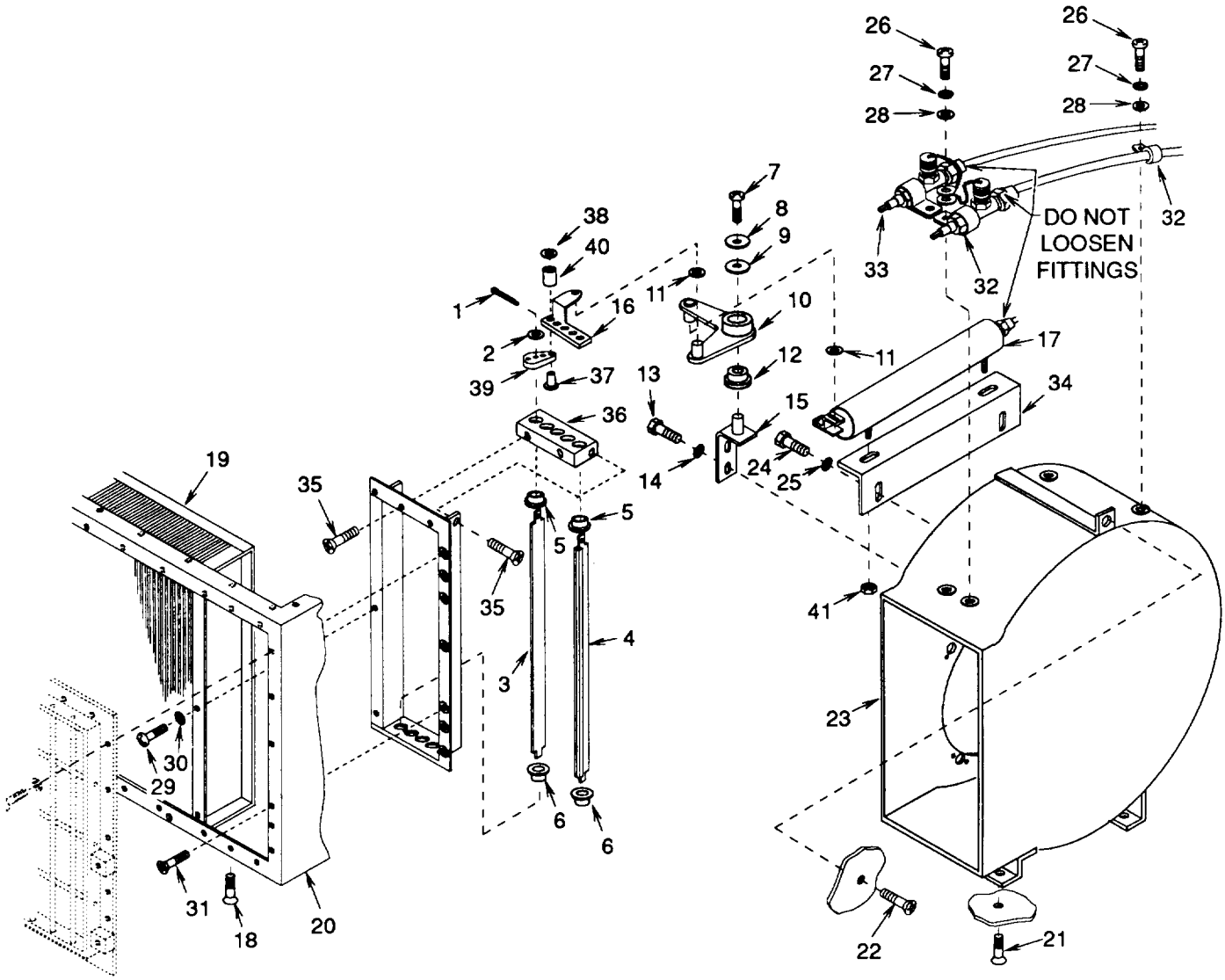


Figure 4-19. Condenser Air Discharge Louver and Linkage

c. Replace.

(1) Louver blade or bearings only.

NOTE

Individual louver blades are flexible enough for removal.

(a) Remove cotter pin (1) and flat washer (2) from louver blade (3 or 4) to be removed.

(b) Flex or spring louver blade (3 or 4) to remove ends from bearings (5 and 6). Remove blade.

(c) Replace worn or damaged bearing (5 or 6).

4-21 . CONDENSER AIR DISCHARGE LOUVER AND LINKAGE. - continued

(d) Flexor spring louver blade (3 or 4) and install.

(e) Install flat washer (2) and cotter pin (1).

(2) Pivot arm and bracket assembly.

(a) Remove screw (7) and flat washers (8 and 9).

(b) Remove pivot arm (10) being careful not to lose two nylon washers (11).

(c) Remove sleeve bearing (12).

(d) Remove two sets of screws (13) and flat washers (14). Remove pivot bracket (15).

(e) Replace any worn or damaged parts.

(f) Install pivot bracket (15) and secure with with two setsof screws (13) and flat washers (14).

(g) Install sleeve bearing (12).

(h) install pivot arm (10) with two nylon washers (11) on posts and inserl into connecting link (16) and actuating cylinder (17) plate.

(i) Install screw (7) and flat washers (8 and 9).

(3) Louver assembly.

WARNING

Do not tamper with actuating cylinder or refrigerant tubing connections on a pressurized (charged) system. Injury to personnel can result.

To avoid injury to personnel, two people are required to lift unit.

CAUTION

Do not lay unit on side to access bottom, compressor damage can result from oil being displaced.

(a) Lift and support unit to access hardware in bottom of casing.

(b) Remove four screws (18) securing condenser coil (19) to unit casing (20).

(c) Remove six screws (21) and one screw (22) securing condenser fan housing (23) to unit casing (20).

4-21. CONDENSER AIR DISCHARGE LOUVER AND LINKAGE. - continued

CAUTION

Overheating in cooling mode of operation can result if condenser fins are damaged.

(d) Protect the inside condenser coil (19) fins from damage using thin plywood, heavy cardboard, or any suitable material.

(e) Remove pivot arm and bracket assembly (step (2) above).

CAUTION

If refrigerant lines and components must be moved, be careful not to kink tubing. Refrigerant leak can result.

(f) Remove two sets of screws (24) and flat washers (25).

(g) Remove four sets of screws (26), lock washers (27), and flat washers (28).

(h) Remove three sets of screws (29) and lock washers (30) and two screws (31).

CAUTION

The louver assembly is very difficult to remove from the unit. Be careful not to damage the equipment.

(i) Carefully move the condenser coil (19) and condenser fan housing (23) only enough to allow removal of the louver assembly. Lift and cock the louver assembly to remove (bottom first) from back of unit.

(j) Replace louver assembly if damaged beyond repair.

(k) Cock and install louver assembly (top first) into back of unit.

(l) Secure louver assembly to unit casing (20) using three sets of screws (29) and lock washers (30) and two screws (31).

(m) Secure four clamps (32) and two service valve (33) cap chains to condenser fan housing (23) using four sets of screws (26), lock washers (27), and flat washers (28).

(n) Secure bracket (34) to condenser fan housing (23) using two screws (24) and flat washers (25).

(o) Install pivot arm and bracket assembly (step (2) above).

(p) Remove material used to protect condenser coil (19) fins.

(q) Secure condenser fan housing (23) to unit casing (20) using six screws (21) and one screw (22).

(r) Secure condenser coil (19) to unit casing (20) using four screws (18).

4-21. CONDENSER AIR DISCHARGE LOUVER AND LINKAGE. - continued

WARNING

To avoid injury to personnel, two people are required to lift unit.

(s) Lower unit from supports.

(4) Connecting linkage assembly.

(a) Remove louver assembly (step (3) above).

(b) Remove five cotter pins (1) and flat washers (2). Remove connecting link (16) assembly.

(c) Remove four screws (35) and one bearing plate (36). Remove five louver blade bearings (5).

(d) Remove five sets of rivets (37), flat washers (38), louver blade arms (39), and sleeve spacers (40).

(e) Replace any worn or damaged parts.

(f) Install five sets of sleeve spacers (40), louver blade arms (39), flat washers (38) and secure with rivets (37).

(g) Install five louver blade bearings (5) onto louvers (3 and 4). Install bearing plate (36) onto louver blade bearings and secure with four screws (35).

(h) Install connecting link (16) assembly onto louver blades (3 and 4). Secure with five sets of flat washers (2) and cotter pins (1).

(i) Install louver assembly (step (3) above).

d. Adjust.

NOTE

If unit has been operating wait until it has cooled to ambient temperature, approximately four hours.

(1) Loosen two screws (13) only enough to move pivot bracket (15) up or down.

(2) Position pivot bracket (15) to fully insert pivot arm (10) pin into connecting link (16). Tighten two screws (13).

(3) Loosen two screws (24) only enough to move bracket (34) up or down.

(4) Position bracket (34) to fully insert pivot arm (10) pin into actuating cylinder (17) plate. Tighten two screws (24).

4-21. CONDENSER AIR DISCHARGE LOUVER AND LINKAGE. - continued

(5) Loosen two nuts (41) just enough to move actuating cylinder (17) in bracket (34).

(6) Position actuating cylinder (17) to tightly close louvers, Tighten two nuts (41).

NOTE

FOLLOW-ON MAINTENANCE:

Install top panel (para 4-11).

Install condenser end guard and EMI screen (para 4-17).

4-22. FRESH AIR DAMPER AND ACTUATOR.

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Rags
Appendix E, item 13

Equipment Conditions:

Remove supply air louver (para 4-19).

Remove return air louver (para 4-18).

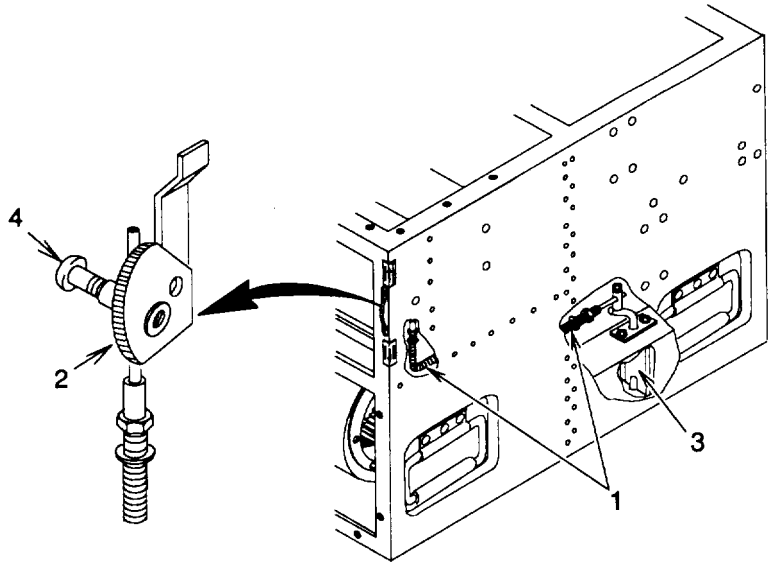


Figure 4-20. Fresh Air Damper and Actuator

4-22. FRESH AIR DAMPER AND ACTUATOR. - continued

a. Inspect.

(1) Check push-pull control cable (1) for operation by turning actuator plate wheel (2).

(2) Check that damper (3) moves when actuator plate wheel (2) is turned.

b. Clean.

Wipe loose dirt from controls and linkages with a clean cloth.

c. Adjust.

(1) Loosen screw (4) to release push-pull control cable (1) end.

(2) Move push-pull control cable (1) end in and out and position at the center between the two extreme stop points of damper (3).

(3) Move actuator plate wheel (2) so that it is centered on the curved portion of the plate.

(4) Tighten screw (4).

(5) Check actuator plate wheel (2) for smooth operation and damper (3) movement.

NOTE

FOLLOW-ON MAINTENANCE:

Install return air louver (para 4-1 8).

Install supply air louver (para 4-19).

4-23. CONDENSATE DRAIN.

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Tee Connector

Tubing
Appendix F, figure F-17

Equipment Conditions.

Remove return air louver (para 4-18).

Remove supply air louver (para 4-19).

Remove mist eliminator (para 4-20).

a. Remove.

(1) Slip clamps (1) off connection points.

(2) Pull tubing (2) loose from drain pan (3) connections (4) and bulkhead (5) connection (6).

(3) Pull tubing (2) loose from tee connector (7).

(4) Remove clamps (1) from tubing (2).

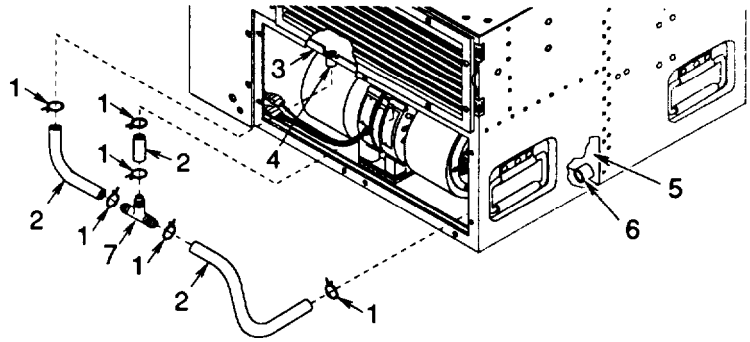


Figure 4-21. Condensate Drain Lines

b. Inspect.

(1) Check tubing (2) for cuts, splits, and deteriorated condition.

(2) Check that aluminum tube from bulkhead (5) connection (6) to rear of unit is not clogged.

(3) Check that tee connector (7) is not clogged.

4-23. CONDENSATE DRAIN. - continued

c. Clean.

(1) Clean connection (4) tubes in bottom of drain pan (3).

(2) Clean aluminum tube running from bulkhead (5) connection (6) to rear of unit.

(3) Clean tee connector (7).

(4) Flush tubes (2) and tee connector (7) with clean water.

d. Replace.

Replace damaged tubing or tee connection found during inspection.

e. Install.

(1) Slide clamps (1) onto tubes (2) away from connection points.

(2) Slip tubing (2) onto tee connector (7). Slip clamps (1) over connection points.

(3) Slip tubing (2) onto connection (4) in drain pan (3) and connection (6) in bulkhead (5). Slip clamps(1) over connection points.

NOTE

FOLLOW-ON MAINTENANCE:

Install mist eliminator (para 4-20).

Install supply air louver (para 4-19).

Install return air louver (para 4-18).

4-24. 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 it 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 rovers the joint, and shrink in place with moderate heat.

4-24. ELECTRICAL WIRING REPAIR - GENERAL. - continued

(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) 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 fromm 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 4-3, Wire List, and to the wiring diagram figure 4-6.

Table 4-3. WIRE LIST

Termination		Termination		AWG Wire	Length	
From	Terminal Type	To	Terminal Type	Size	IN.	CM
		WIRING HARNESS, COMPRESSOR				
P11-A		K2-A2	MS25036-112	12	23.5	59.7
P11-B		K2-B2	MS25036-112	12	24.2	61.3
P11-C		K2-C2	MS25036-112	12	24.8	62.9
P11-D		S6-2	MS25036-108	16	34.0	86.4
P11-F		TB1-1	MS25036-108	16	33.5	85.1
P11-G		TB1-2	MS25036-108	16	34.2	86.9
P11-F		J7-2	13229E4273	16	15.0	38.1
J7-1		S7-1	MS25036-108	16	35.0	88.9
		LEAD, ELECTRICAL				
E1	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-A1	MS25036-108	TB1-1	MS25036-108	16	21.5	54.6
K1-B1	MS25036-108	TB1-2	MS25036-108	16	21.5	54.6
K1-C1	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	MS25036-108	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

Table 4-3. WIRE LIST - continued

Termination		Termination		AWG Wire	Length	
From	Terminal Type	To	Terminal Type	Size	IN.	CM
		WIRING HARNESS				
J10-A	MS3102R20-15P	B1-T1	(00779) 42563-2	14	4.0	10.2
J10-B	MS3102R20-15P	B1-T2	(00779) 42563-2	14	4.0	10.2
J10-C	MS3102R20-15P	B1-T3	(00779) 42563-2	14	4.0	10.2
J10-D	MS3102R20-15P	J10-E		20	4.0	10.2
J10-E	MS3102R20-15P	J10-D		20	4.0	10.2
J10-F	MS3102R20-15P	HR7			12.0	30.5
J10-G	MS3102R20-15P	HR7			12.0	30.5
		WIRING HARNESS, CB1/E1 to TB1				
CB1-LOAD 1	MS25036-115	TB1-1	MS25036-115	8	52.5	133.4
CB1-LOAD 2	MS25036-115	TB1-2	MS25036-115	8	59.2	150.2
CB1-LOAD 3	MS25036-115	TB1 -3	MS25036-115	8	52.4	133.1
E1	MS25036-115	TB1-5	MS25036-115	8	8.0	20.3
BRAID	BRAID	E1	MS25036-108	16	8.0	20.3
		WIRING HARNESS, J4-P15				
J4-A	13229E6716-1	P15-A	13229E6718-2	8	45.0	114.3
J4-B	13229E6716-1	P15-B	13229E6718-2	8	45.0	114.3
J4-C	13229E6716-1	P15-C	13229E6718-2	8	45.0	114.3
J4-D	13229E6716-1	P15-D	13229E6718-2	8	45.0	114.3
J4-E	13229E6716-1	P15-E	13229E6718-2	8	45.0	114.3
		WIRING HARNESS, J5-P15A				
J5-A	13229E6716-1	P15A-A	13229E6718-2	8	45.0	114.3
J5-B	13229E6716-1	P15A-B	13229E6718-2	8	45.0	114.3
J5-C	13229E6716-1	P15A-C	13229E6718-2	8	45.0	114.3
J5-D	13229E6716-1	P15A-D	13229E6718-2	8	45.0	114.3
J5-E	13229E6716-1	P15A-E	13229E6718-2	8	45.0	114.3

Table 4-3. WIRE LIST - continued

Termination		Termination		AWG Wire	Length	
From	Terminal Type	To	Terminal Type	Size	IN.	CM
		WIRING HARNESS, J6 to P1				
J6-1	M24308/2-2	P1-8	M24308/2-2		20.0	50.8
J6-2	M24308/2-2	P1-7	M24308/2-2		20.0	50.8
J6-3	M24308/2-2	P1-6	M24308/2-2		20.0	50.8
J6-4	M24308/2-2	P1-5	M24308/2-2		20.0	50.8
J6-5	M24308/2-2	P1-4	M24308/2-2		20.0	50.8
J6-6	M24308/2-2	P1-3	M24308/2-2		20.0	50.8
J6-7	M24308/2-2	P1-2	M24308/2-2		20.0	50.8
J6-8	M24308/2-2	P1-1	M24308/2-2		20.0	50.8
J6-9	M24308/2-2	P1-15	M24308/2-2		20.0	50.8
J6-10	M24308/2-2	P1-14	M24308/2-2		20.0	50.8
J6-11	M24308/2-2	P1-13	M24308/2-2		20.0	50.8
J6-12	M24308/2-2	P1-12	M24308/2-2		20.0	50.8
SHIELD	13229E4286	GND	MS25036-148	20	4.0	10.2
		WIRING HARNESS, J8 to TB2				
* Use (97403) 13229E4181-2 (97403) 13229E4272		Connector, Pin Housing Pin, Connector				
**Use (97403) 13229E4181-2 (97403) 13229E4273		Connector, Pin Housing Socket, Connector				
J8-1	*	TB2-1	MS25036-108	16	27.3	69.3
J8-2	*	TB2-2	MS25036-108	16	26.6	67.5
J8-3	*	TB2-3	MS25036-108	16	25.9	65.8
J8-4	**	TB2-5	MS25036-108	16	24.5	62.3
		WIRING HARNESS, J10-K2/E1				
* Use (97403) 13229E4181-2 (97403) 13229E4272		Connector, Pin Housing Pin, Connector				
** Use (97403) 13229E4181-2 (97403) 13229E4273		Connector, Pin Housing Socket, Connector				
J10-1	*	K2-A2	MS25036-108	16	24.3	61.6
J10-2	*	K2-B2	MS25036-108	16	23.1	58.7
J10-3	*	K2-C2	MS25036-108	16	22.0	55.9
J10-4	**	E1	MS25036-108	16	10.0	25.4

Table 4-3. WIRE LIST - continued

Termination		Termination		AWG Wire	Length	
From	Terminal Type	To	Terminal Type	Size	IN.	CM
		WIRING HARNESS, J13 to TB1				
*Use (97403) 13229E7620-2		Receptacle				
(97403) 13228E7263		Contact, Female				
J13-1	*	TB1-1	MS25036-115	8	6.8	17.1
J13-2	*	TB1-2	MS25036-115	8	6.2	15.7
J13-3	*	TB1-3	MS25036-115	8	5.6	14.3
J13-4	*	TB1-4	MS25036-115	8	5.1	12.9
J13-5	*	TB1-5	MS25036-115	8	4.5	11.5
SHIELD	-	TB1-5	MS25036-103	20	3.0	7.6
		WIRING HARNESS, K2 to TB2				
TB2-1	MS25036-153	K2-A1	MS25036-108	16	29.0	73.4
TB2-2	MS25036-153	K2-B1	MS25036-108	16	29.1	74.0
TB2-3	MS25036-153	K2-C1	MS25036-108	16	29.3	74.3
		WIRING HARNESS, P3				
*Use (97403) 13229E4181-1		Connector, Pin Housing				
(97403) 13229E4272		Pin, Connector				
**Use (97403) 13229E4181-1		Connector, Pin Housing				
(97403) 13229E4273		Socket, Connector				
J9-1	*	S7-2	MS25036-103	20	62.0	157.5
TB3-1	MS25036-101	K2-X2	MS25036-149	20	34.0	86.4
TB3-2	MS25036-101	K1-X2	MS25036-149	20	5.0	12.7
TB3-3	MS25036-101	CR1-4(-)	-	20	5.0	12.7
TB3-4	MS25036-101	J9-2	**	20	28.0	71.1
TB3-5	MS25036-101	S3-1	MS25036-103	20	4.0	10.2
TB3-6	MS25036-101	S2-1	13216E6191-1	20	30.0	76.2
		WIRING HARNESS, P3				
P3-3	13229E4183	TB3-1	MS25036-145	24	10	25.4
P3-4	13229E4183	TB3-2	MS25036-145	24	10	25.4
P3-5	13229E4183	TB3-3	MS25036-145	24	10	25.4
P3-6	13229E4183	TB3-4	MS25036-145	24	10	25.4
P3-7	13229E4183	TB3-5	MS25036-145	24	10	25.4
P3-8	13229E4183	TB3-6	MS25036-145	24	10	25.4
P3-1	13229E4183	RT1-1	13229E4176	24	10	25.4
P3-2	13229E4183	RT1-2	1322934176	24	10	25.4

Table 4-3. WIRE LIST - continued

From	Terminal Type	To	Terminal Type	Wire Size	Length IN.	Length CM
		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-C1	-	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, P12 to TB2				
*Use	(97403) 13229E7259-2	Plug				
	(97403) 13229E7262	Contact, Male				
P12-1	*	TB2-1	MS25036-115	8	7.8	19.7
P12-2	**	TB2-2	MS25036-115	8	7.1	18.0
P12-3	*	TB2-3	MS25036-115	8	6.4	16.2
P12-5	*	TB2-5	MS25036-115	8	5.0	12.7
SHIELD	-	TB2-5	MS25036-103	20	4.3	11.0
		WIRING HARNESS, P16 to CB1/E1				
P16-A	13229E6718-1	CB1-LINE 1	MS25036-115	8	42.5	108.0
P16-B	13229E6718-1	CB1-LINE 2	MS25036-115	8	43.3	109.9
P16-C	13229E6718-1	CB1-LINE 3	MS25036-115	8	44.0	111.8
P16-D	13229E6718-1	TB1-4	MS25036-115	8	21.0	53.4
P16-E	13229E6718-1	E1	MS25036-115	8	25.0	63.5

4-25. 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.

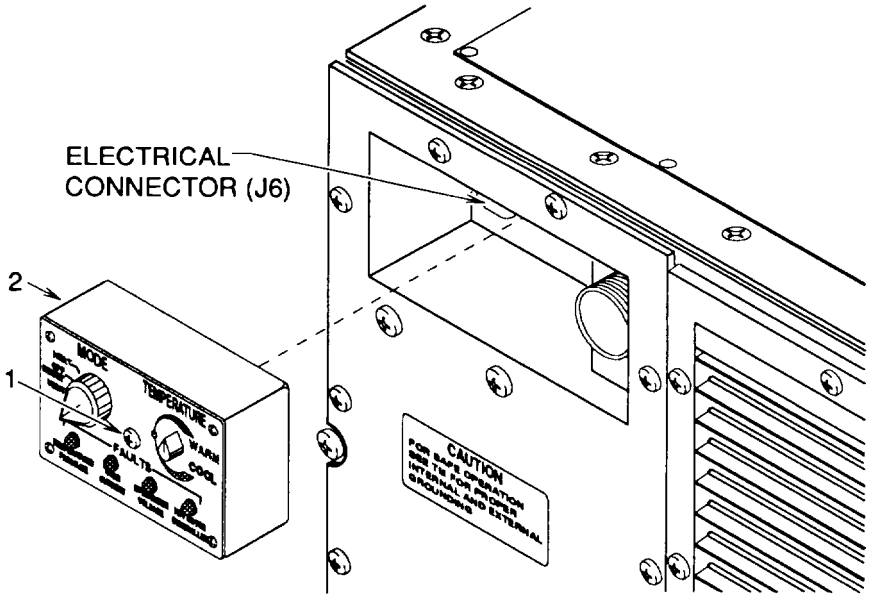


Figure 4-22. Control Panel Removal

4-25. CONTROL PANEL. - continued

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 4-27 through 4-30 for individual components.

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.

4-26. 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

Heat Gun
Appendix B, item 4

Soldering Gun Kit
Appendix B, item 2

Materials/Parts

Control Panel Wiring Harness

Lock Washers (6)

Solder
Appendix E, item 7

Insulation Sleeving
(Heat-Shrink Tubing)

Equipment Conditions:

Remove control panel (para 4-25).

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.

(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.

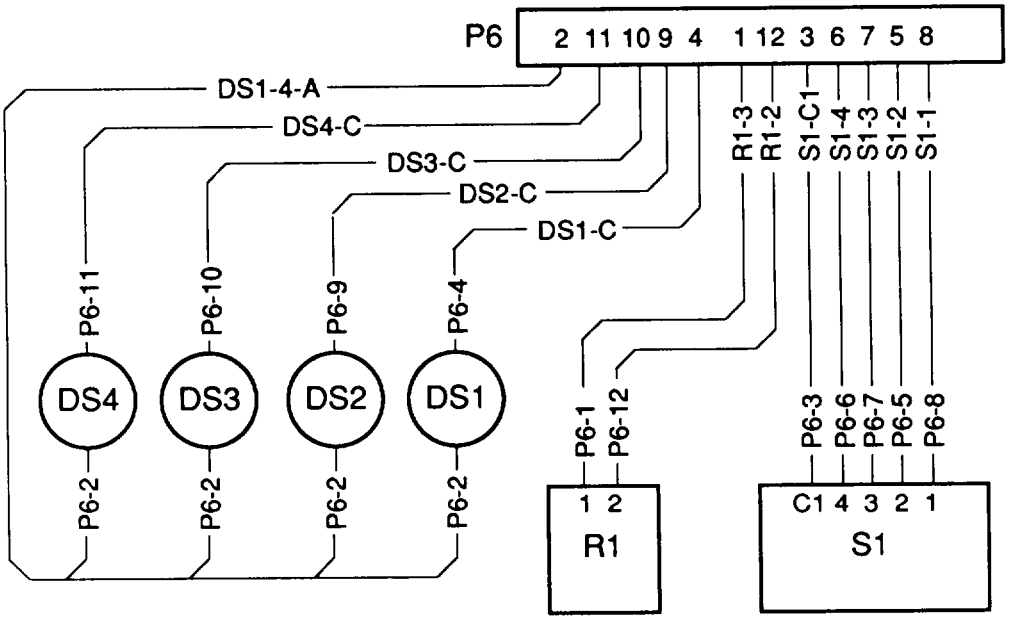
See wiring diagram (figure 4-6) and continuity test individual wires. Repair or replace wires with no continuity.

c. Repair.

(1) See paragraph 4-24 for general wire repair instructions.

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

4-26. WIRING HARNESS, CONTROL PANEL. - continued



CONTROL PANEL WIRING DIAGRAM

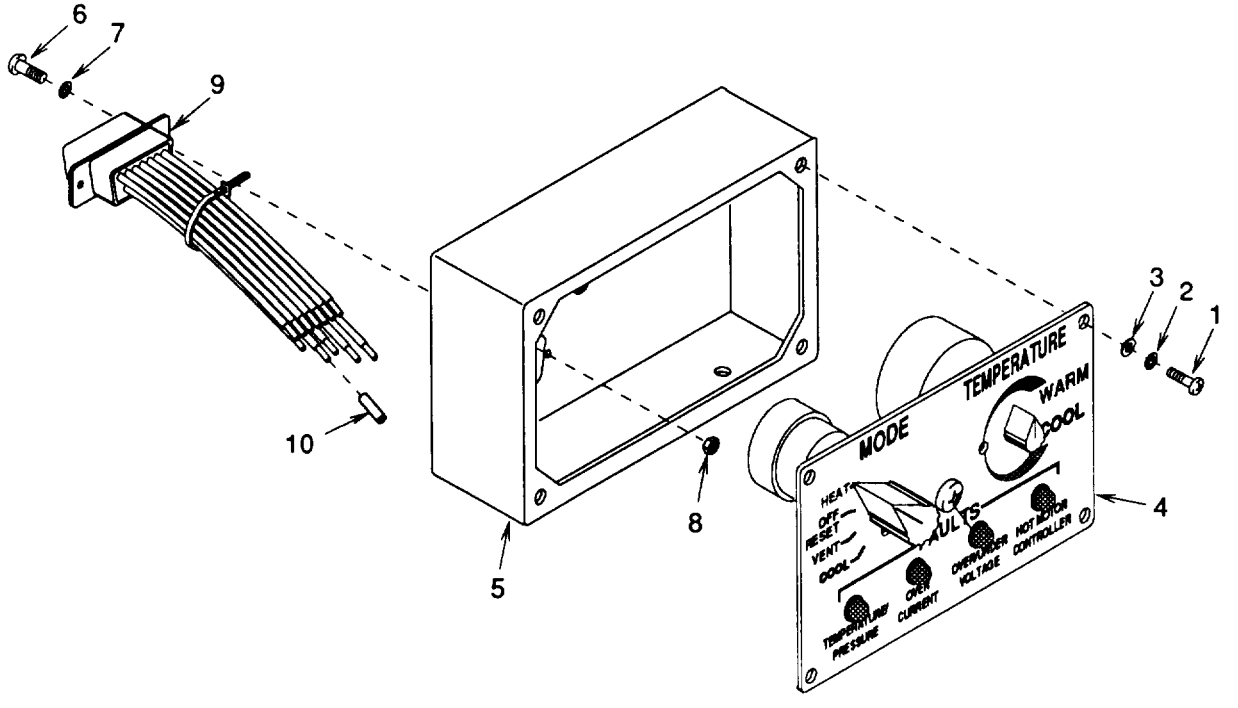


Figure 4-23. Wiring Harness, Control Panel

4-26. WIRING HARNESS, CONTROL PANEL. - continued

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 (figure 4-6).

(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 4-25).

4-27. 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

Heat Gun
Appendix B, item 4

Soldering Gun Kit
Appendix B, item 2

Materials/Parts

Potentiometer

Lock Washers (4)

Solder
Appendix E, item 7

Insulation Sleeving
(Heat-Shrink Tubing)

Equipment Conditions:

Remove control panel (para 4-25).

a. Inspect.

(1) Remove four sets of screws (1), bck 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 potentiometer TEMPERATURE control (6) for general condition and loose, broken, or missing terminals. Replace potentiometer if damaged.

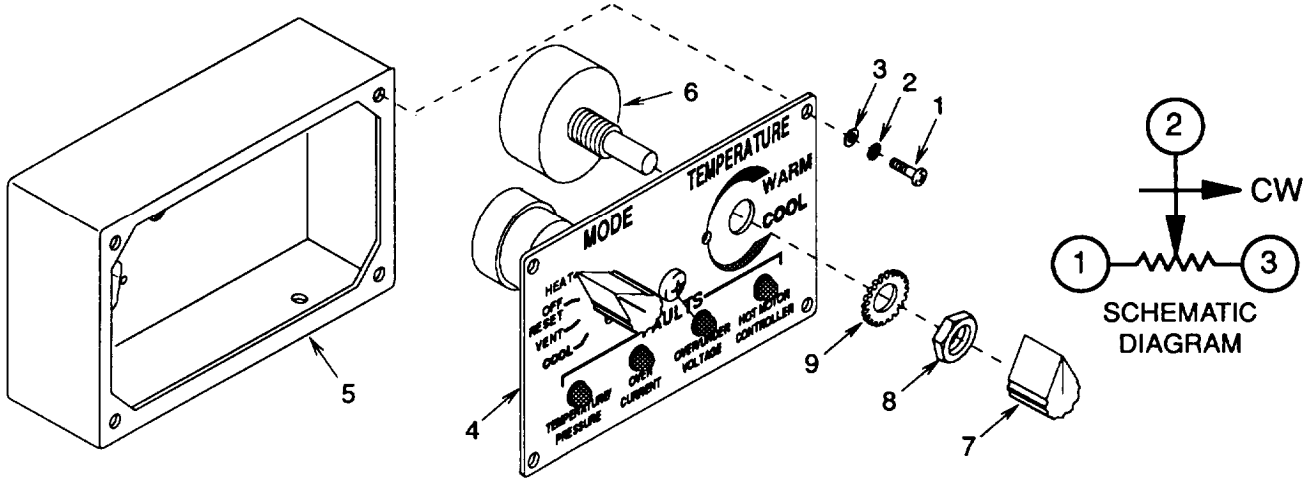


Figure 4-24. Potentiometer (TEMPERATURE Control) (R1)

4-27. POTENTIOMETER (TEMPERATURE CONTROL) (R1). - continued

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 control. (See paragraph 4-24.)

(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 4-6). (See paragraph 4-24.)

(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 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 4-25).

4-28. 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

Heat Gun
Appendix B, item 4

Soldering Gun Kit
Appendix B, item 2

Materials/Parts

Mode Selector Rotary Switch

Lock Washers (4)

Solder
Appendix E, item 7

Insulation Sleeving
(Heat-Shrink Tubing)

Equipment/Conditions:

Remove control panel (para 4-25).

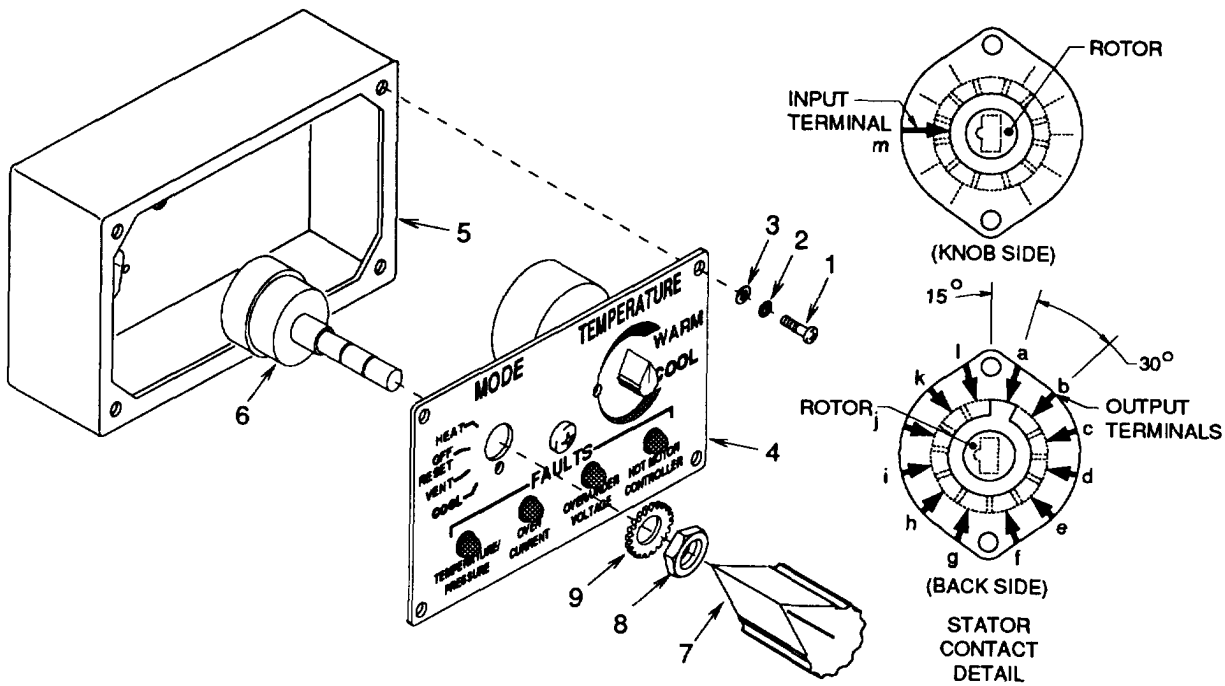


Figure 4-25. MODE Selector Rotary Switch (S1)

a. Inspect.

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

4-28. MODE SELECTOR ROTARY SWITCH (S1) - continued

(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 contaot 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 shouid 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), lock washer (9), and MODE selector rotary switch (6).

(3) Tag and unsolder leads from MODE selector rotary switch (6) terminals. Remove MODE selector rotary switch. (See paragraph 4-24.)

(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 4-6). (See paragraph 4-24.)

(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.

NOTE

FOLLOW-ON MAINTENANCE:

Install control panel (para 4-25).

4-29. 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

Crimping Tool Kit
Appendix B, item 2

Materials/Parts

Light Emitting Diode

Lock Washers (4)

Equipment Conditions:

Remove control panel (para 4-25).

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 missing terminals. Replace if damaged.

b. Test.

(1) Using a multimeter set to test diodes, connect red lead to connector (7) pin number 2 and black lead in turn to pin numbers 4, 9, 10, and 11 (DS1, DS2, DS3, and DS4) (figure 4-6). 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.

4-29. FAULT INDICATOR, LIGHT EMITTING DIODE (DS1, DS2, DS3, AND DS4). - continued

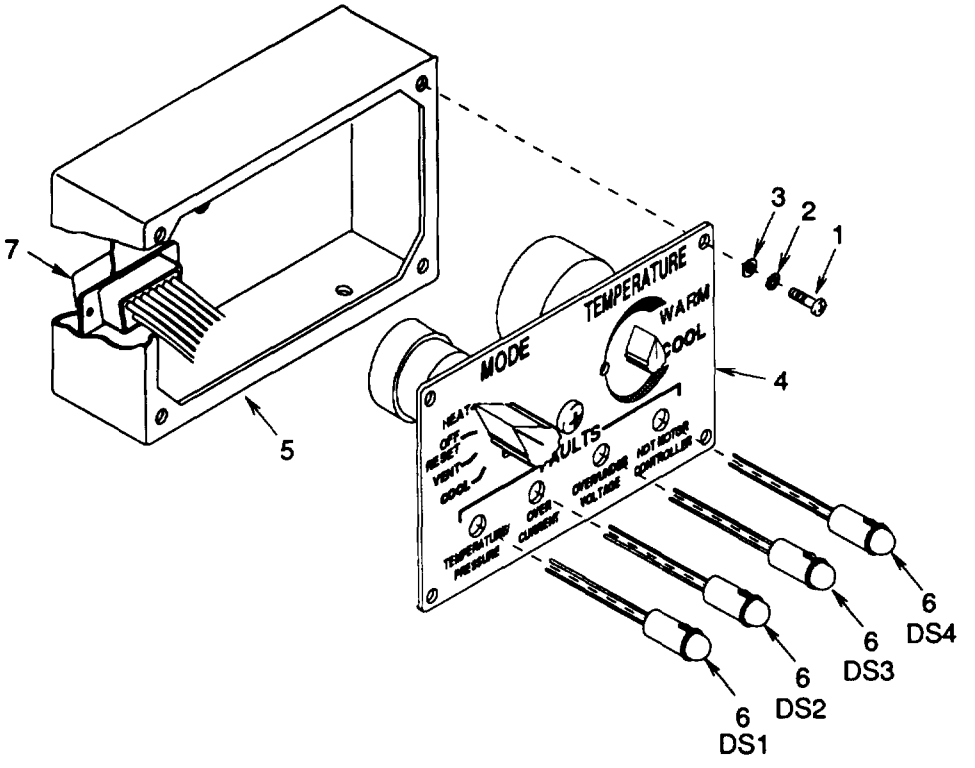


Figure 4-26. Light Emitting Diodes (DS1, DS2, DS3, & DS4)

c. Replace.

(1) Tag lead going to connector (7). Release and remove contact pin.

(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 new light emitting diode (6) into control panel (4).

(5) Crimp new connector (7) 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 4-25).

4-30. 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 Washer

Lock Washer

Lock Washers (4)

Wire Ties (3)

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 4-11).

a. Inspect.

Check electromagnetic interference filter (FL1) (1) for dents, punctures, and evidence of overheating. Replace if badly dented, punctured, burnt, or connectors are damaged.

b. Test.

(1) Disconnect connector J13 from motor controller (MC1) connector P13.

(2) Put circuit breaker CB1 to OFF position.

(3) Check continuity between CB1 terminals LINE 1,2, and 3 and J13 terminal 4 to electromagnetic interference filter (FL1) (1) case. If continuity is indicated, replace filter.

(4) Check continuity as shown in following chart.

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.

(5) If electromagnetic interference filter (FL1) (1) does not meet continuity requirements, replace it.

(6) Reconnect connector J13 to motor controller (MC1) connector P13.

4-30. ELECTROMAGNETIC INTERFERENCE FILTER (FL1). - continued

From J4 (wired for front power) or J5 (wired for rear power)	To	Indication
Pin A	CB1 , LINE 1	Continuity
Pin A	CB1 , LINE 2	None
Pin A	CB1, LINE 3	None
Pin A	J13, Pin 4	None
Pin A	Unit Ground	None
Pin B	CB1, LINE 2	Continuity
Pin B	CB1 , LINE 3	None
Pin B	J13, Pin 4	None
Pin B	Unit Ground	None
Pin C	CB1 , LINE 3	Continuity
Pin C	J13, Pin 4	None
Pin C	Unit Ground	None
Pin D	J13, Pin 4	Continuity
Pin D	Unit Ground	None
Pin E	Unit Ground	Continuity

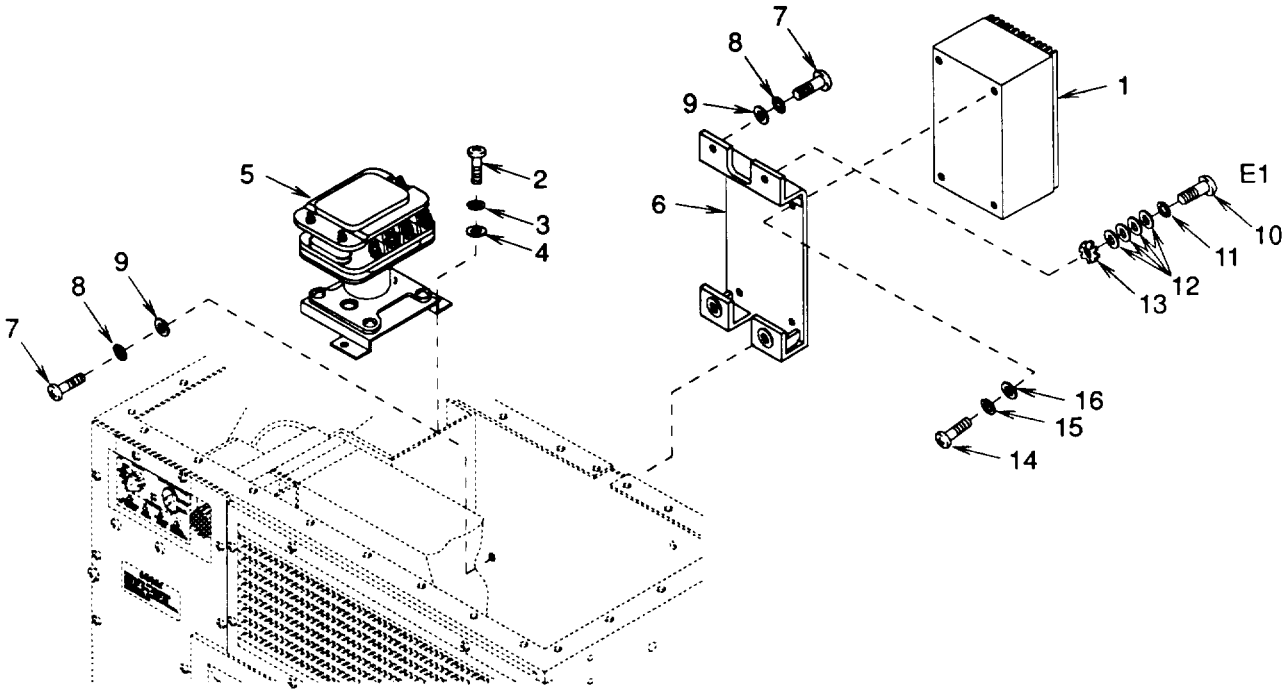


Figure 4-27. Electromagnetic Interference Filter (FL1)

4-30. ELECTROMAGNETIC INTERFERENCE FILTER (FL1). - continued

c. Replace.

(1) Remove motor controller (MC1). (See paragraph 4-31.)

(2) Remove logic box assembly (LGC1). (See paragraph 4-32.)

(3) Remove three sets of screws (2), bck washers (3) and flat washers (4).

(4) Lift relay and bracket assembly (5) to access bracket (6) mounting hardware.

(5) Remove three sets of screws (7), lock washers (8), and fiat washers (9) and screw (10), lock washer (11), four flat washers (12), and lock washer (13).

(6) Cut wire ties as necessary to slip bracket (6) and fitter (1) out of unit as far as wiring harnesses will allow.

W A R N I N G

Capacitors can retain a high electrical charge. Touching the terminais 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.

(7) Disconnect the P15 and P16 piugs from the filter (1).

(8) Discharge filter capacitors at connector, (J15).

(9) Remove four sets of screws (14), lock washers (15), fiat washers (1 6), and bracket (6).

(10) Secure filter (1) to bracket (6) with four sets of screws (14), lock washers (15), and flat washers (16).

(11) Connect the P15 and P16 plugs to the filter (1).

(12) Carefully slip bracket (6) and filter (1) into unit and secure bracket to casing with three sets of screws (7), lock washers (8), and fiat washers (9) and screw (10), lock washer (11), four fiat washers (12), and lock washer (13).

(13) Secure relay and bracket assembly (5) with three sets of screws (2), lock washers (3), and flat washers (4).

(14) Attach wire ties as needed to secure wiring harnesses.

(15) install logic box assembly (LGC1). (See paragraph 4-32.)

(16) install motor controller (MC1). (See paragraph 4-31.)

NOTE

FOLLOW-ON MAINTENANCE:

Install top panel (para 4-11).

Connect power at power source.

4-31. 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 (13)

Lock Washers (4)

Equipment Conditions:

Remove top panel (para 4-11).

Remove electrical access panel (para 4-12).

a. Remove.

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

(2) Carefully rermove motor controller assembly (1) from unit.

b. Inspect.

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

(2) Check connectors P2, J12, and P13 for general condition and loose, broken, or missing contact pins. Replace motor controller assembly (1) if any connectors are damaged.

c. Test.

If a failure is suspected, replace motor controller assembly (1).

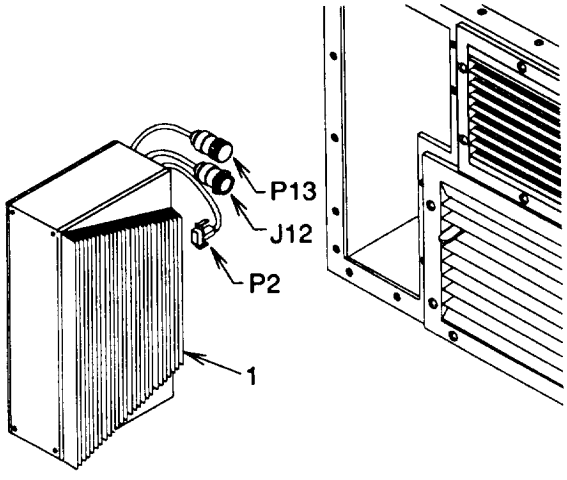


Figure 4-28. Motor Controller Assembly (MC1)

4-31. MOTOR CONTROLLER ASSEMBLY (MC1). - continued

d. Install.

(1) Carefully install motor controller assembly (1) into unit.

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

NOTE

FOLLOW-ON MAINTENANCE:

Install top panel (para 4-11).

Install electrical access panel (para 4-12).

4-32. 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

Equipment/Conditions:

Remove motor controller assembly (para 4-31).

Materials/Parts

Logic Box Assembly

Lock Washers (4)

a. Remove.

(1) Tag and disconnect wiring harness connectors from J1 and J3.

(2) Remove four sets of screws (1), lock washers (2), flat washers (3), and spacers (4). Remove logic box assembly (5) from unit.

b. Inspect.

(1) Check for dents, punctures, or cracked welds. Replace logic box assembly (5) if damaged.

(2) Check connectors J1, J2, and J3 for general condition and loose, broken, or missing contact pins. Replace logic box assembly (5) if any connectors are damaged.

c. Install.

(1) Install logic box assembly (5) into unit and secure with four sets of screws (1), lock washers (2), flat washers (3), and spacers (4).

(2) Connect wiring harness connectors to J1 and J3. Remove tags.

4-32. LOGIC BOX ASSEMBLY (LGC1). - continued

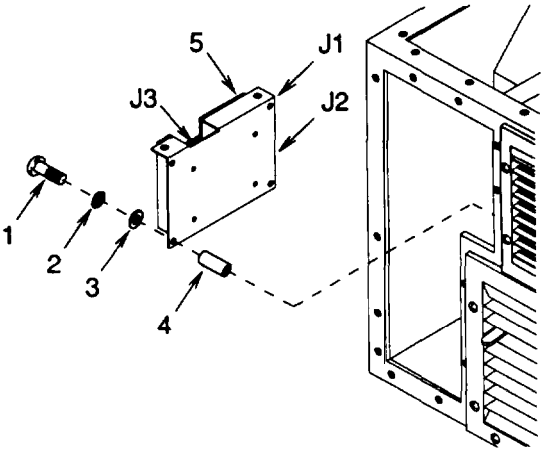


Figure 4-29. Logic Box Assembly (LGC1)

NOTE

FOLLOW-ON MAINTENANCE:

Install motor controller assembly (para 4-31).

4-33. 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

Equipment Conditions:

CAUTION

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

Disconnect power at power source.

Remove panels or components as necessary to access wiring harnesses.

a. Inspect.

(1) Disconnect and inspect connectors for loose, damaged or missing pins. Replace if defective.

4-33. WIRING HARNESSES. - continued

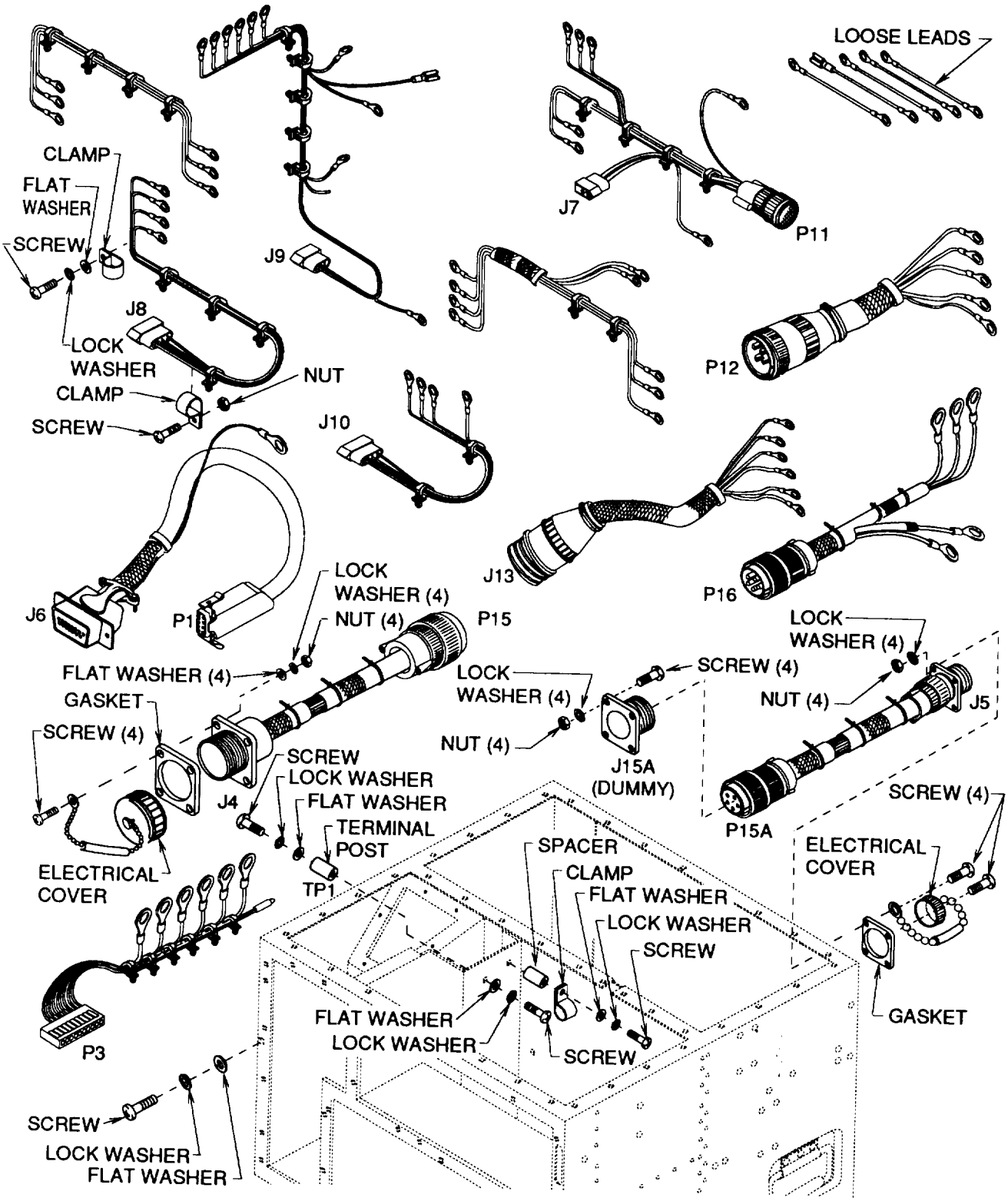


Figure 4-30. Wiring Harnesses

4-33. WIRING HARNESSES. - continued

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

b. Test.

See wiring diagram (figure 4-6). Continuity test individual wires. Replace or repair wires with no continuity.

c. Repair.

(1) See paragraph 4-24 for general wire repair instructions.

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

d. Replace.

Replaoe individual wires, terminals, or connectors if defective.

NOTE

FOLLOW-ON MAINTENANCE:

Connect any connectors loosened for inspection.

Install any components or panels removed for access.

Connect power at power source.

4-34. TERMINAL BOARDS.

This task covers: a. Inspect b. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Terminal Board

Lock Washers (4)

Lock Washers (14)

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 4-11).

a. Inspect.

(1) Check terminals for loose or missing screws and any signs of corrosion.

4-34. TERMINAL BOARDS. - continued

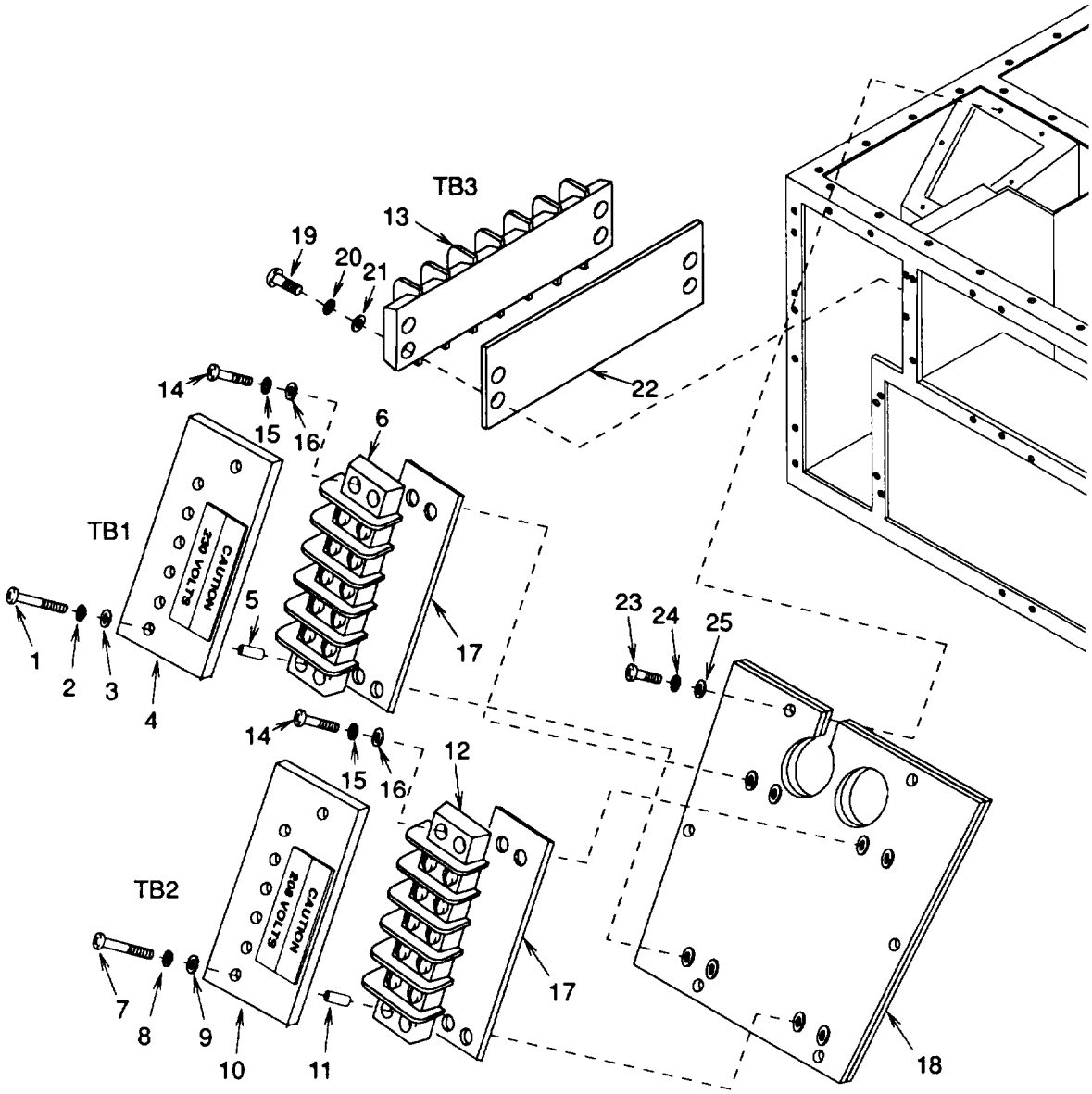


Figure 4-31. Terminal Boards

4-34. TERMINAL BOARDS. - continued

(2) Check that terminal boards are not cracked or broken.

b. Replace.

(1) Remove two screws (1), look washers (2), flat washers (3), one cover (4), and two spacer posts (5) from terminal board TB1 (6).

(2) Remove two screws (7), lock washers (8), flat washers (9), one cover (10), and two spacer posts (11) from terminal board TB2 (12).

(3) Tag and disconnect wire leads from terminal boards TB1 (6), TB2 (12), and TB3 (13).

(4) Remove four screws (14), lock washers (15), flat washers (16), two terminal boards TB1 (6) and TB2 (12), and marker strips (17) from feed through panel (18).

(5) Remove four screws (19), lock washers (20), flat washers (21), terminal board TB3 (13), and marker strip (22) from unit.

(6) Remove four screws (23), lock washers (24), flat washers (25), and feed through panel (18) from unit.

(7) Position feed through panel (18) in unit and align mounting holes. Secure with four screws (23), lock washers (24), and flat washers (25).

(8) Position marker strip (22) and terminal board TB3 (13) in unit and align mounting holes. Secure with four screws (19), lock washers (20), and flat washers (21).

(9) Position each of two marker strips (17) and terminal boards TB1 (6) and TB2 (12) on feed through panel (18) and align mounting holes. Secure each terminal board with two screws (14), lock washers (15), and flat washers (16) in upper left and lower right mounting holes only.

(10) Conneot wire leads to terminal boards TB1 (6), TB2 (12), and TB3 (13) using tags and wiring diagram (figure 4-6). Remove tags.

(11) Install cover (10) onto terminal board TB2 (12) using two spacer posts (11), screws (7), lock washers (8), and flat washers (9).

(12) Install cover (4) onto terminal board TB1 (6) using two spacer posts (5), screws (1), lock washers (2), and flat washers (3).

NOTE

FOLLOW-ON MAINTENANCE:

Install top panel (para 4-11).

Connect power at power source.

4-35. THERMISTOR (RT1).

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Thermistor

Tiedown straps (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 top panel (para 4-11).

a. Inspect.

Check thermistor (1) for loose lead wires and general condition. Replace if damaged.

b. Test.

(1) Remove connector (P3) (2) from logic box connector (J3).

(2) Using multimeter set to read resistance, check continuity between connector (P3) (2) terminals 1 and 2. Resistance should be between 2.4 kiloohms and 33.2 kiloohms. Replace if defective.

c. Replace.

(1) Remove connector (P3) (2) from logic box connector (J3) (3).

(2) Tag and disconnect (P3) harness leads (4) from terminal board (TB3) (5). Remove wiring harness.

(3) Remove six tiedown straps (6).

(4) Remove screw (7), lock washer (8), flat washer (9), and clamp (10).

(5) Remove two sets of screws (11), lock nuts (12), and clamps (13).

(6) Carefully pull thermistor (1) from unit wiring harness.

(7) Remove thermistor (1) lead pins from connector (P3) (2).

(8) Remove pins from thermistor (1) leads and install on replacement thermistor leads.

(9) Insert thermistor (1) lead pins into connector (P3) (2).

(10) Secure wire leads with six tiedown straps (6).

4-35. THERMISTOR (RT1). - continued

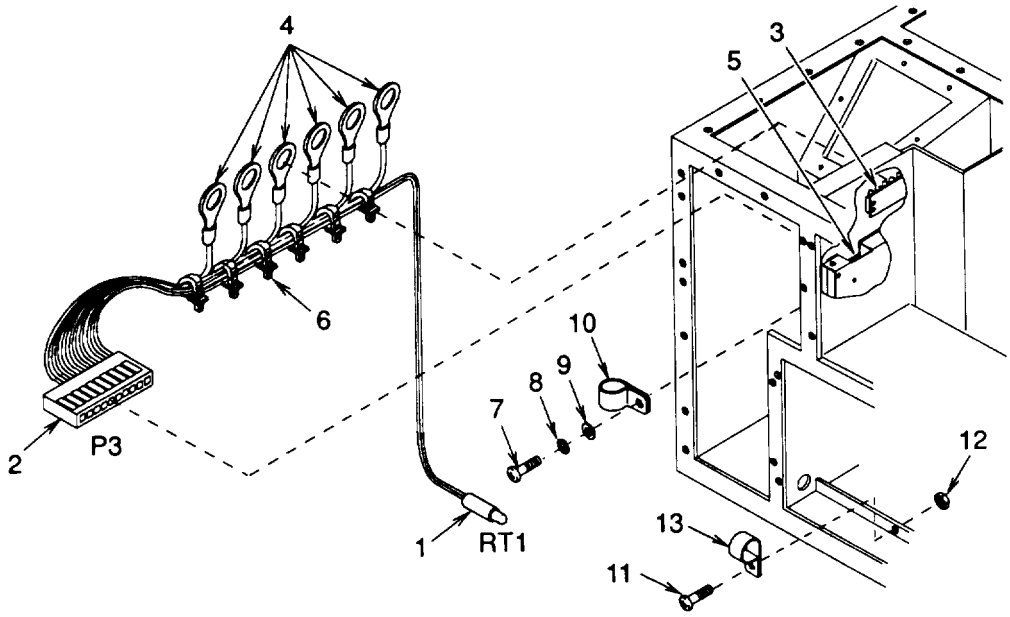


Figure 4-32. Thermistor (RT1)

(11) Carefully route thermistor (1) along unit wiring harness.

(12) Place clamp (10) around thermistor(1) leads and wiring harness and secure with screw (7), lock washer (8), and flat washer (9).

(13) Place two clamps (13) around thermistor (1) leads and wiring harness and secure with two screws (11) and lock nuts (12).

(14) Connect (P3) harness leads (4) to terminal board (TB3) (5) using tags and wiring diagram (figure 4-6). Remove tags.

(15) Connect connector (P3) (2) to logic box connector (J3) (3).

NOTE

FOLLOW-ON MAINTENANCE:

install top panel (para 4-11).

Connect power at power source.

4-36. 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 4-11).

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).

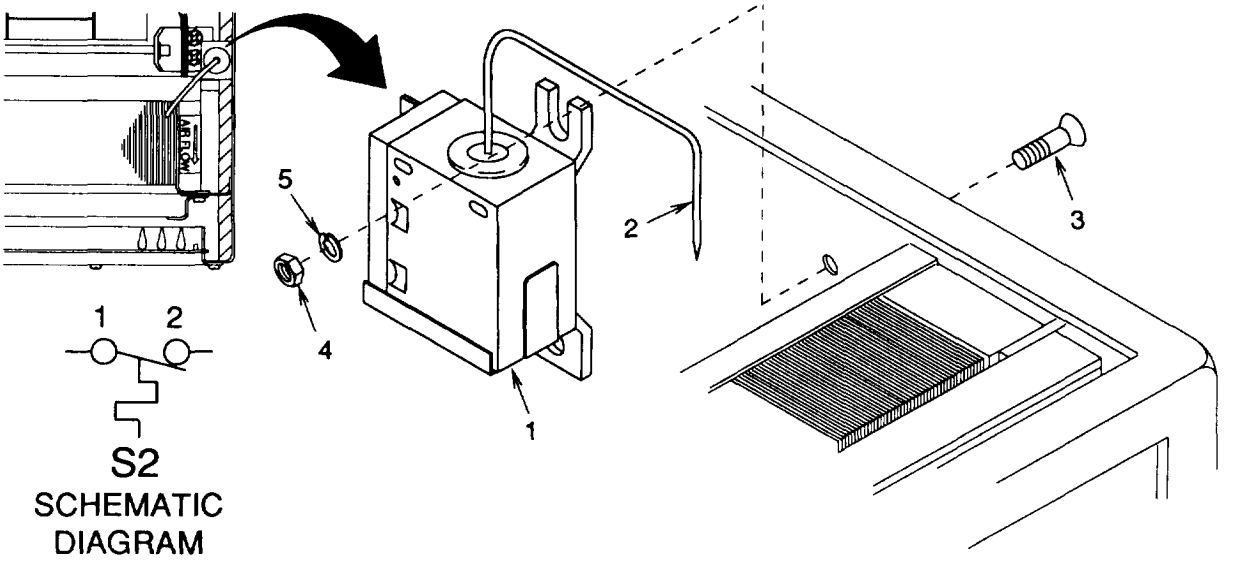


Figure 4-33. Coil Frost Switch (S2)

4-36. 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), and coil frost switch (1).

(4) Place the capillary line temperature sensor (2) in a temperature controlled bath, 47° to 52ºF (8° to 11 °C) and set multimeter to measure continuity. Place rnultimeter leads on terminals 1 and 2 of the coil frost switch (1). A closed circuit (continuity) should be indicated.

(5) Plaoe the capillary line temperature sensor (2) in a temperature controlled bath, 24° to 29°F (-4° to -2°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), and ooil 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 coil frost switch (1) to casing with two sets of screws (3), lock washers (4), and nuts (5).

(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 4-6). Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:

Install top panel (para 4-11).

Connect power at power source.

4-37. 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

Lock Washer

Equipment Conditions:

CAUTION

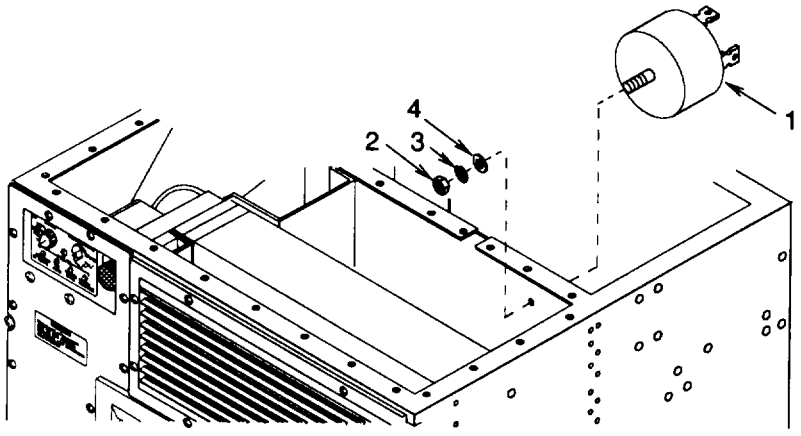
Use disconnect switch (NOT POWER CABLE) to disconnect power to unit. Damage to cable connector pins will result if cable is used.

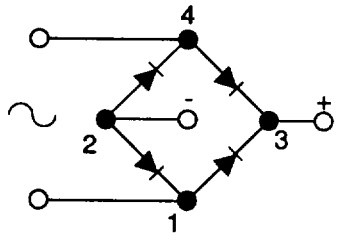
Disconnect power at power source,

Remove top panel (para 4-11).

a. Inspect.

Check rectifier (1) for general condition and broken or missing terminals or leads. Replace if damaged.





CR4 RECTIFIER DIAGRAM

Figure 4-34. Rectifier (CR4)

4-37. RECTIFIER (CR4) - continued

b. Test.

(1) Tag and disconnect wire leads from rectifier (1) terminals.

(2) Remove nut (2), bck washer (3), flat washer (4), and rectifier (1).

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

(4) Conneot positive lead to terminal 2 and negative lead to terminal 1 or 3. An open circuit should be indioated.

(5) Connected positive lead to terminal 4 and negative lead to terminal 1 or 3. A short circuit should be indiciated.

(6) Connect negative lead to terminal 4 and positive lead to terminal 1 or 3. An open circuit should be indicated.

(7) Replace defeotive reotifier.

(8) If rectifier (1) tests good, install in unit using flat washer (4), bck washer (3), and nut (2).

(9) Connect wire leads in place using tags and wiring diagram (figure 4-6). Remove tags.

c. Replace.

(1) Tag and disconnect wire leads from rectifier (1) terminals.

(2) Remove nut (2), Iock washer (3), flat washer (4), and rectifier (1).

(3) Install new rectifier (1) in unit using, flat washer (4), took washer (3), and nut (2).

(4) Connect wire leads in place using tags and wiring diagram (figure 4-6). Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:

Install top panel (para 4-11).

Connect power at power source.

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

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

Rectifier

Capacitor

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 motor controller assembly (para 4-31).

a. Inspect.

Check rectifier (1) and capacitors (2) and (3) for general condition and broken or missing terminals or leads. Replace if damaged.

b. Test.

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

(2) Tag and unsolder wire leads and capacitors (2) and (3) from rectifier (1) terminals. (See paragraph 4-24.)

(3) Remove screw (4), lock washer (5), flat washer (6), and rectifier (1).

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

(4) 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 obtained.

(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.

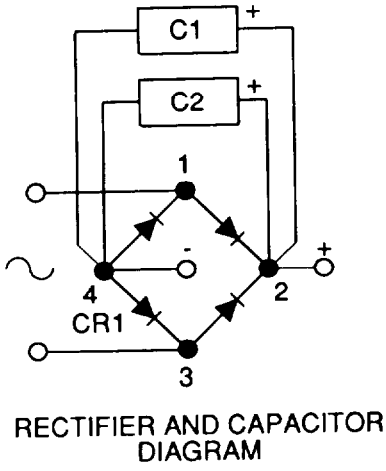
N O T E

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.

(5) 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.



RECTIFIER AND CAPACITOR DIAGRAM

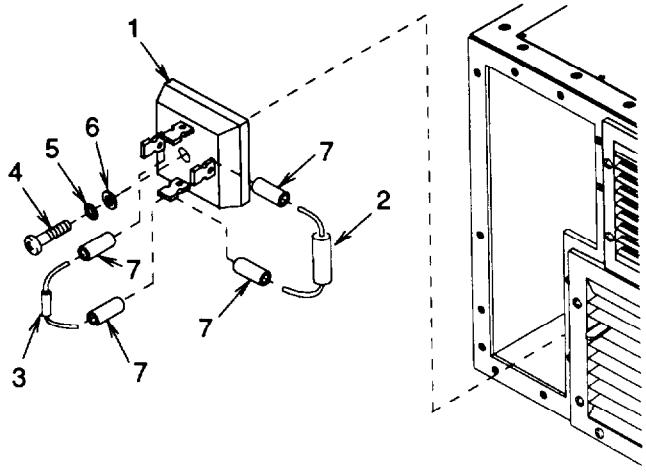


Figure 4-35. Rectifier (CR1) and Capacitors (C1 and C2)

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

(6) Discard old insulation sleeving (7) from capaoitors (2) and (3) leads.

(7) Cut four pieces of new insulation sleeving (7) to a length of 3/4 inch (1.8 cm).

(8) Slip insulation sleeving (7) over capacitors (2) and (3) leads and solder wire and capacitor leads in place using tags and wiring diagram (figure 4-6). Remove tags. (See paragraph 4-24.)

(9) Secure rectifier (1) in plaoe with screw (4), lock washer (5), and flat washer (6).

(10) Replace rectifier (1) and capacitors (2) and (3) if any one component is defective.

c. Replace.

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

(2) Tag and unsolder wire leads from rectfiier (1) terminals. (See paragraph 4-24.)

(3) Remove screw (4), lock washer (5), flat washer (6), and rectifier (1).

(4) Cut four pieces of insulation sleeving (7) to a length of 3/4 Inch (1.8 cm).

(5) Slip insulation sleeving (7) over capacitors (1) and (2) leads and solder wire and capacitor leads in place using tags and wiring diagram (figure 4-6). Remove tags. (See paragraph 4-24.)

(6) Secure in place using screw (4), lock washer (5), and flat washer (6).

NOTE

FOLLOW-ON MAINTENANCE:

Install motor controller assembly (para 4-31).

Connect power at power source.

4-39. TRANSFORMER (T1).

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

Transformer

Lock Washers (4)

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 return air buver and air filter (para 4-18)

a. Inspect.

Check transformer (1) for signs of damage or overheating. Replace if damaged.

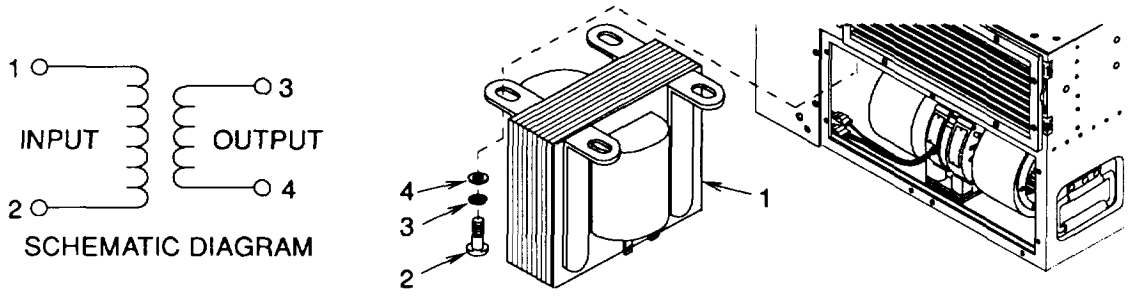


Figure 4-36. Transformer (T1)

4-39. TRANSFORMER (T1). - continued

b. Test.

(1) Tag and unsolder wire leads. (See paragraph 4-24.)

(2) Remove four screws (2), bck washers (3), flat washers (4), and transformer (1).

(3) Using a multimeter, check continuity across the input winding pins 1 and 2 and across the output winding pins 3 and 4. If either winding shows open (no continuity), replace transformer.

(4) Check for shorts between one terminal of each winding and transformer case and also between one input terminal and one output terminal using an insulation tester, megohmeter or multimeter on high ohms setting. Replace transformer if a short is indicated.

(5) Apply 208.0±20.8 volts AC to input terminals 1 and 2. Voltage at transformer output terminals 3 and 4 should be 23.5±0.7 volts AC. Remove power from transformer. Replace if defective.

(6) Secure transformer (1) to unit with four screws (2), bck washers (3), and flat washers (4).

(7) Solder wire leads to transformer (1) terminals using tags and wiring diagram (figure 4-6). Remove tags. (See paragraph 4-24.)

c. Replace.

(1) Tag and unsolder wire leads. (See paragraph 4-24.)

(2) Remove four screws (2), bck washers (3), flat washers (4), and transformer (1).

(3) Secure new transformer (1) to unit with four screws (2), lock washers (3), and flat washers (4).

(4) Solder wire leads to transformer (1) terminals using tags and wiring diagram (figure 4-6). Remove tags. (See paragraph 4-24.)

NOTE

FOLLOW-ON MAINTENANCE:

Install return air buver and air filter (para 4-18).

Connect power at power source.

4-40. COMPRESSOR START RELAY (K2), DIODE (CR3), AND SURGE ARRESTOR (SA1).

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

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
Appendix B, item 2

Materials/Parts

Compressor Start Relay

Diode

Surge Arrestor

Insulation Sleeving
(Heat-Shrink Tubing)

Insulation Tubing

Lug Terminals (4)

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 4-11).

a. Inspect.

Check general condition of compressor start relay (1), diode (2), and surge arrestor (3) and that terminals are not broken or missing. Replace if damaged.

b. Test.

NOTE

Terminal protective cover must be removed to access wire terminals.

(1) Tag and disconnect wire leads, diode assembly, and surge arrestor assembly from relay (1).

(2) Remove four sets of screws (4), bck washers (5), flat washers (6), and relay (1).

4-40. COMPRESSOR START RELAY (K2), DIODE (CR3), AND SURGE ARRESTOR (SA1). - continued

(3) Compressor start relay (1).

(a) Apply 28VDC to terminals X1 (positive) and X2 (negative).

(b) Using multimeter, check continuity across terminals A1 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).

(4) Diode (2).

(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. The multimeter should give no indication.

(5) Surge Arrestor (3).

Using a multimeter set to check resistance, check continuity across leads. The multimeter should indicate an open circuit.

(6) Install relay (1) in unit and secure with four sets of screws (4), lock washers (5), and flat washers (6).

(7) Connect wire leads, diode assembly (band end to terminal X1), and surge arrestor assembly to relay (1) using tags and wiring diagram (figure 4-6). Remove tags.

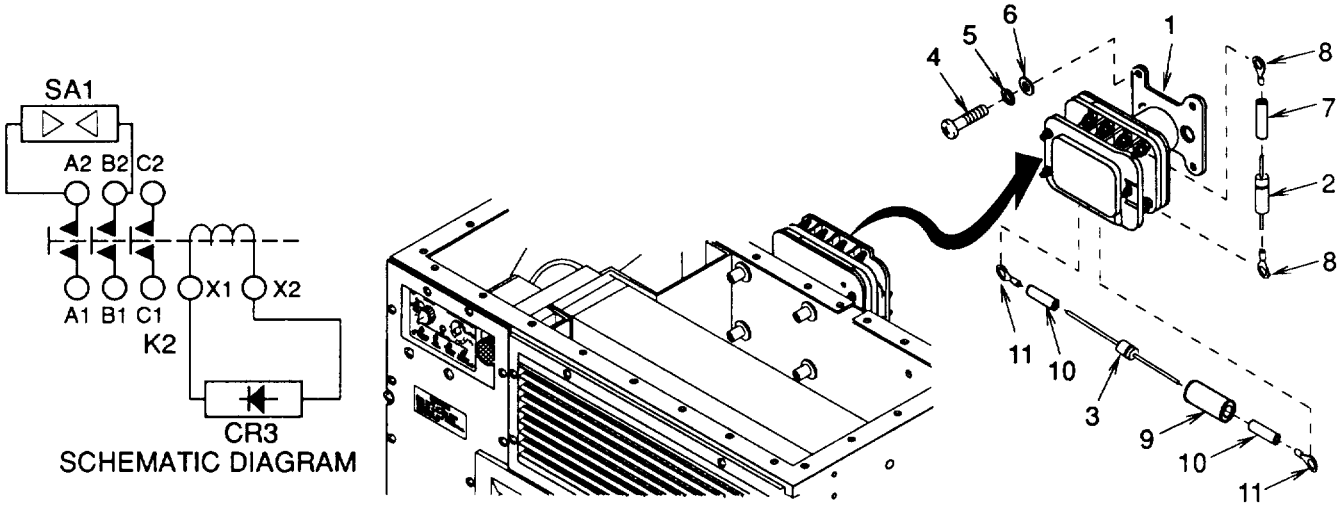


Figure 4-37. Compressor Start Relay (K2), Diode (CR3), and Surge Arrestor (SA1)

4-40. COMPRESSOR START RELAY (K2), DIODE (CR3), AND SURGE ARRESTOR (SA1). - continued

c. Replace.

NOTE

Terminal protective cover must be removed to access wire terminals.

(1) Tag and disconnect wire leads, diode assembly, and surge arrestor assembly from relay (1).

(2) Remove four sets of screws (4), lock washers (5), flat washers (6), and relay (1).

(3) Diode (2).

(a) Cut insulation sleeving (7) to 3/4 inch (1.9 cm) brig.

(b) Slip insulation sleeving (7) over leads.

(c) Crimp lug terminals (8) onto lead ends.

(4) Surge arrestor (3).

(a) Cut insulation sleeving (9) and tubing (10) to approximately 1 inch (2.5 cm) long each.

(b) Slip insulation sleeving (9) over arrestor (3) body and tubing (10) over leads. Heat to shrink sleeving in place.

(c) Crimp lug terminals (11) onto lead ends.

(5) Install relay (1) in unit and secure with four sets of screws (4), lock washers (5), and flat washers (6).

(6) Connect wire leads, diode assembly (band end to terminal X1), and surge arrestor assembly to relay (1) using tags and wiring diagram (figure 4-6). Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:

Install top panel (para 4-11).

Connect power at power source.

4-41. HEATER RELAY (K1) AND DIODE (CR2)

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

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
Appendix B, item 2

Materials/Parts

Heater Relay

Diode

Insulation Sleeving
(Heat-Shrink Tubing)

Lug Terminals (2)

Lock Washers (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 top panel (para 4-11).

Remove logic box assembly (LGC1) (para 4-32).

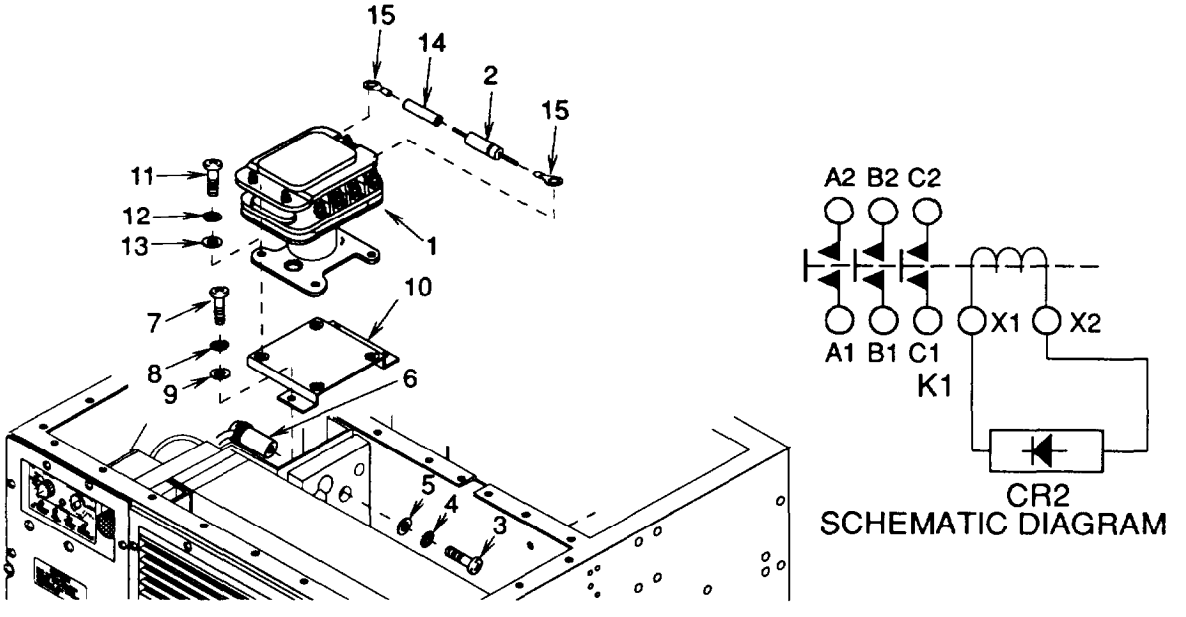


Figure 4-38. Heater Relay (K1) and Diode (CR2)

4-41. HEATER RELAY (K1) AND DIODE (CR2). - continued

a. Inspect.

Check general condition of relay (1) and diode (2) and that terminals are not broken or missing. Replace if damaged.

b. Test.

(1) Remove screw (3), lock washer (4), and flat washer (5).

(2) Push terminal post (6) away to access relay (1). Remove three sets of screws (7), lock washers (8), flat washers (9), and lii relay with bracket (10) 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 (2) assembly from relay (1).

(4) Relay (1).

(a) Apply 28VDC to terminals X1 (positive) and X2 (negative).

(b) Using multimeter set to measure resistance, check continuity across terminals Al and A2, B1 and B2, and Cl and C2. The multimeter must indicate that contacts are closed continuity).

(c) Remove power. Multimeter must indicate that contacts are open (no continuity).

(d) Replace relay (1) if defective.

(5) Diode (2).

(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.

(c) Replace diode (2) if defective.

(6) Connect wire leads and diode (2) assembly (band end to terminal X1) to relay (1) using wiring diagram (figure 4-6) and tags. Remove tags.

(7) Secure relay (1) and bracket (10) in unit using three sets of screws (7), lock washers (8), and flat washers (9).

(8) Secure terminal post (6) to unit using screw (3), lock washer (4), and flat washer (5).

c. Replace.

(1) Remove screw (3), bck washer (4), and flat washer (5).

(2) Push terminal post (6) away to access relay (1). Remove three sets of screws (7), lock washers (8), flat washers (9), and Iift relay with bracket (10) as far as wire leads will allow.

4-41. HEATER RELAY (K1) AND DIODE (CR2). - continued[

NOTE

Terminal protective oover must be removed to access wire terminals.

(3) Tag and disconnect wire leads and diode (2) assembly from relay (1).

(4) Remove four sets of screws (11), bck washers (12), flat washers (13), and bracket (10) from relay (1).

(5) Diode (2).

(a) Cut two pieces of insulation sleeving (14) to approximately 3/4 inch (1.9 cm) brig.

(b) Slip insulation sleeving (14) over new diode (2) lead ends.

(c) Crimp lug terminals (15) onto diode- (2) lead ends.

(6) Attach bracket (10) to relay (1) using four sets of screws (11), look washers (12), and flat washers (13).

(7) Connect wire leads and diode (2) assembly (band end to terminal X1) to relay (1) using wiring diagram (figure 4-6) and tags. Remove tags.

(8) Secure relay (1) and bracket (10) in unit using three sets of screws (7), lock washers (8), and flat washers (9).

(9) Secure terminal post (6) to unit using screw (3), bck washer (4), and flat washer (5)

NOTE

FOLLOW-ON MAINTENANCE:

Install top panel (para 4-11).

Install logic box assembly (LGC1) (para 4-32).

Connect power at power source.

4-42. CIRCUIT BREAKER (CB1).

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Circuit Breaker

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 top panel (para 4-11).

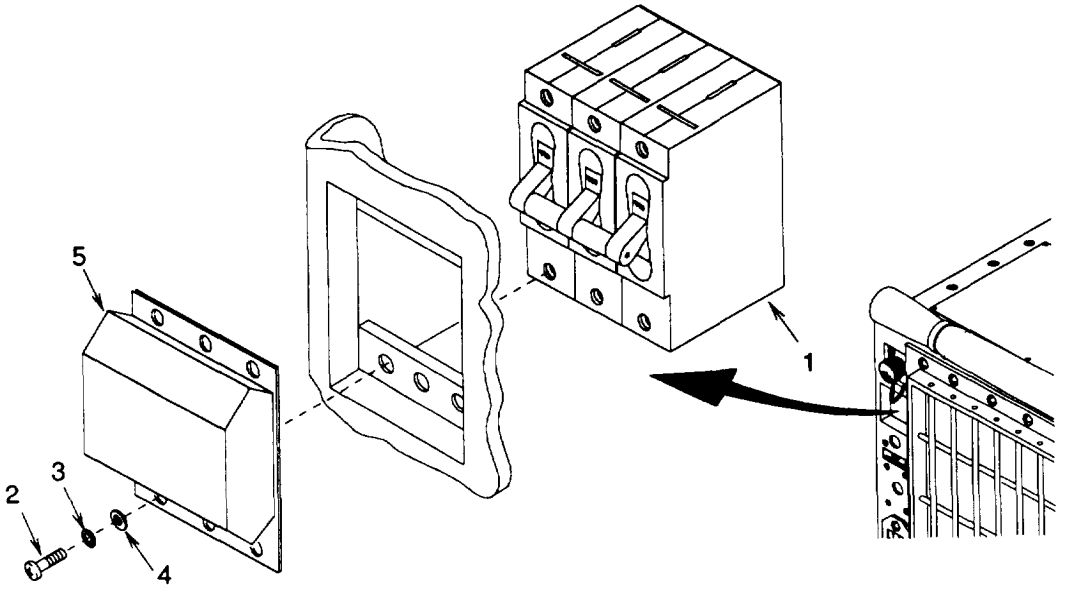


Figure 4-39. Circuit Breaker (CB1)

a. Inspect.

Check general condition of circuit breaker (1) and that terminals are not broken or missing. Replace if damaged.

4-42. CIRCUIT BREAKER (CB1). - continued

b. Test.

(1) Tag and disconnect wire leads from circuit breaker (1).

(2) Remove six screws (2), bck washers (3), flat washers (4), boot (5), and circuit breaker (1) from unit.

(3) With circuit breaker (1) in ON position, use multimeter set to measure resistance and check continuity across terminals LINE and LOAD of each pole. The multimeter must indicate that contacts are closed (continuity).

(4) With circuit breaker (1) in OFF position, use multimeter set to measure resistance and check continuity across terminals LINE and LOAD of each pole. The multimeter must indicate that contacts are open (no continuity).

(5) Replace circuit breaker (1) if it tests defective.

(6) Secure circuit breaker (1) and boot (5) onto unit using six screws (2), lock washers (3), and flat washers (4).

(7) Connect wire leads to circuit breaker (1) using tags and wiring diagram (figure 4-6). Remove tags.

c. Replace.

(1) Tag and disconnect wire leads from circuit breaker (1).

(2) Remove six screws (2), bck washers (3), flat washers (4), boot (5), and circuit breaker (1) from unit.

(3) Replace boot (5) if damaged.

(4) Secure new circuit breaker (1) and boot (5) onto unit using six screws (2), lock washers (3), and flat washers (4).

(5) Connect wire leads to circuit breaker (1) using tags and wiring diagram (figure 4-6). Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:

Install top panel (para 4-11).

Connect power at power source.

4-43. EVAPORATOR FAN, MOTOR, AND HOUSING.

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Motor

Fan Impeller (Left)

Fan Impeller (Right)

Bell Inlet (2)

Self-locking Nut

Grommets (4)

Front Fan Housing (Left)

Front Fan Housing (Right)

Rear Fan Housing (Left)

Rear Fan Housing (Right)

Tiedown Straps (3)

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.

Remove condensate drain tubing (para 4-23).

Remove transformer (para 4-39).

Personnel required

Two

a. Inspect.

(1) Check that all fan housing parts are in place and in good condition.

(2) Inspect fan impellers (1) and (2) for damaged or bent blades and free rotation.

(3) Inspect the motor (3) for signs of overheating.

(4) Check all mounting hardware for tightness.

(5) Disconnect P8 and P9 motor connectors and check for loose, damaged, or missing pins.

(6) Connect P8 and P9 motor connectors.

b. Service.

Wipe all dust or dirt from fan impellers (1) and (2), motor (3), and fan housing assembly.

4-43. EVAPORATOR FAN, MOTOR, AND HOUSING. - continued

c. Test.

NOTE

The motor is equipped with an internal thermal safety. If the motor is hot, it must be allowed to cool before testing.

(1) Disconnect P8 and P9 motor connector plugs.

(2) Use a multimeter set to measure resistance and check continuity at P8 between pins 1 and 2, 1 and 3, and 2 and 3. Continuity should exist. If no continuity exists, replace motor.

(3) Use a multimeter set to measure resistance and check continuity at P9 between pins 1 and 2. Continuity should exist. If no continuity exists, replace motor.

(4) Use a multimeter set to measure resistance and check continuity at P8 and P9 between P8 pin 4 and all other pins. Continuity should not exist, If continuity exists, replace motor.

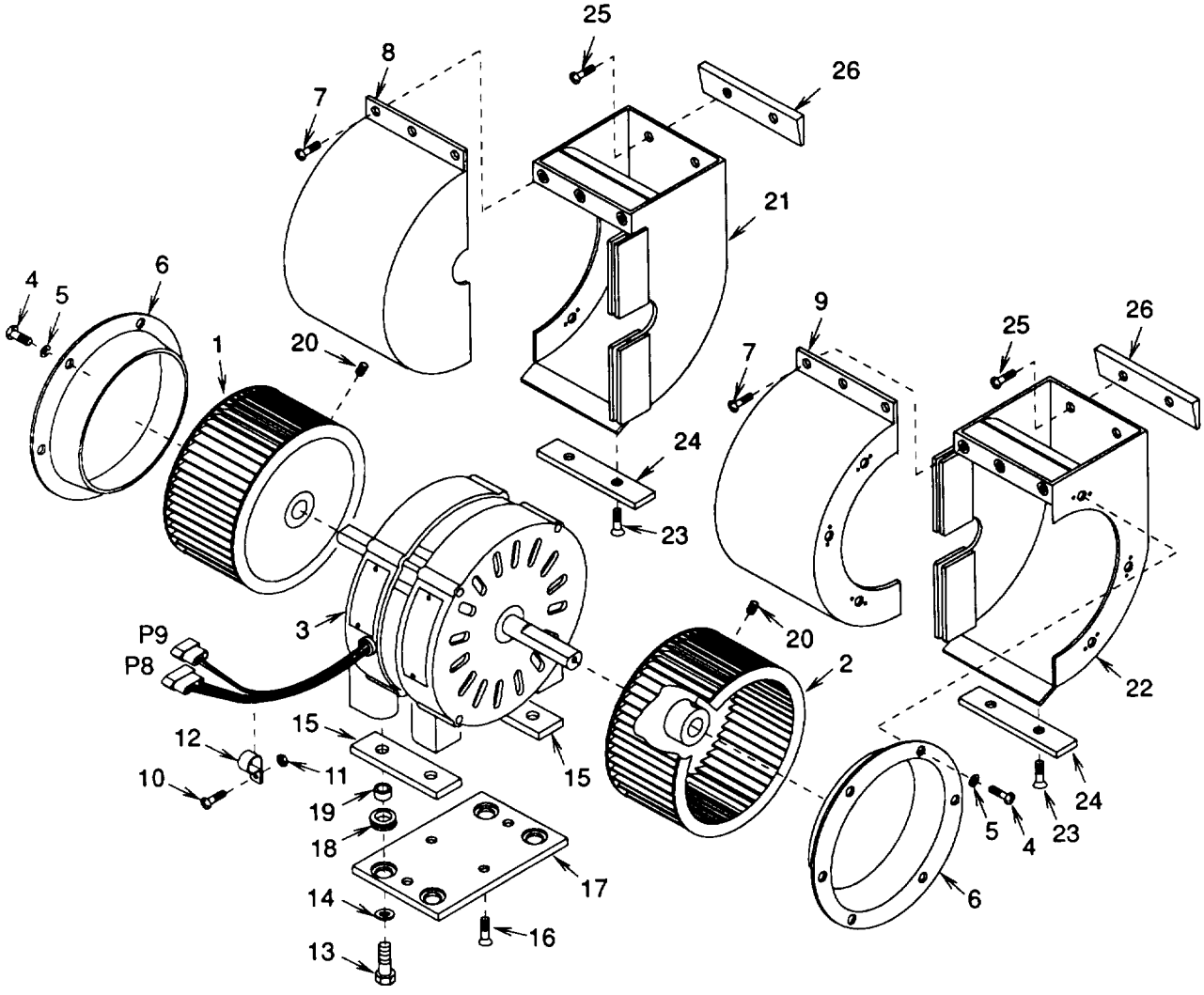


Figure 4-40. Evaporator Fan, Motor, and Housing

4-43. EVAPORATOR FAN, MOTOR, AND HOUSING. - continued

d. Replace.

(1) Remove 12 screws (4), flat washers (5), and two bell inlets (6).

(2) Remove six screws (7) from front fan housings (8) and (9). Carefully rermove front fan housings.

WARNING

Two people are required to lift unit. Personal injury can result.

CAUTION

Do not lay unit on side to access bottom, compressor damage can result from oil being displaced.

(3) Carefully lift and block air conditioner to access bottom of unit.

(4) Remove screw (10), self-locking nut (11), and clamp (12). Cut tiedown straps on motor (3) wiring harnesses and carefully remove thermal sensor (RT1). Disconnect P8 and P9 motor connectors.

(5) Fan motor assembly.

(a) Remove four screws (13) and flat washers (14). Carefully remove fan motor assembly and two pads (15). Remove four screws (16) and support (17). Remove four grommets (18) and sleeve bushings (19) from support.

(b) Loosen two setscrews (20) and remove two fan impellers (1) and (2) from motor (3) shaft.

(c) Install two fan impellers (1) and (2) onto motor (3) shaft and secure with two setscrews (20).

(d) Install four grommets (18) and sleeve bushings (19) into support (17) motor mount holes. Install support (17) into unit and secure using four screws (16) .Carefully install fan motor assembly and two pads (15) into unit and secure using four screws (13) and flat washers (14).

(6) Rear fan housings (21) and (22).

(a) Remove fan motor assernbly. (See (5) above.)

(b) Remove four screws (23) and two filler bars (24).

(c) Remove four screws (25), two filler blocks (26), and rear fan housings (21) and (22).

(d) Install rear fan housings (21) and (22) and two filler blocks (26). Secure with four screws (25).

(e) Install two filler bars (24) and secure with four screws (23).

(f) Install fan motor assembly. (See (5) above,)

(7) Conneot P8 and P9 motor connectors. Carefully mute thermal sensor (RT1) with wiring harness. Install clamp (12) and secure with screw (10) and self-locking nut (11). Secure harness in place with three tiedown straps.

(8) Carefully install front fan housings (8) and (9) and secure with six screws (7).

4-43. EVAPORATOR FAN, MOTOR, AND HOUSING. - continued

(9) Install two bell inlets (6) and secure with 12 screws (4) and flat washers (5).

NOTE

FOLLOW-ON MAINTENANCE:

Install condensate drain tubing (para 4-23).

Install transformer (para 4-39).

Connect power at power source.

4-44. HEATER THERMOSTAT (S3).

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Heater Thermostat

Lock Washer

Lock Washers (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.

Remove top panel (para 4-11).

a. Inspect.

(1) Check thermostat (1) for obvious damage and loose or missing terminals. Replace if damaged.

(2) Check bracket (2) for cracks or obvious damage. Replace if damaged.

b. Test.

(1) Tag and disconnect wire leads from thermostat (1) terminals.

(2) Using multimeter set to measure resistance, check continuity on thermostat (1) terminals 1 and 2. Continuity should be indicated.

(3) Connect wire leads to thermostat (1) terminals using tags and wiring diagram (figure 4-6). Remove tags.

4-44. HEATER THERMOSTAT (S3). - continued

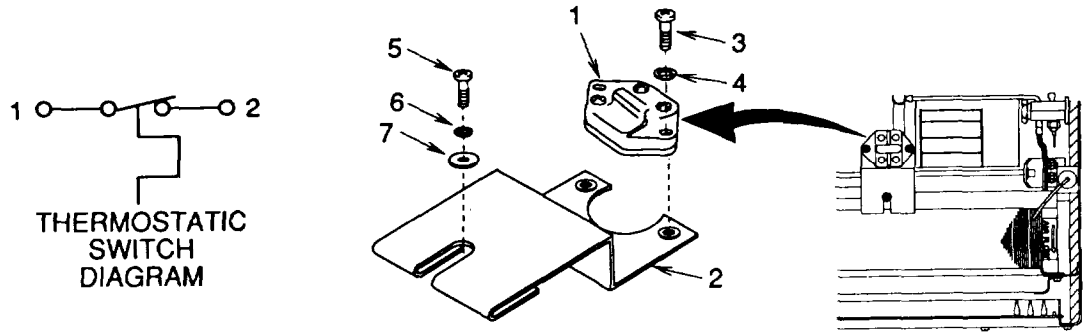


Figure 4-41. Heater Thermostat (S3)

c. Replace.

(1) Thermostat (1).

(a) Tag and disconnect wire leads from thermostat (1) terminals.

(b) Remove two screws (3), lock washers (4), and thermostat (1).

(c) Attach new thermostat (1) to bracket (2) with two screws (3) and lock washers (4).

(d) connect wire leads to thermostat (1) terminals using tags and wiring diagram (figure 4-6). Remove tags.

(2) Bracket (2).

(a) Remove two screws (3), lock washers (4), and thermostat (1).

(b) Remove screw (5) look washer (6) flat washer (7) and bracket (2).

(c) Attach new braoket (2) to unit with screw (5), look washer (6), and flat washer (7).

(d) Attach thermostat (1) to bracket (2) with two screws (3) and lock washers (4).

NOTE

FOLLOW-ON MAINTENANCE:

Install top panel (para 4-11).

4-45. HEATER ELEMENTS (HR1-HR6).

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Heater Elements (6)

Lock Washers (6)

Tiedown straps (10)

Equipment Condition

Remove top panel (para 4-11).

Remove electromagnetic interference filter (FL1) (para 4-30).

Remove heater thermostat (para 4-44).

a. Inspect.

(1) Visually inspect each heating element (1) for obvious damage, deformation, cracked or broken sheath, burnt out spots, and loose, broken, or otherwise damaged wire leads and terminals. Replace if damaged.

(2) Check heater support (2) and mounting bracket (3) for obvious damage, cracks, or broken welds. Check for loose or missing mounting hardware. Replace if damaged.

b, Test.

(1) Tag and disconnect wire leads from heater relay (K1) terminals and terminal post (TP1).

(2) Using a multimeter set to measure resistance, check continuity of each heating element (1) between wire lead terminals. Replace if no continuity is indicated.

(3) Using a multimeter set to measure resistance, check continuity of each heating element (1) between one wire lead terminal and heating element sheath. Replace if continuity is indicated.

(4) If no replacement is necessary, connect wire leads to terminal post (TP1) and heater relay (K1) using tags and wiring diagram (figure 4-6). Remove tags.

c. Replace.

(1) Remove channel gasket (4).

(2) Tag and disconnect heater leads from terminal post (5).

(3) Remove screw (6), lock washer (7), flat washer (8), and terminal post (5).

4-45. HEATER ELEMENTS (HR1-HR6). - continued

NOTE

Terminal protective cover must be removed to access wire terminals.

(4) Tag and disconnect heater leads form heater relay (9).

(5) Tag and disconnect wire leads from frost switch (10).

(6) Remove screw (11), bck washer (12), flat washer (13), stand off (14), and clamp (15).

(7) Pull wire leads through mounting bracket (3). Cut tiedown straps as necessary.

(8) Remove two sets of screws (16), lock washers (17), flat washers (18), and one heater support (2).

(9) Remove four sets of screws (19), lock washers (20), and flat washers (21).

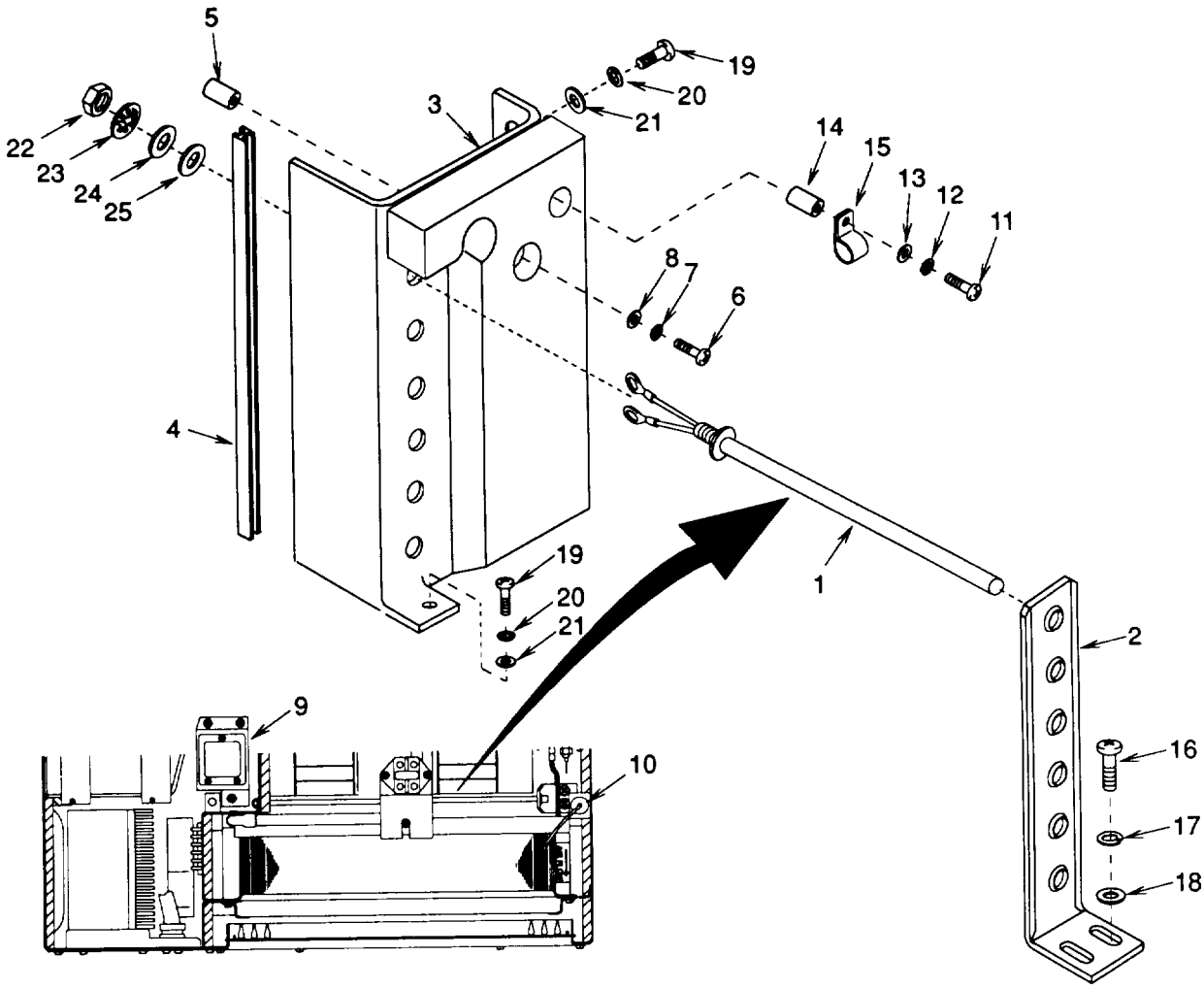


Figure 4-42. Heater Elements (HR1 - HR6)

4-45. HEATER ELEMENTS (HR1-HR6). - continued

(10) Slip mounting bracket (3) and heating elements (1) assembly out of unit.

(11) Remove nut (22), look washer (23), flat washer (24), insulating washer (25) and heating element (1).

(12) Carefully install new heating element (1) into mounting bracket (3) and secure with insulating washer (25), flat washer (24), lock washer (23), and nut (22).

(13) Slip mounting bracket (3) and heating elements (1) assembly into unit.

(14) Secure mounting bracket (3) with four sets of screws (19), lock washers (20), and flat washers (21).

(15) Install heater support (2) onto heater elements (1) and secure with two sets of screws (16), lock washers (17), and flat washers (18).

(16) Pass wire leads through mounting bracket (3).

(17) Secure wire leads with clamp (15), stand off (14), sorew (11), bck washer (1 2), and flat washer (1 3).

(18) Connect wire leads to frost switch (10) using tags and wiring diagram (figure 4-6). Remove tags.

(19) Connect wire leads to heater relay (9) using tags and wiring diagram (figure 4-6). Remove tags.

(20) Secure wire leads with tiedown straps as neoessary.

(21) Connect terminal post (5) to unit using screw (6), lock washer (7), and flat washer (8).

(22) Connect wire leads to terminal pest (5) using tags and wiring diagram (figure 4-6). Remove tags.

(23) Install channel gasket (4) between mounting bracket (3) and unit.

NOTE

FOLLOW-ON MAINTENANCE:

Install electromagnetic interference filter (para 4-30).

install heater thermostat (para 4-44).

Install top panel (para 4-11)

4-46. CONDENSER FAN, MOTOR, AND HOUSING.

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Motor

Scroll

Bell Inlet

Fan Impeller

Lock Washer (3)

Tiedown Straps (3)

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 supply.

Remove electromagnetic interference filter (FL1) (para 4-30).

Personnel Required

Two

a. Inspect.

(1) Check that all fan housing parts are in place and in good condition.

(2) Inspect fan impeller (1) for damaged or bent blades and free rotation.

(3) Inspect the motor (2) for signs of overheating.

(4) Check all mounting hardware for tightness.

(5) Tag and disconnect motor (2) connector plugs (3) and (4). Check for loose, damaged, or missing pins.

(6) Connect motor (2) connector plugs (3) and (4) using tags and wiring diagram (figure 4-6).

b. Service.

Wipe all dust or dirt from fan impeller (1), motor (2), and fan housing assembly.

c. Test.

NOTE

The motor is equipped with an internal thermal safety. If the motor is hot, it must be allowed to cool before testing.

(1) Tag and disconnect motor (2) connector plugs (3) and (4).

4-46. CONDENSER FAN, MOTOR, AND HOUSING. - continued

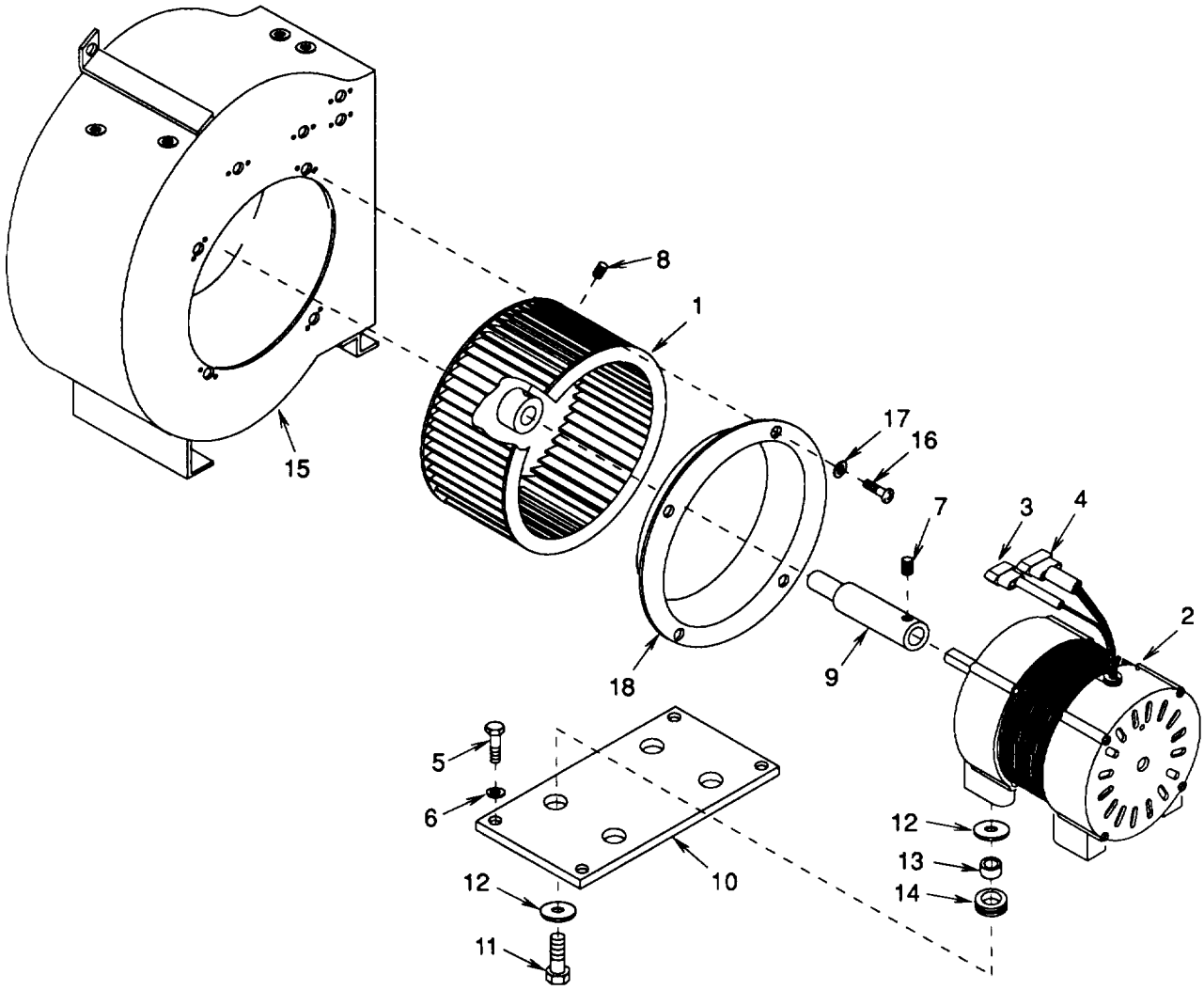


Figure 4-43. Condenser Fan, Motor, and Housing

(2) Use a multimeter set to measure resistance and check continuity at P10 (4) between pins 1 and 2, 1 and 3, and 2 and 3. If no continuity is indicated, replace motor.

(3) Use a multimeter set to measure resistance and check continuity at P7 (3) between pins 1 and 2. If no continuity is indicated, replace motor.

(4) Use a multimeter set to measure resistance and check continuity at P10 (4) and P7 (3) between P10 pin 4 and all other pins. If continuity is indicated, replace motor.

(5) If motor (2) tests good, connect motor connector plugs (3) and (4) using tags and wiring diagram (figure 4-6).

4-46. CONDENSER FAN, MOTOR, AND HOUSING. - continued

d. Replace.

(1) Remove electromagnetic interference filter (FL1). (See paragraph 4-30.)

(2) Remove condenser air discharge louver assembly. (See paragraph 4-21.)

(3) Tag and disconnect motor (2) connector plugs (3) and (4). Cut tiedown straps as necessary to free motor leads.

(4) Remove four screws (5) and flat washers (6).

(5) Loosen two setscrews (7) and (8). Remove shouldered shaft (9).

(6) Carefully lift motor (2) and mounting plate (10) up and out of unit.

(7) Motor (2).

(a) Remove four screws (11), eight flat washers (12), one mounting plate (10), and four sets of bushings (13) and grommets (14).

(b) Install four sets of grommets (14) and bushings (13) into mounting plate (10) motor mount holes.

(c) Attach mounting plate (10) to motor (2) with four screws (11) and eight flat washers (12).

(8) Fan impeller (1) and housing (15).

(a) Carefully rotate fan housing (15) from bottom (opening up) and remove out back of unit.

(b) Remove four screws (16), flat washers (17), and one bell inlet (18).

(c) Remove fan impeller (1).

(d) Place fan impeller (1) into fan housing (15).

(e) Secure bell inlet (18) to fan housing (15) with four sets of screws (16) and flat washers (17).

(f) Carefully install fan housing (15) through back of unit (opening up). Rotate as necessary to position in place.

(9) Carefully place motor (2) and mounting plate (10) into unit.

(10) Install shouldered shaft (9) onto fan impeller (1) and motor (2). Tighten setscrew (8) to secure.

(11) Align mounting plate (10) holes to unit and secure with four screws (5) and flat washers (6).

(12) Position shouldered shaft (9) on motor (2) shaft to maintain a minimal clearance of 1/8 inch between fan impeller (1) and bell inlet (18). Tighten setscrew (7).

(13) Connect motor (2) connector plugs (3) and (4) using tags and wiring diagram (figure 4-6). Secure motor leads as necessary using tiedown straps.

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power supply.

4-47. EVAPORATOR COIL.

This task covers: a. Inspect b. Service

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 Condition

Remove supply air louver (para 4-19).

Remove mist eliminator (para 4-20).

a. Inspect.

(1) Check for accumulated dirt. Clean if accumulation of dirt is evident.

(2) Check fins for dents, bent edges, or any condition that would block or distort airflow. Straighten all damaged fins.

(3) Should a leak or major damage be evident notify your supervisor.

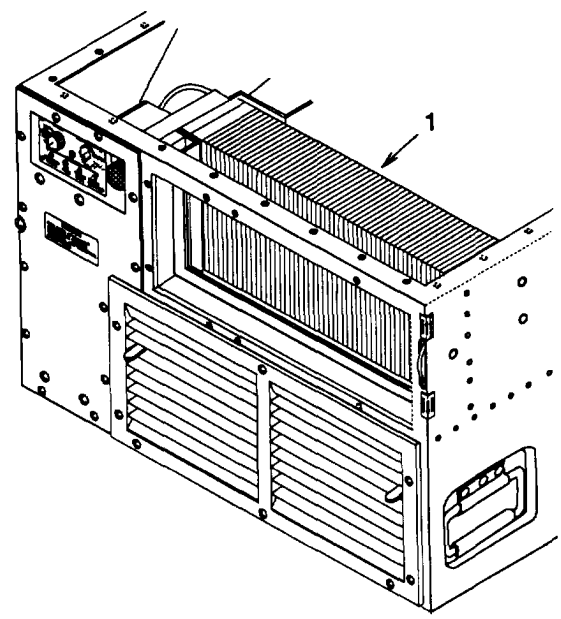


Figure 4-44. Evaporator Coil

4-47. EVAPORATOR COIL. - continued

WARNING

Injury to personnel can result if compressed air used for cleaning purposes exceeds 30 psi (2.1 kg/cm^2).

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.

b. Service.

Clean coil (1) with a soft bristled scrub brush and compressed air at 30 psi (2.1 kg/cm^2) or less. Blow dirt from the inside of the coil out. Take care to avoid fin damage.

NOTE

FOLLOW-ON MAINTENANCE:

Install mist eliminator (para 4-20).

Install supply air louver (para 4-19).

4-48. 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 top panel (para 4-11).

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.

4-48. SOLENOID VALVE (L1) COIL. - continued

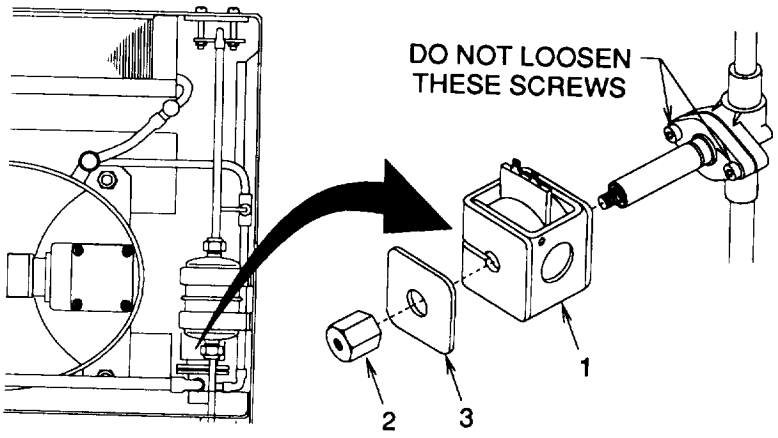


Figure 4-45. Solenoid Valve (L1) Coil

(3) Check for continuity between each solenoid valve (1) terminal 1 and 2 and coil casing. If continuity is found the coil is grounded and must be replaced.

(4) If continuity checks are satisfactory, apply 28 volts do 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.

(5) If all checks are satisfactory, connect wire leads to solenoid valve coil (1) using tags and wiring diagram (figure 4-6). 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 coil (1) and data plate (3) onto valve body and secure with nut (2).

(4) Connect wire leads to solenoid valve coil (1) using tags and wiring diagram (figure 4-6). Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:

Install top panel (para 4-11)

4-49. CONDENSER COIL.

This task covers: a. Inspect b. Service

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Safety Glasses
Appendix B, item 2

Scrub Brush
Appendix B, item 2

Equipment Condition

Remove top panel (para 4-11).

Remove condenser end guard (para 4-17).

a. Inspect.

(1) Check for accumulated dirt. Clean if accumulation of dirt is evident.

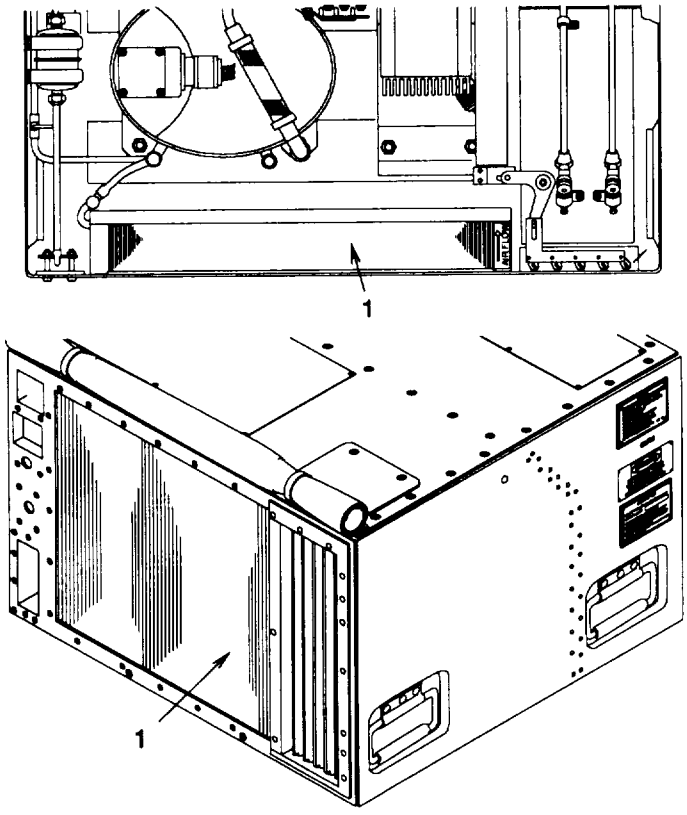


Figure 4-46. Condenser Coil

4-49. CONDENSER COIL. - continued

(2) Check fins for dents, bent edges, or any condition that would block or distort air flow. Straighten all damaged fins.

(3) Should a leak or major damage be evident notify your supervisor.

WARNING

Injury to personnel can result if compressed air used for cleaning purposes exceeds 30 psi (2.1 kg/cm^2).

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.

b. Service.

Clean coil (1) with a soft bristled scrub brush and compressed air at 30 psi (2.1 kg/cm^2) or less. Blow dirt from the inside of the coil out. Take care to avoid fin damage.

NOTE

FOLLOW-ON MAINTENANCE:

Install condenser end guard (para 4-17)

Install top panel (para 4-11)

4-50. HOUSING.

This task covers: a. Inspect b. Service

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Scrub Brush
Appendix B, item 2

Materials/Parts

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.

a. Inspect.

Check housing for cracks, dents, tears, or any signs of obvious damage. Notify supervisor if damaged.

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. Service.

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

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

4-51. INPUT POWER CONNECTOR (INSTALLATION).

This task covers: a. Inspect b. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

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

Appendix F, figure F-47 shows fabrication information for input power cable/connector.

a. Inspect.

Check for loose, missing, or damaged pins and cut or broken wires on connector or any other damage.

b. Replace.

Replace damaged wires or connector. (See paragraph 4-24.)

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

4-52. INSTALLATION HARDWARE.

This task covers: a. Inspect b. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

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

Each unit is supplied with mounting hardware for the four base attachment points.

a. Inspect.

Inspect hardware to be sure it is tight, properly installed, and in good condition.

b. Replace.

Replace missing, damaged, or defective parts.

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

4-52. INSTALLATION HARDWARE. - continued

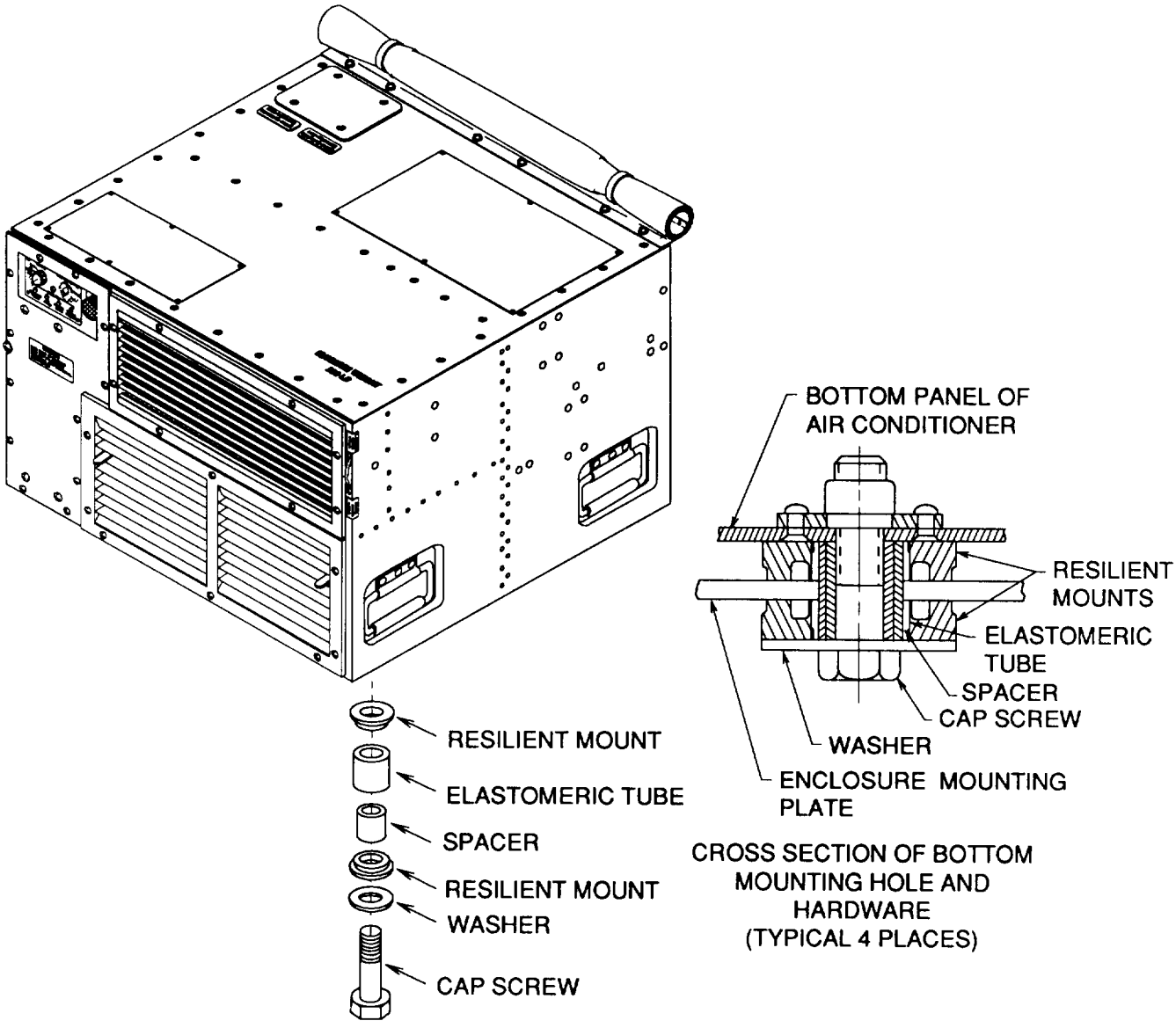


Figure 4-47. Installation Hardware

Section VII PREPARATION FOR STORAGE OR SHIPMENT

4-53. 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. 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. 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

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 TM9-4120-401-24P. No special tools are required for direct support maintenance of the air conditioner except those listed in c. 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	Tool Number
Logic Box Test Fixture	(94833) 111K8002-1

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 4-2 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.

SYMPTOM INDEX

WARNING

Disconnect Power from the air conditioner before doing any maintenance work to the electrical system. High voltage in air conditioner can kill.

Refigerant under pressure is used in the operation of this equipment.

Death or severe injury may result if personnel fail to observe safety precautions.

Never use a heating torch on any part that contains refrigerant R-22.

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 thermal protective 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.

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 compressor still does not start, test switches. (See paragraphs 5-27 and 5-28.)

Table 5-1. DIRECT SUPPORT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
1. COMPRESSOR WILL NOT START. - continued	
Step 2. Check compressor motor windings. (See paragraph 5-33.)	Replace compressor if windings are defective.
2. COMPRESSOR SHORT CYCLES.	
Step 1. Check system operating pressures. (See paragraph 5-21.)	Adjust refrigerant charge if necessary. (See paragraph 5-18.)
Step 2. Check compressor motor windings. (See paragraph 5-33.)	Replace compressor if windings are defective.
Step 3. Check solenoid valve. (See paragraphs 4-48 and 5-25.)	Repair or replace if defective.
3. AIR CONDITIONER INSUFFICIENT COOLING.	
Step 1. Check to make sure condenser discharge louvers are opening. (See paragraph 5-26.)	Replace actuating cylinder if defective.
Step 2. Check system operating pressures. (See paragraph 5-21.) **NOTE** A clogged refrigerant desiccant dehydrator can cause bubbles in sight glass and reduce cooling capacity.	Adjust refrigerant charge if necessary. (See paragraph 5-18.)
Step 3. Cheek for refrigerant leaks. (See paragraph 5-16.)	Repair or replace defective part.
Step 4. Check solenoid valve. (See paragraphs 4-48 and 5-25.)	Repair or replace if defective.
Step 5. Check expansion valve for proper operation. (See paragraph 5-24.)	Replace if defective.
4. REFRIGERANT SYSTEM CONTINUOUSLY LOSING REFRIGERANT.	
Check refrigerant tubing and components for leaks using a leak detector. (See paragraph 5-16.)	Repair or replace as required.

Table 5-1. DIRECT SUPPORT TROUBLESHOOTING - continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

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 thermal protective 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.

5. AIR CONDITIONER OPERATES CONTINUOUSLY ON COOLING CYCLE.

Step 1. Check position of potentiometer TEMPERATURE control. (See paragraph 2-2.)

Move control to WARM.

Step 2. Check potentiometer TEMPERATURE control. (See paragraph 4-27.)

Replace if defective.

Step 3. Check solenoid valve. (See paragraph 5-25.)

Replace if defective.

6. SIGHT GLASS APPEARS YELLOW INSTEAD OF GREEN.

Step 1. Sight glass appears yellow.

Replace refrigerant desiccant dehydrator. (See paragraph 5-22.)

Step 2. Run unit for one hour and check for yellow sight glass.

Replace refrigerant desiccant dehydrator and re-check. (See paragraph 5-22.)

7. AIR CONDITIONER NOISY DURING OPERATION.

Step 1. Check expansion valve. (See paragraph 5-24.)

Replace if defective.

Step 2. Check compressor for internal noise and loose mounting. (See paragraph 5-33.)

a. Repair loose mounting.

b. Replace compressor if defective.

Section III MAINTENANCE PROCEDURES

5-3. GENERAL.

WARNING

Disconnect power from the air conditioner before doing any maintenance work to the electrical system. High voltage in air conditioner can kill.

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

Equipment Conditions:

Remove fabric cover (para 4-10).

Materials/Parts

Fabric Cover

Snap Fastener Caps and Sockets (7)

a. Repair.

(1) Minor rips, cuts, tears, or punctures may be repaired by applying a patch to the inside surface.

(2) Snap fasteners are not repairable and must be replaced if defective.

b. Replace.

Replace fabric cover if badly torn or punctured.

NOTE

FOLLOW-ON MAINTENANCE:

Install fabric cover (para 4-10).

5-5. PANELS.

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 Remover
Appendix E, item 16

Adhesive
Appendix E, item 2

Gasket
Appendix F

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 panels as necessary (para 4-11 thru 4-15).

NOTE

Use only gasket and insulation material identified in TM 9-4120-401-24P.

a. Repair.

(1) 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.

(2) Soften and remove old adhesive and material residue, using adhesive remover and a stiff brush.

(3) Fabricate gaskets/insulation in accordance with dimensions provided in Appendix F.

(4) Coat mating surfaces of metal and material with adhesive. Let both surfaces air dry until adhesive is tacky but will not stick to fingers.

5-5. PANELS - continued.

(5) Starting with an end, carefully attach material to the metal. Press into firm contact all over.

(6) Minor dents and bent edges can be straightened using common sheet metal repair procedures.

(7) Should touch up or refinishing be necessary, see TM 43-0139.

b. Replace.

Replace panels that are badly dented, bent, or punctured.

NOTE

FOLLOW-ON MAINTENANCE:

Install panels (para 4-11 thru 4-15).

Connect power at power source,

5-6. INFORMATION PLATES.

This task covers: Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Brush
Appendix B, item 2

Gloves
Appendix B, item 2

Rivet Gun
Appendix B, item 11

Materials/Parts

Adhesive Remover
Appendix E, item 16

Rivets

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

See figure 2-6 for location and information contained on information plates.

Use only information plates identified in TM 9-4120-401-24P.

5-6. INFORMATION PLATES. - continued

Replace.

(1) Riveted information plates.

(a) Drill out rivets using a drill bit slightly smaller than the rivet. Use a drill stop or similar tool to avoid damage to internal parts.

(b) Install new plate and secure with proper size rivets.

(2) Self-adhesive information plates.

(a) Pull plate off and remove as much adhesive from unit as possible by pulling or scraping it off

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.

(b) Soften and remove old adhesive using adhesive remover and a stiff brush.

(c) Peel backing off new plate and position in place on unit. Press into firm contact all over.

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

5-7. FRESH AIR DAMPER AND ACTUATOR.

This task covers: Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Self-locking Nuts (2)

Lock Washer

Lock Washers (3)

Spring Washers (2)

Push On Nut

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 return air louver (para 4-18).

Remove supply air louver (para 4-19).

Remove mist eliminator (para 4-20).

Remove compressor (para 5-33).

Replace.

(1) Loosen screw (1) on mechanical post (2) and disconnect push-pull control cable (3).

(2) Remove two screws (4), lock washers (5), and flat washers (6) and lift damper (7) from air conditioner.

(3) Remove screw (8), lock washer (9), nut (10), spacer(11) and loop clamp (12).

(4) Loosen screw (13) in actuator plate blind nut (14) to free end of push-pull control cable (3).

(5) Remove outer nuts (15) from both ends of push-pull control cable (3) and remove cable from unit.

(6) Remove screw (16), self-locking nut (17), two spring washers (18) and actuator plate (19).

(7) Remove screw (13), push on nut (20), and blind nut (14) from actuator plate (19).

(8) Remove self-locking nut (21), screw (1), mechanical post (2), two sleeve bearings (22), and cover (23) from damper (7).

(9) Insert blind nut (14) into actuator plate (19) and secure with push on nut (20).

(10) Install screw (13) into blind nut (14). Do not tighten.

(11) Attach two sleeve bearings (22), cover (23), mechanical post (2), and self-locking nut (21) to damper (7).

(12) Install screw (1) into mechanical post (2). Do not tighten.

5-7. FRESH AIR DAMPER AND ACTUATOR. - continued

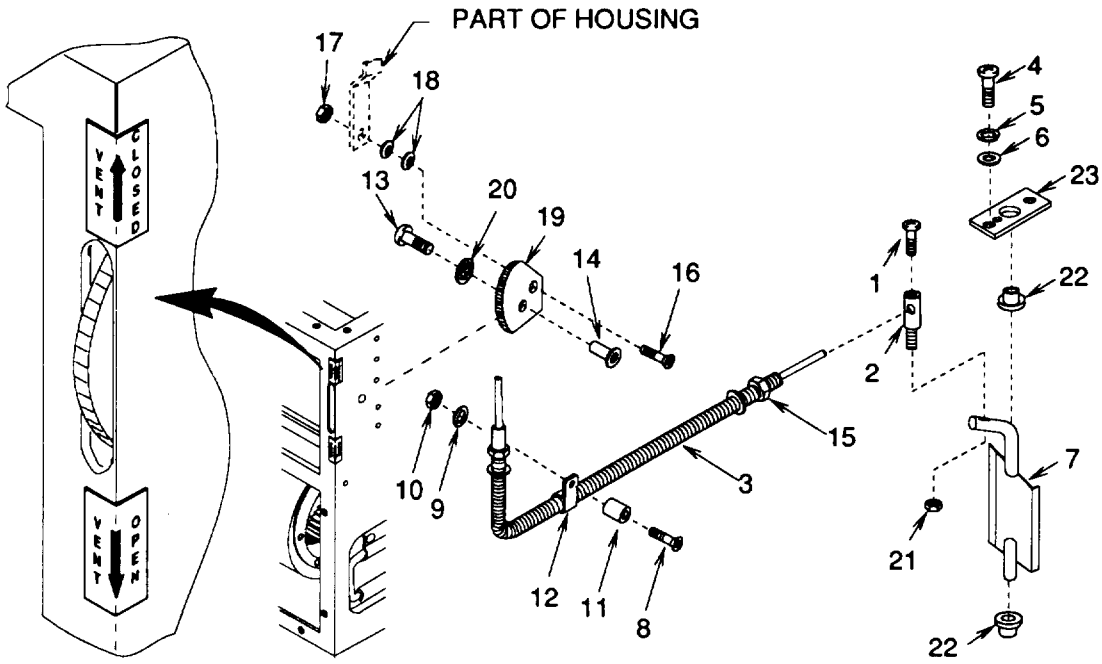


Figure 5-1. Fresh Air Damper and Actuator

(13) Install actuator plate (19) with screw (16), two spring washers (18), and self-locking nut (17).

(14) Install damper (7) in opening of housing.

(15) Secure damper cover (23) to housing with two screws (4), lock washers (5), and flat washers (6).

(16) Install one nut (15) seven turns onto each end of push-pull control cable (3).

(17) Install ends of cable through openings in housing.

(18) Install outer nuts (15) on push-pull control cable (3) and tighten.

(19) Insert cable (3) ends into mechanical post (2) and blind nut (14).

(20) Install loop clamp (12), spacer (11), screw (8), nut (10), and washer (9).

NOTE

Be sure equal lengths of push-pull control cable extend from ends.

(21) Put actuator plate (19) in center position and tighten screw (13).

5-7. FRESH AIR DAMPER AND ACTUATOR. - continued

(22) Put damper (7) in center position and tighten screw (1).

(23) Check actuator plate (19) for smooth operation.

NOTE

FOLLOW-ON MAINTENANCE:

Install compressor (para 5-33).

Install mist eliminator (para 4-20).

Install supply air buver (para 4-19).

Install return air buver (para4-18).

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 12

Materials/Parts

Logic Box Assembly

Equipmenr 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 4-32).

Test.

NOTE

If a complete test fixture is unavailable, see appendix F, figure F-48 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 5-2.) if a test fixture was fabricated per schematic (appendix F, figure F-48), 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.

5-8. LOGIC BOX ASSEMBLY (LGC1). - continued

(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.

(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-secmd delay LEDs 1 and 7 shall illuminate and multimeter shall read 6.3 vdc or higher.

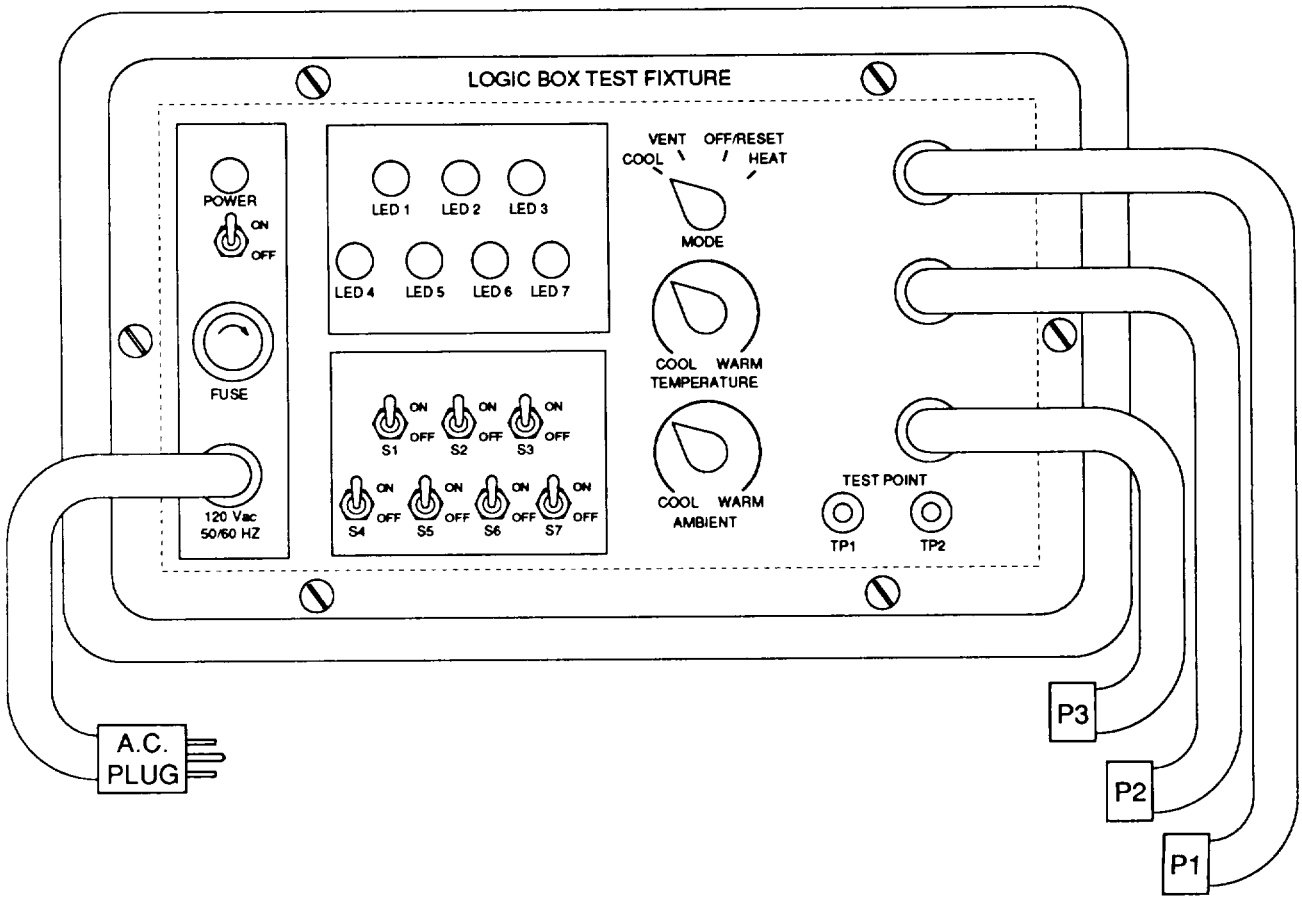


Figure 5-2. Logic Box Test Fixture

5-8. LOGIC BOX ASSEMBLY (LGC1). - continued

(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.

(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 seoonds 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 folbwing 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 thru 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.

5-8. LOGIC BOX ASSEMBLY (LGC1). - continued

(n) Steps 2 thru 4 shall repeat twice. Then LED 5 illuminates and LED 7 remains illuminated. End of routine.

(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 pcsition. 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 thru 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 thru 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 thru 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 thru 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.

(d) Rotate AM BIENT 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.

5-8. LOGIC BOX ASSEMBLY (LGC1). - continued

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 oontinue to be off. LED 7 shall illuminate.

5 Steps 2 thru 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 thru 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 thru 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.

4 LED 7 illuminates for 2 seconds and then turns off for 2 seconds.

5 LEDs 2 and 7 shall illuminate. End of routine.

5-8. LOGIC BOX ASSEMBLY (LGC1). - continued

(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 seoonds 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 turnoff. 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.

(r) Place S2 in the ON position. LEDs 2 and 7 remain illuminated. S2 has no effect.

5-8. LOGIC BOX ASSEMBLY (LGC1). - continued

(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 seoond 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 4-32).

5-9. EVAPORATOR FAN MOTOR (B1) REPAIR..

This task covers: Repair

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Bearings (2)

Spring Washer

Oil
Appendix E, item 17

Lock Washers (4)

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.

Remove evaporator fan motor (B1) (para 4-43).

NOTE

For additional information on electric motor repair refer to FM 20-31 (Electric Motor and Generator Repair).

Repair.

(1) To replace connector (1) or (2).

(a) Tag and disconnect wire leads from connector (1) or (2) terminals. (See paragraph 4-24.)

(b) Attach new connector (1) or (2) to wire leads using tags and wiring diagram (figure 4-6). Remove tags. (See paragraph 4-24.)

(2) To replace bearings (3).

(a) Match mark stator (4) and two end plates (5) and (6) to ease reassembly.

(b) Remove four nuts (7), lock washers (8), and screws (9).

NOTE

Improper insertion of rotor will cause motor to run backwards.

(c) Carefully separate end plates (5) and (6) from stator (4) and slip grommet (10) out of end plate (5)

(d) Slide end plates (5) and (6) off rotor (11) shaft. Mark wire lead end of rotor for proper insertion at reassembly and remove from stator (4).

(e) Carefully remove two bearings (3) from rotor (11) shafts. Use bearing puller if necessary.

5-9. EVAPORATOR FAN MOTOR (B1) REPAIR. - continued[

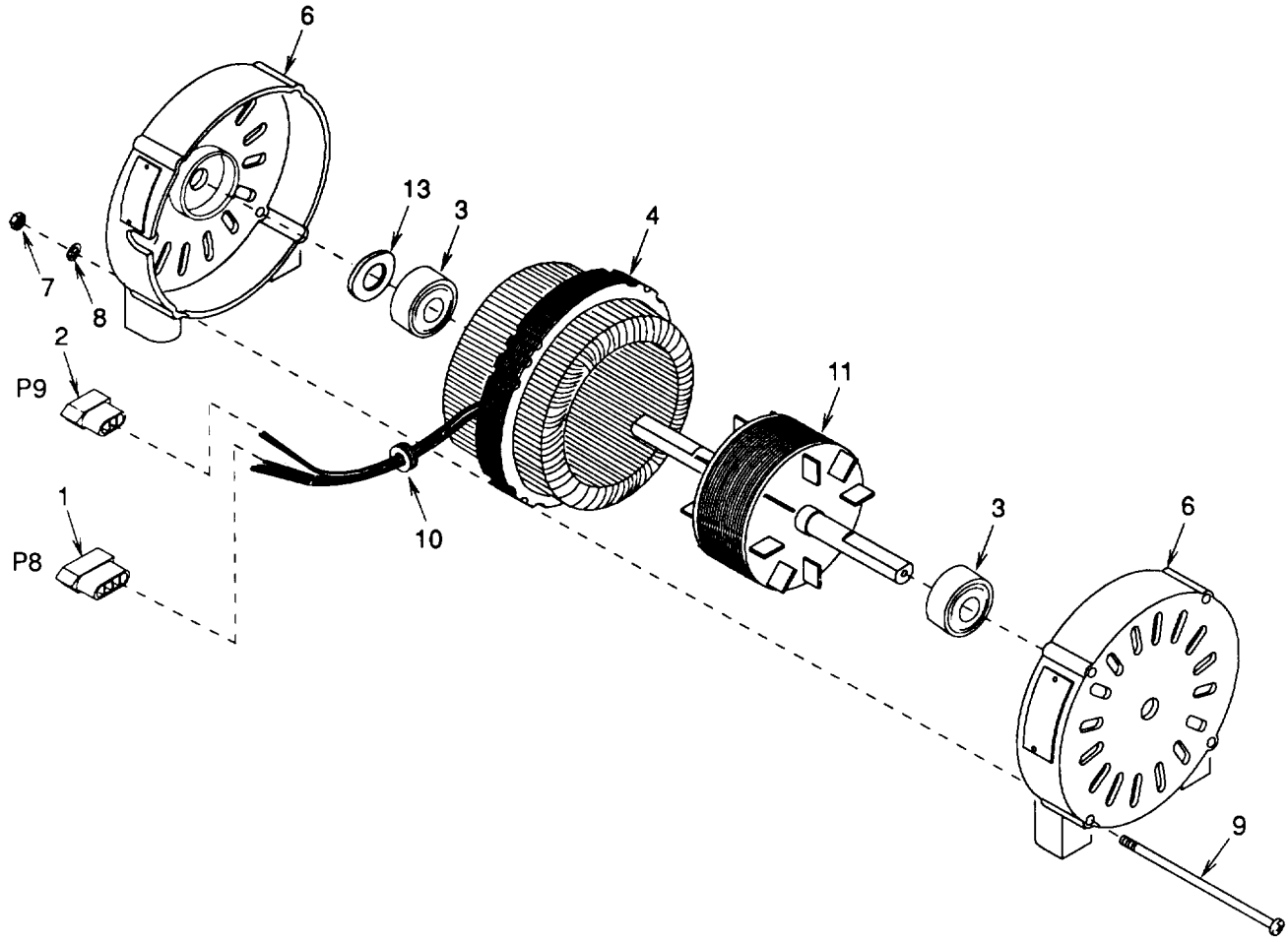


Figure 5-3. Evaporator Fan Motor (B1)

(f) Remove spring washer (13) from end plate (5).

(g) Inspect stator (4) for any visible damage or shorted windings (paragraph 4-43). If stator is damaged, replace motor.

(h) Inspect end plates (5) and (6) for cracks or any visible damage. If damaged, replace.

(i) Inspect rotor (11) and shafts for evidence of overheating. Replace rotor if overheating is evident.

(j) Inspect rotor (11) for nicks, gouges, and deformation. Dress high metal defects in shaft with a fine file or stone. If shaft is beyond repair, replace rotor.

(k) Coat bearing cavity of end plates (5) and (6), two new bearings (3), and new spring washer (13) with oil.

(l) Install spring washer (13) and bearing (3) into end plate (5).

5-9. EVAPORATOR FAN MOTOR (B1) 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.

(m) Install bearing (3) into end plate (6).

(n) Carefully place rotor (11) into stator (4) per marking made during disassembly.

(o) Coat rotor (11) shafts with oil and slip end plates (5) and (6) onto shaft ends.

(p) Slip grommet (10) into end plate (5) and aline match marks. Secure motor assembly with four screws (9), lock washers (8), and nuts (7).

(q) Turn rotor (11) shaft by hand to check rotation. There should be no drag or binding, Correct as necessary.

(r) Check for proper end play (0.002 -0.005 inch (0.051 -0.127 mm)).

NOTE

FOLLOW-ON MAINTENANCE:

Install evaporator fan motor (B1) (para 4-43).

Connect power at power source.

5-10. CONDENSER FAN MOTOR REPAIR.

This task covers: Repair

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Bearings (2)

Spring Washer

Oil
Appendix E, item 17

Lock Washers (4)

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.

Remove condenser fan motor (B2) (para 4-46).

NOTE

For additional information on electric motor repair refer to FM 20-31 (Electric Motor and Generator Repair).

Repair.

(1) To replace connector (1) or (2).

(a) Tag and disconnect wire leads from connector (1) or (2) terminals. (See paragraph 4-24.)

(b) Attach new connector (1) or (2) to wire leads using tags and wiring diagram (figure 4-6). Remove tags. (See paragraph 4-24.)

(2) To replace bearings (3).

(a) Match mark stator (4) and two end plates (5) and (6) to ease reassembly.

(b) Remove four nuts (7), lock washers (8), and screws (9).

(c) Carefully separate end plates (5) and (6) from stator (4) and slip grommet (10) out of end plate (6).

(d) Remove screw (11) to loosen ground wire (12) from end plate (6).

(e) Slide end plate (5) off rotor (13) shaft.

(f) Carefully remove two bearings (3) from rotor (13) shafts. Use bearing puller if necessary.

(g) Remove spring washer (14) and spacer (15) from end plate (6).

5-10. CONDENSER FAN MOTOR REPAIR. - continued

(h) Inspedstator (4) for any visible damge or shorted windings (paragraph 4-46). If stator is damaged, replace motor.

(i) Inspect end plates (5) and (6) for cracks or any visible damage. If damaged, replace.

(j) Inspect rotor (13) and shafts for evidence of overheating. Replace rotor if overheating is evident.

(k) Inspect rotor (13) for nicks, gouges, and deformation, Dress high metal defects in shaft with a fine file or stone. If shaft is beyond repair, replace rotor.

(l) Coat bearing cavity of end plates (5) and (6), new spring washer (14), and spacer (15) with oil.

(m) Install spacer (15), spring washer (14), and bearing (3) into end plate (6).

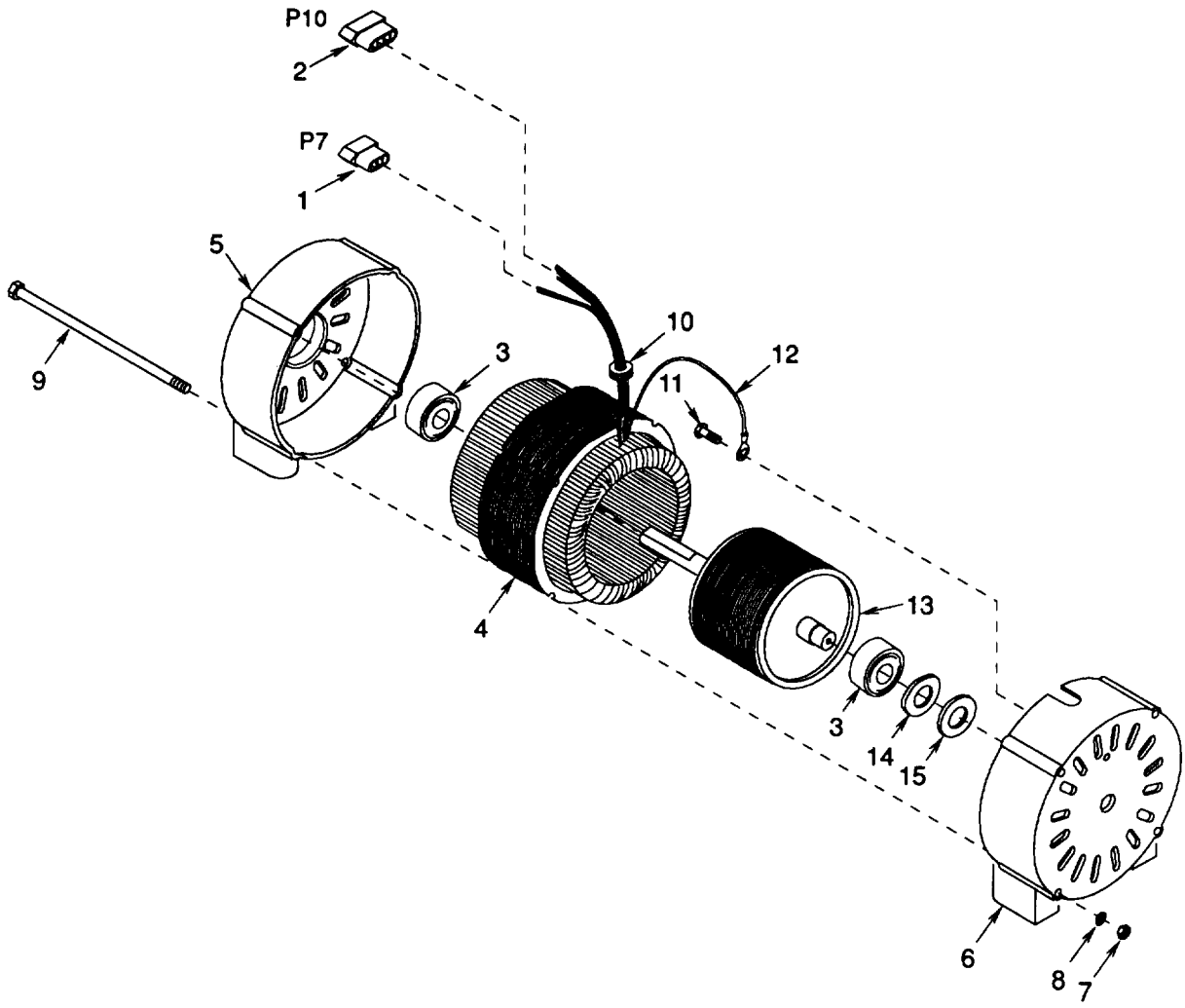


Figure 5-4. Condenser Fan Motor (B2)

5-10. CONDENSER FAN MOTOR 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.

(n) Install bearing (3) into end plate (5).

(o) Carefully place rotor (13) into stator (4) with short shaft end at wire lead in end of motor.

(p) Attach ground wire (12) to end plate (6) with screw (11).

(q) Coat rotor (13) shaft ends with oil and slip end plates (5) and (6) onto shafts.

(r) Slip grommet (10) into end plate (6) and aline match marks. Secure motor assembly with four screws (9), lock washers (8), and nuts (7).

(s) Turn rotor (13) shaft by hand to check rotation. There should be no drag or binding. Correct as necessary.

(t) Check for proper end play (0.002 -0.005 inch (0.051 -0.127 mm)).

NOTE

FOLLOW-ON MAINTENANCE:

Install condenser fan motor (B2) (para 4-46).

Connect power at power source.

5-11. 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 Coditions

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.

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.

Refrigerant can cause suffocation. Work in a well ventilated area.

a. Install.

(1) Remove four screws (1) and access panel (2).

(2) Check that HIGH and LOW PRESSURE CHARGING VALVES are closed.

(3) Remove protective caps from HIGH and LOW PRESSURE CHARGING VALVES.

(4) Connect the pressure gauge hose to HIGH PRESSURE CHARGING VALVE and the compound gauge hose to LOW PRESSURE CHARGING VALVE.

(5) Check that all four service manifold valves are closed.

(6) Open HIGH and LOW PRESSURE CHARGING 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.

5-11. SERVICE MANIFOLD INSTALLATION. - continued

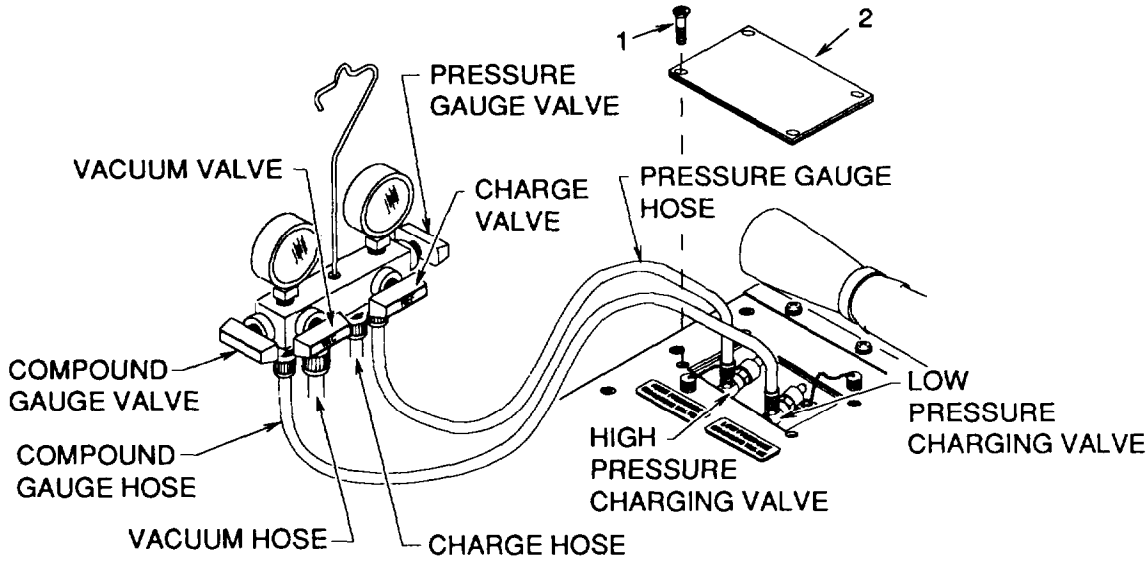


Figure 5-5. Service Manifold Installation

b. Remove.

(1) Cheek that HIGH and LOW PRESSURE CHARGING VALVES are closed.

(2) Open all four service manifold valves to bleed off pressure.

(3) Remove hoses from HIGH and LOW PRESSURE CHARGING VALVES.

(4) Close service manifold valves.

(5) Install protective caps onto HIGH and LOW PRESSURE CHARGING VALVES.

(6) Install access panel (2) and secure with four screws (1).

NOTE

FOLLOW-ON MAINTENANCE:

Connect power at power source.

5-12. DISCHARGING THE REFRIGERANT SYSTEM.

This task covers: Discharge

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Goggles
Appendix B, item 2

Gloves
Appendix B, item 2

Refrigerant Recovery and Recycle Unit
Appendix B, item 9

Equipment Conditon

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.

Install service manifold (para 5-11).

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.

Refrigerant can cause suffocation. Work in a well ventilated area.

NOTE

Venting chlorofluorocarbon refrigerants into the atmosphere rather than recovering them is a violation of public law and subject to severe penalties.

Discharge

(1) Connect the charge hose to an approved container or refrigerant recovery unit.

(2) Open pressure gauge and compound gauge valves.

5-12. DISCHARGING THE REFRIGERANT SYSTEM. - continued

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.

(3) Discharge refrigerant.

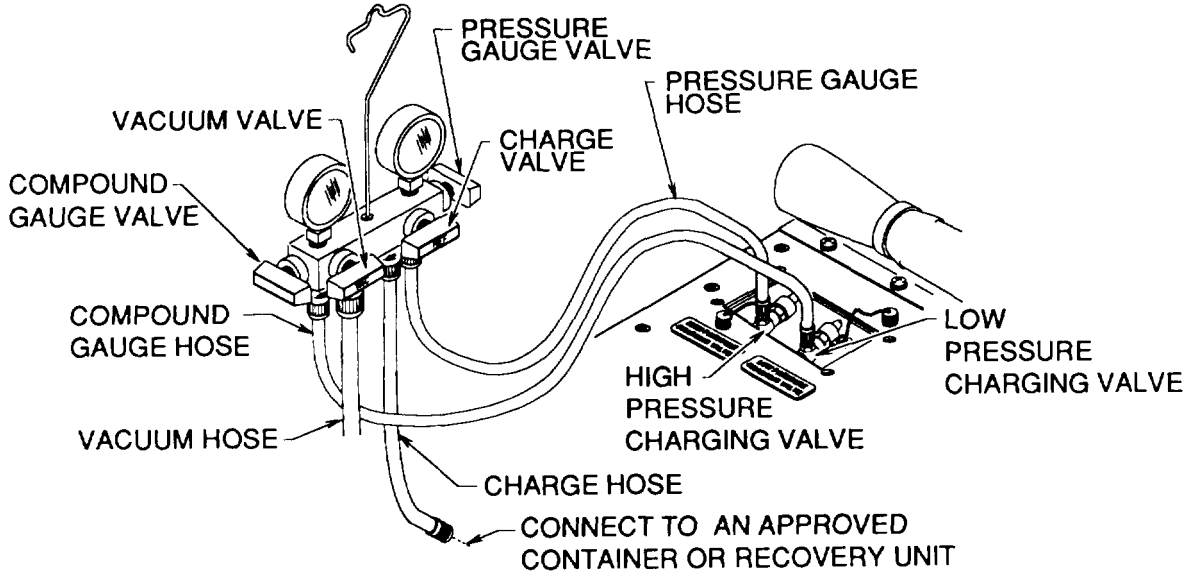


Figure 5-6. Discharging Refrigerant

NOTE

FOLLOW-ON MAINTENANCE:

Remove service manifold (para 5-11).

5-13. 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

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.

Install service manifold (para 5-11).

Discharge refrigerant system (para 5-12).

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.

(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 compound gauge and vacuum valves are closed.

(4) Be sure that HIGH and LOW PRESSURE CHARGING VALVES are open.

(5) Open the 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 m^3/minute) of nitrogen flows through the system.

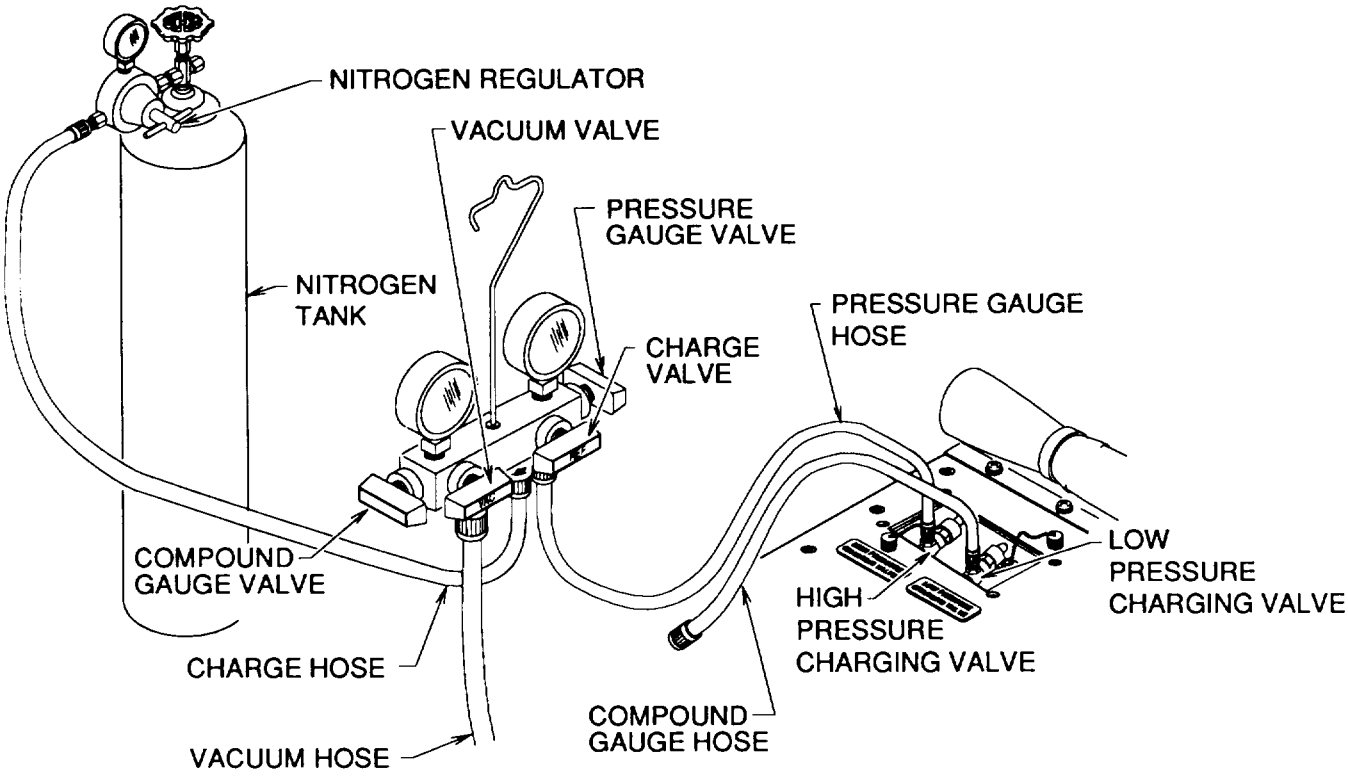
(7) Check discharge from the compound gauge hose attached to the LOW PRESSURE CHARGING VALVE to be sure that no oil is being forced out of the system.

(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.

5-13. PURGING THE REFRIGERANT SYSTEM. - continued]



Figiure 5-7. Nitrogen Tank Connection

NOTE

FOLLOW-ON MAINTENANCE:

Remove service manifold (para 5-11).

5-14. BRAZING/DEBRAZING PROCEDURES.

This task covers: a. Debraze b. Clean c. Braze

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

Material/Parts

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

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.

Install service manifold (para 5-11).

Discharge refrigerant system (para 5-12).

a. Debraze.

WARNING

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

(1) Purge refrigerant system with dry nitrogen. (See paragraph 5-13.)

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 a well ventilated area.

(2) Protect insulation, wiring harnesses, and other components with appropriate heat shields.

5-14. 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 of a joint, 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

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

(1) Purge refrigerant system with dry nitrogen. (See paragraph 5-13.)

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 a well ventilated area.

(2) Protect insulation, wiring harnesses, and other components with appropriate heat shields.

5-14. 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 5-11).

5-15. 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

Power Supply
Appendix B, item 6

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

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 refrigerant desiccant dehydrator (para 5-22).

Remove compressor (para 5-33).

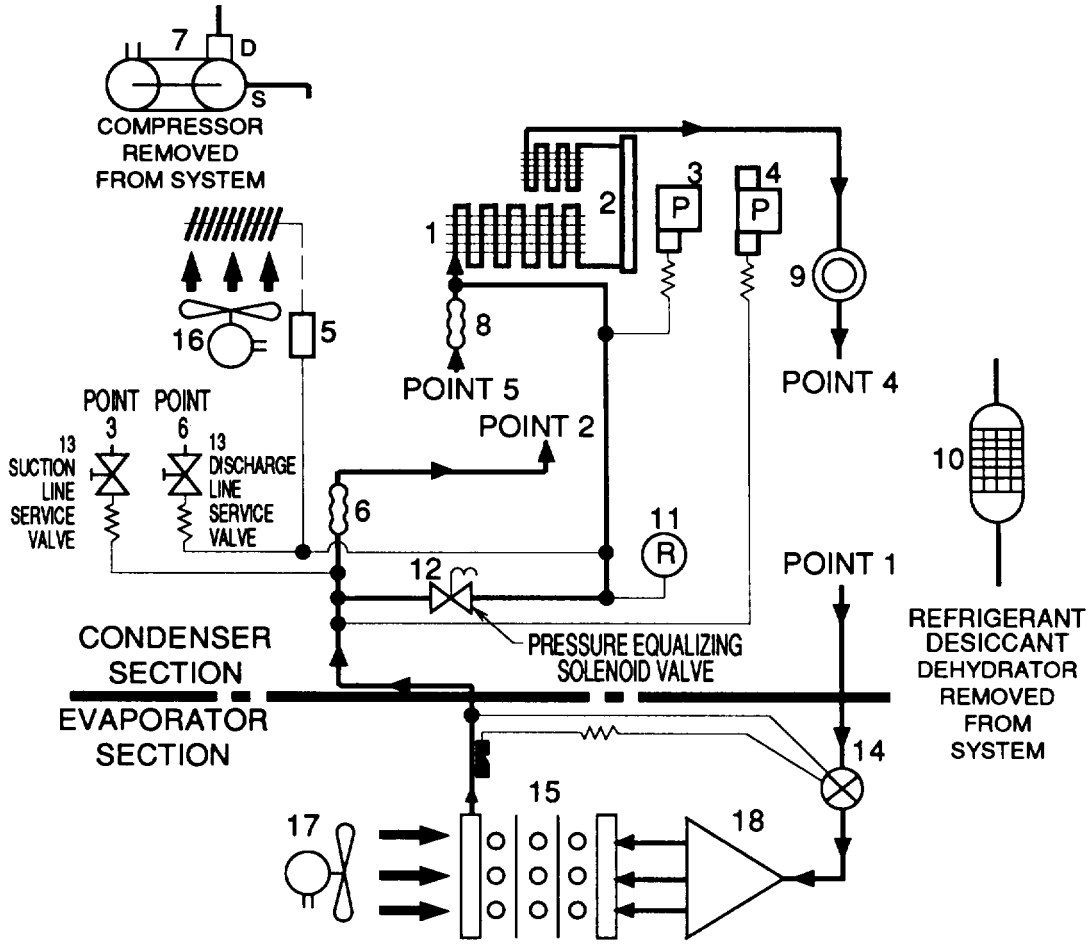
a. Flush.

NOTE

The refrigerant 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.

(1) Fill a small drum or suitable reservoir with refrigerant R-114. Connect a line from the suction side of the diaphragm pump to draw from the bottom of the reservoir. Connect a recovery line with filter to discharge into the reservoir.

5-15. FLUSHING THE REFRIGERANT SYSTEM. - continued



COMPONENT REFERENCE LIST		
FIND NO.	QTY	DESCRIPTION
1	1	CONDENSER COIL
2	1	RECEIVER
3	1	PRESSURE SWITCH (HIGH)
4	1	PRESSURE SWITCH (LOW)
5	1	LINEAR ACTUATOR CYLINDER
6	1	METAL HOSE ASSEMBLY (SUCTION)
7	1	COMPRESSOR
8	1	METAL HOSE ASSEMBLY (DISCHARGE)
9	1	SIGHT GLASS
10	1	REFRIGERANT DESICCANT DEHYDRATOR
11	1	PRESSURE RELIEF VALVE
12	1	SOLENOID VALVE
13	2	SERVICE VALVE
14	1	EXPANSION VALVE
15	1	EVAPORATOR COIL
16	1	MOTOR, CONDENSER FAN
17	1	MOTOR, EVAPORATOR FAN
18	1	DISTRIBUTOR

Figure 5-8. Refrigerant Flow System with Refrigerant Desiccant Dehydrator and Compressor Removed

5-15. 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.

(2) Flush the refrigerant system with refrigerant R-114 using a diaphragm pump.

(a) Connect a line between POINTS 1 and 4.

(b) Connect a line from the discharge side of the diaphragm pump to POINT 5.

(c) Connect the reservoir recovery line to POINT 2.

(d) Close suction and discharge line service valves.

(e) Tag and disconnect the pressure equalizer solenoid valve wire leads. (See paragraph 4-48.)

(f) Connect solenoid valve wire leads to power supply and apply 28 volts dc to energize valve.

(g) Flush for 10 minutes.

(h) Reverse the lines at POINTS 2 and 5.

(i) Flush for 10 minutes.

(j) Disconnect power from solenoid valve leads.

(k) Remove line from POINT 5 and cap POINT 5.

(l) Connect reservoir recovery line to POINT 3 and open suction line service valve.

(m) Flush for 2 minutes.

(n) Remove reservoir recovery line and connect to POINT 6. Close suction line service valve and open discharge line service valve.

(o) Flush for 2 minutes.

(p) Close discharge line service valve. Remove lines from POINTS 2 and 6 and cap from POINT 5.

5-15. FLUSHING THE REFRIGERANT SYSTEM. - continued

b. Purge.

WARNING

Never pressurize refrigerant lines with oxygen. Mixing oxygen 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.

Purge the system with dry nitrogen regulated to approximately 30 psig (2.11 kg/cm2).

(a) Connect a line from the dry nitrogen cylinder regulator to POINT 5.

(b) Connect a line (without filter) from POINT 2 to the reservoir.

(c) Apply 28 volts do to solenoid valve wire leads to energize valve.

(d) Blow nitrogen through system for at least 30 seconds after moisture stops being discharged.

(e) Reverse the line at POINTS 2 and 5.

(f) Blow nitrogen through system for at least 30 seconds after moisture stops being discharged.

(g) Disconnect power from solenoid valve wire leads and remove power supply. Connect solenoid valve wire leads using tags and wiring diagram (figure 4-6). Remove tags. (See paragraph 4-48.)

(h) Remove line from POINT 5 and cap POINT 5.

(i) Connect line from reservoir to POINT 3 and open suction line service valve.

(j) Blow nitrogen through system for at least 30 seconds after moisture stops being discharged.

(k) Remove line from POINT 3 and connect to POINT 6. Close suction line service valve and open discharge line service valve.

(l) Blow nitrogen through system for at least 30 seconds after moisture stops being discharged.

(m) Close discharge line service valve. Remove lines from POINTS 2 and 6 and cap from POINT 5. Cap or plug open connections if compressor and refrigerant desiccant dehydrator are not to be installed immediately.

NOTE

FOLLOW-ON MAINTENANCE:

Install compressor (para 5-33).

Replace refrigerant desiccant dehydrator (para 5-22).

5-16. LEAK TESTING.

This task covers: Testing

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

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 supply.

Remove top panels (para 4-11).

Install service manifold (para 5-11).

WARNING

Never pressurize refrigerant lines with oxygen. Mixing oxygen 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

An electronic refrigerant gas leak detector should be used to test for leaks.

An electronic refrigerant gas leak detector should be used in accordance with the procedures contained in TM 9-4940-435-14, “Leak Detector, Refrigerant Gas”.

To perform leak testing with the electronic refrigerant gas leak detector, it is necessary that the system be pressurized with a proportion of refrigerant gas.

5-16. LEAK TESTING. - continued

a. Test.

(1) To pressurize a system that has some refrigerant charge:

(a) Connect the charge hose to a refrigerant R-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/cm^2).

(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 5-14.)

(g) If a leak was not found, check unit charge. (See paragraph 5-18.)

(2) To pressurize a system that has been discharged and purged:

(a) Connect the charge hose to a cylinder of refrigerant R-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/cm^2).

(e) Close service manifold valves and refrigerant cylinder valve.

(f) Disconnect the 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/cm^2).

(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 5-14.)

(m) After performing leak tests, discharge and purge system before performing maintenance, or evacuating and charging system, as appropriate. (See paragraph 5-13.)

NOTE

FOLLOW-ON MAINTENANCE:

Remove service manifold (para 5-11).

Install top panels (para 4-11).

5-17. 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 3

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.

Install service manifold (para 5-11).

Discharge the refrigeration system (para 5-12).

Evacuate.

(1) Check that new refrigerant desiccant dehydrator was installed. If not, install one. (See paragraph 5-22.)

(2) Check that service manifold charge valve is closed.

(3) Check that unit HIGH and LOW PRESSURE CHARGING VALVES are open

(4) Connect the vacuum hose to vacuum pump.

(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 5-16.)

(9) Close unit HIGH and LOW PRESSURE CHARGING VALVES.

(10) Close service manifold high pressure gauge, compound gauge, and vacuum valves.

(11) Stop vacuum pump.

5-17. EVACUATING THE REFRIGERANT SYSTEM. - continued

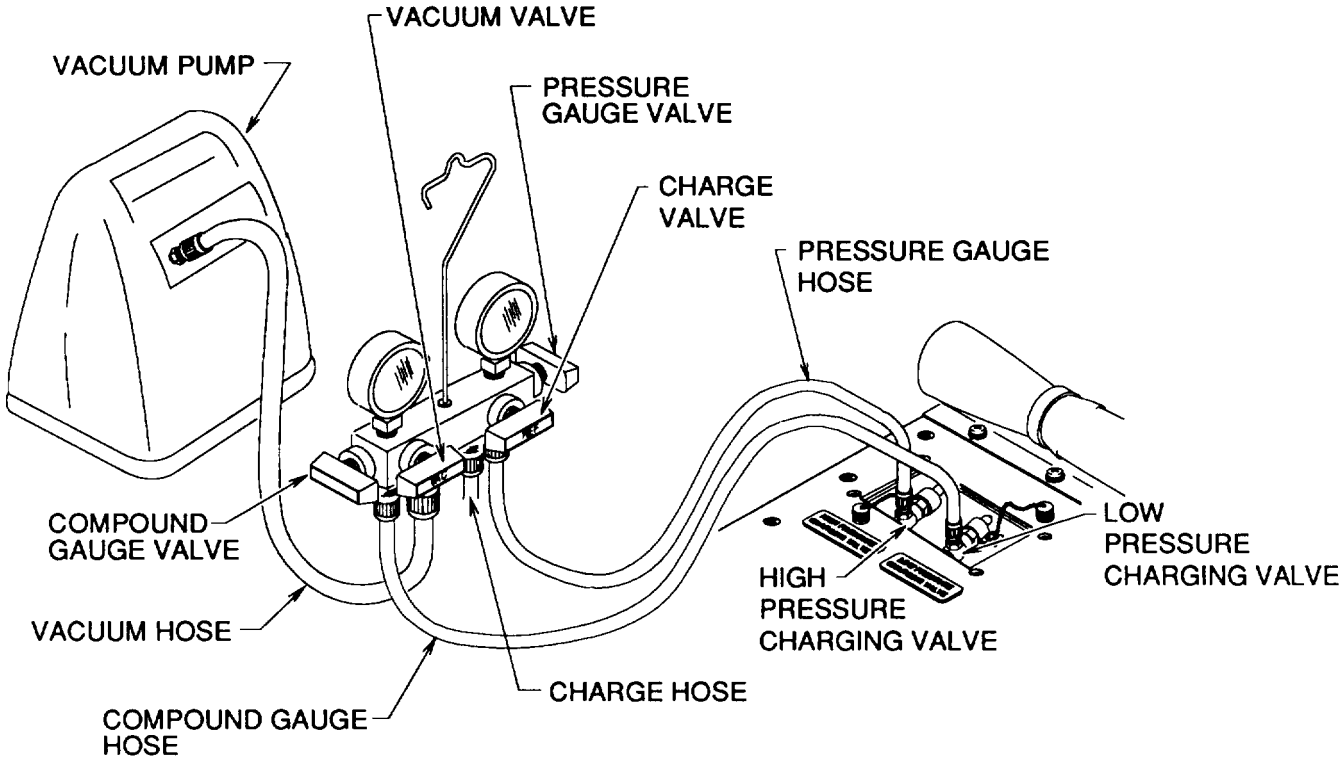


Figure 5-9. Evacuation of Refrigerant System

(12) Disconnect the vacuum hose from vacuum pump.

(13) Charge there frigerant system. (See paragraph 5-18.)

5-18. 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

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.

Install service manifold (para 5-11).

Evacuate the refrigerant system (para 5-17).

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 R-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 R-22 set to deliver gas.

(2) Loosen hose connections on the HIGH and LOW PRESSURE CHARGING VALVES slightly.

5-18. CHARGING THE REFRIGERANT SYSTEM. - continued

(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 HIGH and LOW PRESSURE CHARGING 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 HIGH and LOW PRESSURE CHARGING VALVES.

(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.

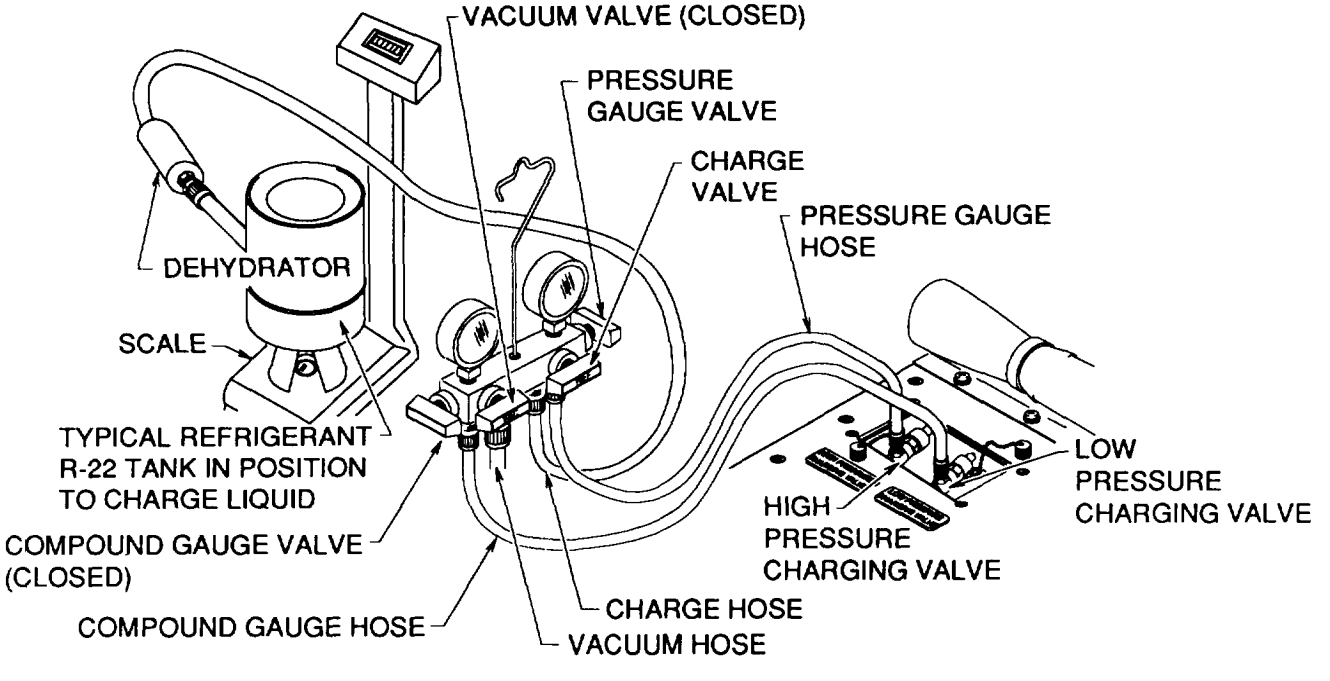


Figure 5-10. Refrigerant Charging (Total System)

5-18. CHARGING THE REFRIGERANT SYSTEM. - continued

NOTE

If 3.4 pounds (1.5 kg) full charge was obtained, skip steps (13) through (23).

(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.

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 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.

(22) Close compound gauge, charge, and refrigerant cylinder valves.

(23) Turn rotary MODE selector switch to OFF/RESET.

5-18. 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 R-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 R-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 HIGH and LOW PRESSURE CHARGING 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.

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.

(8) Connect power at power source.

5-18. CHARGING THE REFRIGERANT SYSTEM. - continued

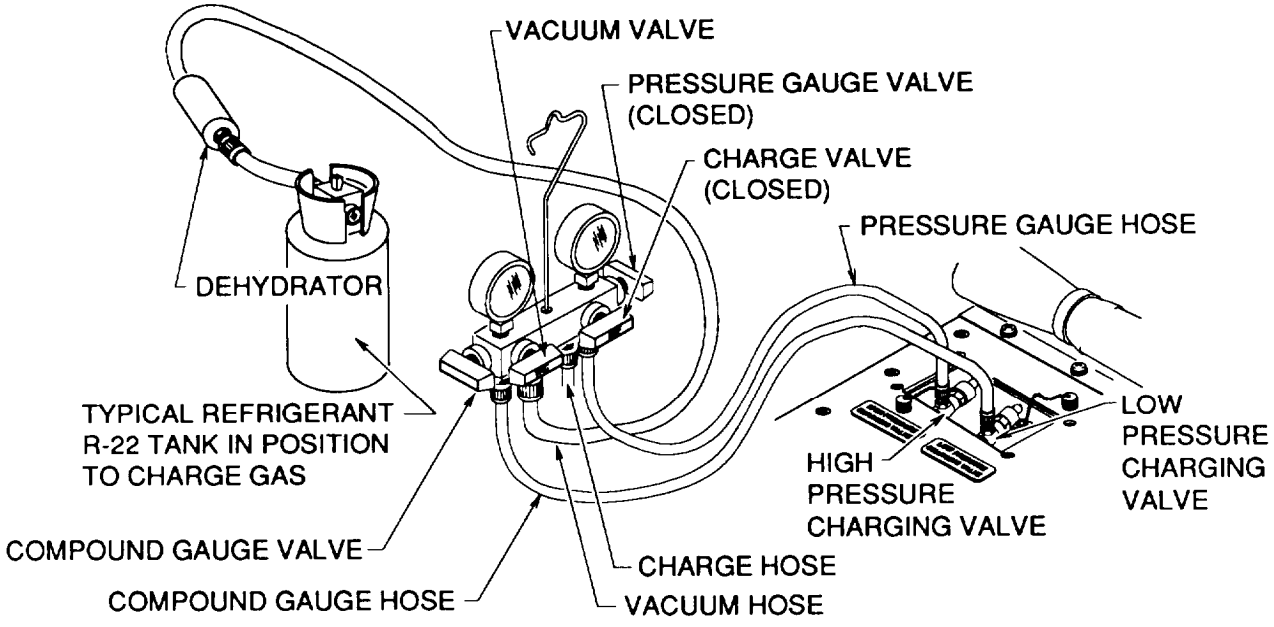


Figure 5-11. Refrigerant Charging (Partial System/Small Quantity Charge)

(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.

5-18. CHARGING THE REFRIGERANT SYSTEM. - continued

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 5-11).

5-19. 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 from chartreuse until it reaches 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. Leak test per paragraph 4-16.

(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. Leak test per paragraph 4-16.

(3) Turn rotary MODE selector switch to OFF/RESET.

5-20. 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.

5-21. REFRIGERANT 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 5-11).

Test.

(1) Check that unit HIGH and LOW PRESSURE CHARGING VALVES are open and all four service manifold valves are closed.

(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 5-16.)

(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) It 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 5-11).

Table 5-2. PRESSURE-TEMPERATURE RELATIONSHIP OF SATURATED REFRIGERANT R-22

Temperature		Pressure		Temperature		Pressure	
°F	°C	Psig	kg/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(38°C)	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(27°C) 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

5-22. 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

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 from power source.

Remove top panel (para 4-11).

Discharge refrigerant system (para 5-12).

a. Inspect.

Check refrigerant desiccant dehydrator (1) for visible signs of damage. Replace if damaged.

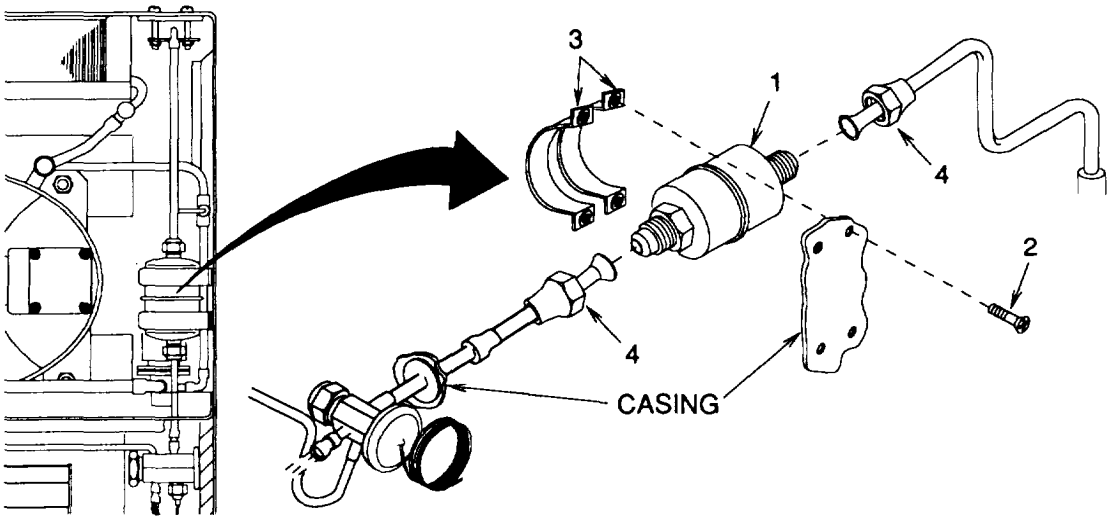


Figure 5-12. Refrigerant Desiccant Dehydrator (Filter-Drier)

5-22. REFRIGERANT DESICCANT DEHYDRATOR (FILTER-DRIER). - continued

b. Replace.

(1) Remove four screws (2) and two mounting clamps (3).

(2) Disconnect two flare nuts (4) and remove refrigerant desiccant dehydrator (1) from unit.

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.

(3) Connect two flare nuts (4) to each end of refrigerant desiccant dehydrator (1).

(4) Install two mounting clamps (3) on refrigerant desiccant dehydrator (1) and aline mounting holes. Secure with four screws (2).

NOTE

FOLLOW-ON MAINTENANCE:

Leak test refrigerant system (para 5-16).

Evacuate refrigerant system (para 5-17).

Install top panel (para 4-11).

Charge refrigerant system (para 5-18).

5-23. EVAPORATOR COIL.

This task covers: Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Gloves
Appendix B, item 2

Materials/Parts

Evaporator Coil

Lock Washers (12)

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.

Remove supply air louver (para 4-19).

Remove mist eliminator (para 4-20).

Remove heater elements (para 4-45).

Remove refrigerant desiccant dehydrator (para 5-22).

Purge refrigerant system (para 5-13).

Replace.

(1) Remove two screws (1) and lock washers (2). Remove locking plate (3).

(2) Remove two screws (4), lock washers (5), and flat washers (6).

(3) Remove four screws (7), lock washers (8), and flat washers (9). Remove mist eliminator holder (10).

(4) Remove screw (11), lock washer (1 2), flat washer (13), and loop clamp (14).

(5) Debraze tube connection (15) at elbow. (See paragraph 5-14.)

WARNING

When handling coils, wear gloves to avoid cuts and reduce fin damage on the coil.

(6) Carefully lift evaporator coil (16) and tubing up and out of unit.

(7) Debraze tube connections (17), (18), (19), and (20) from coil (16). (See paragraph 5-14.)

(8) Braze tube connections (20), (17), (18), and (19) to new coil (16). (See paragraph 5-14.)

(9) Carefully lower evaporator coil (16) and tubing into unit.

5-23. EVAPORATOR COIL. - continued

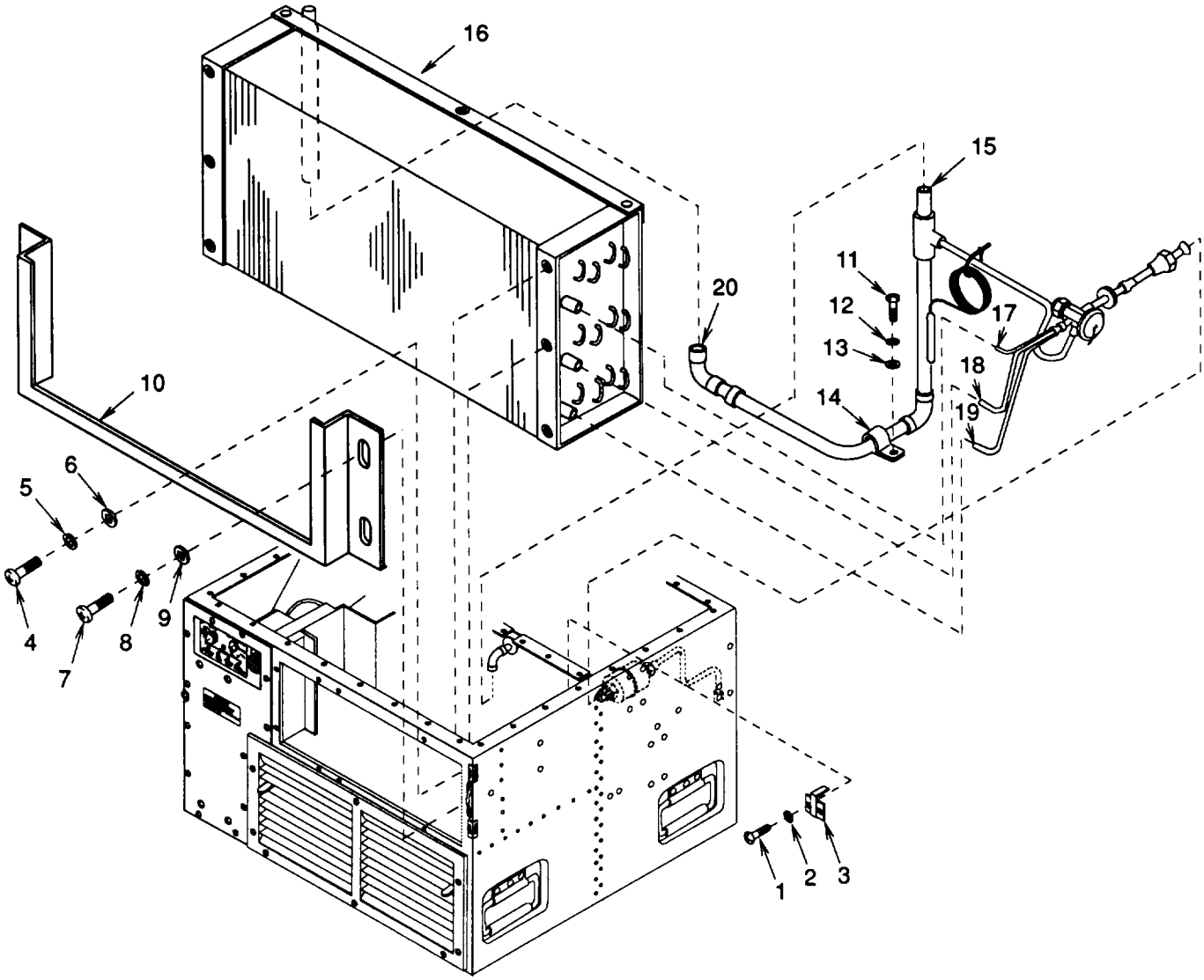


Figure 5-13. Evaporator Coil

(10) Braze tube connection (15) to elbow. (See paragraph 5-14.)

(11) Install loop clamp (14) onto tube and secure with screw (11), lock washer (12), and flat washer (13).

(12 Place mist eliminator holder (10) in unit and aline mounting holes. Secure with four screws (7), lock washers (8), and flat washers (9).

(13) Install two screws (4), lock washers (5), and flat washers (6).

(14) Install locking plate (3) in unit and secure with two screws (1) and lock washers (2).

5-23. EVAPORATOR COIL. - continued

NOTE

FOLLOW-ON MAINTENANCE:

Install heater elements (para 4-45).

Install mist eliminator (para 4-20)

Install supply air louver (para 4-19).

Install new refrigerant desiccant dehydrator (para 5-22).

5-24. EXPANSION VALVE.

This task covers: Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Expansion Valve

Tiedown Straps

Insulation Tape
Appendix E, item 18

Lock Washers (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 from power source.

Remove refrigerant desiccant dehydrator (para 5-22).

Purge refrigerant system (para 5-13).

Replace.

(1) Remove two screws (1) and lock washers (2). Remove locking plate (3).

(2) Unwrap insulation from thermal bulb (4).

(3) Cut plastic tiedown strap (5) holding capillary tubing coil to tubing.

(4) Loosen hardware in thermal bulb clamp (6) and slip bulb (4) out of clamp.

(5) Debraze tube connections (7) and (8) from expansion valve (9). (See paragraph 5-14.)

(6) Remove valve (9) and tubing from unit.

5-24. EXPANSION VALVE. - continued

(7) Debraze tube connection (10) from expansion valve (9). (See paragraph 5-14.)

(8) Braze tube connection (10) to expansion valve (9). (See paragraph 5-14.)

(9) Install expansion valve (9) and tubing into unit.

(10) Braze tube connections (8) and (7) to expansion valve (9). (See paragraph 5-14.)

(11) Insert thermal bulb (4) into thermal bulb clamp (6) and tighten hardware.

(12) Secure capillary tubing coil to tubing with plastic tiedown strap (5).

(13) Wrap insulation around thermal bulb (4).

(14) Install locking plate (3) in unit and secure with two screws (1) and lock washers (2).

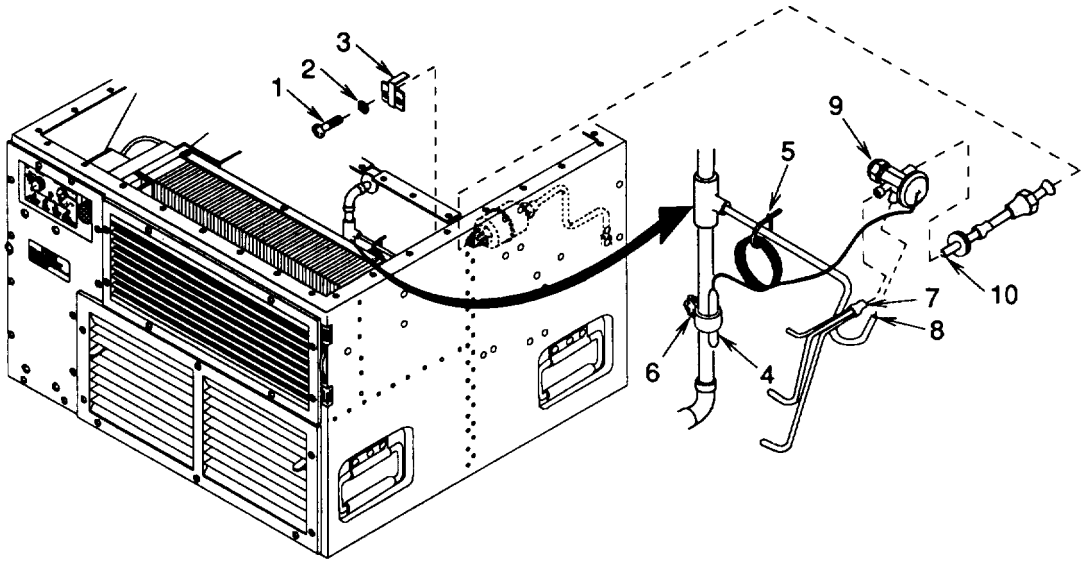


Figure 5-14. Expansion Valve

NOTE

FOLLOW-ON MAINTENANCE:

Install new refrigerant desiccant dehydrator (para 5-22).

5-25. SOLENOID VALVE (L1).

This task covers: Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Solenoid Valve

Flush Bushings (2)

Lock Washers (2)

Equipment Condition

Remove refrigerant desiccant dehydrator (para 5-22).

Purge refrigerant system (para 5-13).

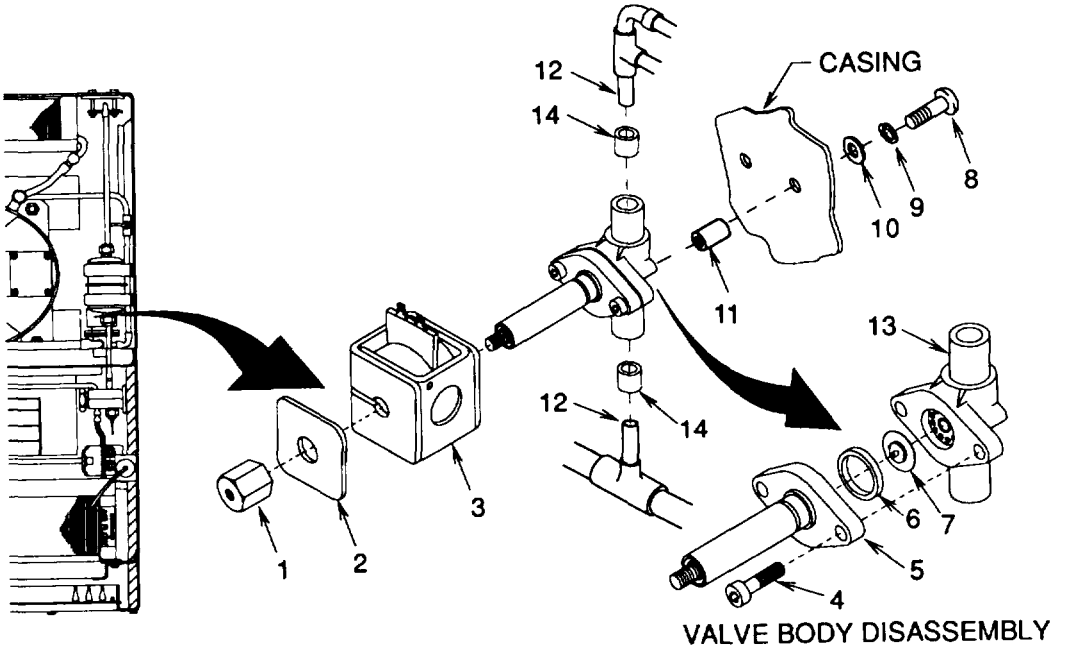


Figure 5-15. Solenoid Valve (L1)

Replace.

(1) Remove nut (1), data plate (2), and coil (3). Carefully lay coil aside to protect wire leads.

(2) Remove two screws (4), tube and plunger assembly (5), O-ring (6), and diaphragm (7).

5-25. SOLENOID VALVE (L1). - continued

(3) Remove two screws (8), lock washers (9), flat washers (10), and spacers (11).

(4) Debraze tubing (12) and remove valve body (13). (See paragraph 5-14.)

(5) Disassemble new solenoid valve (L1). Remove two screws (4), tube and plunger assembly (5), O-ring (6), and diaphragm (7) from valve body (13).

(6) Install new flush bushings (14) into valve body (13) and place valve body on tubing (12).

(7) Braze tubing joints (12) and flush bushings (14) to valve body (13). (See paragraph 5-14.)

(8) Secure valve body (13) to housing with two screws (8), lock washers (9), flat washers (10), and spacers (11).

(9) Assemble diaphragm (7), O-ring (6), and tube and plunger assembly (5), Secure with two screws (4).

(10) Install coil (3) and data plate (2). Secure with nut (1).

NOTE

FOLLOW-ON MAINTENANCE:

Install new refrigerant desicant dehydrator (para 5-22).

5-26. ACTUATING CYLINDER.

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Actuating Cylinder

Equipment Condition

Remove top panel (para 4-11).

a. Inspect.

Check actuating cylinder (1) for signs of damage and loose or missing hardware. Replace if damaged.

b. Replace.

(1) Remove refrigerant desiccant dehydrator. (See paragraph 5-22.)

(2) Disconnect flare nut fitting (2) from actuating cylinder (1).

(3) Remove two nuts (3), flat washers (4) and actuating cylinder (1). Be careful not to lose flat washer (5).

(4) Install new actuating cylinder (1), check that flat washer (5) is in place and attach two flat washers (4) and nuts (3) (do not tighten).

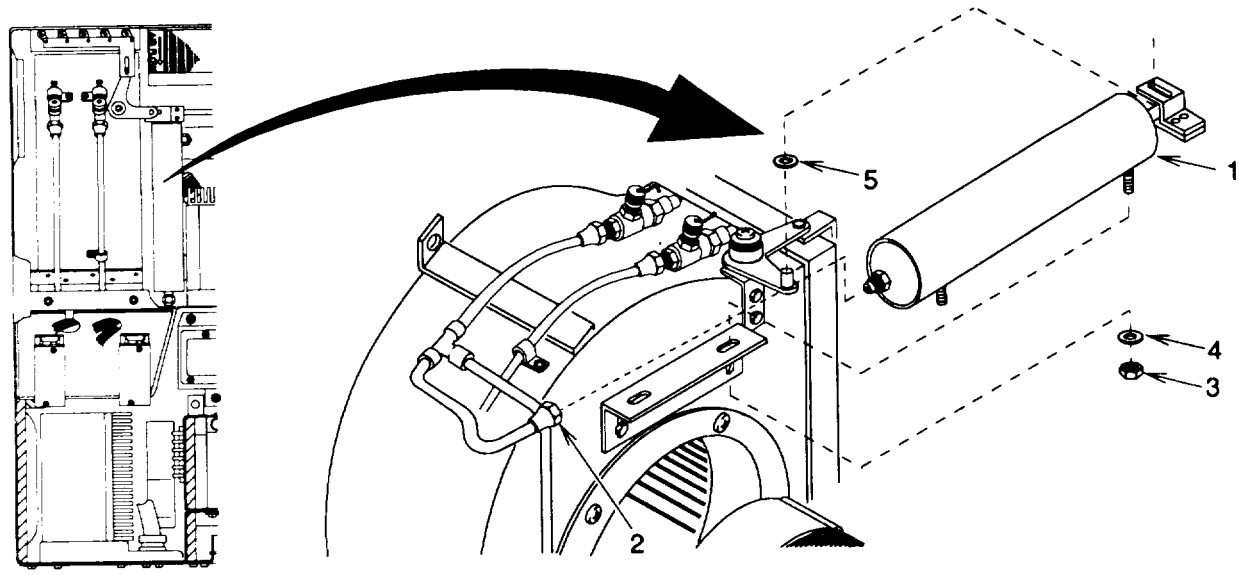


Figure 5-16. Actuating Cylinder

5-26. ACTUATING CYLINDER. - continued

(5) Connect flare nut fitting (2) to actuating cylinder (1). Tighten flare nut fitting.

(6) Adjust actuating cylinder (1).

(7) Install new refrigerant desiccant dehydrator. (See paragraph 5-22.)

c. Adjust.

(1) Loosen two nuts (3).

(2) Position actuating cylinder (1) to just fully close condenser discharge air louvers and tighten two nuts (3).

NOTE

FOLLOW-ON MAINTENANCE:

Install top panel (para 4-11).

5-27. HIGH PRESSURE SWITCH (S6).

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

High Pressure Switch (S6)

Equipment Condition

CAUTION

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

Disconnect power at power source.

Remove top panels (para 4-11).

a. Inspect.

Inspect pressure switch (1) and capillary line for visible signs of damage. Replace if damaged.

5-27. HIGH PRESSURE SWITCH (S6). - continued

b. Test.

CAUTION

Be careful not to kink capillary line.

(1) Remove two screws (2). Carefully pull pressure switch (1) out of unit to access terminals.

(2) Remove terminal cover. Tag and disconnect wire leads.

(3) Using a multimeter set to measure resistance, check continuity between pressure switch (1) terminals 1 and 2.

(a) Press and hold reset button. No continuity should be indicated.

(b) Release reset button. Continuity should be indicated.

(4) Replace pressure switch if defective.

(5) Connect wire leads using tags and wiring diagram (figure 4-6) and attach terminal cover. Remove tags.

CAUTION

Be careful not to kink capillary line.

(6) Carefully position pressure switch (1) into unit and aline mounting holes. Secure with two screws (2).

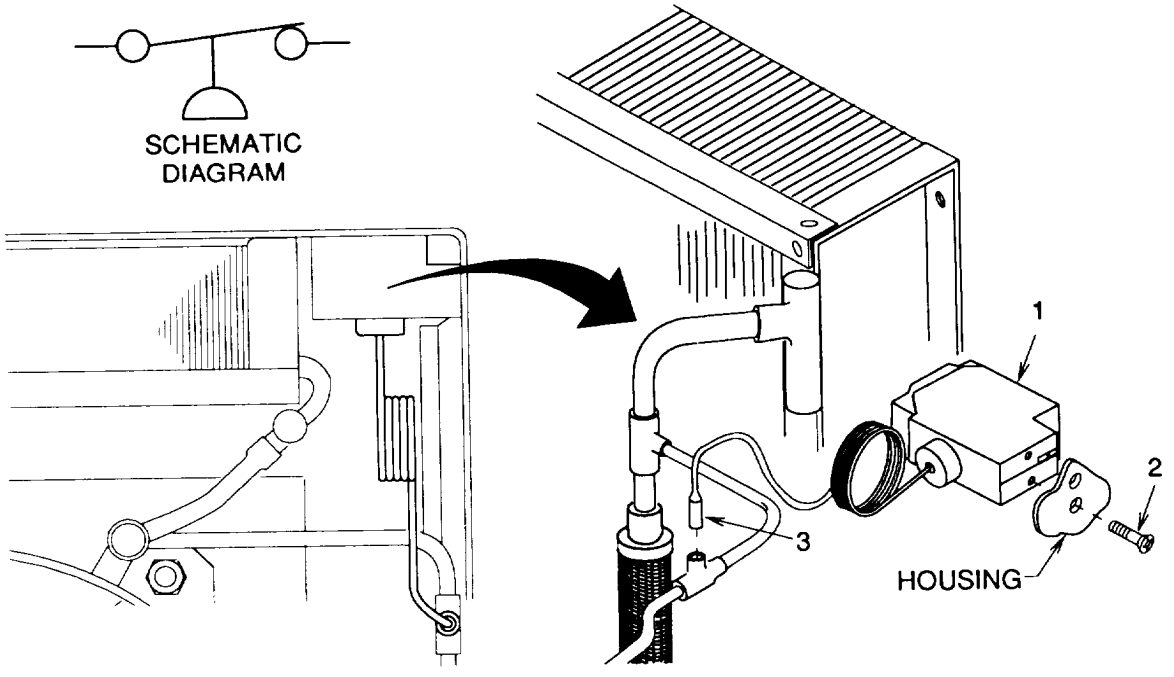


Figure 5-17. High Pressure Switch (S6)

5-27. HIGH PRESSURE SWITCH (S6). - continued

c. Replace.

(1) Remove refrigerant desiccant dehydrator. (See paragraph 5-22.)

(2) Purge refrigerant system. (See paragraph 5-13.)

(3) Remove two screws (2). Carefully pull pressure switch (1) out of unit to access terminals.

(4) Remove terminal cover. Tag and disconnect wire leads.

(5) Debraze capillary line connection (3) from tee. Remove pressure switch (1). (See paragraph 5-14.)

(6) Braze new pressure switch (1) line connection (3) to tee. (See paragraph 5-14.)

(7) Connect wire leads using tags and wiring diagram (figure 4-6) and attach terminal oover. Remove tags.

CAUTION

Be careful not to kink capillary line.

(8) Carefully position pressure switch (1) into unit and aline mounting holes. Secure with two screws (2).

(9) Install new refrigerant desiccant dehydrator. (See paragraph 5-22.)

NOTE

FOLLOW-ON MAINTENANCE:

Install top panels (para 4-11).

5-28. LOW PRESSURE SWITCH (S7).

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Low Pressure Switch (S7)

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.

Remove top panels (para 4-11).

a. Inspect.

Inspect pressure switch (1) and capillary line for visible signs of damage. Replace if damaged.

b. Test.

CAUTION

Be careful not to kink capillary line.

(1) Remove two screws (2). Carefully pull pressure switch (1) out of unit to access terminals.

(2) Remove terminal cover. Tag and disconnect wire leads.

(3) Install service manifold. Gage must read 55 psig or higher to test pressure switch (1). (See paragraph 5-11.)

(4) Using a multimeter set to measure resistance, check continuity between pressure switch (1) terminals 1 and 2. Continuity should be indicated.

(5) Replace pressure switch if defective.

(6) Connect wire leads using tags and wiring diagram (figure 4-6) and attach terminal cover. Remove tags.

CAUTION

Be careful not to kink capillary line.

(7) Carefully position pressure switch (1) into unit and aline mounting holes. Secure with two screws (2).

(8) Remove service manifold. (See paragraph 5-11.)

5-28. LOW PRESSURE SWITCH (S7). - continued

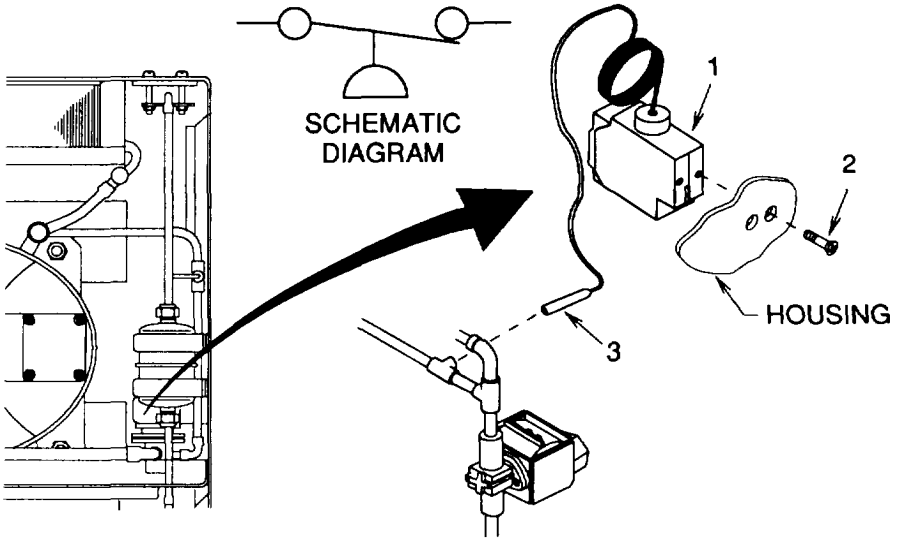


Figure 5-18. Low Pressure Switch (S7)

c. Replace.

(1) Remove refrigerant desiccant dehydrator. (See paragraph 5-22.)

(2) Purge refrigerant system. (See paragraph 5-13.)

(3) Remove two screws (2). Carefully pull pressure switch (1) out of unit to access terminals.

(4) Remove terminal cover. Tag and disconnect wire leads.

(5) Debraze capillary line connection (3) from tee. Remove pressure switch (1). (See paragraph 5-14.)

(6) Braze new pressure switch (1) line connection (3) to tee. (See paragraph 5-14.)

(7) Connect wire leads using tags and wiring diagram (figure 4-6) and attach terminal cover. Remove tags.

CAUTION

Be careful not to kink capillary line.

(8) Carefully position pressure switch (1) into unit and aline mounting holes. Secure with two screws (2).

(9) Install new refrigerant desiccant dehydrator. (See paragraph 5-22.)

NOTE

FOLLOW-ON MAINTENANCE:

Install top panels (para 4-11).

5-29. SERVICE (CHARGING) 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

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 top panels (para 4-11).

a. Inspect.

Check service valve (1) for damaged hose connection fitting or stripped adjusting stem. Replace if damaged.

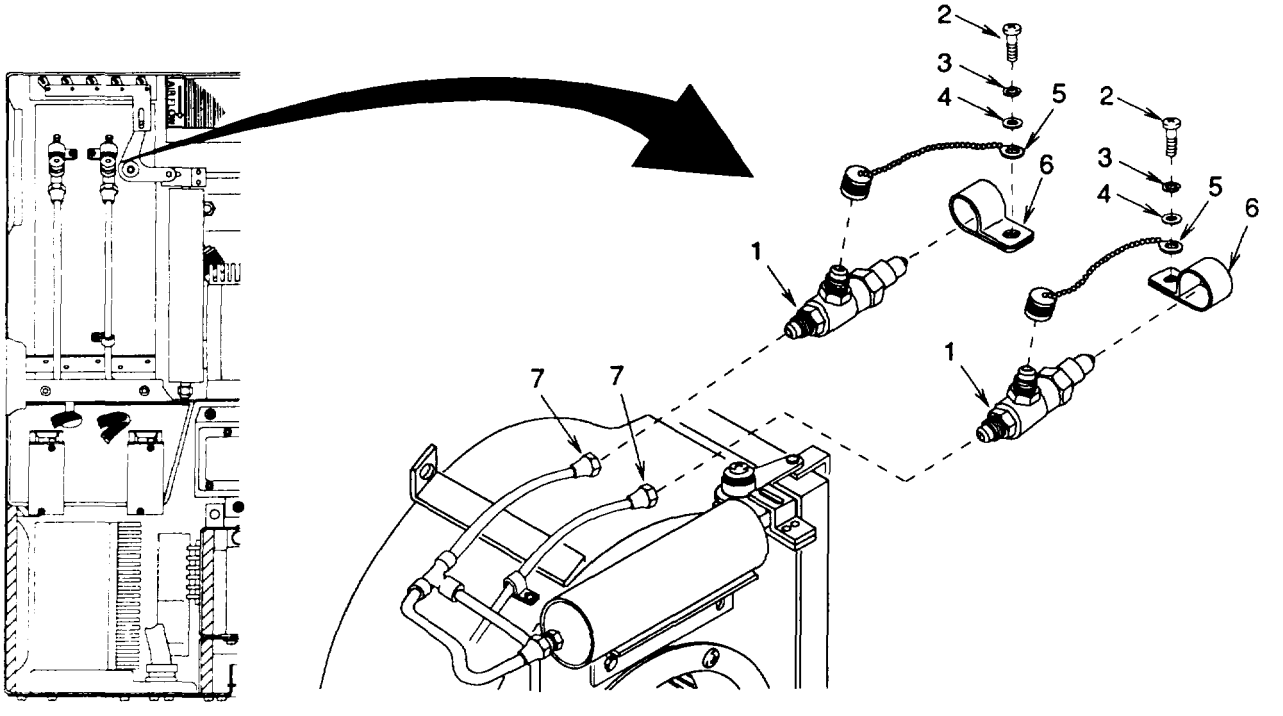


Figure 5-19. Service Valves

5-29. SERVICE (CHARGING) VALVES. - continued

b. Replace.

(1) Remove refrigerant desiccant dehydrator. (See paragraph 5-22.)

(2) Remove screw (2), lock washer (3), flat washer (4), cap and chain (5), and loop clamp (6) from the service valve (1) to be replaced.

(3) Disconnect flare nut (7) and remove service valve (1).

(4) Position new service valve (1) in place and tighten flare nut (7).

(5) Secure valve (1) and cap and chain (5) with loop clamp (6), screw (2), lock washer (3), and flat washer (4).

(6) Install new refrigerant desiccant dehydrator. (See paragraph 5-22.)

NOTE

FOLLOW-ON MAINTENANCE:

Install top panels (para 4-11).

5-30. 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

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 top panels (para 4-11).

a. Inspect.

Check pressure relief valve (1) for any visible damage or signs of leakage. Replace if damaged or leaking.

5-30. PRESSURE RELIEF VALVE. - continued

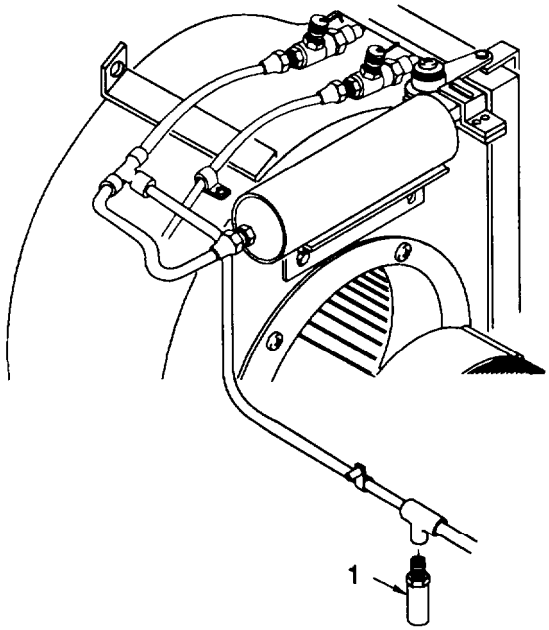


Figure 5-20. Pressure Relief Valve

b. Replace.

(1) Remove refrigerant desiccant dehydrator. (See paragraph 5-22.)

(2) Remove pressure relief valve (1) from tee.

(3) Wrap new pressure relief valve (1) threads with antisieze tape and install in tee.

(4) Install new refrigerant desiccant dehydrator. (See paragraph 5-22.)

NOTE

FOLLOW-ON MAINTENANCE:

Install top panels (para 4-11).

5-31. CONDENSER COIL.

This task covers: Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Gloves
Appendix B, item 2

Materials/Parts

Condenser Coil

Lock Washers (3)

Lock Washers (4)

Spring Nuts (4)

Brazing Alloy
Appendix E, item (9 and 10)

Brazing Flux
Appendix E, item 11

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 from power source.

Remove refrigerant desiccant dehydrator (para 5-22).

Purge refrigerant system (para 5-13).

Remove condenser end guard (para 4-17).

Personnel Required

Two

Replace.

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

(2) Remove cap (4) and carefully pull connector (5) into unit. Remove gasket (6).

(3) Remove two screws (7), lock washers (8), flat washers (9), and mounting plate (10).

(4) Remove four screws (11) and two clamps (12).

(5) Remove screw (13), nut (14), lock washer (15), loop clamp (16), and spacer post (17).

(6) Debraze tubing connection (18). (See paragraph 5-14.)

5-31. CONDENSER COIL. - continued

WARNING

To avoid injury to personnel, two people are required to lift unit.

CAUTION

Do not lay unit on side to access bottom, compressor damage can result from oil being displaced.

(7) Lift and support unit to access hardware in bottom of casing.

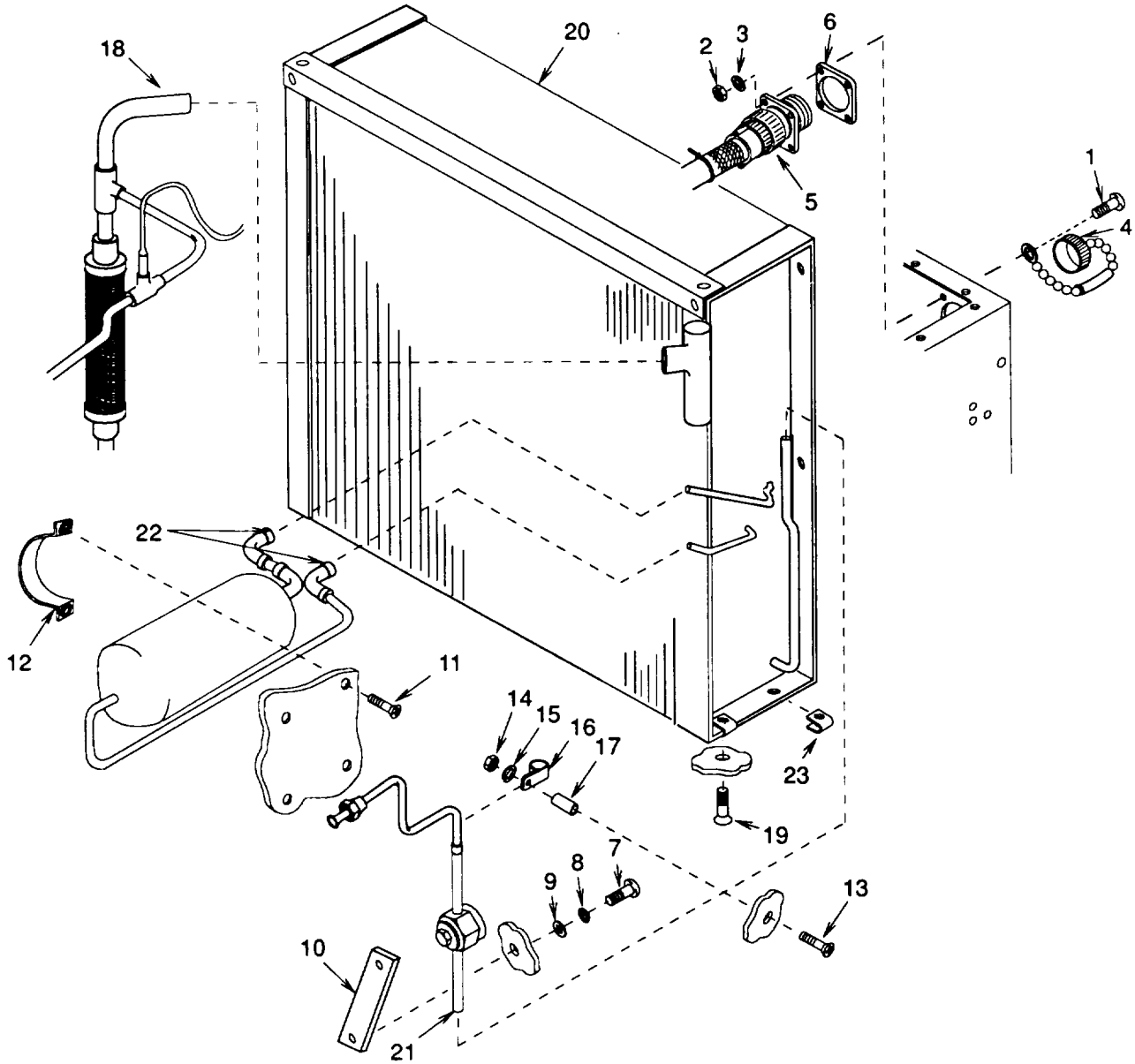


Figure 5-21. Condenser Coil

5-31. CONDENSER COIL. - continued

WARNING

When handling coils, wear gloves to avoid cuts and reduce fin damage.

(8) Remove four screws (19) and carefully lift condenser coil (20) out of unit.

(9) Debraze sight glass tubing connection (21). (See paragraph 5-14.)

(10) Debraze two receiver tubing connections (22). (See paragraph 5-14.)

(11) Braze sight glass tube connection (21) to new condenser coil (20). (See paragraph 5-14.)

(12) Braze two receiver tubing connections (22) to new condenser coil (20). (See paragraph 5-14.)

(13) Install four new spring nuts (23) onto coil (20).

WARNING

When handling coils wear gloves to avoid cuts and reduce fin damage.

(14) Carefully place condenser coil (20) into unit and secure with four screws (19).

(15) Braze tubing connection (18). (See paragraph 5-14.)

(16) Aline sight glass to casing hole and service with mounting plate (10), two screws (7), lock washers (8), and flat washers (9).

(17) Place loop clamp (16) around sight glass tubing and secure with screw (13), spacer post (17), lock washer (15), and nut (14).

(18) Secure receiver with two clamps (12) and four screws (11).

(19) Install gasket (6) onto connector (5). Install connector into case.

(20) Attach cap (4) to connector (5) and secure cap chain and connector to unit using four sets of screws (1), lock washers (3), and nuts (2).

NOTE

FOLLOW-ON MAINTENANCE:

Install new refrigerant desiccant dehydrator (para 5-22).

Install condenser end guard (para 4-17).

5-32. LIQUID INDICATOR (SIGHT GLASS).

This task covers: Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Liquid Indicator

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 from power source.

Remove condenser coil (para 5-31).

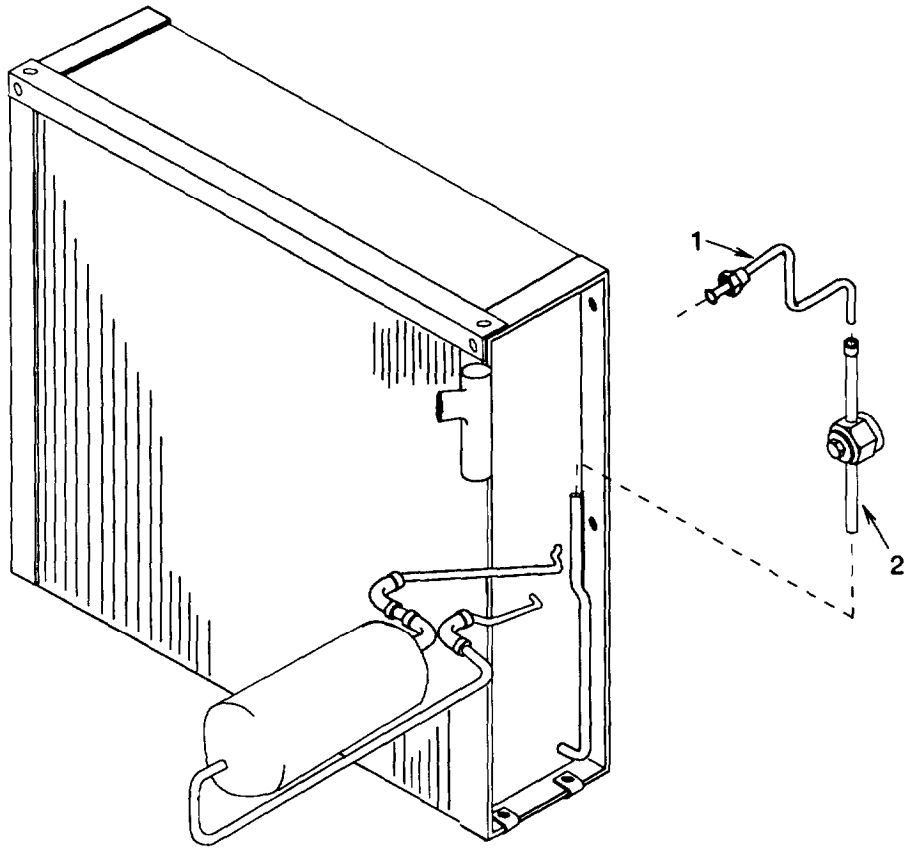


Figure 5-22. Liquid Indicator

5-32. LIQUID INDICATOR (SIGHT GLASS). - continued

Replace.

(1) Debraze tube (1) and set aside. (See paragraph 5-14.)

(2) Debraze liquid indicator (2). (See paragraph 5-14.)

(3) Braze new liquid indicator (2) onto condenser coil tube. (See paragraph 5-14.)

(4) Braze tube (1) onto liquid indicator (2). (See paragraph 5-14.)

NOTE

FOLLOW-ON MAINTENANCE:

Install condenser coil (para 5-31).

5-33. COMPRESSOR.

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

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Compressor

Heater

Connector J11

Lock Washers (4)

Tiedown Strap

Mounting Plate

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 from power source.

Remove top panels (para 4-11).

Personnel Required

Two

a. Test. (See figure 5-23.)

(1) Disconnect wiring harness from connector J11.

(2) Check continuity at connector J11 using a multimeter set to measure resistance.

(a) Check for continuity between pins G and F. If there is no continuity between these pins, heater is bad and should be replaced.

5-33. COMPRESSOR. - continued

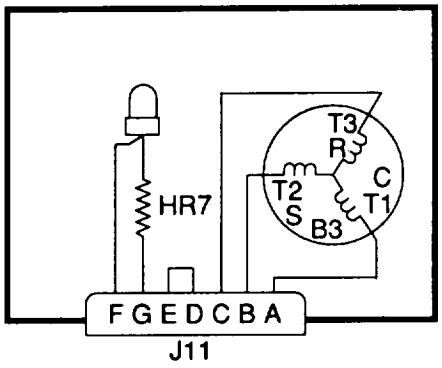


Figure 5-23. Compressor Testing

(b) Check continuity between pins D and E. If there is no continuity between these pins, jumper wire is loose and should be repaired.

(c) Check continuity between pins A and B, B and C, and A and C. If there is no continuity between any pair, replace the compressor.

(d) Check continuity between pins A, B, and C and the compressor body. If continuity exists, replace the compressor.

b. Repair. (See figure 5-24.)

(1) Remove four screws (1), lock washers (2), and cover plate (3)

Repair cover plate. (See paragraph 5-5 and 5-6.)

(2) Connector (6).

(a) Remove four screws (4) and flat washers (5). Carefully pull connector (6) out enough to access the terminal connections.

(b) Tag and disconnect wire leads. Remove the connector (6) and retainer ring (7). (See paragraph 4-24.)

(c) Slip wire leads through retainer ring (7) and connection box and attach to new connector (6) using tags and wiring diagram (figure 4-6). Remove tags. (See paragraph 4-24.)

(d) Secure connector (6) to compressor with four screws (4), flat washers (5), and retainer ring (7).

(3) Heater (8).

(a) Remove four screws (4) and flat washers (5). Carefully pull connector (6) out enough to access the terminal connections.

(b) Disconnect wire leads from terminals F and G on connector (6) and pull out of connection box. (See paragraph 4-24.)

5-33. COMPRESSOR. - continued

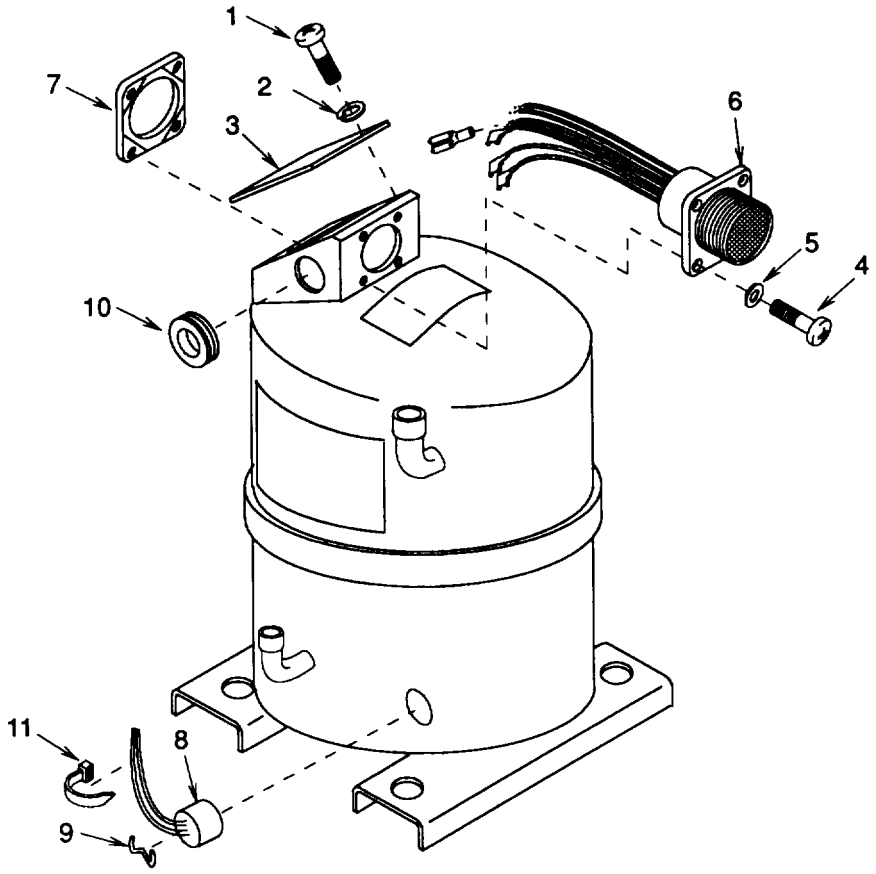


Figure 5-24. Compressor Repair

WARNING

Allow heater to cool before touching. Severe burns can result from touching hot heater.

(c) Remove heater clip (9) and heater (8).

(d) Replace grommet (10) if damaged.

(e) Install heater (8) and secure with clip (9).

(f) Slip wire leads through grommet (10), retainer ring (7), and connection box. Attach to terminals F and G on connector (6). (See paragraph 4-24.)

(g) Secure wire leads with a tiedown strap (11).

(h) Secure connector (6) to compressor with four screws (4), flat washers (5), and retainer ring (7).

(4) install cover (3) and secure with screw (1) and lock washer (2).

5-33. COMPRESSOR. - continued

c. Replace.

(1) Disconnect wiring harness from connector (6).

(2) Remove refrigerant desiccant dehydrator. (See paragraph 5-22.)

(3) Purge refrigerant system. (See paragraph 5-13.)

(4) Debraze compressor tubes. (See paragraph 5-14.)

WARNING

To avoid injury to personnel, two people are required to lift unit.

CAUTION

Do not lay unit on side to access bottom, compressor damage can result from oil being displaced.

(5) Lift and support air conditioner to gain access to underside of housing.

(6) Remove four screws (1), nuts (2), flat washers (3), eight flat washers (4), and four shouldered washers (5).

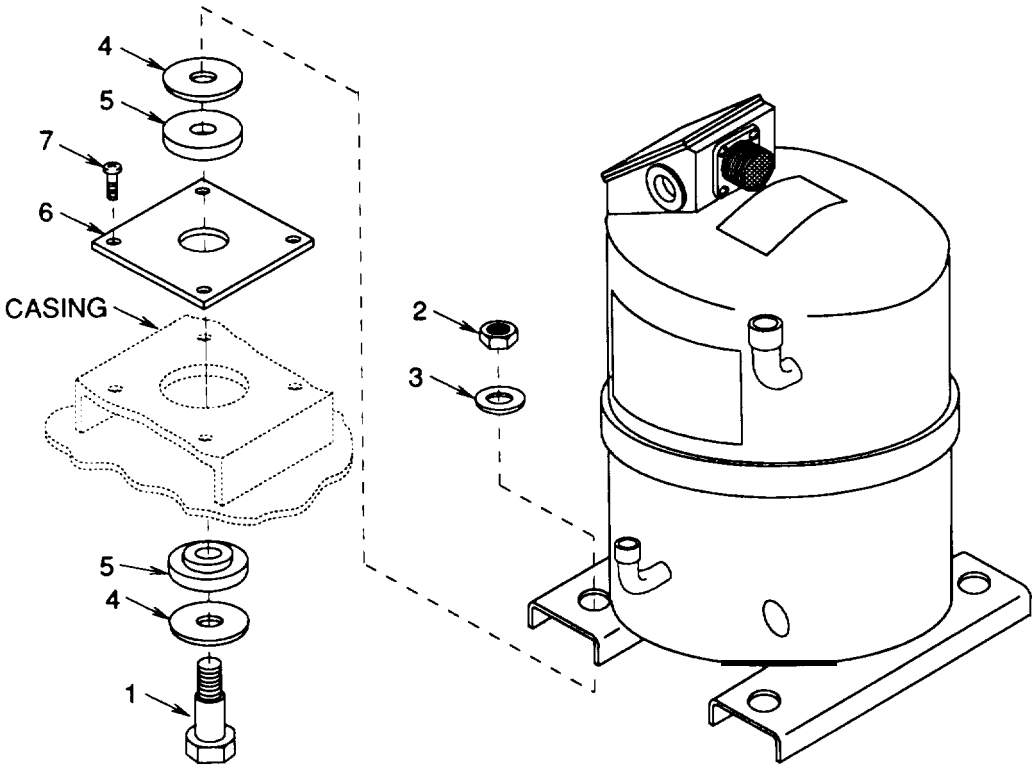


Figure 5-25. Compressor Assembly Replacement

5-33. COMPRESSOR. - continued

WARNING

If compressor is being removed due to burnout, use care when lifting to avoid touching compressor sludge. Acid in sludge can cause burns.

To avoid injury to personnel, two people are required to lift compressor.

(7) Carefully lift compressor from unit.

(8) If mounting plate (6) is to be replaced, remove four screws (7) and mounting plate.

(9) Check compressor to see if a motor burnout is indicated.

(a) Tip compressor toward discharge port and drain a small quantity of oil into a clear glass container.

(b) If oil is clean and clear, and does not have a burnt acid smell, the compressor did not fail because of motor burnout. Install new compressor.

NOTE

You must clean the entire refrigeration system after a burnout has occurred, since contaminants will have been carried to many corners and restrictions in the piping and fittings. These contaminants will soon mix with new refrigerant gas and compressor oil to cause repeated burn outs.

(c) If oil is black, contains sludge, and has a burnt acid odor, the compressor failed because of motor burnout. Before installing new compressor, flush refrigerant system. (See paragraph 5-15.)

(10) Install new mounting plate (6), if removed, with four screws (7).

CAUTION

The compressor is supplied with a complete charge of oil. Take care that oil is not lost when handling and installing compressor.

(11) Carefully lower compressor into unit.

(12) Secure compressor with four screws (1), eight flat washers (4), shouldered washers (5), four flat washers (3), and nuts (2).

(13) Braze compressor tubes. (See paragraph 5-14.)

(14) Connect wiring harness connector (P11) to compressor connector (6).

(15) Install new refrigerant desiccant dehydrator. (See paragraph 5-22.)

NOTE

FOLLOW-ON MAINTENANCE:

Install top panels (para 4-11).

5-34. RECEIVER.

This task covers: a. Inspect b. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

Materials/Parts

Receiver

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 from power source.

Remove top panels (para 4-11).

a. Inspect.

Check receiver (1) for dents or any other signs of damage. Replace if damaged.

b. Replacement.

(1) Remove refrigerant desiccant dehydrator, (See paragraph 5-22.)

(2) Purge refrigerant system. (See paragraph 5-13.)

(3) Remove four screws (2) and two retaining straps (3).

(4) Debraze two receiver (4) lines and remove receiver. (See paragraph 5-14.)

(5) Position new receiver (1) in place and braze two lines (4) to condenser coil (5). (See paragraph 5-14.)

(6) Secure receiver with two retaining straps (3) and four screws (2).

(7) Install new refrigerant desiccant dehydrator. (See paragraph 5-22.)

NOTE

FOLLOW-ON MAINTENANCE:

Install top panels (para 4-11).

5-34. RECEIVER - continued

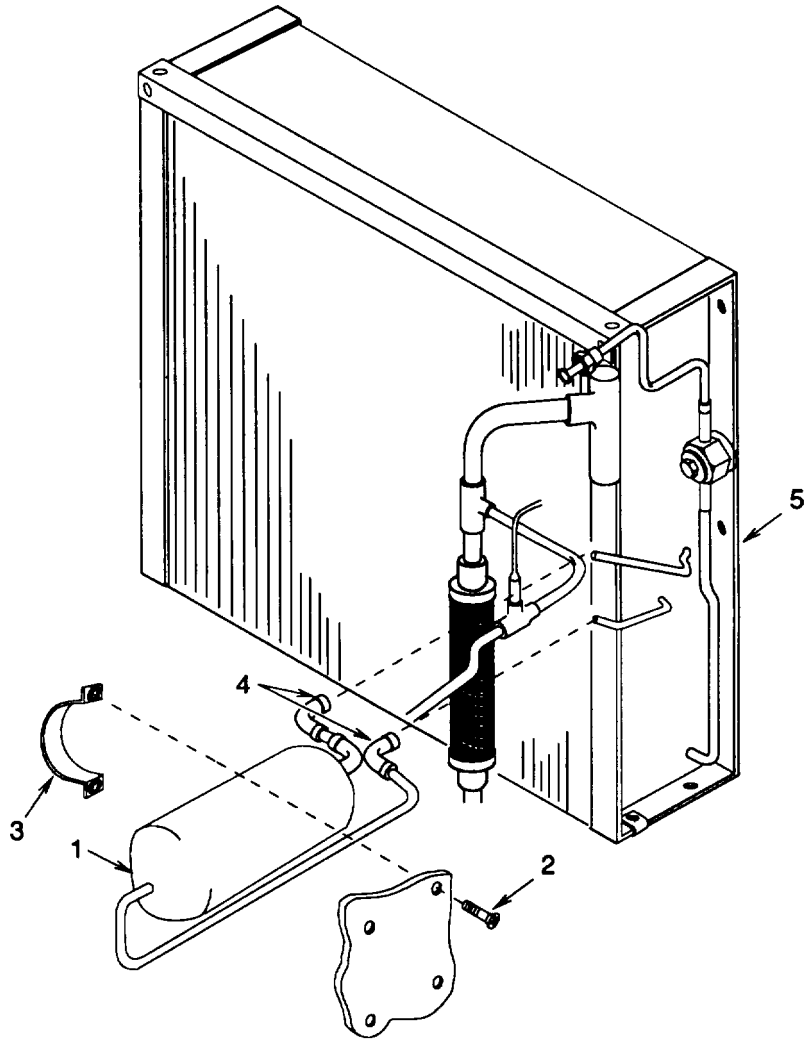


Figure 5-26. Receiver

5-35. TUBING AND FITTINGS.

This task covers: a. Test b. Replace

INITIAL SETUP

Tools

Refrigeration Unit Service Tool Kit
Appendix B, item 1

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 from power source.

Remove top panels (para 4-11).

a. Test.

Test fittings for leaks. Repair or replace as needed. (See paragraph 5-16.)

b. Replace.

(1) Remove refrigerant desiccant dehydrator. (See paragraph 5-22.)

(2) Purge refrigerant system. (See paragraph 5-13.)

(3) Debraze tube or loosen fitting connections and remove part from unit. (See paragraph 5-14.)

(4) Place new part in unit on the tube/fitting ends. Braze *or* tighten the connections. (See paragraph 5-14.)

(5) Install new refrigerant desiccant dehydrator. (See paragraph 5-22.)

NOTE

FOLLOW-ON MAINTENANCE:

Install top panels (para 4-11).

CHAPTER 6

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

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 9-4120-401-24P. 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. HOUSING.

This task covers: a. Repair b. Replace

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

Insulation/Gasket
Appendix F

Adhesive Remover
Appendix E, item 16

Adhesive
Appendix E, item 2

Lifting Handles (4)

Rivets (As Required)

Blind Nuts (As Required)

Nut Plates (As Required)

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

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.

a. Repair.

(1) Disassemble unit as necessary and make repairs as indicated.

(2) Minor dents and bent edges can be straightened using common sheet metal repair procedures.

(3) Should touch up or refinishing be necessary, see TM 43-0139.

6-3. HOUSING. - continued

NOTE

Housing replacement requires total unit disassembly. Normally if the unit is damaged to this extent it should be replaced.

If housing replacement is attempted, see individual installation instructions of components for reinstallation of items removed.

b. Replace.

(1) Gasket and insulation replacement.

(a) Use only gaskets, insulation, or name plates identified in TM 9-4120-401-24P.

(b) Remove as much old gasket or insulation material from unit as possible by pulling or scraping it away from 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.

(c) Soften and remove old adhesive and gasket residue using adhesive remover and a stiff brush.

(d) Fabricate gaskets/insulation in accordance with dimensions provided in Appendix F.

(e) 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.

(f) Starting with an end, carefully attach the new gasket material to the metal. Press into firm contact all over.

(2) 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.

(3) 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.

(4) 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 9-4120-401-24P
• 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 9-4120-401-24

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 disassernbly/assembly[3] procedures, and maintenance actions[4] 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 4 specifies, by the listing of a work time figure in the appropriate 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

[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 ll. - continued

e. Column 5. Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6. Remarks. Column 6 oontains 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 ll, 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. Refernce Code. The code recorded in column 6, Section ll.

b. Column 2. Remarks. This column lists information pertinent to the maintenance function being perlormed as indicated in the MAC, Seotion ll.

Section II MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQPT	(6) REMARKS
01	HOUSING COVERS, PANELS, GRILLES, SCREENS AND INFORMATION PLATES								
	Cover, Fabric	Inspect	0.1						
		Service		0.5					
		Repair			2.0				Note 1
		Replace			1.0				
	Panels	Inspect	0.1						
		Service		0.5					Note 1
		Repair			2.0				
		Replace			0.5				
	Screens and Guards	Inspect	0.1						
		Sevice		0.2					Note 2
		Replace		0.5					
	Louvers	Inspect	0.1						
		Adjust	0.1						
		Service		0.1					
		Replace		1.0					
	Information Plates	Inspect	0.1						
		Replace			0.5				
02	AIR CIRCUITING AND CONDENSATE DRAIN SYSTEM								
	Air Filter	Inspect		0.2					
		Service		1.0					
		Replace		0.5					
	Mist Eliminator	Inspect		0.5					
		Service		1.0					
		Replace		0.5					
	Condenser Air Discharge Louver and Linkage	Inspect		0.5					
		Service		1.0					
		Adjust		1.0					
		Replace		2.0					

MAINTENANCE ALLOCATION CHART – continued

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT	(6) REMARKS
			C	O	F	H	D		
	Fresh Air Damper and Actuator	Inspect		0.5					
		Service		0.5					
		Adjust	0.1	0.5					
		Replace			8.0				
	Condensate Traps and Drain Tubes	Inspect	0.1	0.5					
		Service		0.5					
		Replace		1.0					
03	ELECTRICAL								
	Control Panel Assembly	Inspect	0.1						Note 3
		Adjust	0.1						
		Repair		2.0					Note 4
		Replace		1.0					
	Wiring Harness (Control Panel)	Inspect		0.1					
		Test		1.0					
		Repair		2.0					
		Replace		4.0					
	Potentiometer Temp Select	Inspect		0.1					
		Adjust	0.1						
		Test		0.5					
		Replace		1.0					
	Switch, Rotary Mode Selector	Inspect		0.1					
		Adjust	0.1						
		Test		0.5					
		Replace		1.0					
	Fault Indicator (LED)	Inspect		0.1					
		Test		0.1					
		Replace		0.1					
	EMI Filter	Inspect		0.5					
		Test		0.5					
		Replace		0.5					
	Motor Controller Assembly	Inspect		0.1					
		Test		1.5					
		Replace		1.0					
	|	Repair				3.5		1–12	Note 9
	Logic Box Assembly	Inspect		0.1					
		Test			1.5				
		Replace		0.2					
		Repair		-		3.5		1–12	Note 9

MAINTENANCE ALLOCATION CHART - continued

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT	(6) REMARKS
			C	O	F	H	D		
	Wiring Harnesses (unit)	Inspect		1.0					
		Test		1.0					
		Repair		2.0					
		Replace		4.0					
	Terminal Boards	Inspect		0.1					
		Replace		0.5					
	Thermistor	Inspect		0.1					
		Test		0.5					
		Replace		0.5					
	Coil Frost Switch	Inspect							
		Test		0.1					
		Replace		0.5					
	Transformer	Inspect		0.1					
		Test		0.5					
		Replace		1.0					
	Rectifier	Inspect		0.1					
		Test		0.5					
		Replace		1.0					
	Capacitors	Inspect		0.1					
		Test		0.5					
		Replace		0.5					
	Relays	Inspect		0.2					
		Test		1.0					
		Replace		1.5					
	Diodes	Inspect		0.1					
		Test		0.5					
		Replace		0.5					
	Circuit Breaker	Inspect		0.1					
		Test		0.5					
		Replace		1.0					
04	EVAPORATOR FAN, MOTOR AND HEATER								
	Fan and Housing	Inspect		0.5					
		Service		1.0					
		Replace		2.0					

MAINTENANCE ALLOCATION CHART - continued

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT	(6) REMARKS
			C	O	F	H	D		
	Motor	Inspect		0.5					
		Test		0.5					
		Repair			2.0				Note 5
		Replace		3.0					
	Heater Thermostat	Inspect		0.1					
		Test		1.0					
		Replace		0.5					
	Heater Elements	Inspect		0.1					
		Test		0.5					
		Replace		2.0					
05	CONDENSER FAN, AND MOTOR								
	Fan and Housing	Inspect		0.5					
		Service		0.5					
		Replace		1.0					
	Motor	Inspect		0.5					
		Test		0.5					
		Repair			2.0				Note 5
		Replace		3.0					
06	REFRIGERATION SYSTEM								
	Refrigerant Desiccant Dehydrator	Inspect			0.1				
		Replace			8.0				
	Evaporator Coil	Inspect		0.5					
		Service		1.0					
		Replace			8.0				
	Expansion Valve	Replace			8.0				
	Solenoid Valve Coil	Test		0.5					
		Replace		0.5					Note 6
	Solenoid Valve	Replace			8.0				
	Actuating Cylinder	Inspect			0.1				
		Adjust			1.0				
		Replace			8.0				

MAINTENANCE ALLOCATION CHART - continued

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT	(6) REMARKS
			C	O	F	H	D		
	Pressure Switches	Inspect			0.1				
		Test			0.5				
		Replace			8.0				
	Service Valves	Inspect			0.5				
		Replace			8.0				
	Pressure Relief Valve	Inspect			0.5				
		Replace			8.0				
	Condenser Coil	Inspect		0 5					
		Service		1.0					
		Replace			8.0				
	Liquid Indicator	Inspect	0.5						
		Replace			8.0				
	Compressor	Test			0.5				
		Repair			1.0				Note 7
		Replace			12.0				
	Receiver	Inspect			1.0				
		Replace			8.0				
	Tubing and Fittings	Test			0.5				
		Replace			8.0				
0 7	HOUSING								
	Housing	Inspect		0.5					
		Service		0.5					
		Repair				1.0			Note 8
		Replace				24.0			
0 8	ACCESSORY/LOOSE ITEMS								
	Connectors	Inspect		0.5					
		Replace		2.0					
	Installation Hardware	Inspect							
		Replace		1.0					

Section III TOOL AND TEST EQUIPMENT REQUIREMENTS

MAINTENANCE ALLOCATION CHART

Tool/Test Equipment Reference Code	(2) Maintenance Category	(3) Nomenclature	(4) National/NATO Stock Number	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	Logic Box Test Fixture		(94833) 111K8002-1

SECTION IV. REMARKS

MAINTENANCE ALLOCATION CHART

Reference Code	Remarks
Note 1	Replace gasket, insulation, and information plates.
Note 2	Straighten bent blades.
Note 3	External components only (knobs and switches).
Note 4	Replace components.
Note 5	Replace bearings, thermal overloads or connector.
Note 6	Replace solenoid valve coil only.
Note 7	Replace external components only.
Note 8	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.
Note 9	Repair performed by Specialized Repair Activity (SRA).

APPENDIX C

COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) 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 lll. 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 he item. The last line for each item indicates the Commercial And Government Entity (CAGE) code (in parentheses) followed by the part number. If item needed differs for clifferent 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

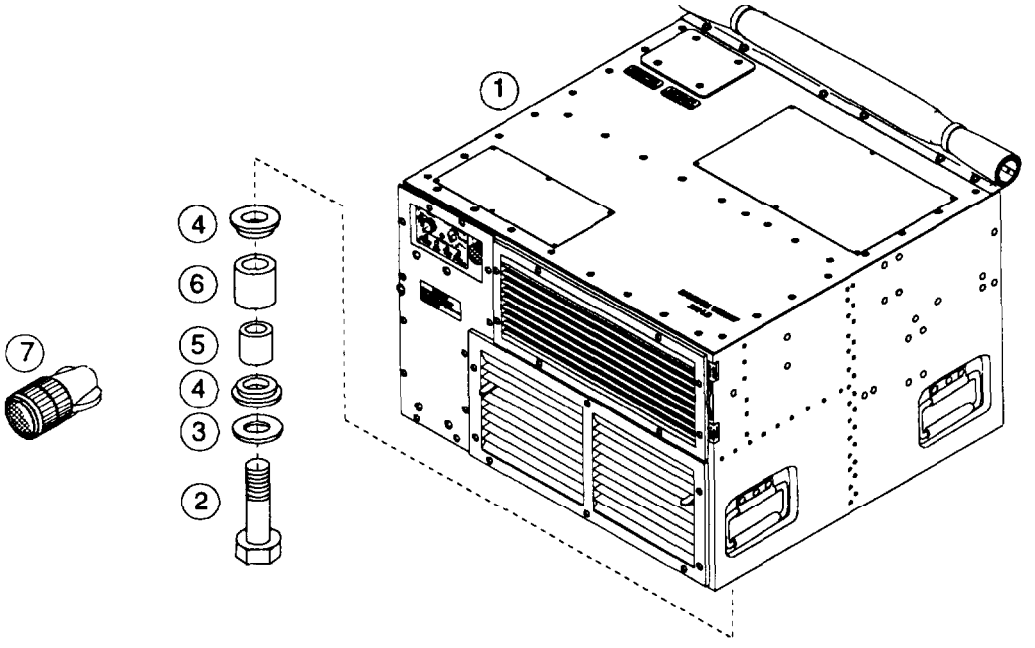


Figure C-1. Components of End Item

(1) Illus. Number	(2) National Stock Number	(3) Description CAGE Code and Part Number	Usable On Code	(4) U/M	(5) Qty Rqr
1	4120-01-327-1316	Air Conditioner (97403) 13229E4200		EA	1
2	5305-00-269-2807	Screw, Cap, Hex Head (96906) MS90726-64		EA	4
3	5310-00-566-9504	Washer (97403) 13216E6138-2		EA	4
4	5340-01-042-5759	Mount Resilient (97403) 13216E6137		EA	8
5	5365-01-044-6408	Spacer (97403) 13216E6152		EA	4
6	4720-01-038-2334	Tube Elastomeric (97403) 13216E6153		EA	4
7	5935-01-413-4953	Connector, Plug Electrical (96906) MS3106R18-11S		EA	1

Section III BASIC ISSUE ITEMS

(1) Illus. Number	(2) National Stock Number	(3) Description CAGE Code 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 9-4120-401-14		EA	1
		Warranty Program for Air Conditioner, Horizontal, Compact, 18,000 BTU/HR TB 9-4120-401-24		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 identfiied as follows: (Not applicable.)

Section II ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION CAGE CODE 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 (EDSML) LIST

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 R-22) BB-F-1421, type 22 (81348)	cy
5	F	6830-00-782-6512	Dichlorotetrafluroethane Technical: w/cylinder (Refrigerant R-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		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 lll	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, Antisieze, 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.

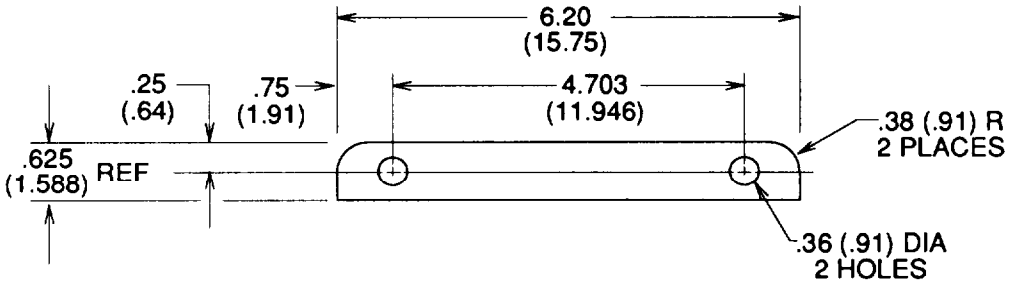
c. All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular list on the illustration.

d. All dimensions are given in inches with centimeters shown in parenthesis.

Manufactured Items Part Number Index

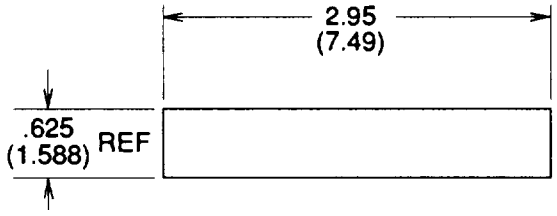
Part Number	Figure Number	Part Number	Figure Number
Input Power Cable Diagram	F-47	13229E4201/46	F-42
Logic Box Test Fixture		13229E4201/47	F-30
Schematic	F-48	13229E4201/48	F-31
Remote Control Cable		13229E4201/49	F-36
Diagram	F-46	13229E4201/50	F-26
13216E6095/4	F-15	13229E4201/51	F-35
13216E6104-1/2	F-14	13229E4201/52	F-29
13216E6151-1	F-17	13229E4201/53	F-33
13216E6151-2	F-17	13229E4201/54	F-34
13216E6151-7	F-17	13229E4201/55	F-26
13220E1353/3	F-15	13229E4201/56	F-27
13227E6911/2	F-44	13229E4201/57	F-32
13227E9208/1	F-45	13229E4201/58	F-28
13229E4194/2	F-43	13229E4201/59	F-26
13229E4198/2	F-1	13229E4201/60	F-40
13229E4198/3	F-2	13229E4201/61	F-41
13229E4198/4	F-3	13229E4208/2	F-24
13229E4199/4	F-4	13229E4210/2	F-18
13229E4199/5	F-5	13229E4210/3	F-19
13229E4199/6	F-6	13229E4210/4	F-20
13229E4199/8	F-8	13229E4210/5	F-21
13229E4199/7	F-7	13229E4210/6	F-23
13229E4199/9	F-9	13229E4210/9	F-22
13229E4200/250	F-16	13229E4230/3	F-10
13229E4201/24	F-38	13229E4230/4	F-11
13229E4201/25	F-39	13229E4230/5	F-12
13229E4201/27	F-37	13229E4230/6	F-13
13229E4201/28	F-39	13229E4230/7	F-11
13229E4201/45	F-25	13229E4230/8	F-11

Section II MANUFACTURED ITEMS ILLUSTRATIONS



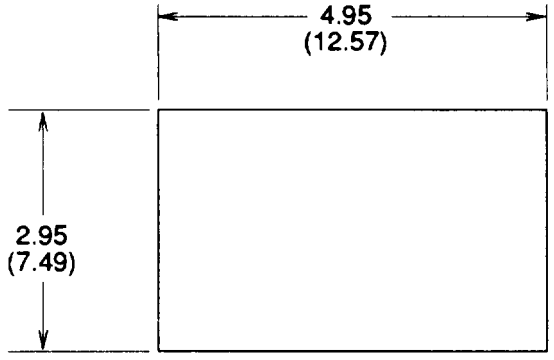
NOTE
1. FABRICATE FROM EM I COMPOSITE GASKET PART NO. (97403)13227E6913-11

Figure F-1. Gasket, EMI, Part Number 13229E4198/2



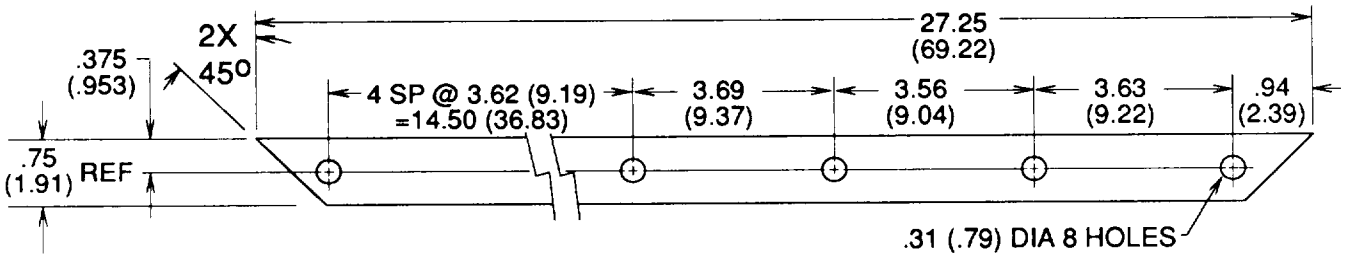
NOTE
1. FABRICATE FROM EMI COMPOSITE GASKET PART NO. (97403)13227E6913-11

Figure F-2. Gasket, EMI, Part Number 13229E4198/3



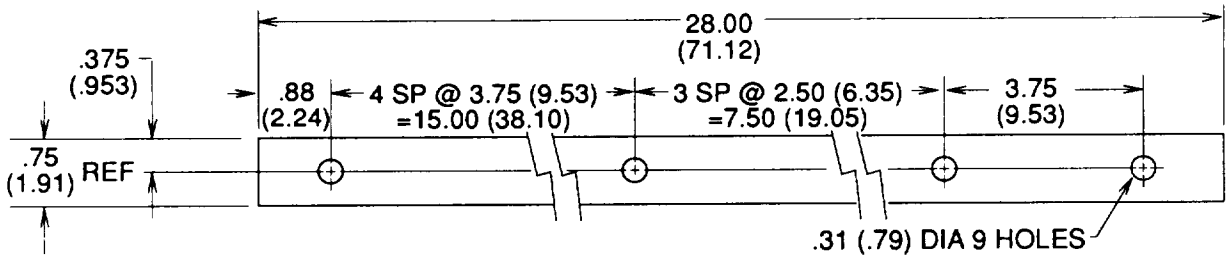
NOTE
1. FABRICATE FROM NSN 9330-00-300-1531 STOCK

Figure F-3. Foam, Flexible, Part Number 13229E4198/4



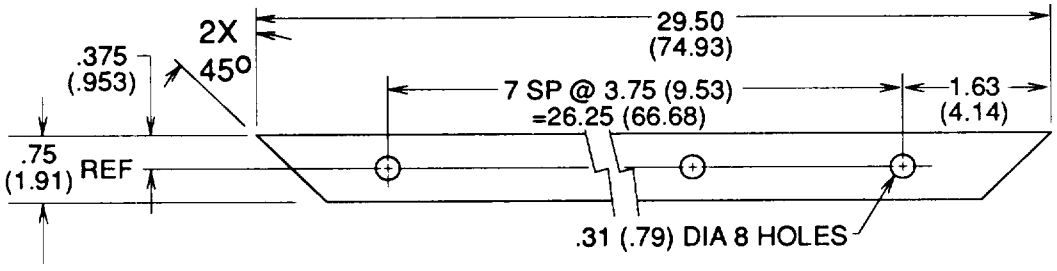
NOTE
1. FABRICATE FROM EMI COMPOSITE GASKET PART NO. (97403)13227E6913-12

Figure F-4. Gasket, EMI, Part Number 13229E4199/4



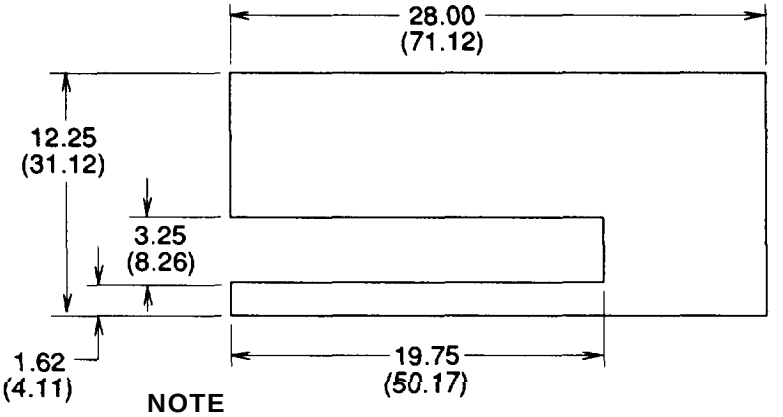
NOTE
1. FABRICATE FROM EMI COMPOSITE GASKET PART NO. (97403)13227E6913-24

Figure F-5. Gasket, EMI, Part Number 13229E4199/5



NOTE
1. FABRICATE FROM EM I COMPOSITE GASKET PART NO. (97403)13227E6913-12

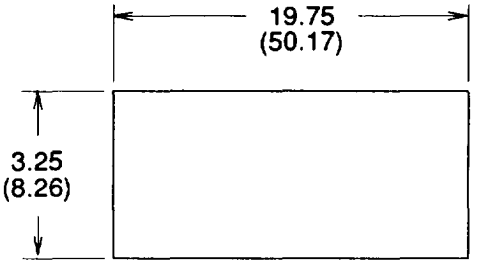
Figure F-6. Gasket, EMI, Part Number 13229E4199/6



NOTE

1. FABRICATE FROM AMS3570/SH-1/4THK FLEXIBLE POLYURETHANE FOAM, OPEN CELL, MEDIUM FLEXIBILITY, 2.5 LB PER CU FT, .25 (.64) STK

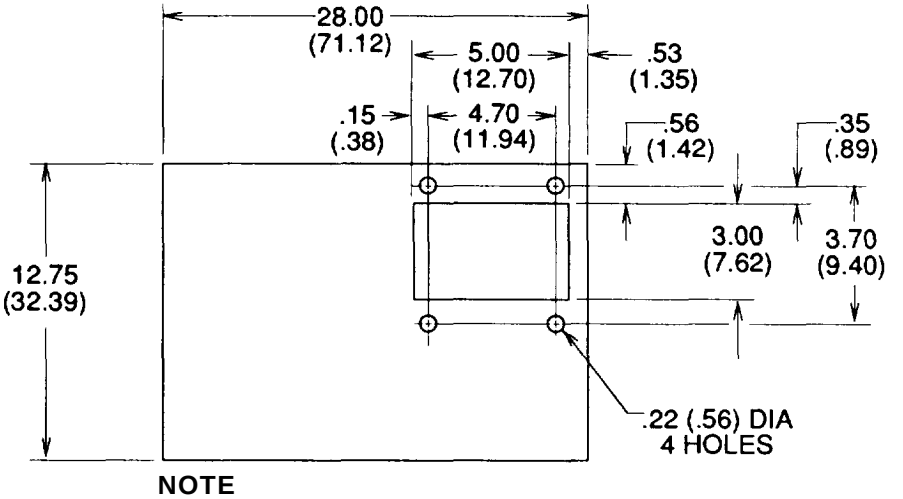
Figure F-7. Foam, Flexible (Insulation), Part Number 13229E4199/7



NOTE

1. FABRICATE FROM NSN 9330-01-044-0186

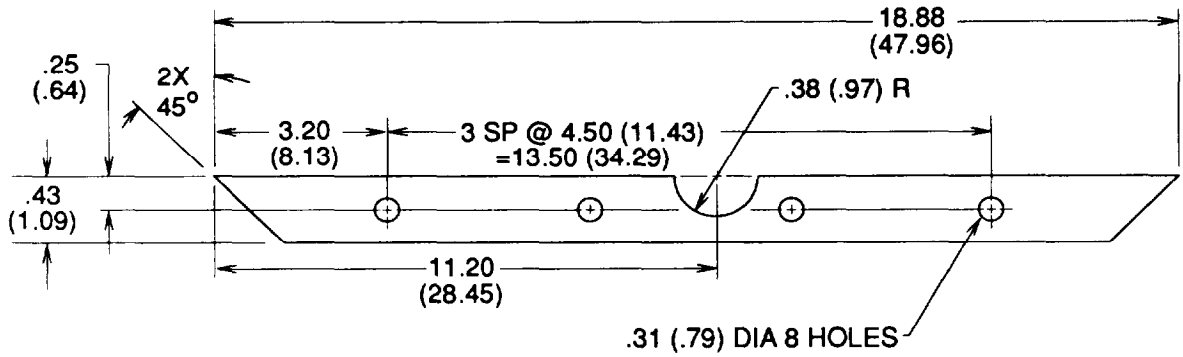
Figure F-8. Foam, Flexible (Insulation), Part Number 13229E4199/8



NOTE

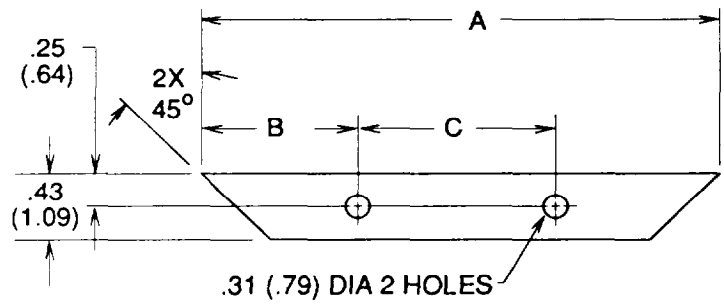
1. FABRICATE FROM AMS3570/SH-1/4THK FLEXIBLE POLYURETHANE FOAM, OPEN CELL, MEDIUM FLEXIBILITY, 2.5 LB PER CU FT, .25 (.64) STK

Figure F-9. Foam, Flexible (Insulation), Part Number 13229E4199/9



NOTE
1. FABRICATE FROM NSN 9320-00-814-4583 STOCK

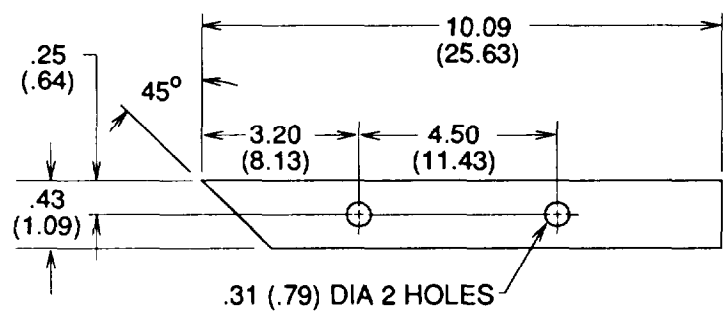
Figure F-10. Rubber, Cellular (Gasket), Part Number 13229E4230/3



A DIM	B DIM	C DIM	PART NUMBER
8.75 (22.23)	2.81 (7.14)	7.12 (18.08)	13229E4230/8
8.79 (22.33)	2.17 (5.51)	4.50 (11.43)	13229E4230/7
6.36 (16.15)	1.56 (3.96)	3.29 (8.36)	13229E4230/4

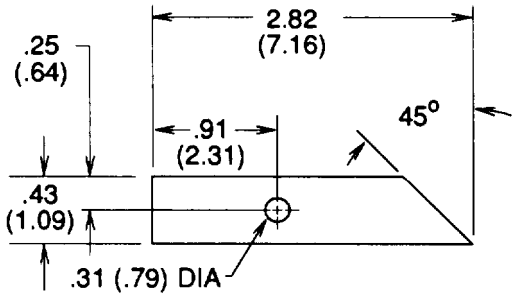
NOTE
1. FABRICATE FROM NSN 9320-00-814-4583 STOCK

Figure F-11. Rubber, Cellular (Gasket)



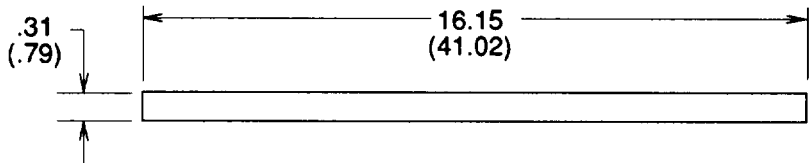
NOTE
1. FABRICATE FROM NSN 9320-00-814-4583 STOCK

Figure F-12. Rubber, Cellular (Gasket), Part Number 13229E4230/5



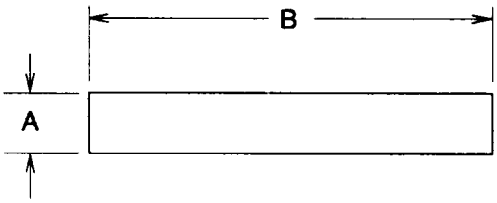
NOTE
1. FABRICATE FROM NSN 9320-00-814-4583 STOCK

Figure F-13. Rubber, Cellular (Gasket), Part Number 13229E4230/6



NOTE
1. FABRICATE FROM NSN 9320-01-174-9526 STOCK

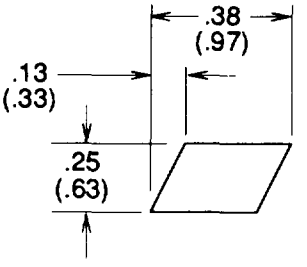
Figure F-14 Rubber, Cellular (Gasket), Part Number 13216E6104-1/2



A DIM	B DIM	PART NUMBER
.25 (.64)	4.24 (10.77)	13216E6095/4
.75 (1.91)	18.00 (45.72)	13220E1353/3

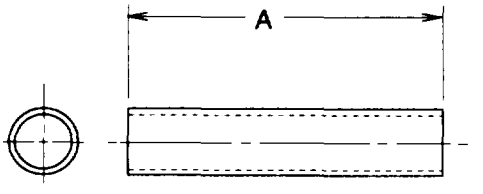
NOTE
1. FABRICATE FROM NSN 9320-00-814-4583 STOCK

Figure F-15. Rubber, Cellular (Gasket)



NOTE
1. FABRICATE FROM NSN 9320-00-814-4583 STOCK

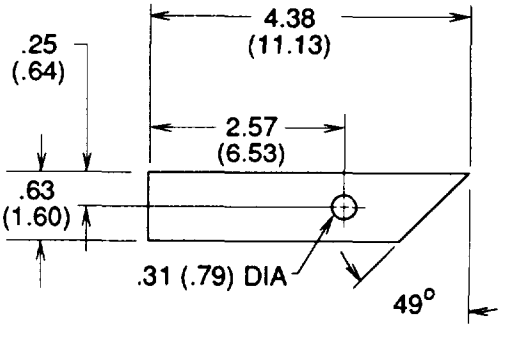
Figure F-16. Rubber, Cellular (Gasket), Part Number 13229E4200/250



A DIM	PART NUMBER
15.00 (38.10)	13216E6151-7
11.25 (28.58)	13216E6151-2
2.00 (5.08)	13216E6151-1

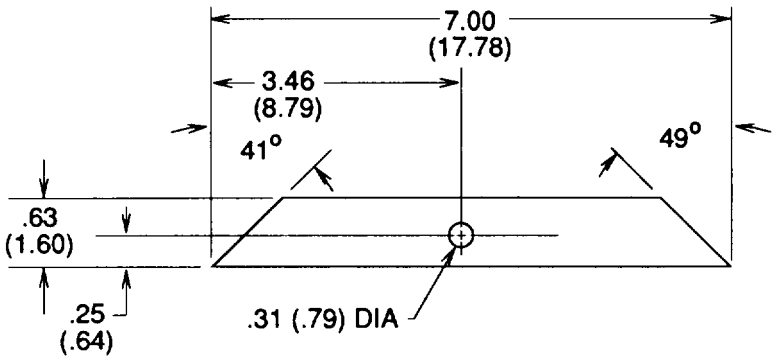
NOTE
1. FABRICATE FROM NSN 9330-01-214-8452

Figure F-17. Tubing, Nonmetallic



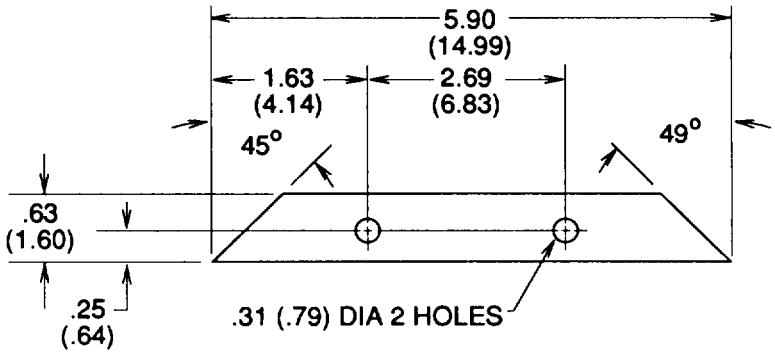
NOTE
1. FABRICATE FROM NSN 9320-00-814-4583 STOCK

Figure F-18. Rubber, Cellular (Gasket), Part Number 13229E4210/2



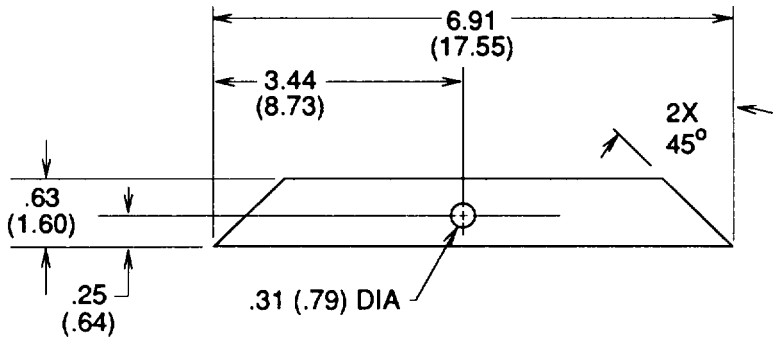
NOTE
1. FABRICATE FROM NSN 9320-00-814-4583 STOCK

Figure F-19. Rubber, Cellular (Gasket) Part Number 13229E4210/3



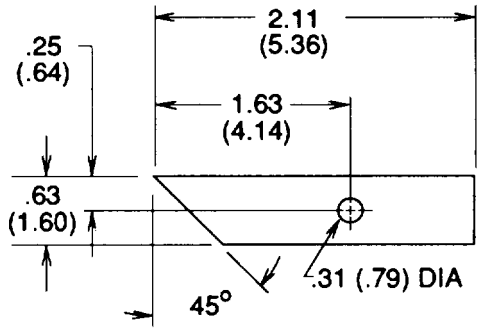
NOTE
1. FABRICATE FROM NSN 9320-00-814-4583 STOCK

Figure F-20. Rubber, Cellular (Gasket) Part Number 13229E4210/4



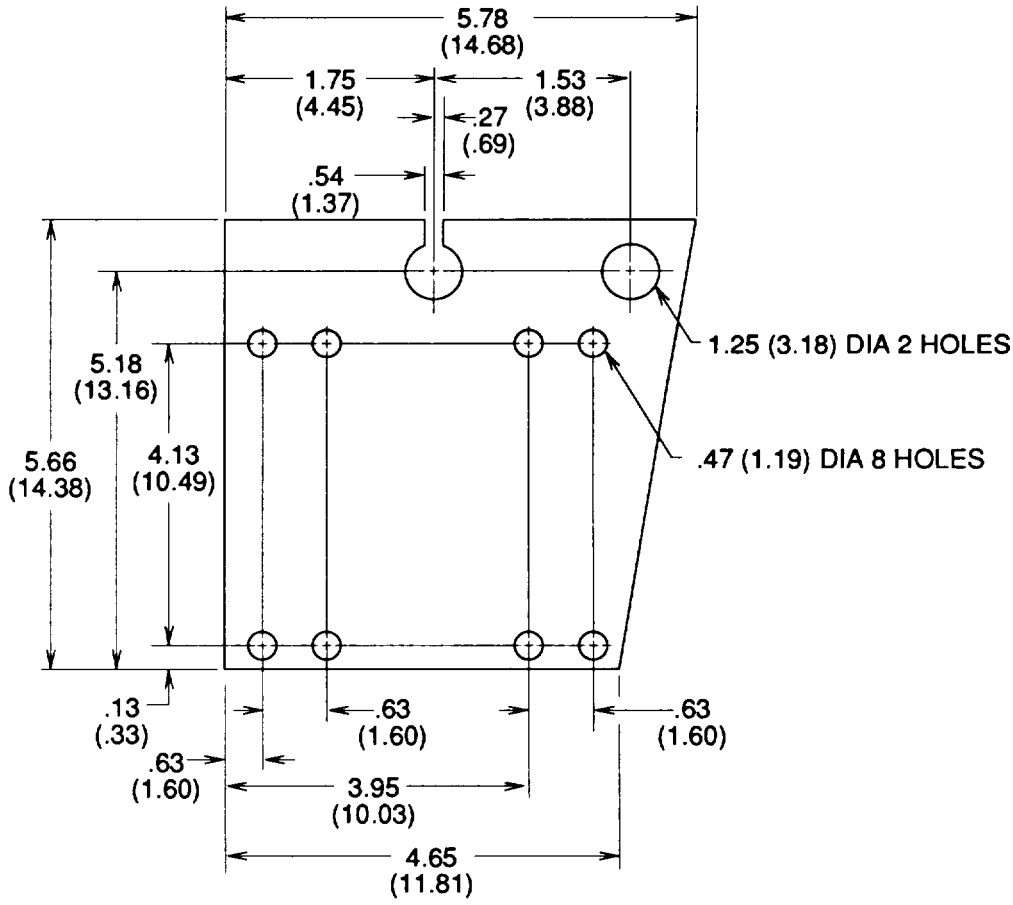
NOTE
1. FABRICATE FROM NSN 9320-00-814-4583 STOCK

Figure F-21. Rubber, Cellular (Gasket) Part Number 13229E4210/5



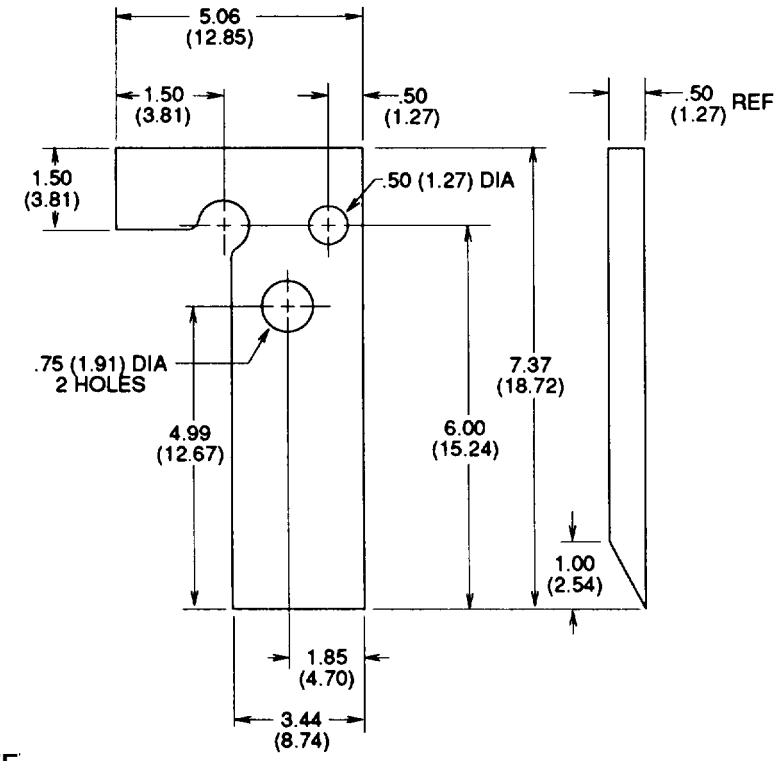
NOTE
1. FABRICATE FROM NSN 9320-00-814-4583 STOCK

Figure F-22. Rubber, Cellular (Gasket), Part Number 13229E4210/9



NOTE
1. FABRICATE MIL-R-6130, TYPE II, GRADE A, COND SOFT RUBBER, CELLULAR, CHEMICALLY BLOWN, CLOSED CELL, OIL AND FLAME RESISTANT, .50 (1.27) THICK STOCK

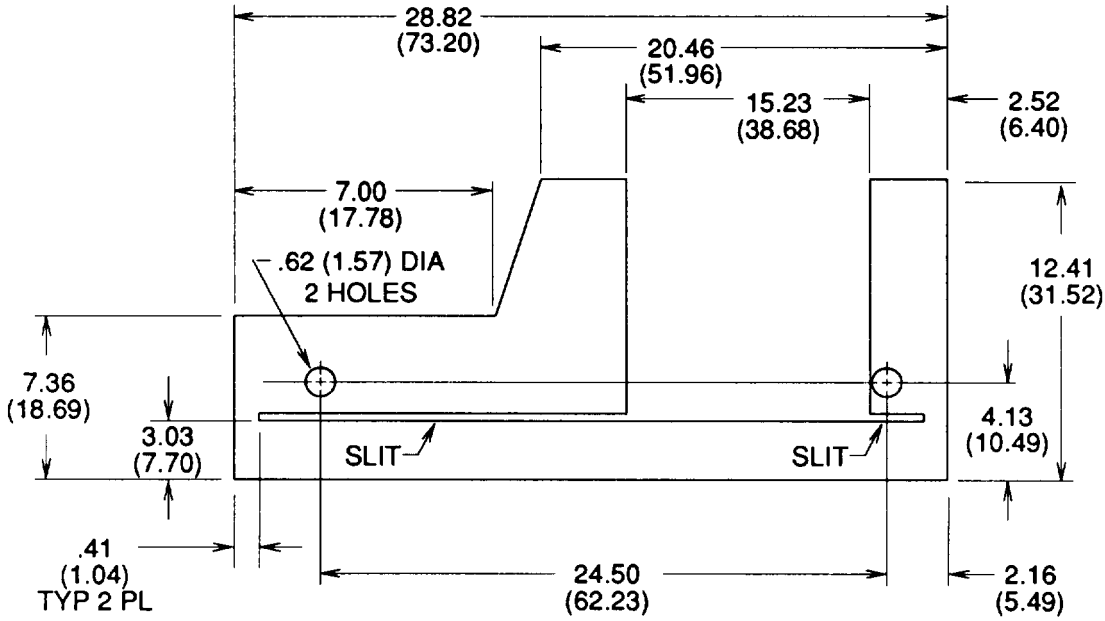
Figure F-23. Rubber, Cellular (Gasket), Part Number 13229E4210/6



NOTE

1. FABRICATE FROM FOAM, ACOUSTIC (97403) 13221E9359

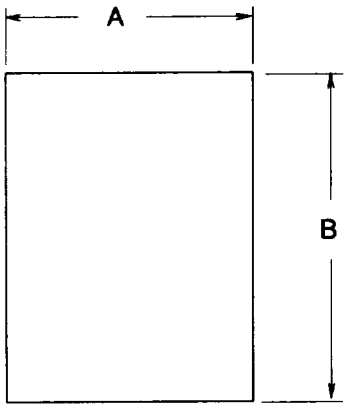
Figure F-24. Foam, Flexible (Insulation), Part Number 13229E4208/2



NOTE

1. FABRICATE FROM FOAM, ACOUSTIC (97403) 13221E9359

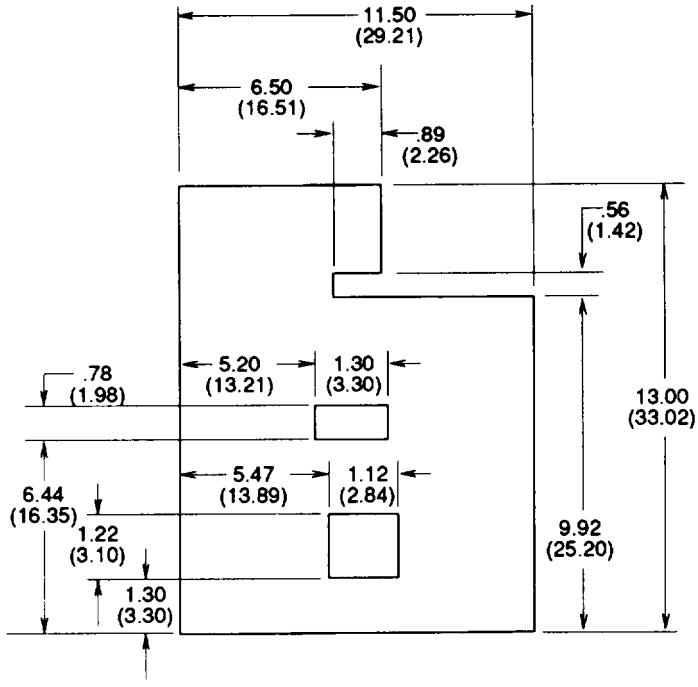
Figure F-25. Foam, Flexible (Insulation), Part Number 13229E4201/45



A DIM	B DIM	PART NUMBER
.50 (1.27)	1.75 (4.45)	13229E4201/50
2.87 (7.28)	9.92 (25.20)	13229E4201/59
8.29 (21.06)	9.92 (25.20)	13229E4201/55

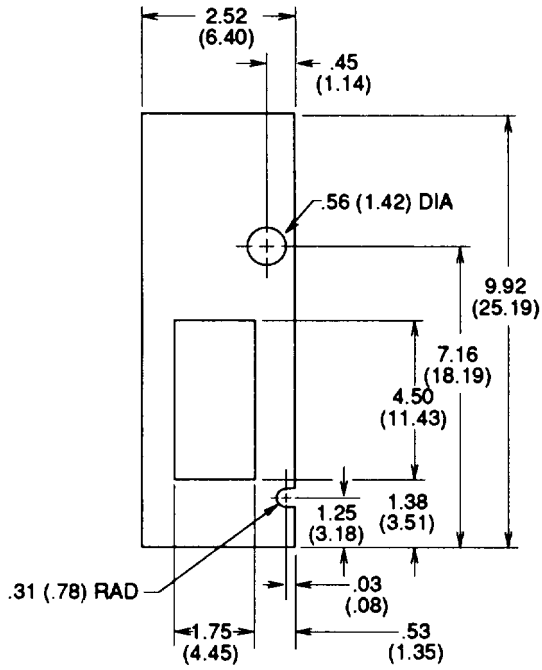
NOTE
1. FABRICATE FROM FOAM, ACOUSTIC (97403) 13221E9359

Figure F-26. Foam, Flexible (Insulation)



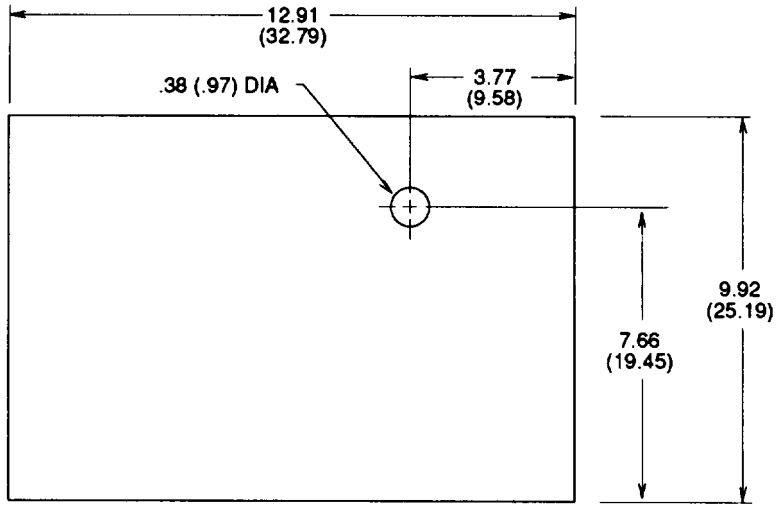
NOTE
1. FABRICATE FROM FOAM, ACOUSTIC (97403) 13221E9359

Figure F-27. Foam, Flexible (Insulation), Part Number 13229E4201/56



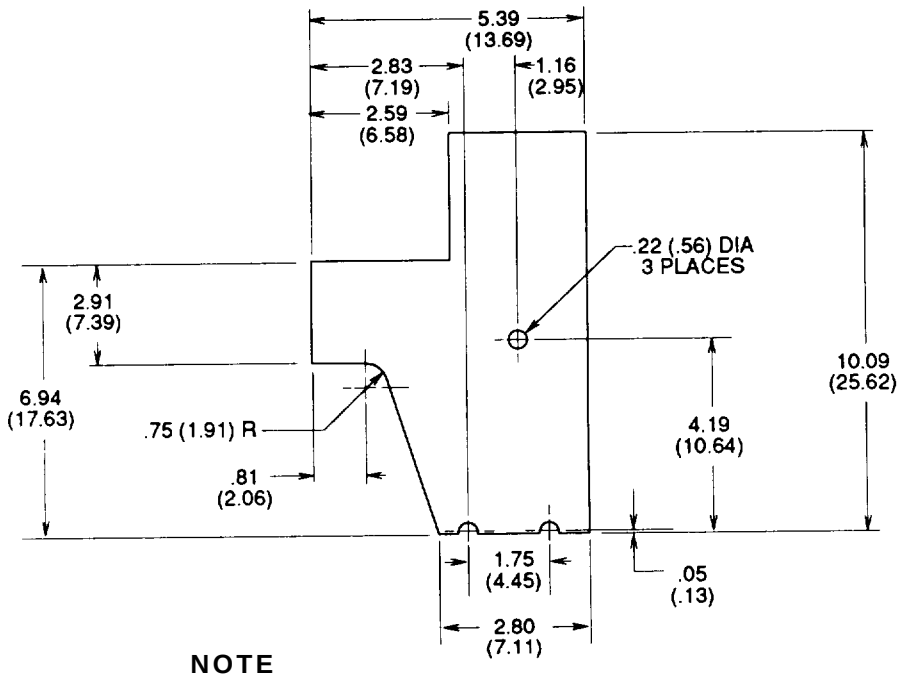
NOTE
1. FABRICATE FROM FOAM, ACOUSTIC (97403) 13221E9359

Figure F-28. Foam, Flexible (Insulation), Part Number 13229E4201/58



NOTE
1. FABRICATE FROM FOAM, ACOUSTIC (97403) 13221E9359

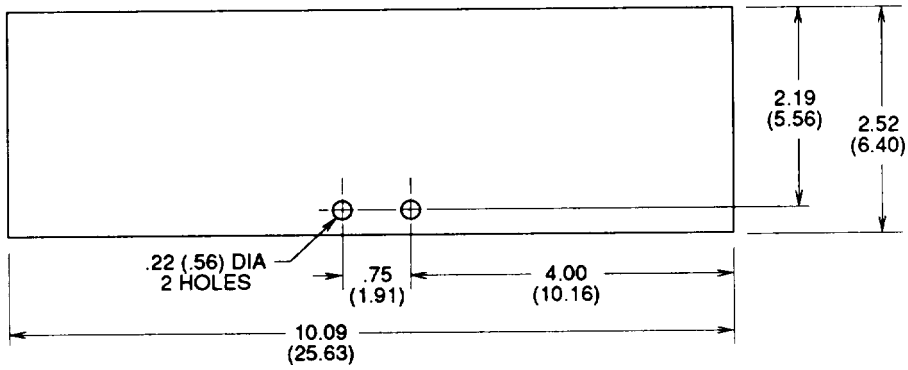
Figure F-29. Foam, Flexible (Insulation), Part Number 13229E4201/52



NOTE

1. FABRICATE FROM FOAM, ACOUSTIC (97403) 13221E9359

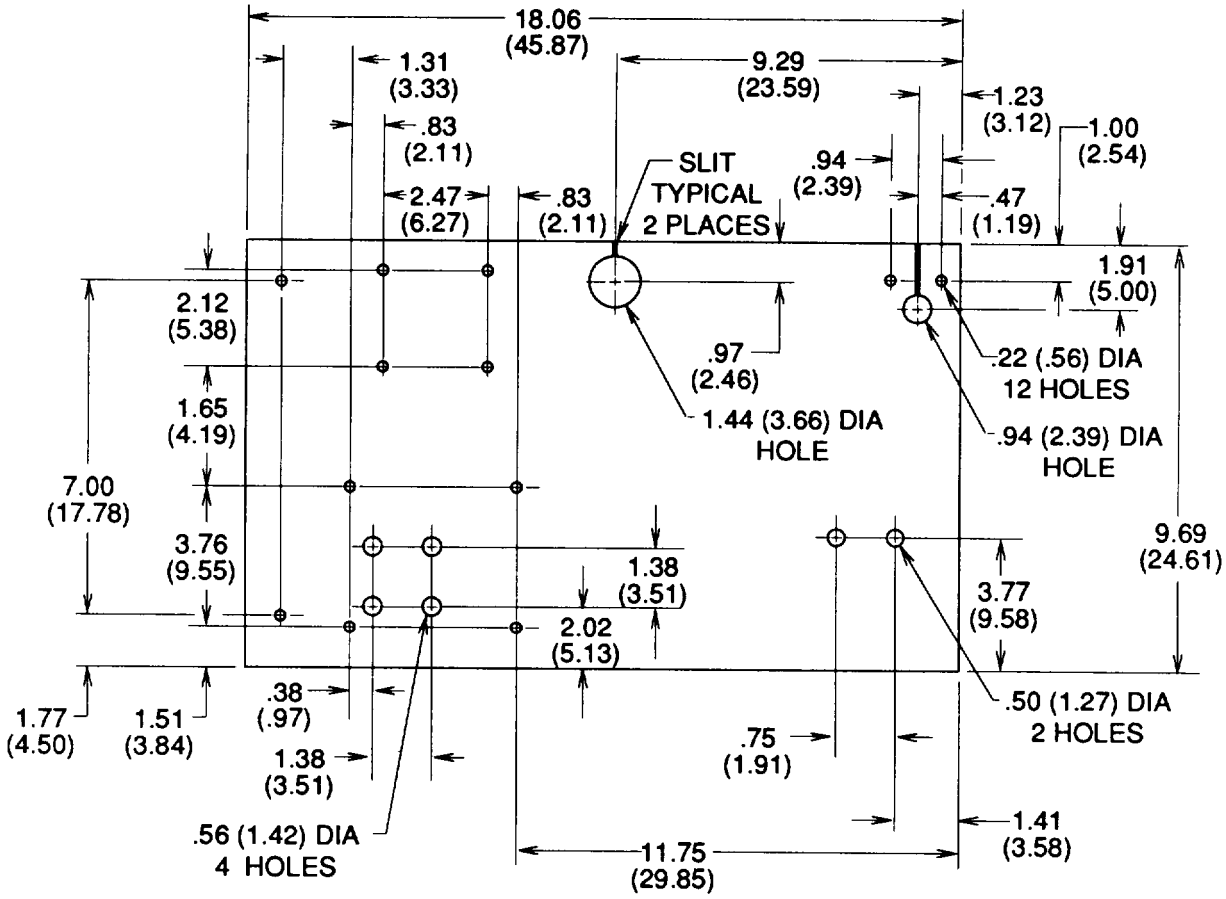
Figure F-30. Foam, Flexible (Insulation), Part Number 13229E4201/47



NOTE

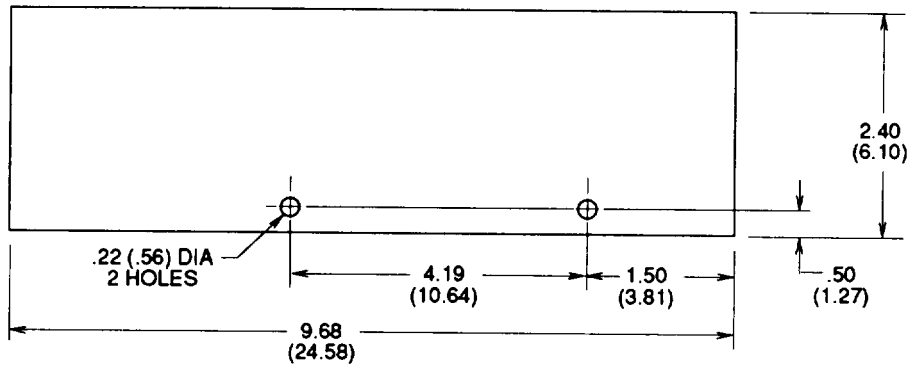
1. FABRICATE FROM FOAM, ACOUSTIC (97403) 13221E9359

Figure F-31. Foam, Flexible (Insulation), Part Number 13229E4201/48



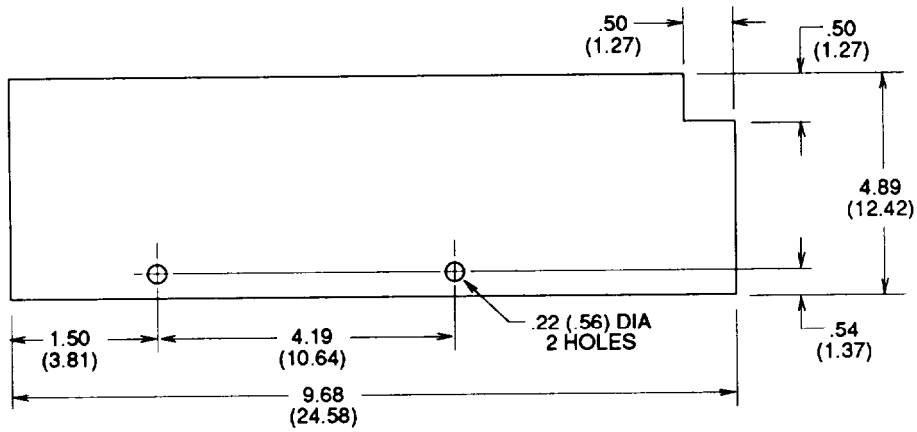
NOTE
1. FABRICATE FROM FOAM, ACOUSTIC (97403) 13221E9359

Figure F-32. Foam, Flexible (Insulation), Part Number 13229E4201/57



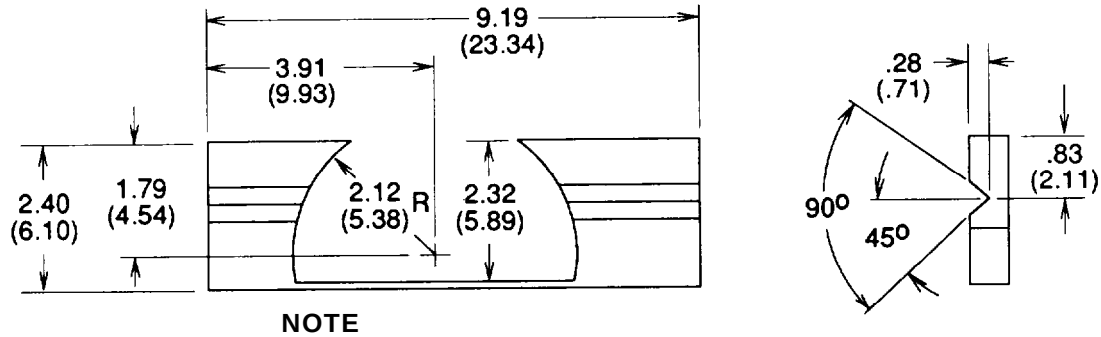
NOTE
1. FABRICATE FROM NSN 5640-00-237-4781 STOCK

Figure F-33. Foam, Flexible (Insulation), Part Number 13229E4201/53



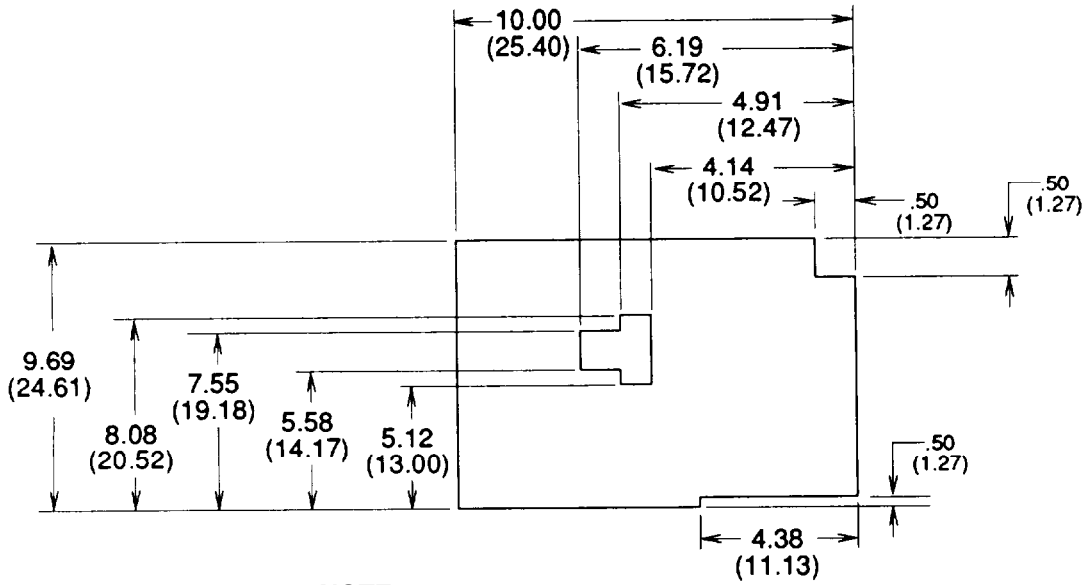
NOTE
1. FABRICATE FROM NSN 5640-00-237-4781 STOCK

Figure F-34. Foam, Flexible (Insulation), Part Number 13229E4201/54



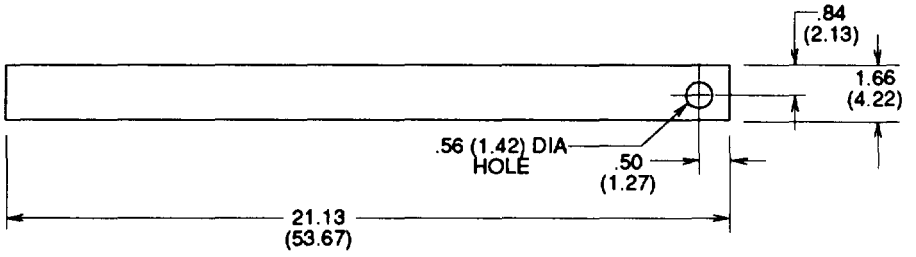
NOTE
1. FABRICATE FROM 5640-00-237-4781 STOCK

Figure F-35. Plastic Foam (Insulation), Part Number 13229E4201/51



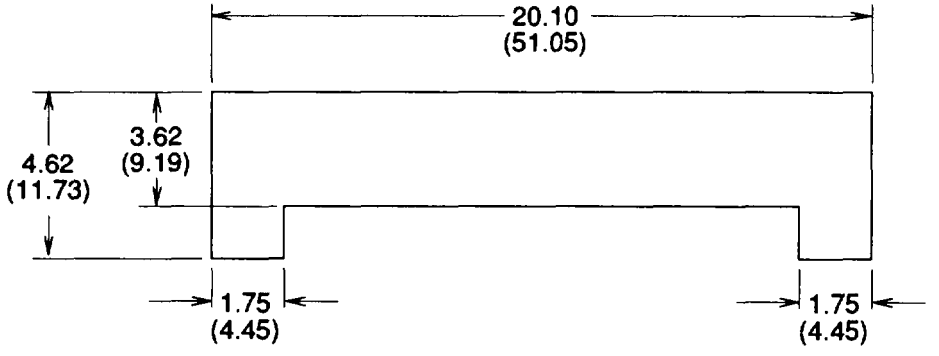
NOTE
1. FABRICATE FROM 5640-00-237-4781 STK

Figure F-36. Plastic Foam (Insulation), Part Number 13229E4201/49



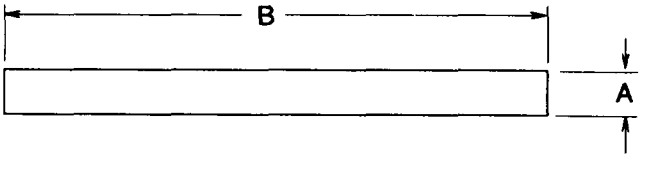
NOTE
1. FABRICATE FROM NSN 5640-00-237-4781 STOCK

Figure F-37. Foam, Flexible (Insulation), Part Number 13229E4201/27



NOTE
1. FABRICATE FROM NSN 5640-00-198-7255 STOCK

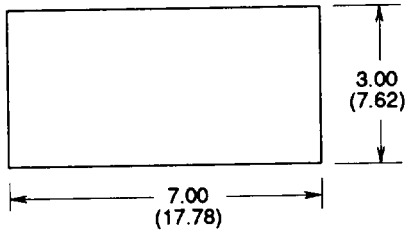
Figure F-38. Foam, Flexible (Insulation), Part Number 13229E4201/24



A DIM	B DIM	PART NUMBER
.50 (1.27)	20.20 (51.31)	13229E4201/28
.50 (1.27)	5.12 (13.00)	13229E4201/25

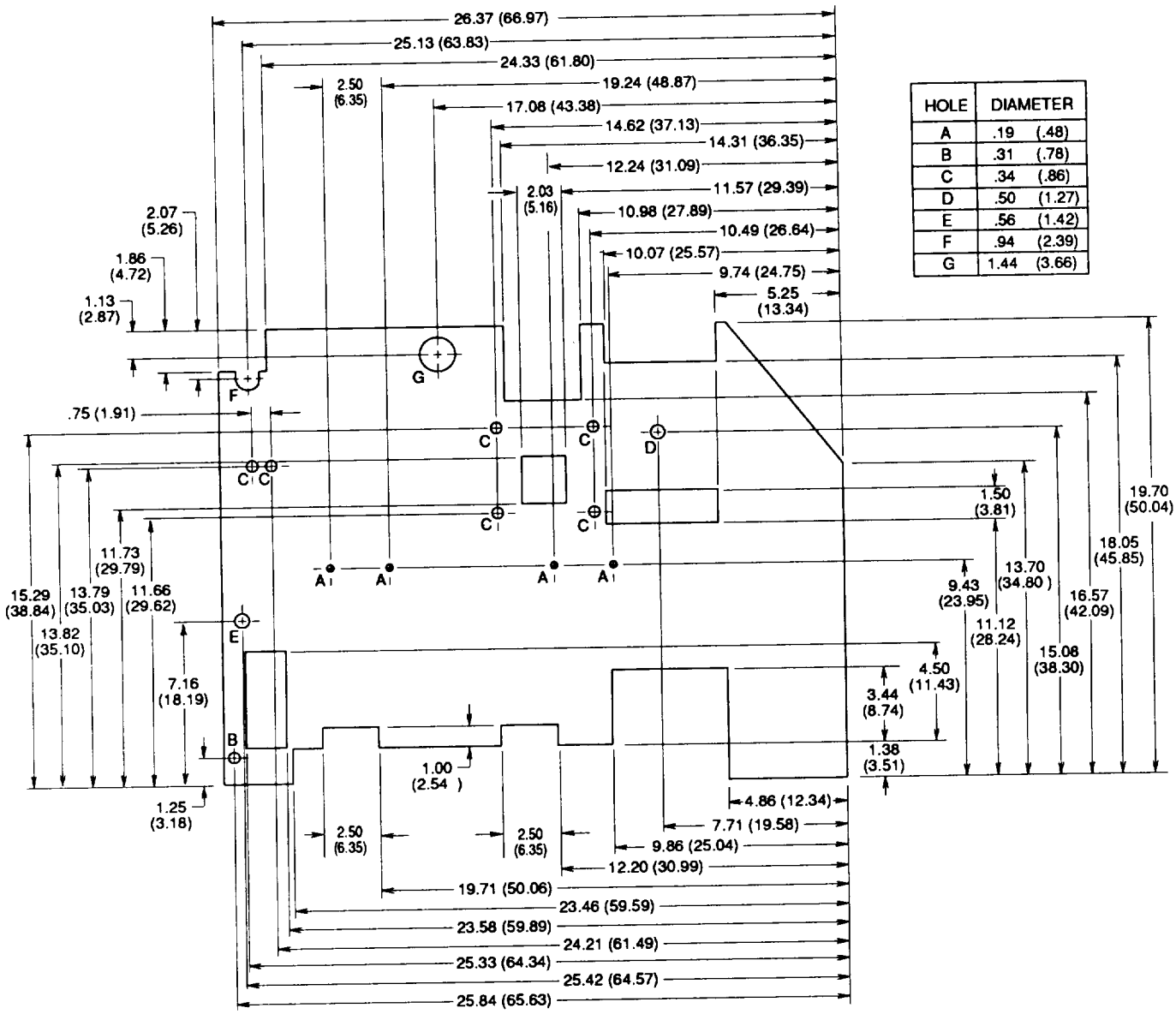
NOTE
1. FABRICATE FROM RUBBER, CELLULAR, CHEMICALLY BLOWN, CLOSED CELL, OIL AND FLAME RESISTANT, MIL-R-6130, TYPE II, GR A, COND MED, .50 (1.27) THICK STOCK

Figure F-39. Rubber, Cellular



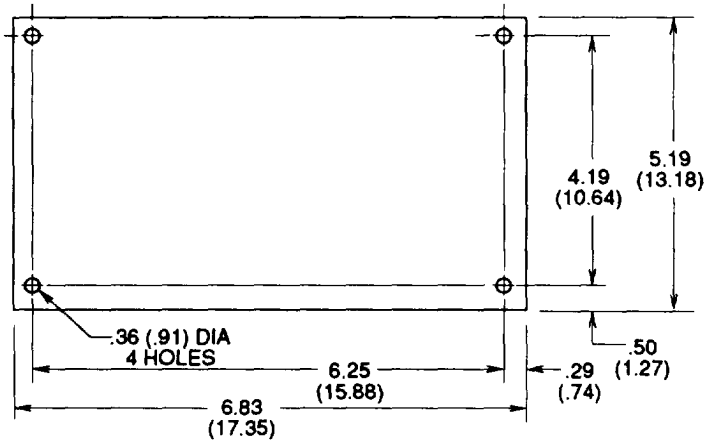
NOTE
1. FABRICATE FROM NSN 5640-00-237-4781 STOCK

Figure F-40. Foam, Flexible (Insulation), Part Number 13229E4201/60



NOTE
1. FABRICATE FROM NSN 5640-00-237-4781 STOCK

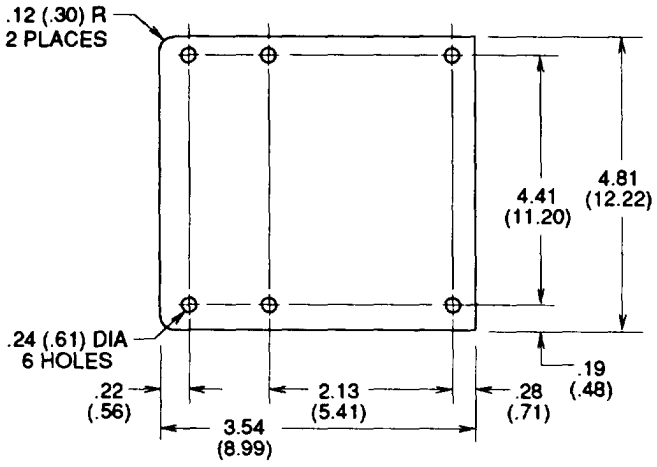
Figure F-41. Foam, Flexible (Insulation), Part Number 13229E4201/61



NOTE

1. FABRICATE FROM RUBBER, CELLULAR, CHEMICALLY BLOWN, CLOSED CELL, OIL AND FLAME RESISTANT, MIL-R-6130, TYPE II, GR A, COND MED, .25 (.64) THICK STOCK

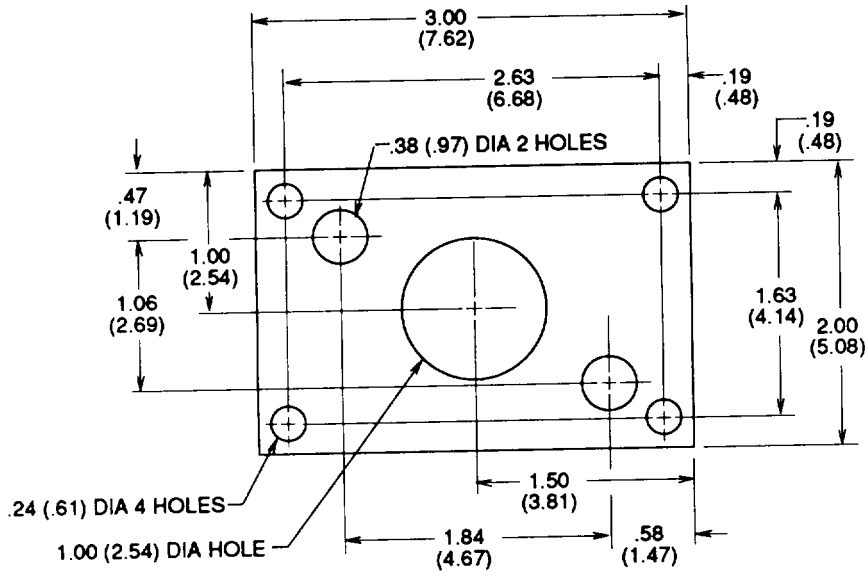
Figure F-42. Rubber, Cellular, Part Number 13229E4201/46



NOTE

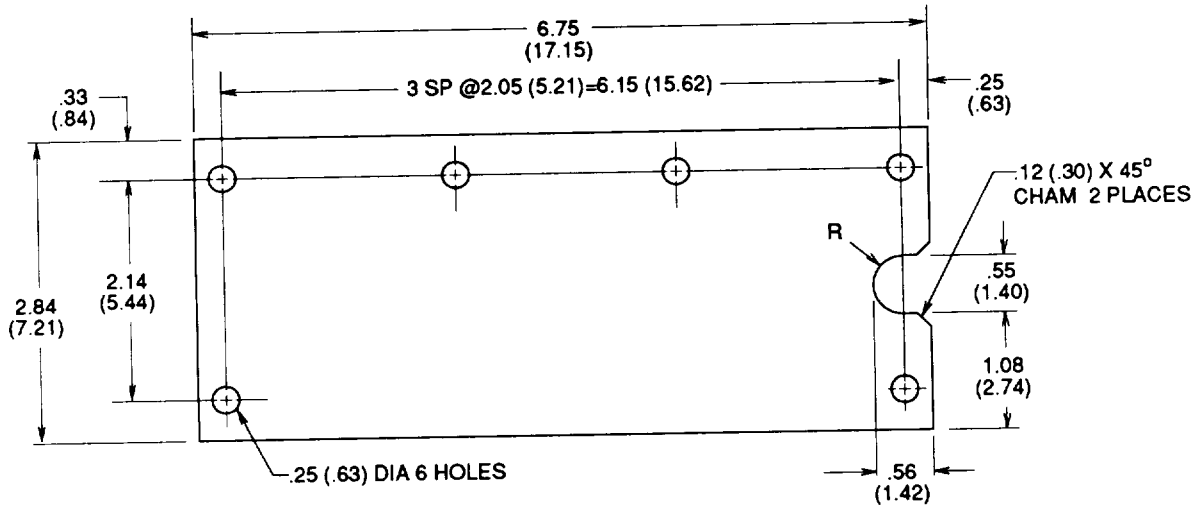
1. FABRICATE FROM EMI COMPOSITE GASKET PART NO. (97403)13227E6913-27

Figure F-43. Gasket, EMI, Part Number 13229E4194/2



NOTE
1. FABRICATE FROM EMI COMPOSITE GASKET PART NO. (97403) 13227E6913-29

Figure F-44. Gasket, EMI, Part Number 13227E6911/2



NOTE
1. FABRICATE FROM EMI COMPOSITE GASKET PART NO. (97403) 13227E6913-28

Figure F-45. Gasket, EMI, Part Number 13227E9208/1

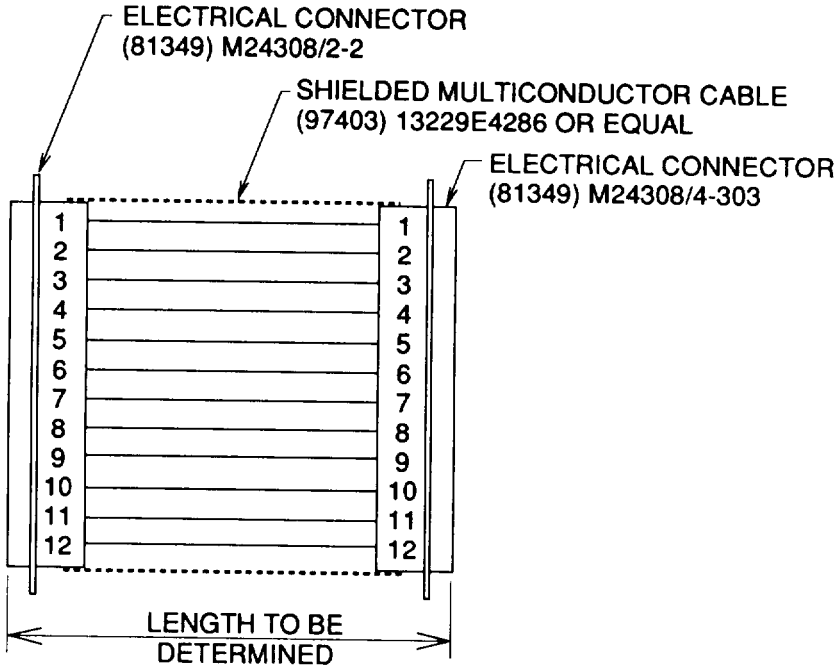


Figure F-46. Remote Control Cable Diagram

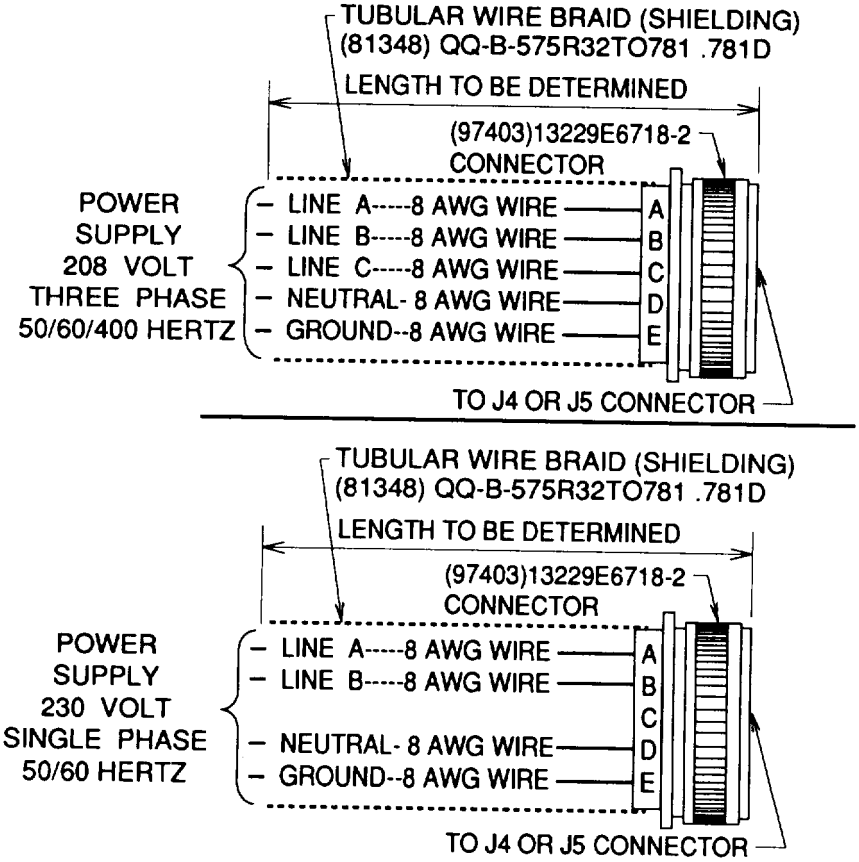
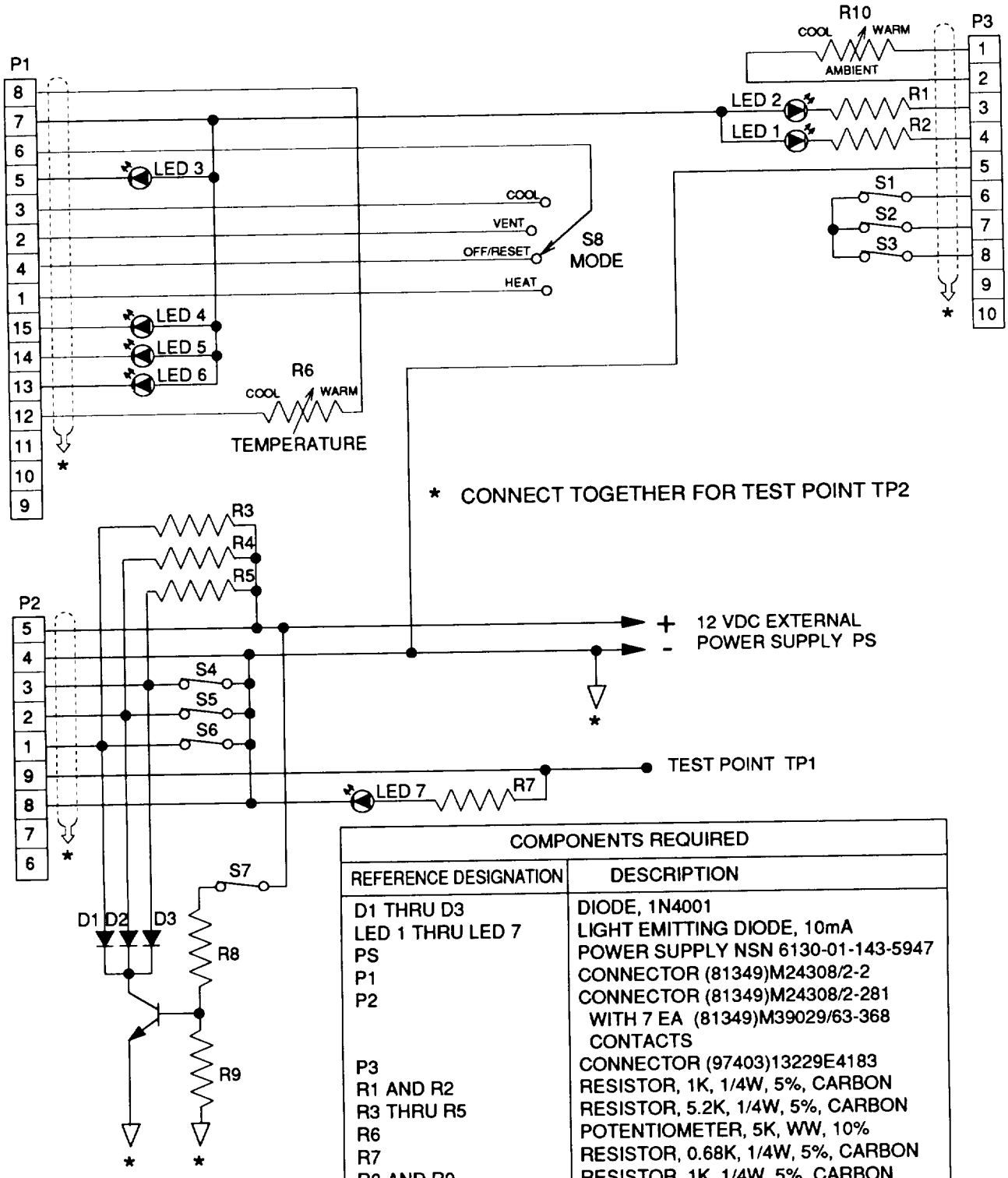


Figure F-47. Input Power Cable Diagram



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)M39029/63-368 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-48. Logic Box Test Fixture Schematic

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
$c m^2$ ..... 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
EMI ..... Electromagnetic Interference
EQPT ..... Equipment
ESC ..... Equipment Serviceable Criteria
F ..... Fahrenheit
Fig ..... Figure
gl ..... Gallon
GS ..... General Support
HR ..... Hour
ID ..... Inside Diameter
in ..... Inch
Illus ..... Illustration
JTA ..... Joint Table of Allowances
kg ..... Kilogram
LB ..... Pounds
LED ..... Light Emitting Diode
m^3 ..... Cubic Meter
MAC ..... Maintenance Allocation Chaft
Max ..... Maximum
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
St . . . . . Saint
TAMMS . . . . . The Army Maintenance Management System
TDA . . . . . Table of Distribution and Allowances
T M . . . . . 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
vdc . . . . . Volt Direct Current

Section II DEFINITION OF UNUSUAL TERMS

NONE

ALPHABETICAL INDEX

Subject, Paragraph

Subject, Paragraph

ALPHABETICAL INDEX - continued

ALPHABETICAL INDEX - continued

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BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO
6	2-1 a		
81		4-3	
125	line 20		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 Cylenders. The engine on my set only has 4 Cylenders. Change the manual to show 4 Cylenders.

Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please correct one or the other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
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SIGN HERE John Doe
JOHN DOE

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

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