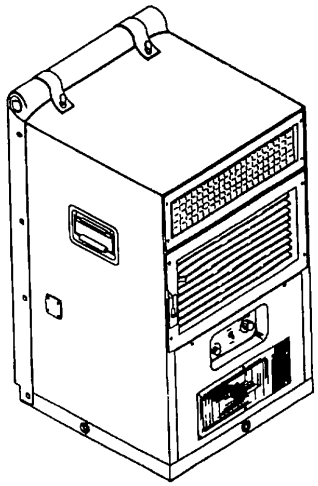
TECHNICAL MANUAL

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

AIR CONDITIONER, VERTICAL, COMPACT
6,000 BTU/HR
115 VOLT. SINGLE PHASE, 50/60 HERTZ
MODEL JHAA/C6V1
NSN 4120-01-327-5447



OPERATING INSTRUCTIONS

OPERATOR'S PMCS

OPERATOR'S MAINTENANCE INSTRUCTIONS

UNIT PMCS

UNIT TROUBLESHOOTING

UNIT MAINTENANCE INSTRUCTIONS

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

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H E A D Q U A R T E R S , D E P A R T M E N T O F T H E A R M Y
2 0 A P R I L 1 9 9 2

CHANGE

NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 30 December 1993

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

FOR

AIR CONDITIONER, VERTICAL, COMPACT
6,000 BTU/HR
115 VOLT, SINGLE PHASE, 50/60 HERTZ
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NSN 4120-01-327-5447

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TM 9-4120-403-14, 20 April 1992, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
i and ii	i and ii
4-137 through 4-140	4-137 through 4-140

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

By Order of the Secretary of the Army:

GORDON R. SULLIVAN
General, United States Army
Chief of Staff

Official:

MILTON H. HAMILTON
Administrative Assistant to the Secretary of the Army
05931

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25-E, block no. 0163, requirements for TM 9-4120-403-14.

WARNING

HIGH VOLTAGE

is used in operation of this equipment

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

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

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

Be careful not to contact high-voltage connections of 115 volts ac input when installing or operating this equipment.

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

Do not operate equipment without all grilles, guards, louvers, and covers in place tightly secured.

WARNING

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

WARNING

While handling coils, wear gloves to avoid cuts and reduce fin damage on coil.

WARNING

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

WARNING

DANGEROUS CHEMICAL
(R22)
is used in this equipment

DEATH

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

WARNING

Do not attempt any disassembly of solenoid valve other than coil removal with a refrigerant charge in the system. Refrigerant will be sprayed out dangerously if screws that attach tube and plunger assembly to valve body are loosened.

WARNING

Discharge refrigerant in an open area and not around an open flame.

WARNING

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

WARNING

If compressor burnout is suspected, use care when handling compressor to avoid touching compressor sludge. Acid in sludge can cause bums.

WARNING

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

WARNING

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

WARNING

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves and other suitable protective clothing. DO NOT LIFT without holding unit in upright position. Otherwise, unit will fall over and could cause injury to personnel.

WARNING

Toluene is flammable, and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, and keep away from sparks or flame. Use goggles, gloves, and apron when appropriate.

WARNING

Death or serious injury could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure if/has been reduced to 30 psi (2.11 kg/cm^2) or less. When working with compressed air always use chip guards and wear eye protection and other protective equipment.

TECHNICAL MANUAL

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 20 APRIL 1992

No. 9-4120-403-14

OPERATOR'S, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL FOR AIR CONDITIONER, VERTICAL, COMPACT, 6,000 BTU/HR 115 VOLT, SINGLE PHASE, 50/60 HERTZ MODEL JHAA/C6V1 NSN 4120-01-327-5447

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual direct to: Commander, US Army Aviation and Troop Command, ATTN: AMSAT-I-M P, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished to you.

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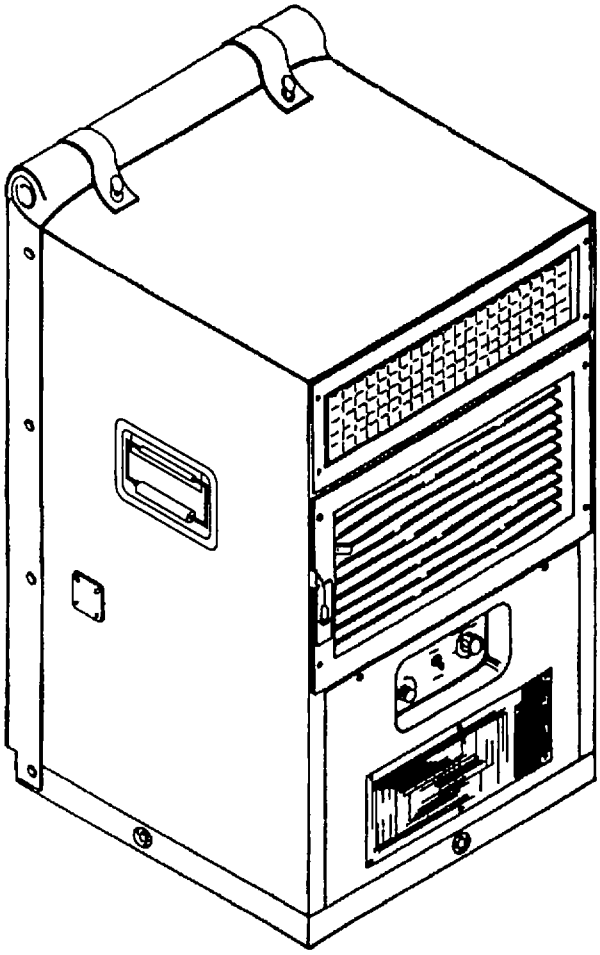
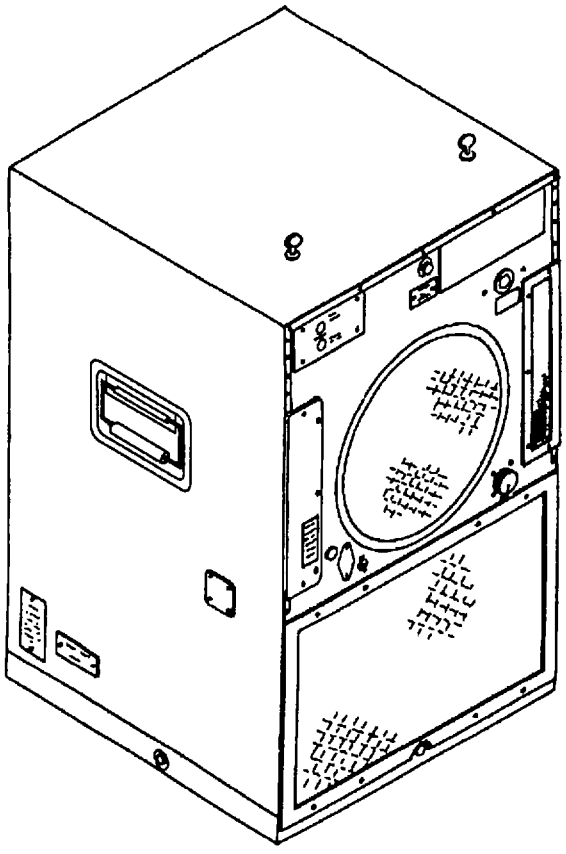


FRONT VIEW



REAR VIEW

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. Model JHAA/C6V 1, Vertical Compact, 6,000 BTU/HR, 115 Volt, Single-Phase, 50/60 Hertz Air Conditioner.

c. Purpose of Equipment. Cools, heats, and ventilates enclosed spaces. 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 PAM 738-750, The Army Maintenance Management System (TAMMS).

1-3. WARRANTY INFORMATION

Warranty information is fully explained in warranty Technical Bulletin (TB) TB 9-4120-403-24.

1-4. 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 (Quality Deficiency Report). Mail it to us at Commander, Headquarters, U.S. Army Troop Support Command, Attention: AMSTR-MOF 4300 Goodfellow Boulevard, St. Louis, Missouri 63120-1798. We will send you a reply.

1-5. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Command decisions, according to tactical situation, will determine when destruction of the air conditioning unit will be accomplished. A destruction plan will be prepared by the using organization, unless one has been prepared by higher authority. For general destruction procedures for this equipment, refer to TM 750-2443, Procedures for Destruction of Equipment to Prevent Enemy Use.

1-6. PREPARATION FOR STORAGE OR SHIPMENT

Contact Unit maintenance for air conditioning unit preparation for storage or shipment. (See para 4-61.)

Section II EQUIPMENT DESCRIPTION

1-7. PURPOSE, CAPABILITIES, AND FEATURES

a. Purpose of Air Conditioner. The Air Conditioner is designed to ventilate, cool or heat, and to filter air in rooms or enclosures.

b. Capabilities and features.

(1) Provides a maximum of 6,000 BTU/HR of cooling or 4,500 BTU/HR of heating.

(2) Provides two stages of heat.

(3) Provides source of outside (fresh) ventilation air.

(4) Self contained in a single cabinet that is suited for van, shelter or room installations.

(5) Operates in environmental conditions from tropic to arctic.

(6) Fully portable.

(7) Connection point for NBC (nuclear, biological, chemical) filter.

(8) Alternate power input connection locations to provide for a variety of installations.

(9) Designed for low-noise level operation.

1-8. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

1 FABRIC COVER Shown on rear view in stowed (operational) position. When rolled down and snapped it protects the rear (exposed) surface of the unit.

2 HEATER ELEMENTS (HR 1 thru HR 6) Consists of two banks of three elements each. Only one bank operates in the LO HEAT mode. Both banks operate in the HI HEAT mode, however, the temperature control thermostat controls only one bank.

3 EVAPORATOR COIL Serves as a heat exchanger by transferring heat from the air passing over the tubing and fins to the refrigerant passing through the tubing.

4 MIST ELIMINATOR Minimizes condensate (water) from being blown from the coil into the room or enclosure.

5 CONDITIONED AIR DISCHARGE GRILLE Adjustable louvers allow directional control of conditioned air.

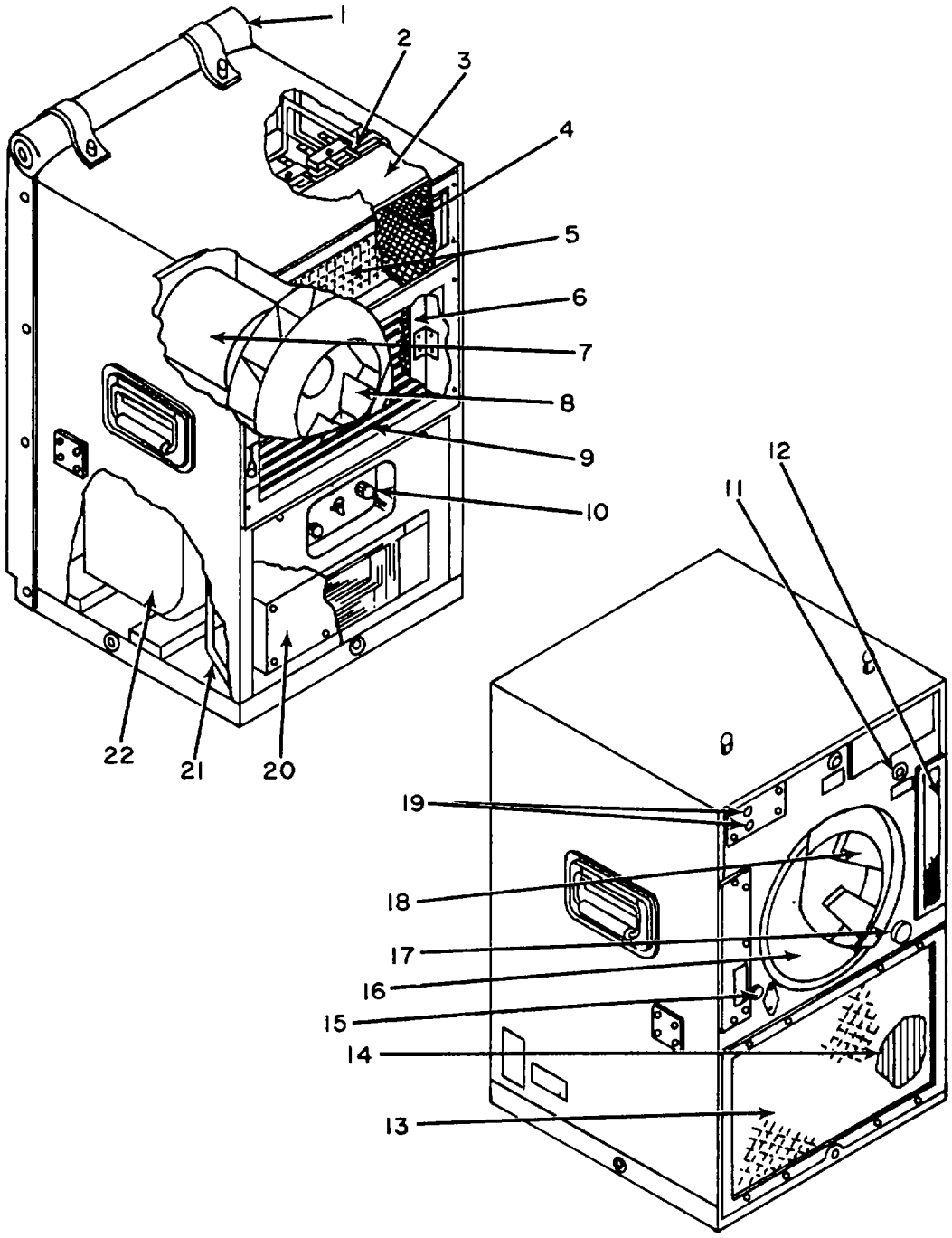


Figure 1-2. Location of Major Components

6 RETURN AIR FILTER Provides filtered return air.

7 FAN MOTOR (B2) Drives both the conditioned air (evaporator) fan and the condenser fan.

8 CONDITIONED AIR (EVAPORATOR) FAN Draws air into the evaporator section and exhausts it through the evaporator (cooling) coil and heater elements into the room or enclosure.

9 INTAKE (RETURN) AIR GRILLE Adjustable louvers allow control of outside (fresh) and return (from room or enclosure) air.

10 CONTROL PANEL Contains a five position mode selector switch, a temperature control thermostat and two position fan toggle switch.

11 REFRIGERANT SIGHT GLASS (liquid sight indicator) Allows visual inspection and indicates condition of liquid refrigerant when the unit is operating in the cool mode.

12 FRESH AIR DAMPER Provides outside air.

13 CONDENSER COIL GUARD Protects coil from damage.

14 CONDENSER COIL Serves as a heat exchanger by transferring heat from the refrigerant passing through the tubing to the air passing over the tubing and fins.

15 COMPRESSOR CIRCUIT BREAKER (CB 1) RESET KNOB Actuates a push-pull type control cable for resetting compressor circuit breaker.

16 CONDENSER AIR OUTLET GRILLE Protects personnel from injury and fan from damage.

17 INPUT POWER RECEPTACLE For connection of external power source cable.

NOTE

The air conditioner is designed so that the input power receptacle may be used in the rear panel location shown, or it may be moved to one of two other alternative locations. See installation instructions (para. 4-9).

18 CONDENSER FAN - Draws air through the condenser coil and discharges the heated air back to the outside during cooling operations.

19 HIGH AND LOW REFRIGERANT PRESSURE CUTOUT SWITCHES (S5 AND S6) - Protects compressor from possible damage due to excessively high or low refrigerant pressures.

20 JUNCTION BOX - Contains and protects electrical system control devices.

21 CONDENSATE WATER DRIP AND DRAIN TRAP - The drip pan is located directly below the evaporator coil and mist eliminator and is built into the casing. Its purpose is to collect condensate that drips off the evaporator coil and mist eliminator during cooling operations. Condensate water then flows through tubing to the drain traps located inside the lower right and left hand front comers of the cabinet. The drain traps contain check valves that prevent air flow between the condenser and evaporator sections through the drain tubing.

22 COMPRESSOR (B1) - Pumps refrigerant through the system during cooling operations.

1-9. PERFORMANCE DATA

OPERATING TEMPERATURES	
LOW	-50°F (-45°C)
HIGH	+120°F (+48.9°C)
PERFORMANCE	
COOLING CAPACITY	6,000 Btu/hr
HEATING CAPACITY	4,500 Btu/hr
POWER REQUIRED	
VOLTAGE	115
PHASE	Single
HERTZ	50/60
AMPERAGE	18.5
DIMENSIONS	
WIDTH	17.0 in. (432mm)
DEPTH	17.5 in. (444mm)
HEIGHT	28.25 in. (718mm)
WEIGHT	162 lb (73.6 Kg)
REFRIGERANT	
TYPE	R-22
CHARGE	2.3 pounds (1.05 Kg)

Section III TECHNICAL PRINCIPLES OF OPERATION

1-10. REFRIGERATION CYCLE

a. Cooling cycle. Unit operation with mode selector switch set on COOL and the temperature control thermostat set to DECREASE.

- Compressor (1) starts.

- To prevent compressor overload and damage during startup, equalizer solenoid valve (9) is open at start of cooling cycle to equalize pressure on both sides of the compressor.

- The compressor (1) takes cold, low pressure refrigerant gas and compresses it to a high temperature, high pressure gas. This gas flows through the metal tubing to the condenser coil (2) and receiver (3).

- The condenser fan draws outside ambient air over and through the condenser coil (2). The high temperature, high pressure gas from the compressor (1) is cooled by the flow of air and is changed into a high pressure liquid.

- The dehydrator (filter drier) (5) removes any moisture (water vapor) or dirt that may be carried by the liquid refrigerant.

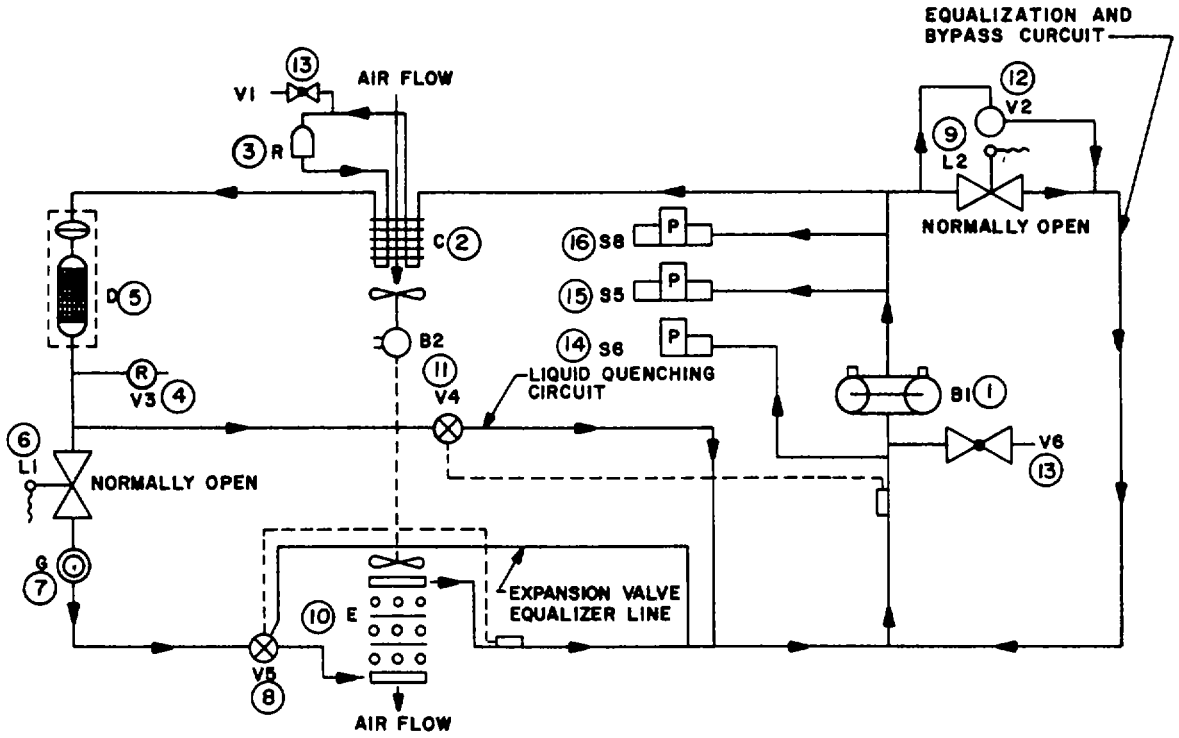
- The sight glass (liquid indicator) (7) indicates the presence of moisture and quantity of refrigerant in the system.

- The liquid line solenoid valve (6) is controlled by the temperature control thermostat on the control panel. This valve will shut off the flow of refrigerant to the evaporator section when the temperature in the conditioned area reaches the set point.

- The expansion valve (8) controls the amount of pressure of liquid refrigerant to the distributor and evaporator coil (10). The expansion valve (8) senses the temperature and pressure of the refrigerant as it leaves the evaporator coil. By use of a sensing bulb and "external equalizer line" the valve constantly adjusts the flow of liquid refrigerant to the evaporator coil (10).

- As the liquid refrigerant leaves the expansion valve (8) it passes thru a distributor and enters the evaporator coil (10). As the liquid enters the coil at a reduced pressure, the reduction in pressure and the warmer air being forced across the tubes of the coil cause the refrigerant to boil and change to a gas (vapor). The evaporator fan circulates the warm air from the conditioned space over and through the evaporator coil. Refrigerant absorbs heat when it changes from a liquid to a gas. As the air from the conditioned spaces comes in contact with the evaporator coil (10), the air is cooled.

- The refrigerant gas is then drawn back to the compressor (1) and the cycle is repeated.



LEGEND					
B1	COMPRESSOR	1	E	EVAPORATOR COIL	10
C	CONDENSER COIL	2	V4	EXPANSION VALVE (QUENCH)	11
R	RECEIVER	3	V2	PRESSURE REGULATING VALVE	12
V3	PRESSURE RELIEF VALVE	4	V1,V6	CHARGING VALVES (2)	13
D	DEHYDRATOR	5	S6	LOW PRESSURE SWITCH	14
L1	LIQUID LINE SOLENOID	6	S5	HIGH PRESSURE SWITCH	15
S	SIGHT GLASS	7	S8	PRESSURE CONTROL SWITCH	16
V5	EXPANSION VALVE	8			
L2	HOT GAS SOLENOID VALVE	9			

Figure 1-3. Refrigeration Schematic

b. Bypass cycle. This unit has a bypass cycle which allows cooling operation at low cooling loads without cycling the compressor (1) on and off. In bypass, the refrigerant is piped from the discharge (high side) to the suction (low side) of the compressor, bypassing the evaporator coil (10).

- When the temperature control thermostat on the control panel senses that cooling conditions have reached the set point, it closes the liquid line solenoid valve (6) to shut off refrigerant flow to the evaporator coil (10).

- As the compressor suction pressure starts to drop, the hot gas solenoid valve (9) closes and the pressure regulating valve (12) opens to allow flow of hot gas from the compressor.

- The expansion valve (quench) (11) senses the temperature of the gas at the suction side of the compressor. To prevent excessively hot gas from reaching the compressor, the expansion valve (quench) (11) opens to allow liquid refrigerant to mix with the hot gas.

- The charging valves (13) are provided for charging, and general servicing of the high and low pressure sides of the refrigerant system.

- The pressure switch (low) (14), the pressure switch (high) (15), and the pressure relief valve (4) are provided to protect the unit from damage due to pressure extremes.

- The pressure control switch (16) overrides the fan speed control switch to place the fan in either HI or LOW SPEED when preset pressures are reached.

1-11. HEATING

a. HI HEAT mode. When the mode selector switch is set for HI HEAT the six heating elements, located behind the evaporator coil, are energized. These elements are protected from overheating by a thermal cutout switch. Three of the elements are thermostatically controlled by the temperature control thermostat, and remaining three are on all of the time.

b. LO HEAT mode. When the mode selector switch is set for LO HEAT, only the three thermostatically controlled elements are used.

CHAPTER 2

OPERATING INSTRUCTIONS

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

2-1. GENERAL

The Air Conditioner is designed for a variety of installations and for operation under a wide range of climatic conditions. It is also designed for continuous or intermittent operation as a self-contained unit or may be connected to or used with external filtering equipment for operation under nuclear-biological-chemical (NBC) environmental conditions. Operators must be aware of any peculiarities or operational limitations for their specific installation. See the appropriate shelter or system manual for instructions peculiar to your specific installation.

2-2. OPERATOR'S CONTROLS

See figures 2-1 and 2-2 for a general description of the controls that an operator will normally be concerned with. For specific operating instructions, see Section III and IV of this chapter.

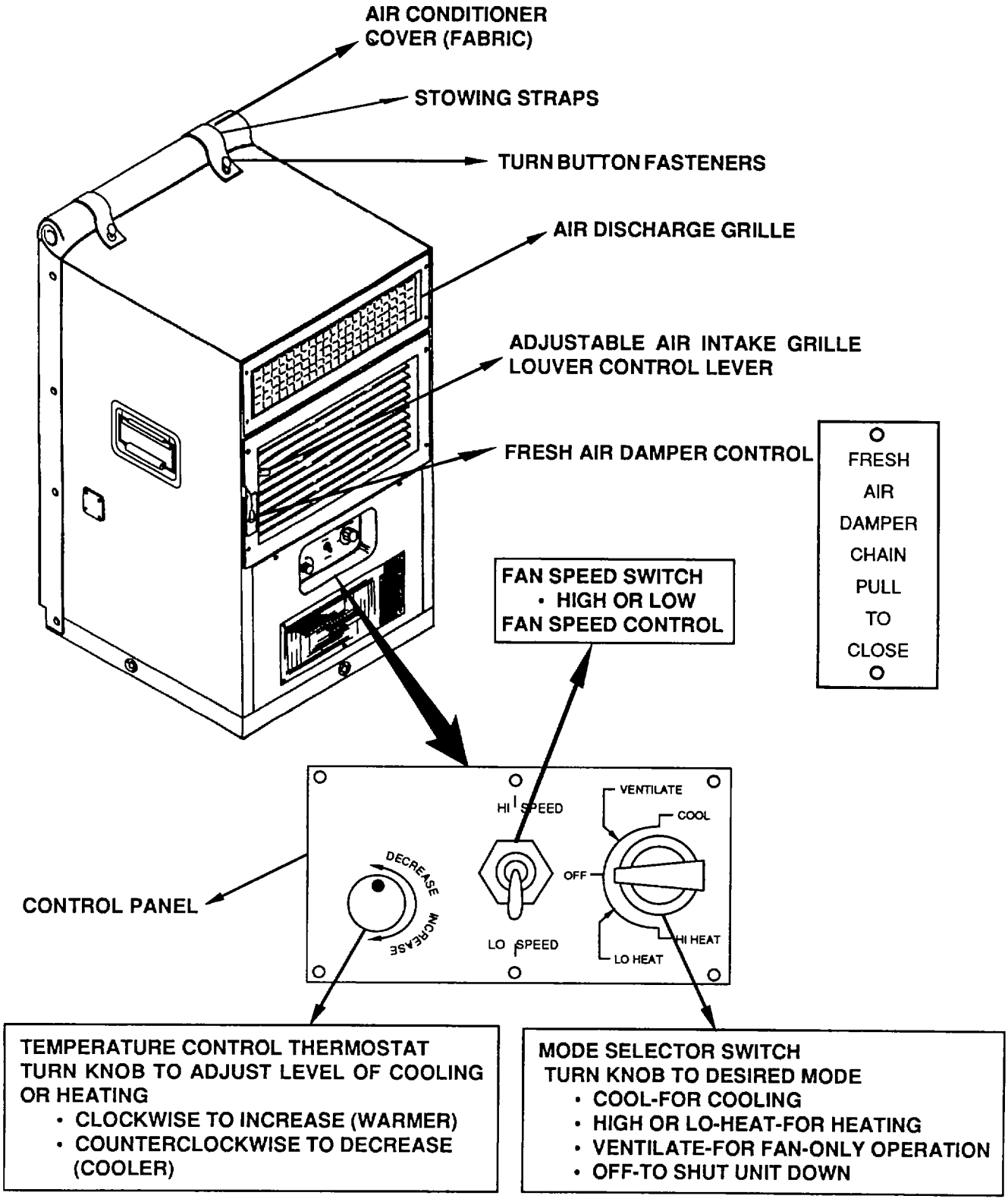


Figure 2-1. Operator's Controls Front

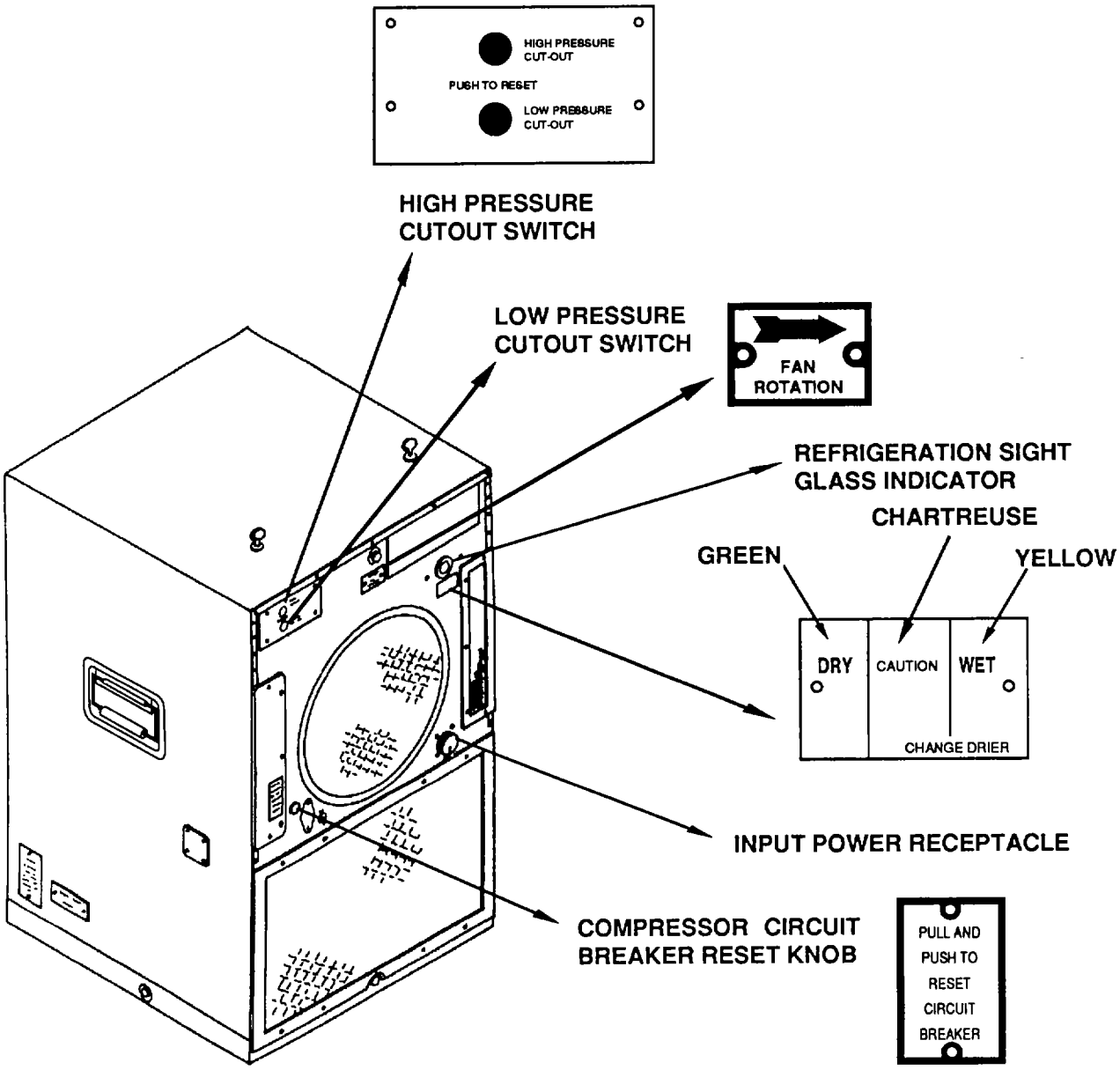


Figure 2-2. Operator's Controls Rear

2-3. INDICATORS

The refrigerant sight glass (fig. 2-2) is the only visual indicator used on the Air Conditioner. The sight glass is a port or window through which the refrigerant condition can be seen. 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 in 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 an opaque, 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.

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. 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 re-checked after each four hours of operation to ensure that the condition has not become worse.

Section II OPERATOR'S 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 are described in table 2-1.

a. Before You Operate. Always keep in mind and observe the WARNINGS and CAUTIONS. Perform your BEFORE (B) PMCS.

b. While You Operate. Always keep in mind and observe the WARNINGS and CAUTIONS. Perform your DURING (D) PMCS.

c. After You Operate. Be sure to perform your AFTER (A) PMCS.

d. If Your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using DA form 2404. See DA PAM 738-750, the Army Maintenance Management System (TAMMS), for instructions.

NOTE

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

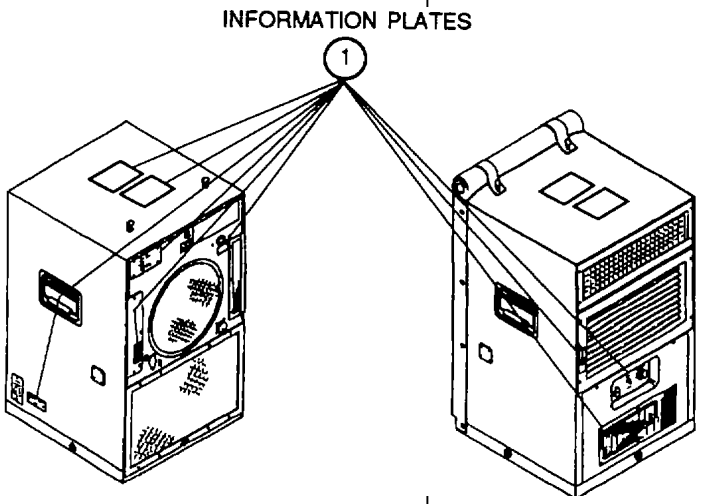
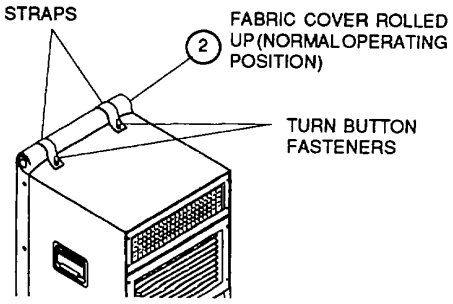
Item No.	B	D	A	Item to be Inspected. Procedure	Equipment Is Not Ready/Available If:
1				Information Plates	
		•		Check for legibility and loose or missing hardware.	
					
2				Fabric Cover	
	•			Check that cover is rolled up for normal operation.	Cover rolled down
			•	Roll cover down and check for condition of snaps, tears or worn edges, and mildew.	
					

TABLE 2-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (Cont)

B - Before D - During A - After

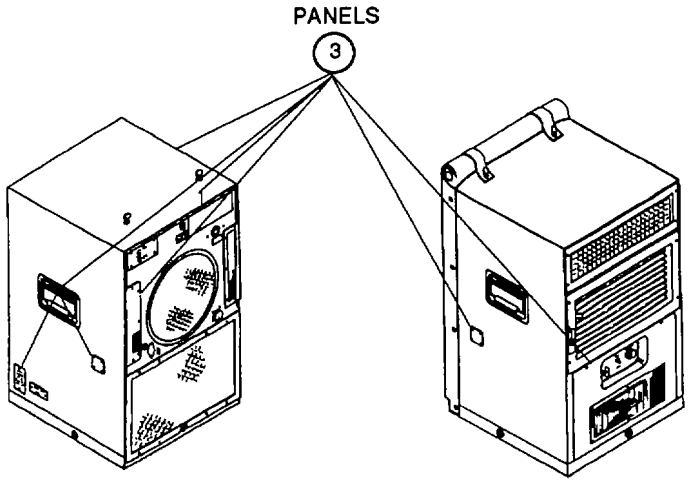
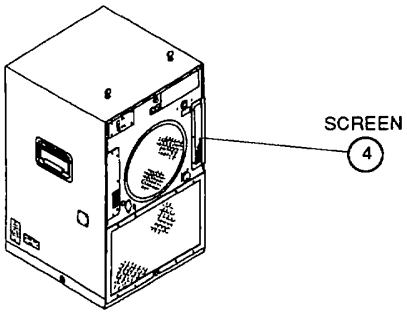
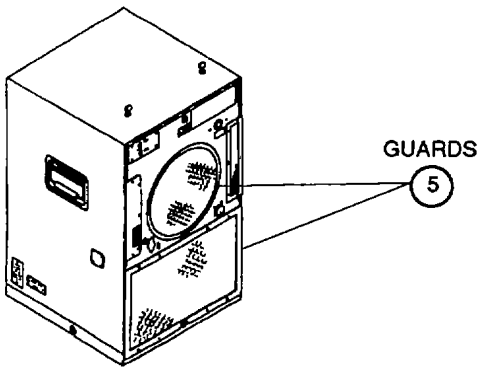
Item No.	B	D	A	Item to be Inspected. Procedure	Equipment Is Not Ready/Available If:
3				Panels	
	•			Check that panels are in place. Check panels for cracks, dents, and missing hardware.	Panels are missing or damaged.
					
4				Fresh Air Inlet Screen	
	•			Check that screen is in place.	Screen missing or damaged.
	•			Check for obstructions, damage, and loose or missing hardware.	
					

TABLE 2-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (Cont)

B - Before D - During A - After

Item No.	B	D	A	Item to be Inspected. Procedure	Equipment Is Not Ready/Available If:
5				Guards	
	•			Check that guards are in place.	Missing parts or damage that would cause operating hazards.
	•			Check them for obstructions, damage, and loose or missing hardware.	
6				Conditioned Air Grilles	
	•			Check for obstructions, damage, proper adjustment, loose, or missing hardware.	
	•			Check louvers for freedom of operation.	



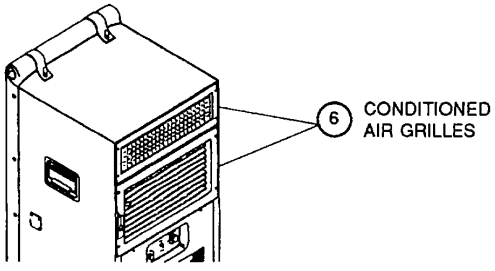


TABLE 2-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (Cont)

B - Before D - During A - After

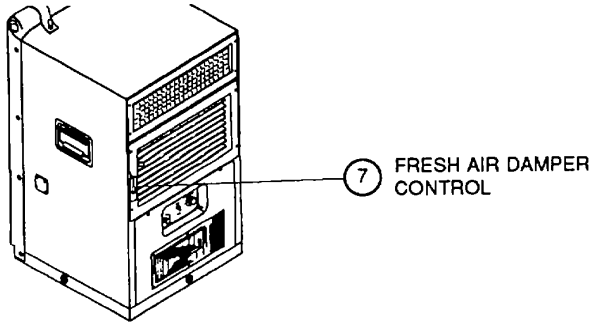
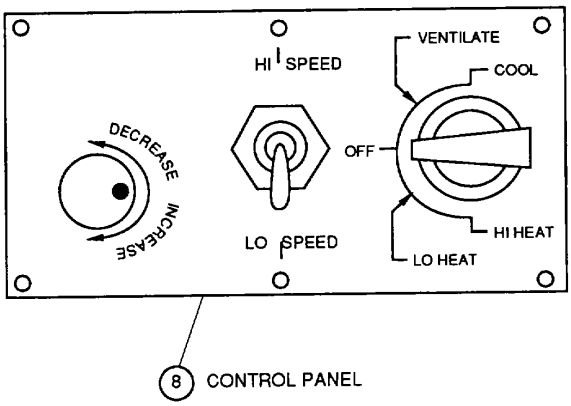
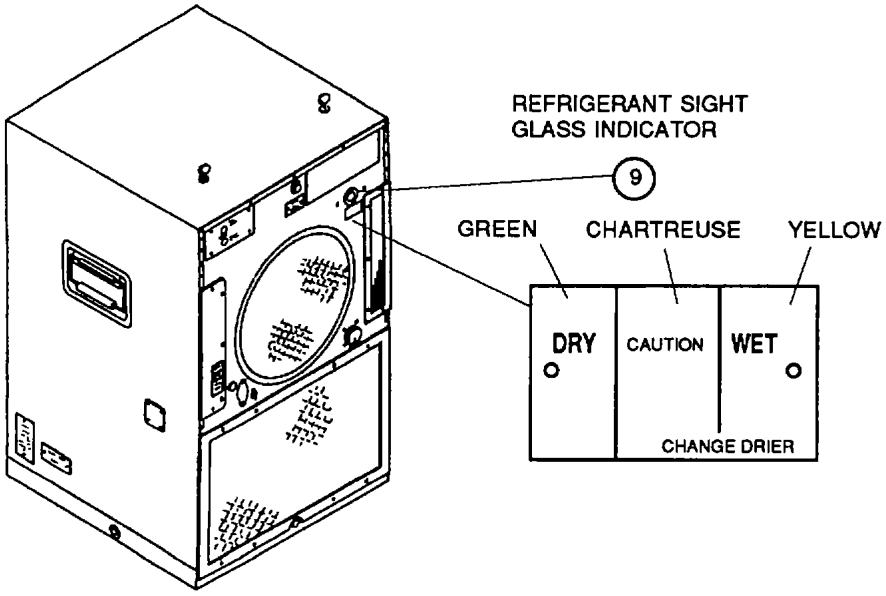
Item No.	B	D	A	Item to be Inspected. Procedure	Equipment Is Not Ready/Available If:
7				Fresh Air Damper	
	•	•		Check for freedom of operation.	Control chain broken, missing or inoperable.
					
8				Control Panel	
	•			Check for obvious damage and missing knobs.	Control panel damaged.
					

TABLE 2-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (Cont)

B - Before D - During A - After

Item No.	B	D	A	Item to be Inspected. Procedure	Equipment Is Not Ready/Available If:
9		•		Refrigerant Sight Glass After 15 minutes of operation in maximum cooling, check for bubbles or milky appearance indicating low refrigerant charge. Check for yellow color which indicates presence of moisture.	Bubbles, milky appearance, or yellow color is observed.



Section III OPERATION UNDER USUAL CONDITIONS

2-5. ASSEMBLY AND PREPARATION FOR USE

Services of Unit Maintenance should be employed for original unpacking, assembly installation, and preparation for use. See paragraph 4-2 thru 4-9.

2-6. INITIAL ADJUSTMENTS AND CHECKS

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

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

2-7. GENERAL OPERATING PROCEDURES

a. Before operation.

(1) Check to see that power cable has been connected to a source of 115 volt, single phase, 3 wire, 50/60 hertz power, and to the input power connector on the unit.

CAUTION

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

(2) Check that fabric cover has been unzipped, rolled up, and secured with both straps to the two turnbutton fasteners.

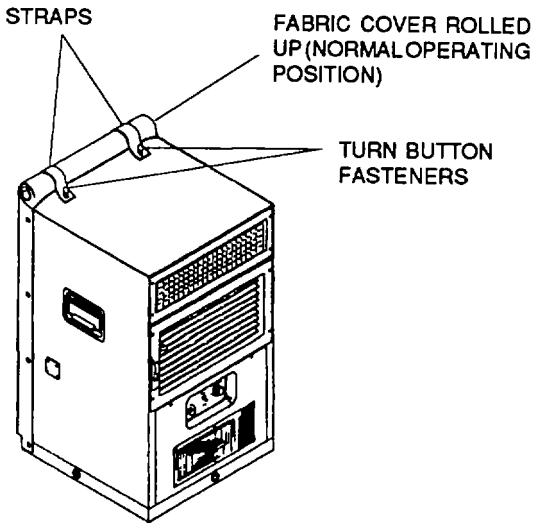


Figure 2-3. Fabric Cover

CAUTION

Under normal operating conditions, before starting the air conditioner in any 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.

EXCEPTION:

Under extreme cold climatic conditions, such as blowing snow, or freezing rain which might enter and damage condenser section, the unit may be operated in the VENTILATE, LO HEAT, or HI HEAT modes with the fabric cover rolled down and zipped in place.

(3) Check that all air inlet and outlet openings are clear (fig. 2-4).

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

(5) Table 2-2 lists 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.

b. General Information (To increase comfort and save energy.)

(1) During warm or cold weather. (Air conditioner operation in COOL or HEAT modes.)

- Limit traffic through doors as much as possible.

- Keep doors and windows tightly closed.
- Limit use of fresh (outside) air.

NOTE

It is normally better to keep the fresh air damper slightly open. This will create a slight overpressure, provide replacement oxygen, and reduce room odors. Damper should be closed during extreme weather conditions and during periods when fast warmup or cooling is necessary.

- Do not adjust controls unnecessarily. Properly set the controls (See para. 2-8 thru 2-11) and the unit will automatically control the temperature. The TEMPerature control thermostat on the control panel operates like a conventional room thermostat except that the temperature scale is not marked on the control panel. The thermostat has a control range of 40°F to 90°F (5° to 32°C). The centered position of the control knob would be approximately 65°F (18°C). The full INCREASE would be 90°F (32°C). The full DECREASE would be 40°F (5°C).

(2) During cold weather

- Adjust shades, blinds, etc. (when applicable) to admit sunlight during day. Close them at night.
- Adjust the conditioned air outlet dampers slightly downward.

(3) During hot weather

- Adjust shades, blinds, etc. (when applicable) to block out sunlight during day.
- Adjust the conditioned air outlet dampers slightly upward.

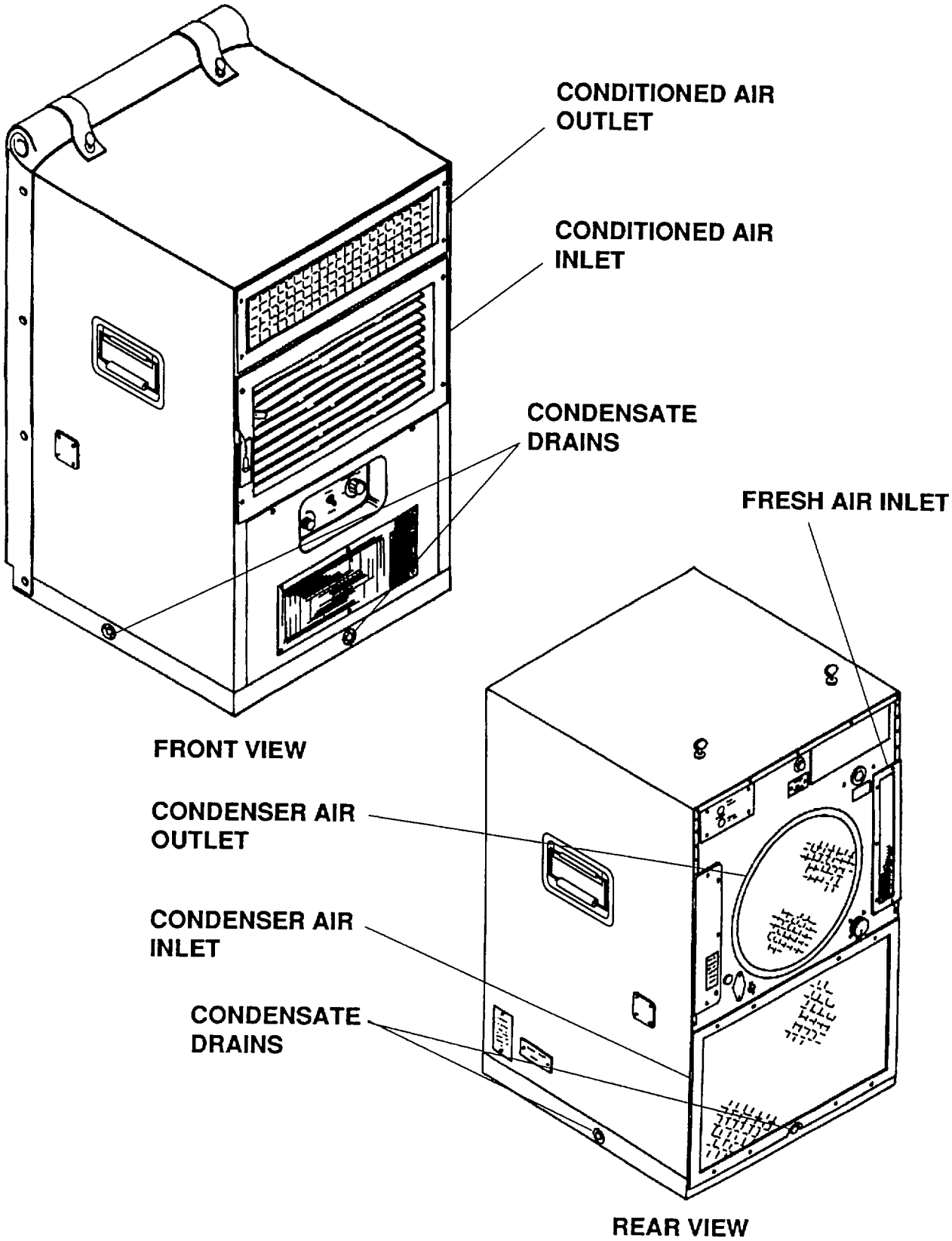


Figure 2-4. Openings and Drains

TABLE 2-2. OPERATOR CONTROL SETTINGS

Mode	Mode Selector Switch	Temperature Control Thermostat	Two Speed Fan Switch	Fresh Air Damper	Conditioned Air Intake Grille	Conditioned Air Discharge Grille	Fabric Cover
Ventilate with 100% recirculated air	VENTILATE	Does not operate	HI SPEED or LOW SPEED	Closed	Open	Adjust to suit	Rolled up or zipped closed
Ventilate with make-up (fresh) air	VENTILATE	Does not operate	HI SPEED or LOW SPEED	Open	Open	Adjust to suit	Rolled up and secured
Ventilate with 100% fresh air	VENTILATE	Does not operate	HI SPEED or LOW SPEED	Open	Closed	Adjust to suit	Rolled up and secured
Heating with 100% recirculated air	LO HEAT or HI HEAT	Desired temperature	HI SPEED then LOW SPEED on demand	Closed	Open	Slightly down for best results	Rolled up or zipped closed
Heating with make-up (fresh) air	LO HEAT or HI HEAT	Desired temperature	HI SPEED then LOW SPEED on demand	Open	Closed	Slightly down for best results	Rolled up and secured
Cooling with 100% recirculated air	COOL	Desired temperature	HI SPEED then LOW SPEED on demand	Closed	Open	Slightly up for best results	Rolled up and secured
Cooling with make-up (fresh) air	COOL	Desired temperature	HI SPEED then LOW SPEED on demand	Open	Open	Slightly up for best results	Rolled up and secured
Any mode with make-up air through NBC filter	Desired mode	Desired temperature	HI SPEED then LOW SPEED on demand	Closed and sealed	Partially closed	Adjust to suit	Rolled up and secured

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

a. Turn mode selector switch to VENTILATE.

b. If maximum circulation is desired, turn fan speed switch to HIGH SPEED.

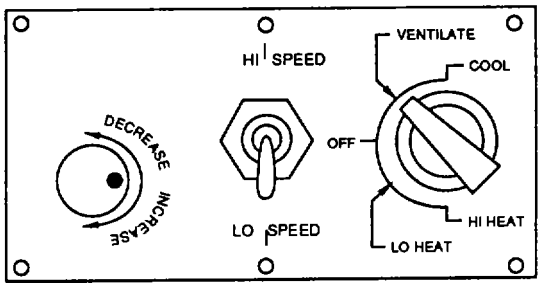


Figure 2-5. Ventilate Control Setting

c. 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 opened.

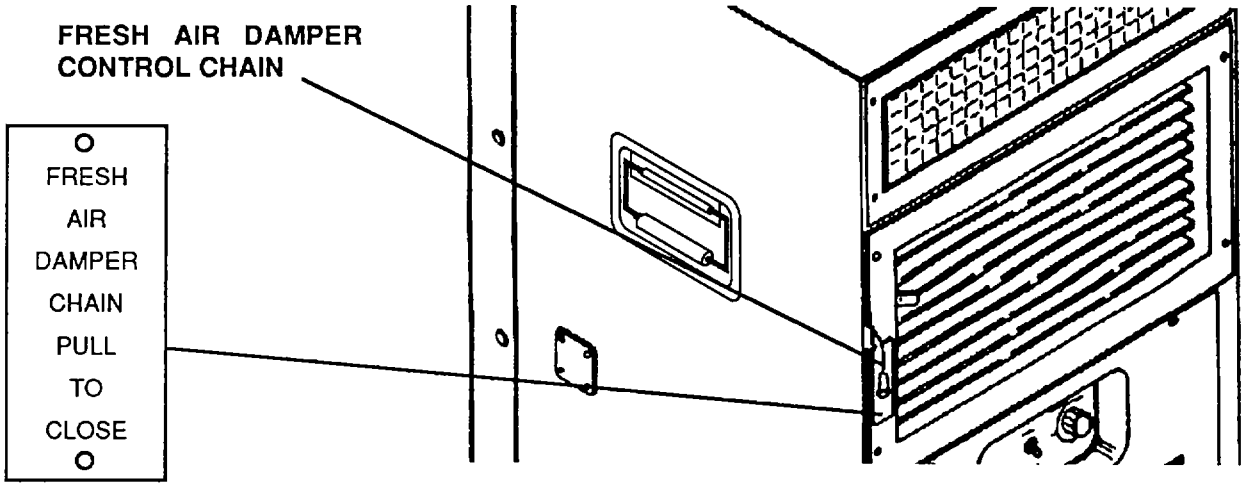


Figure 2-6. Fresh Air Damper (Door) Adjustment

NOTE

The fabric cover must be rolled up and secured if fresh air damper (door) is to be opened. When using fresh air for ventilation, a window, door or vent should be opened. If the room or enclosure is tightly closed, an overpressure will build up and decrease the volume of fresh air drawn in.

d. Adjust louvers to suit.

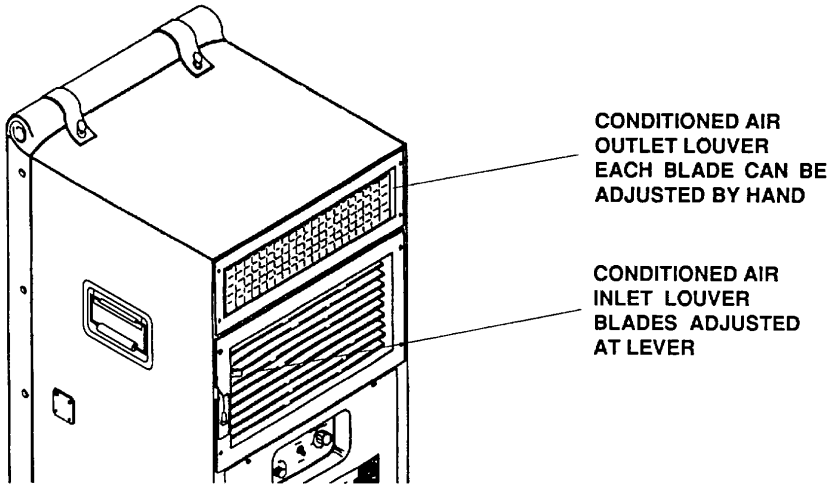


Figure 2-7. Louver Adjustment

NOTE

To pull in maximum of fresh (outside) air, close conditioned air inlet louvers.

2-9. OPERATION IN LO HEAT MODE

In the LO HEAT mode three thermostatically controlled heaters are activated.

a. Turn mode selector switch to LO HEAT.

b. Switch fan speed switch to HIGH SPEED.

c. Turn TEMPerature control thermostat knob as far as it will go in the INCREASE (warmer) position.

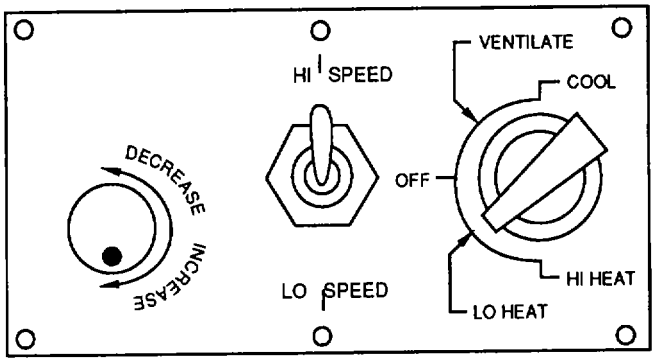


Figure 2-8. LO HEAT Control Setting

NOTE

For faster warmup, start unit in HI HEAT mode. In moderate temperatures, unit can then be switched back to LO HEAT.

d. When room or enclosure temperature reaches the desired level, slowly turn the TEMPerature control thermostat knob toward DECREASE and set fan speed switch to LO SPEED. Heating will stop when you reach the approximate room temperature. Further adjustment can be made by turning the TEMPerature control thermostat knob slightly toward INCREASE (warmer) or DECREASE (cooler) until desired temperature is controlled automatically.

NOTE

Should unit fail to heat the room or enclosure to the desired temperature or fail to maintain the desired temperature with TEMPerature control thermostat set in maximum INCREASE position, switch to HI HEAT.

e. 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 and during fast warmup periods.

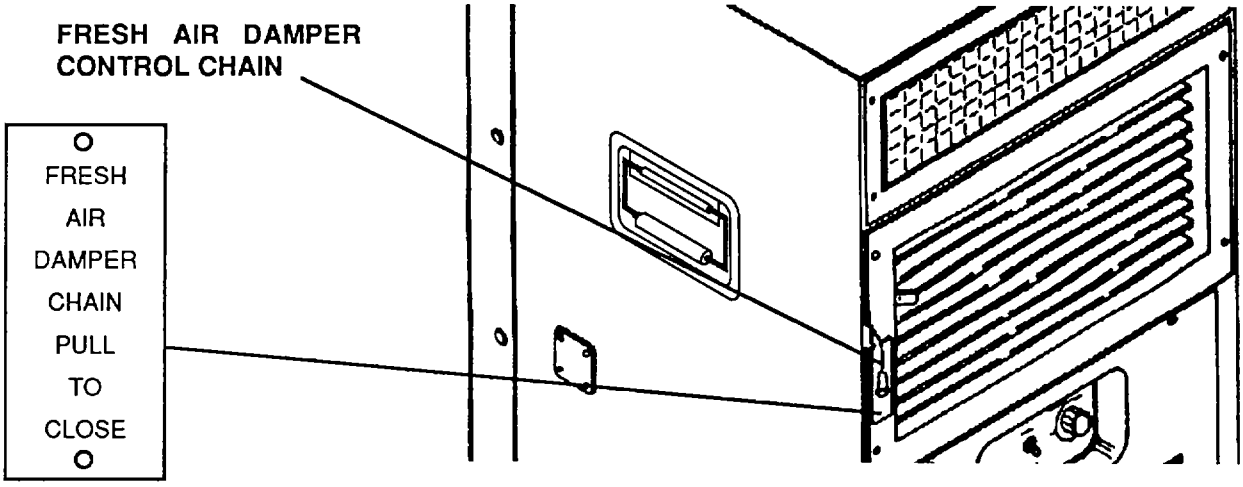


Figure 2-9. Fresh Air Damper (Door) Adjustment

f. Adjust louvers to suit. Since warm air tends to rise, it is normally better to adjust the conditioned air outlet louvers slightly downward. The conditioned air inlet louvers should be full open.

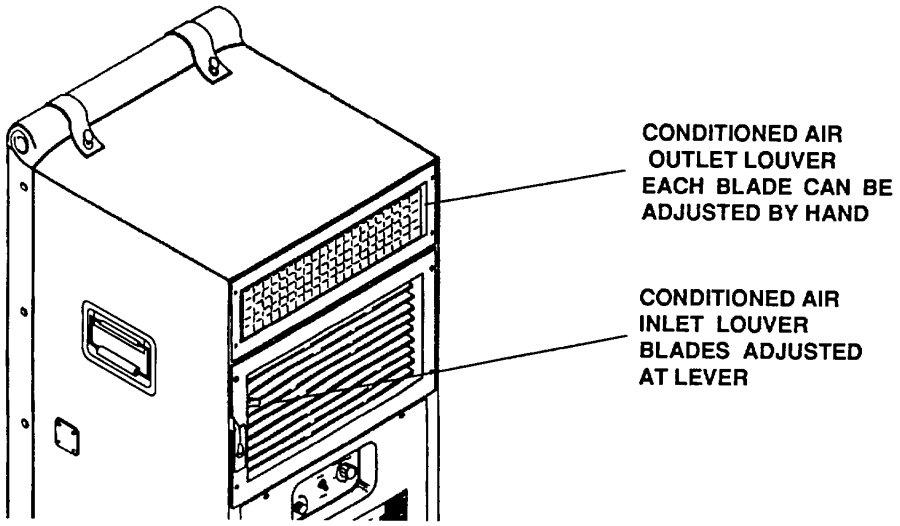


Figure 2-10. Louver Adjustment

NOTE

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

2-10. OPERATION IN HI HEAT MODE

In the HIGH HEAT mode, six heaters are activated. Three are thermostatically controlled. Three operate all of the time.

a. Turn mode selector switch to HI HEAT.

b. Switch fan speed switch to HIGH SPEED.

c. Turn TEMPerature control thermostat knob as far as if will go in the INCREASE (warmer) position.

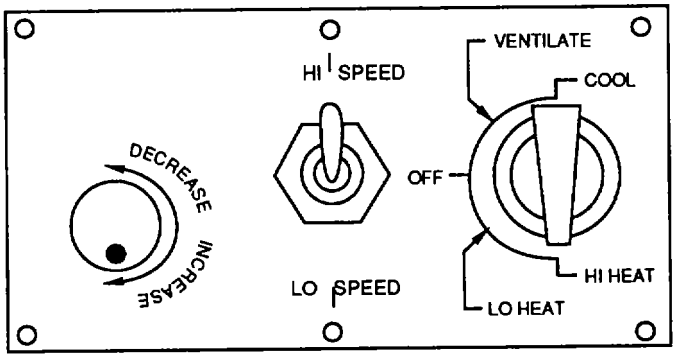


Figure 2-11. HI HEAT Control Setting

d. When room or enclosure temperature reaches the desired level, slowly turn the TEMPerature control thermostat knob toward DECREASE. Make small adjustments until desired temperature is maintained automatically.

NOTE

Should unit continue to produce too much heat with TEMPerature control thermostat knob adjusted toward the decrease setting, switch to LO HEAT and LO SPEED.

e. 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 and during fast warmup periods.

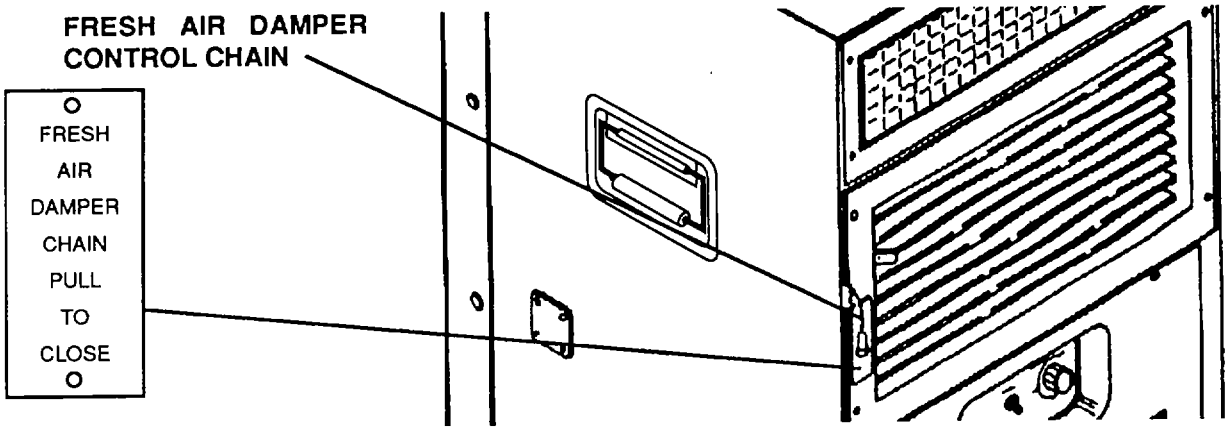


Figure 2-12. Fresh Air Damper (Door) Adjustment

f. Adjust louvers to suit. Since warm air tends to rise it is normally better to adjust the conditioned air outlet louvers slightly downward. The conditioned air inlet louvers should be full open.

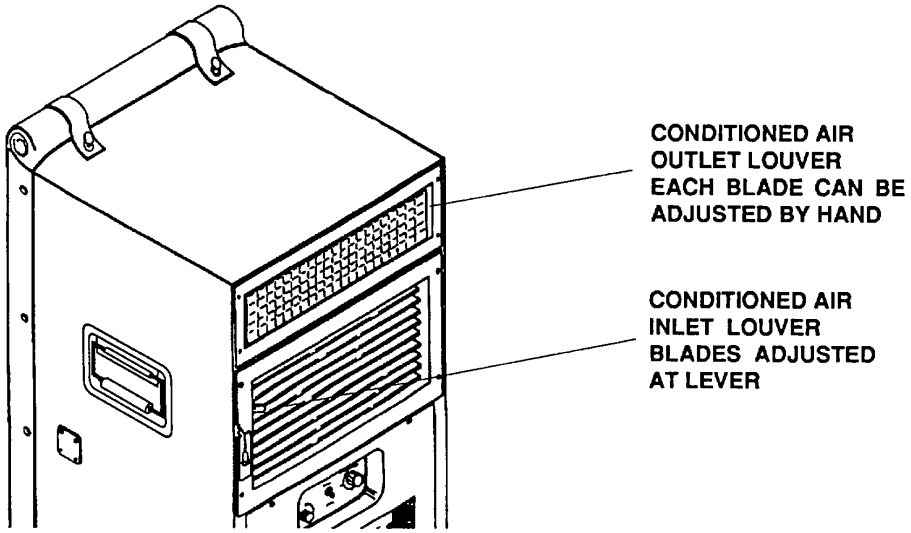


Figure 2-13. Louver Adjustment

g. During periods of very cold weather the fabric cover should be rolled down and zipped.

NOTE

Fresh (outside) air cannot be introduced with fabric cover rolled down and damper closed.

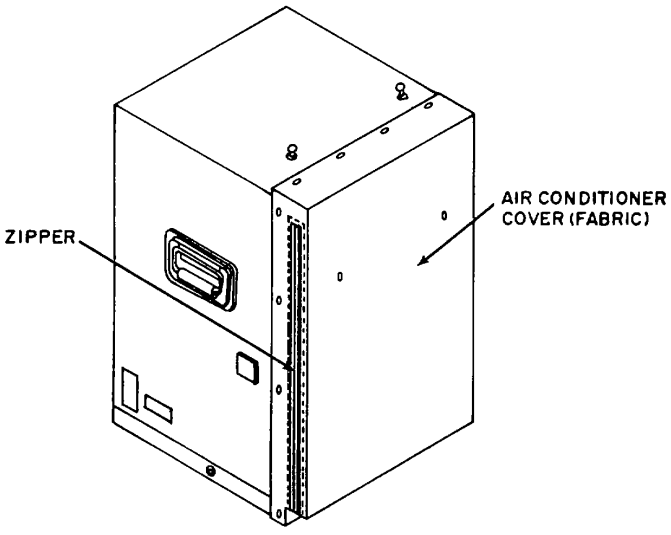


Figure 2-14. Fabric Cover

NOTE

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

2-11. OPERATION IN COOL MODE

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

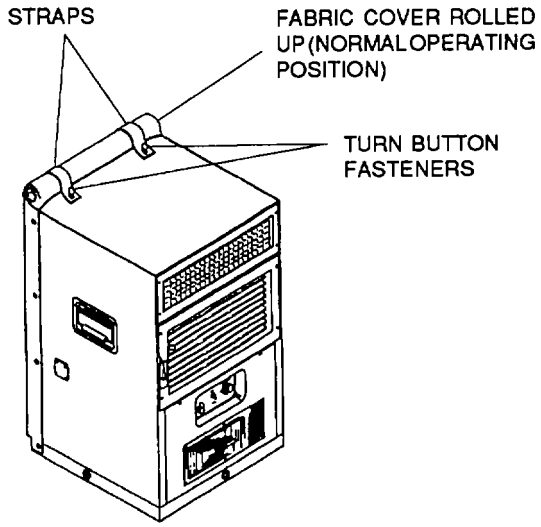


Figure 2-15. Fabric Cover

b. Turn mode selector switch to COOL.

c. Turn TEMPerature control thermostat knob as far as it will go in the DECREASE (cooler) position.

d. Set fan speed switch to HIGH SPEED.

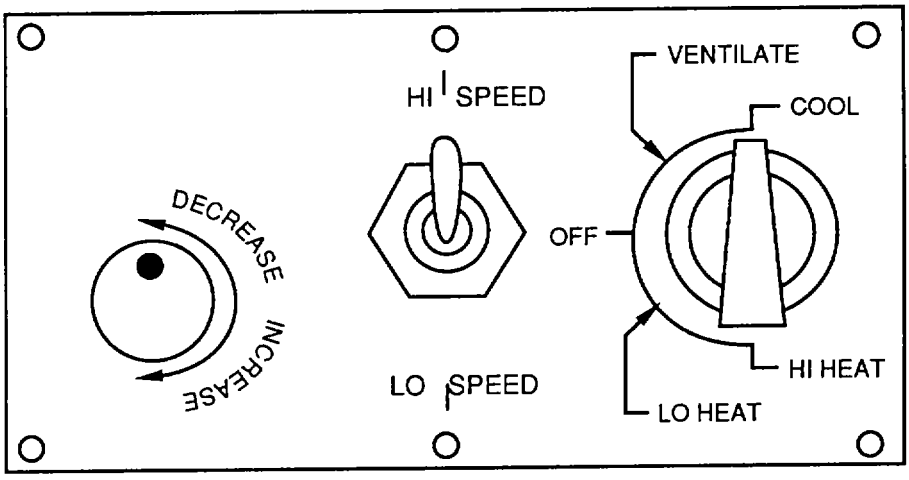


Figure 2-16. COOL Control Setting

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

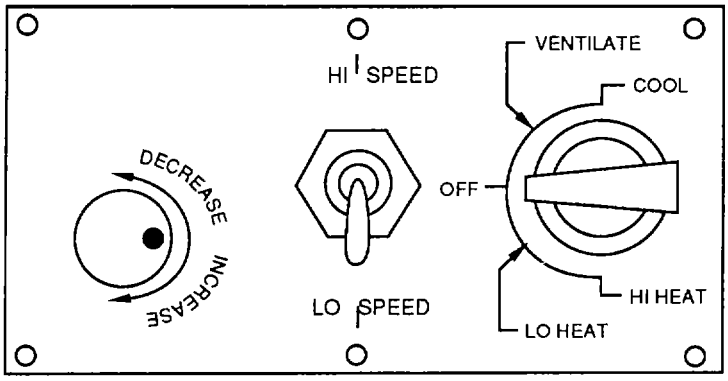


Figure 2-17. Fresh Air Damper (Door) Adjustment

f. When room or enclosure temperature reaches the desired level, slowly turn the TEMPerature control thermostat knob toward INCREASE and set fan speed switch to LO SPEED. Cooling will stop when you reach the approximate room temperature. Further adjustment can be made by turning the temperature control thermostat knob slightly toward DECREASE (cooler) or increase (warmer) until desired temperature is controlled automatically.

g. Adjust louvers to suit. Since cold air tends to flow downward, it is normally better to adjust the conditioned air outlet louvers slightly upward. The conditioned air inlet louvers should be full open.

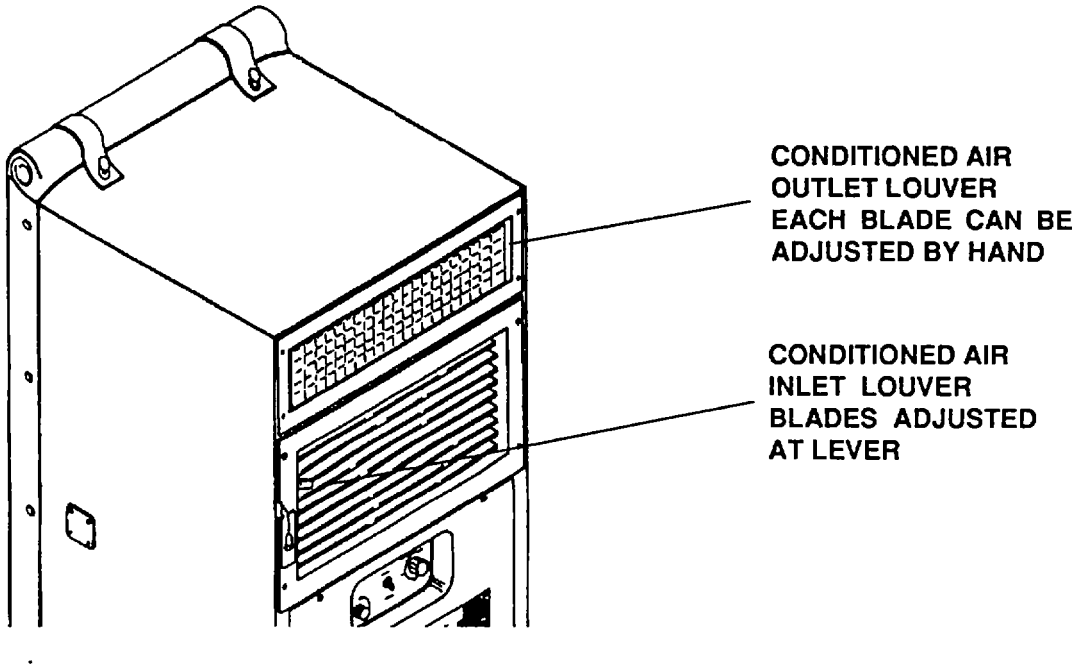


Figure 2-18. Louver Adjustment

2-12. SHUTDOWN (OFF)

Turn mode selector switch to OFF.

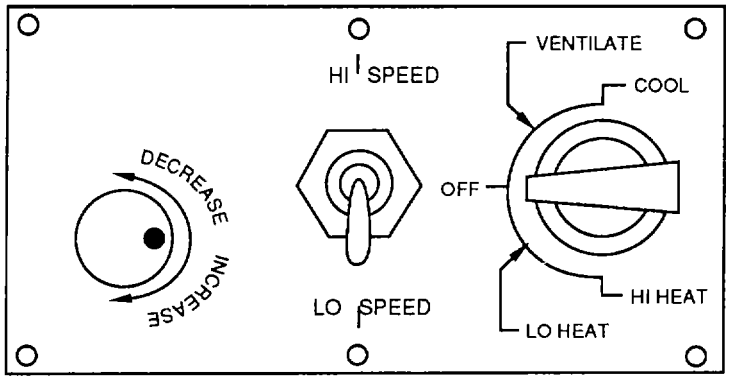


Figure 2-19. OFF Setting

CAUTION

To prevent possible damage to equipment DO NOT disconnect or turn off power to the air conditioner during periods of normal shutdown. Power should be disconnected only if unit is to be serviced, during emergency conditions, or during periods of extended shutdown; due to warmup period of compressor heaters.

2-13. PREPARATION FOR MOVEMENT

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

2-14. INFORMATION PLATES

A number of instruction and identification plates are provided with the unit. See figures 2-20 and 2-21 for external plates.

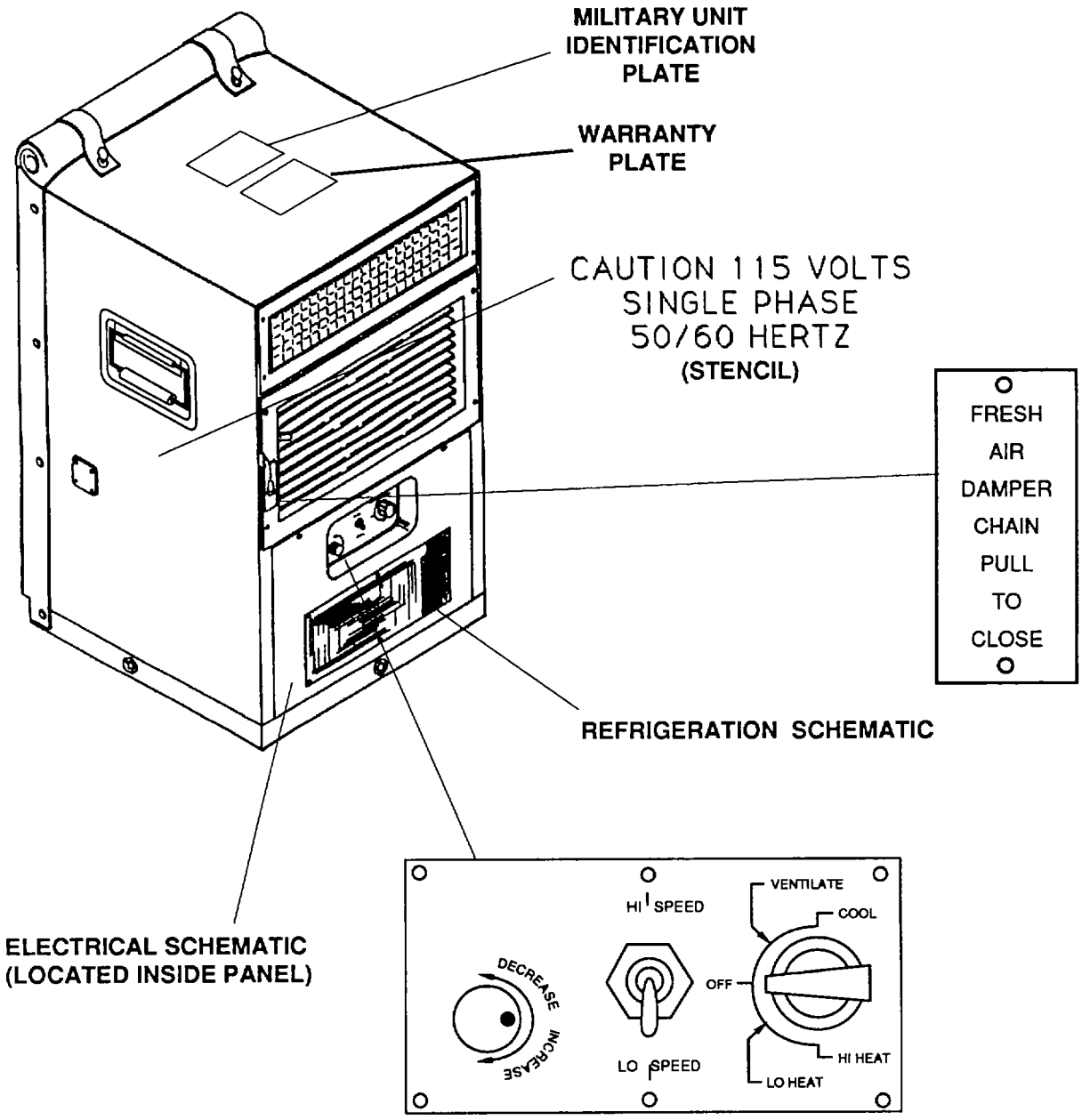


Figure 2-20. Information Plates, Front

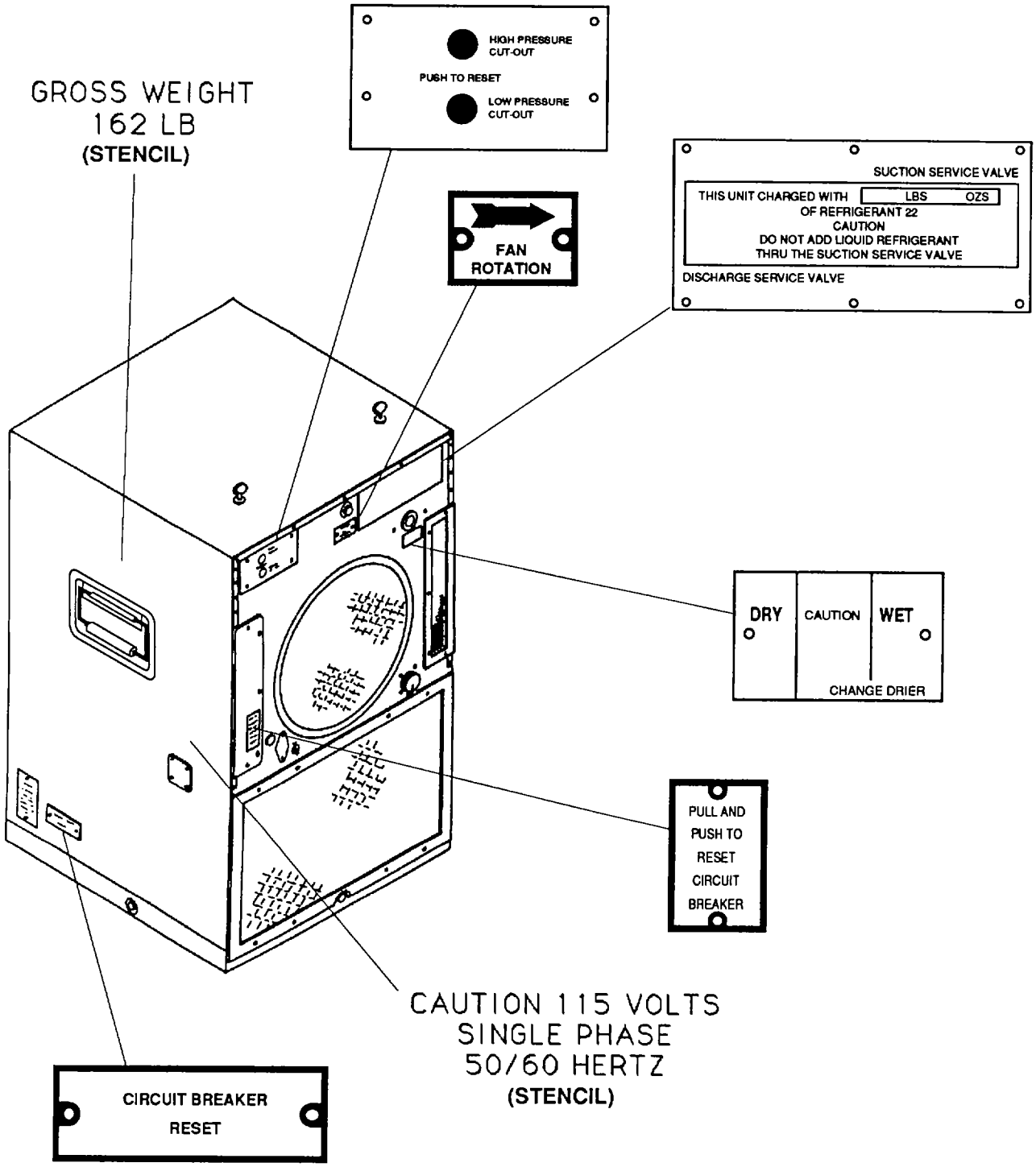


Figure 2-21. Information Plates, Rear

Section IV OPERATING UNDER UNUSUAL CONDITIONS

2-15. GENERAL

The Air Conditioner is designed to operate normally within a wide range of climatic conditions. However, some extreme conditions require special operating and servicing procedures to prevent undue loading and excessive wear on the equipment.

2-16. OPERATION IN EXTREME HEAT

The air conditioner is designed to operate in temperatures up to 120OF (48. 90C). 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 shelter or enclosure, especially doors and windows, to be sure they are tightly closed. Limit in and out traffic, if possible.

b. When possible, use shades or awnings to shut out direct rays of the sun.

c. Limit the use of electric lights and other heat producing equipment.

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

NOTE

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

2-17. 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 temperatures down to -50°F (-45°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 needed for ventilation.

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.

2-18. OPERATION IN DUSTY OR SANDY CONDITIONS

Dusty and sandy conditions can seriously reduce the efficiency of the air conditioner by clogging the air filters and thereby causing a restriction of the 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 mist eliminator, condensate trap, and water drain lines. Some of the steps that may be taken are:

a. Frequent cleaning of filters 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.

d. Perform Unit PMCS daily.

2-19. OPERATION IN UNUSUALLY WET CONDITIONS

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

a. More frequent 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 spells when the air conditioner is not in operation so that the interior can dry out and condensation will not accumulate.

2-20. OPERATION IN SALT AIR OR SEA SPRAY

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

The fabric cover on the back of the cabinet should be rolled down and secured during all periods when the air conditioner is not in operation.

2-21. OPERATION UNDER EMERGENCY CONDITIONS

Power conservation. During periods when full 115 volt, single phase, 50/60 hertz power is in critically short supply, if the air conditioner cannot be turned off completely, it should be operated in VENTILATE mode only.

CHAPTER 3

OPERATOR'S MAINTENANCE INSTRUCTIONS

Section I LUBRICATION INSTRUCTIONS

3-1. GENERAL

The Air Conditioner and its major components are designed so that very little lubrication is required during their serviceable lifetime. The refrigerant compressor and its drive motor are hermetically sealed in a single container; sealed bearings are incorporated in the drive motor; and the compressor crankcase contains a lifetime charge of oil. Sealed bearings are incorporated in the evaporator and condenser fan motor.

The only operator lubrication required is that necessary to relieve stiffness or bindings of the louver blades in the evaporator intake and discharge grilles or the turn button fasteners associated with the fabric cover on the back of the cabinet. Sparingly apply a light machine oil and work it into the joints or pivots involved. Blot up all excess oil with a cloth or paper towel. Report stiffness or binding of all other operational controls to Unit Maintenance for appropriate action.

Section II OPERATOR'S TROUBLESHOOTING PROCEDURES

3-2. USE OF TABLE

Table 3-1 contains troubleshooting instruction designed to be useful in diagnosing and correcting unsatisfactory operation or failure 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 tests/inspections and corrective actions in the order listed.

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

c. Report any trouble or corrective action beyond the scope of operator maintenance to your supervisor and Unit Maintenance.

TABLE 3-1. OPERATOR'S TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. AIR CONDITIONER DOES NOT START IN ANY MODE.

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

Connect input power.

Step 2. Check to see if compressor circuit breaker is tripped.

Slowly PULL out AND PUSH in reset knob TO RESET CIRCUIT BREAKER. If circuit breakers continue to trip, contact your supervisor.

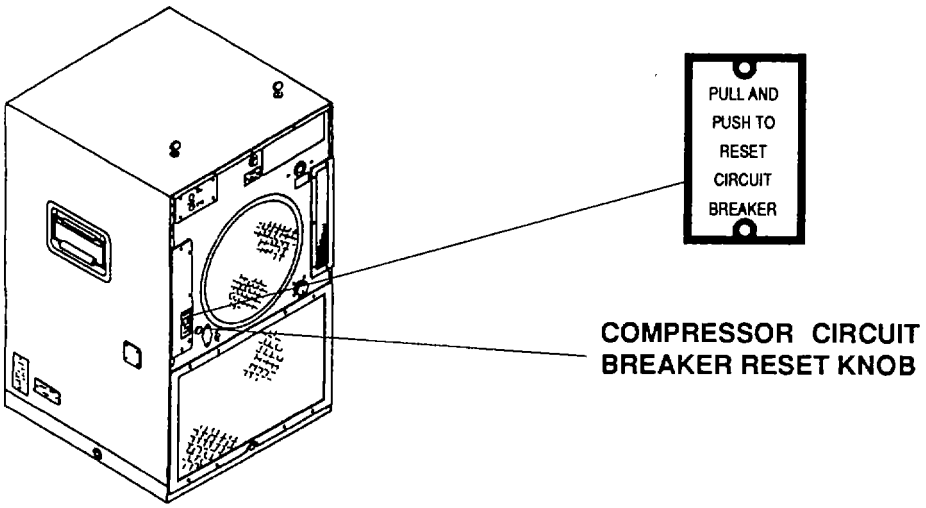


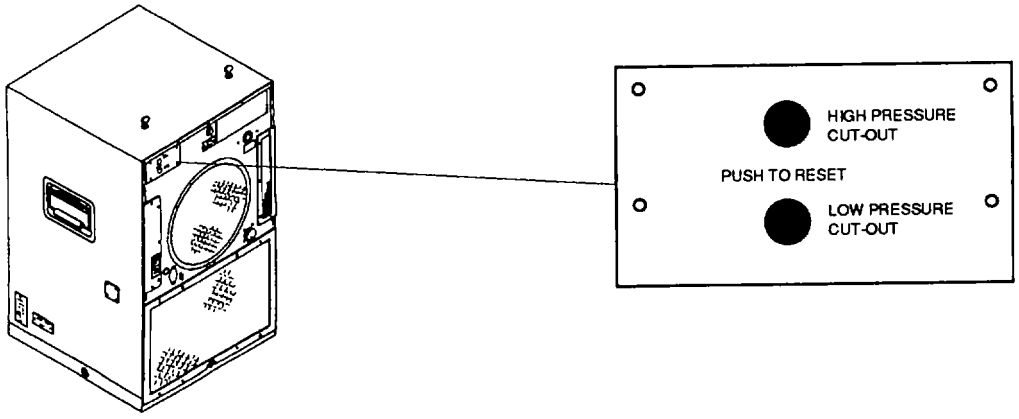
TABLE 3-1. OPERATOR'S TROUBLESHOOTING (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. COMPRESSOR DOES NOT START IN COOL MODE.

Step 1. Check to see if HIGH or LOW PRESSURE CUT-OUT switch has tripped.

PUSH and release TO RESET.



Step 2. Be sure thermostat is in full DECREASE position.

If cut-out switch(es) continue to trip, contact your supervisor.

Step 3. Check operation of mode selector switch.

Turn switch to OFF, then reset to COOL. Allow 30 seconds time delay for compressor to start. If malfunction still exists, contact your supervisor.

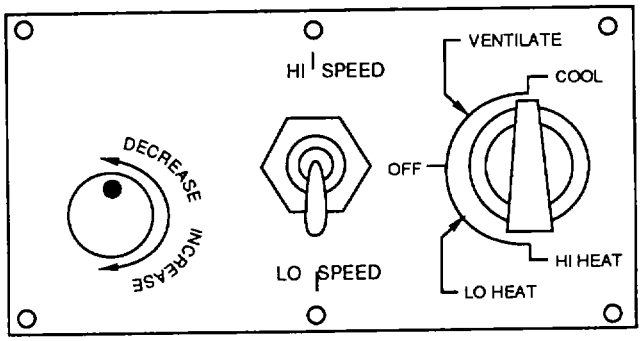


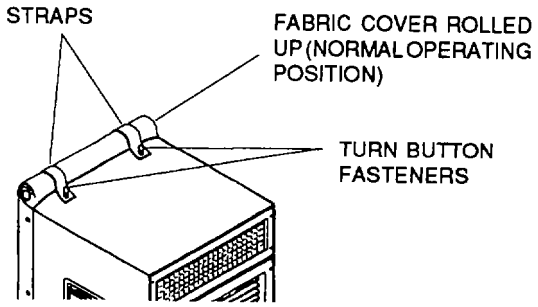
TABLE 3-1. OPERATOR'S TROUBLESHOOTING (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. COMPRESSOR STARTS NORMALLY, BUT HIGH OR LOW PRESSURE CUT-OUT SWITCH SOON TRIPS.

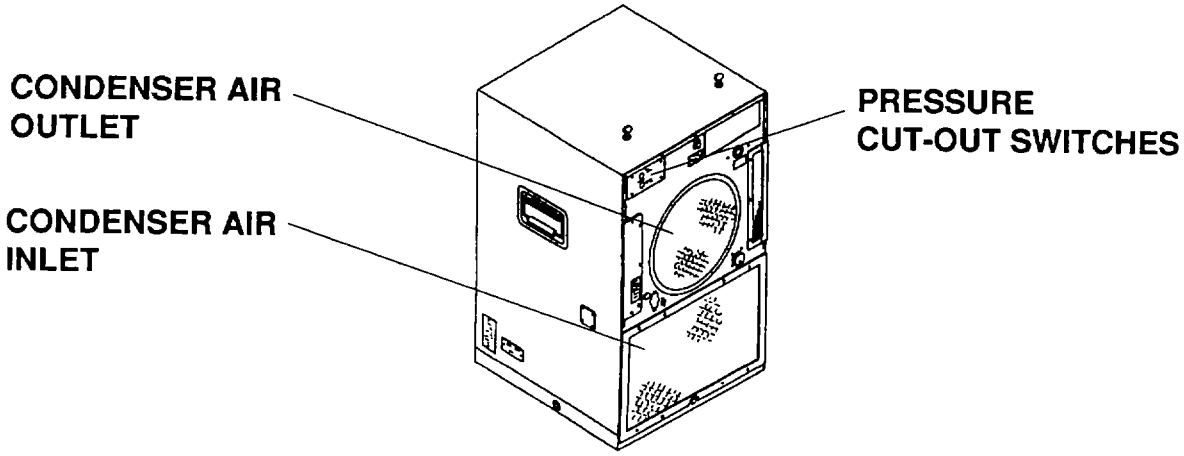
Step 1. Check to be sure fabric cover is rolled up.

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) PRESSURE CUT-OUT switch(es) and restart unit.

If unit does not start notify your supervisor.

TABLE 3-1. OPERATOR'S TROUBLESHOOTING (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

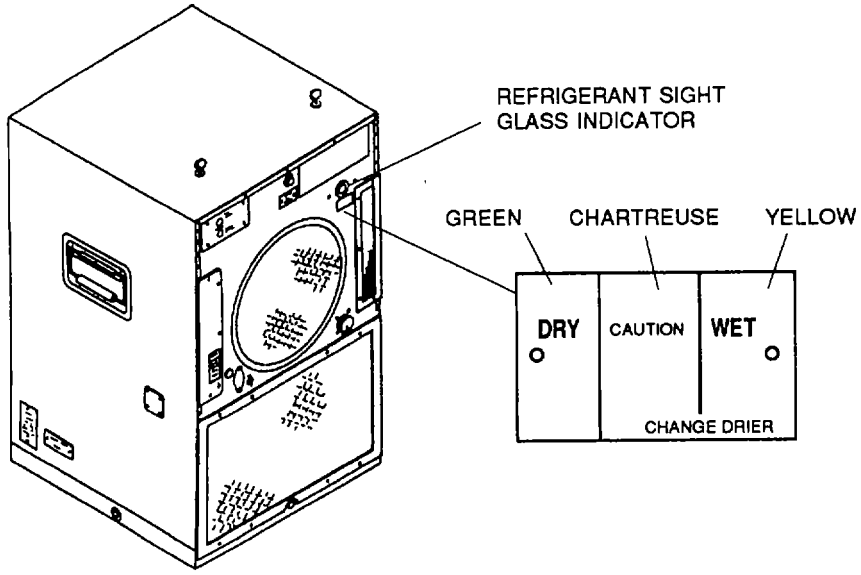
Step 4. Check to be sure that condenser fan is operating. (Air being discharged from condenser air outlet.)

If fan is not operating, shut unit off and notify your 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 and notify your supervisor.

If refrigerant sight glass is normal and malfunction still exists, notify your supervisor.



4. REDUCED COOLING CAPACITY.

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

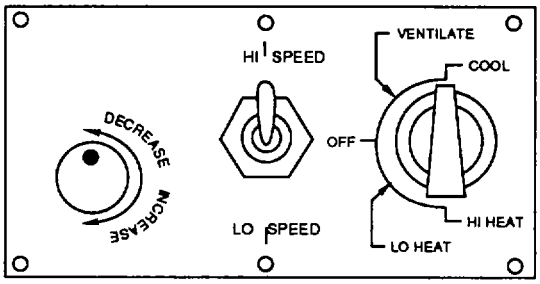
Tightly close all openings.

TABLE 3-1. OPERATOR'S TROUBLESHOOTING (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 2. Check operation of TEMPerature control thermostat.

Set control at maximum DECREASE and fan speed switch to HI SPEED; then, if condition improves, adjust properly.



Step 3. 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.

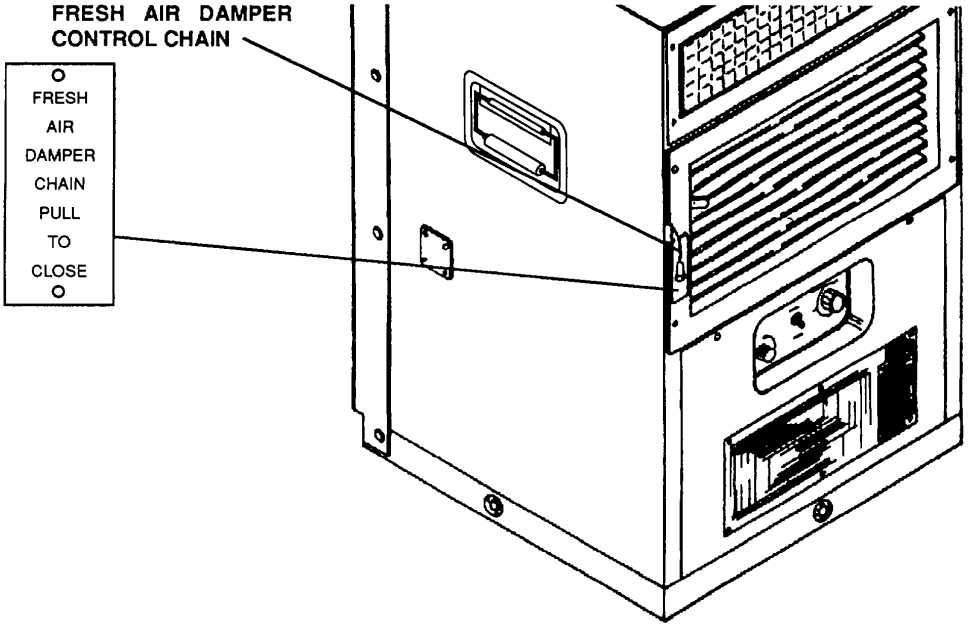
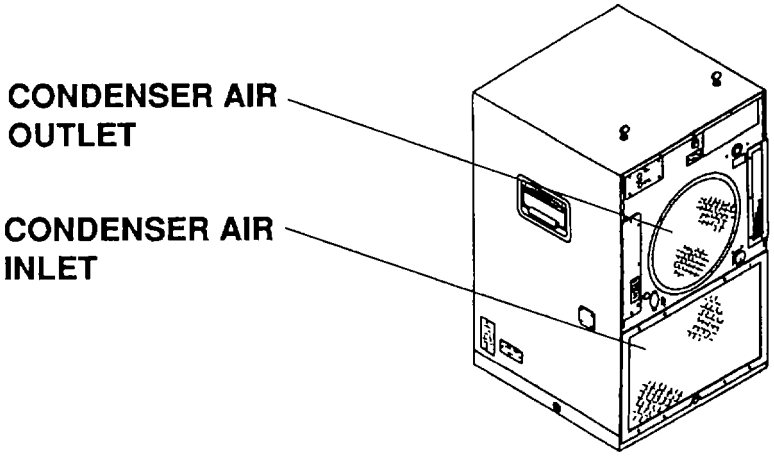


TABLE 3-1. OPERATOR'S TROUBLESHOOTING (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 4. Check to be sure condenser air inlet and outlet are not obstructed.

Remove obstructions.



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 window, turn selector switch to OFF and notify your supervisor. If refrigerant sight glass is normal and malfunction still exists, notify your supervisor.

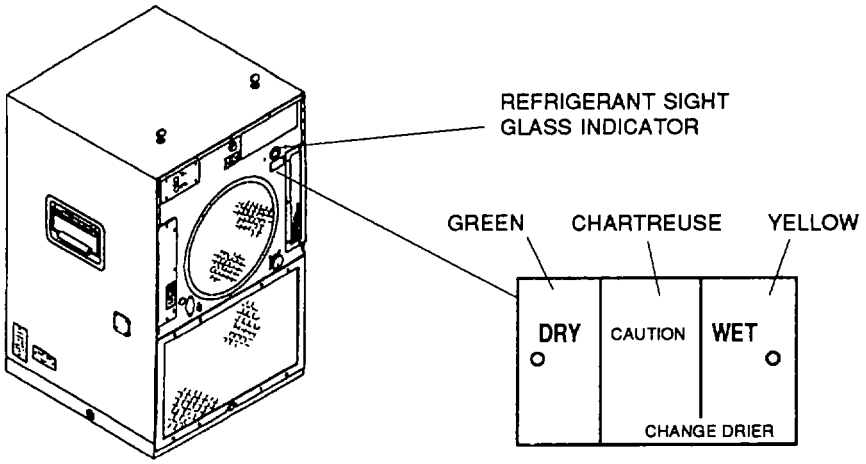


TABLE 3-1. OPERATOR'S TROUBLESHOOTING (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

5. REDUCED HEATING CAPACITY

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

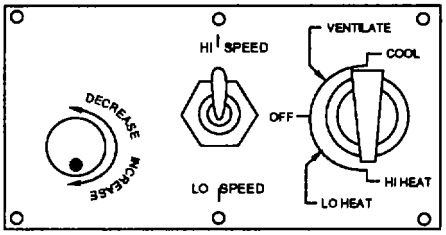
Tightly close all openings

Step 2. Check operation of TEMPerature control thermostat.

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

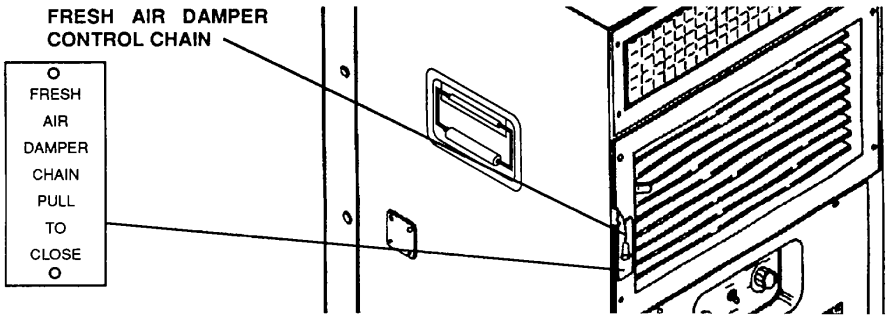
Step 3. Check to be sure fan switch is set properly.

Set switch to HI SPEED.



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. If malfunction still exists, notify your supervisor.



CHAPTER 4

UNIT MAINTENANCE INSTRUCTIONS

Section I REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

4-1. GENERAL

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

b. Test, Measurement, and Diagnostic Equipment (TMDE) and support equipment include standard equipment found in any unit maintenance shop.

c. Repair parts and special tools are listed and illustrated in the TM 9-4120-403-24P Repair Parts and Special Tools List (RPSTL), covering Unit, Direct Support, and General Support Maintenance for this equipment.

Section II SERVICE UPON RECEIPT OF EQUIPMENT

4-2. 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 forks of materiel handling equipment.

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

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

WARNING

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

CAUTION

Damage to equipment could occur from improper hoisting. Hoist the load slowly to avoid slipping slings or load shift. Do not jerk the load or swing it from side-to-side when hoisting. This places additional stress on hoisting components which can cause failure and loss of load. Be sure hoisting equipment is on solid footing and is suitable for the size of the load. Watch boom angle and overhead clearance when hoisting.

4-3. UNPACKING

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

NOTE

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

b. Remove shipping container. Cut metal bands that encircle the container top and bottom. Remove staples that secure bands to container. Pry up the top of the container and remove. Pry sides and ends apart and remove from base.

NOTE

It is recommended that nails be removed from the top, sides, and ends after they are removed from the base, to avoid injury. Nails may be reused when repacking.

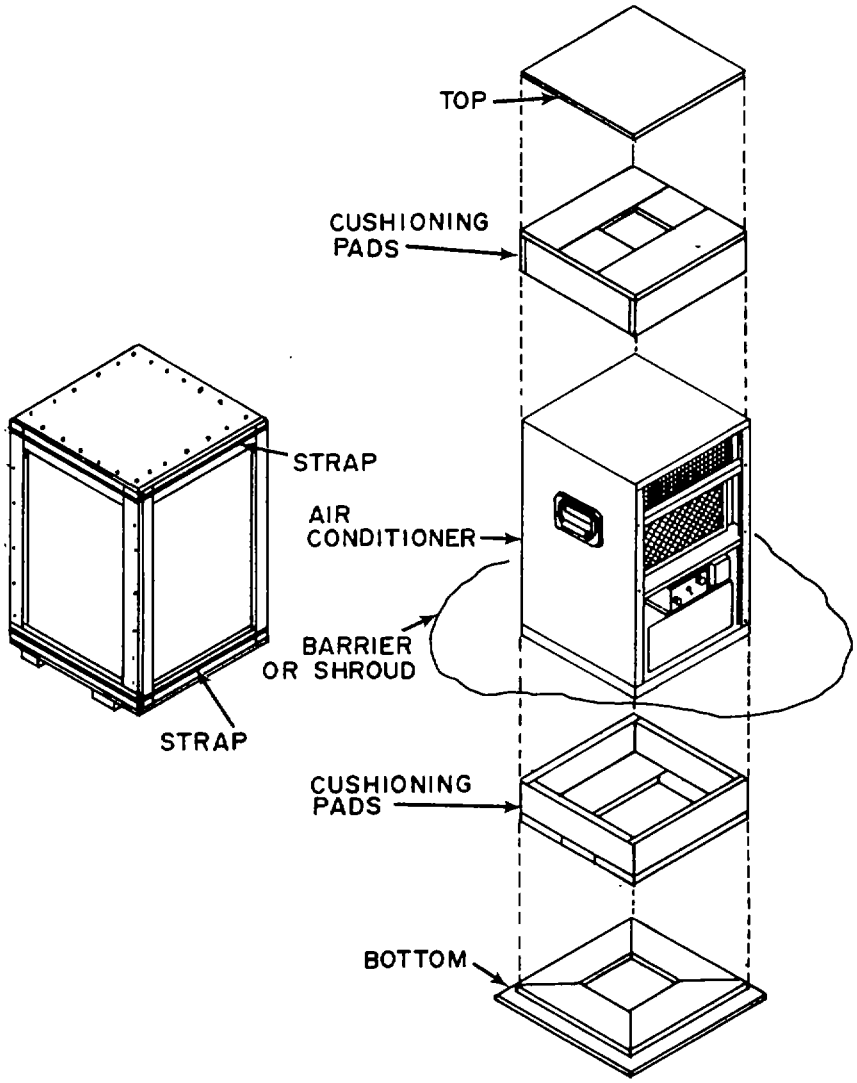


Figure 4-1. Unpacking

c. Remove packaging. Remove cushioning from top and sides.

(1) Level A/B Pack. Remove barrier by cutting as close as possible to the heat-sealed seams. Fold away from air conditioner cabinet. Remove desiccant and technical publications envelope. Put publications in a safe place.

(2) Level C/B Pack. Remove polyethylene shroud from air conditioner cabinet by removing tape and folding away from cabinet. Remove technical publications envelope and put them in a safe place.

WARNING

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

d. Lift air conditioner from bottom (base).

4-4. CHECKING UNPACKED EQUIPMENT

Perform receiving inspection of the air conditioner in the following manner:

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report damage on SF 364, Report of Discrepancy.

b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA PAM 738-750.

c. Check to see whether the equipment has been modified.

4-5. INSTALLATION SITE PREPARATION

a. General. 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 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:

(1) 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 with 5° from front to back and side to side. See figure 4-2 for installation dimensions.

(2) An unobstructed flow of air from outside the conditioned area to inlet and outlet of the condenser.

(3) An unobstructed flow of air from inside the conditioned area to the conditioned air intake and discharge.

(4) An unobstructed flow of air from outside the conditioned area to the fresh air damper intake and/ or NBC filter intake, if installed.

(5) Access to the front and back of the cabinet for routine operation and servicing and for necessary maintenance actions.

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

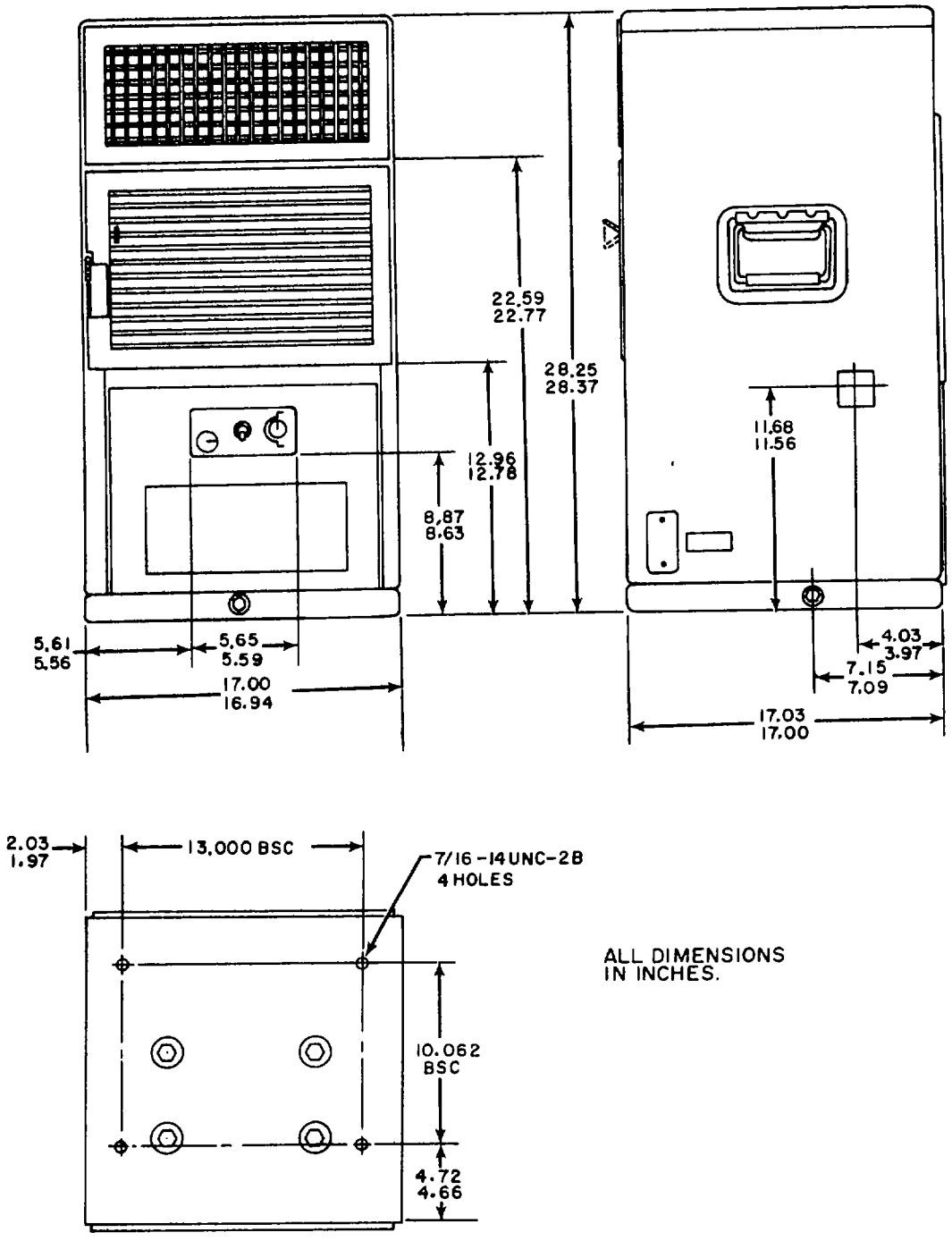


Figure 4-2. Installation Dimensions

(7) A source of 115 volt, single phase, 50/60 hertz input power rated at 18. 5 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 shut-down.

(8) An earth ground capable of handling 18. 5 amps.

(9) Check that no source of dangerous or objectionable fumes are located near the fresh air intake.

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

(11) If possible avoid locations where the condenser and fresh air intakes will be laden with dust, dirt, soot, smoke, or other debris.

b. Through the wall installation. Prepare an opening in the wall large enough to slide the air conditioner through. (See fig. 4-2.) Consideration should be given to service of internal components. All openings around air conditioner must be sealed air tight.

c. Inside installation. Manufacture an arrangement of ducts for the condenser intake and discharge air openings, and the fresh air damper intake and/or NBC filter intake, if installed. Ducts may be made for attachment to the air conditioner cabinet using the mounting holes for the condenser inlet and outlet guards, and the fresh air screen and/or the air intake on the NBC filter or some other arrangement may be made. Prepare appropriate openings in an exterior wall for the ducts. Ducts may be designed to use the condenser inlet and outlet guards, and the fresh air screen supplied with the air conditioner and relocated and installed on the new duct work. Adequate replacements or some other arrangement of these items may be provided.

CAUTION

Easy access to fresh or return air filters must be provided. Filters may be left in position in unit or relocated in duct work. Some installations (filters relocated in duct work) may require different size filters.
d. Outside installation. Manufacture an arrangement of ducts for the conditioned air intake and discharge air. Ducts may be made for attachment to the air conditioner cabinet using the mounting holes for the conditioned air intake and discharge grilles or some other arrangement may be made. Ducts may also be made for installation of the conditioned air intake and discharge grilles on the inside ends or replacements for these items may be used. Prepare appropriate openings in the appropriate wall for the ducts.

NOTE

Retain all items removed from unit. Store in safe place. Parts must be reinstalled prior to return to supply. For a list of required items, see Appendix C.

4-6. AIR CONDITIONER PREPARATION FOR INSTALLATION

No 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. For alternate installation methods, some preparation is necessary.

4-7. INSTALLATION INSTRUCTIONS

All alterations to the shelter or facility into which the air conditioner is to be installed should be complete before installation of air conditioner.

WARNING

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

a. Move air conditioner into position and aline mounting holes.

b. Secure unit with appropriate mounting hardware.

Base . 4375-14 UNC (4 holes)

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

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

e. Install a 10 AWG minimum ground wire between frae ground (E4) on air conditioner cabinet and an adequate earth ground.

Section III UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-8. INTRODUCTION, INSPECTION, AND SERVICE

a. Systematic, periodic, Preventive Maintenance Checks and Services (PMCS) are essential to ensure that the air conditioner is ready for operation at all times. The purpose of a preventive maintenance program is to discover and correct defects and deficiencies before they can cause serious damage or complete failure of the equipment. Any effective preventive maintenance program must begin with the indoctrination of operators to report all unusual conditions noted during daily checks or actual operation to unit maintenance. All defects and deficiencies discovered during maintenance inspections must be recorded, together with corrective action taken, on DA Form 2404 (Equipment Inspection and Maintenance Worksheet).

b. A schedule for unit preventive maintenance inspection and service should be established immediately after installation of the air conditioner. A quarterly interval, equal to three calendar months or 250 hours of operation (whichever occurs first) is recommended for usual operating conditions. When operating under unusual conditions, such as a very dusty or sandy environment, it may be necessary to reduce the interval to monthly or even less if conditions are extreme.

c. Table 4-1 lists the unit preventive maintenance checks and services that should be performed at quarterly intervals (or otherwise stated in table 4-1). 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.

WARNING

Voltages used can kill. Always disconnect power cord to air conditioner before performing any internal maintenance. Shutting unit off at its control panel does not disconnect unit power.

TABLE 4-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

Q - Quarterly

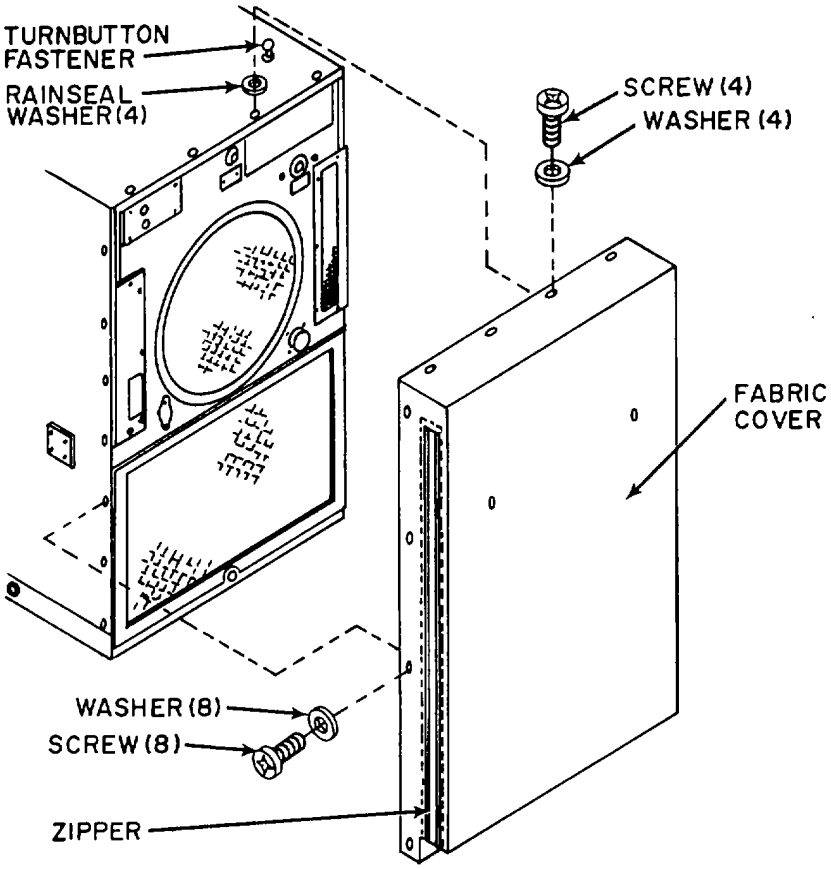
Item No.	Item To Be Inspected/ Serviced	Q	Procedures
1	Fabric Cover		
		•	a. Inspect zipper for ease of use and lubricate with silicone lubricant.
		•	b. Roll down the cover and inspect for tears, cracks, or any other sign of damage or deterioration.

TABLE 4-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

Q - Quarterly

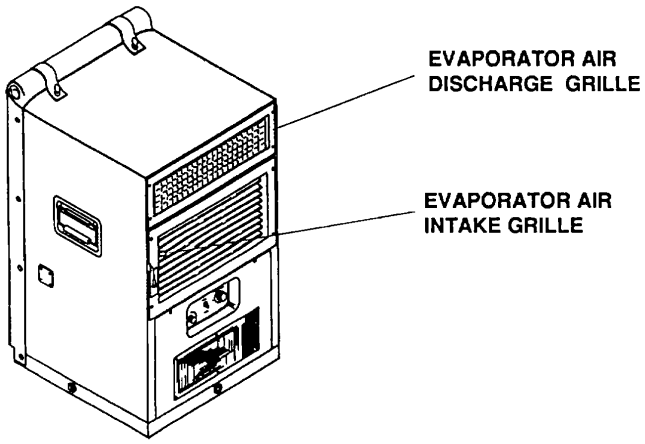
Item No.	Item To Be Inspected/ Serviced	Q	Procedures
2	Evaporator Air Intake Grille	•	a. Check operation of louvers for stiffness or binding. b. Remove, clean, inspect, repair, and lubricate grille as necessary. (See para 4-22.)
3	Evaporator Air Discharge Grille	•	a. Check operation of louvers for stiffness or binding. b. Remove, clean, inspect, repair, and lubricate grille as necessary. (See para 4-21.) 

TABLE 4-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

Q - Quarterly

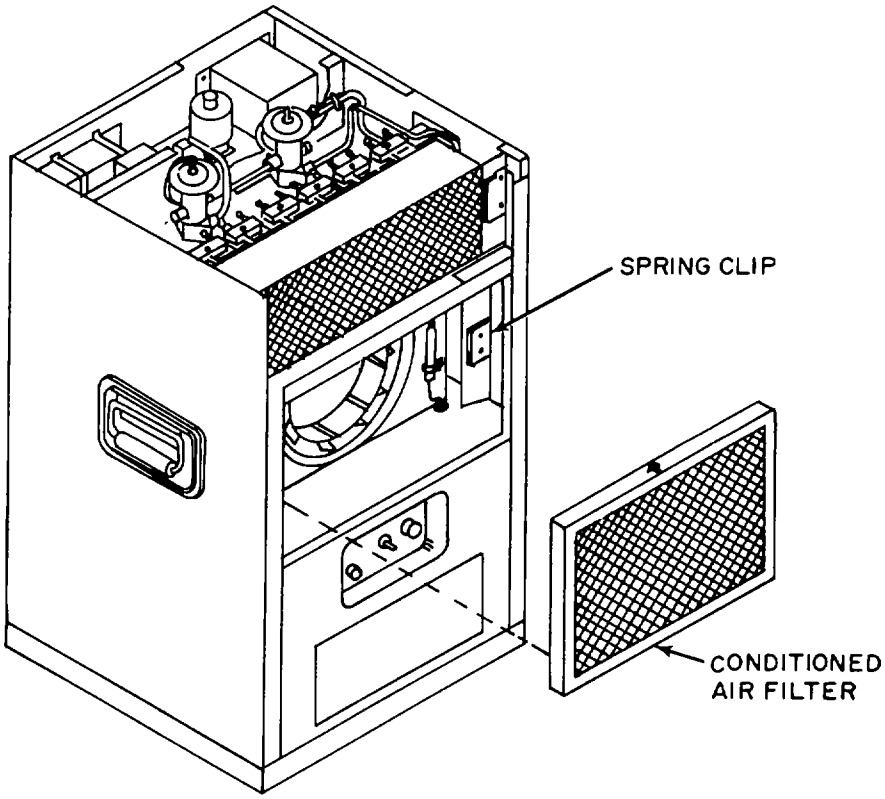
Item No.	Item To Be Inspected/ Serviced	Q	Procedures
4	Conditioned Air Filter	•	a. Remove, clean, and inspect filter. (See para 4-23.) b. Discard filter and obtain replacement, if damaged. 

TABLE 4-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

Q - Quarterly

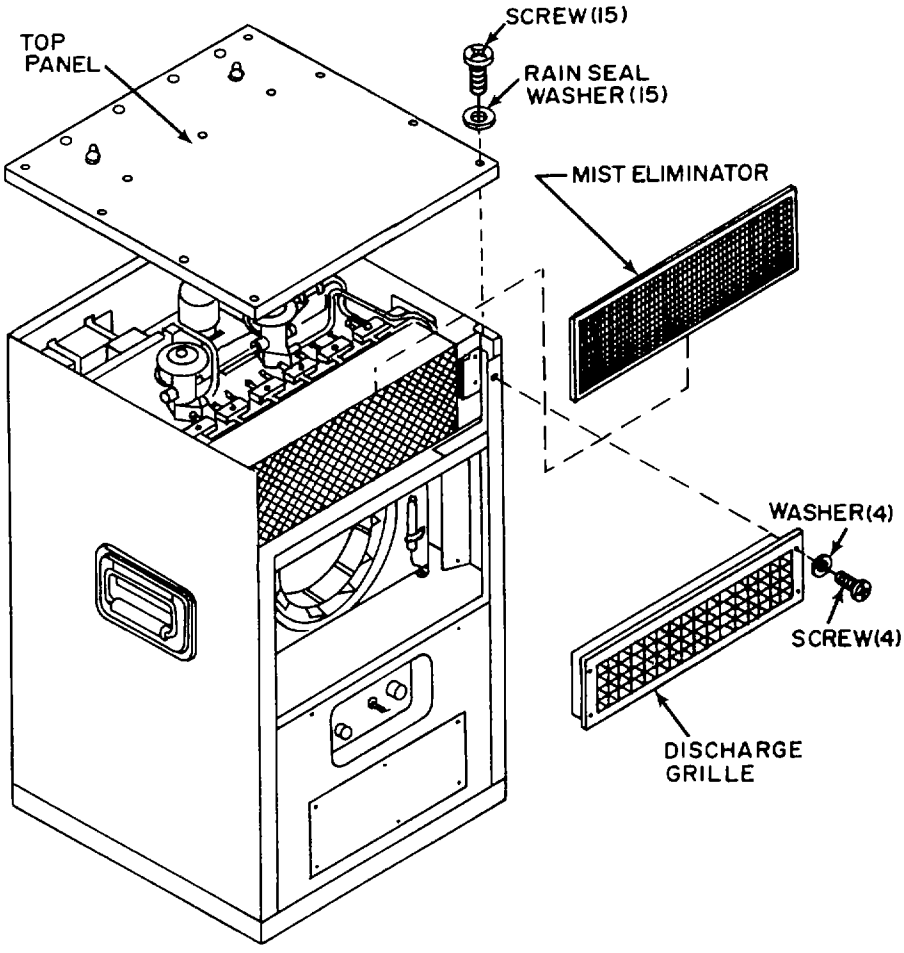
Item No.	Item To Be Inspected/ Serviced	Q	Procedures
5	Mist Eliminator	•	Remove, clean, inspect, and service the mist eliminator. (See para 4-24.) 

TABLE 4-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

Q - Quarterly

Item No.	Item To Be Inspected/ Serviced	Q	Procedures
6	Fresh Air Damper	•	a. Inspect chain and mounting hardware for tightness and security.
		•	b. Check that the damper door seats properly to form a seal when in the closed position.
7	Control Panel/ Junction Box	•	a. Remove lower panel. (See para 4-17).
			b. Check operation of circuit breaker and flexible cable to remote reset knob for stiffness and binding.
			c. Inspect all remaining wiring harnesses in the lower section of the cabinet for damage or chafing, and all electrical connections for tightness.
		•	d. Check all mounting hardware for tightness and security.

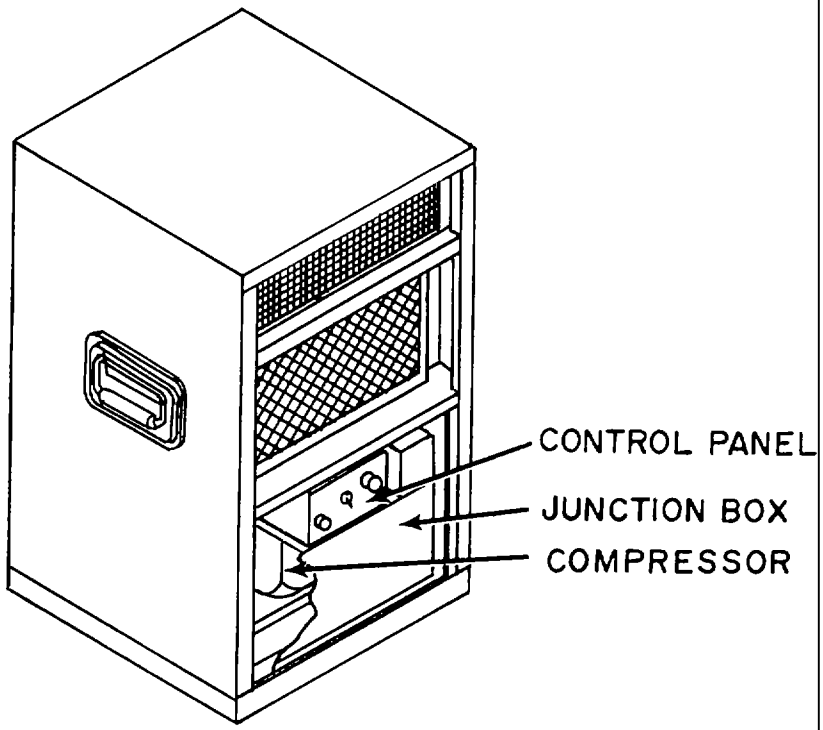


TABLE 4-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

Q - Quarterly

Item No.	Item To Be Inspected/ Serviced	Q	Procedures
8	Evaporator Coil	•	a. Clean evaporator coil per para 4-59.
		•	b. Inspect coil for obvious damage and all mounting hardware for tightness and security.
9	Condenser Coil	•	a. Clean condenser coil per para 4-60.
		•	b. Inspect coil for obvious damage, and all mounting hardware for tightness and security.

Section IV UNIT TROUBLESHOOTING

4-9. GENERAL

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

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

c. Table 4-2 lists the common malfunctions which you may find during the operation or maintenance of the air conditioner unit or its components. Before using this table, be sure you have performed all applicable checks and the tests/inspections and the corrective actions in the order listed.

WARNING

HIGH VOLTAGE

is used in operation of this equipment.

DEATH ON CONTACT

may result if personnel fail to observe safety precautions.

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

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

Be careful not to contact high-voltage connections of 115 volts ac input when installing or operating this equipment.

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

Do not operate equipment without all grilles, guards, louvers, and covers in place and tightly secured.

TABLE 4-2. UNIT TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. AIR CONDITIONER DOES NOT START IN ANY MODE.
Step 1. Make sure that power is 115 Volt, single phase, 50/60 hertz.
Connect correct input power.
Step 2. Check operation of the circuit breaker external reset control
Test reset control. (See para 4-34.) Replace if defective.
Step 3. Check operation of mode selector switch (S).
Test switch. (See para 4-27.) Replace switch, if defective.
Step 4. Check all terminals and internal wiring within junction box for tightness and damage.
Tighten terminals, or repair wiring as necessary. (See para 4-47.) If malfunction still exists, notify your supervisor.
2. COMPRESSOR DOES NOT START, BUT FAN MOTOR OPERATES IN HI- AND LOW-SPEED.
Step 1. Check operation of time delay relay (K6).
Test relay. (See para 4-38.)
Step 2. Check operation of compressor motor relay (K1).
Test relay. (See para 4-36.) Replace relay if defective.
Step 3. Check operation of armature relay (K10).
Test relay. (See para 4-52.) Replace if defective.
Step 4. Check operation of compressor run capacitor (C2).
Test capacitor. (See para 4-51.) Replace if defective.

TABLE 4-2. UNIT TROUBLESHOOTING (cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 5. Check operation of compressor motor start capacitor (C4).

Test capacitor. (See para 4-49.) Replace if defective.

Step 6. Check operation of ambient air thermostat (S2).

Test thermostat. (See para 4-46.) Replace if defective. If malfunction still exists, notify your supervisor.

3. COMPRESSOR STARTS NORMALLY, BUT CIRCUIT BREAKER SOON TRIPS.

CAUTION

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

Step 1. Check that fan blades are tight and operating freely.

If not operating properly; see paras 4-55b, evaporator fan and 4-56b, condenser fan.

Step 2. Check to be sure that fan motor is running.

If not running, see malfunction 9.

Step 3. Check circuit breaker (CB)

Test circuit breaker. (See para 4-35.) Replace if defective. If malfunction still exists, notify your supervisor.

TABLE 4-2. UNIT TROUBLESHOOTING (cont)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

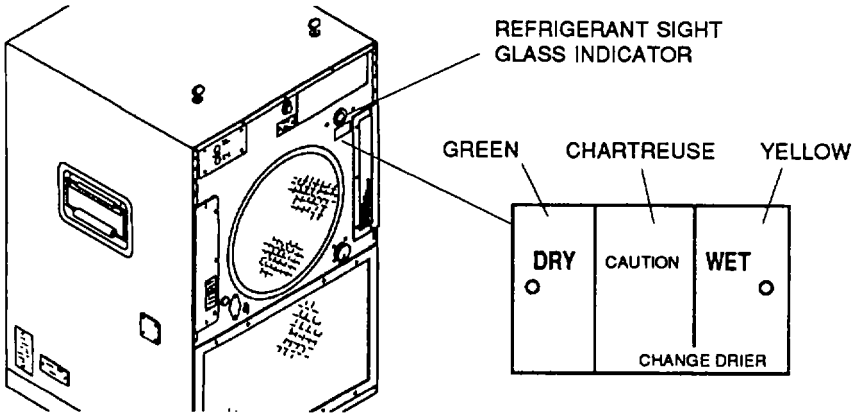
4. COMPRESSOR STARTS NORMALLY, BUT HIGH OR LOW PRESSURE CUT-OUT SWITCH SOON TRIPS.

Step 1. Check that fan blades are tight and are operating freely.

If not operating properly; see paras 4-55b, evaporator fan and 4-56b, condenser fan.

Step 2. 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 and notify your supervisor.



Step 3. Reset (PUSH) PRESSURE CUT-OUT switch(es) and restart unit.

If unit does not start notify your supervisor.

5. REDUCED COOLING CAPACITY

Step 1. Check operation of fan toggle switch (S7).

Switch from LO to HI SPEED. If no change results, test switch. (See para 4-29.) Replace defective switch.

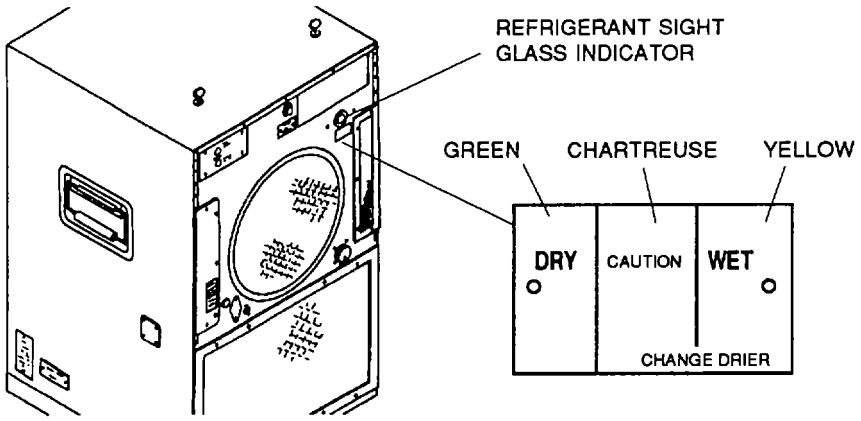
TABLE 4-2. UNIT TROUBLESHOOTING (cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 2. Check operation of time delay relay (K9)

Test relay. (See para 4-39.) Replace if defective.

Step 3. With unit operating in COOL mode, check condition of refrigerant in sight glass.



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

Step 4. Check operation of temperature control thermostat (S 1)

Test thermostat. (See para 4-28.) Inspect sensing bulb and capillary for damage or leakage. Replace if defective. If malfunction still exists, notify your supervisor.

6. REDUCED HEATING CAPACITY

Step 1. Check operation of heater thermostat (S3).

Test thermostat. (See para 4-54.) Replace thermostat if defective.

Step 2. Check individual heaters (HR1 thru HR6).

Test heaters. (See para 4-58.) Replace defective heaters.

TABLE 4-2. UNIT TROUBLESHOOTING (cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 3. Check operation of fan toggle switch (S7).

Switch from LO to HI SPEED. If no change results, test switch. (See para 4-29.) Replace defective switch.

Step 4. Check operation of time delay relay (K9).

Test relay. (See para 4-39.) Replace if defective.

Step 5. Check operation of temperature control thermostat (S 1).

Test thermostat. (See para4-28.) Inspect sensing bulb and capillary for damage or leakage. Replace if defective. If malfunction still exists, notify your supervisor.

7. NO HEAT IN EITHER HI HEAT OR LOW HEAT MODE.

Step 1. Check operation of heater thermostat (S3).

Test thermostat. (See para 4-54.) Replace if defective.

Step 2. Check operation of mode selector switch (S).

Test switch. (See para 4-27.) Replace if defective. If malfunction still exists, notify your supervisor.

8. HEAT IN HI HEAT MODE, BUT NOT IN LO HEAT MODE.

Step 1. Check operation of temperature control thermostat (S 1).

Test thermostat. (See para 4-28.) Inspect sensing bulb and capillary for damage or leakage. Replace if defective.

Step 2. Check operation of mode selector switch (S).

Test Switch. (See para 4-27.) Replace if defective.

TABLE 4-2. UNIT TROUBLESHOOTING (cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 3. Check operation of heater relay (K2).

Test relay. (See para 4-37.) Replace if defective. If malfunction still exists, notify your supervisor.

9. FAN MOTOR (B2) DOES NOT OPERATE.

Step 1. Check operation of mode selector switch (S).

Test switch. (See para 4-27.) Replace switch if defective.

Step 2. Check operation of fan motor relay (K7).

Test relay. (See para 4-53.) Notify your supervisor if defective.

Step 3. Check operation of fan motor capacitor (C4).

Test capacitor. (See para 4-49.) Replace if defective.

Step 4. Check operation of fan motor (B2).

Test motor. (See para 4-57.) Notify your supervisor if defective.

Section V UNIT MAINTENANCE PROCEDURES

4-10. GENERAL

The procedure 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 actions authorized to be performed by Unit Maintenance in the order in which they appear on the MAC.

WARNING

Panels, covers, screens, grilles, and guards installed on unit are there for a purpose.

Do not operate unit with them off or open unless instructions tell you to. When necessary, do so with care.

4-11. AIR CONDITIONER (FABRIC) COVER

This task covers:

a. Removal
b. Cleaning
c. Lubrication
d. Inspection
e. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Rags
(Appendix E item 1)
Detergent
(Appendix E item 2)
Silicone
(Appendix E item 3)
Rain Seal Washers
(Appendix E item 4)

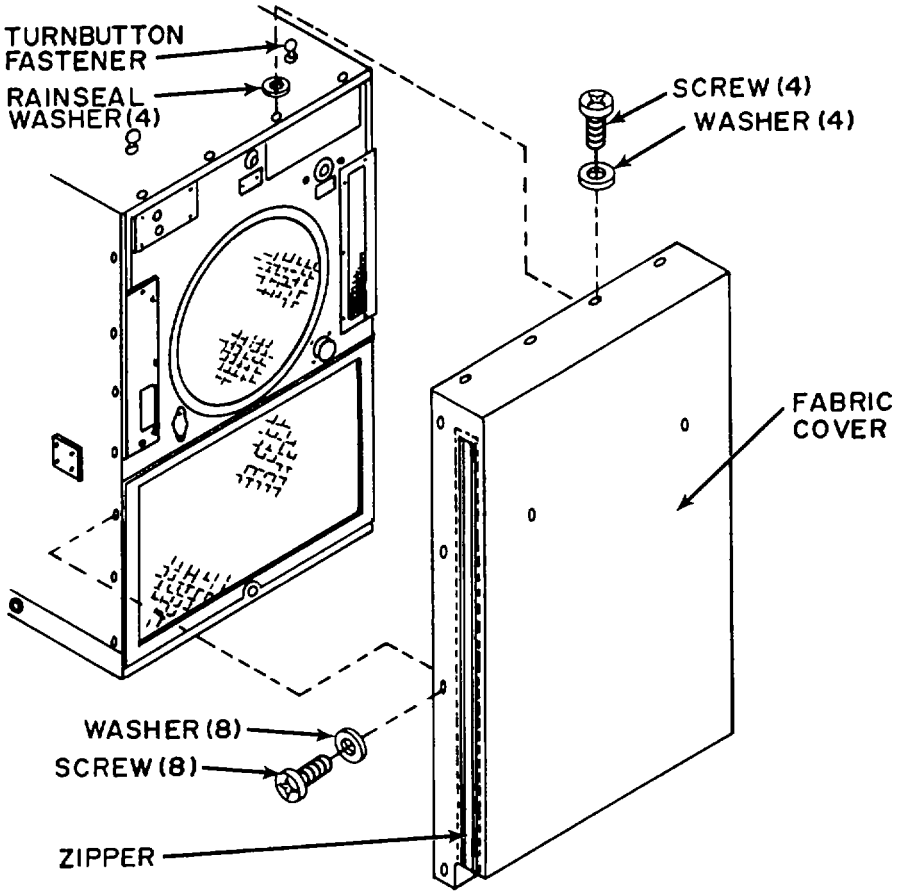


Figure 4-3. Fabric Cover

Removal

(1) Rotate turnbutton fasteners and remove two straps.

(2) Roll cover down and close zipper.

(3) Remove eight screws and flat washers from the sides.

(4) Remove four screws, four flat washers, and four rain seal washers from the top.

(5) Remove four screws and flat washers from the condenser bottom.

(6) Carefully remove the cover.

Cleaning

(1) Wipe clean with rag and mild detergent solution.

(2) Thoroughly rinse with fresh water and dry.

Lubrication

(1) Lubricate zipper with silicone type lubricant or a wax stick.

(2) Lubricate turnbutton fasteners with silicone type lubricant or light oil.

Inspection

(1) Inspect for rips, cuts, tears, or punctures in the fabric.

(2) Inspect for damaged, loose, or missing eyelets and snap fasteners.

(3) Refer repair to your supervisor.

Installation

(1) Aline eyelets to casing mounting holes.

(2) Secure top of fabric cover with four screws, four flat washers, and four rain seal washers.

(3) Secure sides with eight screws and flat washers.

(4) Secure bottom to condenser with four screws and flat washers.

(5) If the air conditioner is to be returned to normal operation, open the turnbutton fasteners, roll up the back flap, and secure it with the stowing straps and turnbutton fasteners.

NOTE

If air conditioner installation requires removal of cover, reinstall mounting screws, washers, and rain seal washers. This will protect threads in the casing and prevent water leaks.

4-12. NBC (NUCLEAR, BIOLOGICAL, AND CHEMICAL) DUCT COVER

This task covers:

a. Removal
b. Inspection
c. Repair
d. Installation

INITIAL SETUP

Tools

Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts

Apron
(Appendix E item 5)
Respirator
(Appendix E item 6)
Goggles
(Appendix E item 7)
Gloves, Protective
(Appendix E item 8)
Toluene
(Appendix E item 9)
Adhesive
(Appendix E item 10)
Lockwashers
(Appendix E item 11)
Gasket
(Appendix F item 1)

General Safety Instructions

WARNING

Toluene is flammable, and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well-ventilated area, and keep away from sparks or flame. Use goggles, gloves and apron when appropriate.

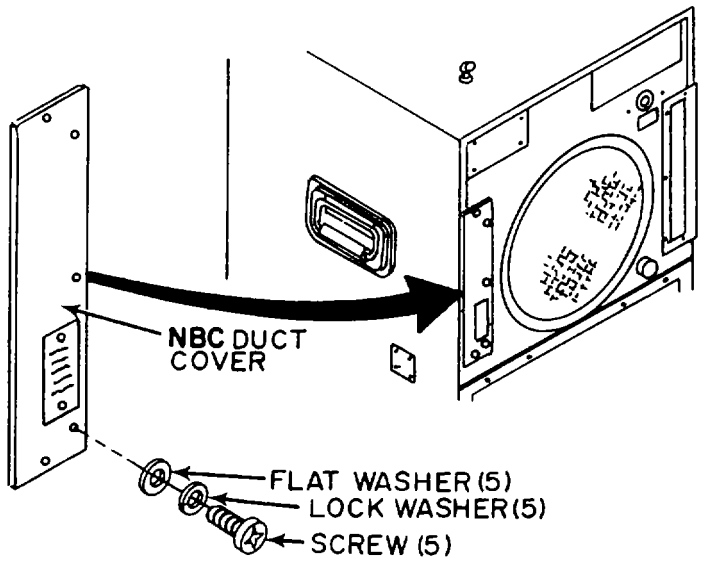


Figure 4-4. NBC (Nuclear, Biological, and Chemical) Duct Cover

Removal

(1) Remove five screws, five flat washers and five lock washers.

(2) Remove cover.

Inspection

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

(2) Check that gasket is not torn, loose, or missing. Replace gasket if damaged.

Repair

(1) Remove as much old gasket material as possible, by pulling or scraping away from the metal surface.

(2) Soften and remove old adhesive and gasket residue, using toluene and a stiff brush.

(3) Cut replacement gasket to size per dimensions in Appendix F.

(4) Be sure that the surface to which the gasket is to be applied is clean and free of old adhesive material.

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

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

Installation

(1) Aline mounting holes with casing fasteners.

(2) Secure cover to casing with five screws, five flat washers and five lockwashers.

4-13. ACCESS (CHARGING VALVES) COVER

This task covers:

a. Removal
b. Inspection
c. Repair
d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Apron
(Appendix E item 5)
Respirator
(Appendix E item 6)
Goggles
(Appendix E item 7)
Gloves, Protective
(Appendix E item 8)
Toluene

General Safety Instructions
(Appendix E item 9)
Adhesive
(Appendix E item 10)
Gasket
(Appendix F item 2)

WARNING

Toluene is flammable, and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well-ventilated area, and keep away from sparks or flame. Use goggles, gloves and apron when appropriate.

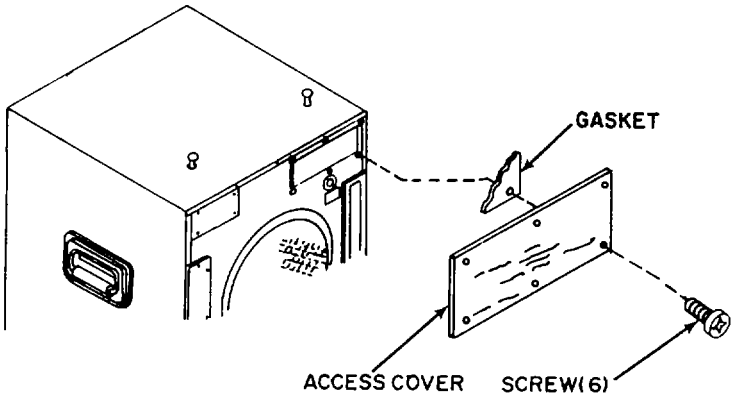


Figure 4-5. Access (Charging Valves) Cover

Removal

Remove six screws and cover.

Inspection

(1) Check that cover is not bent, cracked, or punctured.

(2) Check that gasket is not torn, loose, or missing

(3) Check that information plate is readable and in place.

Repair

(1) Remove as much old gasket material as possible, by pulling or scraping away from the metal surface.

(2) Soften and remove old adhesive and gasket residue, using toluene and a stiff brush.

(3) Cut replacement gasket to size per dimensions in Appendix F.

(4) Be sure that the surface to which the gasket is to be applied is clean and free of old adhesive material.

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

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

Installation

Aline mounting holes with casing fasteners and secure cover to casing with six screws.

4-14. CONNECTOR COVER PLATES

This task covers:

a. Removal
b. Inspection
c. Repair

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Locknuts
(Appendix E item 12)

Equipment Conditions:
Junction Box Removed (para 4-32)

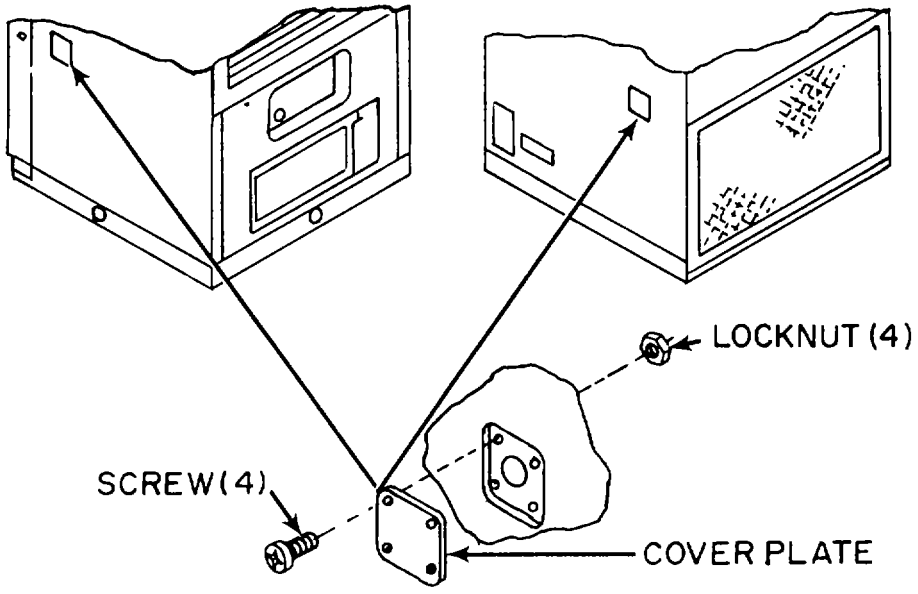


Figure 4-6. Connector Cover Plates

Removal

Remove four screws, locknuts, and cover plate.

Inspection

Check that cover is not bent, cracked, or punctured. If damaged, replace cover.

Installation

Aline mounting holes and install cover plate with four screws and locknuts.

Follow-on procedure: Replace Junction Box. (See para 4-32.)

4-15. CIRCUIT BREAKER ACCESS PLATE

This task covers:

a. Removal
b. Inspection
c. Repair
d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Apron
(Appendix E item 5)
Respirator
(Appendix E item 6)
Goggles
(Appendix E item 7)
Gloves, Protective
(Appendix E item 8)
Toluene
(Appendix E item 9)
Adhesive
(Appendix E item 10)
Gasket
(Appendix F item 3)

General Safety Instructions

WARNING

Toluene is flammable, and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well-ventilated area, and keep away from sparks or flame. Use goggles, gloves and apron when appropriate.

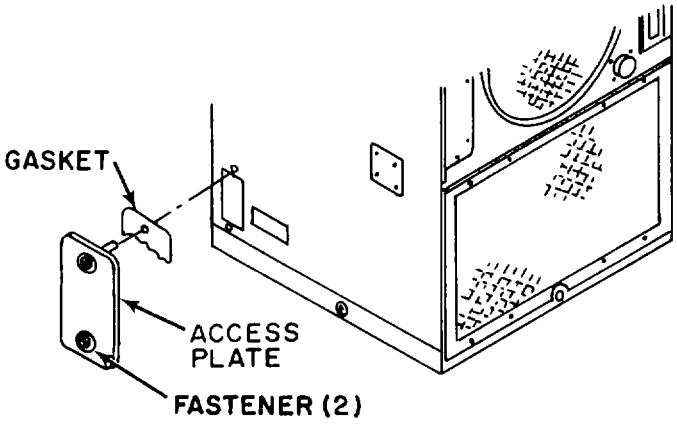


Figure 4-7. Circuit Breaker Access Plate

Removal

Loosen two quarter-turn fasteners and remove plate.

Inspection

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

(2) Check that gasket is not torn, loose, or missing. Repair damaged gasket

Repair

(1) Remove as much old gasket material as possible, by pulling or scraping away from the metal surface.

(2) Soften and remove old adhesive and gasket residue, using toluene and a stiff brush.

(3) Cut replacement gasket to size per dimensions in Appendix F.

(4) Be sure that the surface to which the gasket is to be applied is clean and free of old adhesive material.

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

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

Installation

Secure plate to casing with two quarter-turn fasteners.

4-16. TOP PANEL

This task covers:

a. Removal
b. Inspection
c. Repair
d. Installation

INITIAL SETUP

Tools

Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts

Apron
(Appendix E item 5)
Respirator
(Appendix E item 6)
Goggles
(Appendix E item 7)
Gloves, Protective
(Appendix E item 8)
Toluene
(Appendix E item 9)
Adhesive
(Appendix E item 10)
Rain Seal Washers
(Appendix E item 13)
Gasket
(Appendix F item 4)
Gasket
(Appendix F item 5)
Insulation
(Appendix F item 6)
Gasket
(Appendix F item 7)
Insulation
(Appendix F item 8)
Gasket
(Appendix F item 9)
Insulation
(Appendix F item 10)

General Safety Instructions

WARNING

Voltages used can kill. Always disconnect power cord from air conditioner before performing any internal maintenance. Shutting unit off at its control panel does not disconnect unit power.

WARNING

Toluene is flammable, and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well-ventilated area, and keep away from sparks or flame. Use goggles, gloves and apron when appropriate.

Gasket
(Appendix F item 11)

Equipment Conditions:
Power Cord Disconnected
Fabric Cover Removed (para 4-11)

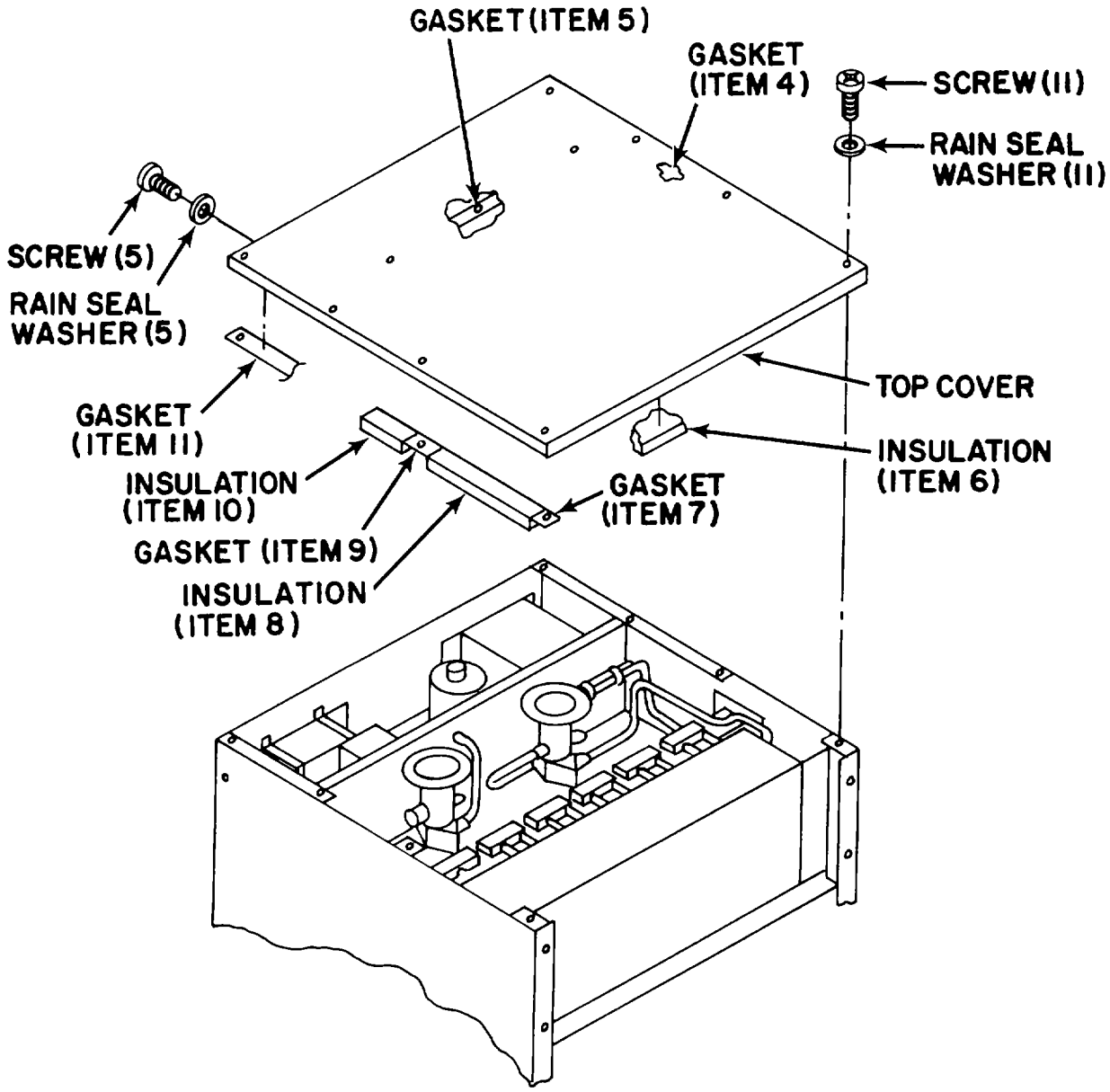


Figure 4-8. Top Panel

Removal

Remove sixteen screws, rain seal washers, and top panel.

Inspection

(1) Check that panel is not bent, cracked, or punctured.

(2) Check that gaskets and insulation are not torn, loose, or missing. Repair damaged gaskets and insulation.

Repair

(1) Remove as much old gasket or insulation material as possible, by pulling or scraping away from the metal surface.

(2) Soften and remove old adhesive and gasket or insulation residue, using toluene and a stiff brush.

(3) Cut replacement gasket or insulation to size per dimensions in Appendix F.

(4) Be sure that the surface to which the gasket or insulation is to be applied is clean and free of old adhesive material.

(5) Coat the mating surfaces of the metal and the gasket or insulation with adhesive. Let both surfaces air dry until the adhesive is tacky, but will not stick to fingers.

(6) Starting with an end, carefully attach the gasket or insulation to the metal. Press into firm contact all over.

Installation

Reinstall top panel, sixteen screws and rain seal washers.

Follow-on procedures:

1. Install fabric cover. (See para 4-11.)
2. Connect power cord.

4-17. LOWER PANEL

This task covers:

a. Removal
b. Inspection
c. Repair
d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Apron
(Appendix E item 5)
Respirator
(Appendix E item 6)
Goggles
(Appendix E item 7)
Gloves, Protective
(Appendix E item 8)
Toluene
(Appendix E item 9)
Adhesive
(Appendix E item 10)
Insulation
(Appendix F item 12)
Gasket
(Appendix F item 13)
Gasket
(Appendix F item 14)
Gasket
(Appendix F item 15)
Insulation
(Appendix F item 16)

General Safety Instructions

WARNING

Voltages can kill. Always disconnect power cord to air conditioner before performing any internal maintenance. Shutting unit off at its control panel does not disconnect unit power.

WARNING

Toluene is flammable, and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well-ventilated area, and keep away from sparks or flame. Use goggles, gloves and apron when appropriate.

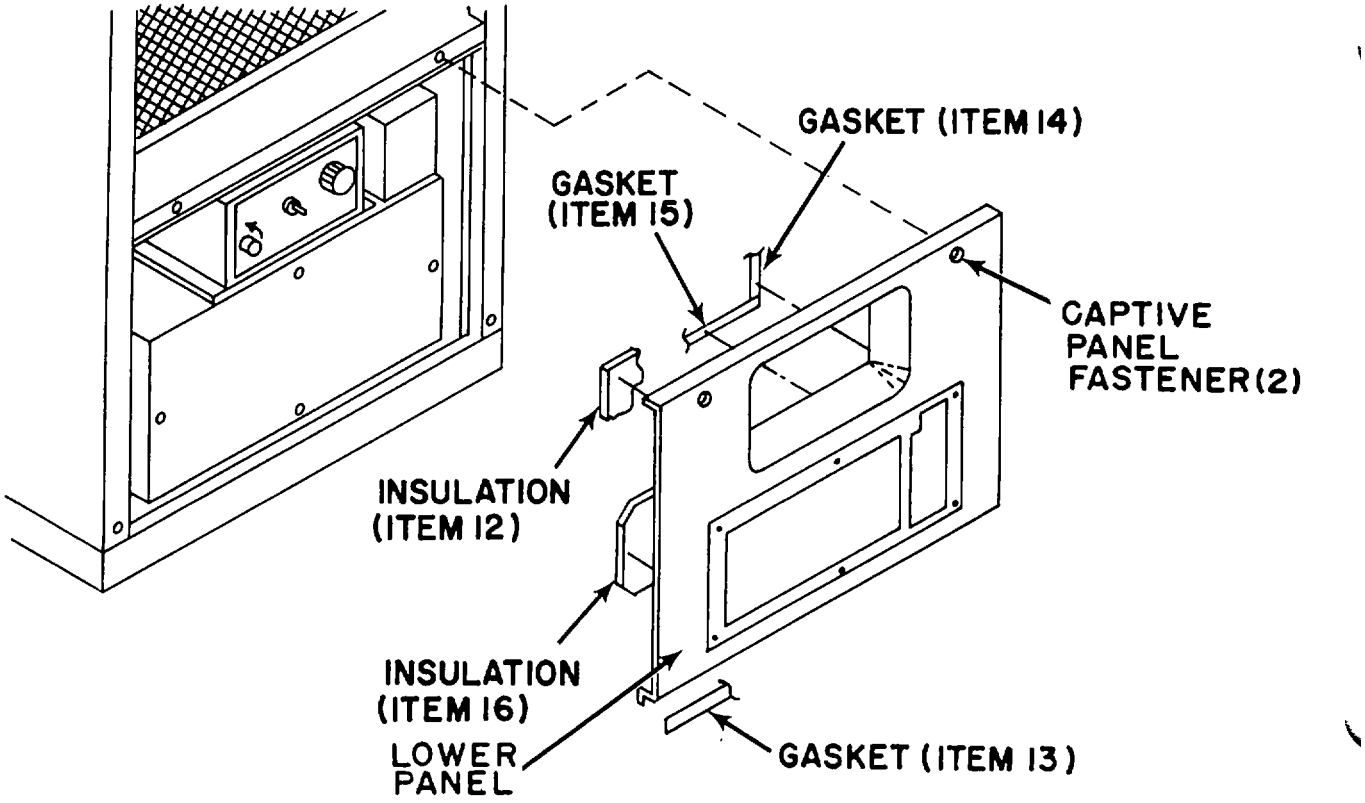


Figure 4-9. Lower Panel

Removal

(1) Loosen two captive panel fasteners.

(2) Tilt top of lower front panel out and lift panel up to remove.

Inspection

(1) Check that panel is not bent, cracked, or punctured.

(2) Check that gaskets and insulation are not torn, loose, or missing. Replace damaged gaskets or insulation.

(3) Check that wiring diagram plate is readable and in place.

Repair

(1) Remove as much old gasket or insulation material as possible, by pulling or scraping away from the metal surface.

(2) Soften and remove old adhesive and gasket or insulation residue, using toluene and a stiff brush.

(3) Cut replacement gasket or insulation to size per dimensions in Appendix F.

(4) Be sure that the surface to which the gasket or insulation is to be applied is clean and free of old adhesive material.

(5) Coat the mating surfaces of the metal and the gasket or insulation with adhesive. Let both surfaces air dry until the adhesive is tacky, but will not stick to fingers.

(6) Starting with an end, carefully attach the gasket or insulation to the metal. Press into firm contact all over.

Installation

(1) Set the bottom of the panel in position so that the flange is inside the lip on the cabinet base.

(2) Push the top of the panel back into position.

(3) Secure panel to casing with two captive panel fastener screws.

4-18. FRESH AIR (INLET) SCREEN

This task covers:

a. Removal
b. Inspection
c. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Lockwashers
(Appendix E item 11)

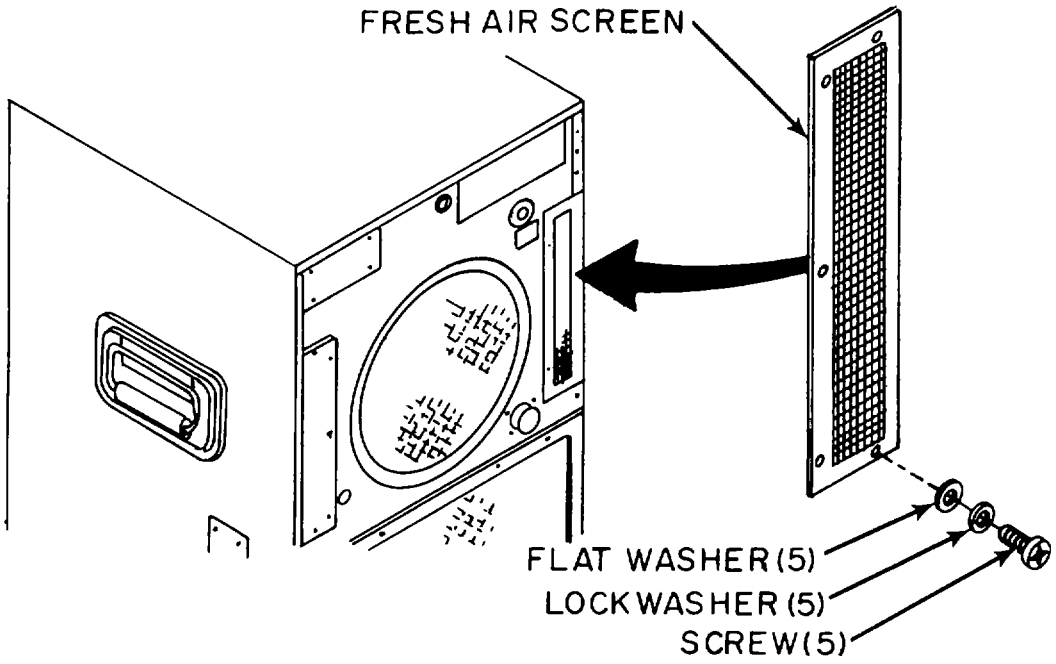


Figure 4-10. Fresh Air (Inlet) Screen

Removal

Remove five screws, lockwashers, flat washers, and screen.

Inspection

(1) Check that screen is not bent, punctured, cracked, or otherwise damaged.

(2) If damaged, replace screen.

Installation

Secure screen to casing with five screws, lockwashers and flat washers.

4-19. CONDENSER AIR DISCHARGE GUARD

This task covers:
a. Removal b. Inspection c. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Lockwashers
(Appendix E item 11)

Equipment Conditions:
Power Cord Disconnected

General Safety Instructions

WARNING

Voltages used can kill. Always disconnect power cord to air conditioner before performing any internal maintenance. Shutting unit off at its control panel does not disconnect unit power.

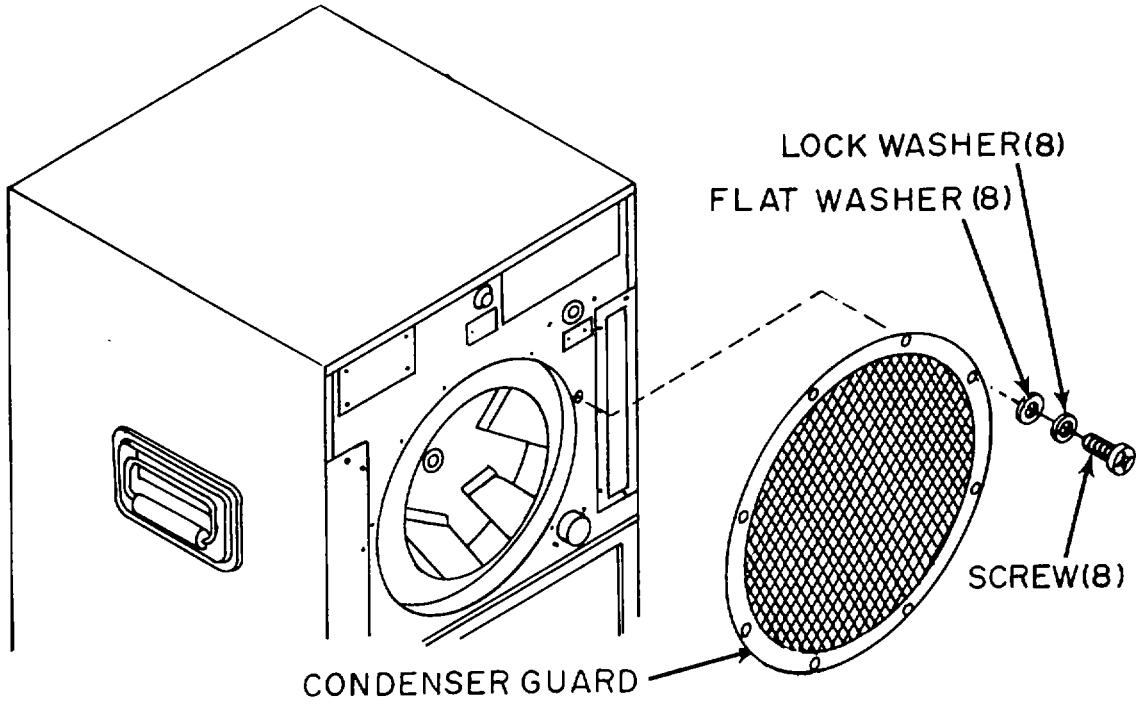


Figure 4-11. Condenser Air Discharge Guard

Removal

Remove eight screws, lockwashers, flat washers and guard.

Inspection

Check that guard is not bent or broken. If damaged, replace guard.

Installation

Secure guard to casing with eight screws, lockwashers and flat washers.

Follow-on procedure: Connect power cord.

4-20. CONDENSER COIL GUARD

This task covers:
a. Removal b. Inspection c. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Equipment Conditions:
Fabric Cover Removed (para 4-11)

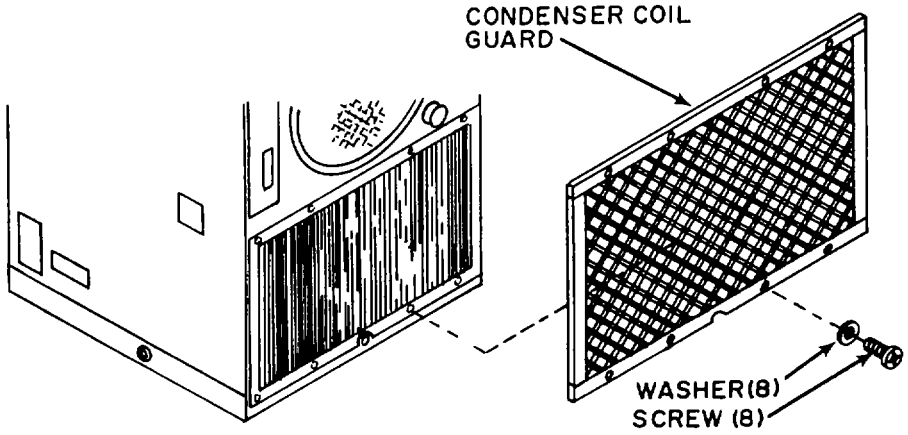


Figure 4-12. Condenser Coil Guard

Removal

Remove eight screws, flat washers and condenser coil guard.

Inspection

Check that guard is not bent, cracked, or otherwise damaged. Replace guard if damaged.

Installation

Secure guard assembly to casing with eight screws and flat washers.

Follow-on procedure: Connect power cord.

4-21. EVAPORATOR AIR DISCHARGE (OUTLET) GRILLE ASSEMBLY

This task covers:

a. Removal
b. Cleaning
c. Inspection
d. Lubrication
e. Repair
f. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Rags
(Appendix E item 1)
Apron
(Appendix E item 5)
Respirator
(Appendix E item 6)
Goggles
(Appendix E item 7)
Gloves, Protective
(Appendix E item 8)
Toluene
(Appendix E item 9)
Adhesive
(Appendix E item 10)
Lubricating Oil
(Appendix E item 14)
Gasket
(Appendix F item 17)
Gasket
(Appendix F item 18)
Gasket
(Appendix F item 19)
Gasket
(Appendix F item 20)

General Safety Instructions

WARNING

Toluene is flammable, and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well-ventilated area, and keep away from sparks or flame. Use goggles, gloves and apron when appropriate.

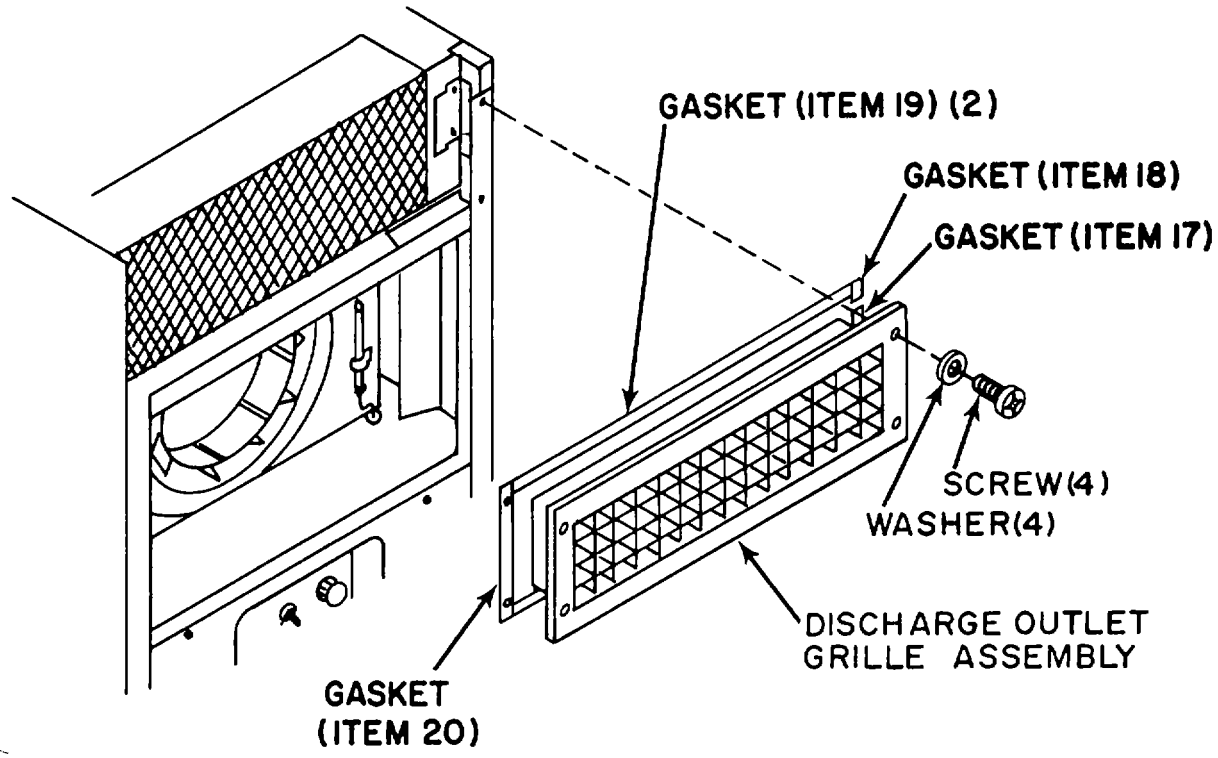


Figure 4-13. Evaporator Discharge (Outlet) Grille Assembly

Removal

Remove four screws, washers and grille.

Cleaning

Wipe with rags or vacuum all dust and dirt off louvers and inside of grille. Be careful not to damage gasket strips.

Inspection

(1) Inspect each grille for general condition and proper operation.

(2) Bent louvers can usually be straightened with fingers.

(3) Check that gaskets are not torn, loose, or missing. Repair damaged gaskets.

Lubrication

(1) Apply a few drops of light oil to all pivot points of the louvers.

(2) Wipe or blot up all excess oil with a cloth.

Repair

(1) Remove as much old gasket material as possible, by pulling or scraping away from the metal surface.

(2) Soften and remove old adhesive and gasket residue, using toluene and a stiff brush.

(3) Cut replacement gasket to size per dimensions in Appendix F.

(4) Be sure that the surface to which the gasket is to be applied is clean and free of old adhesive material.

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

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

Installation

Secure grille with four screws and washers.

4-22. EVAPORATOR AIR INTAKE GRILLE ASSEMBLY

This task covers:

a. Removal
b. Cleaning
c. Inspection
d. Lubrication
e. Repair
f. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Rags
(Appendix E item 1)
Apron
(Appendix E item 5)
Respirator
(Appendix E item 6)
Goggles
(Appendix E item 7)
Gloves, Protective
(Appendix E item 8)
Toluene
(Appendix E item 9)
Adhesive
(Appendix E item 10)
Lubricating Oil
(Appendix E item 14)
Gasket
(Appendix F item 21)
Gasket
(Appendix F item 22)
Gasket
(Appendix F item 23)
Gasket
(Appendix F item 24)

General Safety Instructions

WARNING

Toluene is flammable, and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well-ventilated area, and keep away from sparks or flame. Use goggles, gloves and apron when appropriate.

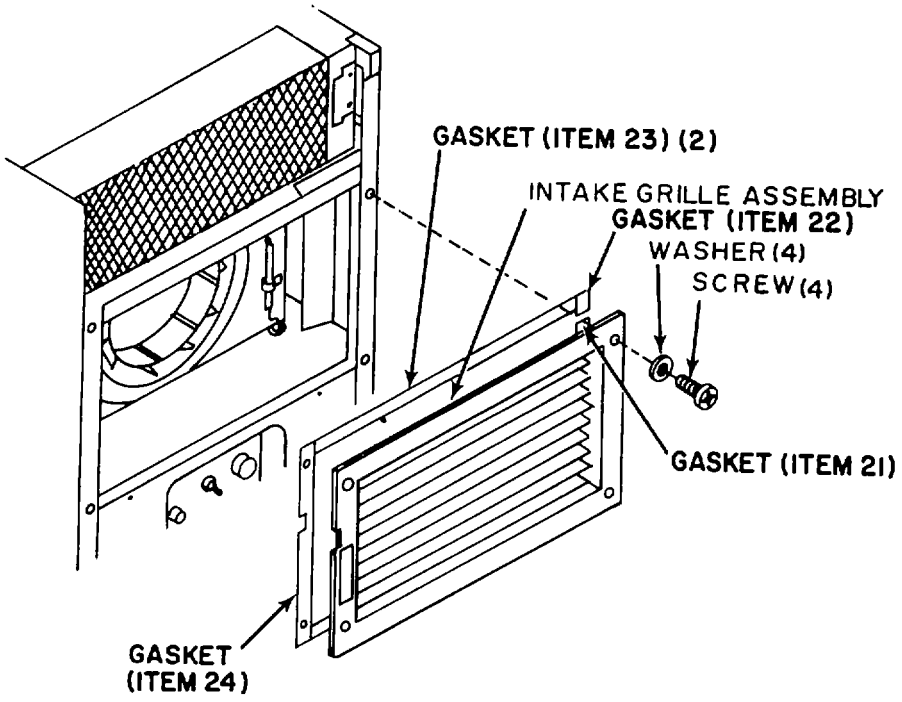


Figure 4-14. Evaporator Air Intake Grille Assembly

Removal

Remove screws, washers and intake grille assembly.

Cleaning

Wipe with rags or vacuum all dust and dirt off louvers and inside of grille. Be careful to not damage gasket strips.

Inspection

(1) Inspect each grille for general condition and proper operation.

(2) Bent louvers can usually be straightened with fingers.

(3) Check that gaskets are not torn, loose, or missing. Replace gaskets if damaged.

(4) Check that information plate is readable and in place.

Lubrication

(1) Apply a few drops of light oil to all pivot points of the louvers.

(2) Wipe or blot up all excess oil with a cloth or paper towel.

Repair

(1) Remove as much old gasket material as possible, by pulling or scraping away from the metal surface.

(2) Soften and remove old adhesive and gasket residue, using toluene and a stiff brush.

(3) Cut replacement gasket to size per dimensions in Appendix F.

(4) Be sure that the surface to which the gasket is to be applied is clean and free of old adhesive material.

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

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

Installation

Secure grille with four screws and washers.

4-23. CONDITIONED AIR FILTER

This task covers:

a. Removal
b. Cleaning
c. Inspection
d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Detergent
(Appendix E item 2)

Equipment Conditions:
Intake Grille Assembly Removed (para 4-22)

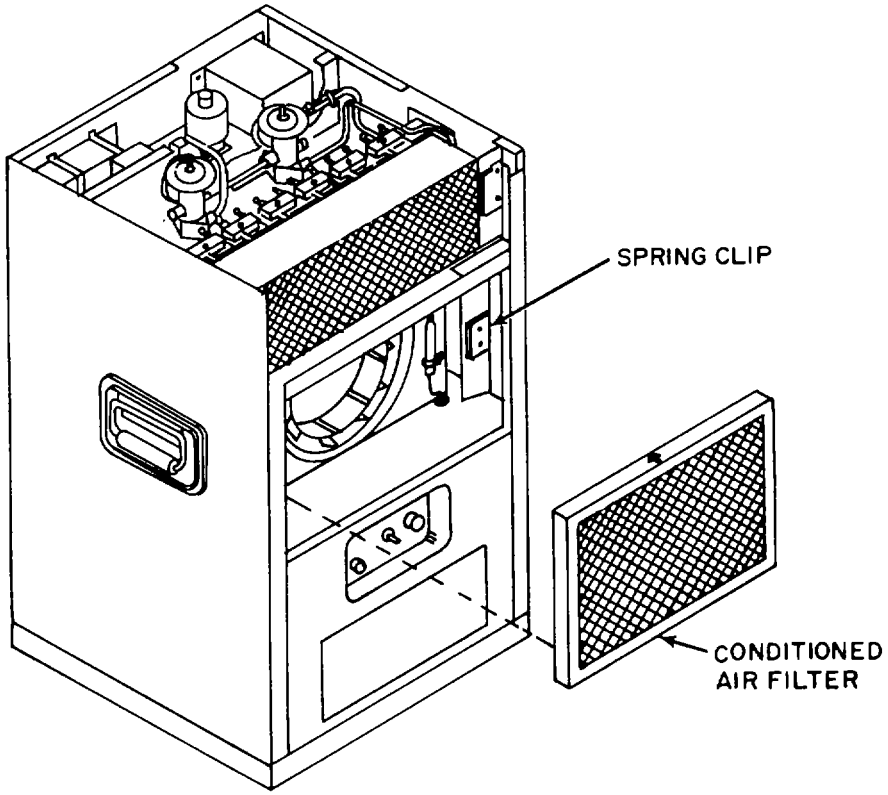


Figure 4-15. Conditioned Air Filter

Removal

(1) Snap filter out of spring clip.

(2) Carefully remove filter.

Cleaning

(1) Wash filter in a mild detergent and water solution.

(2) Rinse thoroughly in clean water.

(3) Shake out excess water prior to installation.

Inspection

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

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

(3) Replace damaged filter.

Installation

NOTE

Be sure air flow arrow points to evaporator fan as shown in figure 4-21.

(1) Position left side of filter in bracket.

(2) Carefully push right side of filter to engage spring clip.

Follow-on procedure: Install intake grille assembly (para 4-22)

4-24. MIST ELIMINATOR

This task covers:

a. Removal
b. Cleaning
c. Inspection
d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Detergent
(Appendix E item 2)

Equipment Conditions:
Top Panel Removed (para 4-16)
Evaporator Discharge Grille Removed (para 4-21)

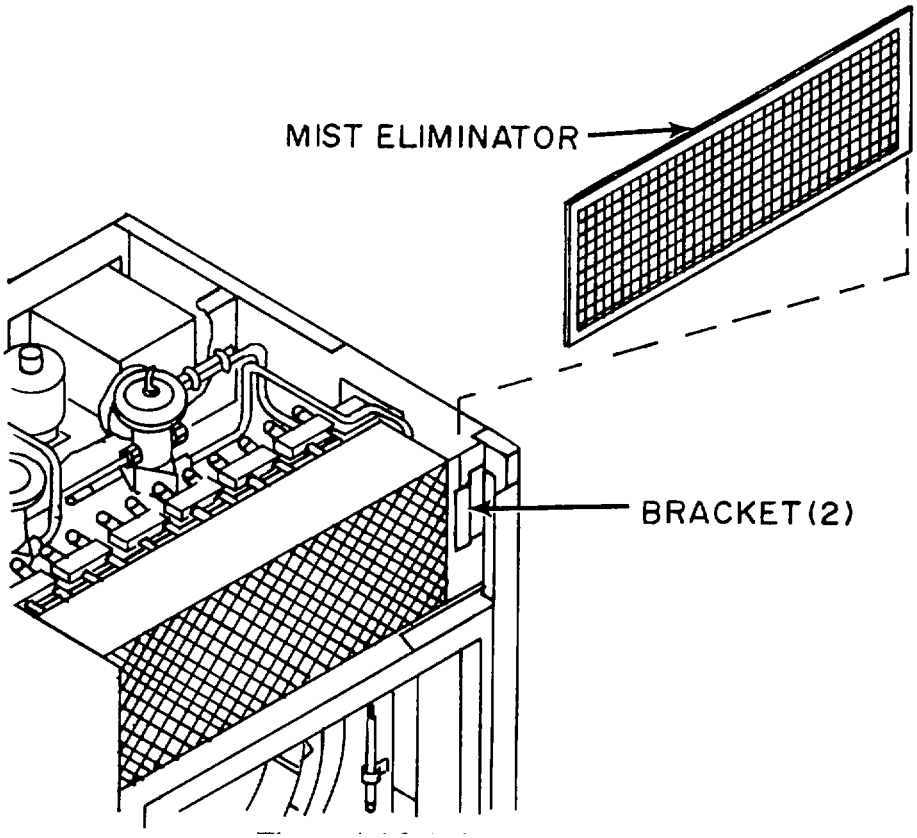


Figure 4-16. Mist Eliminator

Removal

Lift mist eliminator straight up and out of brackets.

Cleaning

(1) Wash in mild detergent and water solution.

(2) Rinse thoroughly in clear water.

(3) Shake out excess water prior to installation.

Inspection

(1) Check for punctures, cuts, and other visible damage.

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

(3) Replace if defective.

Installation

Slide mist eliminator straight down into brackets.

Follow-on procedure:

(1) Install discharge grille. (See para 4-21.)

(2) Install top panel. (See para 4-16.)

4-25. CONDENSATE TRAPS AND DRAIN HOSE

This task covers:

a. Cleaning
b. Removal
c. Disassembly
d. Inspection
e. Assembly
f. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Equipment Conditions:
Discharge Grille Removed (para 4-21)
Junction Box Removed (para 4-32)

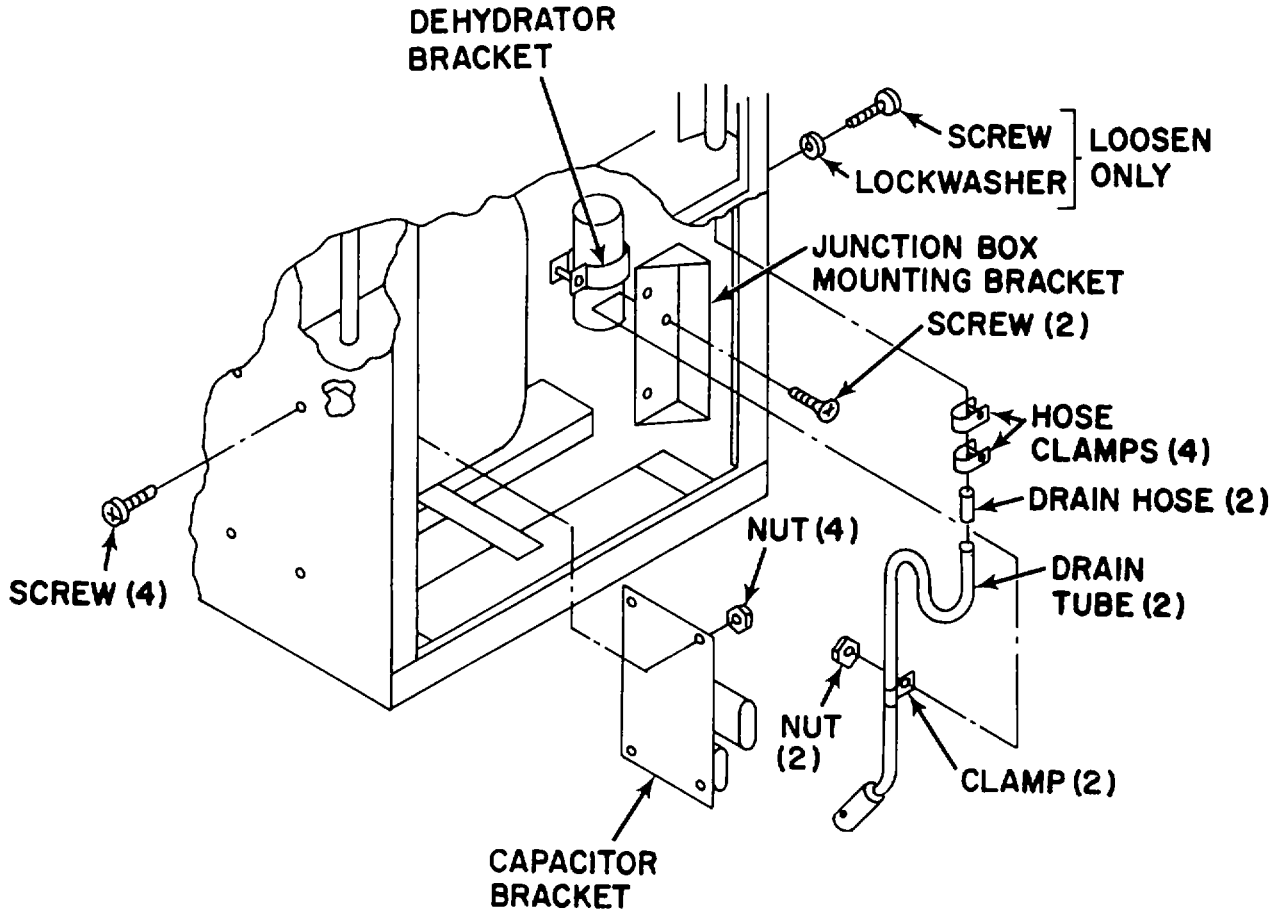


Figure 4-17. Drain Hose Removal

Cleaning

(1) Pour some clean fresh water into condensate drip pan.

(2) If water does not flow out of the ends of the drain tubes or has a muddy appearance, insert a flexible wire up the drain tube. Agitate until clog and accumulated debris are loose.

(3) Pour additional water in the drip pan until an unrestricted flow of clean water pours from the ends of the drain tubes.

(4) Be sure the springs, balls, and ball seats (end of drains where balls and springs are inserted) are clean.

Removal

(1) For left drain, remove four screws, four lockwashers and capacitor bracket.

(2) For right drain, loosen dehydrator bracket on right side of unit.

(3) Remove nut, clamp and screw in lower drain tube and junction box mounting bracket.

(4) Loosen two hose clamps on drain hoses.

(3) Slip drain tubes down and off of drain hoses.

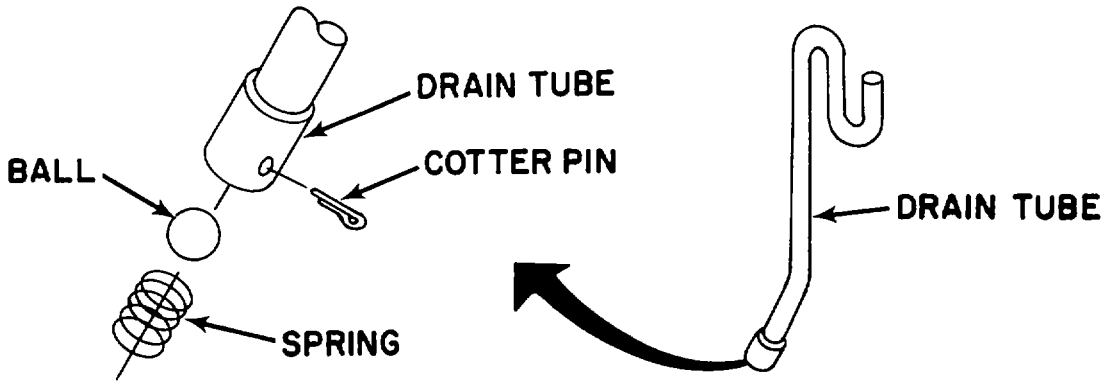


Figure 4-18. Drain Tube Disassembly

Disassembly

(1) Remove cotter pins.

(2) Remove springs and balls from drain tube ends.

Inspection

(1) Check balls, springs, and cotter pins for nicks and wear.

(2) Replace balls if they are nicked or have any damage that would keep them from sealing properly.

(3) Replace springs if they are worn or have any damage that would keep them from applying pressure to balls.

Assembly

(1) Insert balls and springs. Be sure that balls are above springs.

(2) Depress springs with screwdriver far enough to install cotter pins.

(3) Secure cotter pins.

Installation

(1) Slip drain tubes up and in place on casing drain hoses.

(2) Secure clamps.

(3) Secure screw, nut and clamp in lower tube and junction box mounting bracket.

(4) Replace capacitor bracket (left drain removal) and secure with four screws and nuts

(5) Tighten screw and lockwasher on dehydrator bracket (right drain removal).

Follow-on procedure:

(1) Install junction box. (See para 4-32.)

(2) Install discharge grille. (See para 4-21.)

4-26. CONTROL PANEL

This task covers:

a. Removal
b. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Sealant
(Appendix E item 15)

Equipment Conditions:
Air Filter Removed (para 4-23)
Junction Box Removed (para 4-32)

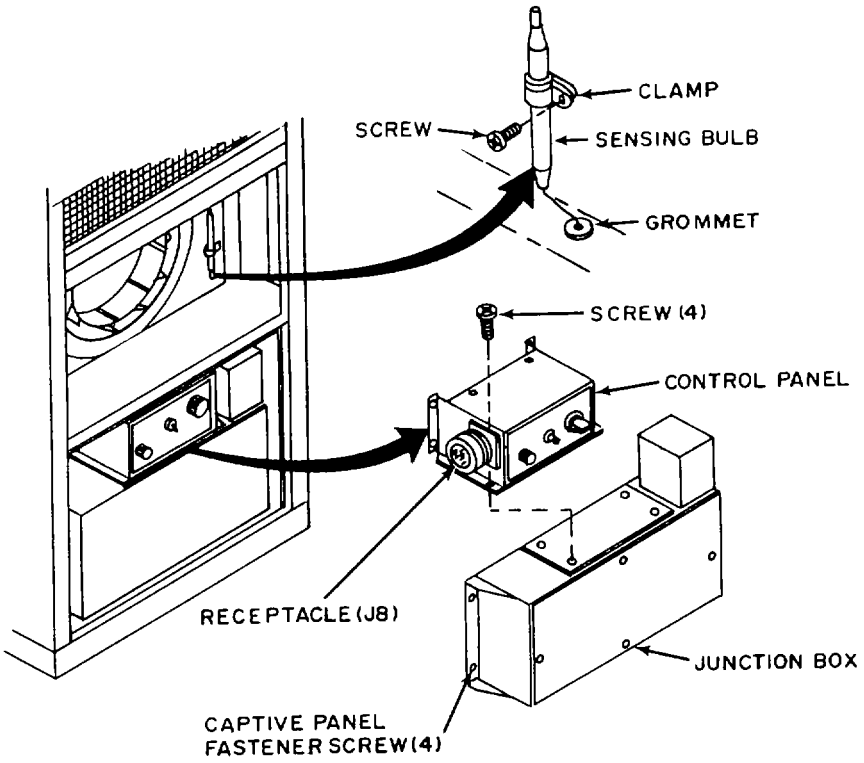


Figure 4-19. Control Panel

Removal

(1) Remove screw and clamp from remote sensing bulb.

(2) Remove grommet from bulkhead.

CAUTION

Take care that sensing bulb capillary line is not kinked and that bulb and capillary are not cut or damaged when removing.

(3) Carefully slip remote sensing bulb down through bulkhead.

(4) Remove four screws that secure control panel to junction box and remove control panel.

Installation

(1) Secure control panel to junction box with four screws.

CAUTION

Take care that sensing bulb capillary line is not kinked and that bulb and capillary are not cut or damaged during installation

(2) Carefully feed sensing bulb and capillary up and into conditioned air intake compartment.

(3) Secure remote sensing bulb with clamp and screw.

(4) Install grommet in bulkhead.

(5) Secure capillary tube and grommet in panel with sealant.

(6) Coil excess capillary tubing in recess behind control panel.

Follow-on procedures:

(1) Install junction box. (See para 4-32.)

(2) Install air filter. (See para 4-23.)

4-27. MODE SELECTOR (ROTARY) SWITCH (S)

This task covers:

a. Inspection
b. Test
c. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Locknuts
(Appendix E item 16)

Equipment Conditions;
Control Panel Removed (para 4-26)

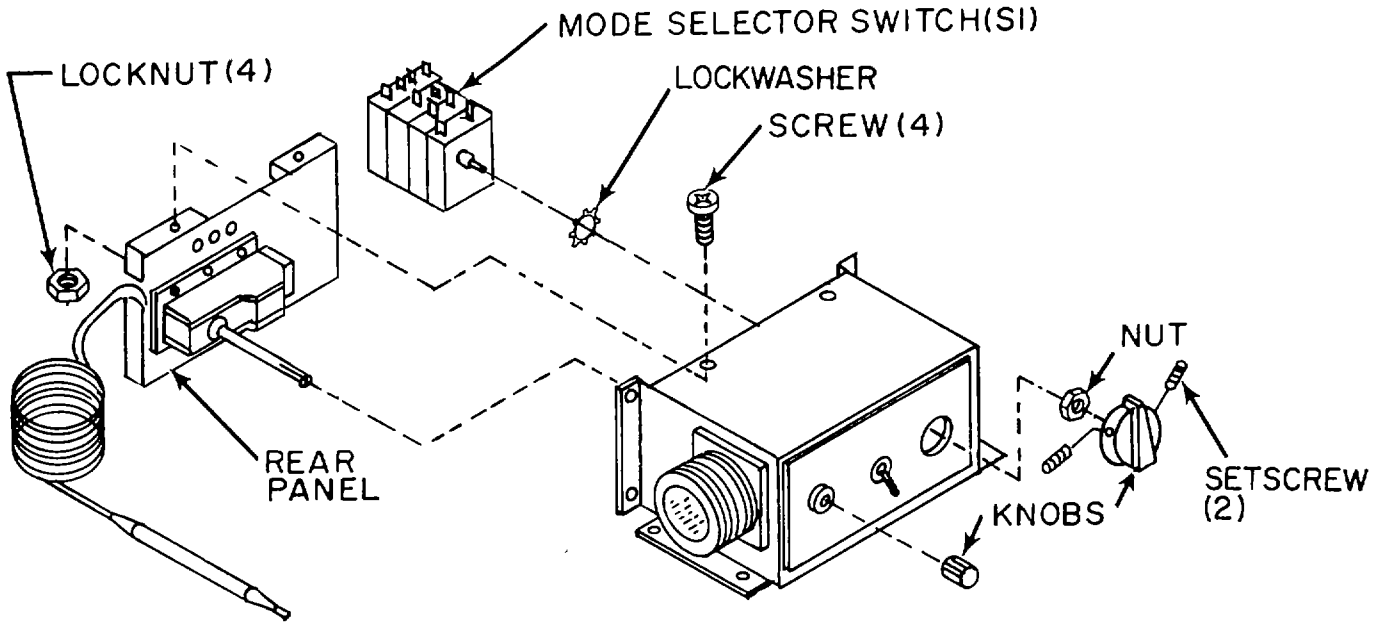


Figure 4-20. Mode Selector (Rotary) Switch (S)

Inspection

(1) Loosen setscrews in both knobs and remove knobs.

(2) Remove four screws and locknuts that secure rear panel.

(3) Pull rear panel away from box as far as harness will allow.

(4) While holding rear of mode selector switch, remove nut, lockwasher and switch.

(5) Check switch to see that all leads are properly connected. (See wiring diagram, fig. 4-43).

(6) Repair or replace all loose or broken leads.

(7) Check that switch terminals are not loose or broken.

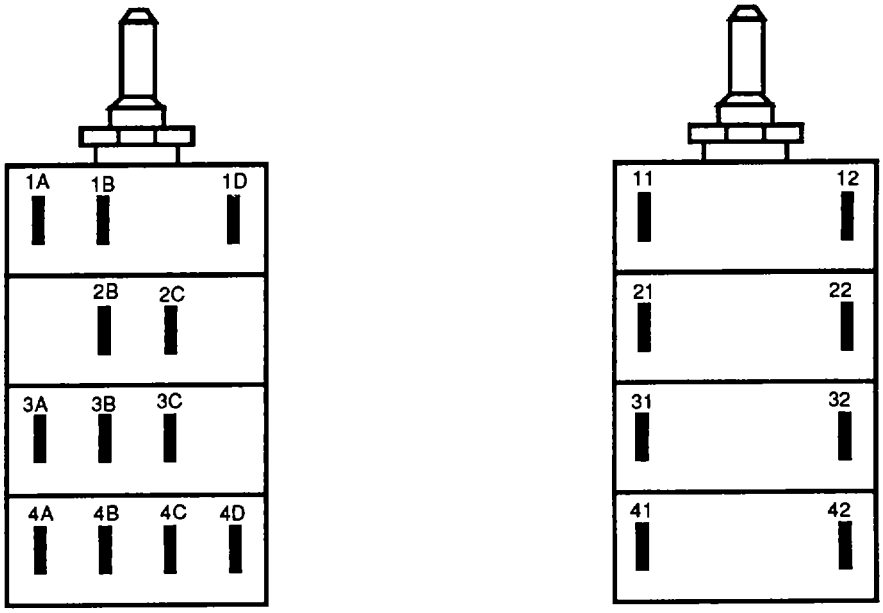
(8) Check switch for evidence of overheating or other visible damage.

(9) Replace switch if damaged.

Test

(1) Using multimeter and switch position chart shown on figure 4-21, check continuity at contacts indicated. With switch position closed, continuity should be indicated. With switch position open no continuity should be indicated. Check between each set of contacts and at each switch position.

(2) Replace switch if it fails above test.



SELECTOR SWITCH POSITION	SWITCH FUNCTION	SWITCH WAFERS AND TERMINALS CONNECTED			
		A	B	C	D
1	HI-HEAT	12 AND 1A	21 AND 2C 22 AND 2B	31 AND 3C 32 AND3A	41 AND 4C 42 AND4A
2	LO-HEAT	12AND1A	21 AND 2C 22 AND 2B	31 AND 3C	
3	OFF				
4	VENT		21 AND 2C 22 AND 2B	31 AND 3C	
5	COOL	12 AND 1B 11 AND 1D	21AND 2C 22 AND 2B	31AND 3C 32 AND 3B	41 AND 4D 42 AND 4B

Figure 4-21. Switch Position and Terminal Location

Replacement

(1) Tag and disconnect wire leads.

(2) Remove switch.

(3) See tags and wiring diagram and connect leads. (See fig. 4-7.)

(4) Remove tags.

(5) Slip lockwasher onto switch shaft.

(6) Slip switch into control box and place shaft through hole.

(7) While holding backside of switch, secure switch to box with nut. Be sure that switch positions match front plate.

(8) Insert rear panel into box and aline holes.

(9) Secure rear panel with four screws and locknuts.

(10) Place knobs on switch shafts and aline setscrews with flats on shafts.

(11) Tighten setscrews in both knobs.

Follow-on procedure: Install control panel. (See para 4-26.)

4-28. TEMPERATURE CONTROL THERMOSTAT (S1)

This task covers:

a. Inspection
b. Test
c. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Adhesive
(Appendix E item 10)
Locknuts
(Appendix E item 16)

Equipment Conditions:
Control Panel Removed (para 4-26)

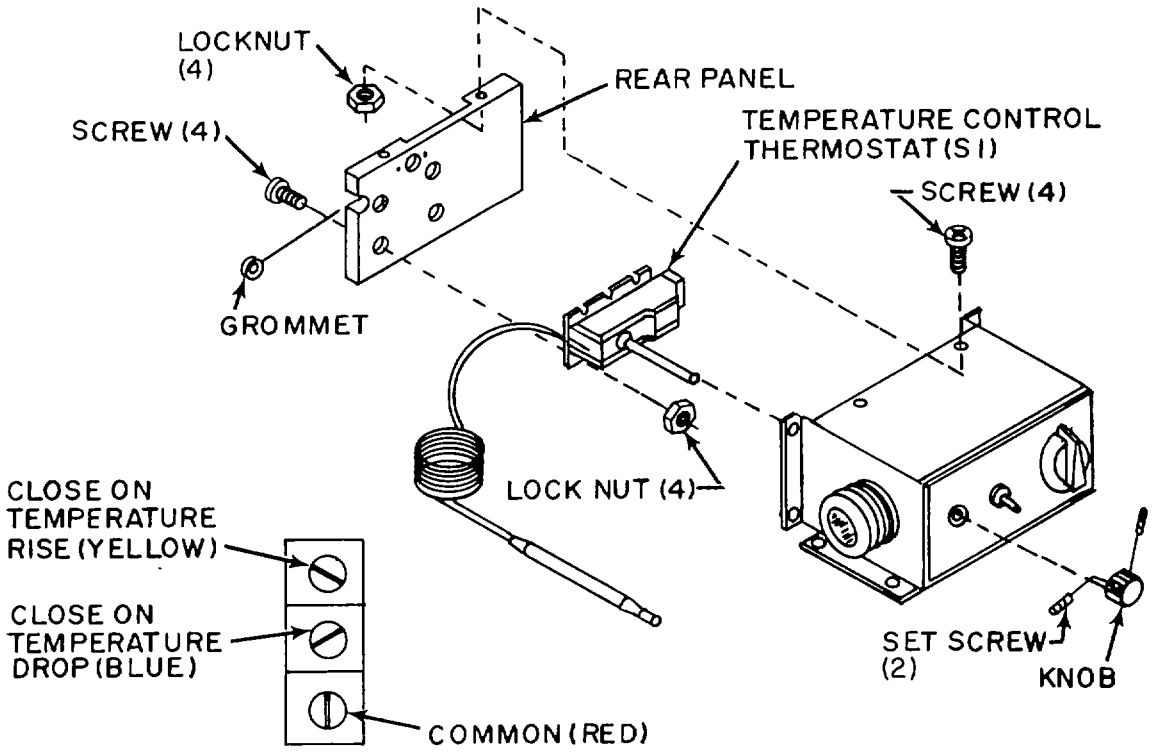


Figure 4-22. Temperature Control Thermostat (S1)

Inspection

(1) Loosen TEMPerature control thermostat knob setscrews and remove knob.

(2) Remove four screws and locknuts that secure rear panel.

CAUTION

Take care that sensing bulb capillary line is not kinked and that bulb and capillary are not cut or damaged during removal

(3) Pull rear panel away from box as far as harness will allow.

(4) Check that leads are properly connected. (See wiring diagram, fig. 4-43.)

(5) Check that capillary line and sensing bulb are not damaged.

(6) Check TEMPerature control thermostat for signs of overheating or other obvious damage. Replace if damaged.

Test

(1) Using multimeter, place probes on the red and blue terminals.

(2) Turn TEMPerature control thermostat shaft fully counterclockwise.

(3) Check continuity. If temperature at sensing bulb is above 40°F (50C), there should be no continuity.

(4) Slowly turn shaft clockwise until continuity is indicated. Turn shaft back and forth slightly to check that switch contacts open and close on a very narrow band.

(5) Place multimeter probes on the red and yellow terminals.

(6) Turn TEMPerature control thermostat shaft fully clockwise.

(7) Check continuity. If temperature at sensing bulb is below 90°F (320C) there should be no continuity.

(8) Slowly turn shaft counterclockwise until continuity is indicated. Turn shaft back and forth slightly to check that switch contacts open and close on a very narrow band.

(9) Replace TEMPerature control thermostat if it fails any of the above tests.

Replacement

(1) Tag and disconnect wires.

CAUTION

Take care that sensing bulb capillary line is not kinked and that bulb and capillary are not cut or damaged during installation

(2) Remove four screws, locknuts and TEMPerature control thermostat.

(3) Secure TEMPerature control thermostat to rear panel with four screws and locknuts.

(4) Place capillary line through notch and split grommet in rear panel.

(5) Secure capillary tube and grommet in panel with adhesive.

(6) See tags and wiring diagram (fig. 4-43) and connect leads.

(7) Insert rear panel into box and aline holes.

CAUTION

Be sure no internal wiring interferes with shaft rotation

(8) Secure rear panel with four screws and locknuts.

(9) Place TEMPerature control thermostat knob on shaft and aline setscrews with flat on shaft.

(10) Tighten setscrews.

Follow-on procedure: Install control panel. (See para 4-26.)

4-29. TWO-SPEED FAN (TOGGLE) SWITCH (S7)

This task covers:

a. Inspection
b. Test
c. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Locknuts
(Appendix E item 16)

Equipment Conditions:
Control Panel Removed (para 4-26)

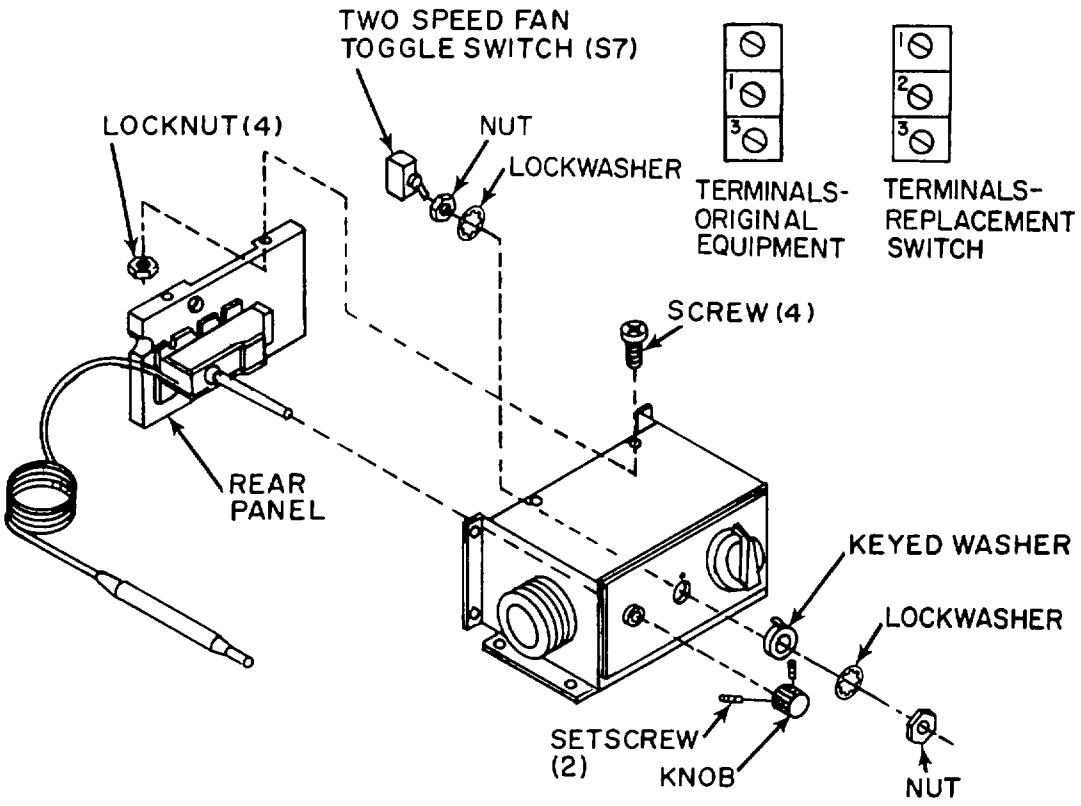


Figure 4-23. Two-Speed Fan (Toggle) Switch

Inspection

(1) Loosen setscrews and remove thermostat knob.

(2) Remove four screws and locknuts that secure panel.

(3) Pull rear panel away from box as far as harness will allow.

(4) While holding rear of switch, remove nut, lockwasher and keyed washer from threaded shaft.

(5) Check switch to see that the leads are properly connected (see wiring diagram fig. 4-43).

(6) Tag and disconnect wire leads.

(7) Repair or replace loose or broken leads.

(8) Check that switch terminals are not loose, broken, or corroded.

(9) Check switch for evidence of overheating or other visible damage.

(10) Replace switch if damaged.

Test

(1) Using multimeter, place probes on terminals 1 (center) and 3 (bottom).

(2) Place switch in up position (HI SPEED). Continuity should be indicated.

(3) Place switch in down position (LO SPEED). No continuity should be indicated.

(4) If the switch fails any of the above tests, replace switch.

Replacement

NOTE

Fan speed switch provided as original equipment has center terminal marked "1" and bottom marked "3". Replacement switch may have numbers cast in body different than original. Be sure to wire between center and bottom terminals.

(1) Install nut and lockwasher onto switch shaft.

(2) Install switch in control panel.

(3) Slip keyed locking ring on threaded shaft and align with hole in control panel.

(4) While holding rear of switch, secure with lockwasher and nut.

(5) Install wire leads and remove tags.

(6) Insert rear panel and aline holes.

(7) Using screwdriver and wrench, secure rear panel with four screws and locknuts.

(8) Place knob on thermostat switch shaft and secure all setscrews.

Follow-on procedure: Install control panel. (See para 4-26.)

4-30. WIRING HARNESS, CONTROL PANEL

This task covers:

a. Inspection
b. Removal
c. Installation
b. Test
d. Repair

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Locknuts
(Appendix E item 16)
Locknuts
(Appendix E item 17)

Equipment Conditions:
Mode Selector Switch Removed (para 4-27)

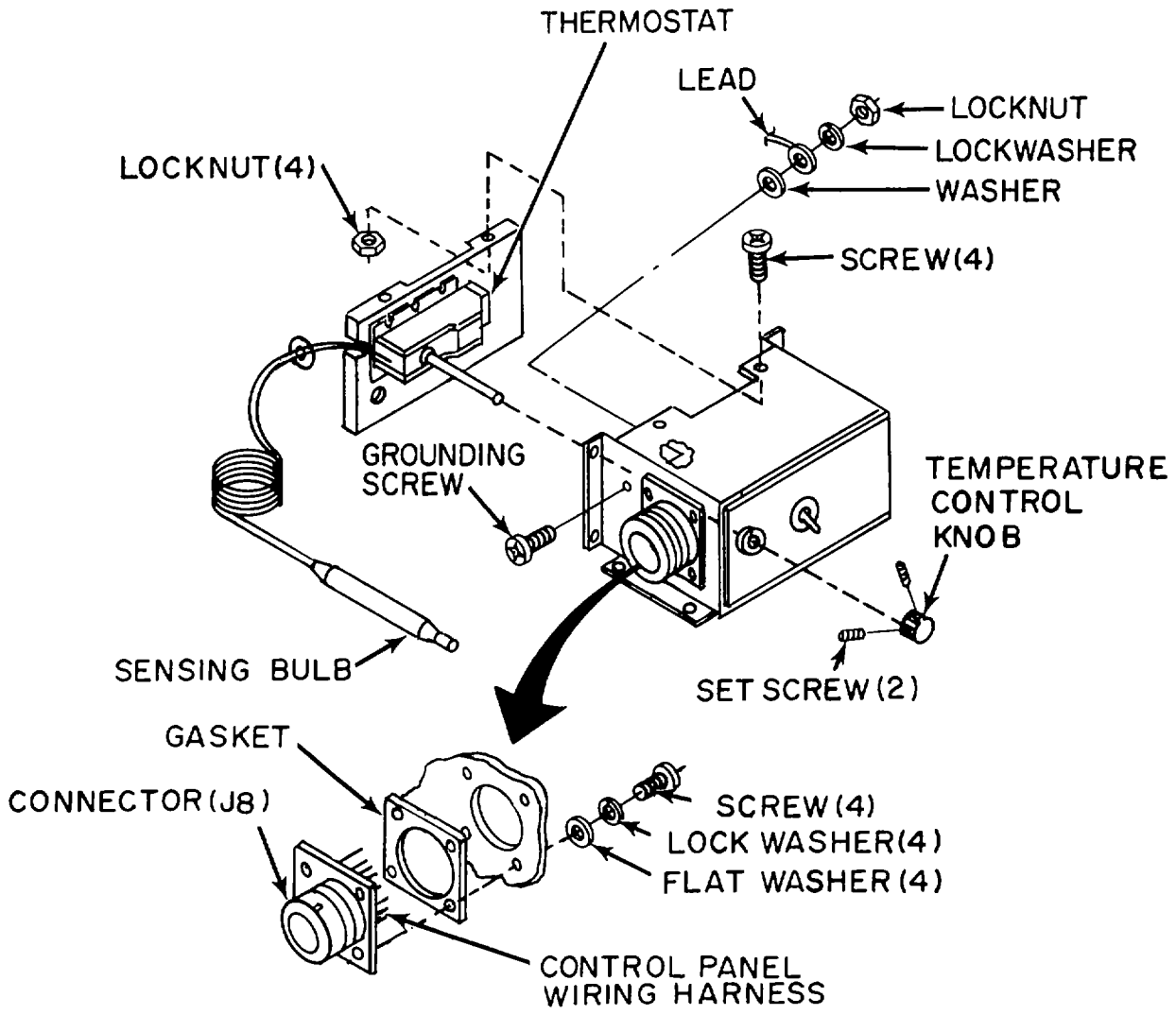


Figure 4-24. Wiring Harness, Control Panel

Inspection

(1) heck connector for general condition and loose, broken, or missing contacts. Replace connector if damaged.

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

Test

See wiring diagram (fig. 4-43) and continuity test individual wires. Repair or replace wires with no continuity.

Removal

(1) Remove four screws, washers, and lockwashers from J8 connector.

(2) Remove locknut, lockwasher, and flat washer from grounding screw.

(3) Tag and disconnect leads from switches.

(4) Remove harness.

(5) Remove gasket behind J8. Check for tears.

Repair

(1) See paragraph 4-47 for general wire repair instructions.

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

Installation

(1) Install harness and gasket.

(2) Secure connector J8 (keeping keyway pointing upward) and gasket to box with four screws, washers, and lockwashers.

(3) Secure ground wire to grounding screw with flat washer, lockwasher, and locknut.

(4) See tags and wiring diagram (fig. 4-43) and reconnect leads.

(5) Remove tags.

(6) Install mode selector switch (See para 4-27).

(7) Insert rear panel into box and aline holes.

(8) Secure rear panel with four screws and locknuts.

(9) Place TEMPerature control thermostat knob on shaft and tighten setscrews.

Follow-on procedure: Install control panel. (See para 4-26.)

4-31. CONTROL PANEL HOUSING

This task covers: a. Inspection
b. Repair

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Apron
(Appendix E item 5)
Respirator
(Appendix E item 6)
Goggles
(Appendix E item 7)
Gloves, Protective
(Appendix E item 8)
Toluene
(Appendix E item 9)
Adhesive
(Appendix E item 10)
Locknuts
(Appendix E item 16)
Insulation
(Appendix F item 25)

Equipment Conditions:
Temperature Control Thermostat Removed (para 4-28)
Fan Speed Switch Removed (para 4-29)
Control Panel Harness Removed (para 4-30)

General Safety Instructions

WARNING

Toluene is flammable, and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well-ventilated area, and keep away from sparks or flame. Use goggles, gloves and apron when appropriate.

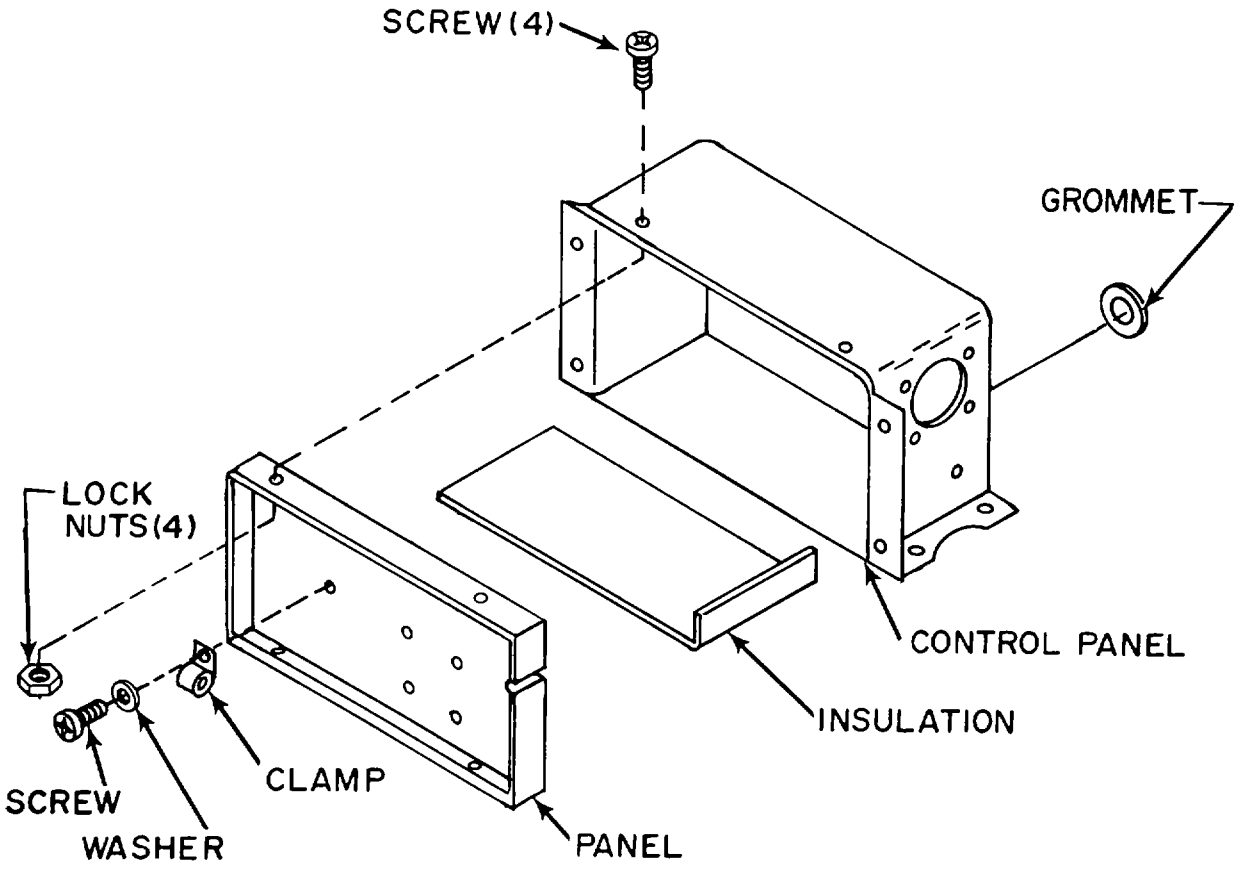


Figure 4-25. Control Panel Housing

Inspection

(1) Check control panel for dents, cracks, or punctures. Replace if damage creates a hazard or interferes with operation.

(2) Check that insulation, clamp, and grommet are in place and secure. Repair or replace as needed.

(3) Check panels for cracks or dents that create a hazard or interfere with operation.

Repair

(1) Tighten mounting hardware.

(2) Remove as much old insulation material as possible, by pulling or scraping away from the metal surface.

(3) Soften and remove old adhesive and insulation residue, using toluene and a stiff brush.

(4) Cut replacement insulation to size per dimensions in Appendix F.

(5) Be sure that the surface to which the insulation is to be applied is clean and free of old adhesive material.

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

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

Follow-on procedures:

(1) Install control panel wiring harness. (See para 4-30.)

(2) Install two-speed fan switch. (See para 4-29.)

(3) Install temperature control thermostat. (See para 4-28.)

4-32. JUNCTION BOX

This task covers: a. Removal
b. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Locknuts
(Appendix E item 18)

Equipment Conditions:
Power Cord Disconnected
Lower Panel Removed (para 4-17)

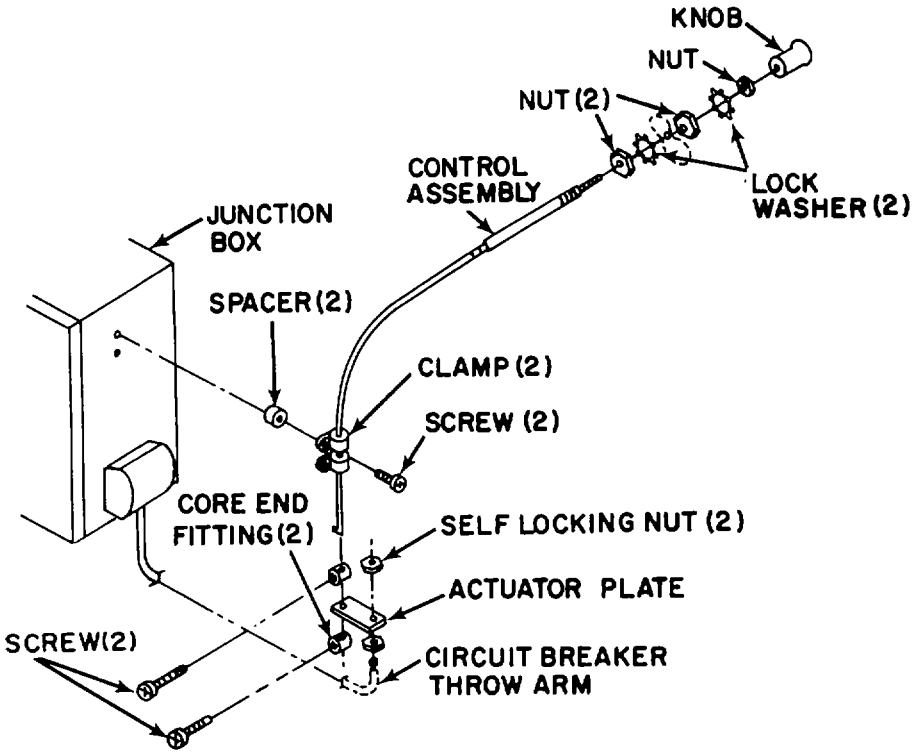


Figure 4-26. Circuit Breaker External Reset Control

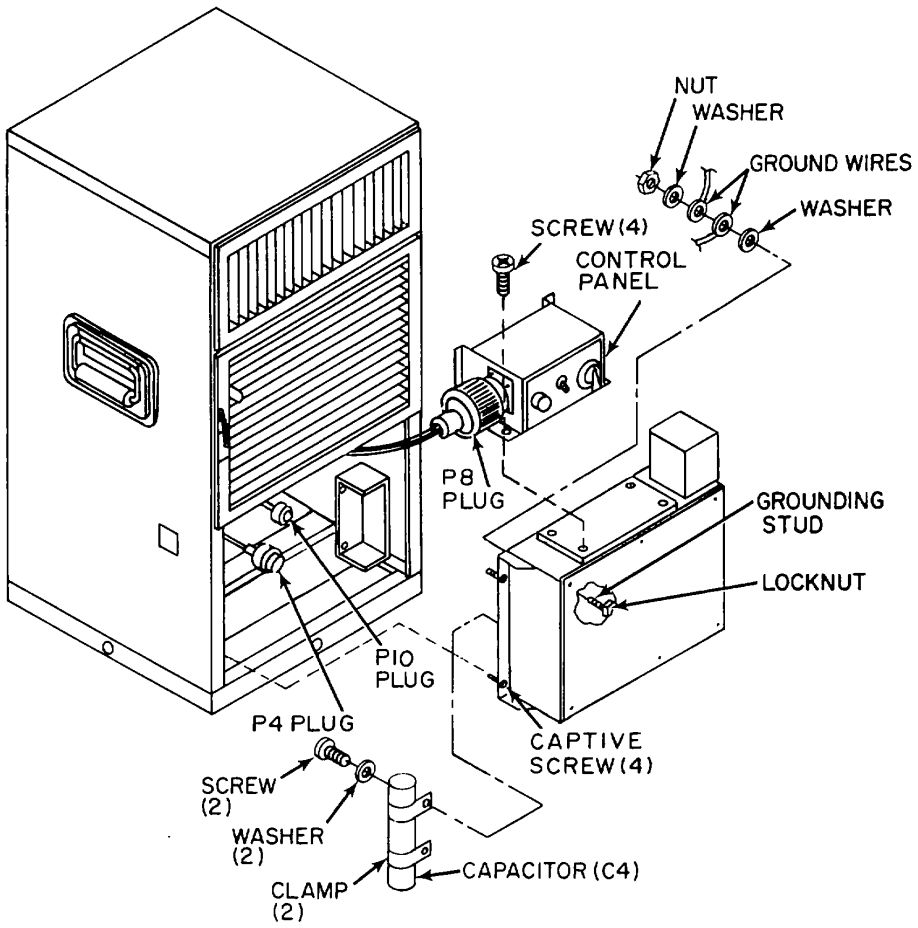


Figure 4-27. Junction Box Removal/Installation

Removal

(1) Place circuit breaker actuator arm in up position.

(2) Unscrew four captive screws from flanges of junction box.

(3) Carefully slide junction box outward.

(4) Loosen screw in lower end fitting of circuit breaker control cable.

(5) Remove two screws from clamps.

(6) Slide actuator cable up and out.

(7) Extend junction box out far enough to remove plugs P4, P8 and P10.

(8) Remove four screws at flanges of control panel.

(9) Support control panel so that capillary line and electrical harness will not be damaged.

(10) Tag and remove ground wires.

(11) Secure lower locknut, then remove nut, wires, and two washers from grounding stud E2.

(12) Remove two screws, flat washers, clamps and capacitor C4.

(13) Remove junction box.

Installation

(1) Mount and secure control panel to junction box with four screws.

(2) Slide capacitor C4 into two mounting clamps on junction box.

(3) Tighten two screws on two capacitor mounting clamps.

(4) Place junction box far enough in unit to attach ground wires.

(5) Secure ground wires on grounding stud with two washers and locknut.

(6) Secure junction box cover to junction box with four panel fastener screws.

(7) Position loop clamps on cable assembly.

(8) Install lower end fitting on cable as shown in figure 4-26.

(9) Secure loop clamps to junction box.

(10) Connect electrical plugs P4, P8 and P10.

(11) Position junction box in unit.

(12) Secure four panel fastener screws in flanges of junction box.

Follow-on procedure:

(1) Install lower panel. (See para 4-17.)

(2) Connect power cord.

4-33. RECTIFIER (CR)

This task covers:
a. Inspection
b. Test
c. Removal
d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Equipment Conditions:
Junction Box Removed (para 4-32)

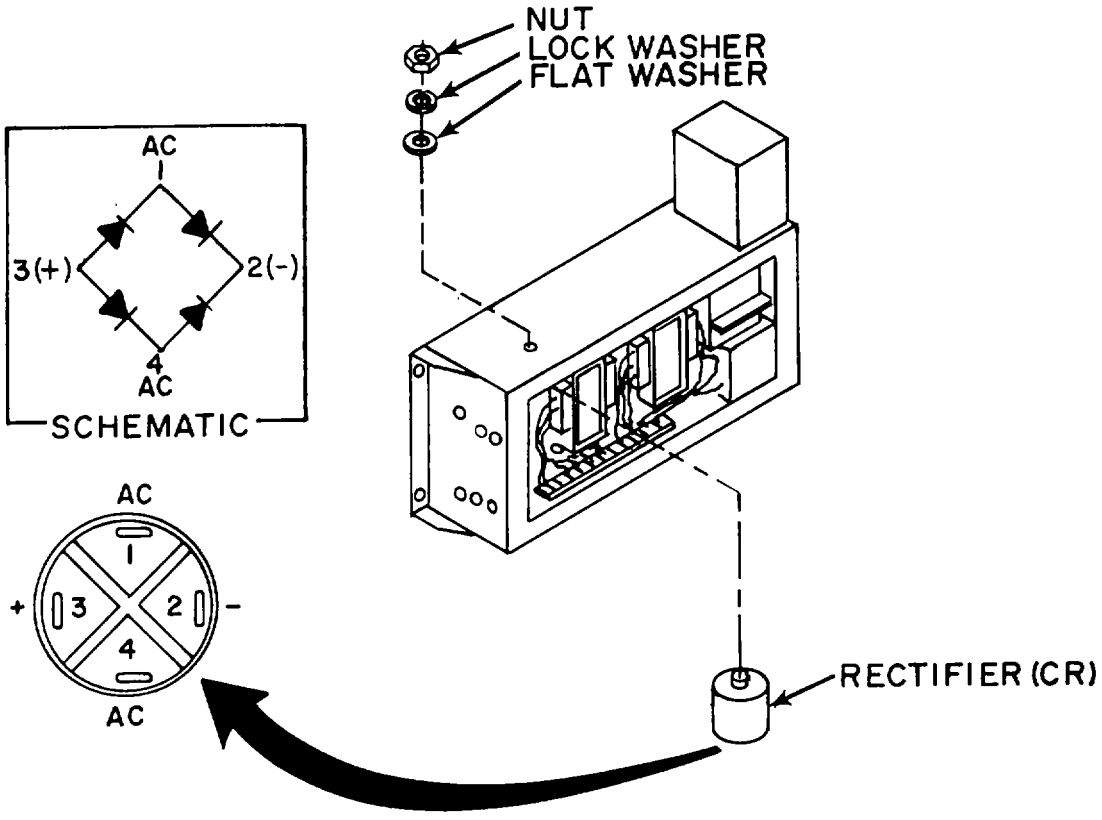


Figure 4-28. Rectifier (CR)

Inspection

(1) Loosen four captive panel fastener screws and remove junction box cover.

(2) Check that wire leads are properly connected to rectifier and are not damaged. See wiring diagram (fig. 4-43).

Test

(1) Tag and remove rectifier leads.

(2) Use a multimeter set on the lowest OHMS scale to test for continuity between each of the four rectifier terminals and mounting plate. If continuity is found between any rectifier terminal and mounting plate, replace rectifier.

(3) Using a multimeter, test each diode in the forward and reverse directions.

(4) Replace if defective.

Removal

(1) Tag and remove rectifier leads.

(2) Remove nut, lockwasher, and flat washer from rectifier stud.

(3) Remove rectifier.

Installation

(1) Insert rectifier mounting stud through hole in component mounting panel and secure with nut, lockwasher, and flat washer.

(2) Replace leads.

(3) Remove tags.

(4) Secure junction box cover with four captive panel fastener screws.

Follow-on procedure: Install junction box. (See para 4-32.)

4-34. CIRCUIT BREAKER EXTERNAL RESET CONTROL

This task covers:
a. Inspection
b. Adjustment
c. Repair

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Lockwashers
(Appendix E item 19)

Equipment Conditions:
Lower Panel Removed (para 4-17)

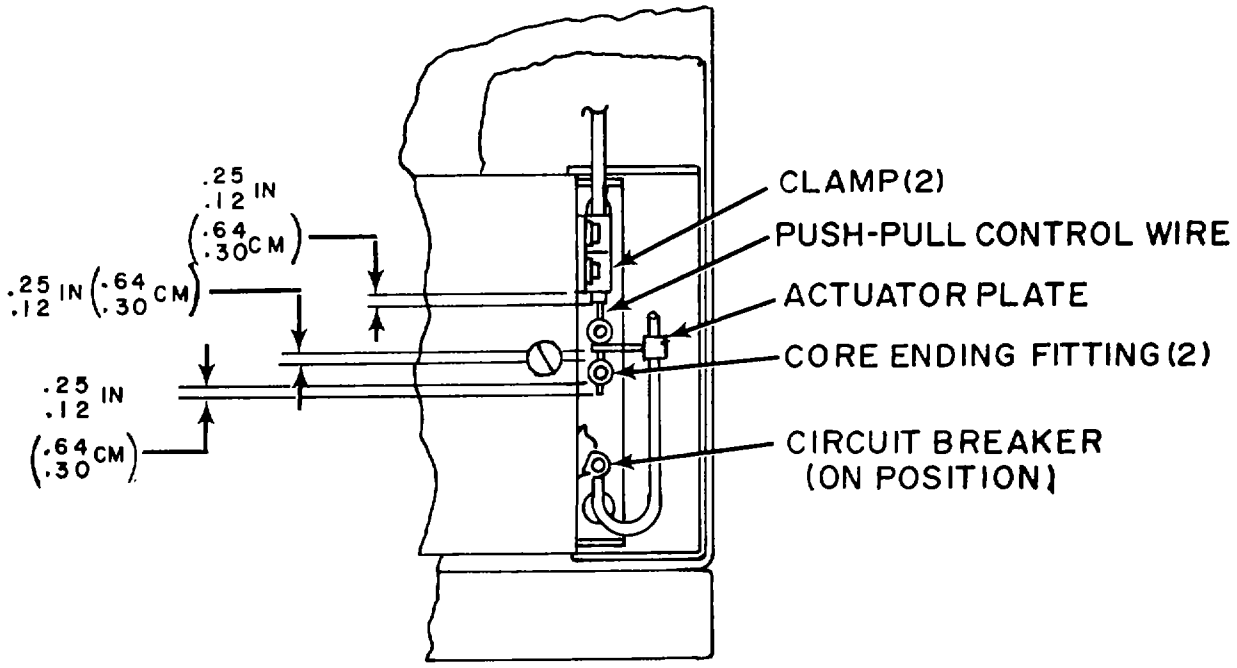


Figure 4-29. Circuit Breaker External Reset Control

Inspection

(1) Check that parts are in place and that wires move freely in cable.

(2) Check that all screws in clamps and end fittings are tight.

Adjustment

(1) Move circuit breaker to "ON" position.

(2) Loosen two clamp screws.

(3) Push and hold knob in rear of panel all the way in and hold it before making adjustment.

NOTE

Knob must be held in. Adjustment is critical

(4) Position sleeve end .12 to .25 inches below bottom clamp.

NOTE

Actuator arm must be vertical while adjusting.

(5) Position bottom end core fitting .12 to .25 inches below actuator plate.

(6) Position top core end fitting flush with actuator plate.

(7) Move circuit breaker to "OFF" position. Be sure actuator plate does not touch sleeve end.

Repair

(1) Remove knob, lockwasher and nut from cable.

(2) Remove two screws, washers, and clamps.'

(3) Loosen two screws and remove two core end fittings.

(4) Remove two nuts and actuator plate from actuator arm.

(5) Remove shaft and actuator arm from circuit breaker.

(6) Install shaft and actuator arm in circuit breaker.

(7) Secure actuator arm to actuator plate with two nuts.

(8) Attach two core end fittings and tighten screws.

(9) Secure two clamps with two screws and washers.

(10) Secure cable to rear panel with lockwasher and nut and install knob.

(11) Perform adjustment procedure

Follow-on procedure: Install lower panel. (See para 4-17.)

4-35. COMPRESSOR CIRCUIT BREAKER (CB)

This task covers: a. Inspection b. Test c. Removal d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Lockwashers
(Appendix E item 20)

Equipment Conditions
Junction Box Removed (para 4-32)

Inspection

(1) Loosen four panel fastener screws and junction box cover.

(2) Check that mounting hardware, circuit breaker cover, actuator arm, and circuit breaker are in place and secure.

(3) Check that wire leads are properly connected to circuit breaker and are not damaged. See wiring diagram (fig. 4-43).

(4) Check circuit breaker for signs of overheating or other visible damage. Replace if damaged.

Test

(1) Set circuit breaker to OFF.

(2) Use multimeter set on lowest OHMS scale to check continuity between terminals A1 and A2, B1 and B2, and auxiliary switch terminals C and NO. All contacts should be open. If there is continuity on any check, replace circuit breaker.

(3) Set reset bar to OFF, then set it to ON.

(4) Use a multimeter set on the lowest OHMS scale and repeat continuity checks between terminals A1 and A2, B1 and B2, and auxiliary switch terminals C and NO. All contacts should be closed. If there is no continuity on any check, replace circuit breaker.

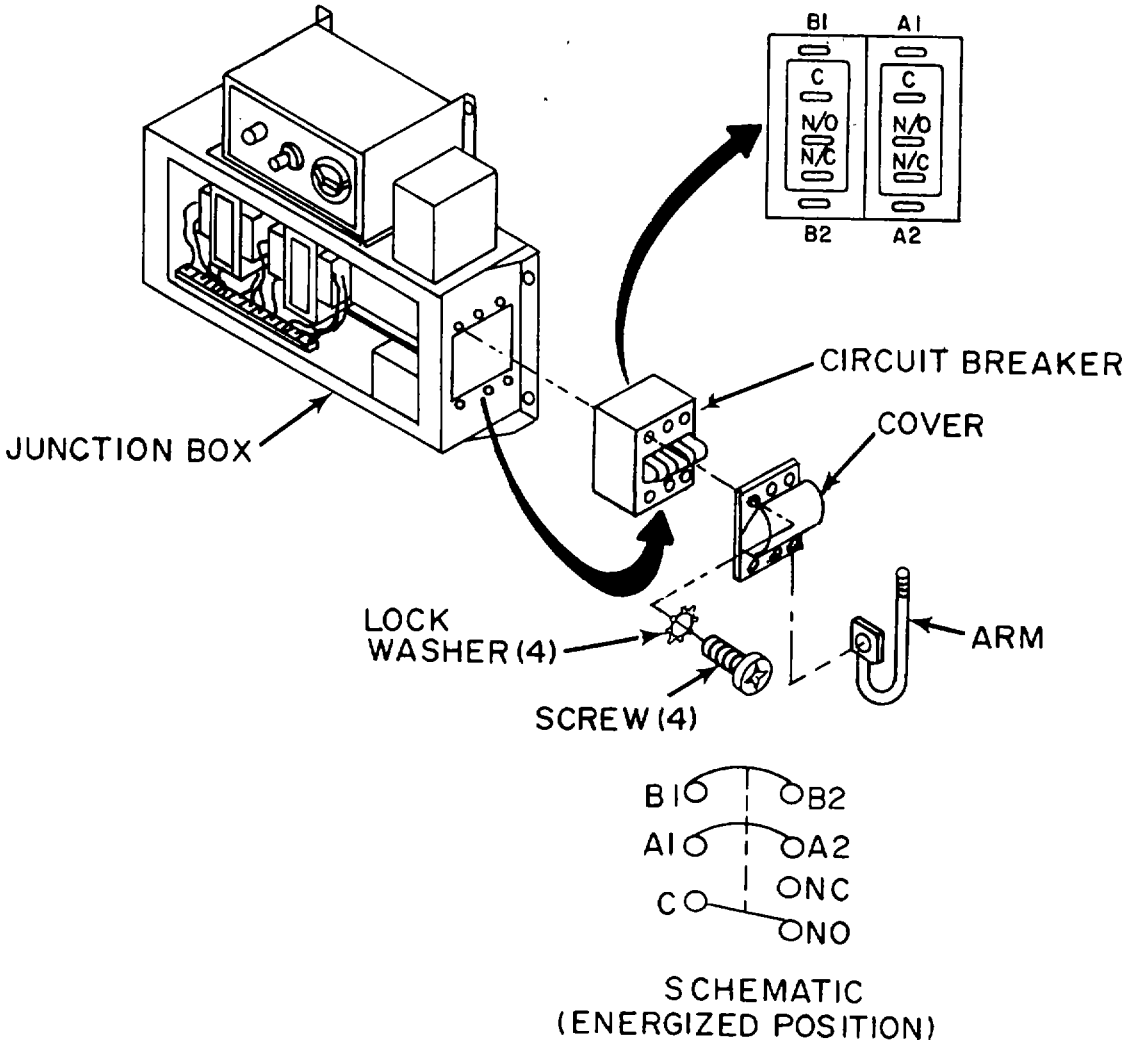


Figure 4-30. Circuit Breaker (CB)

Removal

(1) Remove four screws and lockwashers securing circuit breaker and circuit breaker cover.

(2) Tap out shaft that holds reset toggles together and disconnect reset actuator arm.

(3) Tag and remove wires.

(4) Remove circuit breaker.

NOTE

See paragraph 4-34 for repairs on circuit breaker push-pull reset parts.

Installation

(1) Place actuator arm into position and insert toggle shaft.

(2) Install circuit breaker and circuit breaker cover with four screws and lockwashers.

(3) Using tags and wiring diagram (fig. 4-43) connect leads.

(4) Install junction box cover with four panel fastener screws.

Follow-on procedure: Install junction box. (See para 4-32.)

4-36. COMPRESSOR RELAY (K1)

This task covers:
a. Inspection
b. Test
c. Removal
d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Equipment Conditions;
Junction Box Removed (para 4-32)

Inspection

(1) Loosen four captive panel fastener screws in junction box cover.

(2) Remove junction box cover.

(3) Remove the four nuts and lockwashers that secure the terminal guards.

(4) Tag and disconnect wire leads.

(5) Check for loose, corroded, missing, or broken terminal connections.

(6) Check relay for cracks, evidence of overheating, and other visible damage. Replace if damaged.

Test

(1) Use a multimeter set on the lowest OHMS scale to check continuity between terminals A1 and A2, B1 and B2, and C1 and C2. All three contacts should be open. If there is continuity, replace the relay.

(2) Check continuity between coil terminals X1 and X2. If there is not continuity, the coil is open. Replace the relay.

Removal

Remove four screws from relay.

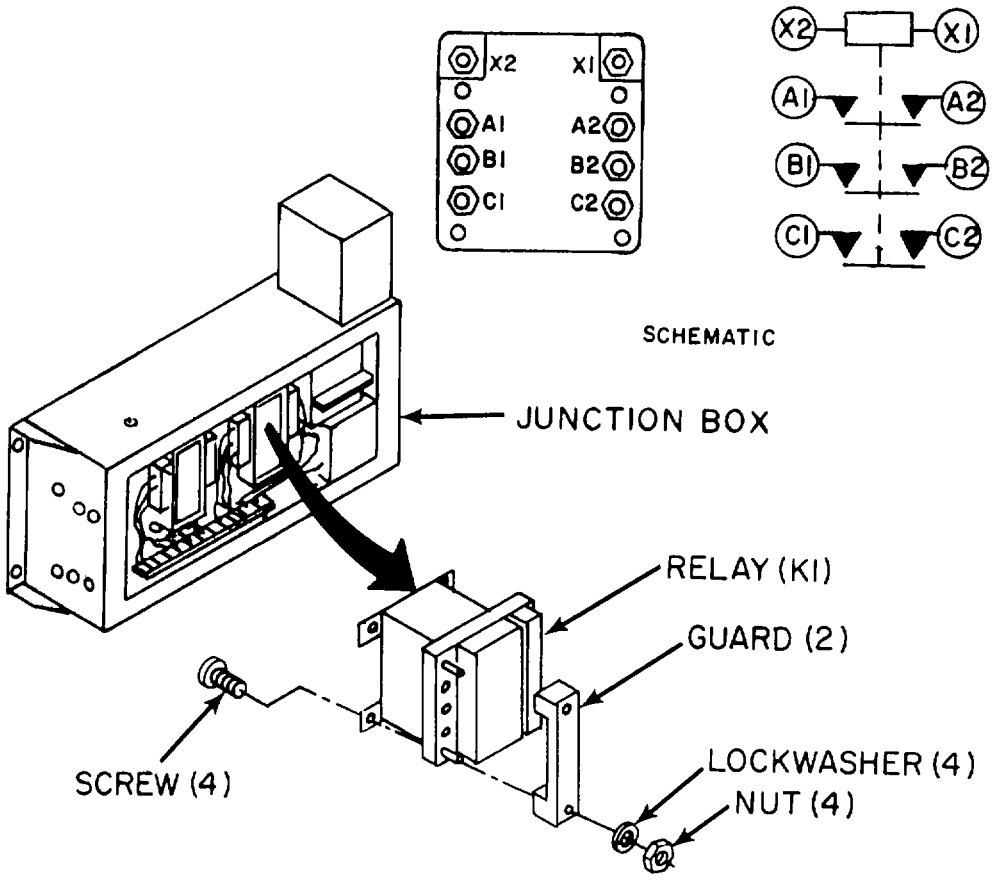


Figure 4-31. Compressor Relay (K1)

Installation

(1) Secure relay with four screws.

(2) See tags and wiring diagram (fig. 4-43) and connect wiring leads.

(3) Remove tags.

(4) Secure terminal guard with four nuts and lockwashers.

(5) Secure junction box cover with four captive panel fastener screws.

Follow-on procedure: Install junction box (See para 4-32.)

4-37. HEATER RELAY (K2)

This task covers: a. Inspection b. Test c. Removal d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Equipment Conditions:
Junction Box Removed (para 4-32)

Inspection

(1) Loosen four captive panel fastener screws in junction box cover.

(2) Remove junction box cover.

(3) Remove the four nuts and lockwashers that secure the terminal guards.

(4) Tag and disconnect wire leads.

(5) Check for loose, corroded, missing, or broken terminal connections.

(6) Check relay for cracks, evidence of overheating, and other visible damage. Replace if damaged.

Test

(1) Use a multimeter set on the lowest OHMS scale to check continuity between terminals A1 and A2, B1 and B2, and C1 and C2. All three contacts should be open. If there is continuity, replace the relay.

(2) Check continuity between coil terminals X1 and X2. If there is no continuity, the coil is open. Replace the relay.

Removal

Remove four screws from relay.

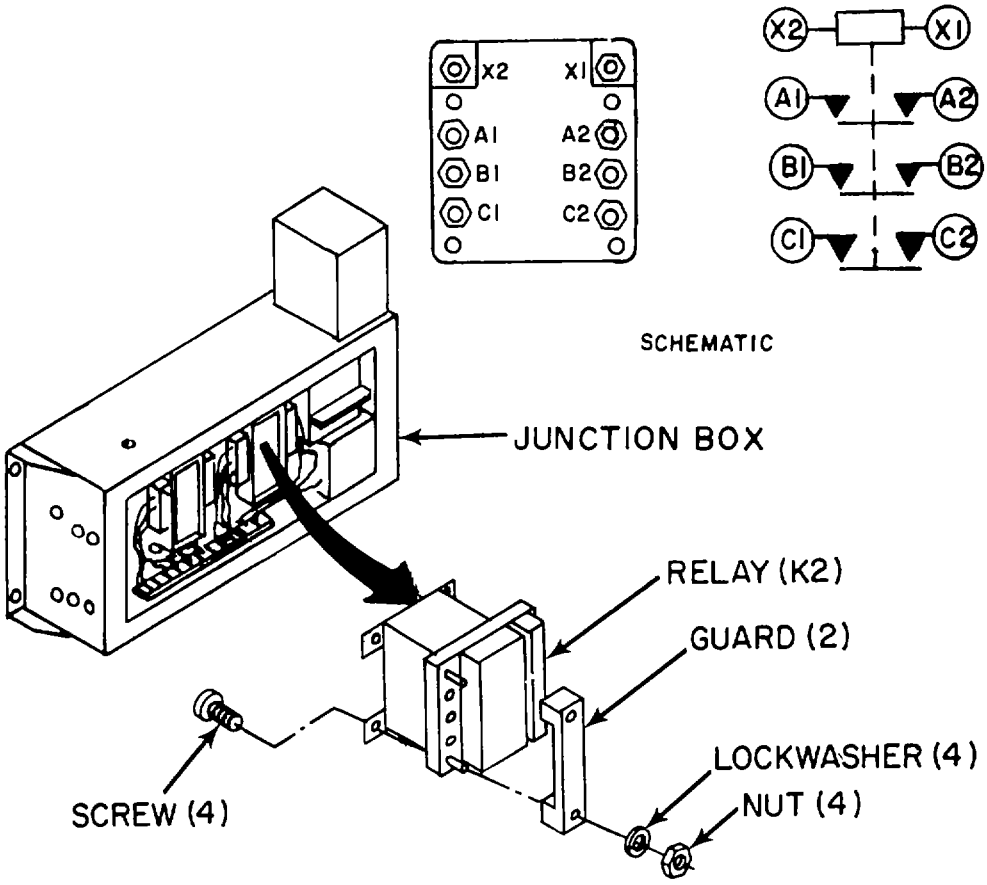


Figure 4-32. Heater Relay (K2)

Installation

(1) Secure relay with four screws.

(2) See tags and wiring diagram (fig. 4-43) and connect wiring leads.

(3) Remove tags.

(4) Secure terminal guard with four nuts and lockwashers.

(5) Secure junction box cover with four captive panel fastener screws.

Follow-on procedure: Install junction box. (See para 4-32.).

4-38. TIME DELAY RELAY (K6) (COMPRESSOR)

This task covers:
a. Removal
b. Inspection
c. Test
d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Heat Gun
(Appendix B item 2)

Materials/Parts
Solder
(Appendix E item 21)
Flux
(Appendix E item 22)
Heat-Shrink Tubing
(Appendix E item 23)
Locknuts
(Appendix E item 24)

Equipment Conditions:
Junction Box Removed (para 4-32)
Relay K1 Removed (para 4-36)

Removal

(1) Loosen four captive panel fastener screws and remove junction box cover.

(2) Remove one screw on bracket on right side of junction box.

(3) Remove two screws on bracket in rear of junction box.

(4) Extend relays and bracket from junction box, taking care not to damage leads.

(5) Remove and tag leads from relay (K6).

(6) Remove the four screws and locknuts on bracket and remove relay (K6).

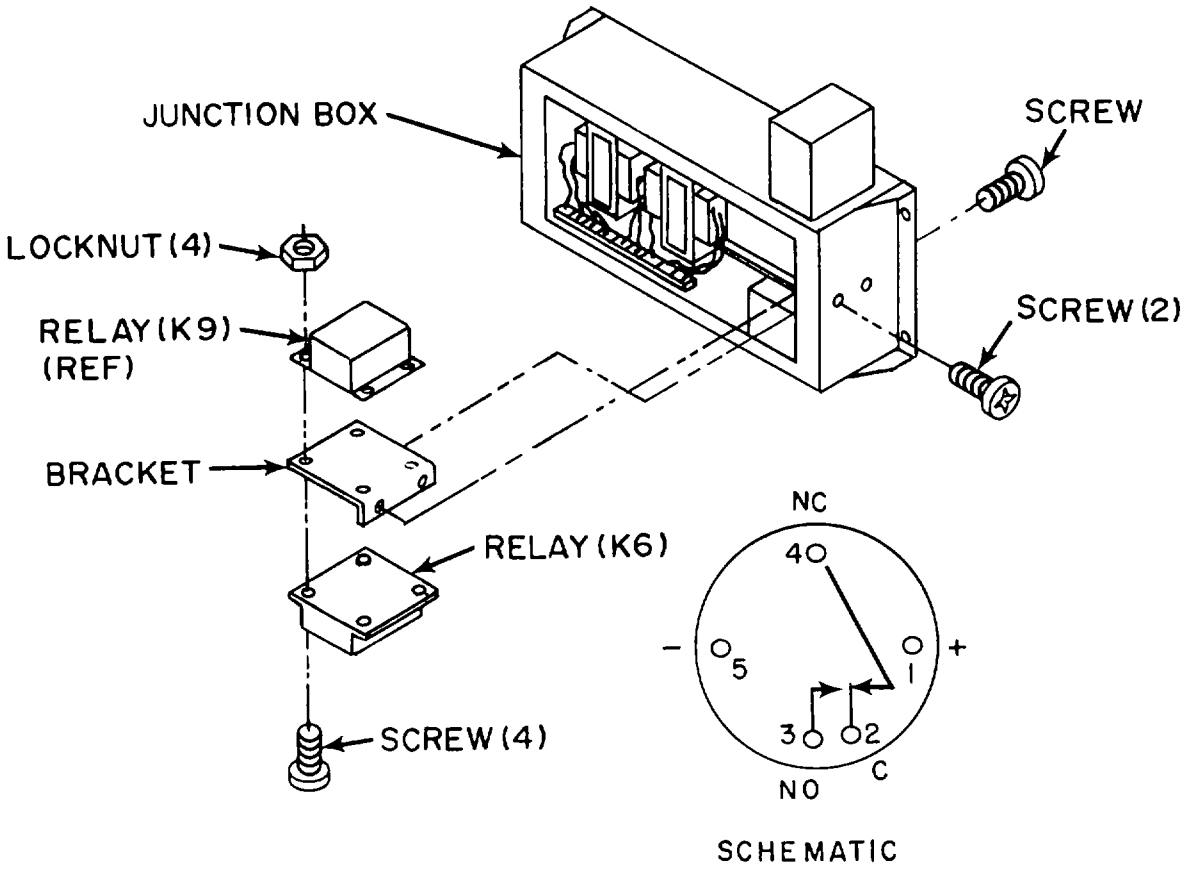


Figure 4-33. Time Delay Relay (K6) (Compressor)

Inspection

Check relay for cracks, evidence of overheating, and any other visible damage. Replace if damaged.

Test

(1) Using a multimeter, set on lowest OHMS scale, check continuity.

- Terminal 1 (+) to 5 (-) - Continuity should not be indicated.
- Terminal 2 to 3 - Continuity should not be indicated.
- Terminal 3 to 4 - Continuity should not be indicated.
- Terminal 2 to 4 - Continuity should be indicated.

(2) Replace time delay relay (K6) if it fails any of the above tests.

Installation

(1) Install insulating heat shrink tubing over wires.

(2) Solder leads in place using tags and wiring diagram. (See fig. 4-43,)

(3) Slide heat shrink tubing over splices and remove tags.

(4) Heat shrink insulating tubing.

(5) Install relay on bracket with four screws and locknuts.

(6) Secure bracket and relays with three screws.

(7) Install relay K1 (See para 4-36)

(8) Secure junction box cover with four captive panel fastener screws.

Follow-on procedure: Install junction box. (See para 4-32.)

4-39. TIME DELAY RELAY (K9) (FAN MOTOR)

This task covers:
a. Removal
b. Inspection
c. Test
d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Heat Gun
(Appendix B item 2)

Materials/Parts
Solder
(Appendix E item 21)
Flux
(Appendix E item 22)
Heat-Shrink Tubing
(Appendix E item 23)
Locknuts
(Appendix E item 24)

Equipment Conditions:
Junction Box Removed (para 4-32)
Relay K1 Removed (para 4-36)

Removal

(1) Loosen four captive panel fastener screws and remove junction box cover.

(2) Remove one screw on bracket on right side of junction box.

(3) Remove two screws on bracket in rear of junction box.

(4) Extend relays and bracket from junction box, taking care not to damage leads.

(5) Remove and tag wire leads from relay (K9).

(6) Remove the four screws and locknuts on bracket and remove relay (K9).

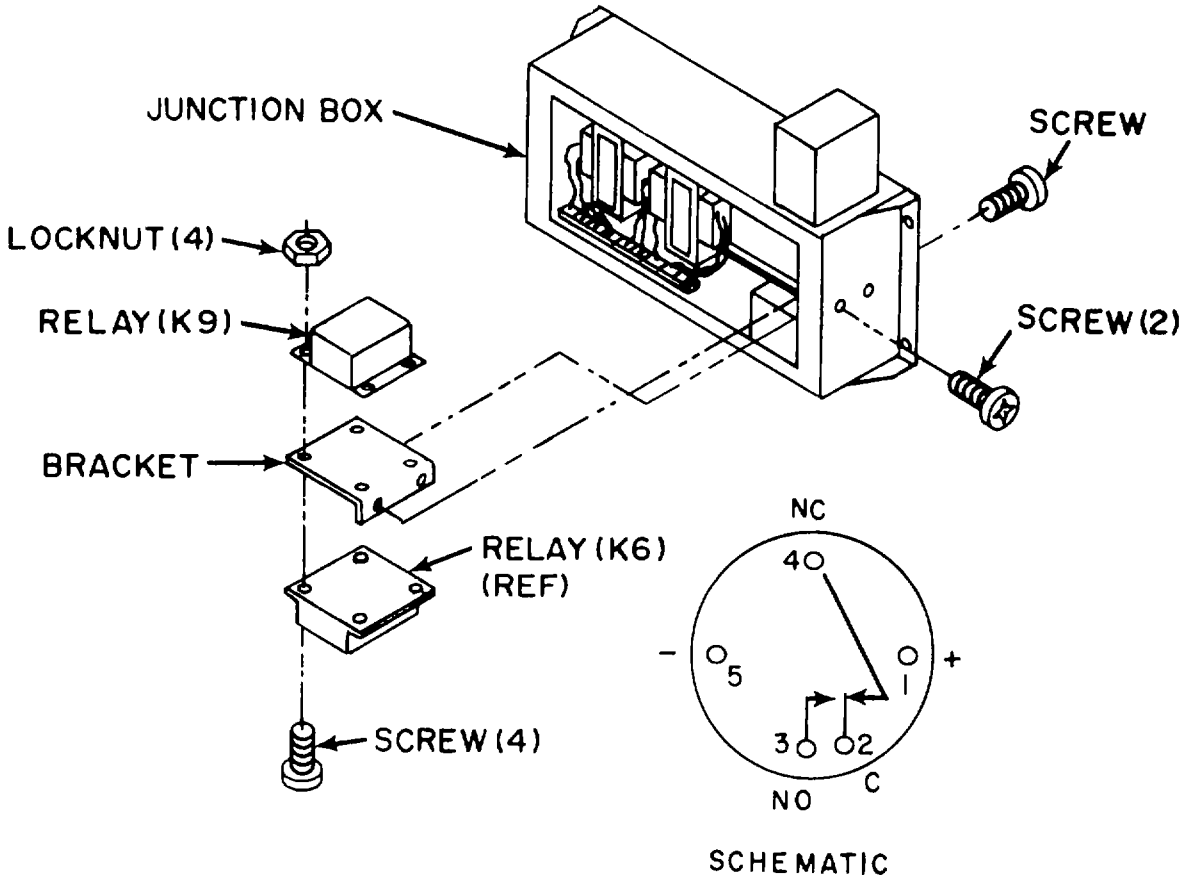


Figure 4-34. Time Delay Relay (K9) (Fan Motor)

Inspection

Check relay for cracks, evidence of overheating, and any other visible damage. Replace if damaged.

Test

(1) Using a multimeter, set on lowest OHMS scale, check continuity.

- Terminal 1 (+) to 5 (-) - Continuity should not be indicated.
- Terminal 2 to 3 - Continuity should not be indicated.
- Terminal 3 to 4 - Continuity should not be indicated.
- Terminal 2 to 4 - Continuity should be indicated.

(2) Replace time delay relay (K9) if it fails any of the above tests.

Installation

(1) Install insulating heat shrink tubing over wires.

(2) Solder leads in place using tags and wiring diagram. (See fig. 4-43.)

(3) Slide heat shrink tubing over splices and remove tags.

(4) Heat shrink insulating tubing.

(5) Install relay on bracket with four screws and locknuts.

(6) Secure bracket and relays with three screws.

(7) Install relay K1 (See para 4-36).

(8) Using screwdriver, secure junction box cover with four captive panel fastener screws.

Follow-on procedure: Install junction box. (See para 4-32.)

4-40. CAPACITOR ASSEMBLY (C3)

This task covers: a. Removal b. Test c. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Locknuts
(Appendix E item 25)

Equipment Conditions:
Junction Box Removed (para 4-32)
Screws Securing Time Delay Relay Bracket To Junction Box Removed (para 4-38)

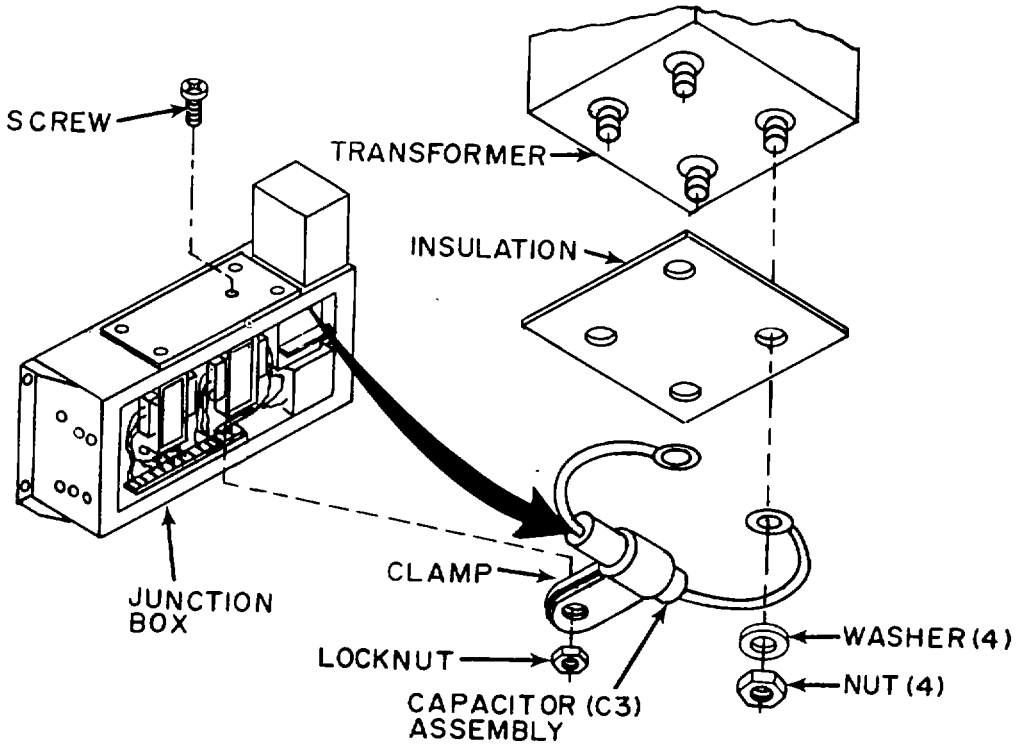


Figure 4-35. Capacitor Assembly (C3)

Removal

(1) Tag leads.

(2) Remove two nuts and washers that secure capacitors to terminals X1 and X2 of transformer.

(3) Remove screw, clamp and capacitor, and locknut from top of junction box.

Test

(1) Use multimeter to test for continuity.

(2) If continuity exists, replace capacitor assembly.

Installation

(1) Install capacitor assembly in clamp.

(2) Install clamp and capacitor assembly in junction box, using screw and locknut.

(3) See tags and install capacitor assembly leads on terminals X1 and X2 of transformer, and secure with two nuts and washers. Remove tags.

Follow-on procedure:

(1) Install screws securing time delay relay mounting bracket to junction box. (See para 4-38.)

(2) Replace junction box. (See para 4-32.)

4-41. TRANSFORMER (T)

This task covers:
a. Inspection
b. Removal
c. Test
d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
Appendix B item 1)

Equipment Conditions:
Junction Box Removed (para 4-32)
Screws Securing Time Delay Relay Bracket To Junction Box Removed (para 4-38)
Capacitor Assembly Removed (para 4-40)

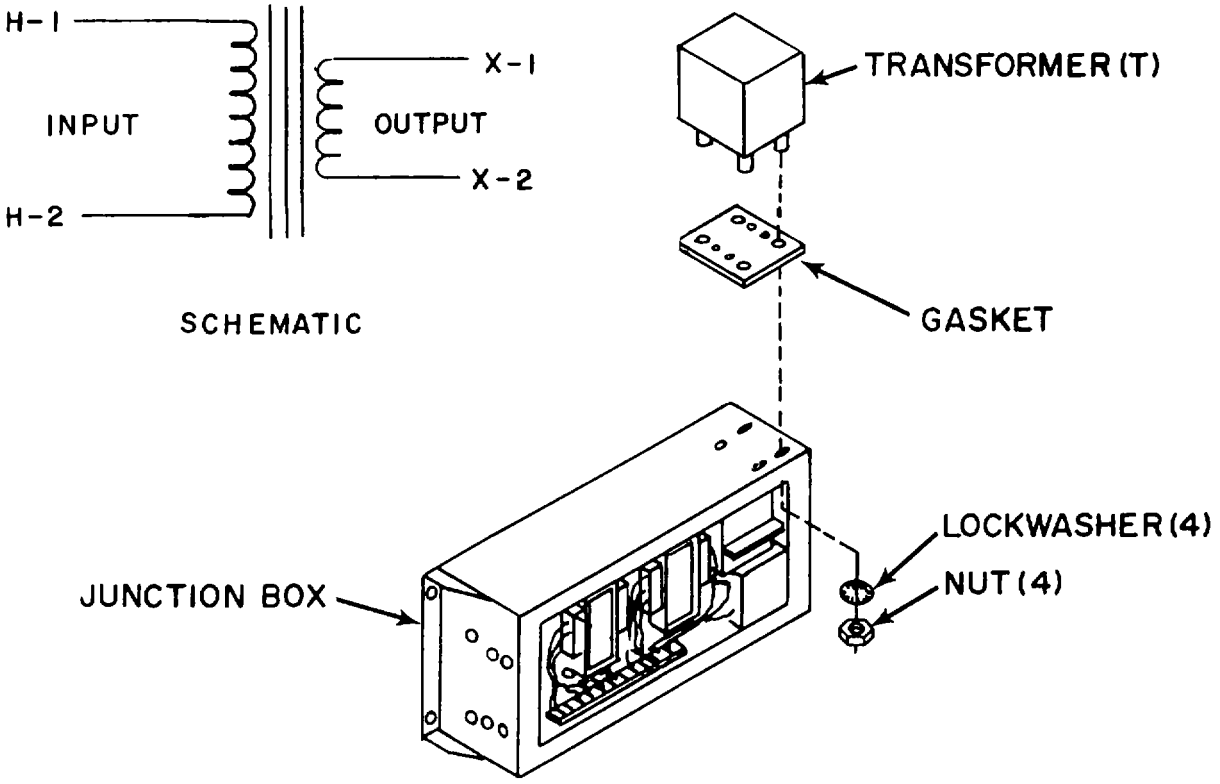


Figure 4-36. Transformer (T)

Inspection

(1) Loosen four captive panel fastener screws and remove junction box cover.

(2) Inspect transformer for overheating or obvious damage.

(3) Inspect terminal connections for tightness or damaged wires.

Removal

(1) Tag and disconnect wire leads.

(2) Remove four nuts and lockwashers from transformer mounting studs.

(3) Remove transformer and gasket.

Test

(1) Connect the probes of a multimeter set on the lowest OHMS scale to terminal studs H1 and H2. If the primary winding is open, replace the transformer.

(2) Connect the probes of a multimeter set on the lowest OHMS scale to terminal studs X1 and X2. If the secondary winding is open, replace the transformer.

(3) Connect one probe of a multimeter set on high OHMS scale to either terminal stud H1 or H2 and the other probe to the transformer case. If resistance is less than 500,000 ohms, replace the transformer.

(4) Connect one probe of a multimeter set on high OHMS scale to either terminal stud X1 or X2 and the other probe to the transformer case. If resistance is less than 500,000 ohms, replace the transformer.

(5) Connect one probe of a multimeter set on high OHMS scale to either terminal stud H1 or H2 and the other probe to either terminal stud X1 or X2. If resistance is less than 500,000 ohms, replace the transformer.

Installation

(1) Position transformer and gasket on outside rear of junction box.

(2) Secure transformer with four nuts and lock washers.

(3) Install capacitor assembly (see para 4-40).

(4) See tags and wiring diagram (fig 4-43) and connect wiring leads to transformer studs and secure with four nuts and lockwashers.

(5) Remove tags.

(6) Secure junction box cover with four panel fastener screws.

Follow-on procedure:

(1) Install screws securing time delay relay mounting bracket to junction box. (See para 4-38.)

(2) Install junction box (see para 4-32).

4-42. FUSES (F1 AND F2)

This task covers:
a. Inspection
b. Test
c. Removal
d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Locknuts
(Appendix E item 24)'
Insulation
(Appendix F item 26)
Insulation
(Appendix F item 27)

Equipment Conditions:
Junction Box Removed (para 4-32)
Rectifier Removed (para 4-33)
Relay K2 Removed (para 4-37)

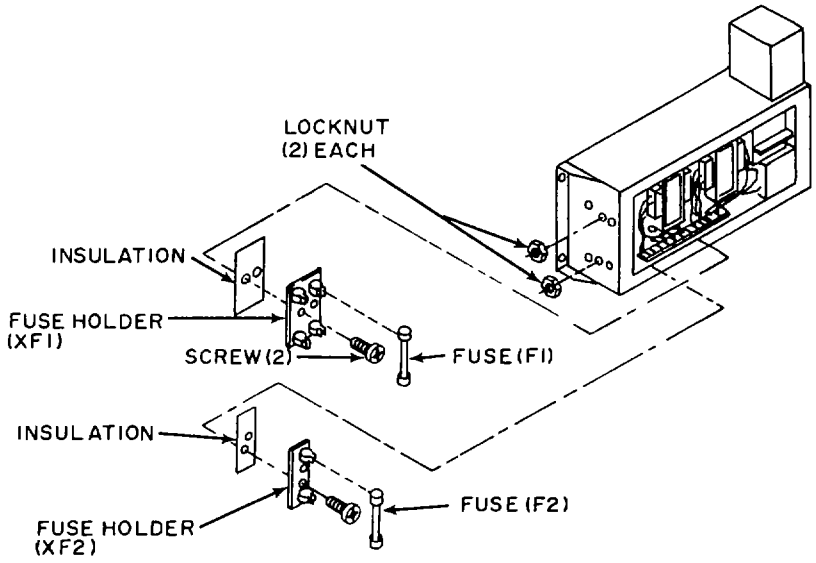


Figure 4-37. Fuses (F1 and F2)

Inspection

(1) Loosen four captive panel fastener screws and remove junction box cover.

(2) Inspect for cracks, corrosion, loose electrical connections, and loose mounting hardware. Repair and tighten loose electrical connections and tighten loose mounting hardware. Replace fuse block if it is cracked, broken, or badly corroded.

(3) If a fuse is suspected to be bad, pull it from the fuse block and look for broken or melted element.

Test

Using a multimeter, check continuity. If there is no continuity, replace fuse.

Removal

(1) Pull fuses.

(2) If fuse block is to be replaced, tag and remove wire leads.

(3) Remove two screws and locknuts.

(4) Pull fuse block and insulation from junction box.

Installation

(1) Place fuse block and insulation in junction box, aline holes.

(2) Secure fuse block and insulation to junction box with two screws and locknuts.

(3) See tags and wiring diagram (fig. 4-43) and connect leads. Remove tags.

(4) Place fuse(s) into fuse block clips.

(5) Install junction box cover and tighten four captive panel fastener screws.

Follow-on procedure:

(1) Install K2 relay. (See para 4-37.)

(2) Install rectifier. (See para 4-33.)

(3) Install junction box. (See para 4-32.)

4-43. TERMINAL BOARDS (TB1, TB2)

This task covers: a. Inspection
b. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Locknuts
(Appendix E item 18)

Equipment Conditions:
Junction Box Removed (para 4-32)
Rectifier Removed (para 4-33)
Relay K1 Removed (para 4-36)
Relay K2 Removed (para 4-37)
Fuse Blocks Removed (para 4-42)

Inspection

(1) Loosen four captive panel fastener screws and remove junction box cover.

(2) Check terminal boards for loose or corroded terminals, cracks, and obvious damage.

(3) Check that wire leads are secure and properly located. (See fig. 4-43.)

Replacement

(1) Tag and disconnect wire leads.

(2) Remove four screws and locknuts and terminal board (TB1).

(3) Remove two screws and locknuts and terminal board (TB2).

(4) See tags and wiring diagram (fig. 4-43) and connect wire leads.

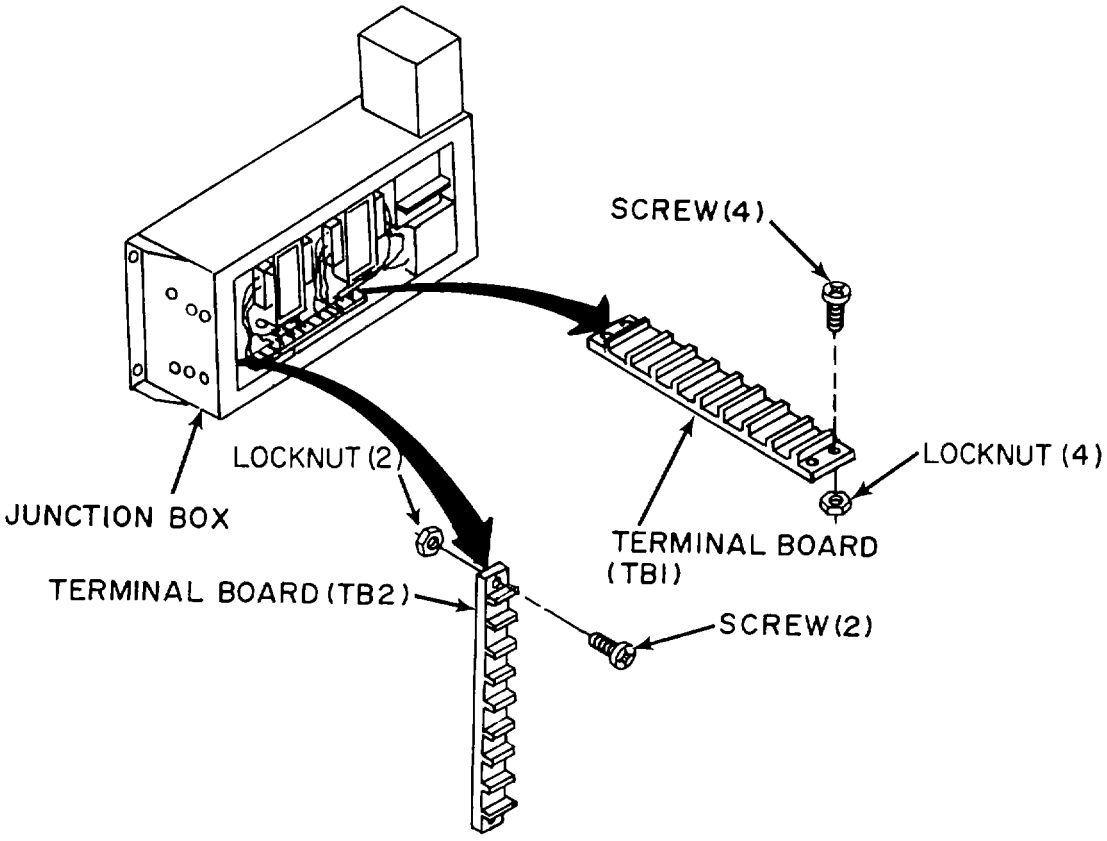


Figure 4-38. Terminal Boards (TB 1 and TB2)

(5) Remove tags.

(6) Secure terminal board (TB2) with two screws and locknuts.

(7) Secure terminal board (TB 1) with four screws and locknuts.

(8) Secure junction box cover with four captive panel fastener screws.

Follow-on procedure:

(1) Install fuse blocks. (See para 4-42.)

(2) Install K2 relay. (See para 4-37.)

(3) Install K1 relay. (See para 4-36.)

(4) Install rectifier. (See para 4-33.)

(5) Install junction box. (See para 4-32.)

4-44 JUNCTION BOX WIRING HARNESS

This task covers: a. Inspection b. Test c. Removal d. Repair e. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Locknuts
(Appendix E item 24)

Equipment Conditions:
Junction Box Removed (para 4-32)
Rectifier Removed (para 4-33)
Circuit Breaker Removed (para 4-35)
Relay K1 Removed (para 4-36)
Relay K2 Removed (para 4-37)
Relay K6 Removed (para 4-38)
Relay K9 Removed (para 4-39)
Transformer Removed (para 4-41)
Fuse Blocks Removed (para 4-42)
Terminal Boards Removed (para 4-43)

Inspection

(1) Loosen four captive panel fastener screws and remove junction box cover.

(2) Check connectors for general condition and loose, broken or missing contacts. Replae connector if damaged.

Test

(1) Check individual wires for loose solder connections, loose terminal lug connections, cut or frayed insulation, and cut or broken wires.

(2) See wiring diagram (fig. 4-43) and continuity test individual wires. Repair or replace wires with no continuity.

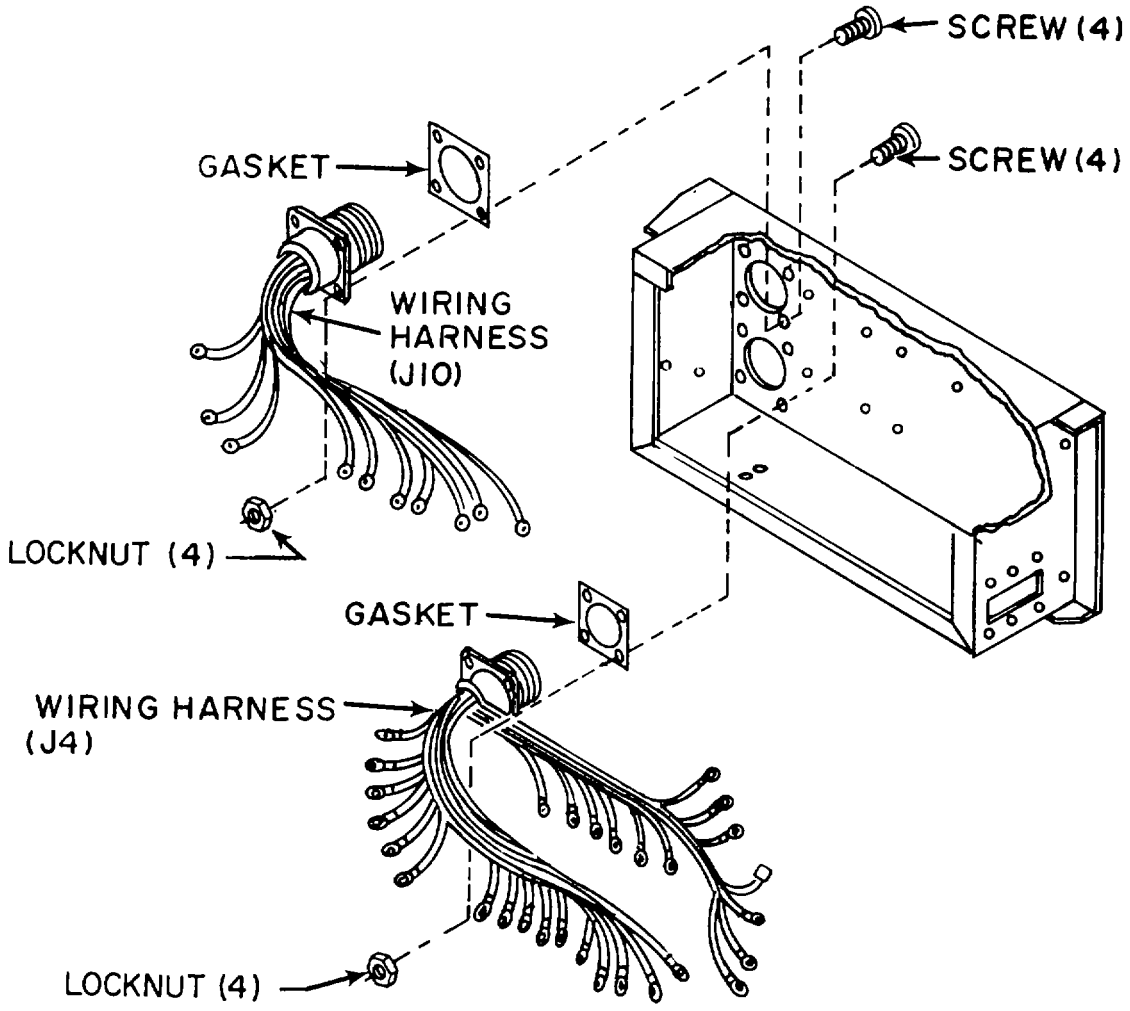


Figure 4-39. Junction Box Wiring Harnesses

Removal

(1) Remove four screws and locknuts from J4 and J10 connectors.

(2) Tag and disconnect leads from parts.

(3) Remove harness.

Repair

(1) See paragraph 4-47 for general wire repair instructions.

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

Installation

(1) Position harnesses in junction box.

(2) See tags and wiring diagram (fig. 4-43) and reconnect leads.

(3) Remove tags.

(4) Secure J4 and J10 connectors and gaskets, with four each screws and lockuts.

(5) Secure junction box cover with four captive panel fastener screws

Follow-on procedure:

(1) Install terminal boards. (See para 4-43.)

(2) Install fuse blocks and fuses. (See para 4-42.)

(3) Install transformer. (See para 4-41.)

(4) Install K9 relay. (See para 4-39.)

(5) Install K6 relay. (See para 4-38.)

(6) Install K2 relay. (See para 4-37.)

(7) Install K1 relay. (See para 4-36.)

(8) Install circuit breaker. (See para 4-35.)

(9) Install rectifier. (See para 4-33.)

(10) Install junction box. (See para 4-32.).

4-45. JUNCTION BOX HOUSING AND COVER

This task covers: a. Inspection b. Repair c. Installation

INITIATL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Apron
(Appendix E item 5)
Respirator
(Appendix E item 6)
Goggles
(Appendix E item 7)
Gloves, protective
(Appendix E item 8)
Toluene
(Appendix E item 9)
Adhesive
(Appendix E item 10)
Gasket
(Appendix F item 28)
Gasket
(Appendix F item 29)
Gasket
(Appendix F item 30)

Equipment Conditions:
Junction Box Removed (para 4-32)

General Safety Instructions

WARNING

Toluene is flammable, and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well-ventilated area, and keep away from sparks or flame. Use goggles, gloves and apron when appropriate.

Inspection

(1) Loosen four captive panel fastener screws and remove junction box cover.

(2) Check that cover is not bent or punctured. Replace if damaged.

(3) Check that gaskets are not cracked, loose, or missing. Replace gasket as required.

(4) Check junction box housing for loose or missing hardware. Replace or repair as required.

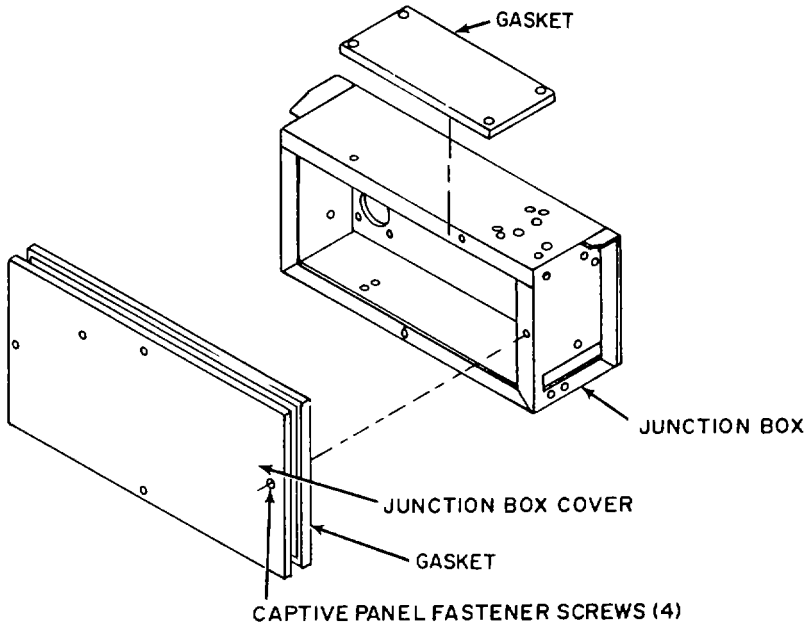


Figure 4-40. Junction Box Housing and Cover

Repair

(1) Remove as much old gasket material as possible, by pulling or scraping away from the metal surface.

(2) Soften and remove old adhesive and gasket residue, using toluene and a stiff brush.

(3) Cut replacement gasket to size per dimensions in Appendix F.

(4) Be sure that the surface to which the gasket is to be applied is clean and free of old adhesive material.

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

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

Installation

Secure junction box cover with four captive panel fastener screws.

Follow-on procedure: Install junction box. (See para 4-32.)

4-46. AMBIENT AIR THERMOSTAT (S2)

This task covers: a. Inspection b. Test c. Removal d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Torque Wrench
(Appendix B item 3)
Socket Attachment
(Appendix B item 4)
Thermometer
(Appendix B item 5)

Materials/Parts
Thermal Mastic
(Appendix E item 26)
Tape, Pressure-Sensitive
(Appendix E item 27)

Equipment Conditions:
Junction Box Tilted Out and Plug P4 Disconnected (para 4-32)

Inspection

Check thermostat for cracks or evidence of other visible damage. Replace if damaged.

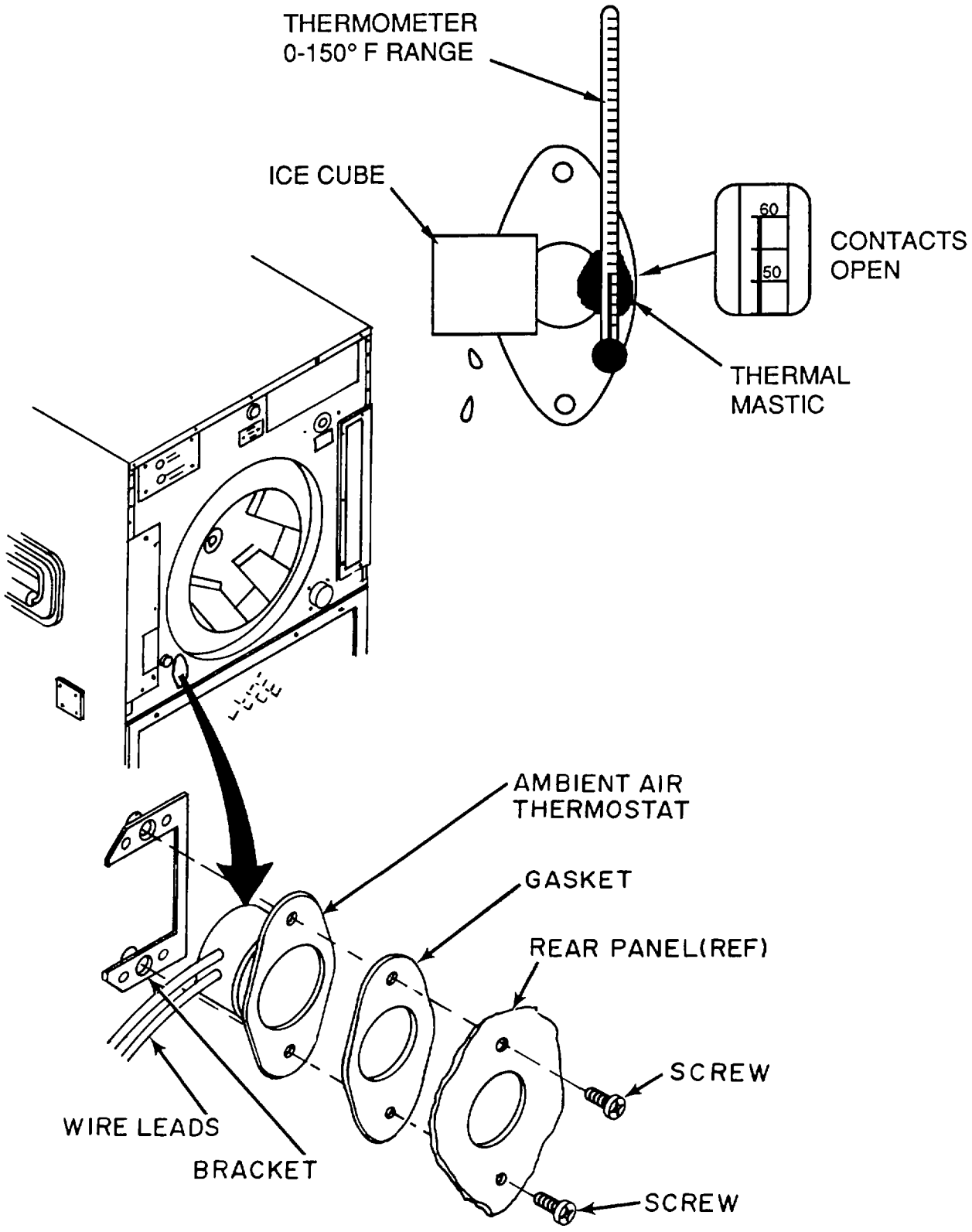


Figure 4-41. Ambient Air Thermostat Test Set-Up and Installation

Test

(1) Using multimeter set on lowest OHMS scale, check continuity at pins F and G on P4 wiring harness plug. Contacts should be closed when the surrounding temperature is above 50°F (10°C). If there is no continuity, replace thermostat.

(2) Tape the bulb of a thermometer to the thermostat, gasket surface. Use a blob of thermal mastic to improve conductivity.

(3) Place an ice cube to the face of the thermostat gasket surface.

(4) When the temperature of the thermostat reaches approximately 50°F (10°C) the contacts should open.

(5) Remove the ice cube.

(6) When the temperature reaches approximately 60°F (160C) the contacts should close.

(7) If the thermostat fails any of the above tests, replace thermostat.

Removal

(1) Remove junction box (see para 4-32).

(2) Remove condenser air discharge guard (see para 4-21).

(3) Loosen two setscrews on hub of condenser fan.

(4) Remove condenser fan and key.

(5) Remove two screws in thermostat.

(6) Remove thermostat, gasket and bracket.

(7) Cut thermostat leads near thermostat body.

Installation

(1) Splice thermostat leads (polarity is not important). See paragraph 4-47 for general wire repair instructions.

(2) Secure bracket, thermostat and gasket with two screws.

(3) Install condenser fan and key flush to motor shaft.

(4) Torque two setscrews to 82 inch-pounds.

Follow-on procedures:

(1) Install condenser air discharge guard. (See para 4-21.)

(2) Install junction box. (See para 4-32.)

4-47. ELECTRICAL WIRING REPAIR GENERAL

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. 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 4-43).

a. Soldering connection. Wire connections must be made mechanically sound before they are soldered; solder alone does not provide sufficient strength to prevent breakage. Joining surfaces of connections to be soldered must be clean and bright. If a separate flux is used, it should conform to Specification MIL-F-14256, rosin base flux, item 22, Appendix E, and should be brushed onto the joint before soldering. If a flux-core solder is used, it should be a rosin-core electrical solder. If an uncored solder is used, it should be a lead-tin solder, item 21, Appendix E, conforming to Specification QQ-S-571. Wires should always be heated to the point at which the solder will melt completely and flow into all parts of the joint. Excessive build-up of solder "gobs" on the joint should be avoided or removed.

b. 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 one-inch length for covering joints at terminals or connectors, or to a length about 1/2 inch (13 mm) longer than the joint to be insulated, and slide the tubing over the wire before making the joint. After the joint is made, slide the tubing so that it covers the joint, and shrink in place with moderate heat.

c. Splicing wires. To repair broken or cut wires that are otherwise sound, the mating ends can be stripped and spliced. A commercial butt splice can be crimped onto the end to join them, or a "Western Union" wire splice can be made. The latter is made by stripping 1/4 1/2 inch (0.6 13 mm) of insulation from the wire ends, holding the ends parallel and facing opposite directions, then twisting each end around the other wire at least three turns. Solder and apply insulation as described above.

d. Crimping terminals. To install a terminal on the end of a wire, strip 1/4 1/2 inch (0.6 13 mm) of insulation from the end of the wire, apply a one-inch piece of heat-shrink tubing (if the terminals are of the uninsulated type), and insert wire end into the shank of the terminal. Crimp the shank, and install heat-shrink tubing, if necessary.

4-48. WIRING HARNESSES

This task covers: a. Inspection c. Repair
b. Test

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Solder Gun Kit
(Appendix B item 6)

Materials/Parts
Solder
(Appendix E item 21)
Flux
(Appendix E item 22)
Heat-Shrink Tubing
(Appendix E item 23)

Equipment Conditions:
Top Panel Removed (para 4-16)
Intake Grille Removed (para 4-22)
Air Filter Removed (para 4-23)
Junction Box Removed (para 4-32)
Discharge Guard Removed (para 4-21)

Inspection

(1) Check connectors for general condition and loose, broken, or missing contacts. Replace damaged connectors.

(2) Check individual wires for loose solder connection, loose terminal lug connection, cut or frayed insulation, and cut or broken wires.

Test

See wiring diagram (fig. 4-43) and continuity test individual wires. Repair or replace wires with no continuity.

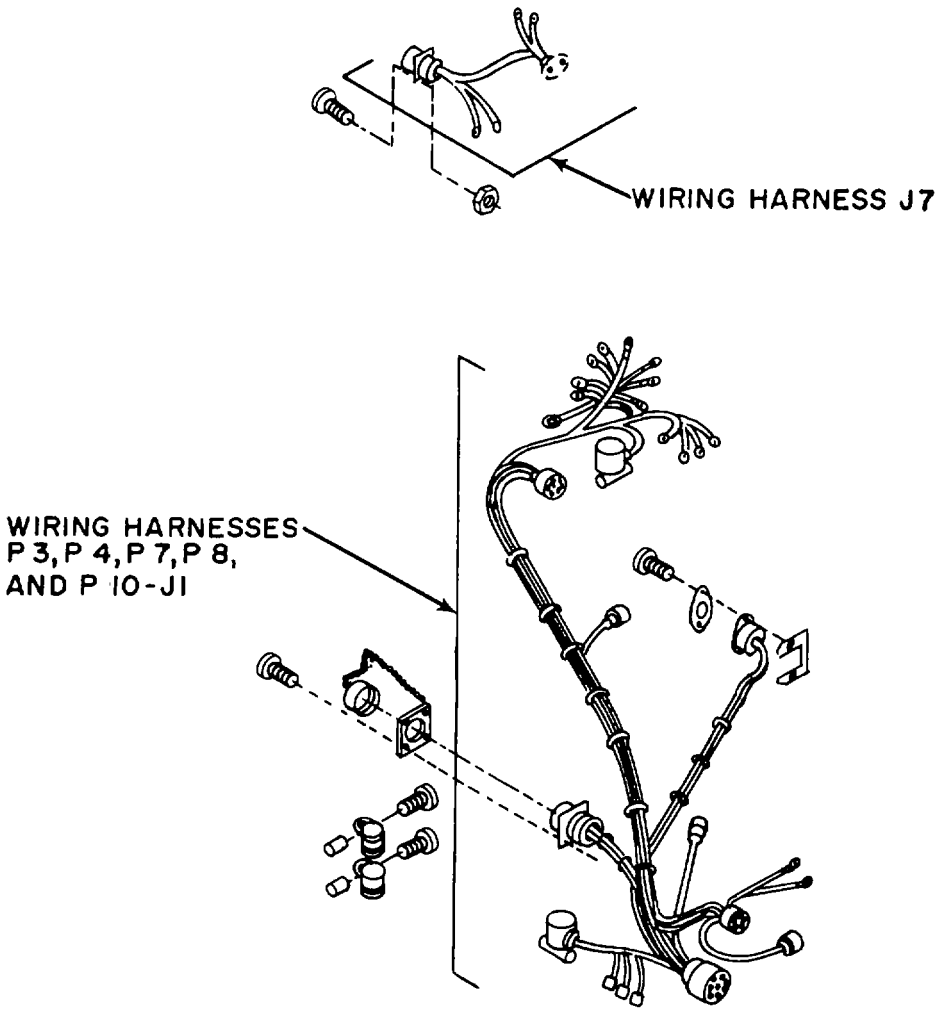


Figure 4-42. Wiring Harnesses

Repair

(1) See paragraph 4-47 for general wire repair instructions.

(2) See table 4-3 (Wire List) for wire lengths and terminal/connector information.

Follow-on procedures:

1. Install top panel. (See para 4-16.)
2. Install air intake grille. (See para 4-22.)
3. Install air filter. (See para 4-23.)
4. Install junction box. (See para 4-32.)
5. Install condenser air discharge guard. (See para 4-21.)

TABLE 4-3. WIRE LIST

TERMINATION		TERMINATION		WIRE	LENGTH
FROM	TERMINAL TYPE	TO	TERMINAL TYPE	SIZE	IN INCHES
		LOOSE WIRE			
TBl-1	MS25036-153	K2-L1	MS25036-108	16	7.25
TBl-1	MS25036-153	CB-A1	13216E6191-2	14	11.12
TB1-2	MS25036-153	T-2	MS25036-106	16	17.50
TB1-2	MS25036-153	TB1-3	MS25036-153	14	4.00
CB-B1	13216E6191-3	TB1-4	MS25036-156	12	4.00
CB-B2	13216E6191	TB1-2	MS25036-156	12	10.00
K1-A2	MS25036-108	CB-A2	13216E6191-2	14	7.25
HR2-A	MS25036-108	HR1-A	MS25036-108	16	4.25
HR2-A	MS25036-108	HR3-A	MS25036-108	16	4.25
HR2-B	MS25036-108	HR1-B	MS25036-108	16	4.25
HR2-B	MS25036-108	HR3-B	MS25036-108	16	4.25
HR5-A	MS25036-108	HR6-A	MS25036-108	16	4.25
HR5-A	MS25036-108	HR4-A	MS25036-108	16	4.25
HR5-B	MS25036-108	HR6-B	MS25036-108	16	4.25
HR5-B	MS25036-108	HR4-B	MS25036-108	16	4.25
XF1-2	MS25036-153	T-1	MS25036-106	16	15.00
T-3	MS25036-106	CR-1	13216E6191-2	16	12.00
T-4	MS25036-106	CR-4	13216E6191-2	16	12.00
E2	MS25036-112	E3	MS25036-157	10	24.00
XFI-1	MS25036-153	CB-NO	13216E6192	16	13.00
CR-3	13216E6191-2	XF2-1	MS25036-153	16	6.50
S 1-R	MS25036-153	S-11	13211E8288	16	6.00
S1-R	MS25036-153	S7-3	MS25036-106	16	5.12
S5-1	MS25036-153	S6-2	MS25036-153	16	5.25
TB1-6	MS25036-153	K6-1		16	7.00
K6-1		K6-2		16	3.00
TB1-6	MS25036-153	K1-B1	MS25036-108	16	8.50
K1-B2	MS25036-108	K1-X2	MS25036-153	16	5.00
K6-3		K1-X2	MS25036-153	16	4.00
S1-Bl	MS25036-153	S-12	13211E8288	16	7.75
K1-X1	MS25036-153	K2-X2	MS25036-153	16	7.50
K2-X2	MS25036-153	TB1-8	MS25036-153	16	10.00
TB1-8	MS25036-153	TB1-7	MS25036-153	16	3.00
TB1-7	MS25036-153	CR-2	13216E6191-2	16	8.00
TB2-6	MS25036-106	K9-2		16	12.00
TB1-8	MS25036-153	K9-3		16	6.00

TABLE 4-3. WIRE LIST (Cont)

TERMINATION		TERMINATION		WIRE	LENGTH
FROM	TERMINAL TYPE	TO	TERMINAL TYPE	SIZE	IN INCHES
		LOOSE WIRE (Cont.)			
TB1-7	MS25036-153	K9-5		16	6.50
K6-5		K9-5		16	5.00
XF2-2	MS25036-153	K9-1		16	12.00
E2	MS25036-112	E4	MS25036-112	10	27.00
C2-1	13216E6191-2	K10-4	MS25036-153	14	28.00
K10-4	MS25036-153	C4-1	13216E6191-2	16	9.00
K10-2	MS25036-153	C2-2	13216E6191-2	14	28.00
K10-1	MS25036-153	C4-2	13216E6191-2	16	9.00
		WIRE HARNESS J10			
J10-A	MS3102R-28-9S	TB1-6	MS25036-153	16	9.75
J10-B	MS3102R-28-9S	TB1-3	MS25036-153	14	8.00
J10-C	MS3102R-28-9S	J10-F		14	3.00
J10-D	MS3102R-28-9S	K1-A1	MS25036-108	14	12.50
J10-E	MS3102R-28-9S	TB1-3	MS25036-153	16	6.25
J10-G	MS3102R-28-9S	K1-A1	MS25036-108	14	12.50
J10-H	MS3102R-28-9S	TB2-3	MS25036-153	16	5.00
J10-J	MS3102R-28-9S	K2-L2	MS25036-108	16	7.50
J10-K	MS3102R-28-9S	TB1-5	MS25036-153	16	7.50
J10-L	MS3102R-28-9S	TB2-1	MS25036-106	16	6.50
J10-M	MS3102R-28-9S	TB1-4	MS25036-153	16	7.00
		WIRE HARNESS J4			
J4-A	MS3102R-32-7P	TB2-2	MS25036-106	16	5.00
J4-B	MS3102R-32-7P	J4-a		16	3.00
J4-C	MS3102R-32-7P	J4-X		16	3.00
J4-D	MS3102R-32-7P	TB1-4	MS25036-153	16	7.50
J4-E	MS3102R-32-7P	TB2-1	MS25036-106	16	4.00
J4-F	MS3102R-32-7P	TB2-3	MS25036-106	16	5.00
J4-G	MS3102R-32-7P	TB2-2	MS25036-106	16	5.00
J4-H	MS3102R-32-7P	K1-X1	MS25036-153	16	11.00
J4-I	MS3102R-32-7P	TB 1-7	MS25036-153	16	8.25
J4-J	MS3102R-32-7P	TB2-5	MS25036-106	16	6.00
J4-K	MS3102R-32-7P	J4-F		16	6.00
J4-L	MS3102R-32-7P	CB-C	13216E6192	16	12.00
J4-M	MS3102R-32-7P	TB2-4	MS25036-106	16	6.00
J4-N	MS3102R-32-7P	TBl-1	MS25036-153	16	6.25

TABLE 4-3. WIRE LIST (Cont)

TERMINATION		TERMINATION		WIRE	LENGTH
FROM	TERMINAL TYPE	TO	TERMINAL TYPE	SIZE	IN INCHES
		WIRE HARNESS J4 (Cont)			
J4-P	MS3102R-32-7P	TBl-1	MS25036-156	12	7.50
J4-R	MS3102R-32-7P	TB1-4	MS25036-156	12	9.25
J4-T	MS3102R-32-7P	E2	MS25036-112	12	12.00
J4-W	MS3102R-32-7P	TB1-5	MS25036-153	16	9.00
J4-Y	MS3102R-32-7P	K2-X1	MS25036-108	16	7.00
J4-Z	MS3102R-32-7P	TB2-4	MS25036-106	16	6.00
J4-b	MS3102R-32-7P	XF2-2	MS25036-153	16	4.00
J4-c	MS3102R-32-7P	E2	MS25036-108	16	12.00
J4-d	MS3102R-32-7P	TB2-5	MS25036-106	16	6.00
J4-e	MS3102R-32-7P	TB2-6	MS25036-106	16	6.50
J4-g	MS3102R-32-7P	TB1-8	MS25036-153	16	11.00
J4-j	MS3102R-32-7P	TB2-5	MS25036-106	16	6.00
J4-k	MS3102R-32-7P	TB1-7	MS25036-153	16	11.00
J4-0	MS3102R-32-7P	TB1-3	MS25036-153	14	7.50
J4-V	MS3102R-32-7P	TBl-1	MS25036-153	16	7.50
J4-h	MS3102R-32-7P	TB1-2	MS25036-153	16	7.50
		WIRE HARNESS J7			
J7-A	MS3100R-16-1OP	HR2-A	MS25036-108	16	16.00
J7-B	MS3100R-16-10P	HR5-A	MS25036-108	16	7.00
J7-C	MS3100R-16-10P	S3-4	13211E8265	16	9.00
S3-5	13211E8265	HR5-B	MS25036-108	16	4.81
S3-6	13211E8265	HR-B	MS25036-108	16	8.00
		WIRE HARNESS P3. P4. P7. P8 AND P10-J1			
P4-A	MS3106R-32-7S	S5-2	MS25036-153	16	33.00
P4-B	MS3106R-32-7S	S6-1	MS25036-153	16	33.00
P4-C	MS3106R-32-7S	P2-C	MS3106R-14S-6S	16	38.50
P4-D	MS3106R-32-7S	K7-7	MS25036-153	16	84.00
P4-E	MS3106R-32-7S	K7-4	MS25036-153	16	84.00
P4-F	MS3106R-32-7S	S2-1	13211E8180		25.50
P4-G	MS3106R-32-7S	S2-2	13211E8180		35.50
P4-H	MS3106R-32-7S	L2-1	13214E3524		69.00
P4-I	MS3106R-32-7S	L1-2	13214E3524		44.00
P4-J	MS3106R-32-7S	P8-C	MS3100R-28-17S	16	12.50
P4-K	MS3106R-32-7S	P8-D	MS3100R-28-17S	16	12.50
P4-L	MS3106R-32-7S	P8-E	MS3100R-28-17S	16	12.50

TABLE 4-3. WIRE LIST (Cont)

TERMINATION		TERMINATION		WIRE	LENGTH
FROM	TERMINAL TYPE	TO	TERMINAL TYPE	SIZE	IN INCHES
	WIRE HARNESS P3, P4, P7, P8, AND P10-J1 (Cont)				
P4-M	MS3106R-32-7S	LI-l	13214E3524		44.00
P4-N	MS3106R-32-7S	P8-H	MS3100R-28-17S	16	12.50
P4-O	MS3106R-32-7S	K10-4	MS25036-153	14	14.06
P4-P	MS3106R-32-7S	J1-A	MS3100R-20-4PX	12	23.00
P4-R	MS3106R-32-7S	J1-B	MS3100R-20-4PX	12	23.00
P4-T	MS3106R-32-7S	J1-D	MS3100R-20-4PX	12	23.00
P4-V	MS3106R-32-7S	P3-G	MS3106R-16S-1S	16	20.50
P4-W	MS3106R-32-7S	P8-J	MS310OR-28-17S	16	14.50
P4-X	MS3106R-32-7S	P8-K	MS3100R-28-17S	16	14.50
P4-Y	MS3106R-32-7S	P8-L	MS310O0R-28-17S	16	14.50
P4-Z	MS3106R-32-7S	P8-M	MS310O0R-28-17S	16	14.50
P4-a	MS3106R-32-7S	P8-N	MS3100R-28-17S	16	14.50
P4-b	MS3106R-32-7S	P8-P	MS3100R-28-17S	16	14.50
P4-c	MS3106R-32-7S	P8-R	MS3100R-28-17S	16	14.50
P4-d	MS3106R-32-7S	S8-3	MS25036-107	16	14.50
P4-e	MS3106R-32-7S	K7-2	MS25036-153	16	84.00
P4-f	MS3106R-32-7S	S8-2	MS25036-107	16	74.00
P4-g	MS3106R-32-7S	L2-2	13214E3524		69.00
P4-h	MS3106R-32-7S	P3-F	MS3106R-16S-1S	16	21.50
P4-J	MS3106R-32-7S	K7-1	MS25036-153	16	84.00
P4-K	MS3106R-32-7S	K7-15	MS25036-153	16	84.00
P2-A	MS3106R-14S-6S	K7-6	MS25036-153	16	84.00
P2-B	MS3106R-14S-6S	K7-3	MS25036-153	16	84.00
P2-D	MS3106R-14S-6S	K7-8	MS25036-153	16	84.00
P2-E	MS3106R-14S-6S	K7-5	MS25036-153	16	84.00
P10-A	MS3106R-28-9P	P3-E	MS3106R-16S-1S	16	21.50
P10-B	MS3106R-28-9P	P3-C	MS3106R-16S-1S	16	21.50
P10-C	MS3106R-28-9P	P3-B	MS3106R-16S-1S	16	21.50
P10-D	MS3106R-28-9P	P3-A	MS3106R-16S-1S	16	21.50
P10-E	MS3106R-28-9P	P7-C	MS310R-16S-10S	16	41.00
P10-F	MS3106R-28-9P	C2-2	13216E6191-2	14	19.00
P10-G	MS3106R-28-9P	K10-5	MS25036-153	14	13.50
P10-H	MS3106R-28-9P	P3-D	MS3106R-16S-1S	16	21.50
P10-J	MS3106R-28-9P	P7-A	MS3106R-16S-10S	16	41.00
P10-K	MS3106R-28-9P	P7-B	MS3106R-16S-10S	16	41.00
P10-L	MS3106R-28-9P	C1-1	13216E6191-2	16	21.56
P10-M	MS3106R-28-9P	C1-2	13216E6191-2	16	3.88

TABLE 4-3. WIRE LIST (Cont)

TERMINATION		TERMINATION		WIRE	LENGTH
FROM	TERMINAL TYPE	TO	TERMINAL TYPE	SIZE	IN INCHES
	WIRE HARNESS P3, P4, P7, P8, AND P10-J1 (Cont)				
K7-2	MS25036-153	K7-16	MS25036-153	16	3.88
		WIRE HARNESS J8			
J8-C	13211E8399C28-17P	S7-1	MS25036-100	16	5.00
J8-D	13211E8399C28-17P	S7-3	MS25036-100	16	5.00
J8-E	13211E8399C28-17P	S-2B		16	12.31
J8-H	13211E8399C28-17P	S-32		16	12.31
J8-J	13211E8399C28-17P	S-3A	13211E8288	16	11.81
J8-K	13211E8399C28-17P	S-2B	13211E8288	16	12.31
J8-L	13211E8399C28-17P	S-1A	13211E8288	16	13.31
J8-M	13211E8399C28-17P	S-1B	13211E8288	16	13.31
J8-N	13211E8399C28-17P	S-1D	13211E8288	16	13.31
J8-P	13211E8399C28-17P	S1-R	MS25036-153	16	8.88
J8-R	13211E8399C28-17P	El	MS25036-108	16	4.50
S-32	13211E8288	S-22	13211E8288	16	3.25

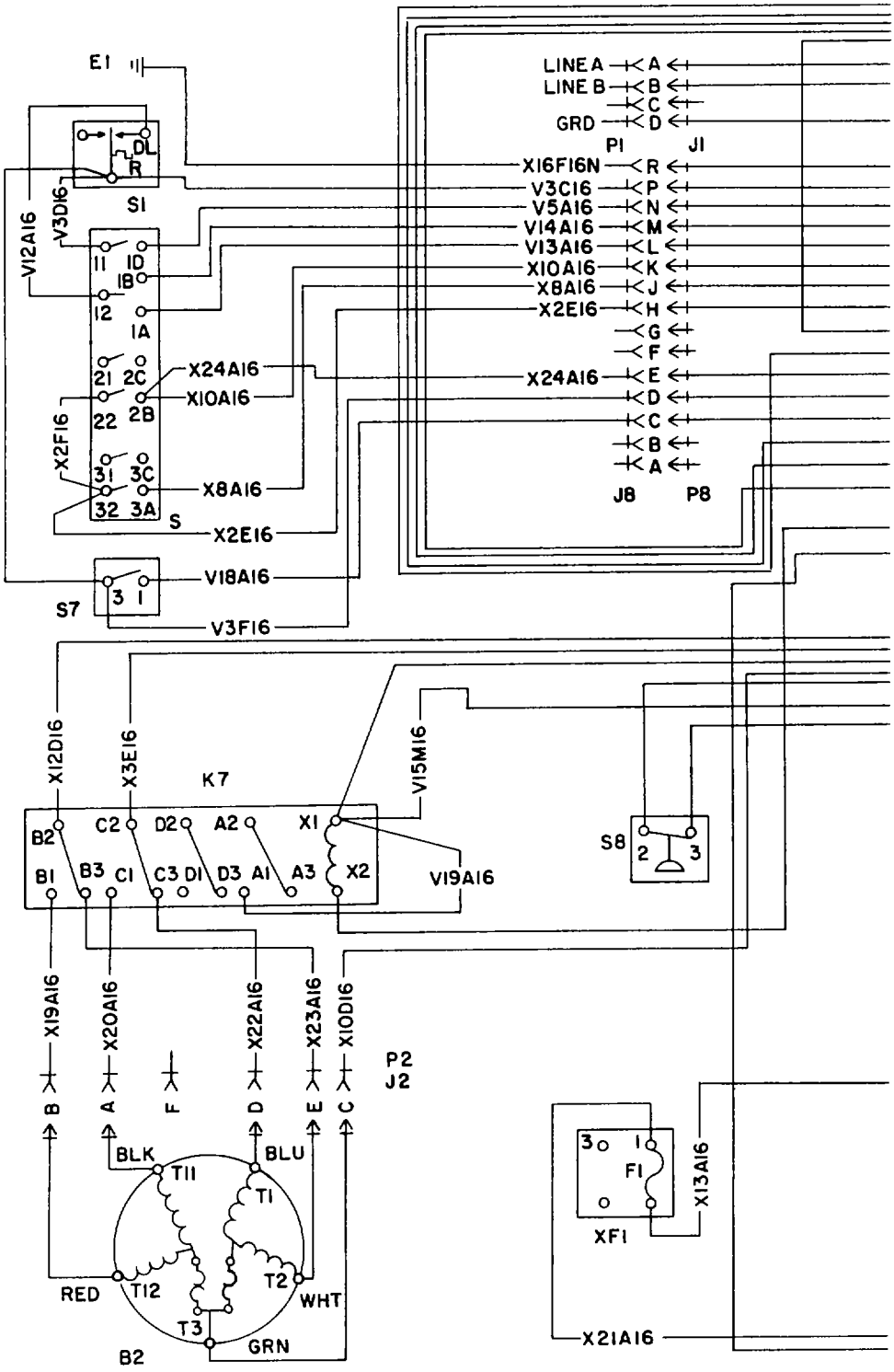


Figure 4-43. Wiring Diagram (Sheet 1 of 5)

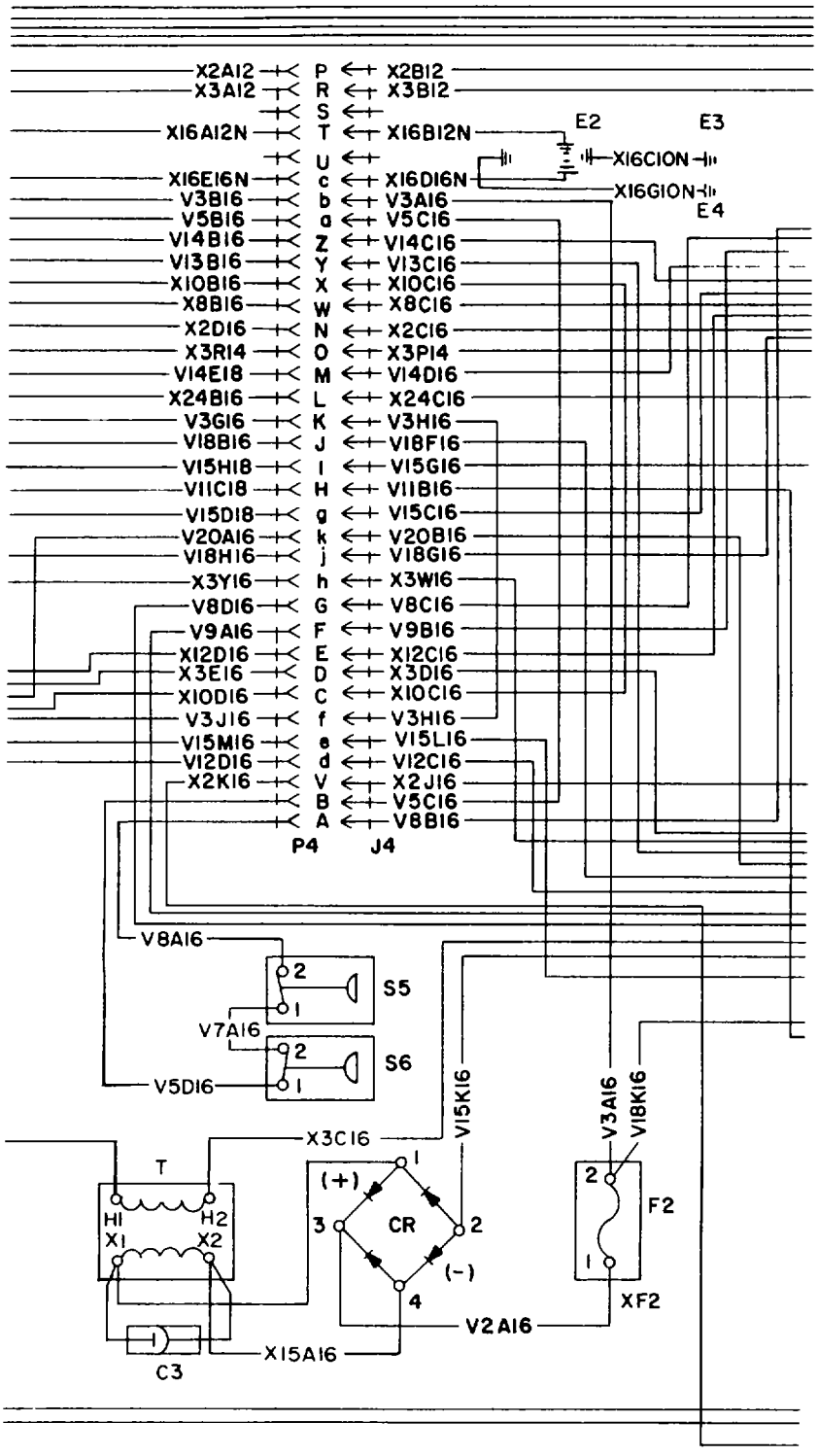


Figure 4-43. Wiring Diagram (Sheet 2 of 5)

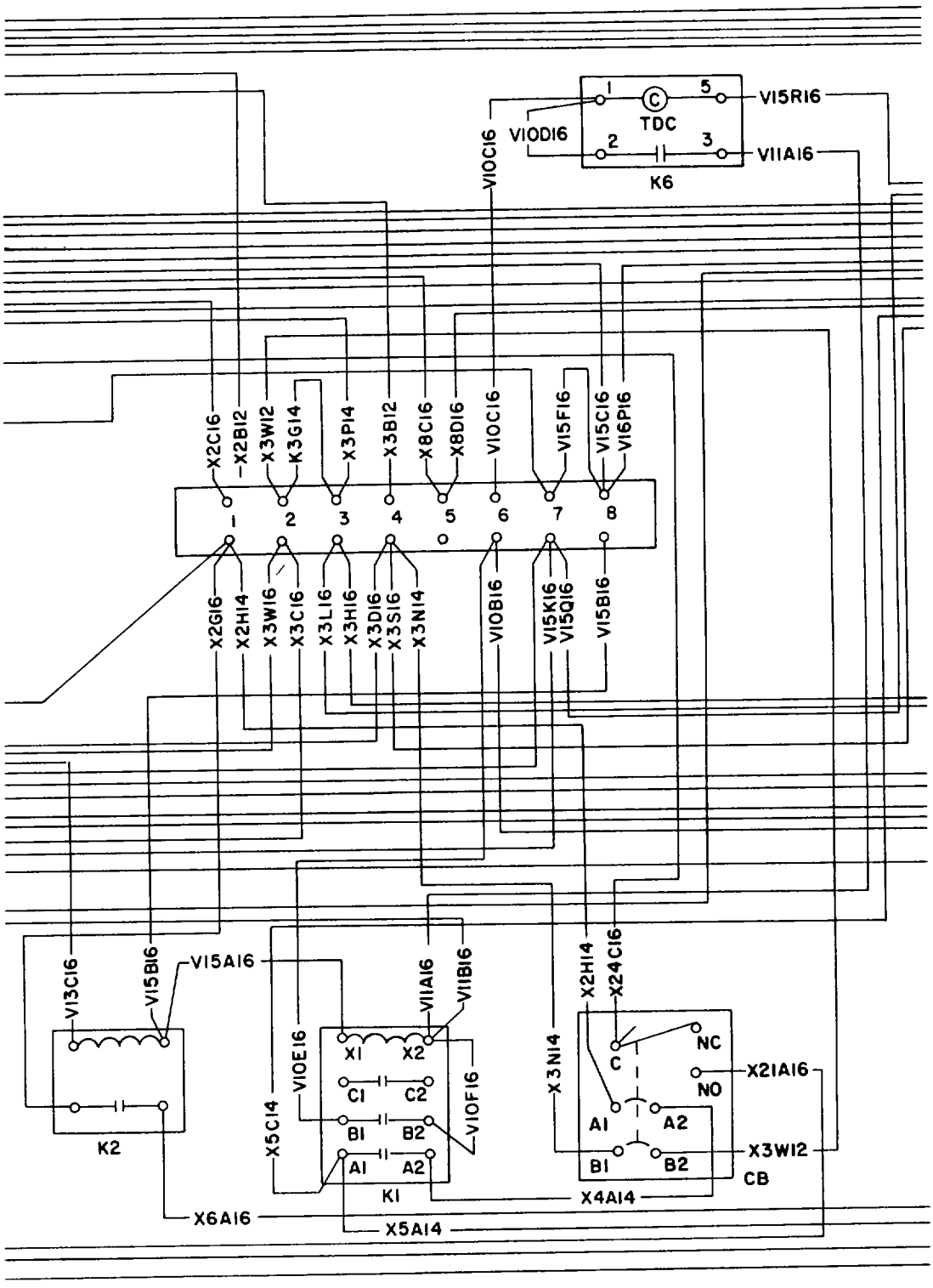


Figure 4-43. Wiring Diagram (Sheet 3 of 5)

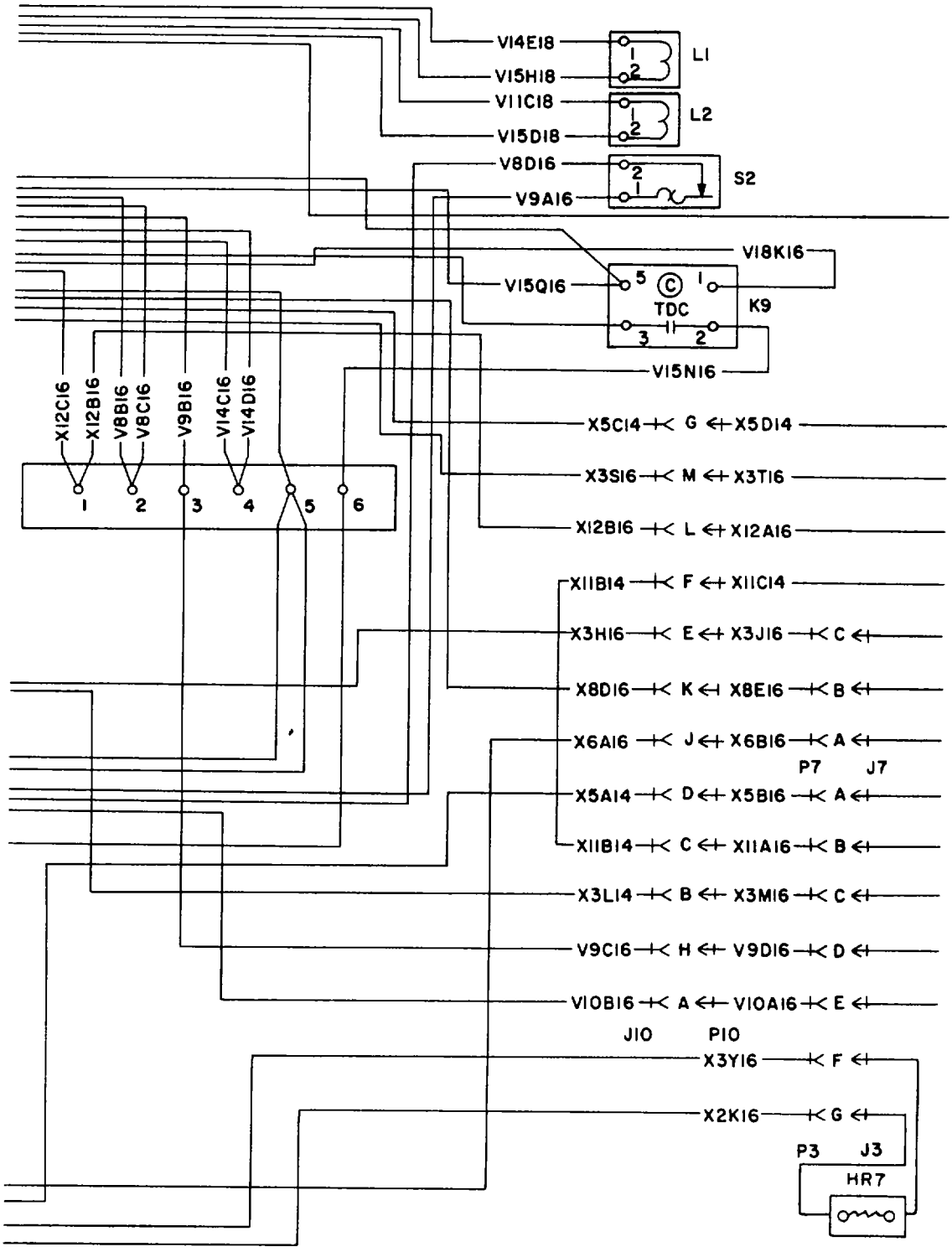


Figure 4-43. Wiring Diagram (Sheet 4 of 5)

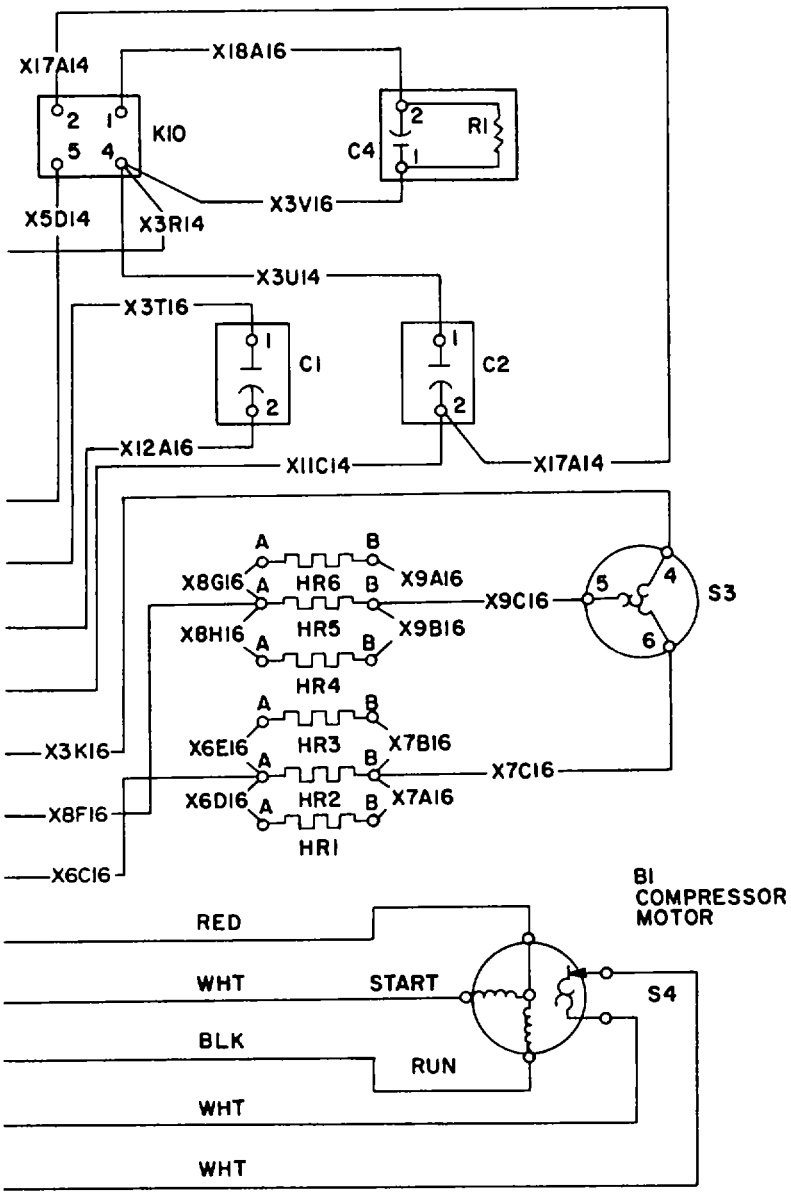
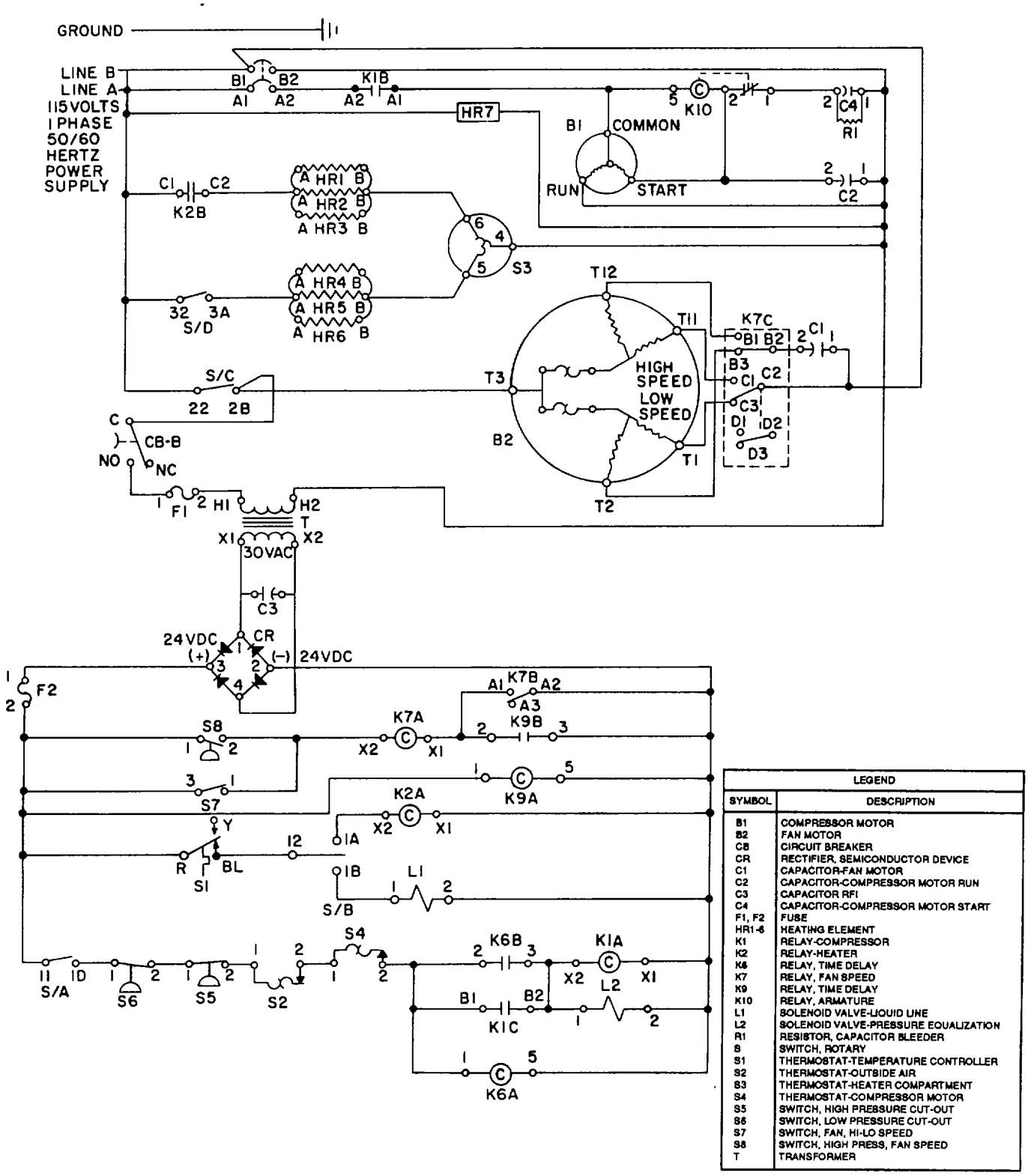


Figure 4-43. Wiring Diagram (Sheet 5 of 5)



LEGEND	
SYMBOL	DESCRIPTION
B1	COMPRESSOR MOTOR
B2	FAN MOTOR
CB	CIRCUIT BREAKER
CR	RECTIFIER, SEMICONDUCTOR DEVICE
C1	CAPACITOR-FAN MOTOR
C2	CAPACITOR-COMPRESSOR MOTOR RUN
C3	CAPACITOR RFI
C4	CAPACITOR-COMPRESSOR MOTOR START
F1, F2	FUSE
HR1-6	HEATING ELEMENT
K1	RELAY-COMPRESSOR
K2	RELAY-HEATER
K6	RELAY, TIME DELAY
K7	RELAY, FAN SPEED
K9	RELAY, TIME DELAY
K10	RELAY, ARMATURE
L1	SOLENOID VALVE-LIQUID LINE
L2	SOLENOID VALVE-PRESSURE EQUALIZATION
R1	RESISTOR, CAPACITOR BLEEDER
S	SWITCH, ROTARY
S1	THERMOSTAT-TEMPERATURE CONTROLLER
S2	THERMOSTAT-OUTSIDE AIR
S3	THERMOSTAT-HEATER COMPARTMENT
S4	THERMOSTAT-COMPRESSOR MOTOR
S5	SWITCH, HIGH PRESSURE CUT-OUT
S6	SWITCH, LOW PRESSURE CUT-OUT
S7	SWITCH, FAN, HI-LO SPEED
S8	SWITCH, HIGH PRESS, FAN SPEED
T	TRANSFORMER

Figure 4-44. Electrical Schematic

4-49. COMPRESSOR MOTOR START CAPACITOR (C4)

This task covers: a. Inspection b. Test c. Removal d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Sealant
(Appendix E item 15)

Equipment Conditions:
Junction Box Removed (para 4-32)

General Safety Instructions

WARNING

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

Inspection

(1) Using jumper cable, make contact with capacitor terminal and any convenient ground.

(2) Check for loose, corroded, missing, or broken terminal connections.

(3) Check capacitor for cracks, evidence of overheating, and any other visible damage. Replace if damaged.

Test

(1) Remove sealer to access capacitor terminals

(2) Use a multimeter for the following steps.

* Set meter to highest OHMS scale.

* Connect positive (+) meter lead to positive (+) capacitor terminal.

* Connect negative (-) meter lead to negative (-) capacitor terminal.

(3) A good capacitor will be shown by meter quickly registering high resistance, then slowly backing off to zero resistance.

(4) If meter displays high resistance and remains there, the capacitor is internally shorted and must be replaced.

(5) If the meter does not show any resistance, the capacitor is open and must be replaced.

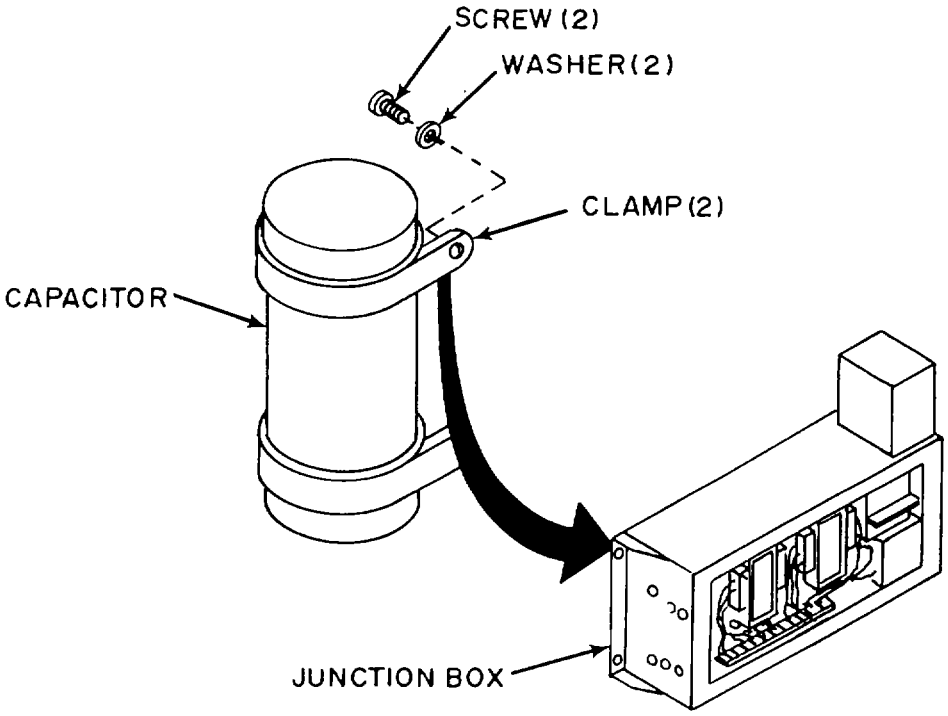


Figure 4-45. Compressor Motor Start Capacitor (C4)

Removal

(1) Tag and disconnect wire leads.

(2) Loosen two screws and remove capacitor from clamps.

Installation

(1) Install capacitor in clamps.

(2) Tighten two screws in clamps.

(3) See tags and wiring diagram (fig. 4-43), connect wire leads, and remove tags.

(4) Cover terminals with sealant

Follow-on procedure:

Install junction box. (See para 4-32.)

4-50. FAN MOTOR CAPACITOR (C1)

This task covers: a. Inspection b. Test c. Removal d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Locknuts
(Appendix E item 25)

Equipment Conditions:
Junction Box Removed (para 4-32)

General Safety Instructions

WARNING

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

Inspection

(1) Remove capacitor boots from capacitor bodies.

(2) Using jumper cable, make contact with capacitor terminals and any convenient ground.

(3) Check capacitor for cracks, evidence of overheating, and any other visible damage. Replace if damaged.

(4) Check that top of capacitor is flat. If the top is "ballooned", it had failed and must be replaced.

Test

(1) Tag and disconnect wire leads on capacitor (C1).

(2) Conduct the following test using a multimeter.

* Set meter to highest OHMS scale.

* Connect positive (+) meter lead to positive (+) capacitor terminal.

* Connect negative (-) meter lead to negative (-) capacitor terminal.

(3) A good capacitor will be shown by meter quickly registering high resistance, then slowly backing off to zero resistance.

(4) If meter displays high resistance and remains there, the capacitor is internally shorted and must be replaced.

(5) If the meter does not show any resistance, the capacitor is open and must be replaced.

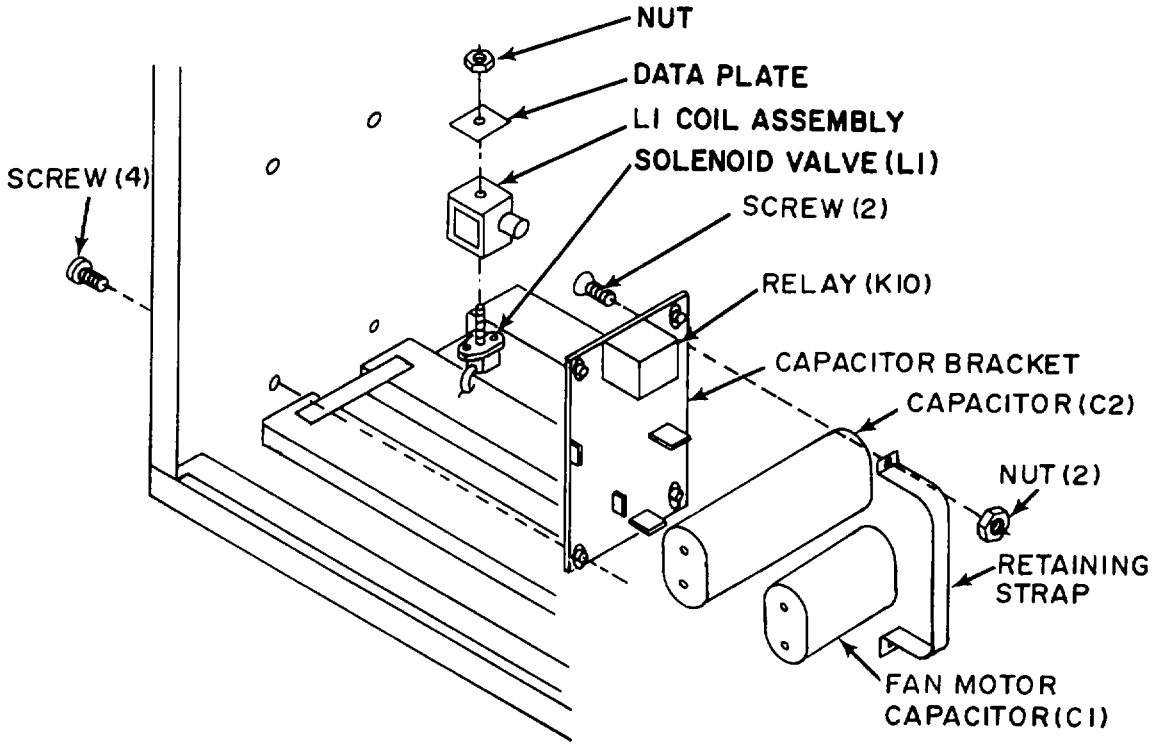


Figure 4-46. Fan Motor Capacitor (C1)

Removal

(1) Remove nut and data plate from solenoid valve L1.

(2) Remove L1 coil assembly and set aside.

(3) Tag and disconnect wire leads on capacitor (C1).

(4) Remove four screws in casing that secure capacitor bracket.

(5) Remove bracket.

(6) Remove two screws and locknuts that secure retaining strap to bracket.

(7) Remove strap.

(8) Note position of (C1) and (C2) capacitors.

(9) Remove capacitor (C1).

Installation

(1) Position capacitors (C1) and (C2) on bracket as noted during removal.

(2) Aline retaining strap on bracket.

(3) Secure retaining strap to bracket with two screws and locknuts.

(4) See tags and wiring diagram (Fig. 4-43) and connect leads. Remove tags.

(5) Aline bracket on inside casing.

(6) Secure bracket to casing with four screws.

(7) Install boots on capacitors.

(8) Install L1 coil assembly, data plate and nut on L1 valve plunger.

Follow-on procedure:

Install junction box. (See para 4-32.)

4-51. COMPRESSOR MOTOR RUN CAPACITOR (C2)

This task covers: a. Inspection c. Removal
b. Test d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Locknuts
(Appendix E item 25)

Equipment Conditions:
Junction Box Removed (para 4-32)

General Safety Instructions

WARNING

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

Inspection

(1) Remove capacitor boots from capacitor bodies.

(2) Using jumper cable, make contact with capacitor terminals and any convenient ground.

(3) Check capacitor for cracks, evidence of overheating, and any other visible damage. Replace if damaged.

(4) Check that top of capacitor is flat. If the top is "ballooned", it has failed and must be replaced.

Test

(1) Tag and disconnect wire leads on capacitor (C2).

(2) Conduct the following test using a multimeter.

* Set meter to highest OHMS scale.

* Connect positive (+) meter lead to positive (+) capacitor terminal.

* Connect negative (-) meter lead to negative (-) capacitor terminal.

(3) A good capacitor will be shown by meter quickly registering high resistance, then slowly backing off to zero resistance.

(4) If meter displays high resistance and remains there, the capacitor is internally shorted and must be replaced.

(5) If the meter does not show any resistance, the capacitor is open and must be replaced.

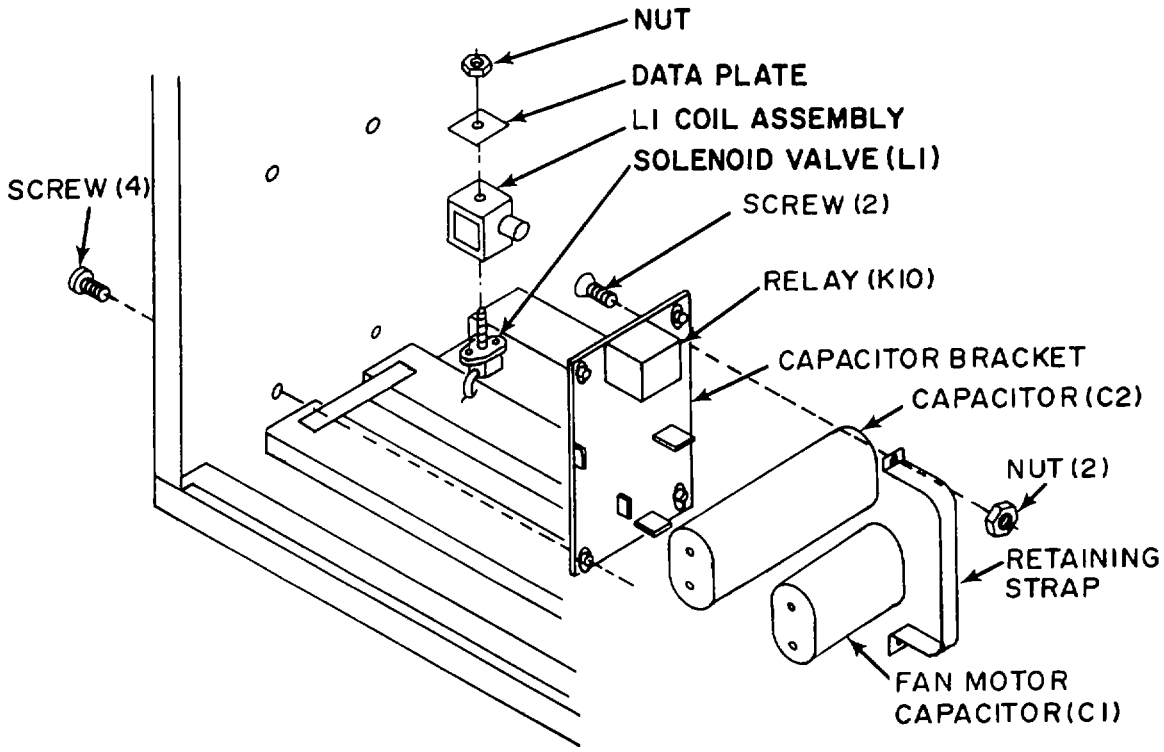


Figure 4-47. Compressor Motor Run Capacitor (C2)

Removal

(1) Remove nut and data plate from solenoid valve L1.

(2) Remove LI coil assembly and set aside.

(3) Tag and disconnect wire leads on capacitor (C2).

(4) Remove four screws in casing that secure capacitor bracket.

(5) Remove bracket.

(6) Remove two screws and locknuts that secure retaining strap to bracket.

(7) Remove strap.

(8) Note position of (C1) and (C2) capacitors.

(9) Remove capacitor (C2).

Installation

(1) Position capacitors (C1) and (C2) on bracket as noted during removal.

(2) Aline retaining strap on bracket.

(3) Secure retaining strap to bracket with two screws and locknuts.

(4) See tags and wiring diagram (fig. 4-43) and connect leads. Remove tags.

(5) Aline bracket on inside casing.

(6) Secure bracket to casing with four screws.

(7) Install boots on capacitors.

(8) Install L1 coil assembly, data plate and nut on L1 valve plunger.

Follow-on procedure:

Install junction box. (See para 4-32.)

4-52. ARMATURE RELAY (K10)

This task covers:

a. Inspection
b. Test
c. Removal
d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Equipment Conditions:
function Box Removed (para 4-32)

Inspection

Check relay for cracks, evidence of overheating, and any other visible damage. Replace if damaged.

Test

(1) Using a multimeter set on lowest OHMS scale, check continuity between terminals (2 and 1). Both contacts should be closed. If there is no continuity, replace relay.

(2) Check continuity between terminals 2 and 5. Resistance should be a nominal 10,000 ohms. If shorted or open, replace relay.

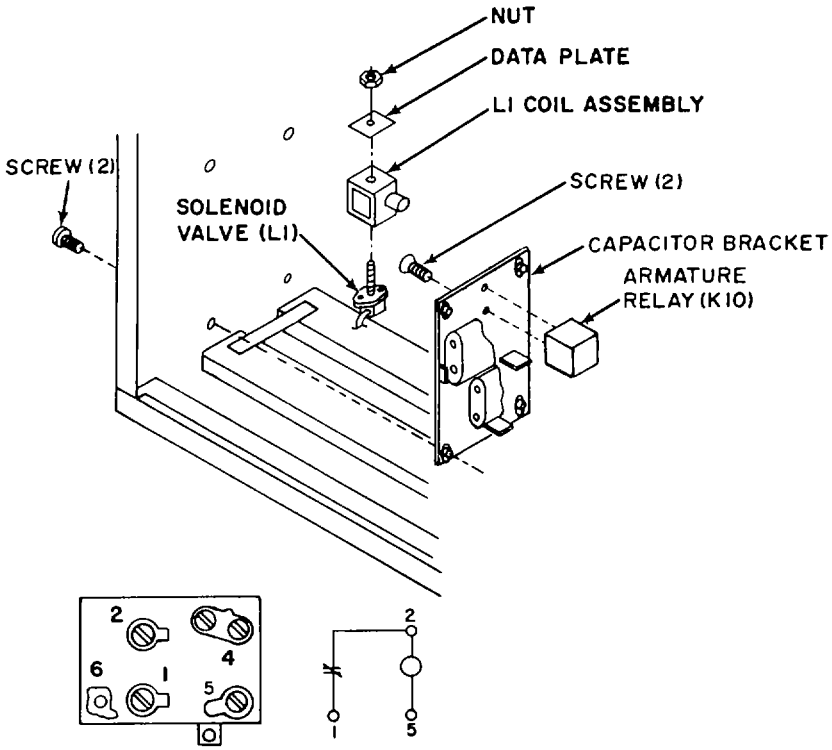


Figure 4-48. Armature Relay (K10)

Removal

(1) Remove nut and data plate from solenoid valve.

(2) Remove L1 coil assembly and set aside.

(3) Remove four screws and capacitor bracket from casing.

(4) Remove screw and relay from bracket.

(5) Tag and disconnect wire leads from relay

Installation

(1) See tags and wiring diagram (fig 4-43) and connect wire leads. Remove tags.

(2) Secure relay to bracket with screw.

(3) Secure bracket to casing with four screws.

(4) Install L1 coil assembly and data plate and secure to L1 valve plunger with nut.

Follow-on procedure:

Install junction box. (See para 4-32.)

4-53. FAN RELAY (K7)

This task covers:

a. Inspection
b. Test

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Equipment Conditions:
Top Panel Removed (para 4-32)

Inspection

(1) Check for loose, corroded, missing, or broken terminal connections.

(2) Check relay for cracks, evidence of overheating, and any other visible damage. Notify your supervisor if damaged.

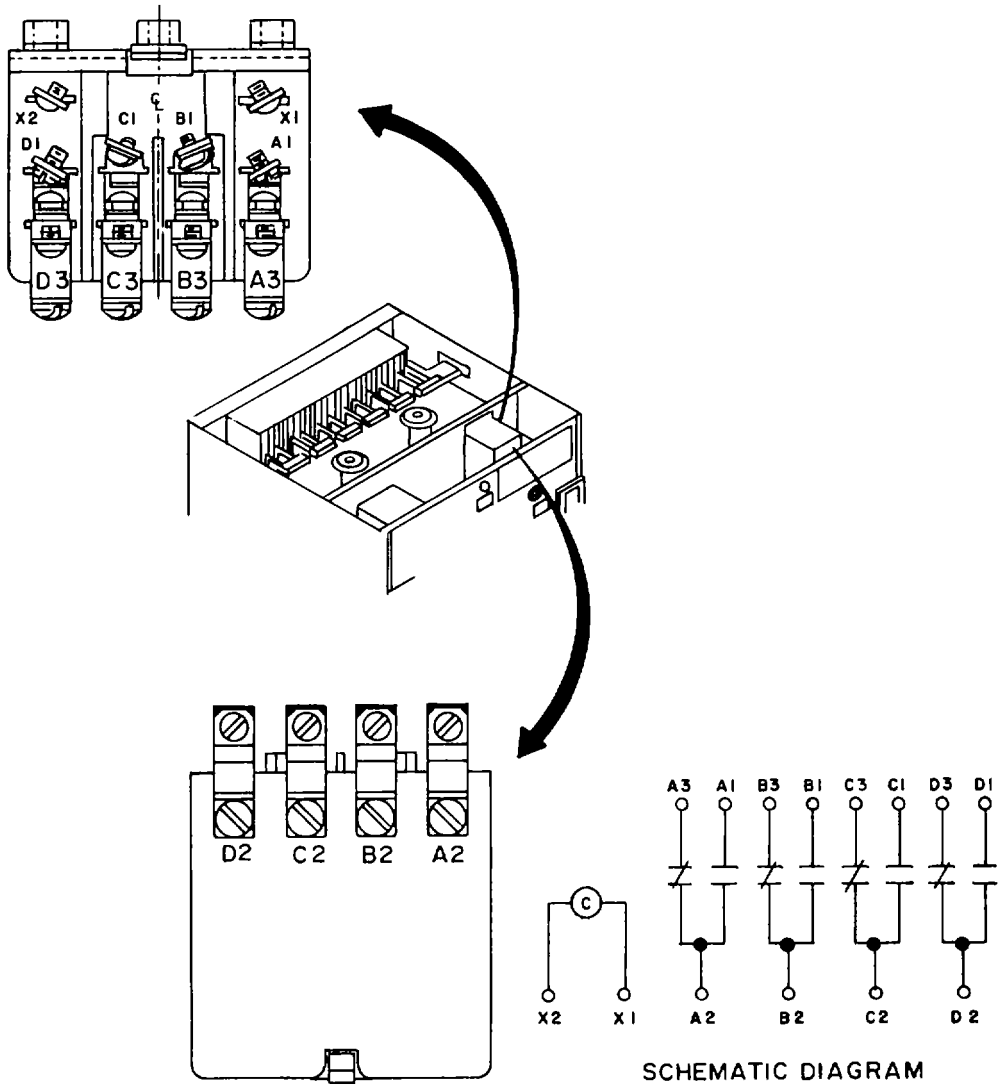


Figure 4-49. Fan Relay (K7)

Test

(1) Tag and disconnect all wires.

(2) Use a multimeter set on lowest OHMS scale to check continuity between terminals Al and A2, B 1 and B2, C 1 and C2, and D 1 and D2. All four contacts should be open. If there is continuity, notify your supervisor.

(3) See tags and wiring diagram (fig 4-43) and connect leads.

Follow-on procedure:

Install top panel. (See para 4-16.)

4-54. HEATER CUTOUT (THERMOSTAT) SWITCH (S3)

This task covers:

a. Inspection
b. Removal
c. Test
d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Solder Gun Kit
(Appendix B item 6)

Materials/Parts
Solder
(Appendix E item 21)
Flux
(Appendix E item 22)
Locknuts
(Appendix E item 25)

Equipment Conditions:
Top Panel Removed (para 4-16)
Heater Elements HR4, HR5, HR6 Removed (para 4-58)

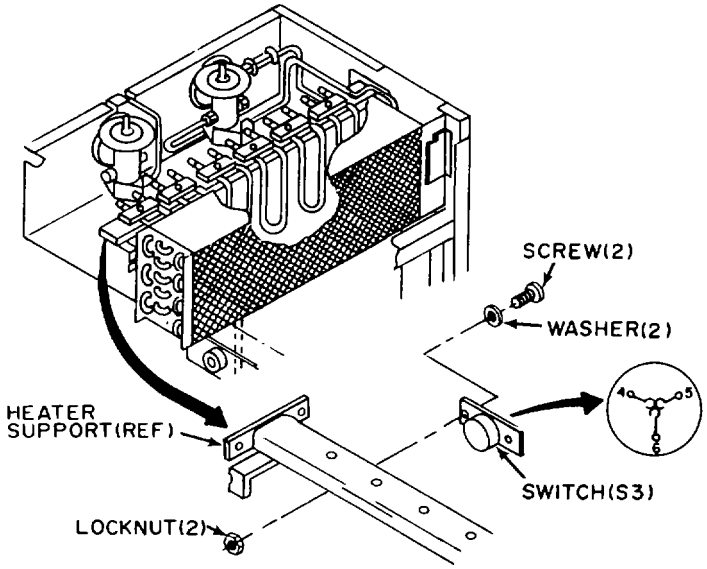


Figure 4-50. Heater Cutout (Thermostat) Switch (S3)

Inspection

(1) Check wire leads for tightness. Tighten if loose.

(2) Check switch for evidence of damage. Replace if damaged.

Removal

(1) Tag and unsolder wire leads.

(2) Remove two screws, washers, locknuts, and heater cutout (thermostat) switch.

Test

With thermostat at room temperature, use a multimeter set on the lowest OHMS scale to check for continuity between each pair of contacts (4 and 6, 4 and 5, and 5 and 6). If continuity is not indicated between all contacts, replace the thermostat.

NOTE

For full operational test of thermostat use an external heat source. Thermostat should open (no continuity across contacts) when temperature reaches 194° F f160 (610 C 9-o).

Installation

(1) Secure thermostat to heater support with two screws, washers, and locknuts.

(2) See tags and wiring diagram (fig. 4-43) solder wire leads, and remove tags.

Follow-on procedure:

(1) Install heater elements HR4, HR5, HR6. (See para 4-58.)

(2) Install top panel. (See para 4-16.)

4-55. EVAPORATOR FAN

This task covers:

a. Removal
b. Inspection
c. Cleaning
d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Torque Wrench
(Appendix B item 3)
Socket Attachment
(Appendix B item 4)

Materials/Parts
Rags
(Appendix E item 1)
Detergent
(Appendix E item 2)
Brush
(Appendix E item 28)

Equipment Conditions:
Intake Grille Removed (para 4-22)
Air Filter Removed (para 4-23)

Removal

(1) Remove six screws and washers in evaporator inlet ring.

(2) Remove ring.

(3) Loosen two setscrews in fan hub.

(4) Carefully pull evaporator fan off of motor shaft.

(5) Remove shaft key. Tape in place so that it will not be lost.

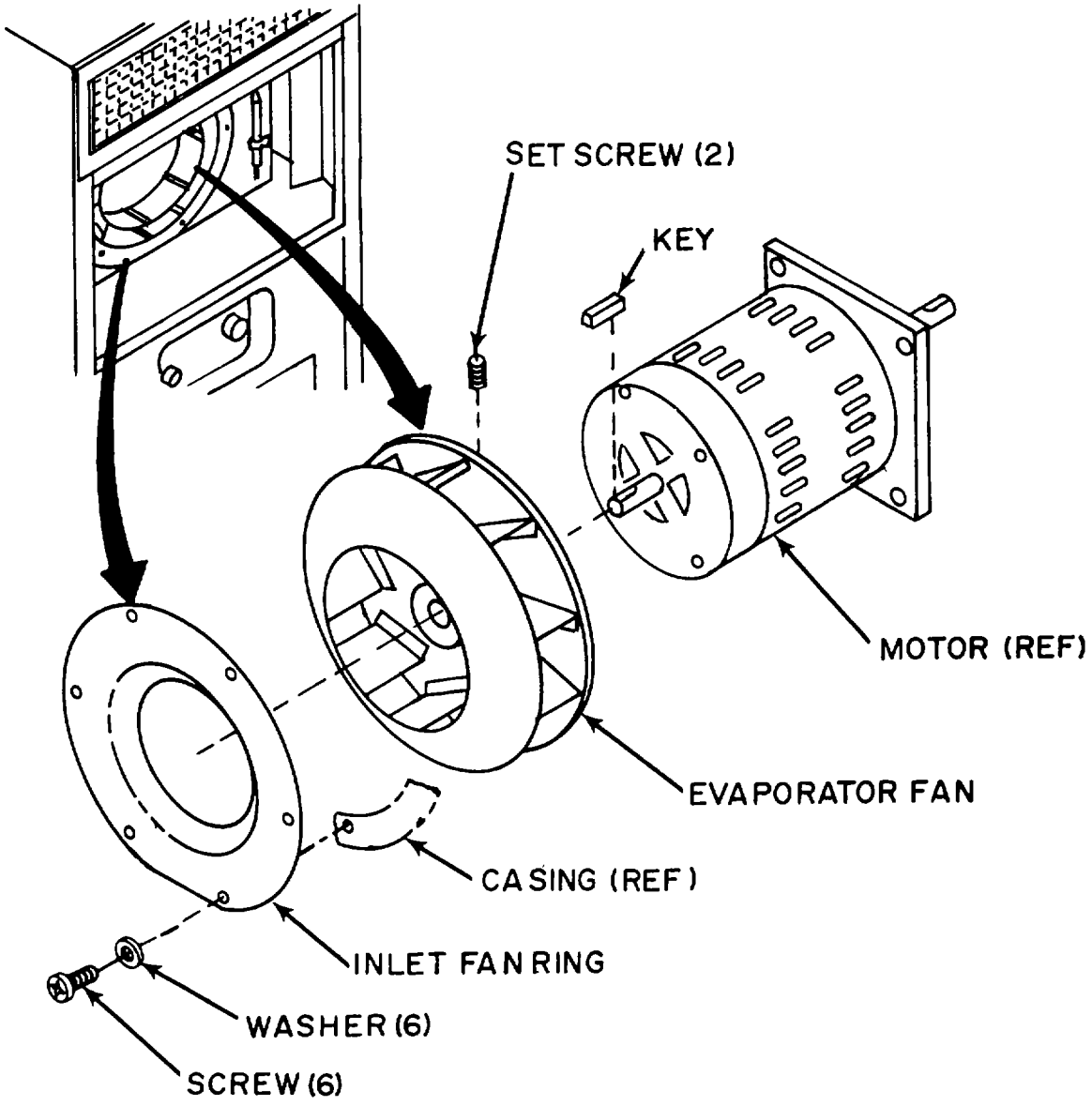


Figure 4-51. Evaporator Fan

Inspection

(1) Check fan for dents, bent or loose fan blades, and that hub is securely attached. Replace if damaged.

(2) Check inlet ring for dents or any distortion that would cause interference with fan. Replace if damaged.

Cleaning

(1) Use a clean dry cloth and a soft brush to remove dirt from fan.

(2) If fan and inlet bell are excessively dirty, wash them with a mild detergent and water solution.

Installation

(1) Check that shaft key is in place.

(2) Aline keyway and shaft key and slip fan onto motor shaft.

(3) Aline fan hub flush with end of motor shaft.

(4) With torque wrench, tighten two setscrews to a torque of 70 (t3) inch-pounds.

(5) Secure inlet ring with six screws and washers.

(6) Spin fan by hand and check for any interference between fan and ring. Adjust fan if necessary.

Follow-on procedures:

(1) Install air filter. (See para 4-23.)

(2) Install evaporator intake grille assembly. (See para 4-22.)

4-56. CONDENSER FAN

This task covers:

a. Removal
b. Inspection
c. Cleaning
d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Torque Wrench
(Appendix B item 3)
Socket Attachment
(Appendix B item 4)

Materials/Parts
Rags
(Appendix E item 1)
Detergent
(Appendix E item 2)
Brush
(Appendix E item 28)

Equipment Conditions:
Discharge Guard Removed (para 4-19)

Removal

(1) Loosen two setscrews in fan hub.

(2) Carefully pull condenser fan off of motor shaft.

(3) Remove shaft key. Tape in place so it will not be lost.

Inspection

Check fan for dents, bent or loose blades, and that the hub is securely attached. Replace if damaged.

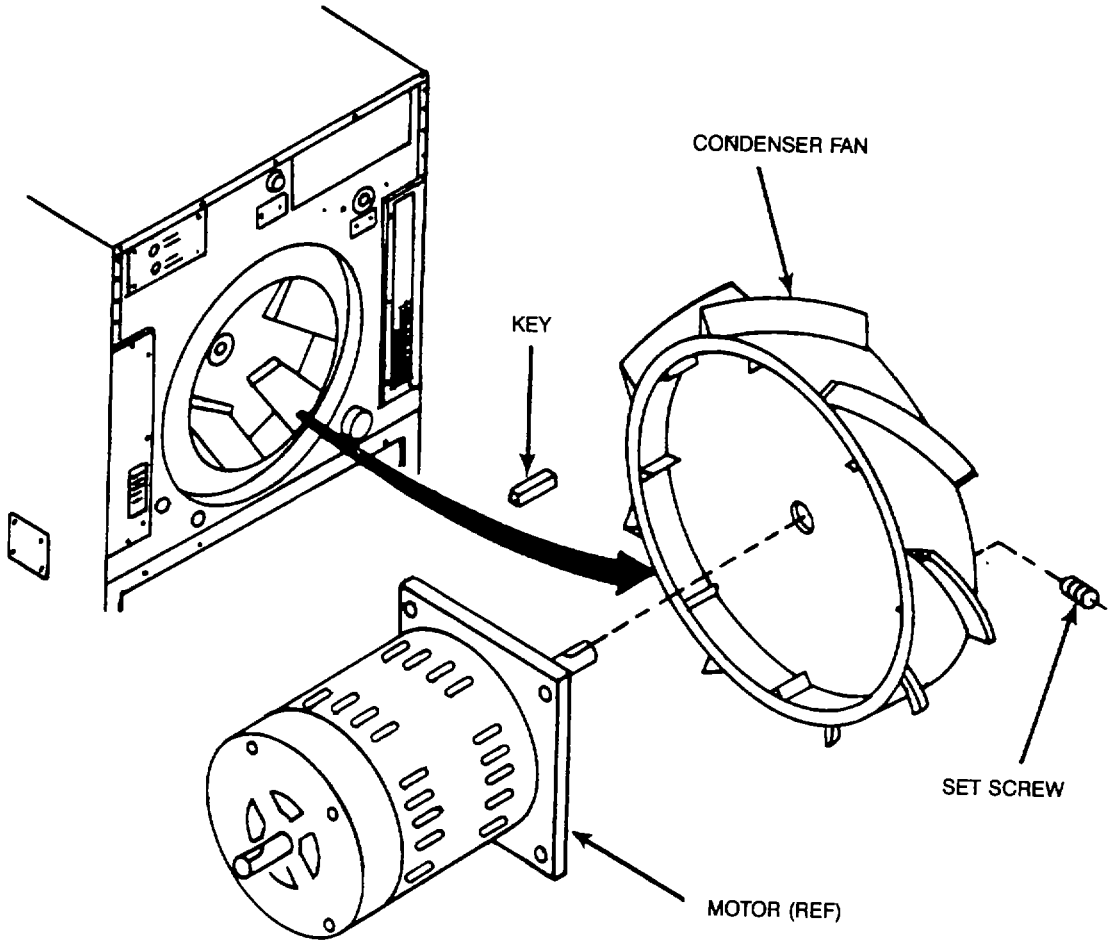


Figure 4-52. Condenser Fan

Cleaning

(1) Use a clean dry cloth and a soft brush to remove dirt from fan.

(2) If fan is excessively dirty, wash with mild detergent and water solution.

Installation

(1) Check that shaft key is in place.

(2) Aline keyway and shaft key and slip fan onto motor shaft.

(3) Aline fan hub flush with end of motor shaft.

(4) Using torque wrench, tighten two setscrews to a torque of 70 (t3) inch-pounds.

Follow-on procedure:

Install condenser air discharge guard. (See para 4-19.)

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4-57. EVAPORATOR AND CONDENSER FAN MOTOR (B2)

This task covers:

a. Inspection
b. Test
c. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Locknuts
(Appendix E item 29)
Lockwashers
(Appendix E item 30)

Equipment Conditions:
Evaporator Fan and Ring Removed (para 4-55)
Condenser fan removed (para 4-56)

Inspection

(1) Check motor for rotational freedom by spinning shaft by hand. If there is any stiffness or binding, contact direct support maintenance.

(2) Pull and push shaft axially to check for end play. If there is excessive end play, contact direct support maintenance.

Test

(1) Using a multimeter set on lowest OHMS scale, check continuity between pins in connector J2 as follows: (See fig. 4-43.)

- Pin A to pin B
- Pin D to pin E
- Pin A to pin C

- Pin D to pin C

(2) If there is no continuity between any pair of pins, the motor winding is open. Replace motor.

(3) Using a multimeter set on high OHMS scale, check continuity between pins A, C, D, and ground. If continuity is found, replace motor.

NOTE

If all the above inspections and tests are satisfactory, but the motor will still not operate properly, notify your supervisor.

Replacement

(1) Disconnect plug P2 from connector J2.

(2) Remove the four screws, washers, and self-locking nuts in motor mounting flange.

(3) Remove two screws, lockwashers, and flat washers in support legs of motor.

(4) Remove two spacers from motor bracket.

(5) Remove three screws, spacers and locknuts from clamps securing two copper tubes to bulkhead wall above motor. Do not remove clamps.

CAUTION

Be careful not to damage tubing when removing motor

NOTE

Motor fits tightly into bulkhead opening. It may be necessary to tap motor loose from bulkhead using a hammer and a block of wood. Do not tap motor shaft.

(6) Rotate motor 90' counterclockwise and remove motor from unit.

(7) Insert the motor through the condenser fan cavity far enough to reach plug P2.

(8) Connect plug P2 to connector J2.

(9) Aline motor flange hole pattern to motor mount flange hole pattern.

(10) Install the four screws through the motor and motor mount flanges.

(11) Install four washers and locknuts on the four screws hand-tight.

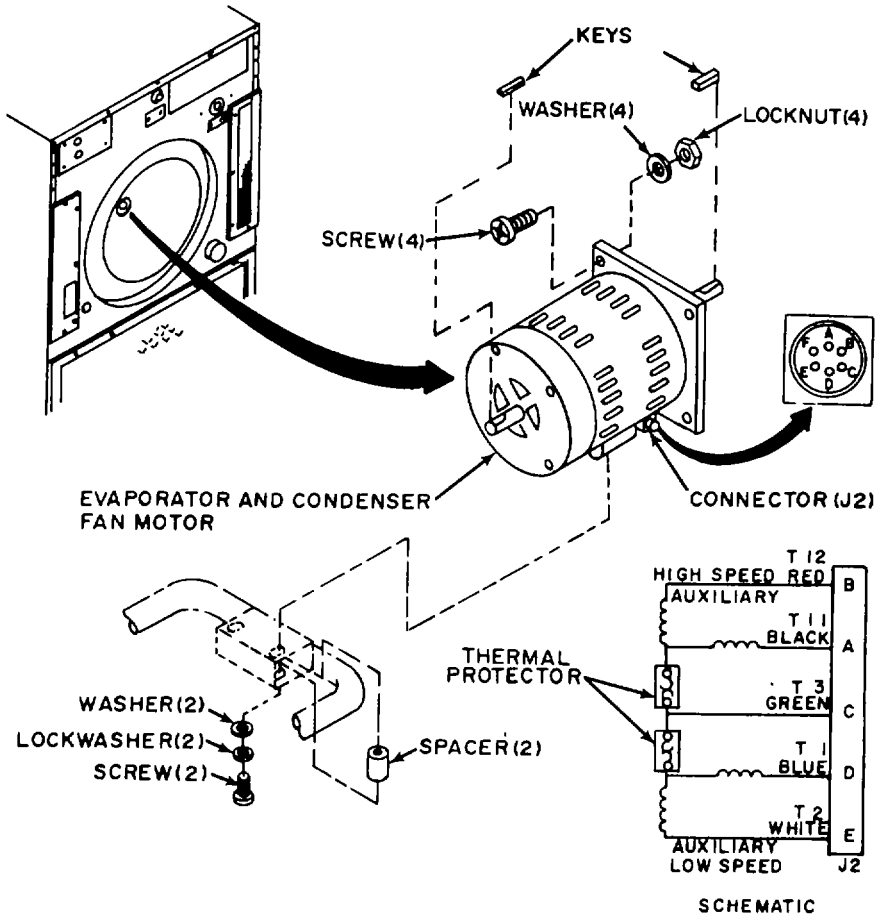


Figure 4-53. Evaporator and Condenser Fan Motor (B2)

(12) Insert the two spacers in motor bracket and aline with holes.

(13) Install two screws, lockwashers and flat washers in motor bracket through spacers.

(14) Hand tighten the four screws, washers, and self-locking nuts in motor flange.

(15) Tighten the two screws, lockwashers and flat washers in motor bracket.

(16) Align clamps securing copper tubing to bulkhead wall with spacers and secure with screws and locknuts.

(17) Connect plug P2 to connector J2.

Follow-on procedure:

(1) Install condenser fan. (See para 4-56.)

(2) Install evaporator and ring. (See para 4-55.)

4-58. ELECTRIC HEATER (ELEMENTS) (HR1 THRU HR6) AND SUPPORT

This task covers:

a. Inspection
b. Test
c. Removal
d. Installation

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Locknuts
(Appendix E item 31)

Equipment Conditions:
Top Panel Removed (para 4-16)

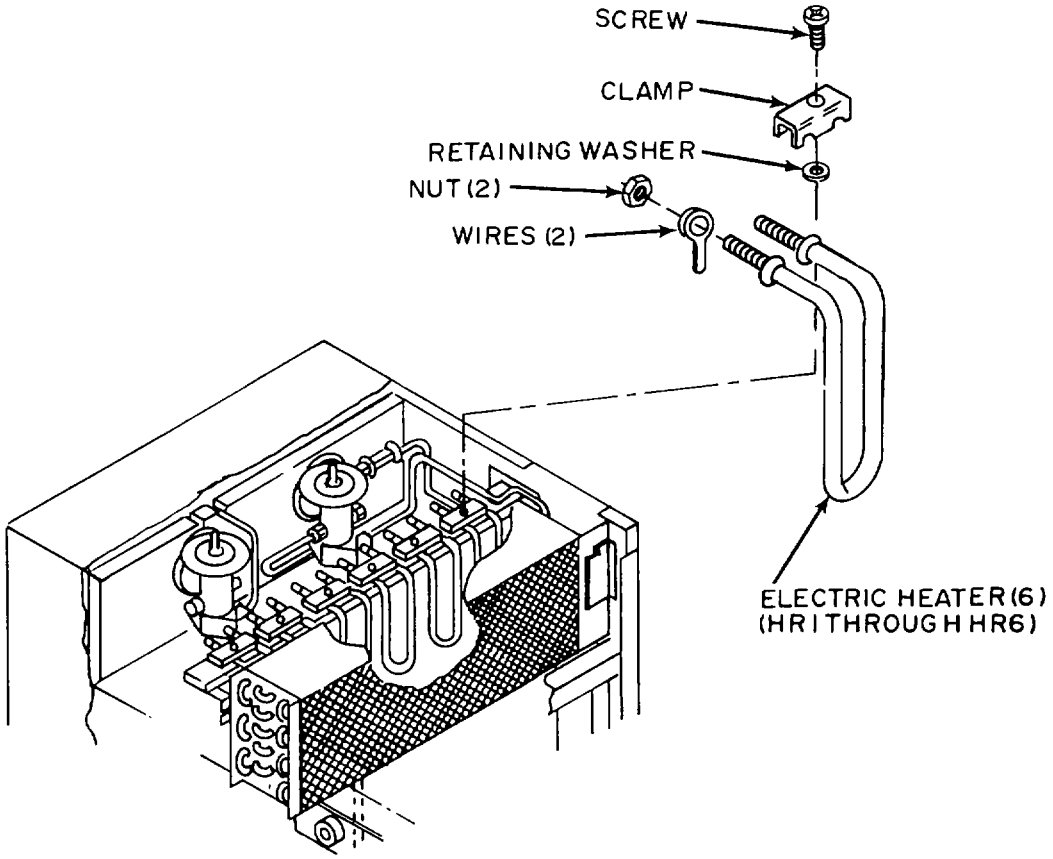


Figure 4-54. Electric Heater (Elements) (HR1 thru HR6)

Inspection

Check heater elements for deformation, damaged terminals or threads and cracked or broken outside covering. Replace if damaged.

Test

(1) Tag and remove one wire from each heater element.

(2) Using a multimeter set on lowest OHMS scale, check for continuity between the two terminal studs. Replace heater if no continuity is indicated.

Removal

a. Heater Element

(1) Tag and disconnect the wire leads from the heater that is being removed.

(2) Loosen the screw and remove retainer clamp assembly.

(3) Remove heater element.

b. Heater support

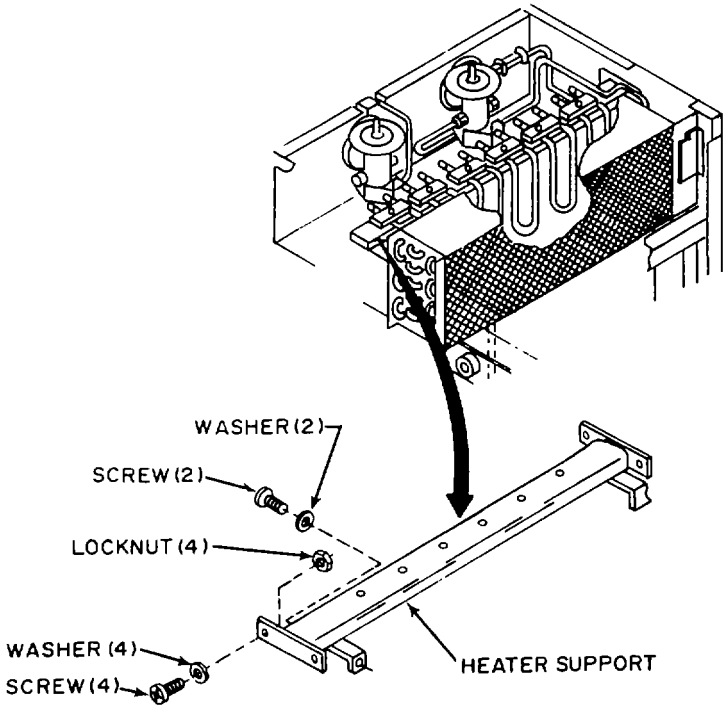


Figure 4-55. Heater Support

(1) Remove all six heaters.

(2) Remove heater cutout switch. (See para 4-54.)

(3) Remove four screws, washers, and locknuts in casing sides.

(4) Remove two screws and washers in evaporator coil.

(5) Remove heater support.

Installation

a. Heater Support

(1) Install heater cutout switch. (See para 4-54.)

(2) Secure heater support to evaporator coil with two screws and washers.

(3) Secure heater support to casing with two screws, washers, and locknuts in each casing side.

b. Heater Elements

(1) Aline heater element over threaded inserts on bracket.

(2) Secure top of heater element with retainer clamp by tightening screw.

(3) See tag and wiring diagram (fig. 4-43) connect wire leads, and remove tags.

Follow-on procedure:

Install top panel. (See para 4-16.)

4-59. EVAPORATOR COIL (E)

This task covers:

a. Inspection
b. Cleaning

INITIAL SETUP

Tools

Tool Kit, Refrigeration
(Appendix B item 1)
Fin Straightener
(Appendix B item 7)

Materials/Parts
Brush
(Appendix E item 28)
protection and other protective equipment.

Equipment Conditions:
Mist Eliminator Removed (para 4-24)

General Safety Instructions

WARNING

Death or serious injury could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure is/has been reduced to 30 psi (2.11 kg/cm2) or less. When working with compressed air always use chip guards and wear eye

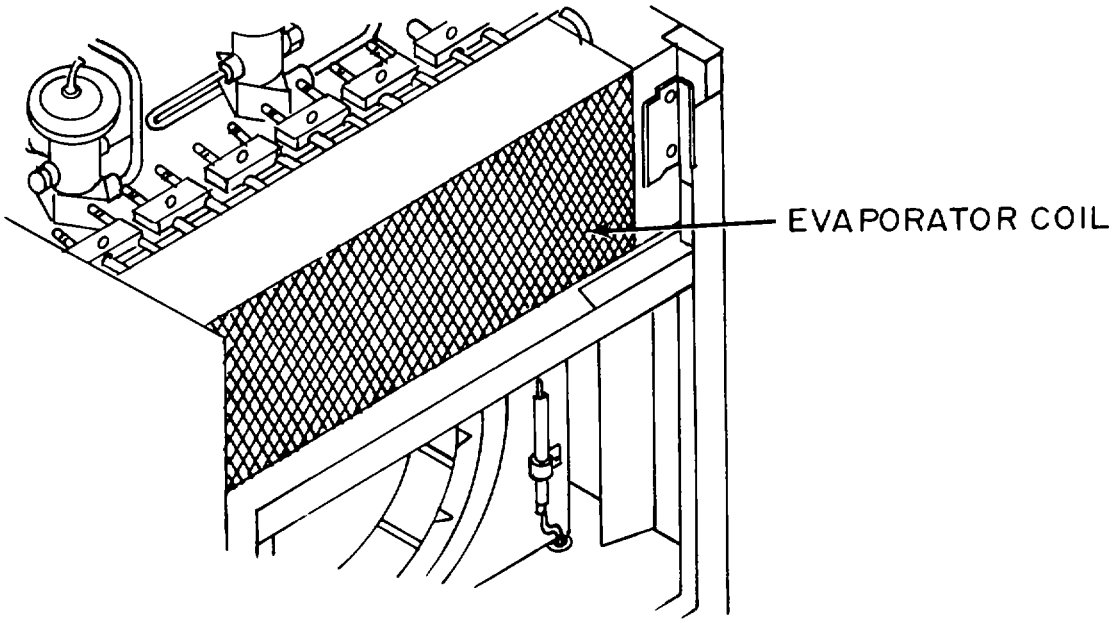


Figure 4-56. Evaporator Coil (E)

Inspection

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

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

Cleaning

Clean coil with a soft bristle brush, or use compressed air at 30 psi or less from the inside of the unit to blow the dirt out. Take care to avoid fin damage. Should a leak or major damage be evident, notify your supervisor.

CAUTION

DO NOT USE STEAM TO CLEAN COIL

Steam cleaning of coil may raise the temperature of refrigerant-22 to a degree where resulting pressures in the refrigeration system could damage refrigeration components.

Follow-on procedures:

Install mist eliminator. (See para 4-24.)

4-60. CONDENSER COIL (C)

This task covers:

a. Inspection
b. Cleaning

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Fin Straightener
(Appendix B item 7)

Materials/Parts
Brush
(Appendix E item 28)

Equipment Conditions:
Condenser Coil Guard Removed (para 4-20)
Junction Box Removed (para 4-32)

General Safety Instructions

WARNING

Death or serious injury could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure is/has been reduced to 30 psi (2.11 kg/cm2) or less. When working with compressed air always use chip guards and wear eye protection and other protective equipment.

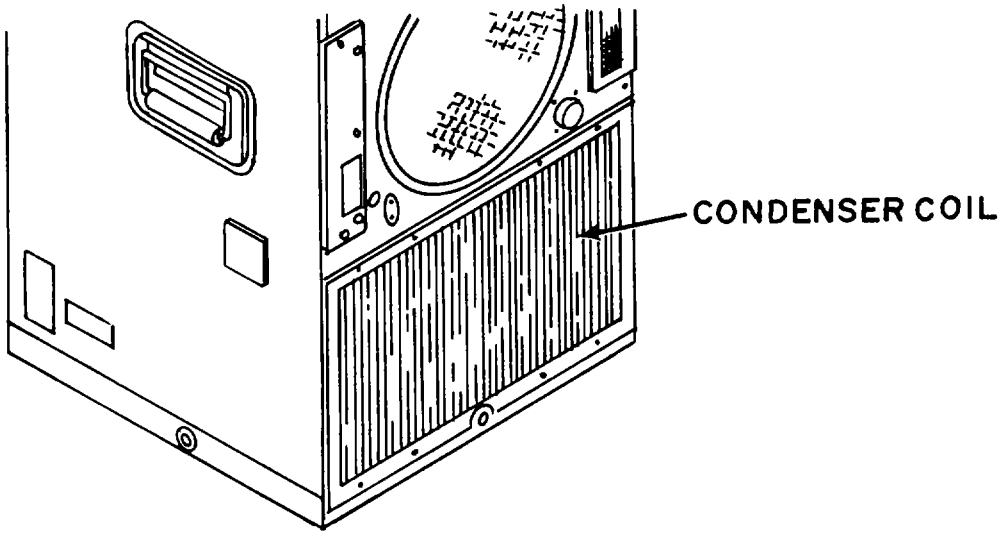


Figure 4-57. Condenser Coil (C)

Inspection

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

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

Cleaning

Clean coil with a soft bristle brush, or use compressed air at 30 psi or less from the inside of the unit to blow the dirt out. Take care to avoid fin damage. Should a leak or major damage be evident, notify your supervisor.

CAUTION

DO NOT USE STEAM TO CLEAN COIL

Steam cleaning of coil may raise the temperature of refrigerant-22 to a degree where resulting pressures in the refrigeration system could damage refrigeration components.

Follow-on procedure:

(1) Install condenser coil guard. (See para 4-20.)

(2) Install junction box. (See para 4-32.)

Section VI PREPARATION FOR STORAGE OR SHIPMENT

4-61. ADMINISTRATIVE STORAGE

a. Placement of equipment in administrative storage should be for short periods of time when a shortage of maintenance effort exists. Items should be in mission readiness within 24 hours or within the time factors as determined by the directing authority. During the storage period appropriate maintenance records will be kept.

b. Before placing equipment in administrative storage, perform the next monthly, quarterly, or semiannual Unit PMCS. Shortcomings and deficiencies should be corrected and all Modification Work Orders (MWO's) should be applied.

c. Storage site selection. Inside storage is preferred for items selected for administrative storage. If inside storage is not available, trucks, vans, conex containers and other containers may be used.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

5-1. GENERAL

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

b. Test, Measurement, and Diagnostic Equipment (TMDE) and support equipment include electrical test equipment, standard pressure and vacuum gages, vacuum pumps, and charging manifolds found as standard equipment in any direct support refrigeration shop.

c. Repair parts are listed and illustrated in the TM 9-4120-403-24P, Repair Parts and Special Tools List, (RPSTL), covering organizational, direct support, and general support maintenance for this equipment.

Section II DIRECT SUPPORT MAINTENANCE PROCEDURES

5-2. AIR CONDITIONER (FABRIC) COVER

This task covers:

a. Repair

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Repair

Minor rips, cuts, tears, or punctures may be repaired by applying a patch to the inside surface. For damage of greater extent, or missing eyelets or snap fasteners, replace the entire cover.

5-3. INFORMATION PLATES

This task covers:

a. Replacement

INITIAL SETUP

Tools

Tool Kit, Refrigeration
(Appendix B item 1)
Drill (part of shop maintenance kit)
(Appendix B item 8)
Drill Bit Set (part of shop maintenance kit)
(Appendix B item 8)
Riveter
(Appendix B item 9)

Materials/Parts

Rivets
(Appendix E item 32)
Rivets
(Appendix E item 33)
Rivets
(Appendix E item 34)
Rivets
(Appendix E item 35)

Equipment Conditions:

Lower Panel Removed (Electrical Schematic Plate Only) (para 4-17)

Replacement

(1) To replace loose or missing rivets drill old rivet out using a drill bit slightly smaller than the diameter of old rivet body.

(2) Install replacement rivet.

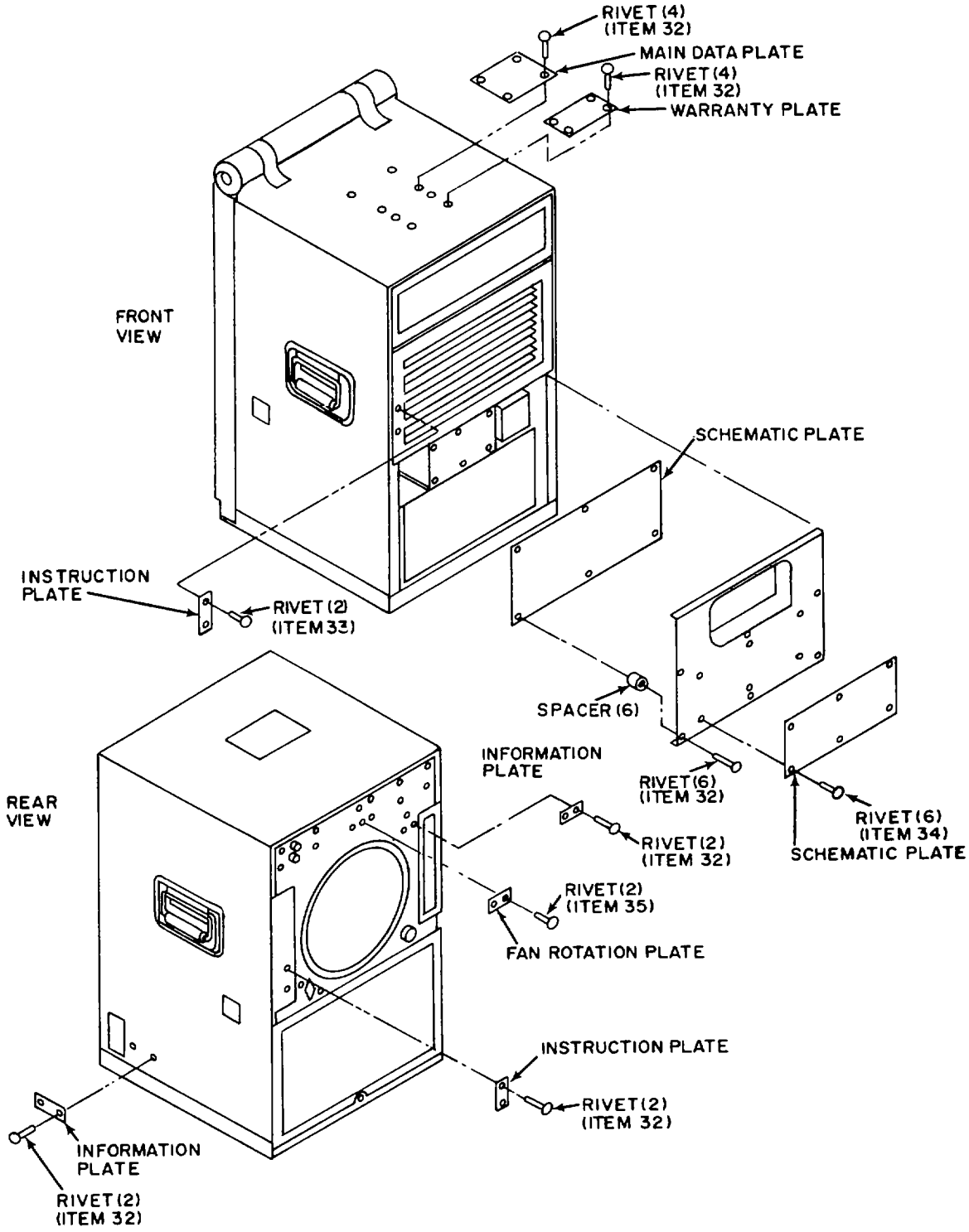


Figure 5-1. Information Plates

5-4. FRESH AIR DAMPER

This task covers:

a. Inspection
b. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Drill (part of shop maintenance kit)
(Appendix B item 8)
Drill Bit Set (part of shop maintenance kit)
(Appendix B item 8)
Riveter
(Appendix B item 9)

Materials/Parts
Apron
(Appendix E item 5)
Respirator
(Appendix E item 6)
Goggles
(Appendix E item 7)
Gloves, Protective
(Appendix E item 8)
Toluene
(Appendix E item 9)
Adhesive
(Appendix E item 10)
Rivets
(Appendix E item 32)
Rivets
(Appendix E item 35)
Rivets
(Appendix E item 36)
Gasket
(Appendix F item 31)
Gasket
(Appendix F item 32)

General Safety Instructions

WARNING

Toluene is flammable, and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well-ventilated area, and keep away from sparks or flame. Use goggles, gloves and apron when appropriate.

Equipment Conditions:
Air Filter Removed (para 4-23)

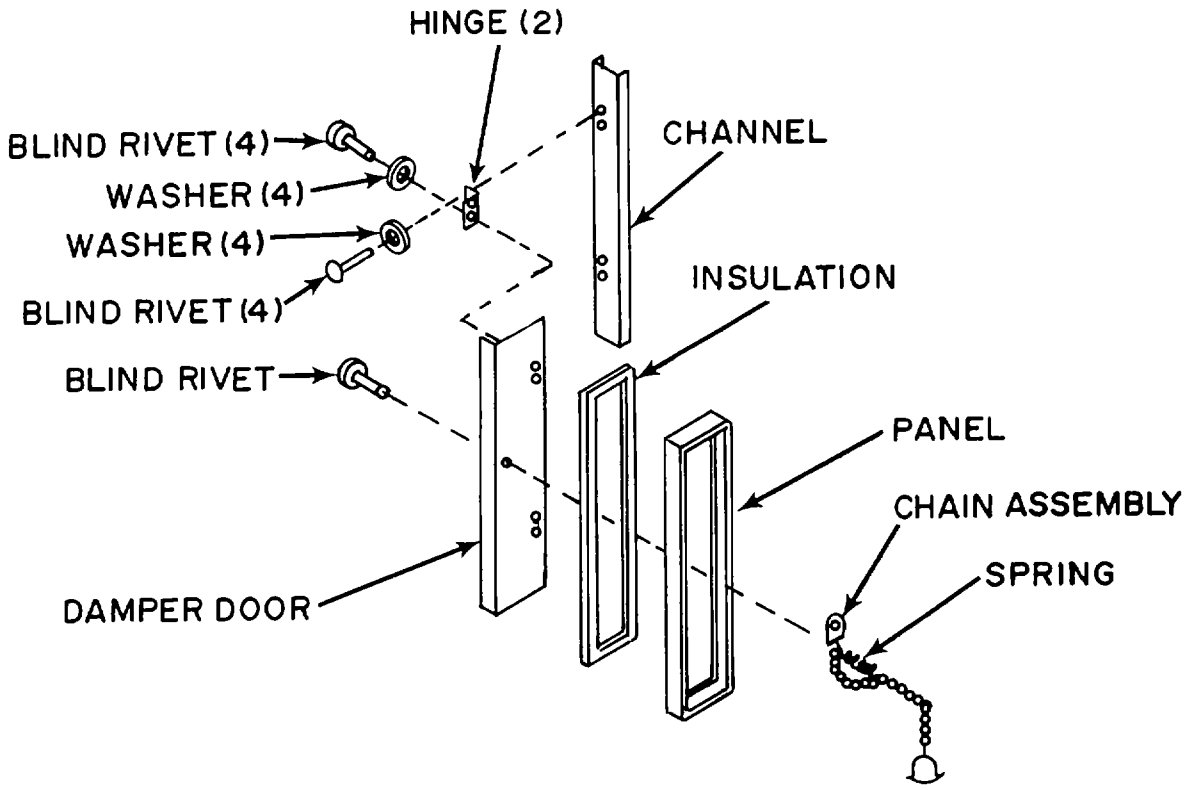


Figure 5-2. Fresh Air Damper

Inspection

(1) Check that chain and pendant are in place and not broken.

(2) Check that spring loaded hinges are secure and that they cause door to open when chain is released.

(3) Check that gasket is not loose, split, or missing.

(4) Check that spring and chain clip are in place and that chain and spring works properly.

(5) Repair or replace parts as indicated.

Replacement

a. Hinge or Door

(1) Use a drill bit slightly smaller than the rivet body to drill old rivets out.

(2) Rivet replacement hinges and door in place.

(3) Check that door springs closed when chain is released.

b. Gasket

(1) Remove as much old gasket material as possible by pulling or scraping it away from the metal surface.

(2) Soften and remove old adhesive and gasket residue, using toluene and a stiff brush.

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

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

c. Chain assembly

(1) Use a drill bit slightly smaller than the rivet body to drill old rivet out.

(2) Rivet replacement chain assembly in place.

Follow-on procedure:

Install air filter. (See para 4-23.)

5-5. FAN RELAY (K7)

This task covers:

a. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Locknuts
(Appendix E item 24)

Equipment Conditions:
Top Cover Removed (para 4-16)
Junction Box Removed (para 4-32)
Fan Motor Removed (para 4-57)
Refrigerant System Discharged (para 5-7)

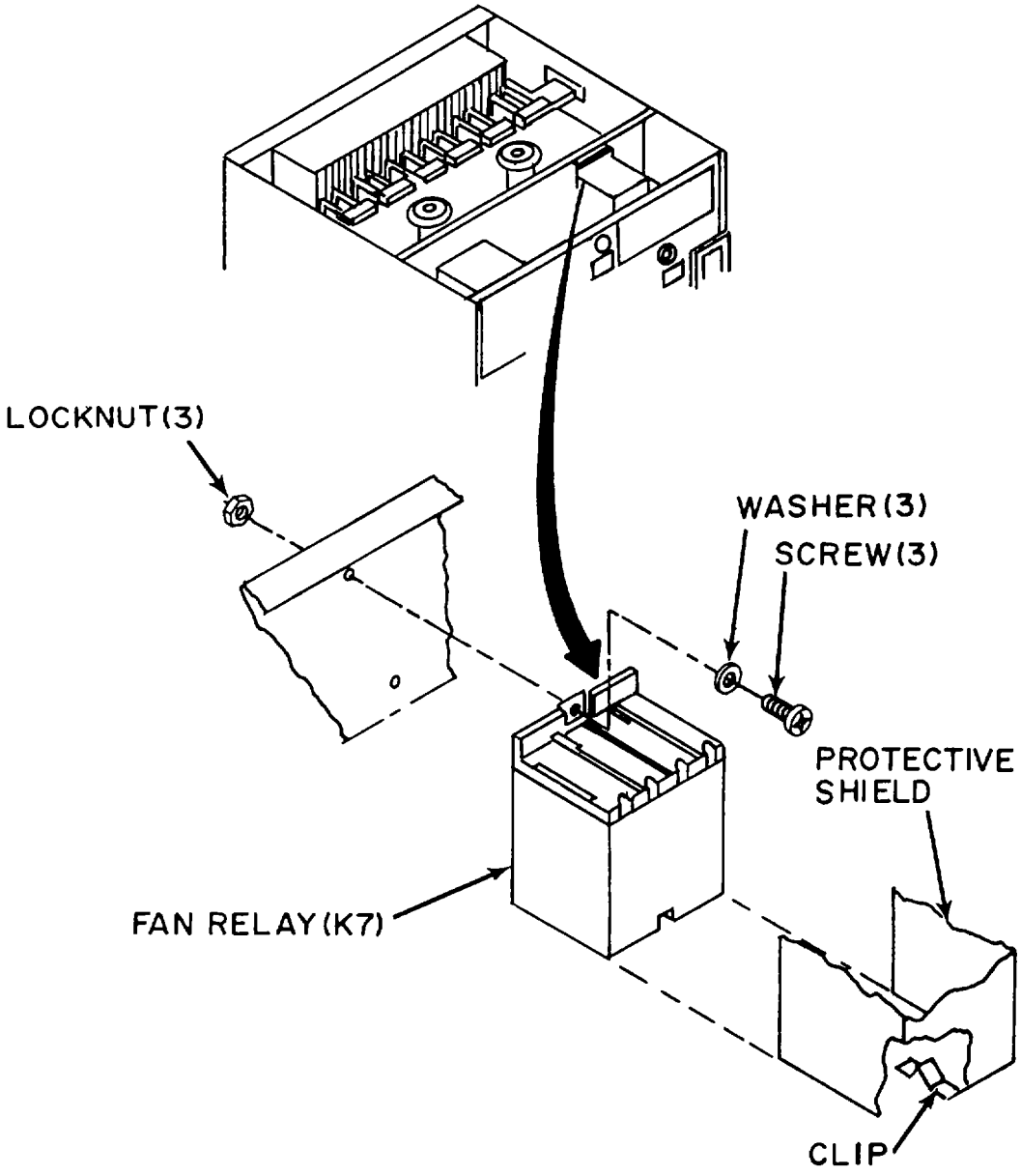


Figure 5-3. Fan Relay (K7)

Replacement

(1) While purging the system with nitrogen, debraze and separate the tube joints to clear the relay.

(2) Depress clip and slide cover off.

(3) Tag and remove wires from relay terminals.

(4) Remove three screws, flat washers, locknuts, and relay.

(5) Install and secure relay with three screws, flat washers, and locknuts.

(6) Connect wires to relay terminals (see tags and wiring diagram figure 4-43).

(7) Replace cover, slide on and latch in place with clip.

(8) Align separated tube joints.

(9) While purging the system with nitrogen, braze the tube joints.

Follow-on procedures:

(1) Replace dehydrator. (See para 5-23.)

(2) Purge system. (See para 5-8.)

(3) Leak test all newly connected joints. (See para 5-10.)

(4) Evacuate system. (See para 5-11.)

(5) Charge system. (See para 5-12.)

(6) Install junction box. (See para 4-32.)

(7) Install fan motor. (See para 4-57.)

(8) Install top cover. (See para 4-16.)

5-6. EVAPORATOR AND CONDENSER FAN MOTOR (B2)

This task covers: a. Repair

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Solder Gun Kit
(Appendix B item 6)

Materials/Parts
Solder
(Appendix E item 21)
Flux
(Appendix E item 22)
Oil
(Appendix E item 42)

Equipment Conditions:
Fan Motor Removed (para 4-57)

Repair

NOTE

Direct support maintenance repair of the fan motor is limited to the replacement of electrical plug, bearings, rotor with shaft, and hardware items. Disassemble motor only as necessary to do required repair. (See figure 5-4.)

a. Connector (J2)

(1) Remove four screws from connector (J2).

(2) Pull connector away from terminal box as far as wires will allow.

(3) Tag and unsolder wire leads.

(4) Remove old connector.

(5) See tags and wiring diagram (fig. 4-43.) and solder leads to new connector.

(6) Remove tags.

(7) Secure connector to terminal box with four screws.

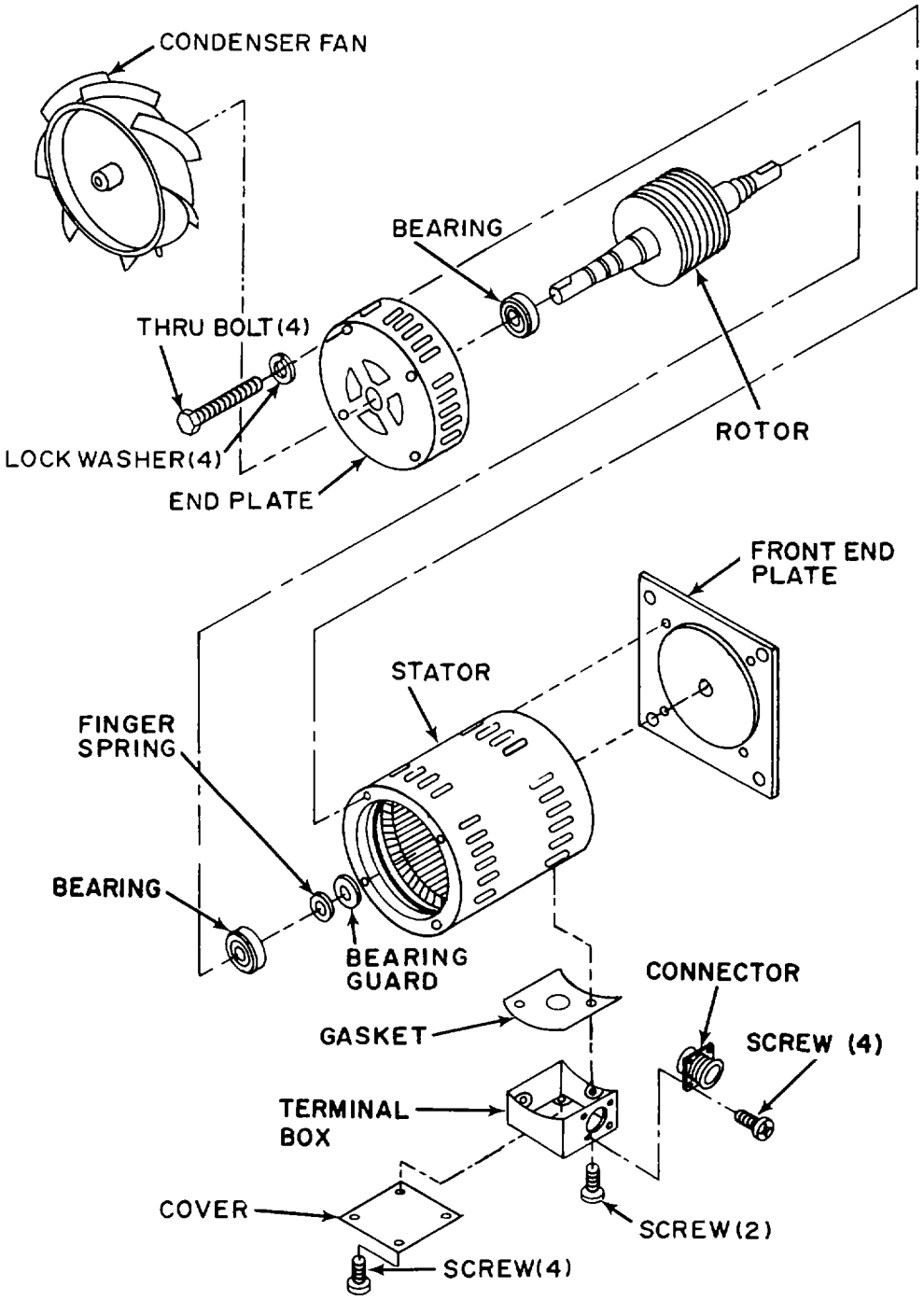


Figure 5-4. Evaporator and Condenser Fan Motor (B2)

(b) Bearing or Rotor

(1) Position motor vertically with end bell up (heads of thru bolts accessible).

(2) Match-mark motor stator and endplate (end bell) to ease reassembly.

(3) Remove four thru bolts from end plate (end bell).

(4) Carefully separate end plate (end bell) from motor stator.

(5) Carefully pull rotor shaft from the stator.

CAUTION

Exercise care not to deform fan blades during disassembly, handling, and assembly

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 assembly.

(6) Carefully remove bearings.

(7) Examine rotor, stator, and shafts for nicks, gouges, deformations, and evidence of overheating.

(8) Dress high metal defects in shafts with a fine file or stone. If shaft is beyond repair, replace rotor and shaft.

(9) Examine motor stator and front end plate for broken flange, stripped threads, visible damage, shorted windings (para 4-57) and evidence of overheating. If motor stator is beyond repair, replace motor.

(10) Coat shaft surfaces with oil.

(11) Coat the bearing cavities of end plate (end bell) and front end plate with oil.

(12) Press bearings onto rotor shaft until they bottom against shoulder at both ends.

(13) Install finger spring and bearing guard.

(14) Carefully insert rotor assembly into stator and front end plate. Bearing is a slip-fit into front end plate.

(15) Carefully work end plate (end bell) onto bearing keeping the match-marks made at the time of disassembly in alignment.

(16) Secure end plate (end bell) with four thru bolts. Before final tightening, check for freedom of rotation by turning shaft by hand. There should be no drag or binding. Correct as necessary and tighten screws. Check again for binding and drag. Follow-on procedure: Install motor. (See para 4-57.)

5-7. DISCHARGING THE REFRIGERANT SYSTEM

This task covers:

a. INSERT FUNCTION b. INSERT FUNCTION c. INSERT FUNCTION

INITIAL SETUP

Tools

Tool Kit, Refrigeration
(Appendix B, item 1)
Recovery and Recycling Unit, Refrigerant
(Appendix B, item 13)

Materials/Parts

Respirator
(Appendix E, item 6)
Goggles
(Appendix E, item 7)
Gloves, Protective
(Appendix E, item 8)

Equipment Conditions:

Power Cord Disconnected

General Safety Instructions

WARNING

Death or serious injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

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

SERVICE

a. Remove six screws and charging valve access cover.

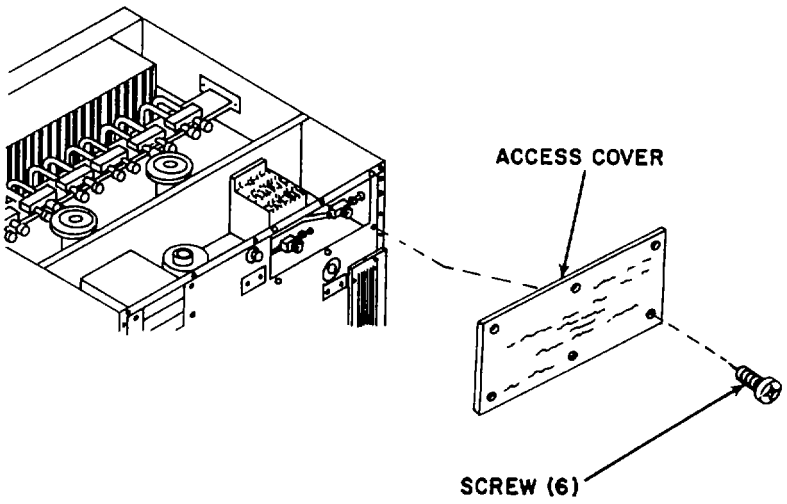


Figure 5-5. Access (Charging Valves) Cover.

b. Unscrew hose connection protective caps.

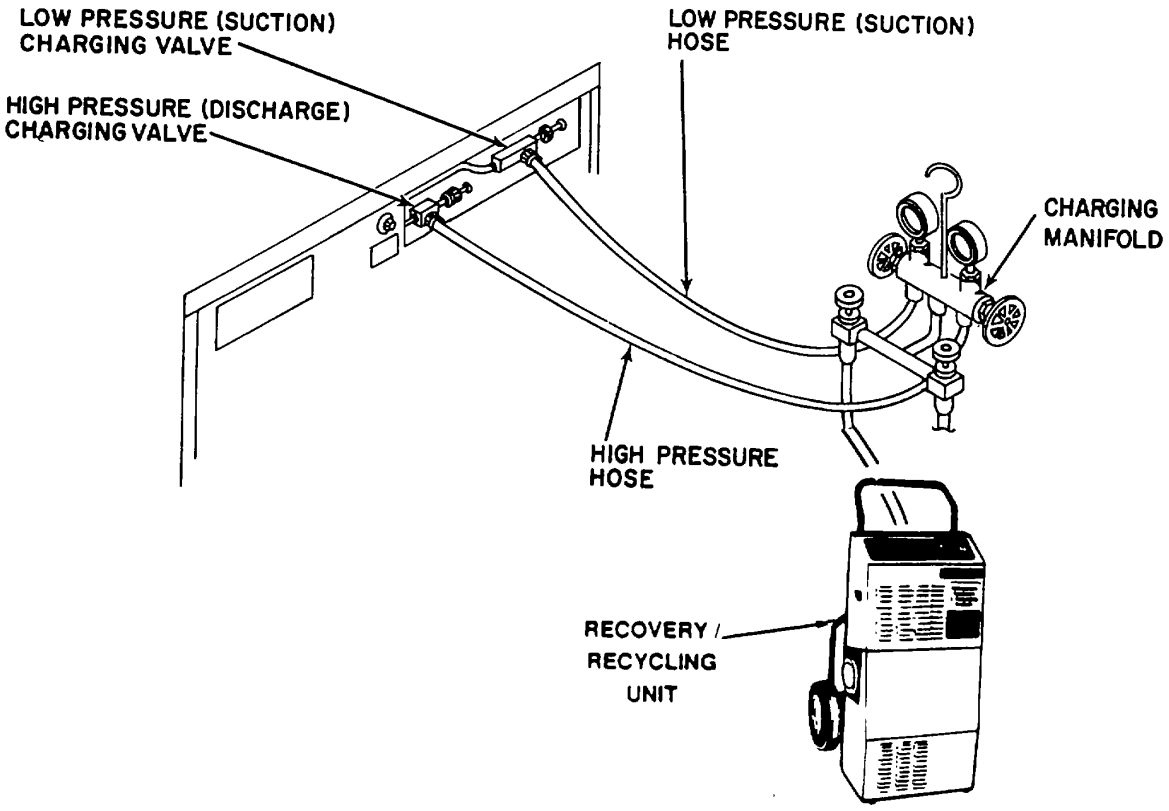


Figure 5-6. Discharge Refrigerant.

c. Connect the charging manifold hoses to the manifold and air conditioner service valves.

NOTE

In accordance with Environmental Protection Agency regulations, refrigerant cannot be discharged into the atmosphere. A refrigerant recovery and recycling unit must be used whenever discharging the refrigerant system. Operation of the recovery/recycling unit must be by AUTHORIZED PERSONNEL ONLY.

d. Connect and operate a recovery/recycling unit in accordance with the manufacturer's instructions.

5-8. PURGING THE REFRIGERANT SYSTEM

This task covers: a. Service

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Nitrogen
(Appendix E item 37)

Equipment Conditions:
Refrigerant Discharged (para 5-7)

General Safety Instructions

WARNING

Nitrogen is an inert gas. However, it also presents danger as a suffocant and, therefore, must also be discharged in a ventilated location.

The refrigeration system must be purged with dry nitrogen before any brazing is performed on any component. A flow of dry nitrogen at the rate of less than 1 2 cfm (0. 028-0. 057 m3/minute) should be continued during all brazing operations to minimize internal oxidation and scaling.

CAUTION

Nitrogen cylinders are pressurized containers. The pressure in the cylinder can exceed 2000 psi. A nitrogen pressure regulator should be used at all times when nitrogen is used for leak check or purge operations.

a. See specific component removal/repair instructions.

b. Be sure that refrigerant has been discharged. (See paragraph 5-7.)

c. Connect the center hose from the charging manifold to a nitrogen regulator and dry nitrogen tank.

d. The hose from the high pressure service valve to the charging manifold must be connected.

e. The hose from the low pressure service valve must be disconnected from the charging manifold.

f. Open both service valves on the unit.

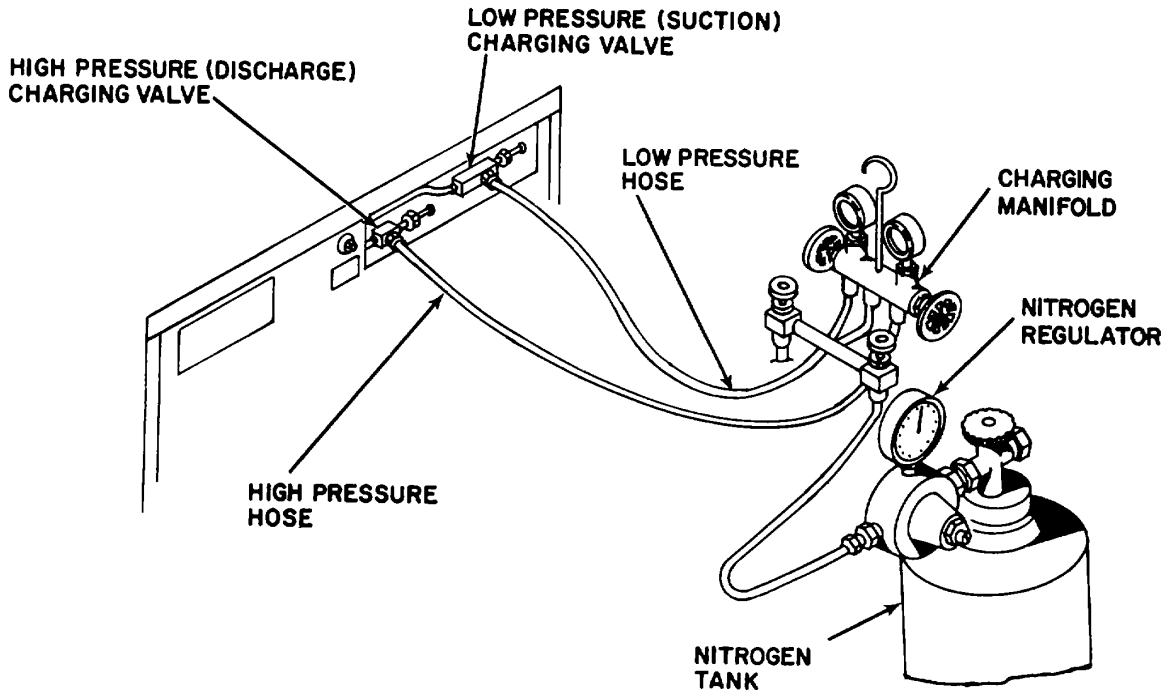


Figure 5-7. Nitrogen Purging Connection

g Close the un-used valve on the charging manifold, and open the one with the nitrogen tank hook up.

h Open the nitrogen cylinder valve and adjust the regulator so that less then 1 - 2 cfm (0. 028-0. 057 m3/minute) of nitrogen flows through the system.

i Check discharge from hose attached to the low pressure charging valve to be sure that no oil is being forced out of the system.

j Allow nitrogen to sweep through the system at the rate of less than1 2 cfm (0. 028-0. 057 m3/minute) for a minimum of 5 minutes, before starting any brazing operation. Then allow it to continue to flow at the same rate until all brazing operations are completed. (See paragraph 5-9 for brazing/debrazing procedures.)

k After installation brazing operations are completed, allow nitrogen to flow for a minimum of 5 minutes.

l Close nitrogen cylinder valve, nitrogen regulator, charging manifold valve, and both high and low pressure service valves on the unit.

m Disconnect the hose from the nitrogen tank.

n Assuming that all repairs are completed, go to paragraph 5-10.

5-9. BRAZING/DEBRAZING PROCEDURES

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Rags
(Appendix E item 1)
Nitrogen
(Appendix E item 37)
Brazing Alloy
(Appendix E item 38)
Brazing Flux
(Appendix E item 39)
Abrasive Cloth
(Appendix E item 58)

Equipment Conditions:
Refrigerant System Discharged (para 5-7)
Refrigerant System Purged (para 5-8)

General Safety Instructions

WARNING

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

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

a General. All tubing in the refrigeration system is seamless copper with a bright internal finish that permits thorough cleaning and prevents entrapment of moisture or other impurities. Rigid grade copper is used for straight sections and soft grade for sections that must be bent. All interconnecting fittings, such as elbows, tees, etc. , are also copper. The bodies of all valves and all connections on other components are brass. All joints, except those provided with flare fittings, are made by brazing in accordance with MIL-B-7883, except that radiographic examination is not required.

b Filler Allo. Grade IV and 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.

c Debrazing. Debraze joints for removal of refrigeration system components as follows: (1) Determine which joints are to be debrazed. Due to the limited work space inside the air conditioner, it may be more convenient to remove a part of the interconnecting tubing with the component rather than debrazing the joints on the component itself.

(2) Before debrazing a joint on a valve, disassemble the valve to the extent possible, then wrap all but the joint with a wet rag to act as a heat sink.

(3) Protect insulation, wiring harnesses, cabinet, and other surrounding components with appropriate shields.

(4) Be sure the work area is well-ventilated and that dry nitrogen is flowing through the refrigeration system at a rate of less than 1 - 2 cfm (0.028-0.057 m3/minute).

(5) Apply sufficient heat uniformly around the joint to quickly melt the filler alloy. If heat is applied slowly, or only on one side, the entire component or length of tubing will be heated and filler alloy in adjacent joints may also be melted. Remove heat as soon as the joint separates.

d Cleaning debrazed joint. All filler alloy must be cleaned from debrazed joints before reassembly. Heat each piece of the joint until the filler alloy is melted and then wipe it away with a damp cloth. Be sure no filler alloy or other debris are left inside any tubing, fitting, or component.

e Reassembly. If tubing sections or fittings were removed with a component, debraze them from the component, clean the joints, and braze them to the new component before reinstallation.

f Brazing. Braze joints within the air conditioner as follows:

(1) Position the component to be installed.

(2) To prepare a joint on a valve for brazing, disassemble the valve to the extent possible. Then wrap all but the joint with a wet rag to act as a heat sink.

(3) Protect insulation, wiring harnesses, and surrounding components with appropriate shields.

(4) Be sure the work area is well-ventilated and that dry nitrogen is flowing through the refrigeration system at a rate of less than 1 - 2 cfm (0.028-0.057 m3/minute).

(5) Apply sufficient heat uniformly around the joint to quickly raise it to a temperature that will melt the filler alloy. Remove heat as soon as brazing is completed.

5-10. LEAK TESTING THE REFRIGERANT SYSTEM

This task covers:

a. Service

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Nitrogen
(Appendix E item 37)
Refrigerant-22
(Appendix E item 40)

Equipment Conditions:
Refrigerant Discharged (para 5-7)
Refrigerant Purged (para 5-8)

a The entire repaired area should be thoroughly leak tested after repair or replacement of any component, before it is recharged with refrigerant -22. Leak testing is also the method for troubleshooting when a system has lost all or part of its refrigerant charge through an undetermined cause.

b Testing Method. There are two acceptable methods for leak testing the refrigeration system.

(1) Refrigerant gas leak detector. If an electronic refrigerant gas leak detector is available it should be used in accordance with the procedures contained in TM 9-4940-435-14, "Leak Detector, Refrigerant Gas".

NOTE

The electronic refrigerant gas leak detector is highly sensitive to the presence of a minute quantity of gas in the air, and due to this factor is quite effective in the detection of small leaks. However, due to the rapid dispersion of refrigerant gas into the surrounding air, difficulty may be encountered in pinpointing large leaks. The detector must be used in a well ventilated but draft-free area.

(2) Soap solutions. In this method, a strong solution of a liquid detergent and water is brushed onto all points of possible leakage while closely watching for the formation of bubbles.

CAUTION

If the soap solution testing method is used, thoroughly rinse with fresh water after testing is completed. A residual soap film will attract and accumulate an excessive amount of dust and dirt during operation.

c Testing procedure. To perform leak testing by use of the electronic detector, it is necessary that the system be pressurized with a proportion of refrigerant gas. To perform leak testing by use of the soap solution method, the system may be pressurized with dry nitrogen alone.

(1) To pressurize a system that has some refrigerant charge, for either leak testing method:

(a) Remove the hose connection protective caps from the high and low pressure service valves.

(b) Connect the hoses from a charging manifold to the service valves.

NOTE

If it is possible that the problem may not be a leak and that you may not have to replace a refrigeration system component, refrigerant -22 may be substituted for the nitrogen ill the following test. If nitrogen is used, you will have to discharge, evacuate, and recharge the system after this test is completed.

(c) Connect a nitrogen pressure regulator and nitrogen bottle to the hose connection of the charging manifold.

(d) Open the unit service valves and the charging manifold valve.

(e) Open the nitrogen tank valve and pressurize the system to 350 psi (24.7 kg/cm2).

(f) Perform leak tests.

(g) If a leak is found, discharge and purge the system repair leak. See specific instruction for components to be removed.

(h) If a leak was not found and refrigerant -22 was used to pressurize the system, see charging instructions. (see para 5-12.)

(2) To pressurize a system that has been discharged and purged for leak testing with an electronic detector:

(a) Remove the hose connection protective caps from the high and low pressure service valves.

(b) Connect the hoses from a charging manifold to the service valves.
(c) Connect a drum of refrigerant -22 to the hose connection of the charging manifold.

CAUTION

Connect the refrigerant -22 drum so that only gas will be used for pressurization.

(d) Open both unit service valves and the charging manifold valves.

(e) Open the refrigerant drum valve slightly and adjust as necessary to prevent formation of frost, and allow system pressure to build up until the gages read 40-50 psi (2.8 - 3.5 kg/cm2).

(f) Close the charging manifold valves and the refrigerant drum valve.

(g) Remove the refrigerant -22 drum from the hose connection.

(h) Connect a nitrogen regulator and cylinder of dry nitrogen to the hose connection.

(i) Open the charging manifold valves and the nitrogen cylinder and regulator valve. Allow system pressure to build up until gages read 350 psi (24.7 kg/cm2).

(j) Perform leak tests, then discharge and purge the system, in accordance with paragraphs 5- 7 and 5-8 before performing maintenance, or before evacuating and charging the system, as appropriate.

(3) Final leak testing. Always perform a final leak test after performing any repair or replacement of components before the air conditioner is reassembled and the refrigeration system is evacuated and charged.

5-11. EVACUATING THE REFRIGERANT SYSTEM

This task covers: a. Service

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Vacuum Pump
(Appendix B item 11)

Materials/Parts
Dehydrator
(Appendix E item 41)
Refrigerant Oil
(Appendix E item 44)
Lockwasher
(Appendix E item 51)
Flare Gasket
(Appendix E item 52)

Equipment Conditions:
Refrigerant Discharged (para 5-7)
Refrigerant Purged (para 5-8)
System Leak Tested (para 5-10)

The refrigeration system must be evacuated to remove all moisture before it is charged with refrigerant -22.

CAUTION

Don't evacuate a leaking system. The vacuum created can cause air, moisture, and dirt to enter system.

a Check that the system was leak tested and has NO LEAKS. (See para 5-10.)

NOTE

In the event that the compressor was replaced as a result of a burn out, check that compressor burn out procedures were followed. (See para 5-24.)

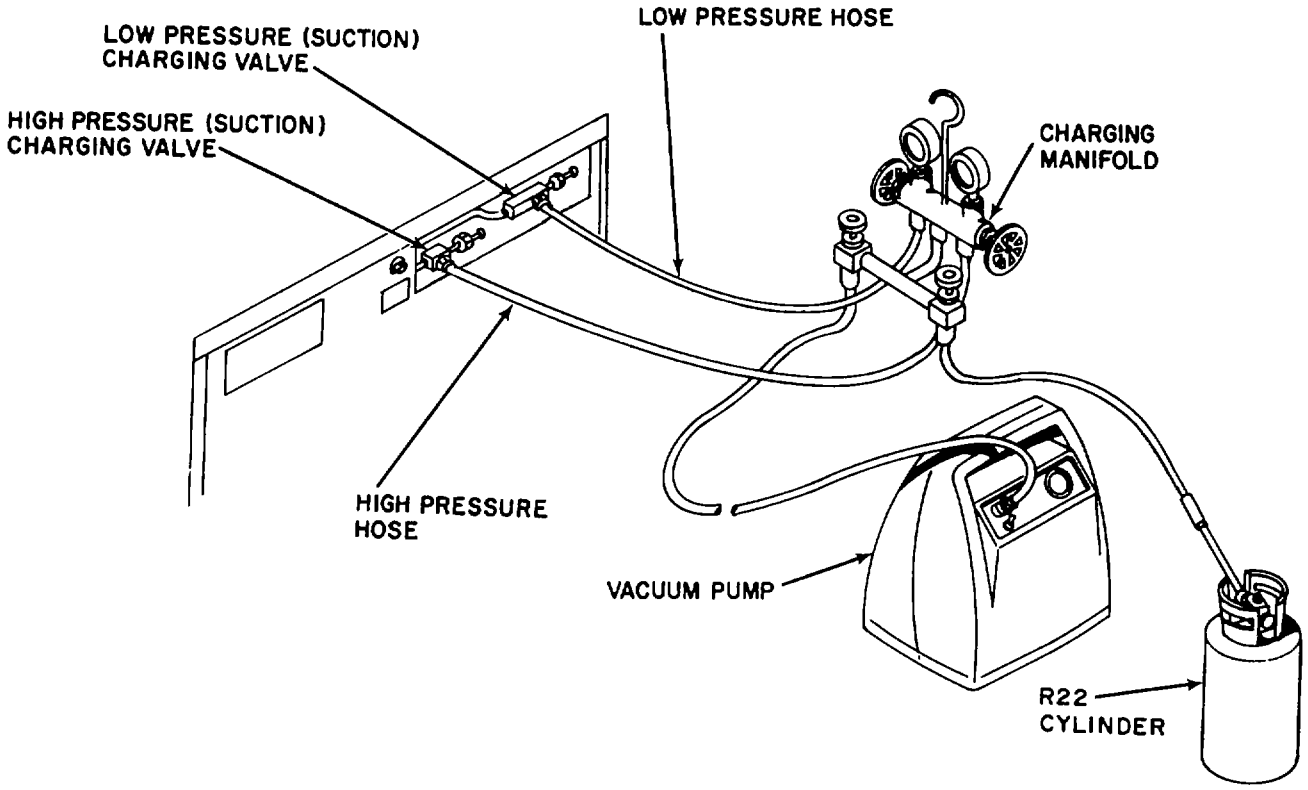


Figure 5-8. Evacuating the Refrigerant System.

b Check that new dehydrator was installed. If not, install one.

c Check that both service valves and charging manifold valves are closed.

d Attach hose assemblies to service valves and charging manifold valves.

e Attach hose assembly to vacuum pump.

f Start vacuum pump.

g Open charging manifold valves.

h Open both unit service valves.

i Run the vacuum pump until at least 29 inches of mercury, measured on the gage, is reached.

NOTE

Inability to reach 29 inches of mercury may indicate either a leak or a problem with the pump.

j Continue running the pump for one more hour while observing the gage. If the gage needle moves back and forth, you have a leak which must be located and corrected first.

k Close both unit service valves.

l Close charging manifold valves.

m Stop vacuum pump.

n Disconnect pump from hose connection.

o Go to paragraph 5-12, charging the refrigerant system.

5-12. CHARGING THE REFRIGERANT SYSTEM

This task covers: a. Service

INITIAL SETUP

Tools

Tool Kit, Refrigeration
(Appendix B, item 1)

General Safety Information

Materials/Parts
Refrigerant-22
(Appendix E, item 40)
Dehydrator
(Appendix E, item 41)
Refrigerant Oil
(Appendix E, item 44)
Lockwasher
(Appendix E, item 51)
Flare Gasket
(Appendix E, item 52)

Equipment Conditions:

Refrigerant Discharge (para 5-7)
Refrigerant Purged (para 5-8)
System Leak Tested (para 5-10)
System Evacuated (para 5-11)

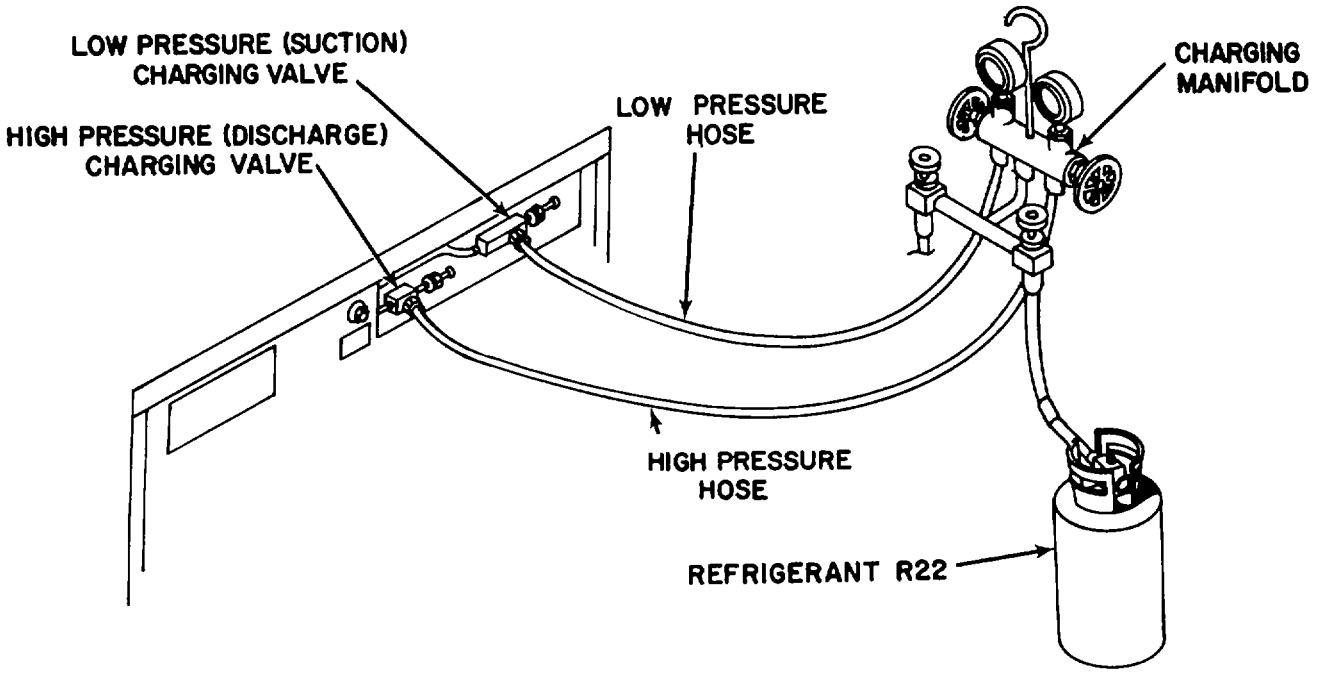


Figure 5-9. Charging the Refrigerant System.

SERVICE

After the system has been satisfactorily evacuated, it must be fully charged with refrigerant-22.

CAUTION

Never introduce liquid refrigerant into the low pressure (suction) service valve.

NOTE

The system must be evacuated before charging. Use only refrigerant-22 to charge the unit. If available, use recycled refrigerant.

a Check that the hose from the low pressure charging valve is connected to the compound gage side of the charging manifold. The hose from the high pressure charging valve should be connected to the pressure gage side of the charging manifold.

b Connect the hose from the charging manifold to a well charged drum of refrigerant-22.

c Loosen the hose connections to the two air conditioner charging valves slightly.

d Open the two charging manifold valves.

e Open the refrigerant -22 drum valve slightly to allow a small amount of refrigerant to purge air from the hoses. Tighten the hose connections at the air conditioner charging valves.

f Close the low pressure (suction) charging manifold valve. Never introduce liquid refrigerant into the low pressure (suction) charging valve.

g Position the refrigerant -22 drum so that liquid will be used for charging. (Some drums must be inverted and some are equipped with a selector valve.)

h Using accurate scales, measure and record the weight of the refrigerant -22 drum.

i Open the refrigerant -22 drum valve.

j Open the high pressure charging valve on the air conditioner. Allow liquid refrigerant to enter the system until the drum weight has decreased by 2.3 pounds (1.05kg) or until system pressure has equalized.

k Close the refrigerant drum valve and the high pressure (discharge) manifold valve.

l Connect airconditioner to a remote control module assembly.

m Connect power.

n Press and release both pressure switch reset buttons.

o Turn airconditioner on and operate in the COOL mode with the TEMPerature control thermostat set at a maximum DECREASE position and fan speed set to HI SPEED.

p If the2.3 pound (1.05 kg) full charge was obtained, skip steps q thru s. If the system pressure equalized prior to obtaining a full charge of 2.3 pounds (1.05kg), proceed with step q.

q Switch the refrigerant drum to the gas only position.

r Be sure that the refrigerant drum had been switched to the gas position and open the refrigerant drum valve, the low (suction) pressure charging manifold valve, and the low (suction) pressure charging valve on the air conditioner.

s Monitor the weight of the refrigerant drum as the air conditioner compressor pulls additional refrigerant gas into the system until the full 2. 3 pound (1. 05 kg) charge is obtained. When the system is fully charged, immediately close the air conditioner low pressure charging valve and the refrigerant drum valve.

t Run the air conditioner in COOL mode (with TEMPerature control thermostat in full DECREASE position and fan speed set at LO SPEED) for 15 minutes.

u. After 15 minutes, observe the sight glass on back of the unit back panel.

- Green center means the refrigerant moisture content is acceptable.
- Yellow center means there is too much moisture in the system. It must be discharged, evacuated, and charged again.
- Milky white or bubbly liquid means the system has a low charge.
- Clear bubble-free liquid around the center means the system is fully charged.

v. If charge is low, add gas refrigerant.

(1) Be sure that drum is switched to gas position. Open the drum valve and the air conditioner low pressure service valve.

(2) Continue to charge until sight glass is clear and bubble-free.

(3) Close the air conditioner low pressure charging valve and refrigerant drum valve.

w. Check air conditioner for proper cooling. There should be at least a 15°F temperature difference between evaporator discharge air and the inlet air. Turn the mode selector switch to OFF.

x. Assure that the high and low pressure air conditioner charging valves are closed and remove the charging manifold hoses from the air conditioner charging valves.

y. Install service valve protective caps.

z. Secure charging valve access cover with six screws.

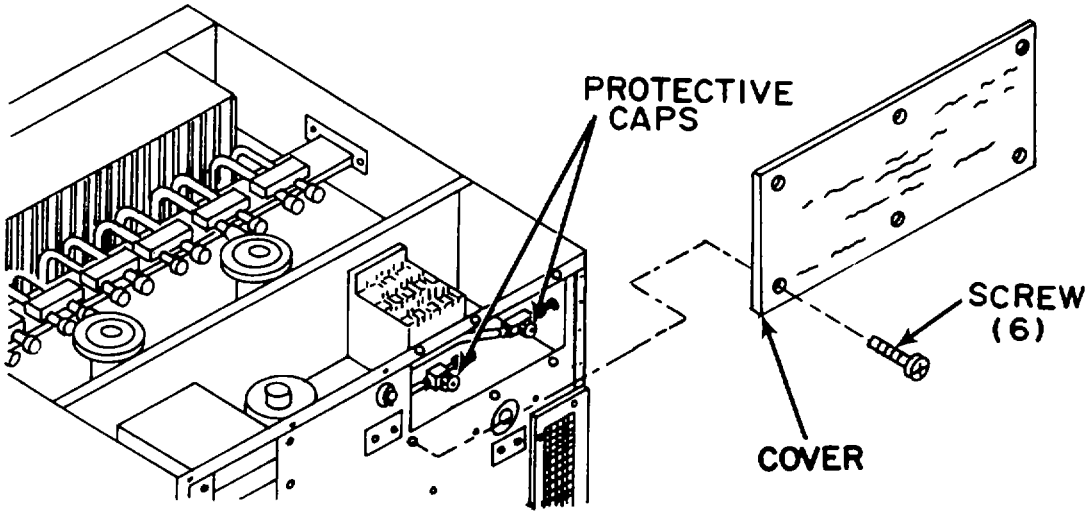


Figure 5-10. Charging Valves Caps and Cover

5-13. REFRIGERANT PRESSURE CHECK

This task covers: a. Service

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Equipment Conditions:
Access (Charging Valves) Cover Removed (para 4-13)
Refrigerant Purged (para 5-8)
System Leak Tested (para 5-10)
System Evacuated (para 5-11)

Except in cases where it is obvious that the refrigerant charge has been lost, the first step in troubleshooting problems in the refrigeration system should be to check discharge and suction pressures under operating conditions. Check pressures as follows:

a. Turn the mode selector switch to OFF.

b. Remove protective caps from charging valves.

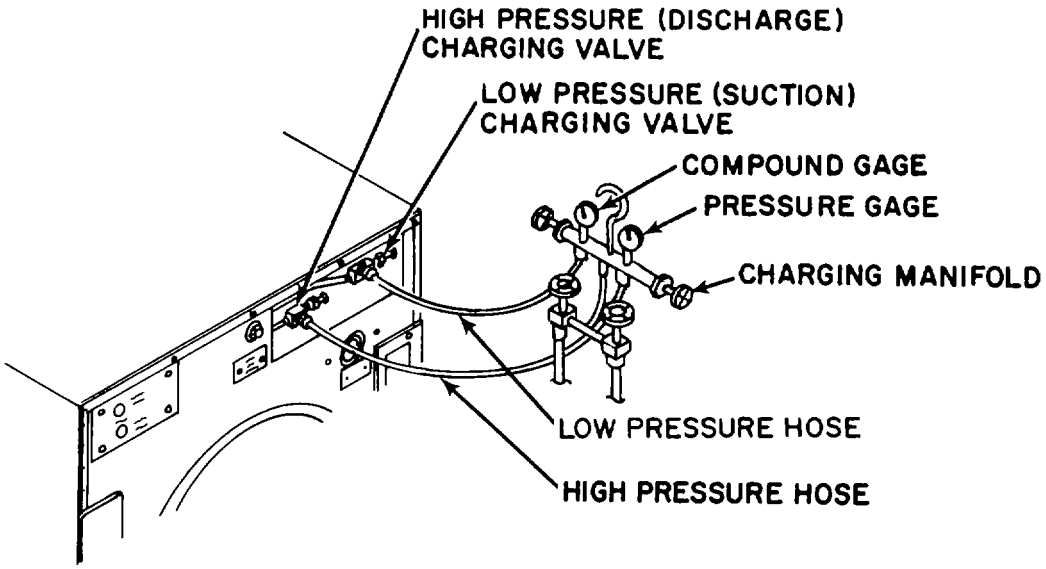


Figure 5-11. Pressure Test Connection

d. Connect individual pressure gages, or a refrigeration charging manifold and hoses to the high (discharge) and low (suction) charging valves.

e.

CAUTION

Take care that only a very small amount of refrigerant is allowed to escape during hose purging.

e. Loosen hose connections at gages or charging manifold.

f. Open high (discharge) pressure charging valve slightly to purge air from hose. Tighten low pressure hose connection at gage fitting as soon as a hissing sound is heard.

g. Open low (suction) pressure charging valve slightly to purge air from hose. Tighten low pressure hose connection at gage fitting as soon as a hissing sound is heard.

h. Open the low (suction) and high (discharge) charging valves.

i. Both gages should read the same. Check the reading with the appropriate column in table 5-1. If the system is even partially charged, the pressure should be approximately equal to that shown in the table for the appropriate ambient temperature. If the pressure is considerably less than shown in the table, the system does not contain enough refrigerant to continue the pressure check; go to leak testing.

j. Turn the mode selector switch to the COOL mode with the TEMPerature control thermostat in the full DECREASE setting for a few minutes.

k. With the unit operating, allow gages to stabilize. Take readings of the two gages.

(1) Discharge pressure too high. Possible causes:

- Dirty or partially blocked condenser coil. (See para 4-60.)
- Partially blocked condenser fan discharge. (See para 4-19.)
- Loose or missing lower panel (see para 4-17), Connector coverplate (see para 4-14), or circuit breaker access plate (see para 4-15).
- Excessive recirculation of hot condenser discharge air back into condenser intake.
- Overcharge of refrigerant. (See para 5-12.)
- Air in refrigerant system. (See para 2-3.)

- High suction pressure - See (4) below.
- Fan motor not operating. (See para 4-57.)
- Condenser fan loose on shaft. (See para 4-56.)
- Too much oil in refrigerant system. (See para 5-24.)

(2) Discharge pressure too low.

Possible causes:

- Cold outside air. (See para 2-7.)
- Low refrigerant charge. (See para 5-12.)
- Compressor not operating. (See para 5-24.)
- Problem with equalizing solenoid valve (L2). (See para 5-29.)
- Problem with pressure regulating valve. (See para 5-26.)
- Internal compressor damage. (See para 5-24.)

(3) Suction pressure too low.

Possible causes:

- Dirty return air filter. (See para 4-23.)
- Discharge or return air louvers closed. (Adjust louvers.)
- Dirty evaporator coil. (See para 4-59.)
- Low refrigerant charge. (See para 5-12.)
- Liquid solenoid valve (L1) closed. (See para 5-29.)
- Fan motor not operating. (See para 4-57.)
- Evaporator fan loose on motor shaft. (See para 4-55.)
- Problem with expansion valve operation. (See para 5-15.)
- Expansion valve superheat too high. (See para 5-15.)

- Plugged or kinked sensing line. (See para 5-15.)
- Suction line or evaporator coil tubing restriction. (See paras 5-14 and 5-25.)
- Clogged dehydrator. (See para 5-23.)
- Moisture in refrigerant system. (See para 5-8.)

(4) Suction pressure too high.

Possible causes:

- Open equalizing solenoid valve (L2). (See para 5-29.)
- Compressor not running. (See para 5-24.)
- Expansion valve bulb damage or poor contact with suction line. (See para 5-15.)
- Internal compressor failure. (See para 5-24.)
- Problem with liquid quench expansion valve. (See para 5-16.)
- Problem with regulating valve. (See para 5-26.)
- Problem with expansion valve. (See para 5-15.)

l. When pressure tests are completed, proceed with the maintenance action indicated.

m. Turn unit OFF.

n. Close charging valves on unit.

o. Remove gages or service manifold hoses from charging valves.

p. Install charging valve protective caps.

Follow-on Procedure:

Secure service valve access cover with six screws.

TABLE 5-1. PRESSURE-TEMPERATURE RELATIONSHIP OF SATURATED REFRIGERANT -22

Temperature		Pressure		Temperature		Pressure	
Deg F	Deg C	Psig	kg/em^2	Deg G	Deg C	Psig	kg/cm^2
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		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	6.648	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	41.4	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 5-2. NORMAL OPERATING PRESSURES (In Full Cooling DECREASE Mode)

Temperatures	Pressure Range (psig)			
Outdoor Ambient	50°F (10°C)	75°F (24°C)	100°F (38°C)	120°F (49°C)
90°F (32°C) Return (Dry Bulb) 175-195	52-62 Air to Unit 235-255	57-67 Suction 300-320	66-76 Suction 370-390	74-84 Suction Suction
	Discharge	Discharge	Discharge	Discharge
80°F (27°C) Return Air to Unit (Dry Bulb)	47-57 Suction 165-185	53-63 Suction 215-235	60-70 Suction 290-310	70-80 Suction 360-380
	Discharge	Discharge	Discharge	Discharge
70°F (21°C) Return Air to Unit (Dry Bulb) 140-160	45-55 Suction 205-225	45-55 Suction 285-305	49-59 Suction 365-385	57-67 Suction
	Discharge	Discharge	Discharge	Discharge

NOTE

Wet bulb temperature uncontrolled (dry coil) pressure ranges are +/-5 (Suction) and +/-10 (Discharge) psig about the tested nominal.

TABLE 5-3. NORMAL OPERATING PRESSURES (In By-Pass Cycle)

Temperature	Pressure Range (psig)			
Outdoor Ambient	50°F (10°C)	75°F (24°C)	100°F (38'C)	120°F(49°C)
90°F (32°C) Return Air to Unit	47-57 Suction 105-125	47-57 Suction 147-167	47-57 Suction 208-228	47-57 Suction 284-304
	Discharge	Discharge	Discharge	Discharge
80°F (27°C) Return Air to Unit	47-57 Suction 105-125	47-57 Suction 146-166	47-57 Suction 208-228	47-57 Suction 284-304
	Discharge	Discharge	Discharge	Discharge
70°F (21°C) Return Air to Unit	47-57 Suction 105-125	47-57 Suction 142-162	47-57 Suction 205-225	47-57 Suction 280-300
	Discharge	Discharge	Discharge	Discharge

5-14. EVAPORATOR COIL (E)

This task covers: a. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Drill (part of shop maintenance kit)
(Appendix B item 8)
Drill Bit Set (part of shop maintenance kit)
(Appendix B item 8)
Riveter
(Appendix B item 9)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Apron
(Appendix E item 5)
Respirator
(Appendix E item 6)
Goggles
(Appendix E item 7)
Gloves, Protective
(Appendix E item 8)
Toluene
(Appendix E item 9)
Adhesive
(Appendix E item 10)
Rivet
(Appendix E item 35)
Nitrogen
(Appendix E item 37)
Brazing Alloy
(Appendix E item 38)
Brazing Flux
(Appendix E item 39)
Refrigerant-22
(Appendix E item 40)

General Safety Instructions

WARNING

Toluene is flammable, and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well-ventilated area, and keep away from sparks or flame. Use goggles, gloves and apron when appropriate.

While handling coils, wear gloves to avoid cuts and reduce fin damage on coil.

Dehydrator
(Appendix E item 41)
Work Gloves
(Appendix E item 43)
Refrigerant Oil
(Appendix E item 44)
Lockwasher
(Appendix E item 51)
Flare Gasket
(Appendix E item 52)
Gasket
(Appendix F item 33)
Gasket
(Appendix F item 34)

Equipment Conditions:
Top Panel Removed (para 4-16)
Discharge Grille Removed (para 4-21)
Mist Eliminator Removed (para 4-24)
Heating Elements (HR1-HR6) and Support Removed (para 4-58)
Refrigerant Discharged (para 5-7)

Replacement

NOTE

Tubes at evaporator coil are most likely disconnect points.

(1) Remove four screws, washers, and mist eliminator brackets.

(2) Drill out six rivets and two coil mounting brackets.

(3) While purging the system with nitrogen, debraze and separate the tube joint at the top of the coil. (See paras 5-8 and 5-9.)

(4) While purging the system with nitrogen, tilt coil, debraze and separate the tube joint at the bottom of the coil.

(5) Using gloves to protect your hands and coil fins, carefully lift the coil up and out of the unit.

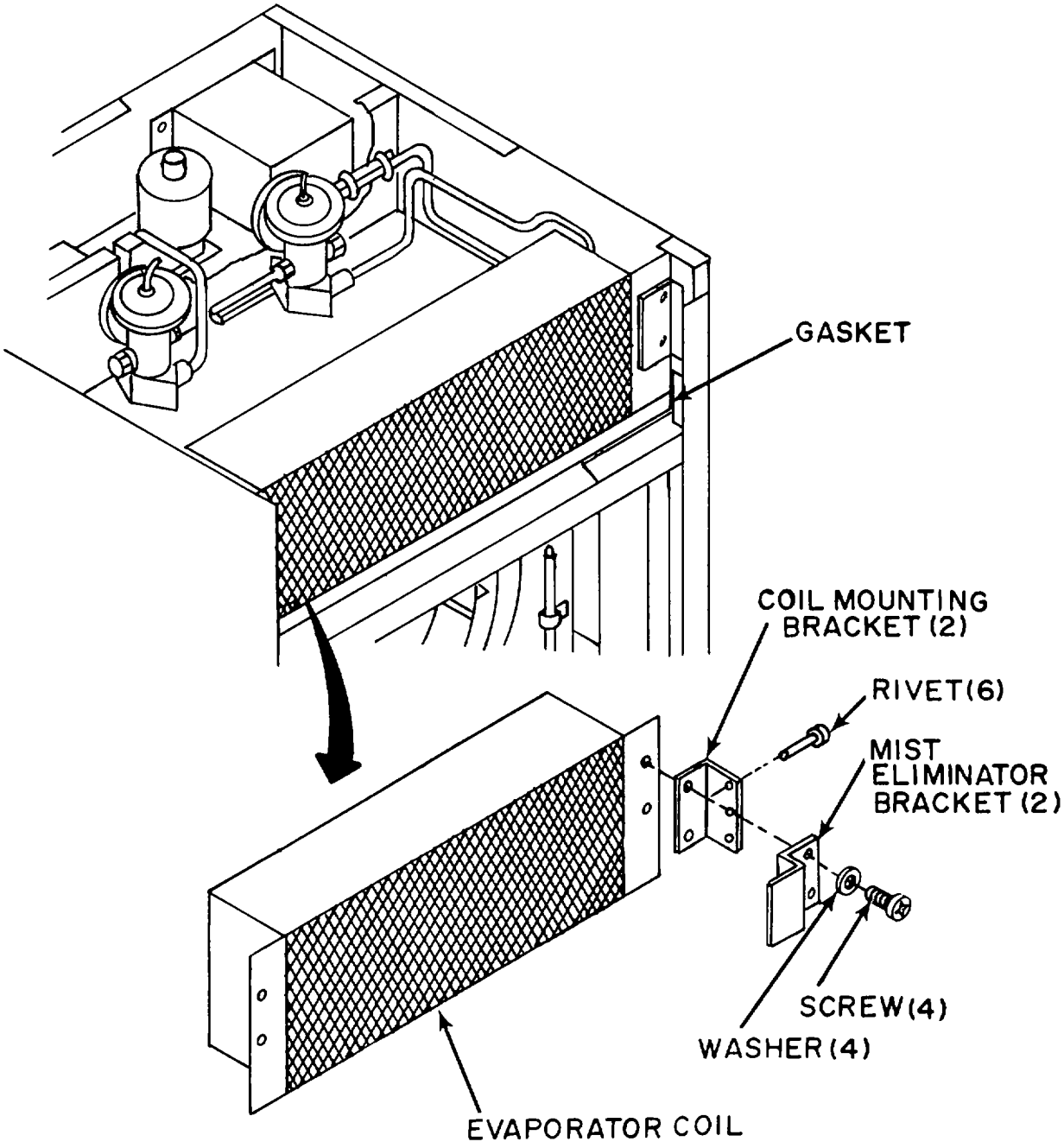


Figure 5-12. Evaporator Coil

(6) Remove as much old gasket material as possible, by pulling or scraping away from the metal surface.

(7) Soften and remove old adhesive and gasket residue, using toluene and a stiff brush.

(8) Cut replacement gasket to size per dimensions in Appendix F.

(9) Be sure that the surface to which the gasket is to be applied is clean and free of old adhesive material.

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

(11) Starting with an end, carefully attach the gasket to the metal. Press into firmcontact all over.

(12) Carefully slide evaporator coil down into unit.

(13) While purging the system with nitrogen, tilt coil and braze the tube to bottom of coil. (See paras 5-8 and 5-9.)

(14) While purging the system with nitrogen, braze the tube to top of coil. (See paras 5-8 and 5-9.)

(15) Rivet two coil mounting brackets to casing with three rivets each.

(16) Secure right and left hand mist eliminator brackets to coil with four screws and washers.

Follow-on procedure:

(1) Replace the dehydrator. (See para 5-23.)

(2) Purge the refrigeration system. (See para 5-8.)

(3) Leak test all newly connected joints and those in the repair area. (See para 5-10.)

(4) Evacuate the refrigeration system. (See para 5-11.)

(5) Charge the refrigeration system, but do not operate unit. (See para 5-12.)

(8) Install heater elements HR1 thru HR6 and support. (See para 4-58.)

(9) Install mist eliminator. (See para 4-24.)

(10) Install evaporator air discharge grille. (See para 4-21.)

(11) Install top panel. (See para 4-16.)

5-15. EXPANSION VALVE (V5)

This task covers:
a. Inspection b. Test c. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Thermometer
(Appendix B item 5)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Thermal Mastic
(Appendix E item 26)
Pressure-Sensitive Tape
(Appendix E item 27)
Nitrogen
(Appendix E item 37)
Brazing Alloy
(Appendix E item 38)
Brazing Flux
(Appendix E item 39)
Insulation Tape
(Appendix E item 47)
Refrigerant-22
(Appendix E item 40)
Dehydrator
(Appendix E item 41)
Refrigerant Oil
(Appendix E item 44)
Lockwashers
(Appendix E item 45)
Insulation Tubing
(Appendix E item 46)
Insulation Tape
(Appendix E item 47)

General Safety Instructions

WARNING

The test procedure must be conducted with the power on. Exercise extreme caution.

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

Lockwashers
(Appendix E item 51)
Flare Gasket
(Appendix E item 52)

Equipment Conditions:
Top Panel Removed (para 4-16)
Fan Motor Removed (para 4-57)
Heater Elements (HR1 thru HR6) and Support Removed (para 4-58)

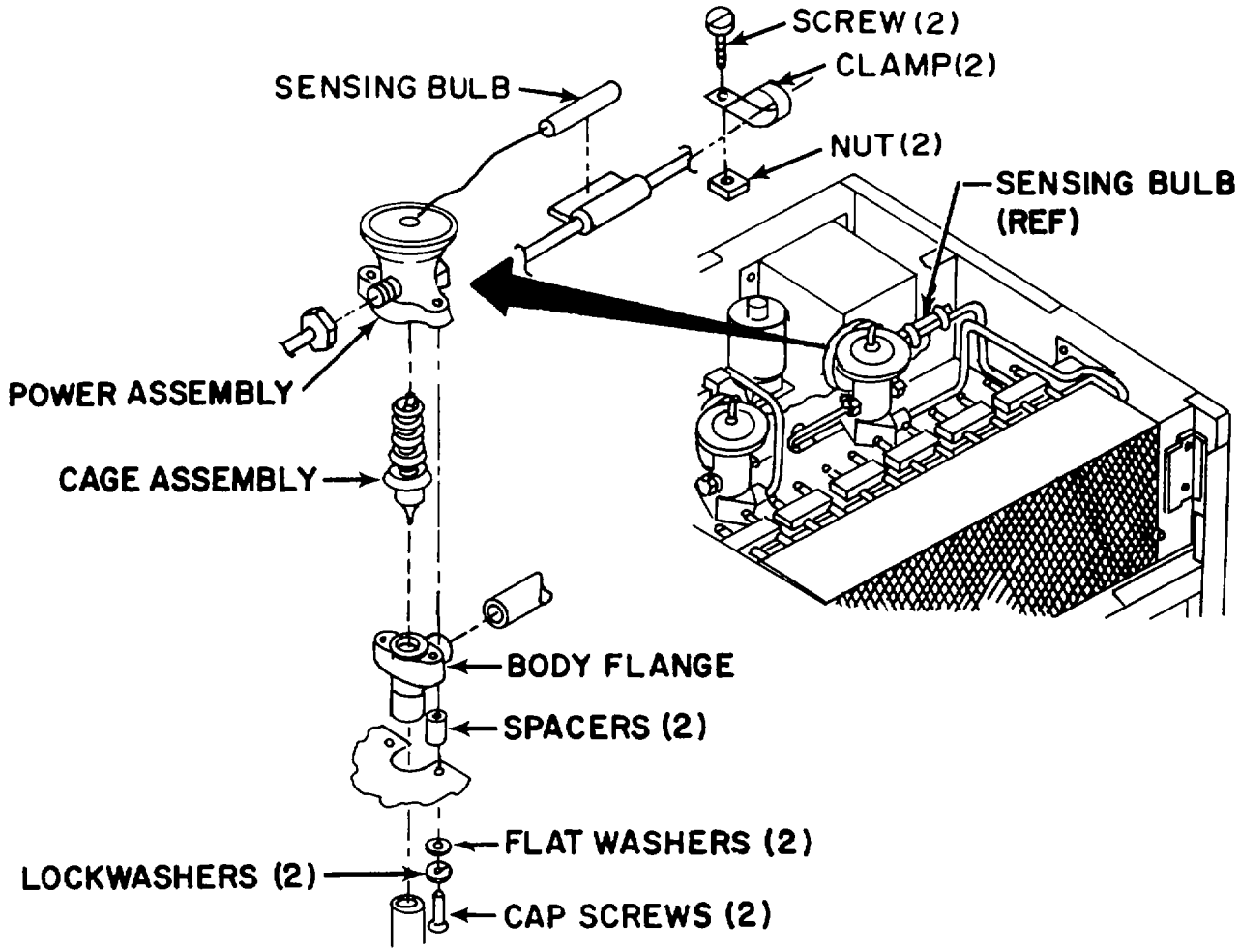


Figure 5-13. Expansion Valve

Inspection

(1) Inspect for kinked, or otherwise damaged capillary line, and loose or missing mounting hardware.

(2) Check thermal bulb to see that it is securely clamped to the suction line.

(3) If a leak is suspected or indicated, test per paragraph 5-10.

Test

NOTE

The expansion valve as supplied with the unit is preset at the factory. This valve should not be adjusted.

(1) Perform a refrigerant pressure check on unit in accordance with paragraph 5-13. Leave gages or service manifold attached.

(2) Remove the suction line insulation from the area of the sensing bulb. Observe location and position of bulb for reinstallation.

(3) Loosen the screws and nuts in the bulb straps that attach the sensing bulb to the suction line, and pull the bulb out of the straps.

CAUTION

Use care to not damage or kink the capillary.

(4) Place the sensing bulb in a container of ice water or crushed ice so that it is reduced to a temperature near 32°F (0°C).

(5) Set TEMPerature control thermostat knob fully DECREASE (counterclockwise), fan speed to LO SPEED, place one hand on the exposed suction return line, and start the air conditioner in COOL mode. If a drop in temperature is felt on the suction return line, the expansion valve is not closing fully and should be replaced. If the return line temperature remains constant, check the pressure gage; it should indicate approximately 59 +/-2 psi (4. 0 +/-0. 14 kg/cm2). If the pressure is not within the above limits, test the operation of the quench valve (para 5-16) and the pressure regulator valve (para 5-26) before attempting replacement of the evaporator expansion valve.

CAUTION

When performing the next test, turn the air conditioner to OFF as soon as a definite drop in temperature is felt on the suction return line. If the test conditions are continued more than a few seconds, the expansion valve will fully open and an excessive flood-back of liquid refrigerant may damage or destroy the compressor.

(6) With one hand still on the suction return line, remove the sensing bulb from the container and warm it in the other palm. If a temperature drop is not felt in the suction return line by the time the sensing bulb no longer feels cold to the hand, the expansion valve is not opening and should be replaced. As soon as a temperature drop is felt, turn the air conditioner to OFF.

(7) Slip the sensing bulb into its mounting loop clamps. Be sure the bulb is installed in its original position and tighten the nuts and screws. Be sure the sensing bulb is making metal-to-metal contact with the suction line.

(8) Attach an accurate thermometer to an exposed surface of the suction return line adjacent to the sensing bulb; use a small gob of thermal mastic to improve conductivity.

(9) Rewrap insulation on the suction return line, being sure to cover the sensing bulb.

(10) Start the air conditioner in the COOL mode with the thermostat set at fully DECREASE (counterclockwise) and allow it to run about 30 minutes, then check to be sure the temperature in the suction line has stabilized and the thermometer reading remains unchanged for at least 2 minutes.

(11) Note the pressure on the gage connected to the low pressure (suction) service valve. Find the saturation temperature for the pressure gage reading (see table 5-1) and compare with the thermometer reading. The thermometer temperature should be 10 +/-1°F (5. 55 +/-. 5°0C) higher than the saturation temperature found on the chart.

(12) If the superheat setting is not within the limits shown above, replace the expansion valve.

Replacement

(1) Discharge the refrigerant system per paragraph 5-7.

(2) Unwrap insulation from suction line so that sensing bulb is exposed. Loosen screws and nuts in clamps. Pull bulb out of clamps.

(3) Disconnect flare nut on external equalizer line from expansion valve.

(4) Remove the two screws, flat washers, lockwashers, and spacers that attach the valve body to its mounting bracket.

(5) Carefully remove the power assembly and cage assembly.

NOTE

If valve body flange is not damaged, do not remove (debraze) it from the system.

(6) If valve body flange is to be removed, purge the system with nitrogen and debraze the two tubes. (See para 5-8 and 5-9.)

(7) If valve body flange was removed, purge the system with nitrogen and braze the two tubing joints. (See paras 5-8 and 5-9.)

(8) Coat three cage assembly gaskets with oil.

(9) Be sure that valve components are properly assembled and aligned and secure power assembly to body flange.

(10) Secure valve assembly with two cap screws, lockwashers, flat washers, and spacers.

(11) Connect flare nut on external equalizer line to expansion valve.

(12 Insert the sensing bulb into its mounting clamps in its original position and tighten the screws and nuts. Be sure the sensing bulb is making good metal-to-metal contact with the suction line.

(13) Cut to length and install insulation tubing over sensing bulb. Be sure insulation extends beyond both ends of bulb.

(14) Wrap insulation tubing with one layer of insulation tape.

(15) Wrap each end of insulation tape with two layers of pressure-sensitive tape.

Follow-on procedures:

(1) Replace the dehydrator. (See para 5-23.)

(2) Purge system. (See para 5-8.)

(3) Leak test all newly connected joints and those in the repair area. (See para 5-10.)

(4) Evacuate the refrigerant system. (See para 5-11.)

(5) Charge the refrigerant system, but do not operate unit. (See para 5-12.)

(6) Install fan motor. (See para 4-57.)

(7) Run air conditioner and check operation. (See para 5-12.)

(8) Install heater elements (HR1 thru HR6) and support. (See para 4-58.)

(9) Install top panel. (See para 4-16.)

5-16. QUENCH VALVE (V4)

This task covers: a. Inspection b Test c. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Thermometer
(Appendix B item 5)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Sealant
(Appendix E item 15)
Thermal Mastic
(Appendix E item 26)
Pressure-Sensitive Tape
(Appendix E item 27)
Nitrogen
(Appendix E item 37)
Brazing Alloy
(Appendix E item 38)
Brazing Flux
(Appendix E item 39)
Insulation Tape
(Appendix E item 47)
Refrigerant-22
(Appendix E item 40)
Dehydrator
(Appendix E item 41)
Refrigerant Oil
(Appendix E item 44)
Lockwashers
(Appendix E item 45)
Insulation Tubing
(Appendix E item 46)

General Safety Instructions

WARNING

The test procedure must be conducted with the power on. Exercise extreme caution.

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

Insulation Tape
(Appendix E item 47)
Lockwashers
(Appendix E item 51)
Flare Gasket
(Appendix E item 52)

Equipment Conditions:
Top Panel Removed (para 4-16)
Junction Box Removed (para 4-32)
Fan Motor Removed (para 4-57)
Heater Elements (HR1 thru HR6) and Support Removed (para 4-58)

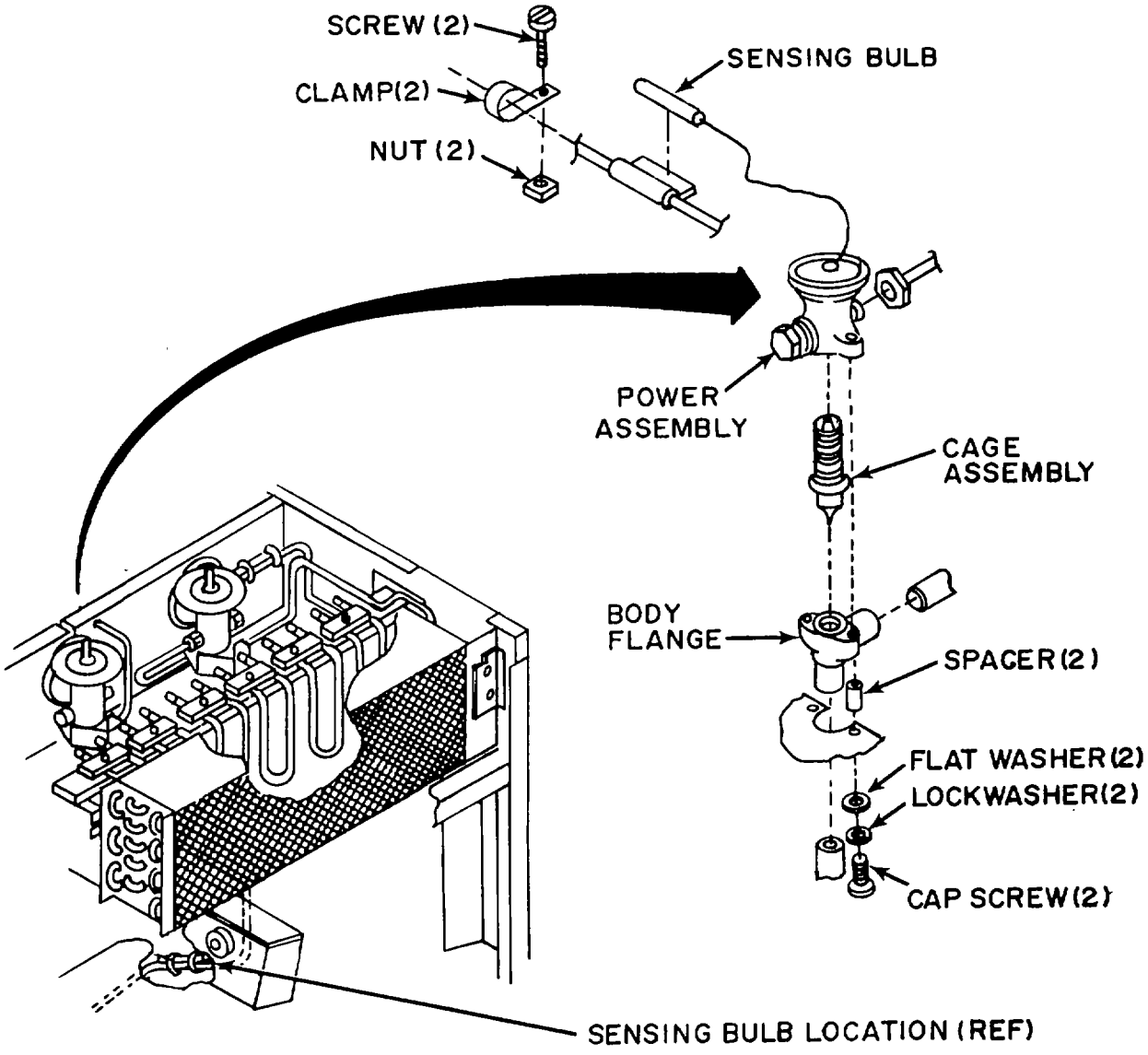


Figure 5-14. Quench Valve (V4)

Inspection

(1) Inspect for kinked, or otherwise damaged capillary line, and loose or missing mounting hardware.

(2) Check thermal bulb to see that it is securely clamped to the suction line.

(3) If a leak is suspected or indicated, test per paragraph 5-10.

Test

NOTE

The quench valve as supplied with the unit is preset at the factory. This valve should not be adjusted. (1) Perform a refrigerant pressure check on unit in accordance with paragraph 5-13. Leave gages or service manifold attached.

(2) Remove the suction line insulation from the area of the sensing bulb. Observe location and position of bulb for re-installation.

(3) Attach an accurate thermometer to an exposed surface of the suction line adjacent to the sensing bulb; use a small gob of thermal mastic, to improve conductivity.

(4) Check that service valve and gage connection to low (suction) side are open. Note pressure indicated on gage and temperature indicated on thermometer.

(5) Set the TEMPerature control thermostat knob to full INCREASE (clockwise). Start the air conditioner in COOL mode. Note that suction pressure drops to 58 +/-2 psig (4. 0 +/-0. 2 kg/cm2). Allow compressor to run for at least 20 minutes. If pressure is not within above limits, test operation of pressure regulating valve (para 5-26) before proceeding with quench valve test.

NOTE

Except in a very hot climate, with room air temperature above 90°F (32. 20C), the refrigeration system will be in a bypass cycle with a maximum volume of hot discharge vapor being recirculated back to suction side of compressor through pressure regulator valve and quench valve.

(6) Observe that temperature indicated remains stable for a minimum of two minutes, then find saturation temperature for pressure indicated on gage, using table 5-1. For example: The saturation temperature for a refrigerant pressure of 69 psig (4. 85 kg/cm2) is 40°F (4. 40C).

(7) Compare the saturation temperature with indicated temperature. The indicated temperature should be 25 +/50 (13. 9 +/2. 20C) higher than the saturation temperature. For example: With a 400 saturation temperature, the thermometer should read 65 +/50F. If indicated temperature is not within above limits, quench valve is not functioning properly and should be replaced.

Replacement

(1) Discharge the refrigerant system per paragraph 5-7.

(2) Unwrap insulation tubing from suction line so that sensing bulb is exposed. Note location and position of bulb for reinstallation. Loosen screws and nuts in clamps. Pull bulb out of clamps.

(3) Using wrench, remove two cap screws, lockwashers, flat washers, and spacers that attach valve body to bracket and power assembly.

(4) Carefully remove the power assembly and cage assembly.

NOTE

If valve body flange is not damaged, do not remove (debraze) it from the system.

(5) If valve body flange is to be removed, purge the system with nitrogen and debraze the two tubes. (See para 5-8 and 5-9.)

(6) If valve body flange was removed, purge the system with nitrogen and braze the two tubing joints. (See para 5-8 and 5-9.)

(7) Coat cage assembly gaskets with oil.

(8) Be sure that valve components are properly assembled and aligned. Secure power assembly to body flange.

(9) Secure valve assembly with two cap screws, lockwashers, flat washers, and spacers.

(10) Insert sensing bulb into its mounting clamps in its original position, and tighten the screws and nuts. Be sure sensing bulb is installed in the original position and is making good metal-to-metal contact with suction line.

(11) Cut to length and install insulation tubing over sensing bulb. Be sure insulation extends beyond both ends of bulb

(12) Wrap insulation tubing with one layer of insulation tape.

(13) Wrap both ends of insulation tape with two layers of pressure-sensitive tape.

(14) Seal grommet and capillary line at bulkhead opening.

Follow-on procedures:

(1) Replace the dehydrator. (See para 5-23.)

(2) Purge system. (See para 5-8.)

(3) Leak test all newly connected joints and those in the repaired area. (See para 5-10.)

(4) Evacuate the refrigerant system. (See para 5-11.)

(5) Charge the refrigerant system, but do not operate unit. (See para 5-12.)

(6) Install fan motor. (See para 4-57.)

(7) Install junction box. (See para 4-32.)

(8) Operate air conditioner and check operation. (See para 5-12.)

(9) Install heater elements (HR1 thru HR6) and support. (See para 4-58)

(10) Install top panel. (See para 4-16.)

5-17. LOW-PRESSURE CUT-OUT SWITCH (S6)

This task covers: a. Inspection b. Test c. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Nitrogen
(Appendix E item 37)
Brazing Alloy
(Appendix E item 38)
Brazing Flux
(Appendix E item 39)
Refrigerant-22
(Appendix E item 40)
Dehydrator
(Appendix E item 41)
Refrigerant Oil
(Appendix E item 44)
Lockwashers
(Appendix E item 48)
Tiedown Strap
(Appendix E item 49)
Lockwashers
(Appendix E item'51)
Flare Gasket
(Appendix E item 52)
Gasket
(Appendix F item 35)

Equipment Conditions:
Top Panel Removed (para 4-16)
Fan Motor Removed (para 4-57)
Refrigerant System Discharged (para 5-7)

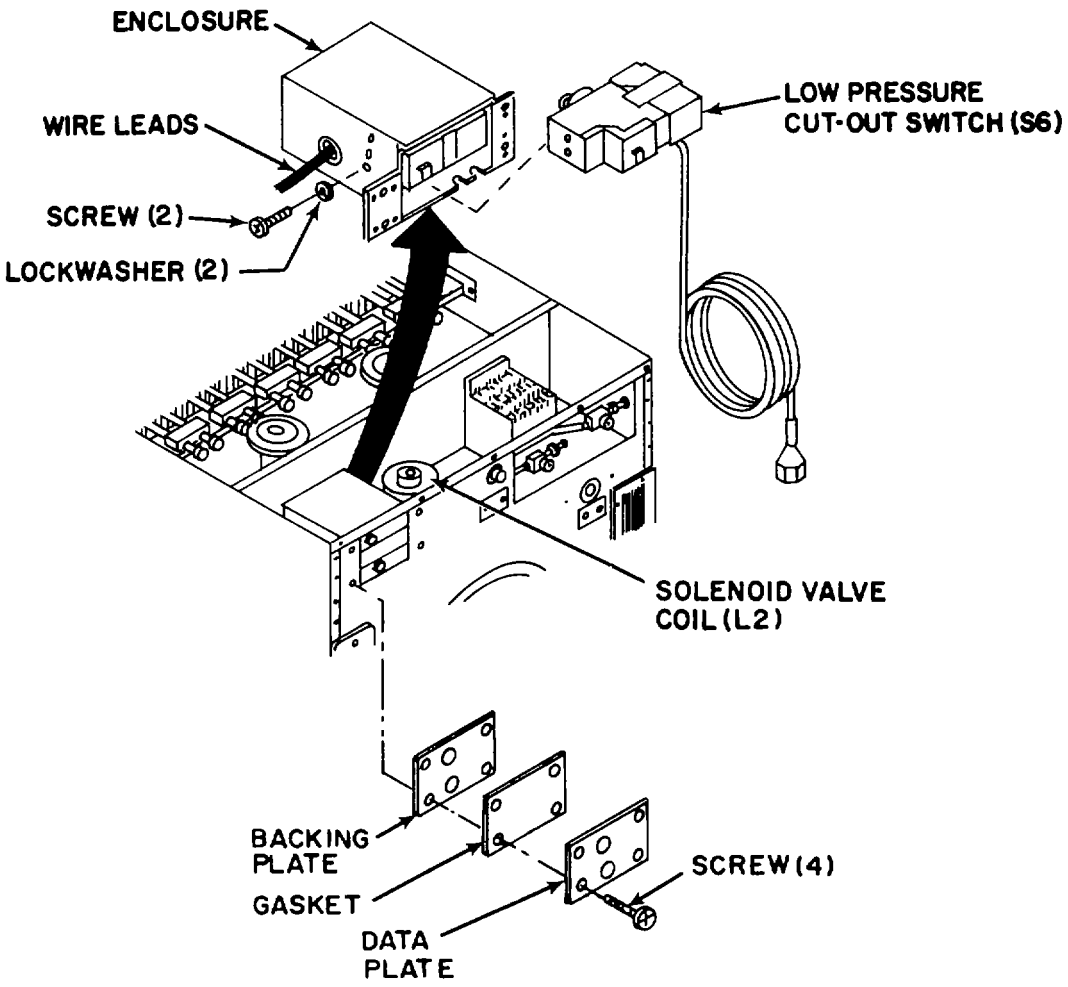


Figure 5-15. Low Pressure Cut-Out Switch (S6)

Inspection

(1) Remove four screws, pressure switch nameplate, backing plate, and gasket.

(2) Carefully pull switch enclosure far enough from unit to gain access to attachment screws.

(3) Remove two screws and lockwashers from switch.

(4) Carefully pull switch from box far enough to gain access to terminals.

(5) Check that wire leads and terminal attachment screws are in place. Tighten if loose. Replace if missing or frayed.

(6) Check that capillary line is not kinked, mashed or broken. Replace switch if capillary line is damaged.

Test

NOTE

Check that refrigerant line is properly charged. (See para 5-13.)

(1) Press and release the reset button to be sure that switch is not tripped.

(2) Use a multimeter to check for continuity between terminals 1 and 2 on switch. If there is continuity, the switch is properly closed. If there is no continuity, switch must be replaced.

Replacement

(1) Tag and disconnect wire leads from switch.

CAUTION

Take care that sensing bulb capillary line is not kinked and that bulb and capillary are not cut or damaged during removal. (2) Using two wrenches, loosen and disconnect switch capillary tubing flare nut from pressure tap.

(3) Remove pressure switch and capillary with flare nut from unit.

(4) See tags and wiring diagram (see fig. 4-43) and connect wire leads. Remove tags.

(5) Feed tubing to connection area and carefully coil excess capillary tubing and secure in place with tiedown straps to eliminate vibration.

(6) Using two wrenches, connect flare nut to pressure tap.

(7) Insert and secure pressure switch to enclosure with two screws and lockwashers.

(8) Seal capillary tube and grommet in enclosure with adhesive.

(9) Install enclosure and switches in unit.

(10) Align the enclosure, backing plate, gasket, and switch nameplate with unit mounting holes.

(11) Secure enclosure, backing plate, gasket, and switch nameplate with four screws.

Follow-on procedures:

(1) Replace the dehydrator. (See para 5-23.)

(2) Purge system. (See para 5-8.)

(3) Leak test all newly connected joints and those in the repaired area. (See para 5-10.)

(4) Evacuate the refrigeration system. (See para 5-11.)

(5) Charge the refrigeration system, but do not operate unit. (See para 5-12.)

(6) Install fan motor. (See para 4-57.)

(7) Run unit and check operation. (See para 5-12.)

(8) Install top panel. (See para 4-16.)

(9) Press and release pressure switch reset buttons to be sure they are not tripped.

5-18. HIGH-PRESSURE CUT-OUT SWITCH (S5)

This task covers: a. Inspection b Test c. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Nitrogen
(Appendix E item 37)
Brazing Alloy
(Appendix E item 38)
Brazing Flux
(Appendix E item 39)
Refrigerant-22
(Appendix E item 40)
Dehydrator
(Appendix E item 41)
Refrigerant Oil
(Appendix E item 44)
Lockwashers
(Appendix E item 48)
Tiedown Strap
(Appendix E item 49)
Lockwashers
(Appendix E item 51)
Flare Gasket
(Appendix E item 52)
Gasket
(Appendix F item 35)

Equipment Conditions:
Top Panel Removed (para 4-16)
Fan Motor Removed (para 4-57)
Refrigerant System Discharged (para 5-7)

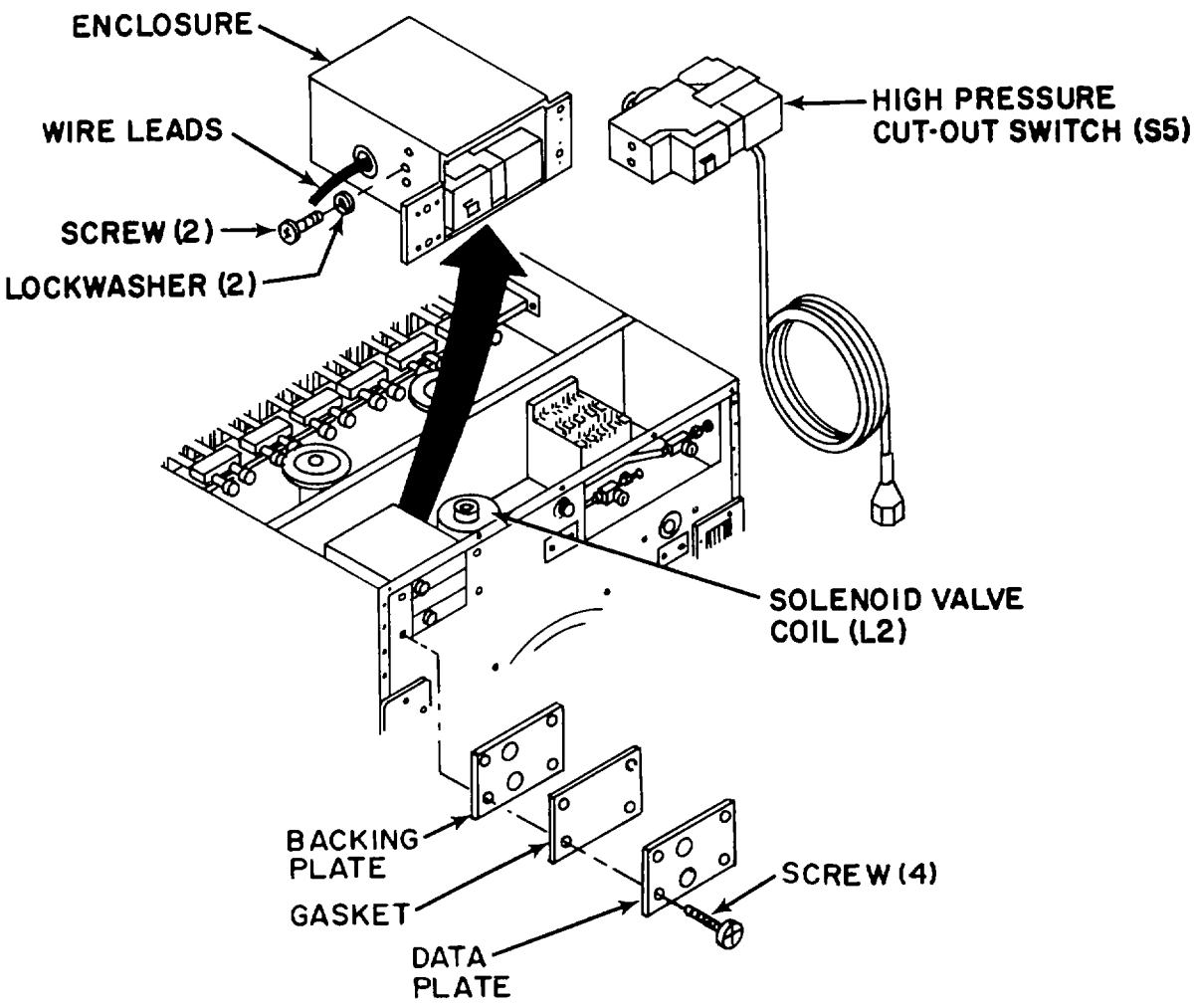


Figure 5-16. High Pressure Cut-Out Switch (S5)

Inspection

(1) Remove four screws, pressure switch nameplate, backing plate, and gasket.

(2) Carefully pull switch enclosure far enough from unit to gain access to attachment screws.

(3) Remove two screws and lockwashers from switch.

(4) Carefully pull switch from box far enough to gain access to terminals.

(5) Check that wire leads and terminal attachment screws are in place. Tighten if loose. Replace if missing.

(6) Check that capillary line is not kinked, mashed or broken. Replace switch if capillary line is damaged.

Test

NOTE

Check that refrigerant line is properly charged. (See para 5-13.)

(1) Press and release the reset button to be sure that switch is not tripped.

(2) Use a multimeter to check for continuity between terminals 1 and 2 on switch. If there is continuity, the switch is properly closed. If no continuity is found, switch must be replaced.

Replacement

(1) Tag and disconnect wire leads from switch.

CAUTION

Take care that sensing bulb capillary line is not kinked and that bulb and capillary are not cut or damaged during removal.

(2) Using two wrenches, loosen and disconnect switch capillary tubing flare nut from pressure tap.

(3) Remove pressure switch and capillary with flare nut from unit.

(4) See tags and wiring diagram (see fig. 4-43) and connect wire leads.

(5) Feed tubing to connection area and carefully coil excess capillary tubing and secure in place with tiedown straps to eliminate vibration.

(6) Using two wrenches, connect flare nut to pressure tap.

(7) Secure pressure switch to enclosure with two screws and lockwashers.

(8) Seal capillary tube and grommet in enclosure with adhesive.

(9) Install enclosure and switches in unit.

(10) Align the enclosure, backing plate, gasket, and switch nameplate with unit mounting holes.

(11) Secure enclosure, backing plate, gasket, and switch nameplate with four screws.

Follow-on procedures:

(1) Replace the dehydrator. (See para 5-23.)

(2) Purge system. (See para 5-8.)

(3) Leak test all newly connected joints and those in the repaired area. (See para 5-10.)

(4) Evacuate the refrigeration system. (See para 5-11.)

(5) Charge the refrigeration system, but do not operate unit. (See para 5-12.)

(6) Install fan motor. (See para 4-57.)

(7) Run unit and check operation. (See para 5-12.)

(8) Install top panel. (See para 4-16.)

(9) Press and release pressure switch reset buttons to be sure they are not tripped.

5-19. FAN SPEED PRESSURE CONTROL SWITCH (S8)

This task covers: a. Inspection b Test c. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Nitrogen
(Appendix E item 37)
Brazing Alloy
(Appendix E item 38)
Brazing Flux
(Appendix E item 39)
Refrigerant-22
(Appendix E item 40)
Dehydrator
(Appendix E item 41)
Refrigerant Oil
(Appendix E item 44)
Lockwashers
(Appendix E item 48)
Tiedown Strap
(Appendix E item 49)
Lockwashers
(Appendix E item 51)
Flare Gasket
(Appendix E item 52)
Gasket
(Appendix F item 35)

Equipment Conditions:
Top Panel Removed (para 4-16)
Fan Motor Removed (para 4-57)
Refrigerant System Discharged (para 5-7)

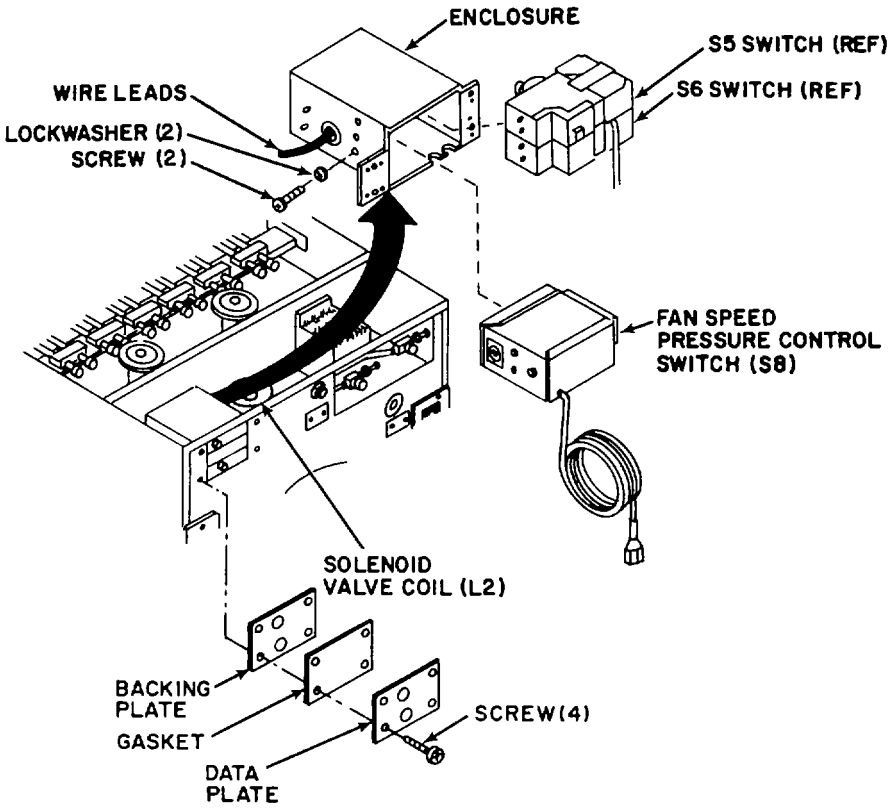


Figure 5-17. Fan Speed Pressure Control Switch (S8)

Inspection

(1) Remove four screws, pressure switch nameplate, backing plate, and gasket.

(2) Carefully pull switch enclosure far enough from unit to gain access to attachment screws.

(3) Remove two screws and lockwashers each from pressure switches (S6) and (S5).

(4) Carefully pull switches (S6) and (S5) from enclosure far enough to gain access to switches (S6) and (S5) terminals.

(5) Tag and remove wire leads on switches (S5) and (S6).

(6) Remove two screws and lockwashers from pressure switch (S8).

(7) Carefully pull switch (S8) from enclosure far enough to gain access to switch terminals.

(8) Check that wire leads and terminal attachment screws are in place. Tighten if loose. Replace if missing.

(9) Check that capillary line is not kinked, mashed or broken. Replace switch if capillary line is damaged.

Test

Use a multimeter to check continuity between terminals 2 and 3 on switch. If there is no continuity, the switch is properly open. If continuity is found, switch must be replaced.

Replacement

(1) Remove high-pressure cutout switch (S5). (See para 5-18).

(2) Remove low-pressure cutout switch (S6). (See para 5-17).

(3) Tag and remove wire leads from switch (S8).

CAUTION

Take care that sensing bulb capillary line is not kinked and that bulb and capillary are not cut or damaged during removal.

(4) Using two wrenches, loosen and disconnect switch capillary tubing flare nut from pressure tap.

(5) Remove pressure switch and capillary with flare nut from unit.

(6) See tags and wiring diagram (see fig. 4-43) and connect wire leads. Remove tags.

(7) Feed tubing to connection area and carefully coil excess capillary tubing and secure in place with tiedown straps to eliminate vibration.

(8) Using two wrenches, connect flare nut to pressure tap.

(9) Secure pressure switch (S8) to enclosure with two screws and lockwashers.

(10) Seal capillary tubes and grommets in enclosure.

(11) Secure pressure switch (S6) to enclosure with two screws and lockwashers.

(12) Secure pressure switch (S5) to enclosure with two screws and lockwashers.

(13) Install enclosure and switches in unit.

(14) Align the enclosure, backing plate, gasket, and switch nameplate with unit mounting holes.

(15) Secure enclosure, backing plate, gasket, and switch nameplate with four screws.

Follow-on procedures:

(1) Replace the dehydrator. (See para 5-23.)

(2) Purge system. (See para 5-8.)

(3) Leak test all newly connected joints and those in the repaired area. (See para 5-10.)

(4) Evacuate the refrigeration system. (See para 5-11.)

(5) Charge the refrigeration system, but do not operate unit. (See para 5-12.)

(6) Install fan motor. (See para 4-57.)

(7) Run unit and check operation. (See para 5-12.)

(8) Install top panel. (See para 4-16.)

(9) Press and release pressure switch reset buttons to be sure they are not tripped.

5-20. CHARGING VALVES (V1 AND V6)

This task covers: a. Inspection b Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Nitrogen
(Appendix E item 37)
Refrigerant-22
(Appendix E item 40)
Dehydrator
(Appendix E item 41)
Refrigerant Oil
(Appendix E item 44)
Locknuts
(Appendix E item 50)
Lockwashers
(Appendix E item 51)
Flare Gasket
(Appendix E item 52)

Equipment Conditions:
Charging Valve Access Cover Removed (para 4-13)
Top Panel Removed (para 4-16)
Refrigerant System Discharged (para 5-7)

Inspection

(1) Check that caps are in place and that keeper rings are not damaged. Replace if missing or damaged.

(2) Check for signs of leakage. Leak test per paragraph 5-10, if leak is suspected.

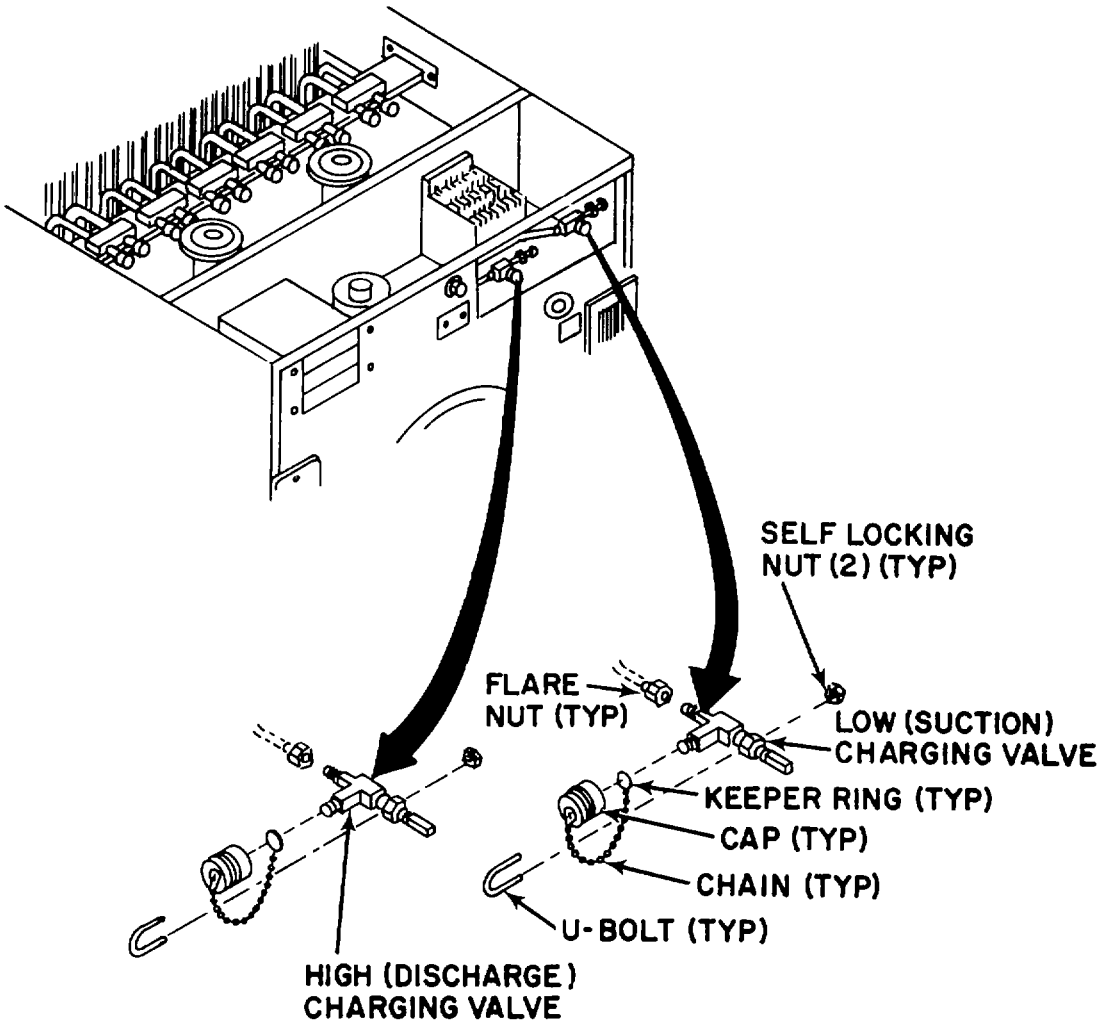


Figure 5-18. Charging Valves (V1 and V6)

Replacement

(1) Using two wrenches, loosen and disconnect tubing flare nut from charging valve.

(2) Observe position of valve for proper installation.

(3) Remove two self-locking nuts, U-bolts, and charging valve.

(4) Position valve in unit as noted during disassembly.

(5) Using two wrenches, restrain valve body and tighten flare nut.

(6) Install valve and U-bolt and secure with two locknuts.

(1) Replace the dehydrator. (See para 5-23.)

(2) Purge system. (See para 5-8.)

(3) Leak test all newly connected joints and those in the repaired area. (See para 5-10.)

(4) Evacuate the refrigeration system. (See para 5-11.)

(5) Charge the refrigeration system. (See para 5-12.)

(6) Install top panel. (See para 4-16.)

(7) Install charging valve access cover. (See para 4-13.)

5-21. CONDENSER COIL (C)

This task covers: a. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Nitrogen
(Appendix E item 37)
Brazing Alloy
(Appendix E item 38)
Brazing Flux
(Appendix E item 39)
Refrigerant-22
(Appendix E item 40)
Dehydrator
(Appendix E item 41)
Work Gloves
(Appendix E item 43)
Refrigerant Oil
(Appendix E item 44)
Lockwashers
(Appendix E item 51)
Flare Gasket
(Appendix E item 52)

Equipment Conditions:
Fabric Cover Removed (para 4-11)
Junction Box Removed (para 4-32)
Refrigerant System Discharged (para 5-7)
Compressor Removed (para 5-24)

General Safety Instructions

WARNING

When handling coils, wear gloves to avoid cuts and reduce fin damage on coil.

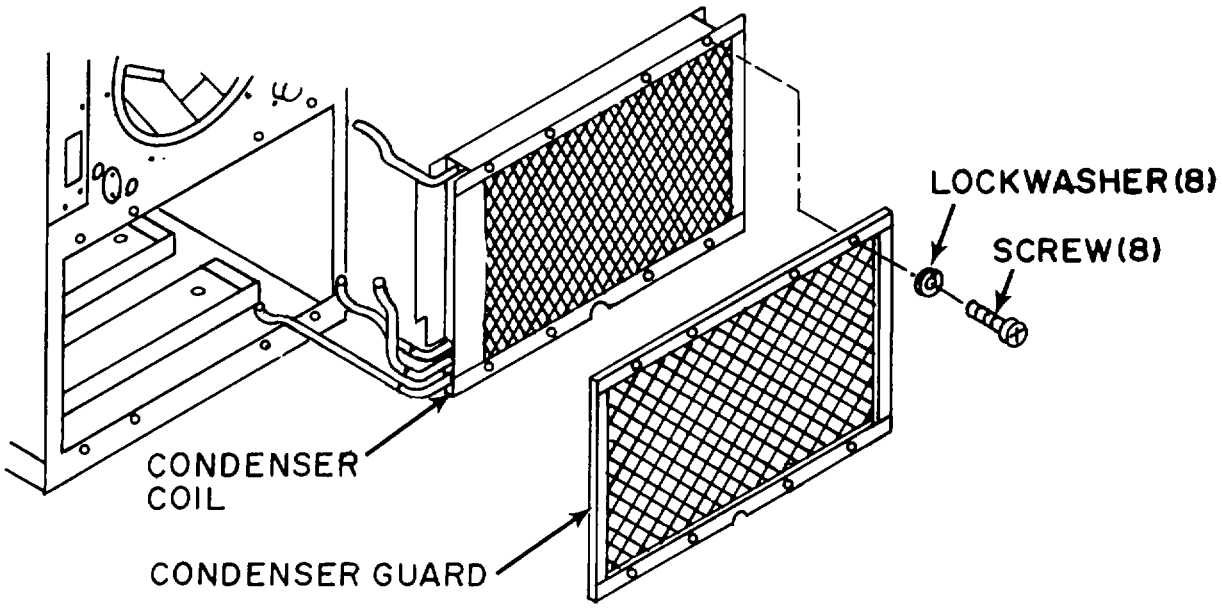


Figure 5-19. Condenser Coil (C)

Replacement

(1) Observe position of tubing from condenser for ease of reassembly.

(2) While purging the system with nitrogen, debraze the remaining tube joints to the condenser. (See paras 5-7 and 5-8.)

(3) Supporting the condenser coil, remove four screws, lockwashers, and condenser coil guard.

(4) Using gloves to protect your hands and coil fins, carefully slip the coil from the unit.

(5) Align condenser coil and guard and secure with four screws and washers.

(6) While purging the system with nitrogen, braze the tubejoints in positions noted at disassembly. (See paras 5-8 and 5-9.)

Follow-on procedures:

(1) Install the compressor. (See para 5-24.)

(2) Replace the dehydrator. (See para 5-23.)

(3) Purge system. (See para 5-8.)

(4) Leak test all newly connected joints and those in the repaired area. (See para 5-10.)

(5) Evacuate the refrigeration system. (See para 5-11.)

(6) Charge the refrigeration system. (See para 5-12.)

(7) Install junction box. (See para 4-32.)

(8) Install fabric cover. (See para 4-11.)

5-22. LIQUID SIGHT INDICATOR (SIGHT GLASS) (S)

This task covers: a. Inspection b Test c. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Nitrogen
(Appendix E item 37)
Brazing Alloy
(Appendix E item 38)
Brazing Flux
(Appendix E item 39)
Refrigerant-22
(Appendix E item 40)
Dehydrator
(Appendix E item 41)
Refrigerant Oil
(Appendix E item 44)
Lockwashers
(Appendix E item 51)
Flare Gasket
(Appendix E item 52)
Gasket
(Appendix F item 36)

Equipment Conditions:
Charging Valve Access Cover Removed (para 4-13)
Top Panel Removed (para 4-16)
Fan Motor Removed (para 4-57)
Refrigerant System Discharged (para 5-7)
Charging Valves Removed (para 5-20)

Inspection

Check that glass window is clean and not cracked or broken. Clean if dirty. Replace liquid sight indicator if cracked or broken.

Test

Check for evidence of leakage. Leak test per paragraph 5-10 if leak is suspected. Repair or replace as indicated.

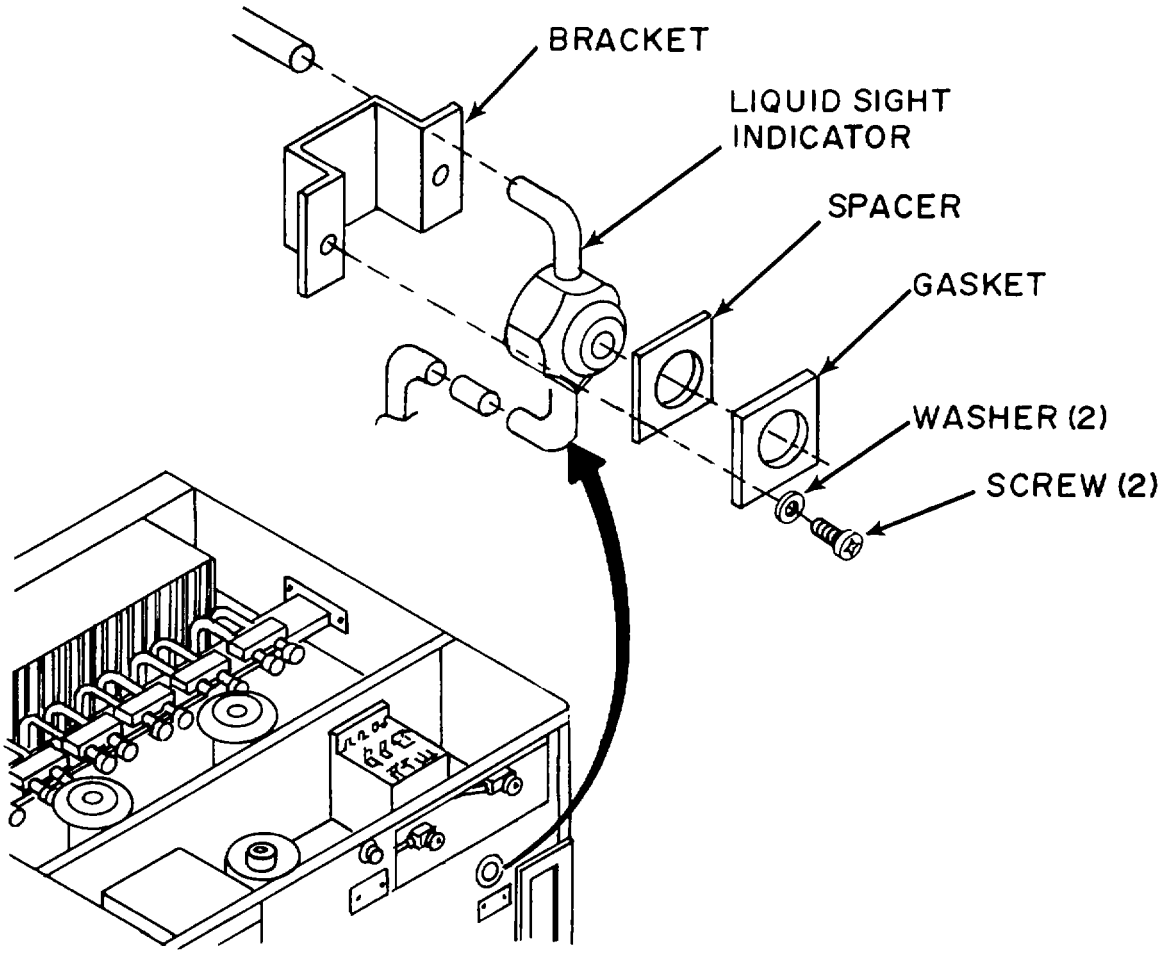


Figure 5-20. Liquid Sight Indicator (Sight Glass)(S)

Replacement

(1) Tag and remove wires from relay (K7).

(2) Remove two screws, washers, and indicator bracket.

(3) Remove spacer and gasket.

(4) While purging the system with nitrogen, debraze the tubing. (See para 5-8 and 5-9.)

(5) Remove liquid sight indicator.

(6) Position liquid sight indicator on tubing.

(7) While purging the system with nitrogen, braze the tubing joints. (See para 5-8 and 5-9.)

(8) Install spacer and gasket and position sight indicator in place.

(9) Install bracket with two screws and washers.

Follow-on procedures:

(1) Replace the dehydrator. (See para 5-23.)

(2) Install charging valves. (See para 5-20.)

(3) Purge system. (See para 5-8.)

(4) Leak test all newly connected joints and those in the repaired area. (See para 5-10.)

(5) Evacuate the refrigeration system. (See para 5-11.)

(6) Charge the refrigeration system, but do not operate unit. (See para 5-12.)

(7) Install fan motor. (See para 4-57.)

(8) See tags and connect fan relay (K7) leads.

(9) Run unit and check operation. (See para 5-12.)

(10) Install top panel. (See para 4-16.)

(11) Install charging valve access cover. (See para 4-13.)

5-23. DESICCANT REFRIGERANT DEHYDRATOR (FILTER-DRIER) (D)

This task covers: a. Inspection b. Test c. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
Appendix B item 1)
Nitrogen Regulator
Appendix B item 10)

Materials/Parts
Nitrogen
Appendix E item 37)
Refrigerant-22
Appendix E item 40)
Refrigerant Oil
Appendix E item 44)
Lockwashers
Appendix E item 51)
Flare Gasket
Appendix E item 52)

Equipment Conditions:
Junction Box Removed (para 4-32)
Refrigerant System Discharged (para 5-7)

NOTE

The dehydrator must be replaced each time the refrigeration system had been opened. It should be installed just before unit is leak tested.

Inspection

1) Check for general condition and signs of leakage.

2) Check that mounting bracket is secure.

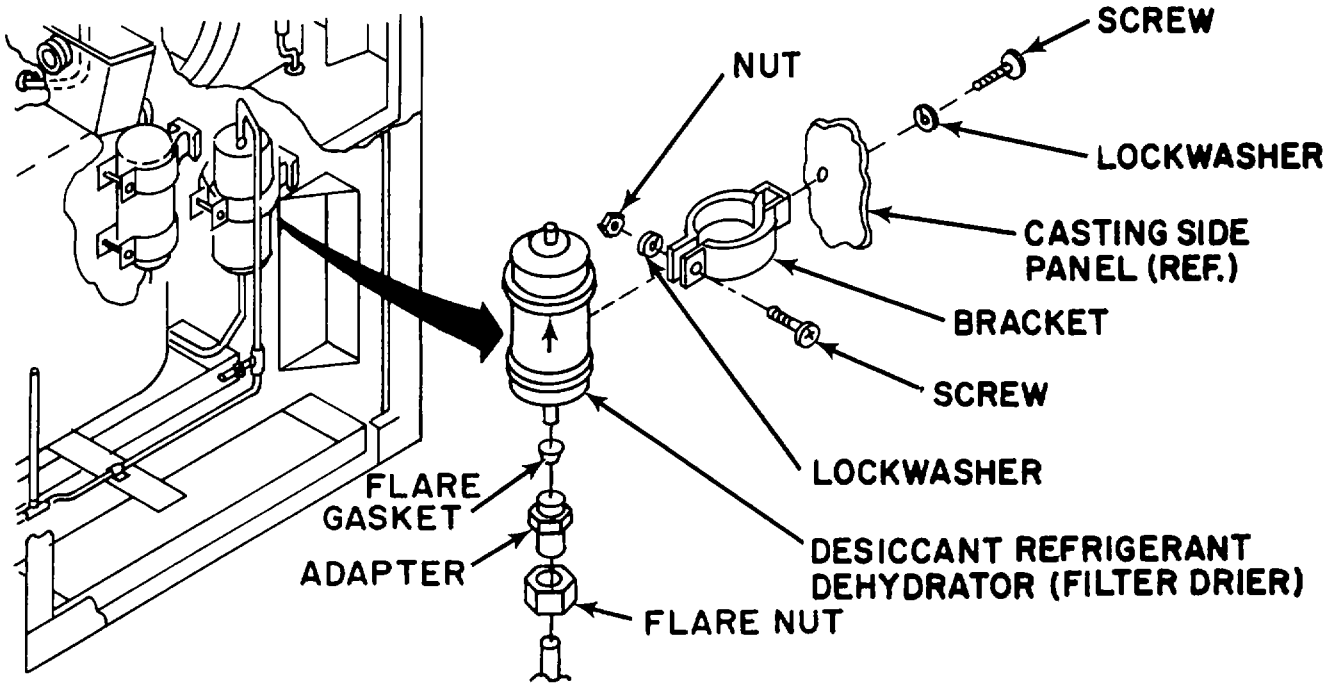


Figure 5-21. Desiccant Refrigerant Dehydrator (Filter Drier) (D)

Test

Leak test per paragraph 5-10.

Replacement

(1) Using two wrenches, loosen and disconnect flare nuts.

(2) Remove screw, lockwasher, dehydrator, and bracket from right side of air conditioner.

(3) Remove screw, lockwasher, and nut from bracket.

(4) Remove dehydrator from bracket.

(5) Remove adapter and flare gasket from dehydrator.

CAUTION

Replacement 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 dehydrator from which caps have been removed for an extended or unknown period of time.

(6) Lubricate flare gasket with refrigerant oil.

(7) Install flare gasket and adapter in dehydrator.

(8) Place dehydrator in bracket.

(9) Loosely assemble bracket with screw, lockwasher, and nut on dehydrator.

NOTE

Be sure that flow arrow is pointing up.

(10) Slip dehydrator and bracket into place.

(11) Using two wrenches, tighten both flare nuts.

(12) Install bracket with screw and lockwasher.

(13) Tighten bracket on dehydrator.

Follow-on procedures:

(1) Purge system. (See para 5-8.)

(2) Leak test all newly connected joints and those in the repaired area. (See para 5-10.)

(3) Evacuate the refrigeration system. (See para 5-11.)

(4) Charge the refrigeration system. (See para 5-12.)

(5) Install junction box. (See para 4-32.)

5-24. COMPRESSOR (B1)

This task covers:
a. Inspection b. Test c. Replacement d. Cleaning

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Rags
(Appendix E item 1)
Respirator
(Appendix E item 6)
Goggles
(Appendix E item 7)
Gloves, Protective
(Appendix E item 8)
Locknuts
(Appendix E item 12)
Nitrogen
(Appendix E item 37)
Brazing Alloy
(Appendix E item 38)
Brazing Flux
(Appendix E item 39)
Refrigerant-22
(Appendix E item 40)
Dehydrator
(Appendix E item 41)
Refrigerant Oil
(Appendix E item 44)
Tiedown Strap
(Appendix E item 49)
Lockwasher
(Appendix E item 51)

General Safety Instructions

WARNING

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

If compressor burnout is suspected, use care when handling compressor to avoid touching compressor sludge. Acid in sludge can cause burns.

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

The compressor is supplied with a complete charge of oil. Be sure that oil is not lost when handling and installing compressor.

Flare Gasket
(Appendix E item 52)
Refrigerant-11
(Appendix E item 53)
Insulation Sleeving
(Appendix E item 54)
Splice Connectors
(Appendix E item 55)

Equipment Conditions:
Top Panel Removed (para 4-16)
Discharge Grille Removed (para 4-21)
Mist Eliminator Removed (para 4-24)
Heating Elements (HR1-HR6) and Support Removed (para 4-58)
Refrigerant Discharged (para 5-7)

Inspection

Carefully feel lower part of compressor:

(a) If air conditioner has been connected to power supply for at least four hours, compressor should feel warm (100 to 120°F). If not warm, test crankcase heater for continuity.
(b) If air conditioner has not been connected to power supply for at least four hours, compressor temperature should be the same as surrounding air temperature.

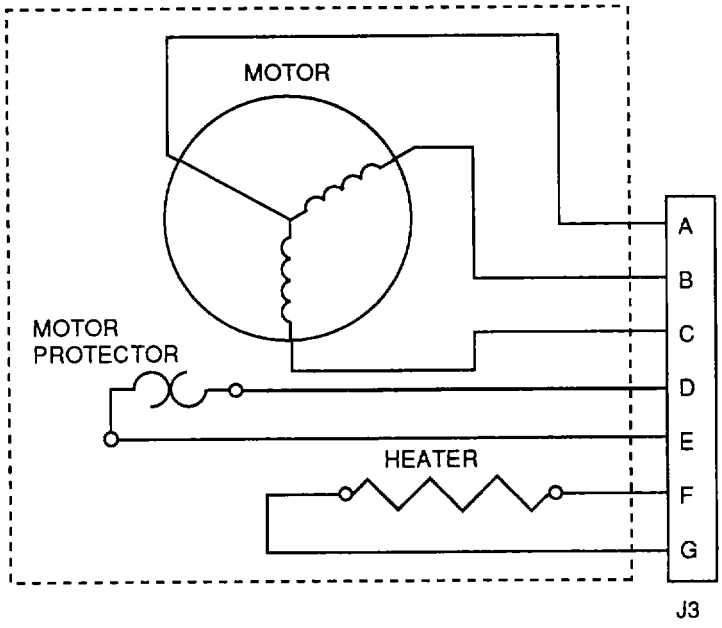


Figure 5-22. Compressor Schematic

Test

(1) Disconnect P3 from J3 (located on the compressor junction box).

(2) Test crankcase heater. Using multimeter, test resistance from pin F to pin G. Resistance should be approximately 400 to 450 ohms. A much lower reading indicates short, an infinite reading indicates an open. Replace shorted or open crankcase heater.

(3) Test compressor motor windings:

(a) Using multimeter, test resistance at J3 between pins A, B, and C and the compressor body. No continuity should exist. If continuity exists, the compressor is bad. Replace compressor.

(b) Using multimeter, test resistance at J3 between pins A to B, B to C, A to C. All resistances should be above zero and less than 2 ohms. If resistance is zero or greater than 2 ohms, replace compressor.

(4) Test motor thermostat.

Using multimeter, test continuity between pin D and pin E. Resistance should be zero indicating motor protector is closed. An infinite reading indicates an open. Replace compressor.

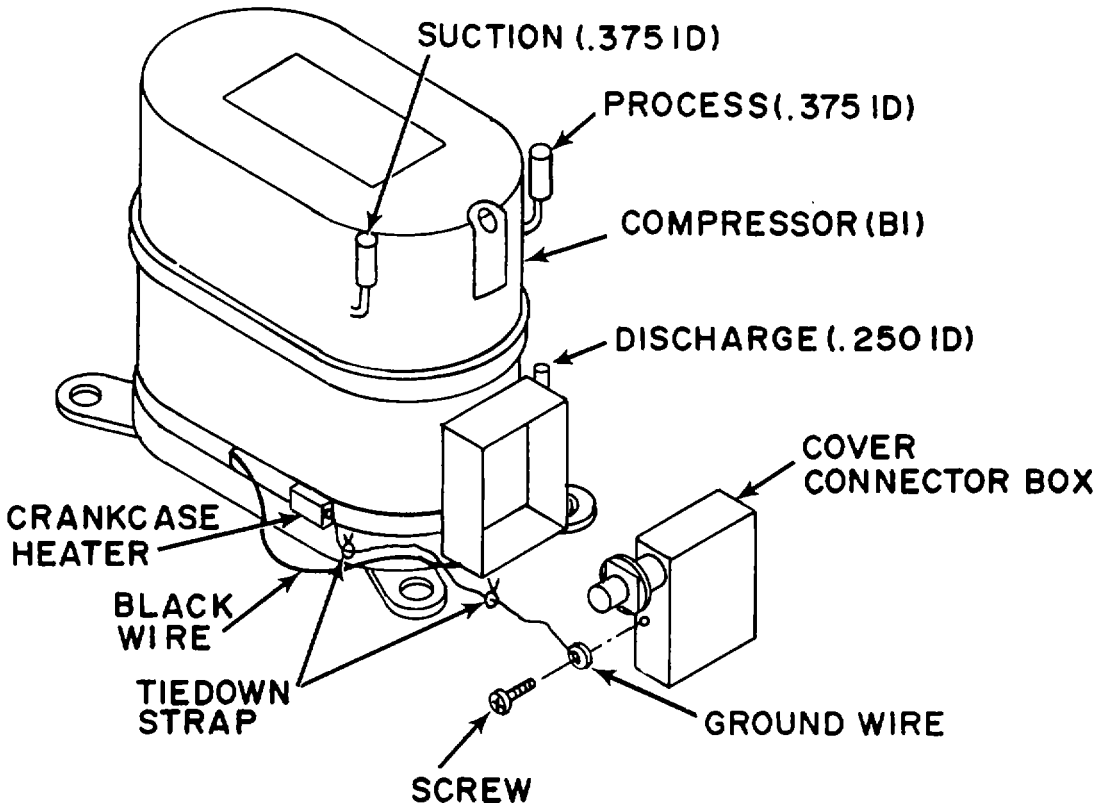


Figure 5-23. Compressor Replaceable Items

Replacement

(1) Heater

(a) Disconnect plug P3 from connector J3 in compressor connector box.

(b) Remove tie down strap, tag and cut black wire leads close to heater element at front.

(c) Remove screw and ground wire terminal from compressor connector box.

(d) Loosen clamp screw, pivot screw, then slide band from clamp and unit.

(e) Strip ends of heater leads exiting bottom of compressor connector box approximately 3/8 of an inch.

(f) Carefully install new heater around compressor base and secure in position.

(g) Cut heater leads to length required to meet with existing leads from compressor connector box. Strip ends approximately 3/8 of an inch.

(h) Place a 2.50" length of insulation sleeving over each lead exiting compressor connector box.

(i) Crimp splice heater leads to the leads from the compressor connector box. Wire ends should be visible in access holes at center of crimp barrel.

(j) Locate and shrink insulation sleeving in place over splice connectors.

(k) Install ground lead and screw to compressor connector box.

(l) Secure position of splice connectors above the level of the heater withtiedown straps.

(2) Compressor

NOTE

If compressor windings are bad, check for compressor burn out prior to installing a new compressor. (See instructions in compressor removal.)

(a) Raise the cabinet and place it on blocks at least four inches high. Be sure the blocks do not obstruct the holes in the base through which the compressor mounting shoulder screws must be removed.

(b) Unwrap the insulation from the suction tube up to the capillary tube so that the joint on the compressor is exposed.

(c) Wrap nearby areas except joint with wet rags to act as a heat sink.

NOTE

For ease of removal, break discharge line at tee above compressor. Remove compressor with stubby process tube and short length of discharge line ("S" shaped) attached to compressor.

(d) While purging the system with nitrogen, debraze the tubing. (See paras 5-8 and 5-9.)

(e) Remove four locknuts and flat washers from top of mounting feet and four shoulder bolts, four oversize flat washers, and four rubber washers from underside of unit.

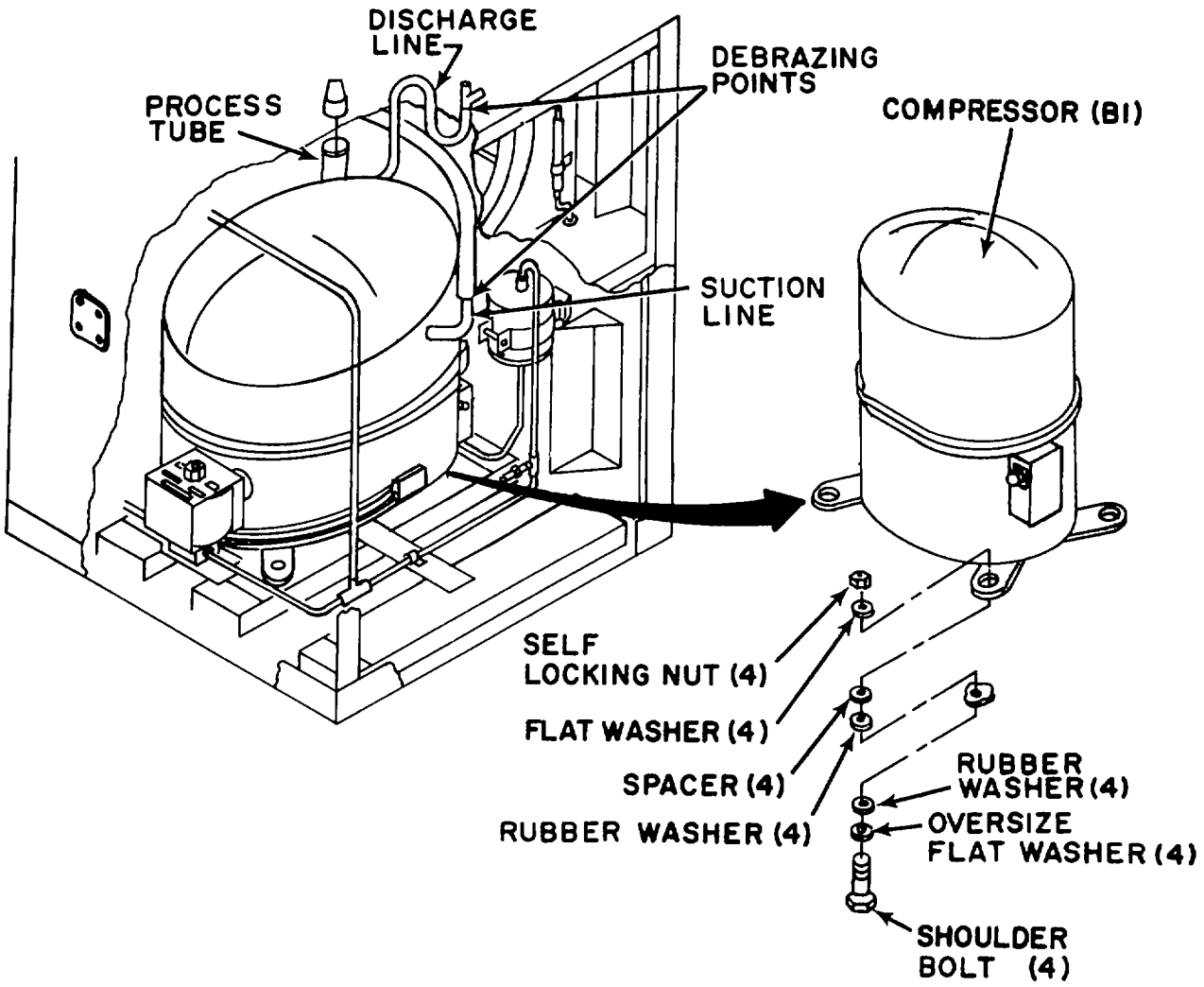


Figure 5-24. Compressor (B1)

(f) Lever or tilt the compressor and remove four rubber washer and four spacers from under each of the four mounting feet.

(g) Carefully slide compressor from air conditioner.

(h) While purging the system with nitrogen, debraze process and discharge tubes (note angle of discharge tube). Save for re-use.

(i) While purging the system with nitrogen, braze stubby process tube and discharge tube to new compressor. Be sure discharge tube is at same angle as removed from old compressor.

NOTE

If compressor motor burnout is suspected, refer to cleaning to remove contaminated oil from system.

If any refrigeration piping was disconnected with the compressor being replaced, transfer the piping to the replacement compressor in the same position as noted during disassembly, before installing it in the air conditioner. Check to see that replacement compressor is equipped with a heater, if not, remove tested heater from old compressor or replace with new one.

(j) Lift compressor through the lower front panel opening and position it on base pan.

(k) Tilt the compressor and install the four spacers and four rubber washers between each of the four compressor mounting feet and the base pan.

(1) Install four oversize flat washers and four rubber washers on the four mounting shoulder screws, then insert the shoulder screws from beneath the base. Secure with four flat washers and locknuts on top of mounting feet.

(m) Wrap wet rags around compressor at connection points.

(n) While purging the system with nitrogen, braze the tubing joints, keeping the flame away from the compressor. (See paras 5-8 and 5-9.)

(o) Connect electrical connector plug (P3) to connector (J3) on compressor connector box.

(p) Replace the dehydrator. (See para 5-23.)

(q) Purge system. (See para 5-8.)

(r) Leak test all newly connected joints and those in the repaired area. (See para 5-10.)

(s) Using insulation removed during disassembly, install on suction tube compressor joint area.

Follow-on procedures:

(1) Evacuate the refrigeration system. (See para 5-11.)

(2) Charge the refrigeration system. (See para 5-12.)

(3) Install junction box. (See para 4-32.)

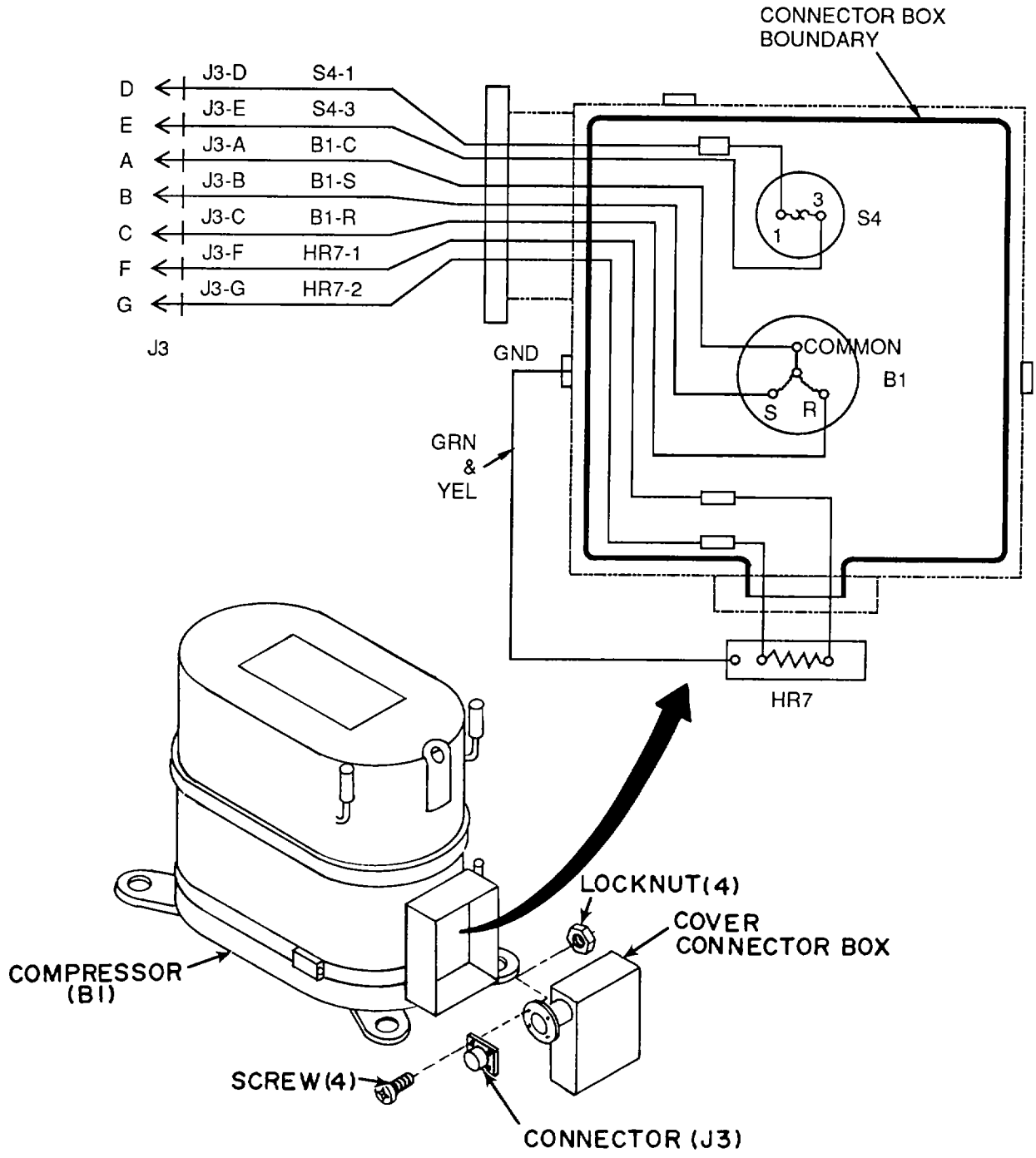


Figure 5-25. Compressor Harness

(3) Connector and harness

NOTE

Compressor must be removed in order to replace connector and harness

(a) Remove four screws, locknuts, and connector from compressor.

(b) Remove three screws, ground wire, and connector box cover.

(c) Tag wire leads.

(d) Cut three wires at splice on compressor side of splice.

(e) Remove four quick-disconnect terminals.

(f) Strip ends of three compressor leads approximately 3/8".

(g) Using tags and wiring schematic (fig. 5-25.), crimp three compressor wire leads to new connector and harness. Remove the tags.

(h) Using tags and wiring schematic (fig. 5-25.), connect four harness quick-disconnect terminals to compressor.

(i) Secure the connector to the compressor connection box with four screws and locknuts.

(j) Secure connector box cover and ground wire with three screws

Cleaning

(a) After removal of a bad compressor from the refrigeration system, remove all external tubing, noting its position, and tip the compressor toward the discharge port to drain sample of oil into a clear glass container.

(b) If the oil is clean and clear, and does not have a burnt acid smell, the compressor did not fail because of motor burnout. If a burnout is not indicated, continue to replace compressor.

(c) If the oil is black, contains sludge, and has a burnt acid odor, the compressor failed because of motor burnout.

(d) You must clean the entire refrigeration system after 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 burnouts.

(e) Remove the dehydrator (filter-drier), and blow down each leg of the refrigeration system. To do this, connect a cylinder of dry nitrogen to each dehydrator connection, in turn, and open the cylinder shutoff valve for at least 30 seconds at 50 psig (3.5 kg/cm2) pressure. Remove dry nitrogen connection.

(f) Bypass dehydrator fittings with a jumper, locally manufactured from refrigerant tubing and fittings.

(g) Clean system by back-flushing with liquid R11 (item 12, Appendix E) from pressurized cylinder with pressure of at least 100 psig.

(h) Connect the R11 tank to the discharge line of the refrigerant system.

(i) Connect a line containing a filter to the suction line in the unit.

NOTE

An unused dehydrator or other suitable medium may be used as a filter.

(j) The other end of the temporary suction line should be connected to a small drum or suitable reservoir.

(k) Open R 11 tank valve. Continue filling the reservoir with refrigerant, R11, until it begins to pour out of the return line. Continue flushing slowly for at least 15 minutes.

(1) Connect R11 tank to the suction connections, replace the filter with a new filtering medium, open tank valve, and backflush the system for an additional 15 minutes.

(m) Remove the filter and dehydratorjumper. Place an empty container below the compressor connections, and connect a cylinder of dry nitrogen to each dehydrator connection in turn. Blow down each leg of the system at 50 psig (3.5 kg/cm2) for at least 30 seconds.

(n) Disconnect the dry nitrogen cylinder. Cap or plug open connections if compressor and dehydrator are not to be installed immediately.

5-25. TUBING AND FITTINGS

This task covers: a. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Tubing
(As required)
Fittings
(As required)
Nitrogen
(Appendix E item 37)
Brazing Alloy
(Appendix E item 38)
Brazing Flux
(Appendix E item 39)
Refrigerant-22
(Appendix E item 40)
Dehydrator
(Appendix E item 41)
Refrigerant Oil
(Appendix E item 44)
Lockwashers
(Appendix E item 51)
Flare Gasket
(Appendix E item 52)

Equipment Conditions:
Covers and panels removed as needed to access repair area Refrigerant system discharged (para 5-7)

Replacement

NOTE

The refrigeration system contains a number of pieces of copper tubing in a variety of material grades, sizes, lengths, and shapes, and a number of elbows, tees, and adapters in several sizes. Observe the following when replacing any piece of tubing or fitting in the system:

(1) Purge the system with nitrogen and debraze the tube connections. (See paras 5-8 and 5-9.)

(2) Remove the part.

(3) Install the replacement part on the tube ends.

(4) While purging the system with nitrogen braze the tube joints. (See paras 5-8 and 5-9.)

Follow-on procedures:

(1) Replace the dehydrator. (See para 5-23.)

(2) Purge system. (See para 5-8.)

(3) Leak test all newly connected joints and those in the repaired area. (See para 5-10.)

(4) Evacuate the refrigeration system. (See para 5-11.)

(5) Charge the refrigeration system. (See para 5-12.)

(6) Install covers and panels.

5-26. FLUID PRESSURE REGULATING VALVE (V2)

This task covers: a. Test b. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Rags
(Appendix E item 1)
Nitrogen
(Appendix E item 37)
Brazing Alloy
(Appendix E item 38)
Brazing Flux
(Appendix E item 39)
Refrigerant-22
(Appendix E item 40)
Dehydrator
(Appendix E item 41)
Refrigerant Oil
(Appendix E item 44)
Lockwashers
(Appendix E item 51)
Flare Gasket
(Appendix E item 52)
Gasket
(Appendix F item 35)

Equipment Conditions:
Top Panel Removed (para 4-16)
Refrigerant System Discharged (para 5-7)
Switch Enclosure, Gasket, Backing Plate, And Pressure Switch Nameplate Removed (para 5-17)
Solenoid Valve (L2) Coil Removed (para 5-29)

Test

NOTE

Valves are factory set and sealed to start opening when suction pressure decreases to 58 psig. Do not break seal.

(1) Perform a refrigeration pressure check on unit in accordance with paragraph 5-13. Leave the gages on service manifold attached.

(2) Set TEMPerature control thermostat knob to fully INCREASE.

(3) Place fan speed switch in HI SPEED.

(4) Start unit in COOL mode.

(5) Observe pressure gages.

(6) Suction pressure should drop to 58+/-2 psi (4.0 +/kg/cm2) shortly after compressor starts, and then remain constant.

(7) If unit fails the above test, the valve must be replaced.

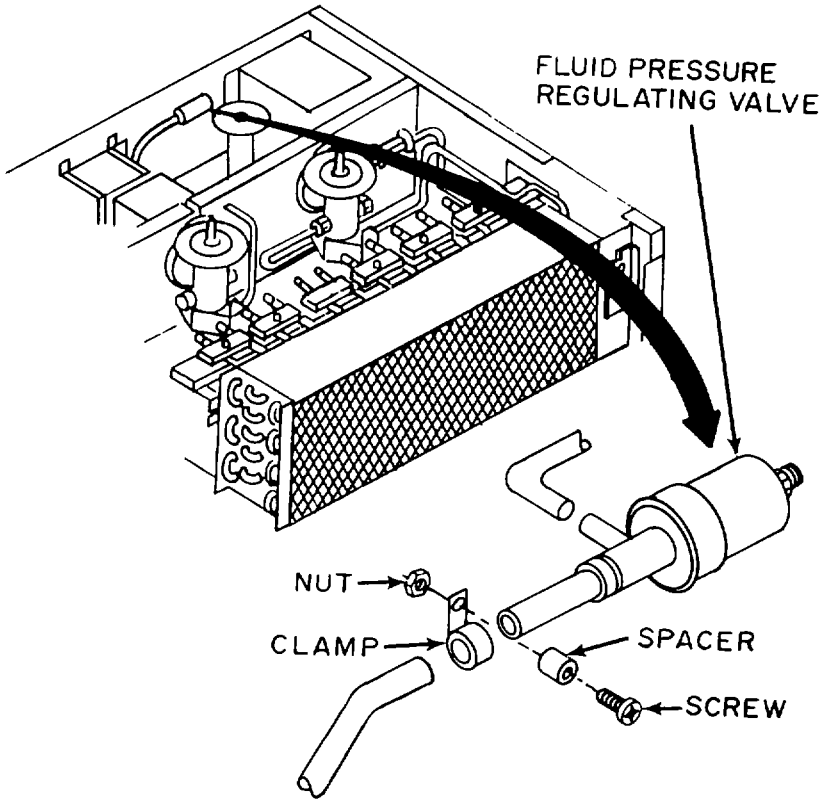


Figure 5-26. Fluid Pressure Regulating Valve (V2)

Replacement

(1) Place coil in a supporting place as far as the leads will allow.

(2) Remove screw, nut, spacer and clamp that secure valve to casing.

(3) Using wet rags, insulate tubing and valves in the area of the fluid pressure relief valve.

(4) While purging the system with nitrogen, debraze the tube joints. (See paras 5-8 and 5-9.)

(5) Remove the fluid pressure regulating valve.

(6) Place the fluid pressure regulating valve on tube ends.

(7) Wrap a wet rag around valve to insulate.

(8) Using wet rags, insulate tubing and valves in the area of the fluid pressure relief valve.

(9) While purging the system with nitrogen ,braze the tube joints. (See para 5-8 and 5-9.)

(10) Secure fluid pressure relief valve to casing with clamp, spacer, nut and screw.

(11) Replace the dehydrator. (See para 5-23.)

(12) Purge system. (See para 5-8.)

(13) Leak test all newly connected joints andthose in the repaired area. (See para 5-10.)

(14) Install and secure coil and data plate on plunger of solenoid valve (L2) with nut.

Follow-on procedures:

(1) Evacuate the refrigeration system. (See para 5-11.)

(2) Charge the refrigeration system. (See para 5-12.)

(3) Install pressure switch enclosure, gasket, backing plate, and pressure switch nameplate. (See para 5-17.)

(4) Install top panel. (See para 4-16.)

5-27. RECEIVER (R)

This task covers: a. Inspection b. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Nitrogen
(Appendix E item 37)
Brazing Alloy
(Appendix E item 38)
Brazing Flux
(Appendix E item 39)
Refrigerant-22
(Appendix E item 40)
Dehydrator
(Appendix E item 41)
Refrigerant Oil
(Appendix E item 44)
Lockwashers
(Appendix E item 51)
Flare Gasket
(Appendix E item 52)

Equipment Conditions:
Junction Box Removed (para 4-32)
Refrigerant System Discharged (para 5-7)

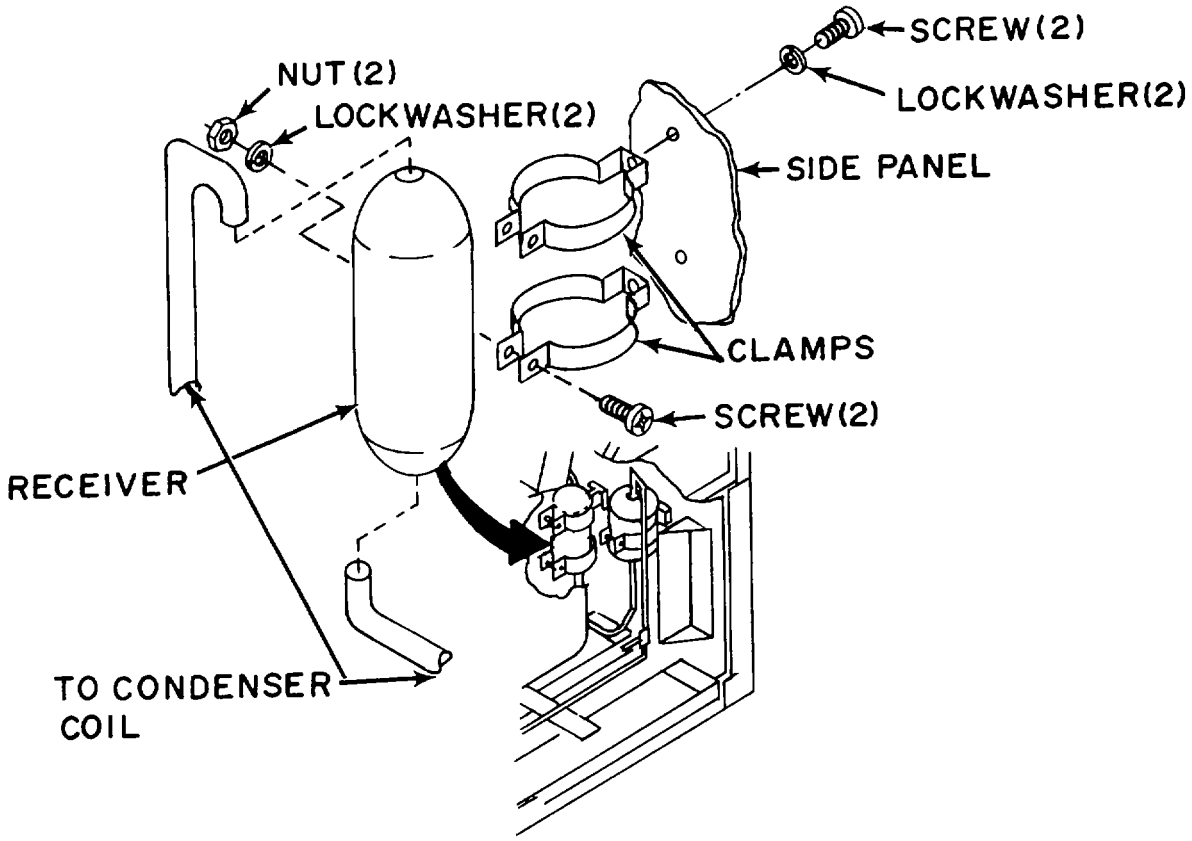


Figure 5-27. Receiver (R)

Inspection

(1) Check for general condition and signs of leakage. If leakage is suspected, leak test per paragraph 5-10.

(2) Check that mounting hardware is secure.

Replacement

(1) Remove two screws and two lockwashers in two clamps.

(2) Remove two screws, lockwashers, nuts, and clamps from the receiver.

(3) While purging the system with nitrogen, debraze the tube joints. (See paras 5-8 and 5-9.)

(4) Remove the receiver.

(5) Loosely secure clamp with two screws, lockwashers and nuts to the receiver.

(6) Place the receiver on the tube ends.

(7) While purging the system with nitrogen, braze the tube joints. (Seeparas 5-8 and 5-9.)

(8) Secure the two receiver clamps to the casing side panel with two screws and lockwashers.

(9) Tighten two clamps on receiver.

Follow-on procedures:

(1) Replace the dehydrator. (See para 5-23.)

(2) Purge system. (See para 5-8.)

(3) Leak test all newly connected joints and those in the repaired area. (See para 5-10.)

(4) Evacuate the refrigeration system. (See para 5-11.)

(5) Charge the refrigeration system, but do not operate unit. (See para 5-12.)

(6) Install junction box. (See para 4-32.)

5-28. PRESSURE RELIEF VALVE (V3)

This task covers: a. Inspection b. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Nitrogen
(Appendix E item 37)
Refrigerant-22
(Appendix E item 40)
Dehydrator
(Appendix E item 41)
Refrigerant Oil
(Appendix E item 44)
Lockwashers
(Appendix E item 51)
Flare Gasket
(Appendix E item 52)
Joint Sealer
(Appendix E item 56)

Equipment Conditions:
Junction Box Removed (para 4-32)
Refrigerant System Discharged (para 5-7)

Inspection

(1) Check for evidence of leakage. Leak test per paragraph 5-10, if leak is suspected.

(2) Check for damage. Replace if damaged.

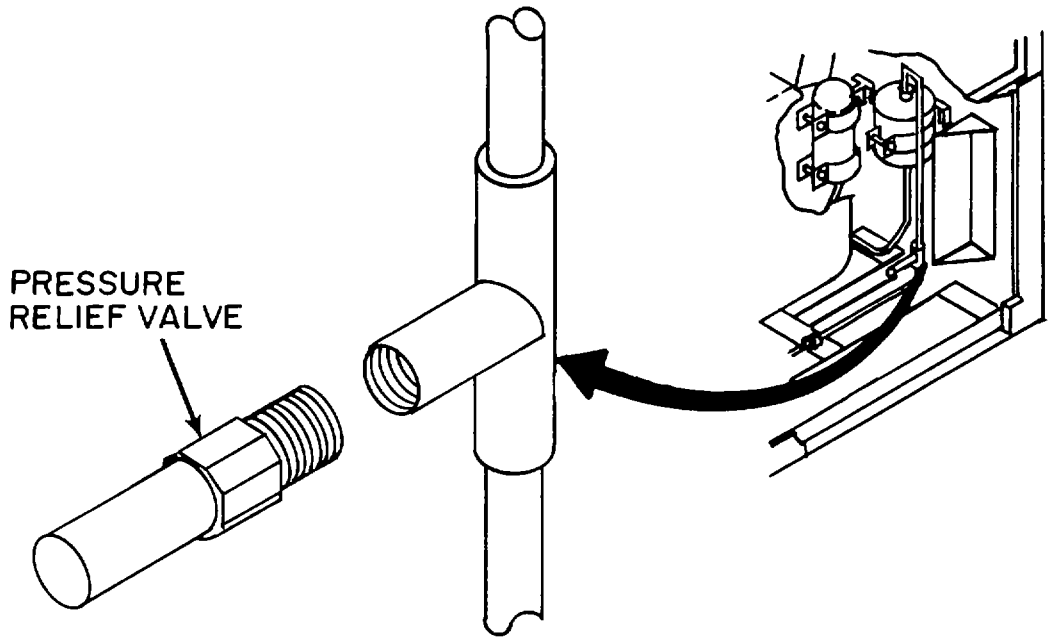


Figure 5-28. Pressure Relief Valve (V3)

Replacement

(1) Using two wrenches, hold fitting so that it is not twisted and unscrew pressure relief valve.

(2) Apply joint sealer to threads of valve.

(3) Using two wrenches, screw pressure relief valve in place while holding adapter fitting.

Follow-on procedures:

(1) Replace the dehydrator. (See para 5-23.)

(2) Purge system. (See para 5-8.)

(3) Leak test all newly connected joints and those in the repaired area. (See para 5-10.)

(4) Evacuate the refrigeration system. (See para 5-11.)

(5) Charge the refrigeration system, but do not operate unit. (See para 5-12.)

(6) Install junction box. (See para 4-32.)

5-29. SOLENOID VALVES (L1 AND L2) COIL REPLACEMENT

This task covers: a. Test b. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Power Supply
(Appendix B item 12)

Equipment Conditions:
Top Panel Removed (For access to L2 only) (para 4-16)
Junction Box Removed (para 4-32)

General Safety Instructions

WARNING

Voltages used can kill. Always disconnect power cord to air conditioner before performing any internal maintenance. Shutting unit off at its control panel does not disconnect unit power.

Do not attempt any disassembly of solenoid valve other than coil removal with a refrigerant charge in the system. Refrigerant will be sprayed out dangerously if screws that attach tube and plunger assembly to valve body are loosened.

Test

NOTE

The following basic instructions apply to both the equalizing solenoid (L2) and the liquid line solenoid (L1).

(1) Using a multimeter set on lowest OHMS scale, check for continuity between contacts I and M on connector P4 (L1) and contacts H and g on connector P4 (L2). If continuity is not found, coil is open and must be replaced.

(2) Using a multimeter to check for continuity between contacts H, I, M, and g in connector P4 and coil casing. If continuity is found between any contact and the casing, the coil is grounded and should be replaced.

(3) If continuity checks are satisfactory, apply 28 volts dc from an external power source across contacts I and M on connector P4 (L1) or H and g on connector P4 (L2). Listen for a sharp click when valve changes position. If click is not heard, internal valve problems are indicated and entire valve should be replaced. (Go to para 5-30.)

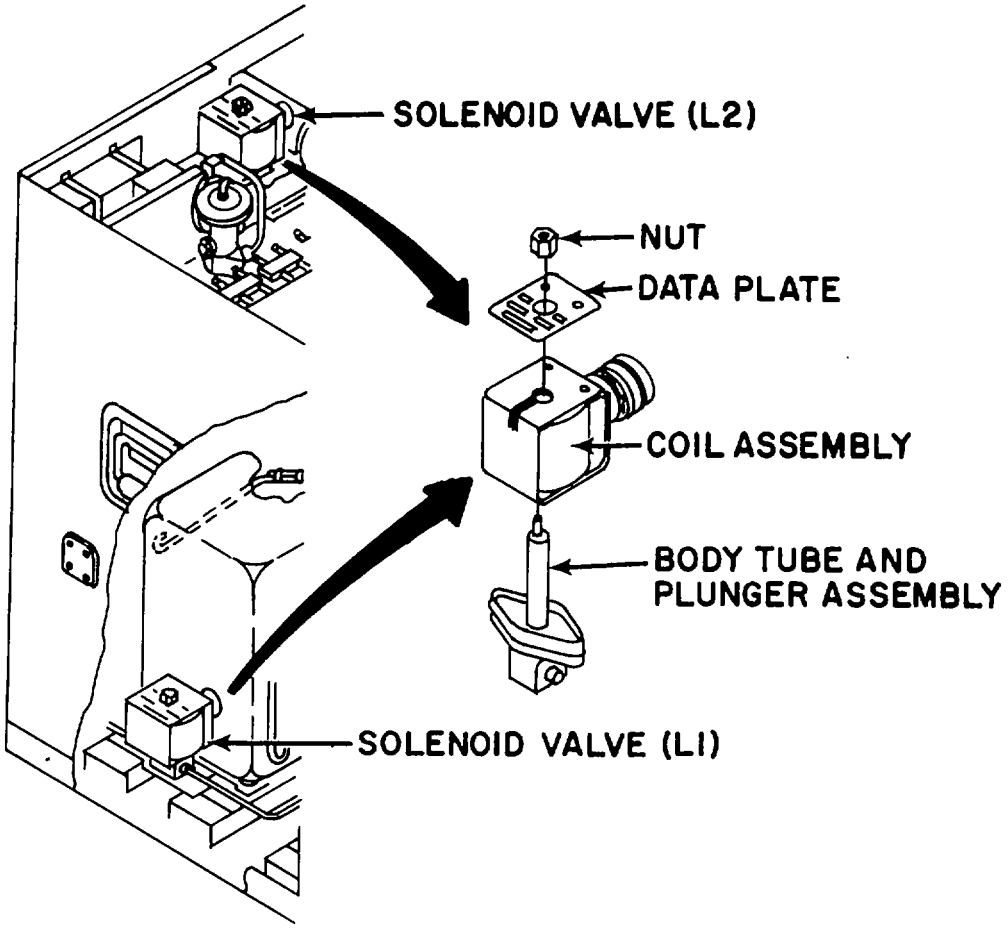


Figure 5-29. Solenoid Valves (L1 and L2) Coil Replacement

Replacement

NOTE

The coil can be replaced without opening the refrigeration pressure system.

(1) Remove nut, data plate, and coil from valve body.

(2) Tag and cut solenoid coil leads at a convenient distance from the coil.

(3) Place coil assembly and data plate on tubeof valve body and secure with nut.

Follow-on procedures:

(1) Install junction box. (See para 4-32.)

(2) Install top panel (for L2 only). (See para 4-18.)

5-30. SOLENOID VALVES (L1 AND L2) REPLACEMENT

This task covers: a. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Nitrogen Regulator
(Appendix B item 10)

Materials/Parts
Nitrogen
(Appendix E item 37)
Brazing Alloy
(Appendix E item 38)
Brazing Flux
(Appendix E item 39)
Refrigerant-22
(Appendix E item 40)
Dehydrator
(Appendix E item 41)
Refrigerant Oil
(Appendix E item 44)
Lockwashers
(Appendix E item 51)
Flare Gasket
(Appendix E item 52)
Preformed Packing
(Appendix E item 57)

Equipment Conditions:
Top Panel Removed (For Access to L2 Only) (para 4-16)
Junction Box Removed (For Access to LI Only) (para 4-32)
Refrigerant System Discharged (para 5-7)
Switch Enclosure Removed (For Access to L2 Only) (para 5-17)

General Safety Instructions

WARNING

Voltages used can kill. Always disconnect power cord to air conditioner before performing any internal maintenance. Shutting unit off at its control panel does not disconnect unit power.

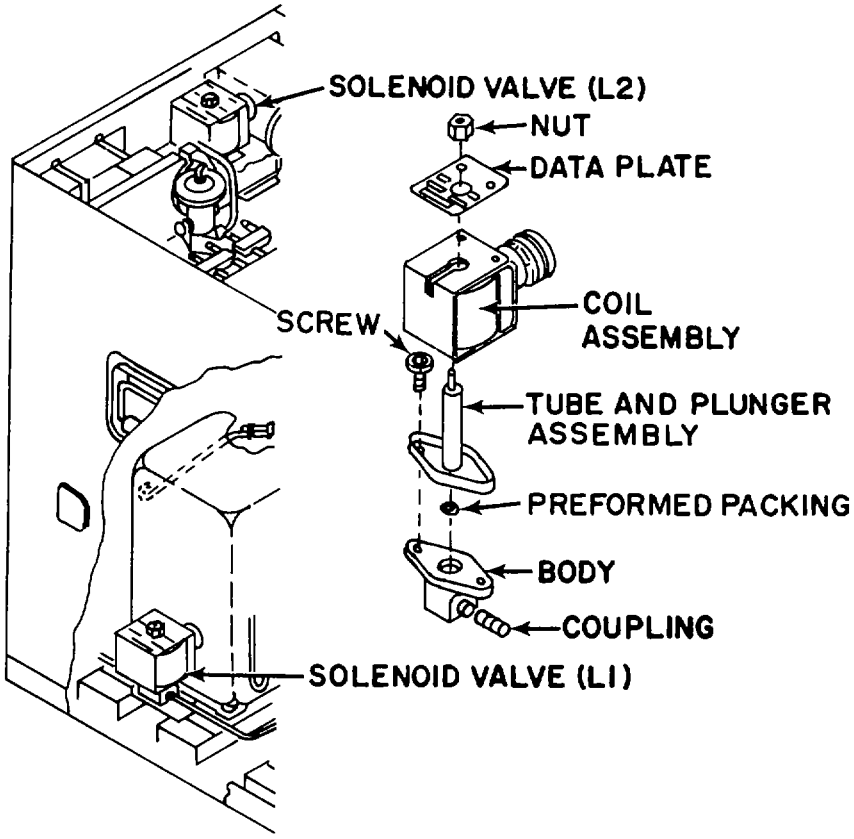


Figure 5-30. Solenoid Valves (L1 and L2) Replacement

Replacement

(1) Remove nut, data plate, and coil assembly from valve body.

(2) Remove two screws, tube and plunger assembly, and preformed packing from valve body.

(3) While purging the system with nitrogen, debraze the tube joints. (See para 5-8 and 5-9.)

(4) Remove the valve body.

(5) Place the valve body on the tube ends.

(6) While purging the system with nitrogen, braze the tube joints. (See para 5-8 and 5-9.)

(7) Check internal surfaces of valve body to be sure it is clean.

(8) Carefully install preformed packing and tube and plunger assembly and secure to valve body with two screws.

(9) Place coil assembly and data plate onto tube and secure with nut.

Follow-on procedures:

(1) Replace the dehydrator. (See para 5-23.)

(2) Purge system. (See para 5-8.)

(3) Leak test all newly connected joints and those in the repaired area. (See para 5-10.)

(4) Evacuate the refrigeration system. (See para 5-11.)

(5) Charge the refrigeration system. (See para 5-12.)

(6) Install junction box (L1 only). (See para 4-32.)

(7) Install switch enclosure (L2 only). (See para 5-17.)

(8) Install top panel (L2 only). (See para 4-16.)

2-31. CASING INSULATION, EVAPORATOR SECTION

This task covers: a. Inspection b. Repair

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Apron
(Appendix E item 5)
Respirator
(Appendix E item 6)
Goggles
(Appendix E item 7)
Gloves, Protective
(Appendix E item 8)
Toluene
(Appendix E item 9)
Adhesive
(Appendix E item 10)

General Safety Instructions

WARNING

Toluene is flammable, and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well-ventilated area, and keep away from sparks or flame. Use goggles, gloves and apron when appropriate.

Gasket
(Appendix F item 37)
Gasket
(Appendix F item 38)
Insulation
(Appendix F item 39)
Insulation
(Appendix F item 40)
Insulation
(Appendix F item 41)
Gasket
(Appendix F item 42)
Gasket
(Appendix F item 43)

Equipment Conditions;
Top Panel Removed (para 4-16)
Air Filter Removed (para 4-23)
Junction Box Removed (para 4-32)

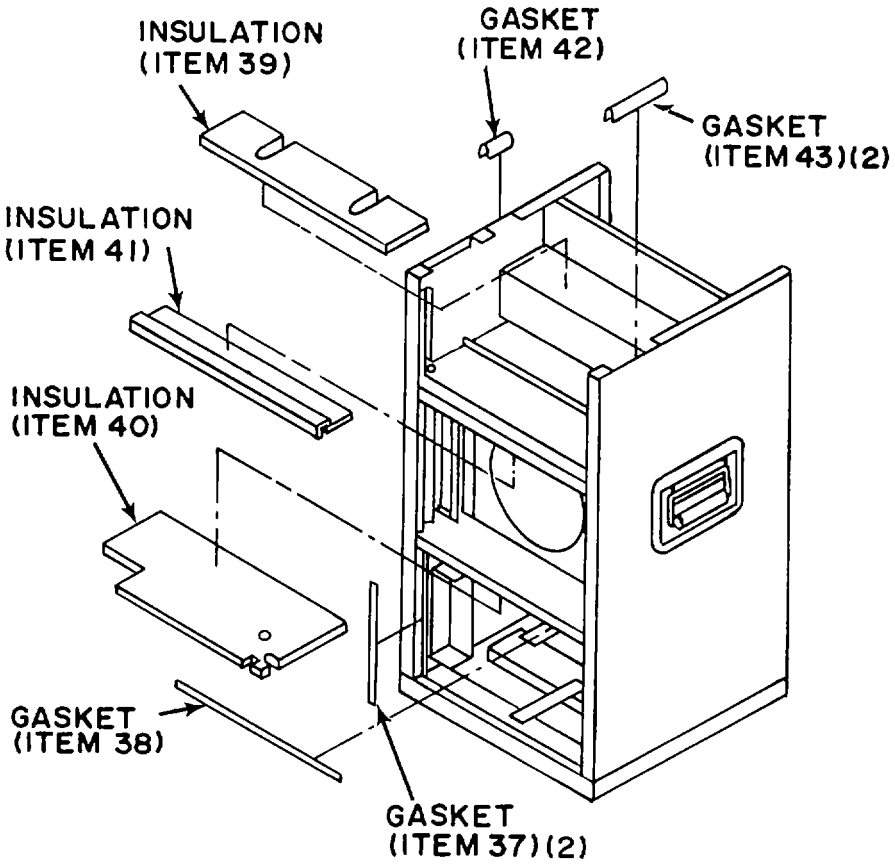


Figure 5-31. Casing Insulation, Evaporator Section

Inspection

Check that insulation is not loose, missing, burnt, or otherwise damaged. Replace if missing or damaged. Reglue if loose.

Repair

(1) Remove as much old gasket material as possible, by pulling or scraping away from the metal surface.

(2) Soften and remove old adhesive and gasket residue, using toluene and a stiff brush.

(3) Cut replacement gasket to size per dimensions in Appendix F.

(4) Be sure that the surface to which the gasket is to be applied is clean and free of old adhesive material.

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

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

Follow-on procedures:

(1) Install top panel. (See para 4-16.)

(2) Install air filter. (See para 4-23.)

(3) Install junction box. (See para 4-32.)

5-32. CASING INSULATION, CONDENSER SECTION

This task covers: a. Inspection b. Repair

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)

Materials/Parts
Apron
(Appendix E item 5)
Respirator
(Appendix E item 6)
Goggles
(Appendix E item 7)
Gloves, Protective
(Appendix E item 8)
Toluene
(Appendix E item 9)
Adhesive
(Appendix E item 10)
Insulation
(Appendix F item 44)
Insulation
(Appendix F item 45)
Insulation
(Appendix F item 46)
Insulation
(Appendix F item 47)
Insulation
(Appendix F item 48)
Insulation
(Appendix F item 49)

Equipment Conditions:
Top Panel Removed (para 4-16)
Fan Motor Removed (para 4-57)

General Safety Instructions

WARNING

Toluene is flammable, and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well-ventilated area, and keep away from sparks or flame. Use goggles, gloves and apron when appropriate.

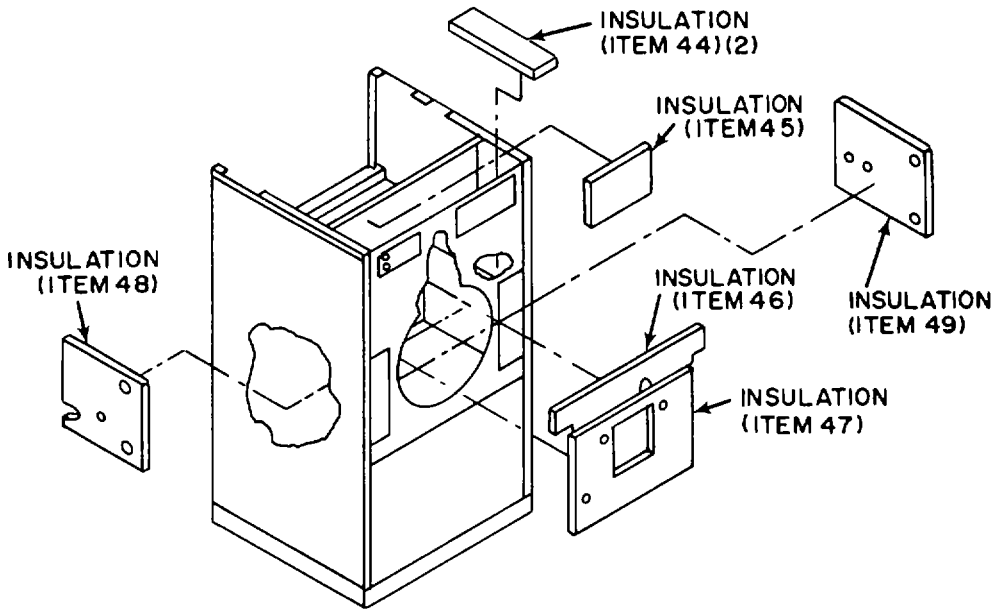


Figure 5-32. Casing Insulation, Condenser Section

Inspection

Check that insulation is not loose, missing, burnt, or otherwise damaged. Replace if missing or damaged. Reglue if loose.

Repair

(1) Remove as much old gasket material as possible, by pulling or scraping away from the metal surface.

(2) Soften and remove old adhesive and gasket residue, using toluene and a stiff brush.

(3) Cut replacement gasket to size per dimensions in Appendix F.

(4) Be sure that the surface to which the gasket is to be applied is clean and free of old adhesive material.

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

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

Follow-on procedures:

(1) Install fan motor. (See para 4-57.)

(2) Install top panel. (See para 4-16.)

CHAPTER 6

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

6-1. GENERAL

Repair parts are listed and illustrated in TM 9-4120-403-24P, Unit, Direct Support, and General Support Maintenance Repair Parts, and Special Tools List. No special tools are required for general support maintenance of the air conditioner. Test, Measurement, and Diagnostic Equipment (TMDE), and support equipment, includes standard electrical test equipment, and standard pressure and vacuum gages, vacuum servicing manifolds found in any general support maintenance refrigeration facility.

Section II MAINTENANCE PROCEDURES

6-2. GENERAL

The only items restricted to general support maintenance level by the Maintenance Allocation Chart (MAC) are the repair of cracked or broken welds, repair or replacement of blind nuts, nut plates, and lifting handles in casing, and blind nuts and nut plates in 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.

5-32. CASING INSULATION, CONDENSER SECTION

This task covers: a. Inspection b. Repair

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Drill (part of shop maintenance kit)
(Appendix B item 8)
Drill Bit Set (part of shop maintenance kit)
(Appendix B item 8)
Riveter
(Appendix B item 9)

Materials/Parts
Sealant
(Appendix E item 15)
Rivets
(Appendix E item 35)

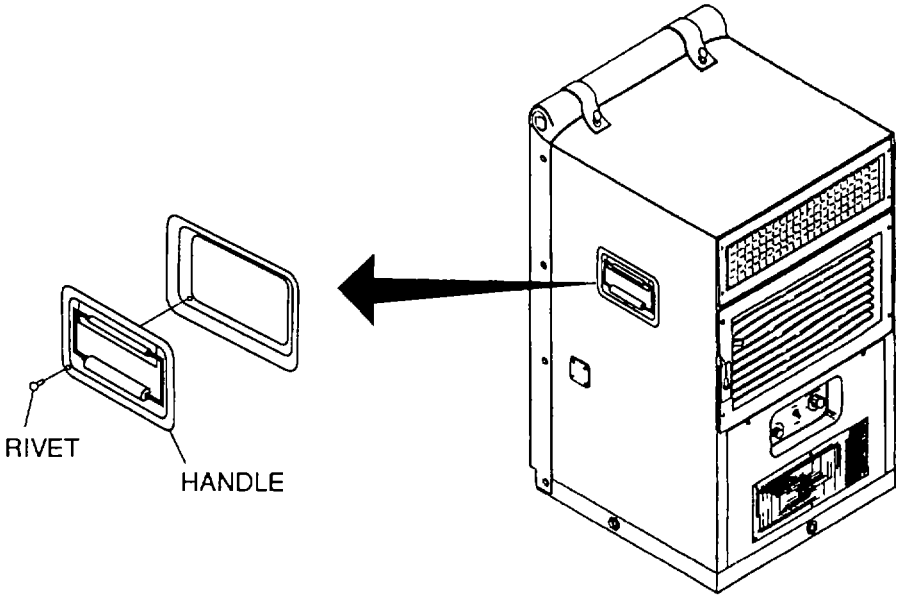


Figure 6-1. Handles

Replacement

(1) Use a drill bit slightly smaller than the rivet body to drill old rivets out.

(2) Remove handle.

(3) Rivet replacement handle in place.

(4) Seal perimeter of handle with sealant.

6-4. BLIND NUTS AND RIVET PLATES

This task covers: a. Replacement

INITIAL SETUP

Tools
Tool Kit, Refrigeration
(Appendix B item 1)
Drill (part of shop maintenance kit)
(Appendix B item 8)
Drill Bit Set (part of shop maintenance kit)
(Appendix B item 8)
Riveter
(Appendix B item 9)

Materials/Parts
Blind Nuts
(As Required)
Rivets
(As Required)

Replacement

a. Blind nuts (rivnuts)

(1) Carefully drill the old blind nut out using a drill slightly smaller than the body of the blind nut.

(2) Install replacement part.

b. Nut plates

(1) Carefully drill the rivets loose using a drill slightly smaller than the body of the rivets securing the nut plate.

(2) Remove the old nut plate.

(3) Install new nut plate with properly sized rivets.

APPENDIX A

REFERENCES

A-1. SCOPE

This Appendix lists all forms, field manuals, technical manuals, and miscellaneous publications referenced in this manual.

A-2. FORMS

Equipment Inspection and MaintenanceWorkSheet	DA Form 2404
Quality Deficiency Report	SF 368
Recommended Changes to DA Publications	DA Form 2028-2
Report of Discrepancy	SF 364

A-3. FIELD MANUALS

Electric Motor and Generator Repair	FM 20-31
First Aid for the Soldier	FM 2111

A-4. MANUALS

Hand Portable Fire Extinguishers Approved for Army Users	TB5-4200-200-10
Leak Detector, Refrigerant Gas	TM 9-4940-435-14&P
Painting Instructions for Field Use	TM 43-0139
Procedures for Destruction of Equipment to Prevent Enemy Use	TM 750-244-3
The Army Maintenance Management System (TAMMS)	DA Pam 738-750
Unit, Direct Support, and General Support Maintenance Repair Parts, and Special Tools List	TM 9-4120-403-24P
Warranty Program for Air Conditioner, 6000 BTU, 13218E9890 Hollingsworth Model JHAA/C6V 1	TB 9-4120-403-24

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 authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with 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, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics 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 equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place, "Replace" is authorized by the MAC and is shown as the third position code of the SMR code.

i. Repair. The application of maintenance services', including fault location/troubleshooting2, removal/installation, and disassembly/assembly3 procedures, and maintenance actions4 to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipments/components.

[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/assembly - encompasses the step-by step taking apart (or breakdown) of 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 or maintenance under consideration.

[4]Actions - welding, grinding, riveting, straightening, facing, remachinery, and/or resurfacing.

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 with the next higher assembly. End item group number shall be "00".

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph B-2.)

d. Column 4, Maintenance Category. 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 that maintenance function at the indicated category 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 task 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 Maintenance

F Direct Support Maintenance

H General Support Maintenance

D Depot Maintenance

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6, Remarks. This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in Section IV.

B-4. EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION III

a. Column 1, Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

b. Column 2, Maintenance Category. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National Stock Number. The National stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number.

B-5. EXPLANATION OF COLUMNS IN SECTION IV

a. Column 1, Reference Code. The code recorded in Column 6, Section II.

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

Section II MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	(5) TOOLS AND EQUIPMENT	(6) REMARKS
00	AIR CONDITIONER 6000 BTU MODEL JHAA/C6V1							
01	Information Plates	Inspect Replace	0.1		1.0		1, 8, 9	
02	HOUSING, COVERS, PANELS, GRILLES, SCREENS							
	Covers (Canvas) & Panels (Covers, Access)	Inspect Repair Replace	0.1	0.1 1.5 0.5			 1 1	 A
	Screens & Guards	Inspect Repair Replace		0.1 0.5 0.3			 1 1	
	Grilles (Louvers)	Inspect Repair Replace		0.1 0.5 0.2			 1 1	 B
03	AIR CIRCULATING & CONDENSATE DRAIN SYSTEM							
	Fresh Air Damper	Inspect Repair Replace	0.1	0.2	0.1 0.7 4.0		 1, 8, 9 1, 8, 9	
	Condensate Traps & Drain Hose	Inspect Repair Replace		0.1 1.0 0.8			 1 1	

Section II MAINTENANCE ALLOCATION CHART

(1)	(2)	(3)	(4) MAINTENANCE LEVEL				(5)	(6)
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	TOOLS AND EQUIPMENT	REMARKS
04	ELECTRICAL							
	Control Panel	Inspect	0.1					
		Test	1.0					
		Repair		1.0			1	
		Replace		0.8			1	
	Control Panel Wiring Harness	Inspect		0.2				
		Test		0.5				
		Repair		1.0			1	
		Replace		1.0			1	
	Junction Box Assy	Inspect	0.5					
		Test		3.0				
		Repair		3.0			1, 2	
		Replace		2.0			1	
	Junction Box Harness	Inspect		0.5				
		Test		0.6				
		Repair		2.0			1	
		Replace		2.5			1	
	Thermostat	Inspect		0.5				
		Test		0.5			5	
		Replace		2.0			1, 3, 4	
	Wiring Harness	Inspect		0.5				
		Test		0.8				
		Replace		1.5			1, 6	
	Capacitors and Relays	Inspect		0.5				
		Test		0.8				
		Replace		1.5			1	
		Replace			2.0		1, 10	C
05	EVAPORATOR-CONDENSER FAN, MOTOR & HEATERS							
	Fans & Housing	Inspect		0.5				
		Replace		0.5			1, 3, 4	

Section II MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	(5) TOOLS AND EQUIPMENT	(6) REMARKS
05	Motor (cont)	Inspect		0.2				
		Test		0.3				
		Repair			2.0		1, 6	
		Replace		4.0			1	
	Heater Elements/Support	Inspect		0.5				
		Service		0.5				
		Test		1.0				
		Replace		2.0			1	
06	REFRIGERA-TION SYSTEM							
	Evaporator/ Condenser Coils	Inspect		0.5				
		Service		0.5			7	
		Replace			6.0		1, 8, 9, 10, 11, 13	E
	Compressor	Inspect			0.5			
		Test			1.0			
		Repair			5.0		1	
		Replace			12.0		1, 10, 11, 13	E
	Receiver, Dehydrator, and Tubing	Inspect			0.5			
		Test			1.0			
		Replace			8.0		1, 10, 11, 13	E
07	FRAME ASSEMBLY							
	Frame	Inspect			0.5			
		Repair			4.0		1	
		Replace				24.0	1, 8, 9	D

APPENDIX B

Section III TOOL AND TEST EQUIPMENT REQUIREMENTS MAINTENANCE ALLOCATION CHART

(1) Tool or Test Equip. Ref Code	(2) Maintenance Category	(3) Nomenclature	(4) National NATO stock number	(5) Tool number
		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)	5180-00-596-1474 SC 5180-	(19099) 90-CL-N18
2	O	Heat Gun	4940-01-042-4855	(16327) 2Z045B
3	O	Torque Wrench, 1/4" Drive	5120-00-900-1283	(58536) A-A-1274
4	O	Socket Wrench Attachment, 1/8"	5120-00-596-0934	(81348) GGG-W-641
5	O-F	Thermometer		
6	O-F	Solder Gun Kit	3439-00-930-1638	(11103) 450K4
7	O	Fin Straightener	5120-00-157-2180	(17529) P12
8	F	Shop Equipment, Automotive Maintenance and Repair, Field Maintenance, Basic, Less Power	4910-00-754-0705	(19204) SC4910-95CLA31

APPENDIX B

Section III TOOL AND TEST EQUIPMENT REQUIREMENTS MAINTENANCE ALLOCATION CHART

(1) Tool or Test Equip. Ref Code	(2) Maintenance Category	(3) Nomenclature	(4) National NATO stock number	(5) Tool number
9	F	Riveter, Blind, Hand	5120-00-017-2849	(10054) 200
10	F	Nitrogen Regulator	6680-00-503-1327	
11	F	Pump, Vacuum	4310-00-098-5272	(64484) 1400B
12	F	Power Supply, 28 Volt	6130-01-143-5967	(82918) 31-4392-501
13	F-H	Recovery/Recycling Unit, refrigerant	4130-01-338-2707	(07295) 17500B

Section IV. REMARKS MAINTENANCE ALLOCATION CHART

REFERENCE CODE	REMARKS
A	Replace gasket and insulation only
B	Replace gasket only
C	K7 relay only
D	Replace blind nuts, plate nuts, and lifting handles only
E	Operation of the Recovery/Recycling unit must be by AUTHORIZED PERSONNEL 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 II. Active time listed for maintenance task functions are with the air conditioner in off-equipment position.

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS 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 section:

a. Section II. Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the air conditioner in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, 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 TOE/MTOE authorization of the end item.

C-3. EXPLANATION OF COLUMNS

The following provides an explanation of columns found in the tabular listing:

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 and will be used for requisitioning purposes.

c. Column (3) - Description. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the CAGEC (in parentheses) followed by the part number.

d. Column (4) - Unit of Measure (U/M). Indicates the measure used in performing the actual operation/ 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 ITEMS

(1) Illus Number	(2) National Stock number	(3) Description CAGEC and Part no.	Usable On Code	(4) U/M	(5) Qty Rqr
		No COEI Items			

Section III BASIC ISSUE ITEMS

(1) Illus Number	(2) National Stock number	(3) Description CAGEC and Part no.	Usable On Code	(4) U/M	(5) Qty Rqr
		Department of Army Technical Manual Operator's, Unit, Direct Support and General Support Maintenance Manual, TM9-4120-403-14		EA	1
		Department of Army Technical Manual Unit, Direct Support, and General Support Maintenance Repair Parts and Special Tools List, TM9-4120-403-24P		EA	1

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

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 all authorized to you by CTA, MTOE, TDA, or JTA.

D-3. EXPLANATION OF LISTING

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (i.e., CTA, MTOE, TDA, or JTA) which authorized the item(s) to you.

SECTION II. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION CAGEC AND PART NUMBER	USABLE ON CODE	(3) U/M	(4) QTY AUTH
7520-00-559-9618	Cotton Duct Case (81349) MIL-C-11743		EA	1

APPENDIX E

EXPENDABLE SUPPLIES AND MATERIALS 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 CTA50-970. 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 listing, (e.g., "Use silicone adhesive sealant, item 1, Appendix "E").

b. Column (2) - level. This column identifies the lowest level of maintenance that requires the listed item.

C-Operator/Crew F-Direct Support Maintenance

O-Unit 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 Commercial and Government Entity Code (CAGEC) in parentheses followed by the part number.

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-F	7920-00-205-1711	Rags DDD-R-30 (81348)	ea
2	O	7930-00-764-5066	Detergent, Liquid P-D-410, type II (80224)	qt
3	O	6520-01-169-0257	Lubricant, Silicone Type 6165Y0001 (17925)	cn
4	O	5310-00-821-2366	Washer, Rain Seal 13214E3469 (97403)	ea
5	O-F	8415-00-082-6108	Apron, General Purpose MIL-A-41829 (81349)	ea
6	O-F	4240-00-022-2524	Respirator, Air Filtering GGG-M-125/6 (81348)	ea
7	O-F	4240-00-816-3819	Goggles, Industrial A-A-1110 (58536)	ea
8	O-F	8415-00-641-4601	Gloves, Thermal Protective ZZ-G-381 (81348)	ea
9	O-F	6810-00-411-4192	Toluene ASTM D841	qt
10	O-F	3040-00-664-0439	Adhesive, General Purpose MMM-A-1617 (81348)	pt
11	O	5310-00-045-3299	Washer, Lock MS35338-42 (96906)	ea
12	O-F	5310-00-088-0551	Nut, Self-Locking, Hex MS21044N04 (96906)	ea
13	O	5330-01-082-5474	Seal, Special 13220E5281 (97403)	ea
14	O	9150-00-265-7301	Lubricating Oil VV-L-825, type IV	qt

Section II EXPENDABLE SUPPLIES AND MATERIALS LIST (Cont)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
15	O-F	8040-00-926-9133	Silicone Adhesive Sealant RTV General Purpose MIL-A-46106, Type I (81349)	tu
16	O	5310-00-889-2549	Nut, Self-Locking, Hex MS21045-08 (96906)	ea
17	O	5310-00-045-3296	Washer, Lock MS35338-43 (96906)	ea
18	O	5310-01-311-4612	Nut, Self-Locking, Hex MS21044N03 (96906)	ea
19	O	5310-00-596-7691	Washer, Lock MS35335-32 (96906)	ea
20	O	5310-00-579-0079	Washer, Lock MS35333-37 (96906)	ea
21	O-F	3439-00-974-1873	Solder, Lead-Tin, QQ-S-571 Type SN60WRAP2 (81348)	rl
22	O-F	3439-01-045-7940	Flux, Soldering, Liquid Rosin Base, MIL-F-14256 (81349)	qt
23	O		Tubing, Heat-Shrink	ft
24	O-F	5310-00-081-8087	Nut, Self-Locking, Hex MS21044N06 (96906)	ea
25	O	5310-00-060-2039	Nut, Self-Locking, Hex MS21044D08 (96906)	ea
26	O-F		Thermal Mastic PM21 (8J132)	gl
27	O-F	7510-00-040-5895	Tape, Pressure- Sensitive MIL-T-22085 (81349)	rl
28	O	8020-00-297-6657	Brush, Paint H-B-491 (81348)	ea

Section II EXPENDABLE SUPPLIES AND MATERIALS LIST (Cont)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
29	O	5310-00-935-9021	Nut, Self-Locking, Hex MS51943-35 (96906)	ea
30	O	5310-00-407-9566	Washer, Lock MS35338-45 (96906)	ea
31	O	5310-00-877-5798	Nut, Self-Locking, Hex MS21044D3 (96906)	ea
32	F	5320-00-932-1972	Rivet, Blind AD42H (07707)	ea
33	F	5320-00-296-3092	Rivet, Solid MS20426AD4-5-5 (96906)	ea
34	F	5320-00-874-4471	Rivet, Blind AD45H (07707)	ea
35	F	5320-00-882-8388	Rivet, Blind AD43H (07707)	ea
36	F	5320-00-956-7362	Rivet, Blind AD62H (07707)	ea
37	F	6830-00-292-0732	Nitrogen BBN411 (81348)	cy
38	F	3439-00-224-3573	Brazing Alloy, Silver QQ-B-654, grade I or II (81348)	cn
39	F	3439-00-640-3713	Flux, Brazing 0-F-499, type B (81348)	cn
			NOTE Whenever available, use recycled refrigerant for charging the refrigeration system.	
40	F	6850-00-837-9927	Monochlorodifluoromethane, Technical: w/cylinder 22 lb. (Refrigerant-22) BB-F-1421, type 22 (81348)	cy
41	F	4130-00-081-5399	Dehydrator EK-052 (70255)	ea
42	F	9150-00-186-6668	Oil MIL-L-2104 GR20 (81349)	qt
43	F	8415-01-155-4661	Work Gloves	pr

Section II EXPENDABLE SUPPLIES AND MATERIALS LIST (Cont)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
44	F	9150r01-064-2666	Oil, Refrigerant Zerol 150 (99252)	qt
45	F	5310-00-004-5033	Washer, Lock MS35338-46 (96906)	ea
46	F	5640-00-237-4829	Insulation Tubing MIL-P-15280 .51 ID (81349)	ft
47	F	9320-01-010-3240	Insulation Tape PT-1 (58727)	rl
48	F	5310-00-045-4007	Washer, Lock MS35338-46 (96906)	ea
49	F	5975-00-451-5001	Strap, Tiedown MS3367-3-9 (96906)	ea
50	F	5310-00-263-2862	Nut, Self-Locking, Hex MS21045C3 (96906)	ea
51	F	5310-00-582-5965	Washer, Lock MS35338-44 (96906)	ea
52	F		Flare Gasket SAE010113	ea
53	F	6830-00-872-5120	Trichloromonofluoromethane Technical: w/cylinder 501b. (Refrigerant- 11) BB-F- 1421 type 11 (81348)	cy
54	F	5970-00-102-4721	Insulation Sleeving M23053/4-104-0 (81349)	ft
55	F	5940-01-079-1375	Splice Connector M7928/3-3 (81349)	ea
56	F		Joint Sealer MS39503 (96906)	tu
57	F	5330-00-119-7503	Packing, Preformed NAS1523C3F (80205)	ea
58	F	5350-00-192-5047	Abrasive cloth P-C-451 (81348)	pg

APPENDIX F

ILLUSTRATED LIST OF MANUFACTURED ITEMS

Section I INTRODUCTION

F-1. SCOPE

This appendix includes complete instructions for making items authorized to be manufactured or fabricated at unit maintenance level.

F-2. GENERAL

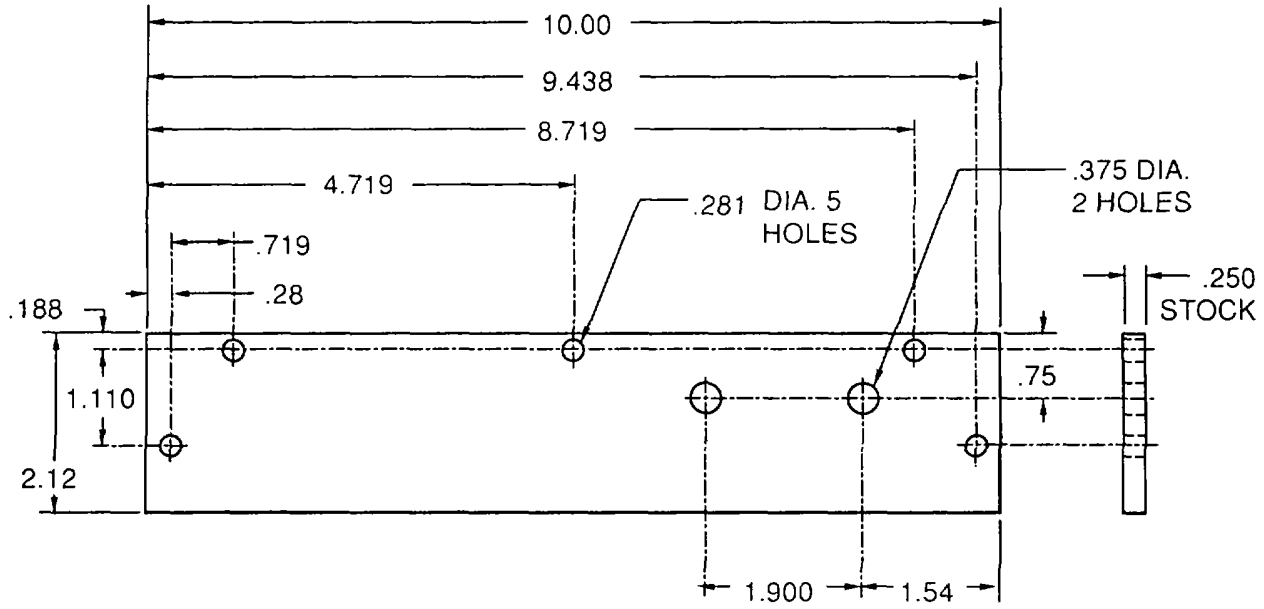
a. A part number index in alphanumeric order is provided for cross-referencing the part number of the item to be manufactured to the figure which covers fabrication criteria.

b. All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular list on the illustration.

Section II MANUFACTURED ITEMS PART NUMBER INDEX

Part Number	Figure Number	Part Number	Figure Number
13211E8255	36	13216E9519-2	35
13214E3384/10	7	13218E6977/2	2
13214E3384/11	11	13218E7076/4	3
13214E3384/12	9	13218E9890/219	44
13214E3384/13	10	13218E9890/220	34
13214E3384/4	6	13218E9890/221	46
13214E3384/6	4	13218E9890/222	47
13214E3384/7	5	13218E9890/223	39
13214E3384/9	8	13218E9890/224	48
13214E3404/6	32	13218E9890/225	41
13214E3404/8	31	13218E9890/226	40
13214E3412/2	28	13218E9890/227	45
13214E3412/3	29	13218E9890/228	49
13214E3477/2	19	13218E9890/241	43
13214E3477/3	18	13218E9890/256	33
13214E3477/4	17	13218E9914/9	30
13214E3477/5	20	13220E6562/11	16
13214E3478/2	22	13220E6562/12	12
13214E3478/3	24	13220E6562/2	14
13214E3478/4	23	13220E6562/3	15
13214E3478/5	21	13220E6562/9	13
13214E3551/2	1	13220E6695-15	37
13214E3726	26	13220E6695-16	38
13214E3762	25	4944-142	42
13214E3814	27		

Section III. MANUFACTURED ITEMS ILLUSTRATIONS

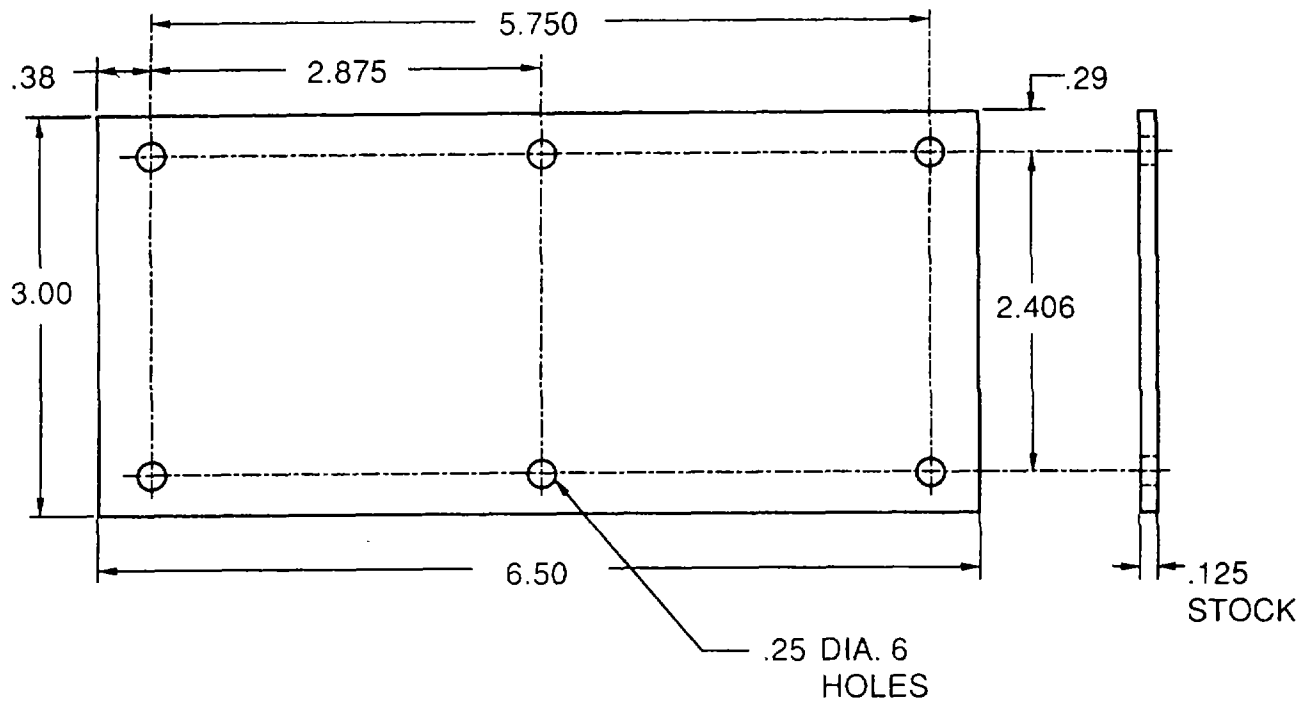


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.06 INCH FOR TWO PLACE DECIMALS AND± 0.03 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-1. Gasket, 13214E3551/2

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

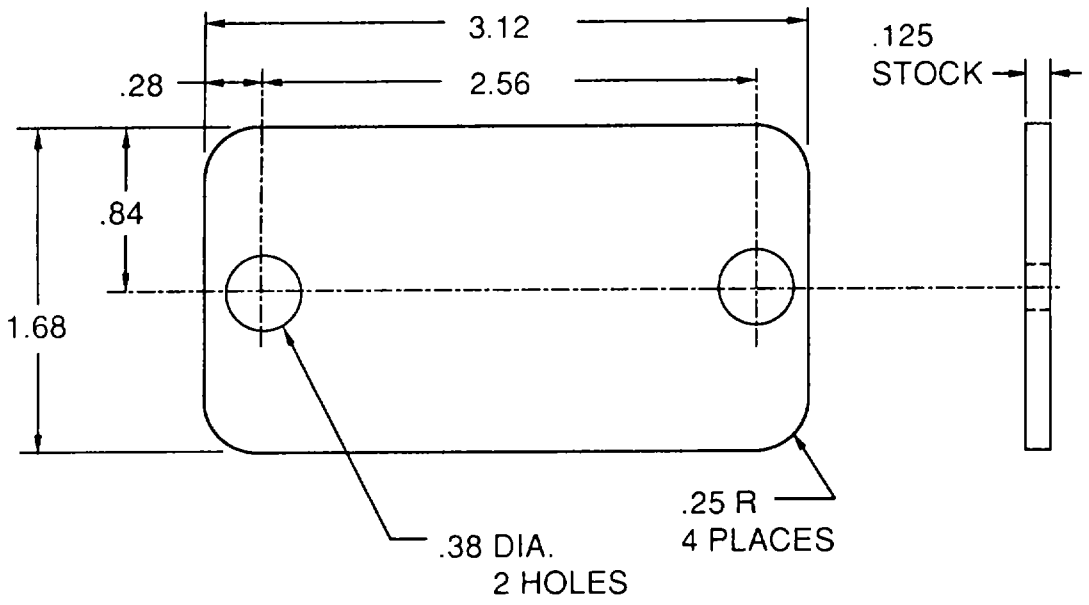


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.06 INCH FOR TWO PLACE DECIMALS AND± 0.03 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-2. Gasket, 13218E6977/2

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

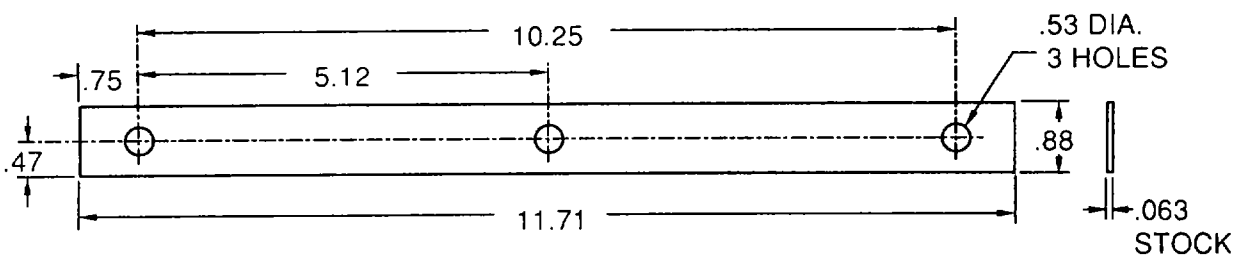


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR 2 PLACE DECIMALS AND ± 0.005 INCH FOR 3 PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-3. Gasket, 13218E7076/4

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

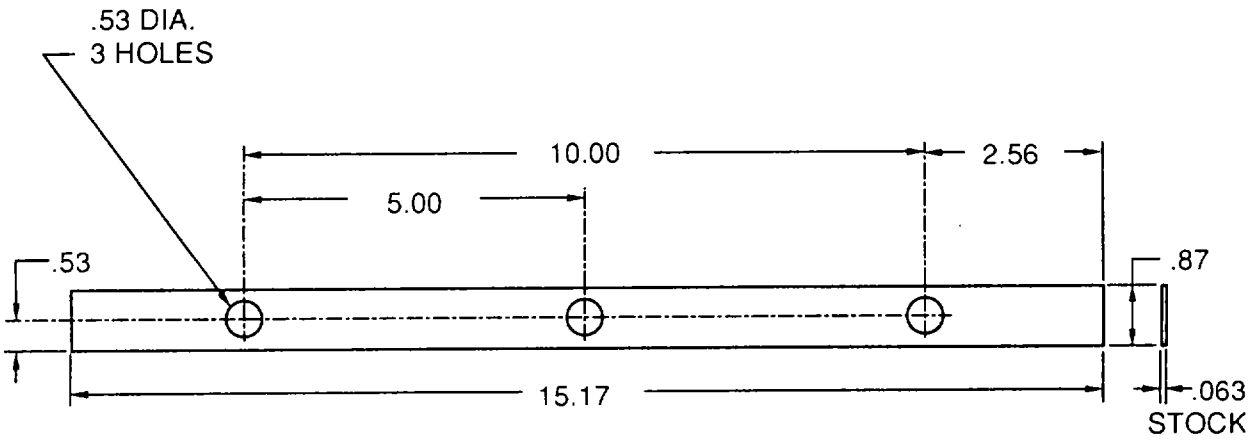


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER 2B3C1F2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-4. Gasket, 13214E3384/6

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

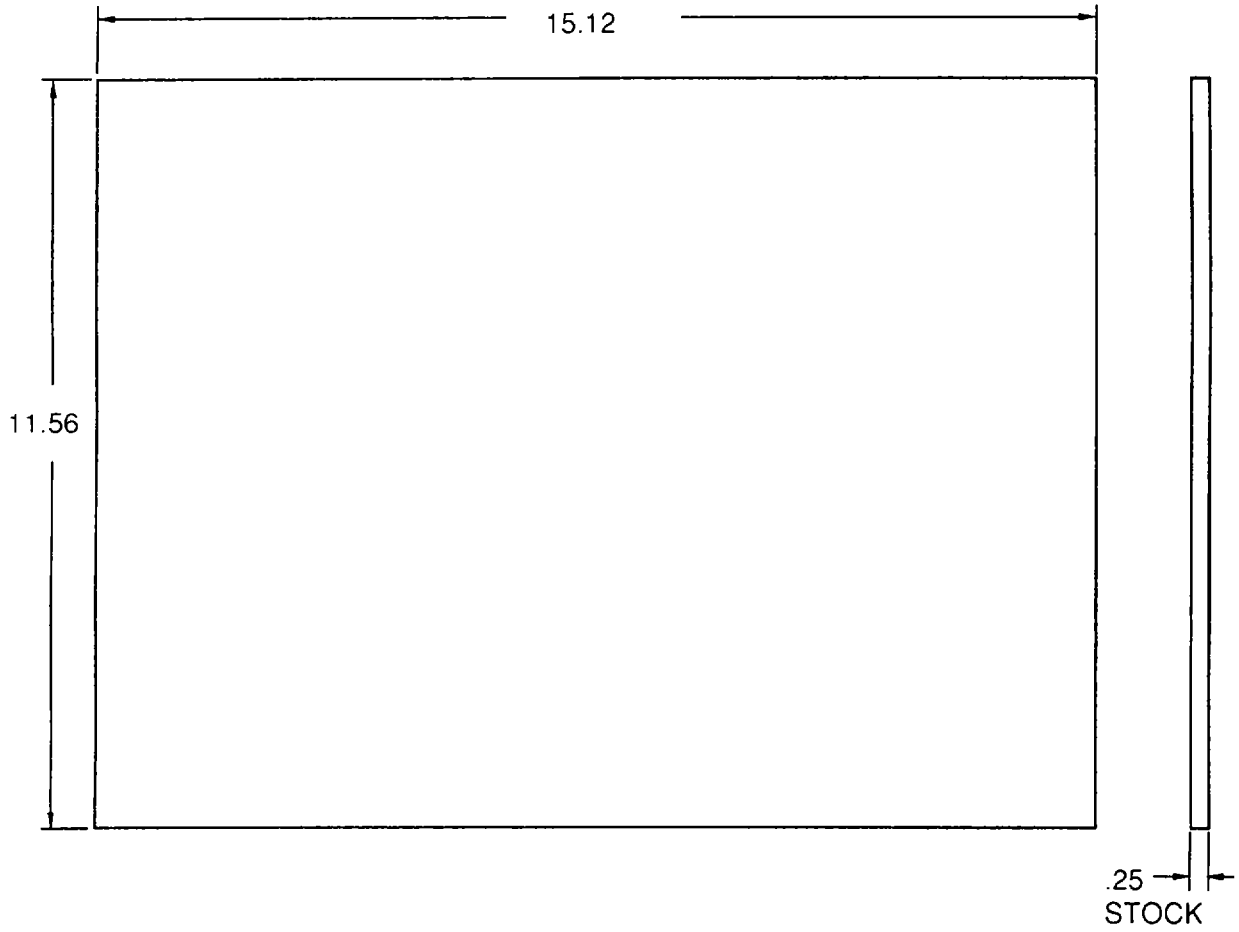


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER 2B3C1F2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-5. Gasket, 13214E3384/7

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

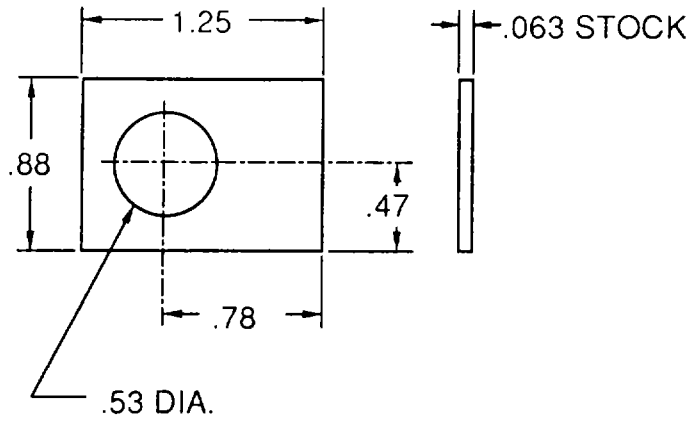


NOTES:

1. MATERIAL: PLASTIC PER MIL-I-14511.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH UNLESS OTHERWISE STATED.

Figure F-6. Insulation, 13214E3384/4

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

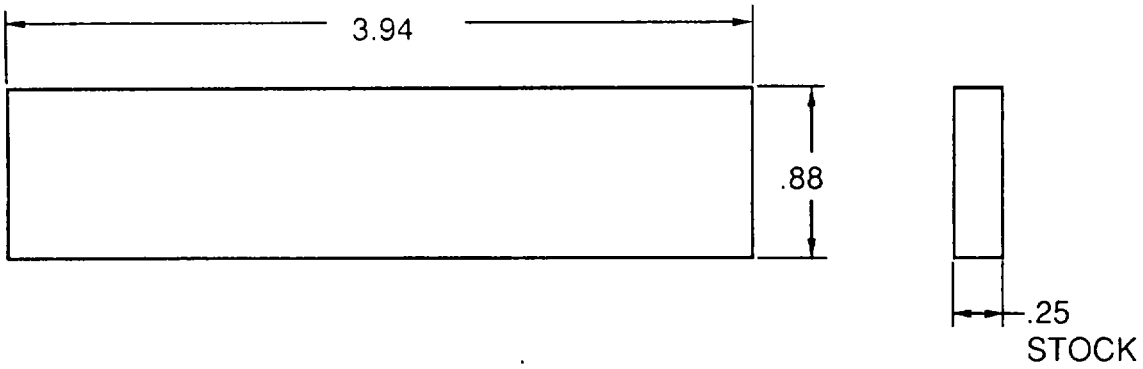


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-7. Gasket, 13214E3384/10

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

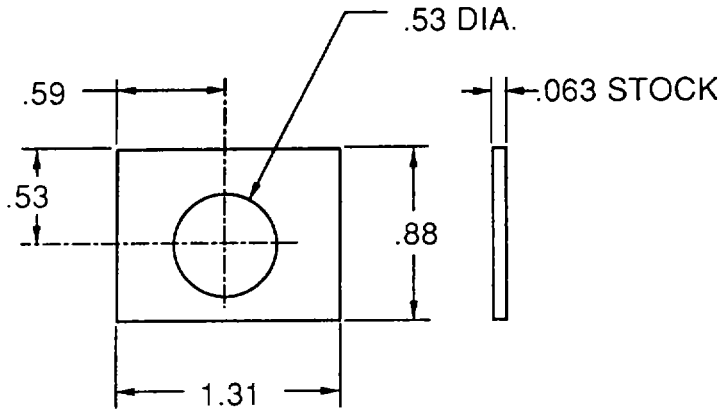


NOTES:

1. MATERIAL: PLASTIC PER MIL-I-14511.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH UNLESS OTHERWISE STATED.

Figure F-8. Insulation, 13214E3384/9

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

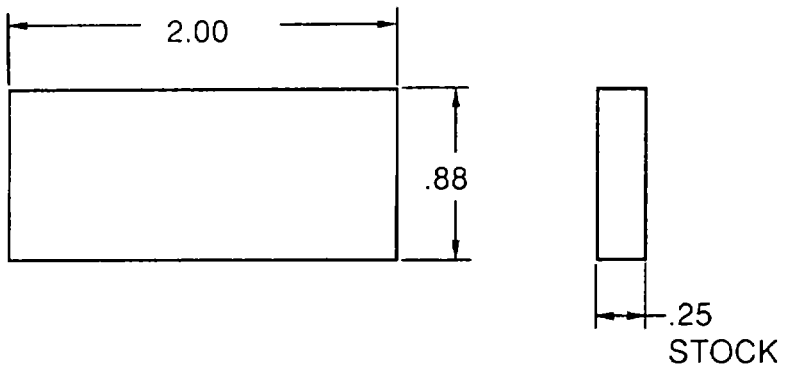


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER 2B3C1F2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-9. Gasket, 13214E3384/12

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

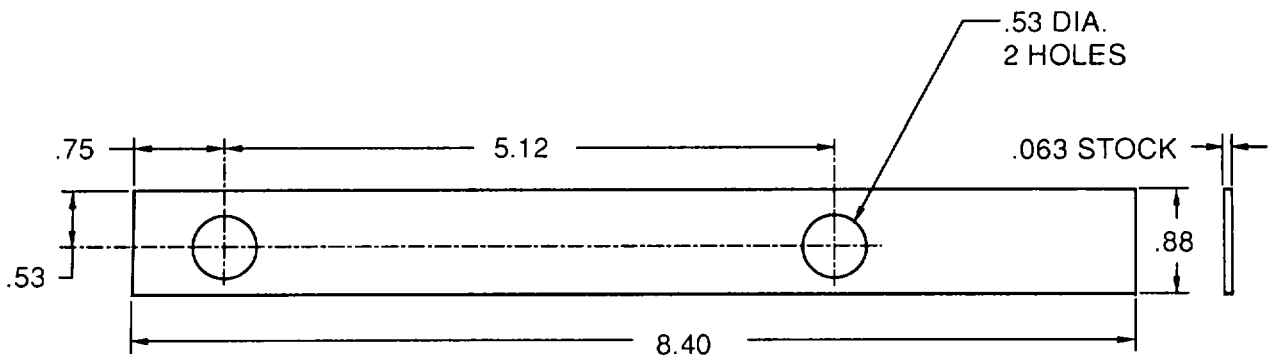


NOTES:

1. MATERIAL: PLASTIC PER MIL-I-14511.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH UNLESS OTHERWISE STATED.

Figure F-10. Insulation, 13214E3384/13

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

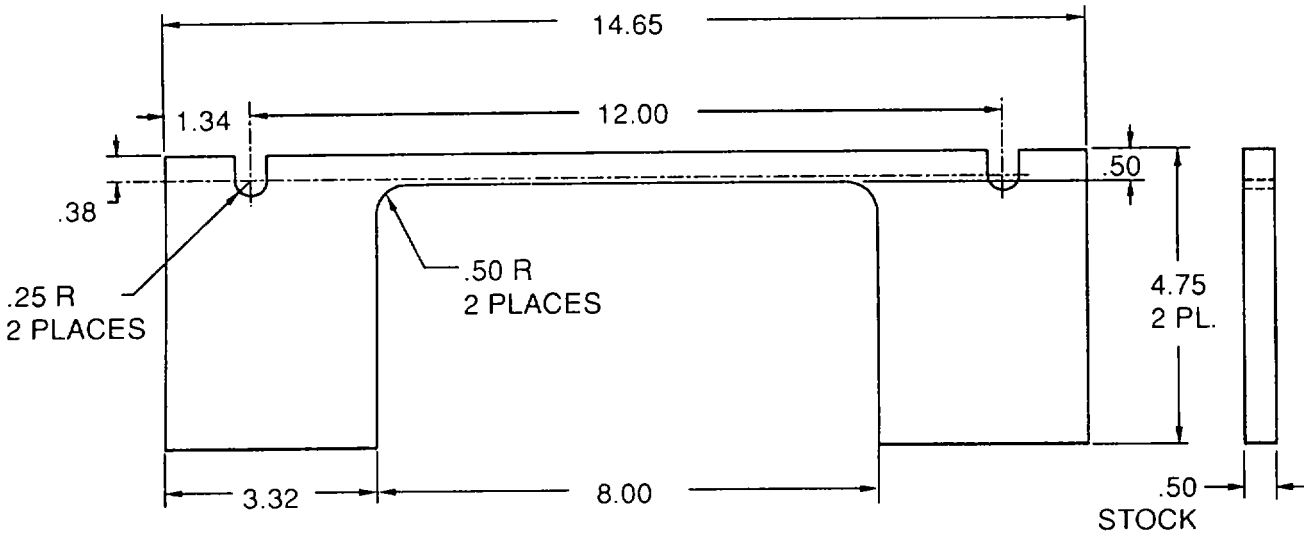


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER 2B3C1F2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-11. Gasket, 13214E3384/11

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

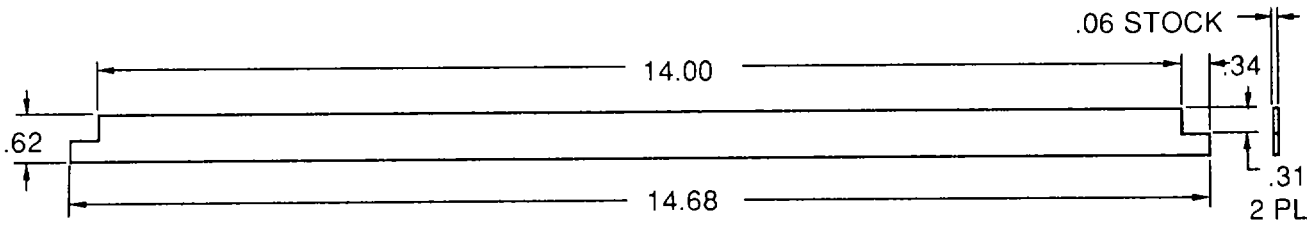


NOTES:

1. MATERIAL: PLASTIC PER MIL-I-14511.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH UNLESS OTHERWISE STATED.

Figure F-12. Insulation, 13220E6562/12

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

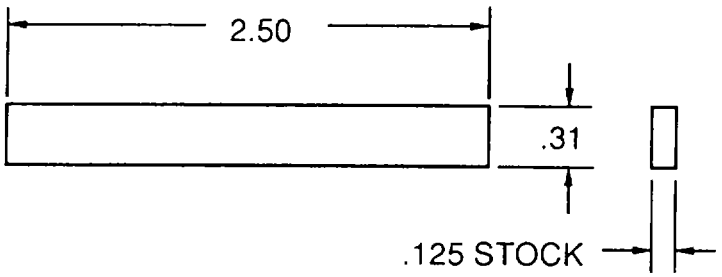


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-13. Gasket, 13220E6562/9

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

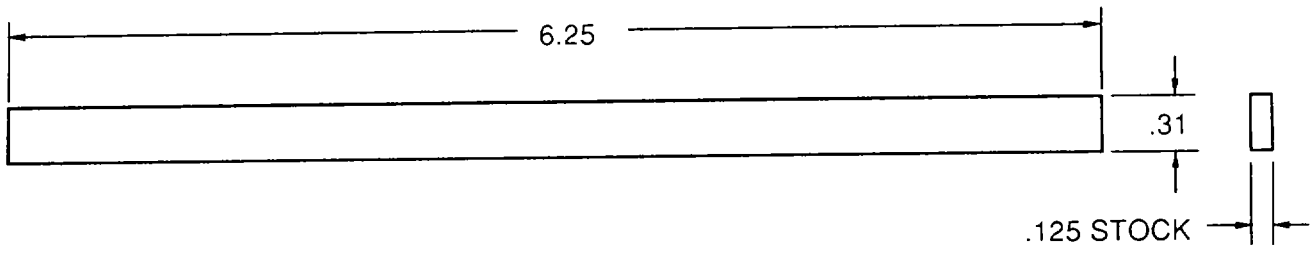


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-14. Gasket, 13220E6562/2

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

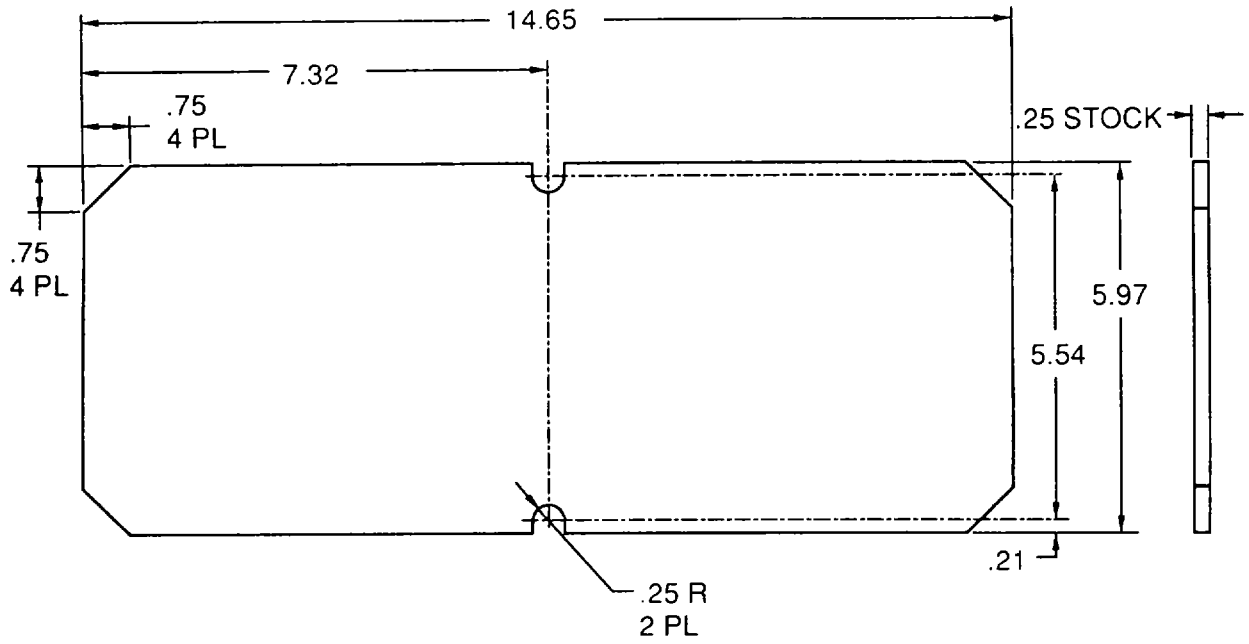


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-15. Gasket, 13220E6562/3

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

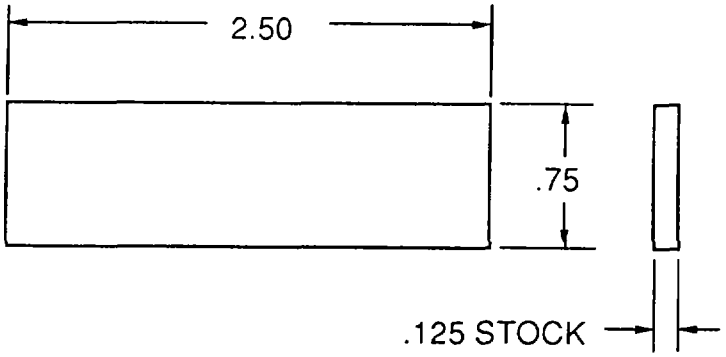


NOTES:

1. MATERIAL: PLASTIC PER MIL-I-14511.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH UNLESS OTHERWISE STATED.

Figure F-16. Insulation, 13220E6562/11

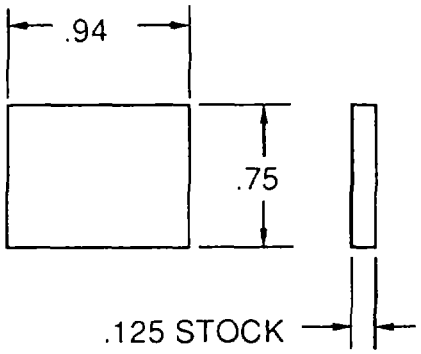
Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)



NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-17. Gasket, 13214E3477/4

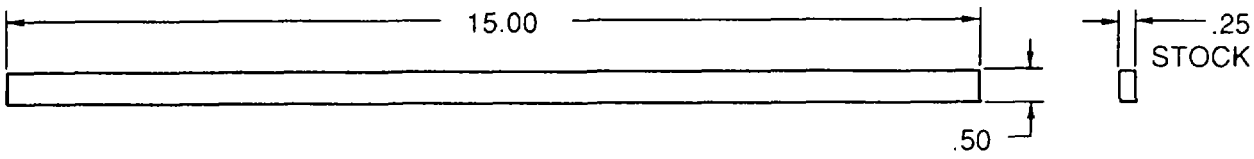


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-18. Gasket, 13214E3477/3

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

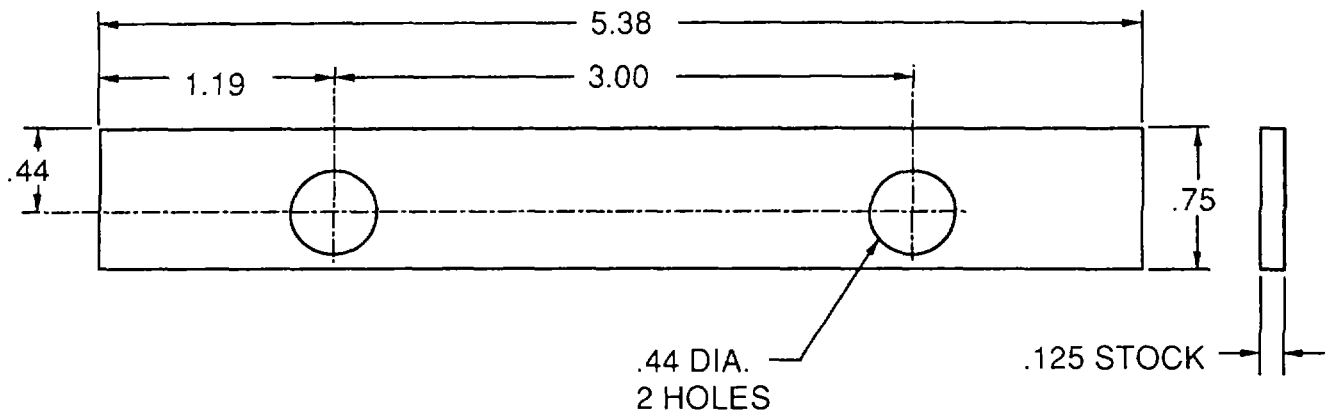


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH UNLESS OTHERWISE STATED.

Figure F-19. Gasket, 13214E3477/2

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

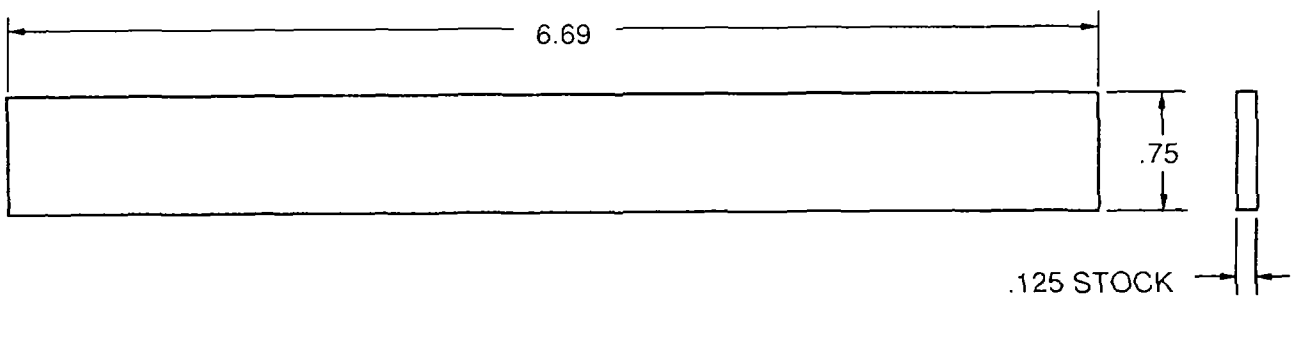


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-20. Gasket, 13214E3477/5

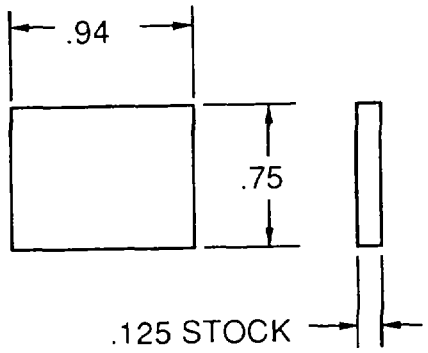
Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)



NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-21. Gasket, 13214E3478/5

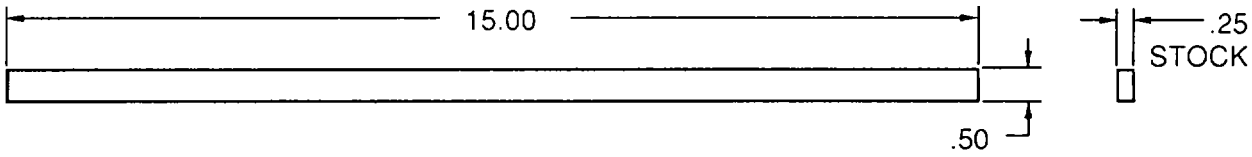


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-22. Gasket, 13214E3478/2

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

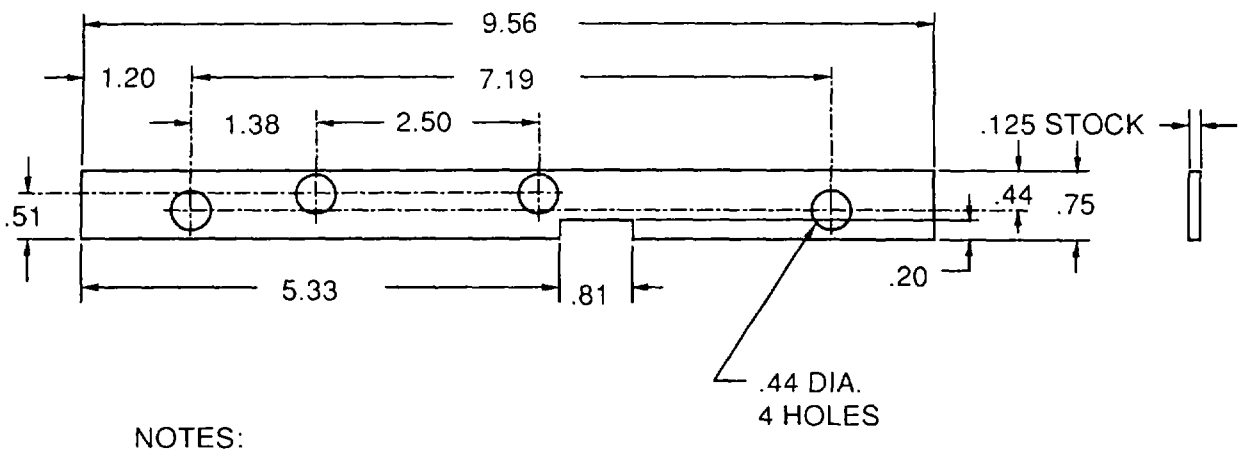


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH UNLESS OTHERWISE STATED.

Figure F-23. Gasket, 13214E3478/4

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

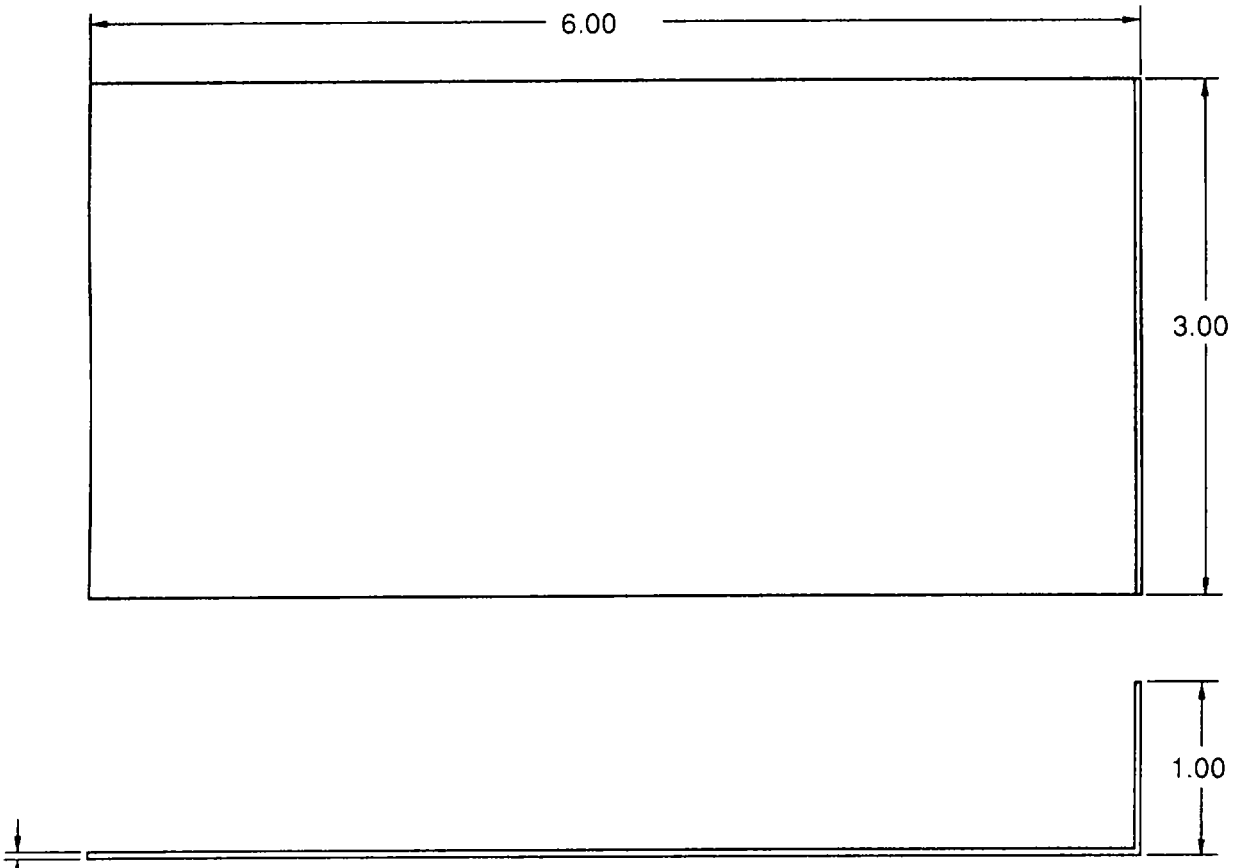


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-24. Gasket, 13214E3478/3

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

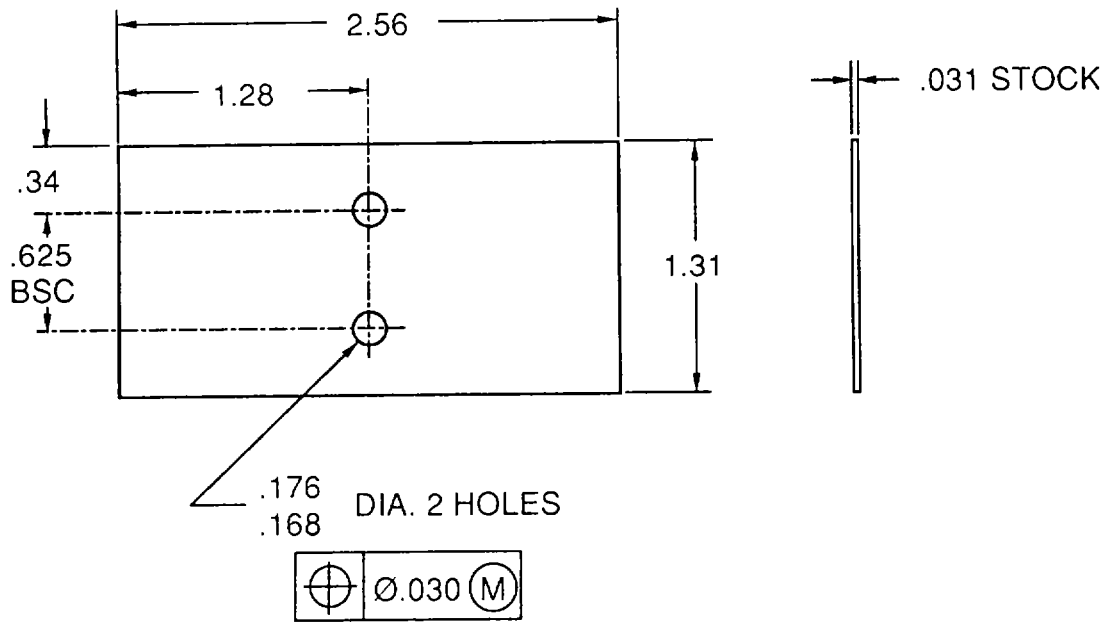


NOTES:

1. MATERIAL: ELECTRICAL INSULATION PAPER PER MIL-I-695, TYPE FP, FORM S.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.06 INCH UNLESS OTHERWISE STATED.

Figure F-25. Insulation, 13214E3762

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

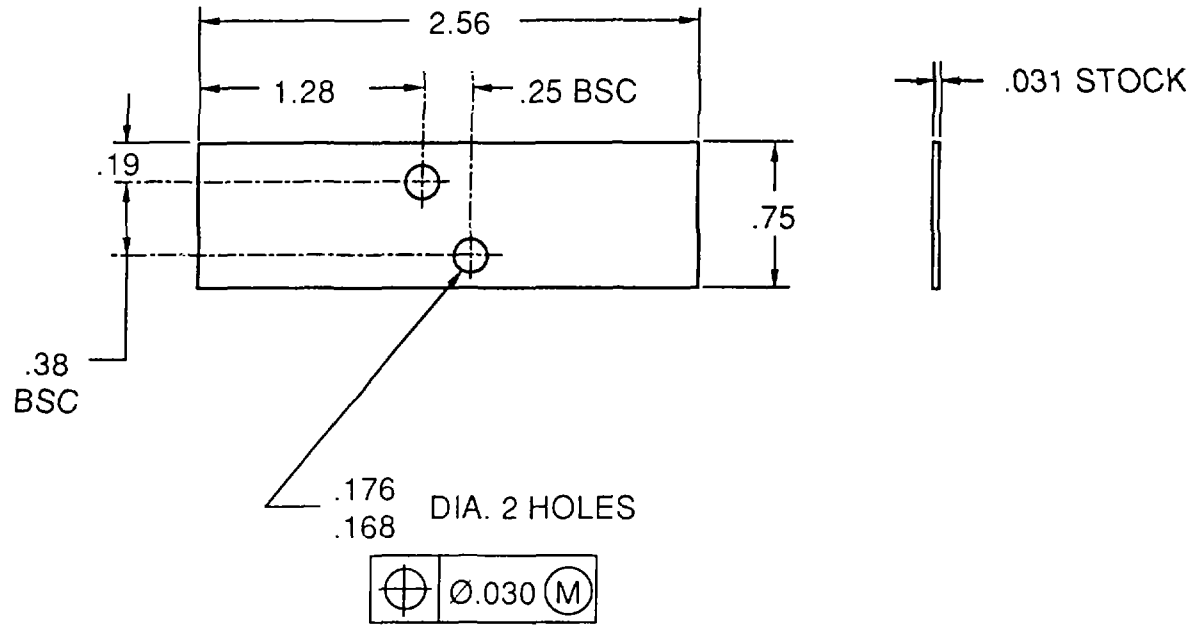


NOTES:

1. MATERIAL: ELECTRICAL INSULATION PER ASTM-D-710, COLOR: GRAY.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.06 INCH UNLESS OTHERWISE STATED.

Figure F-26. Insulation, 13214E3726

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

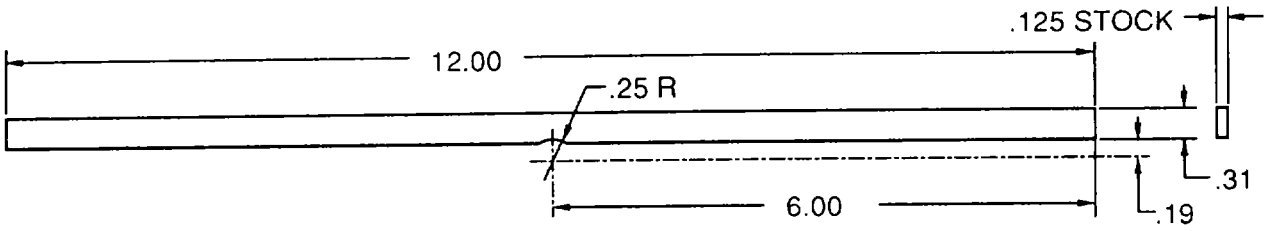


NOTES:

1. MATERIAL: ELECTRICAL INSULATION PER ASTM-D-710, COLOR: GRAY.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH UNLESS OTHERWISE STATED.

Figure F-27. Insulation, 13214E3814

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

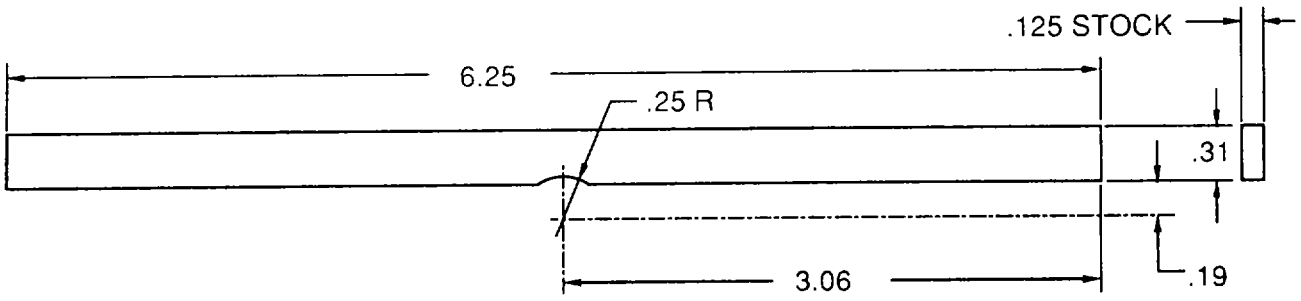


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-28. Gasket, 13214E3412/2

Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)

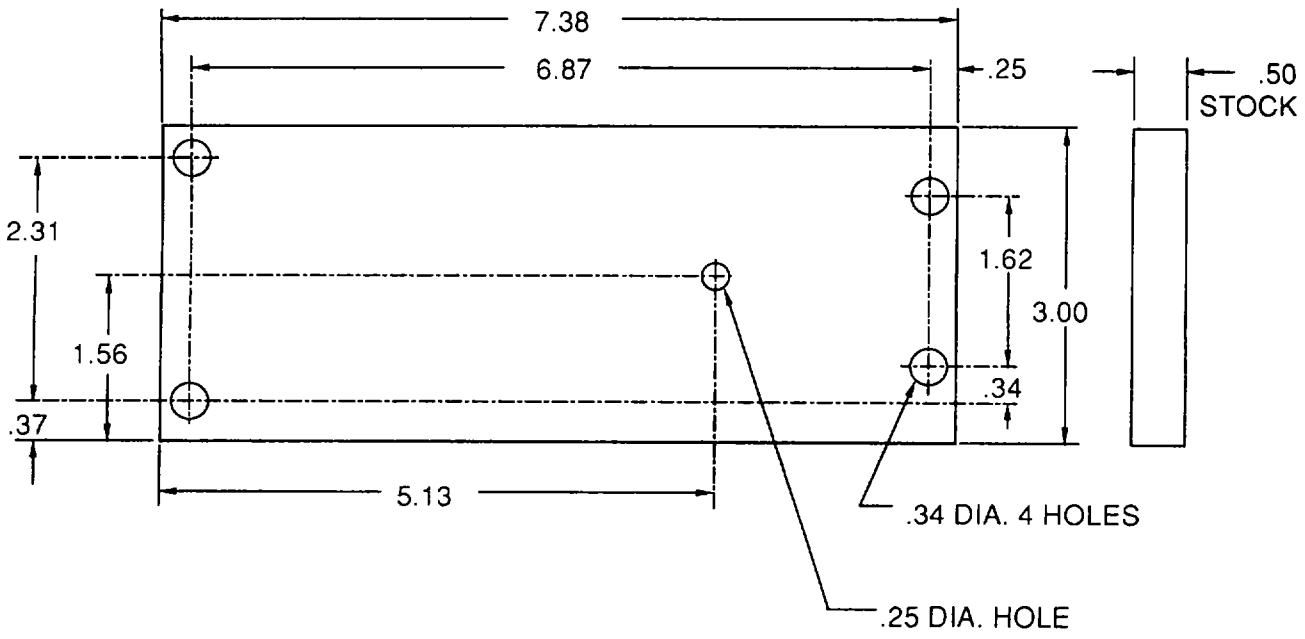


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-29. Gasket, 13214E3412/3

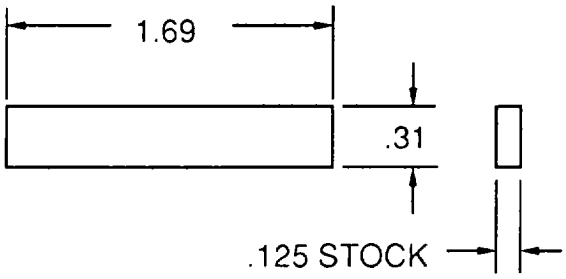
Section III. MANUFACTURED ITEMS ILLUSTRATIONS (cont)



NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-30. Gasket, 13218E9914/9

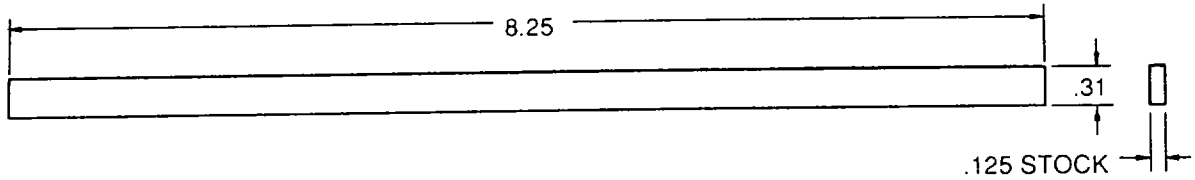


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-31. Gasket, 13214E3404/8

Section III MANUFACTURED ITEMS ILLUSTRATIONS (cont)

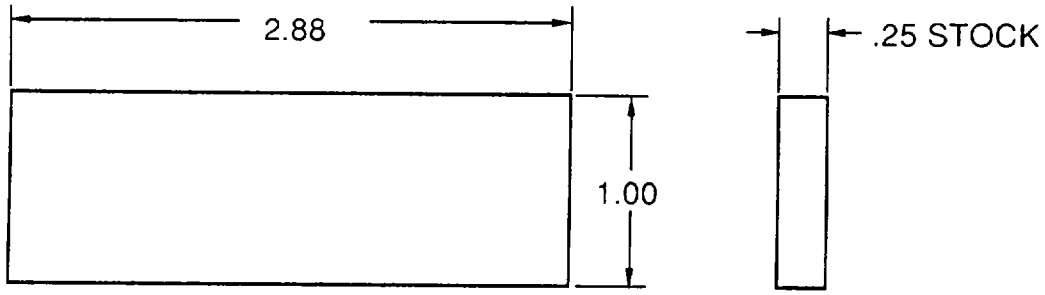


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-32. Gasket, 13214E3404/6

Section III MANUFACTURED ITEMS ILLUSTRATIONS (cont)

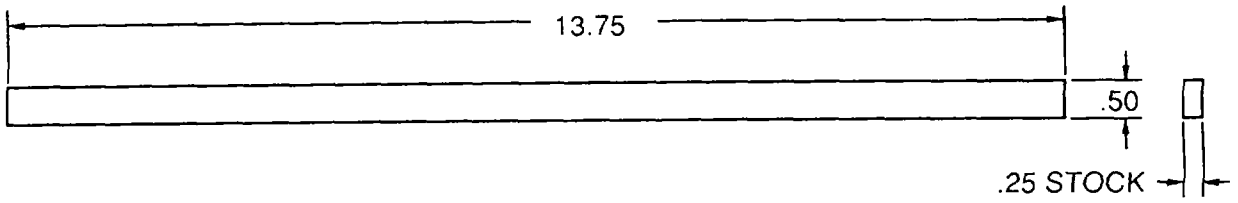


NOTES:

1. MATERIAL: PLASTIC PER MIL-I-14511.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.06 INCH UNLESS OTHERWISE STATED.

Figure F-33. Insulation, 13218E9890/256

Section III MANUFACTURED ITEMS ILLUSTRATIONS (cont)

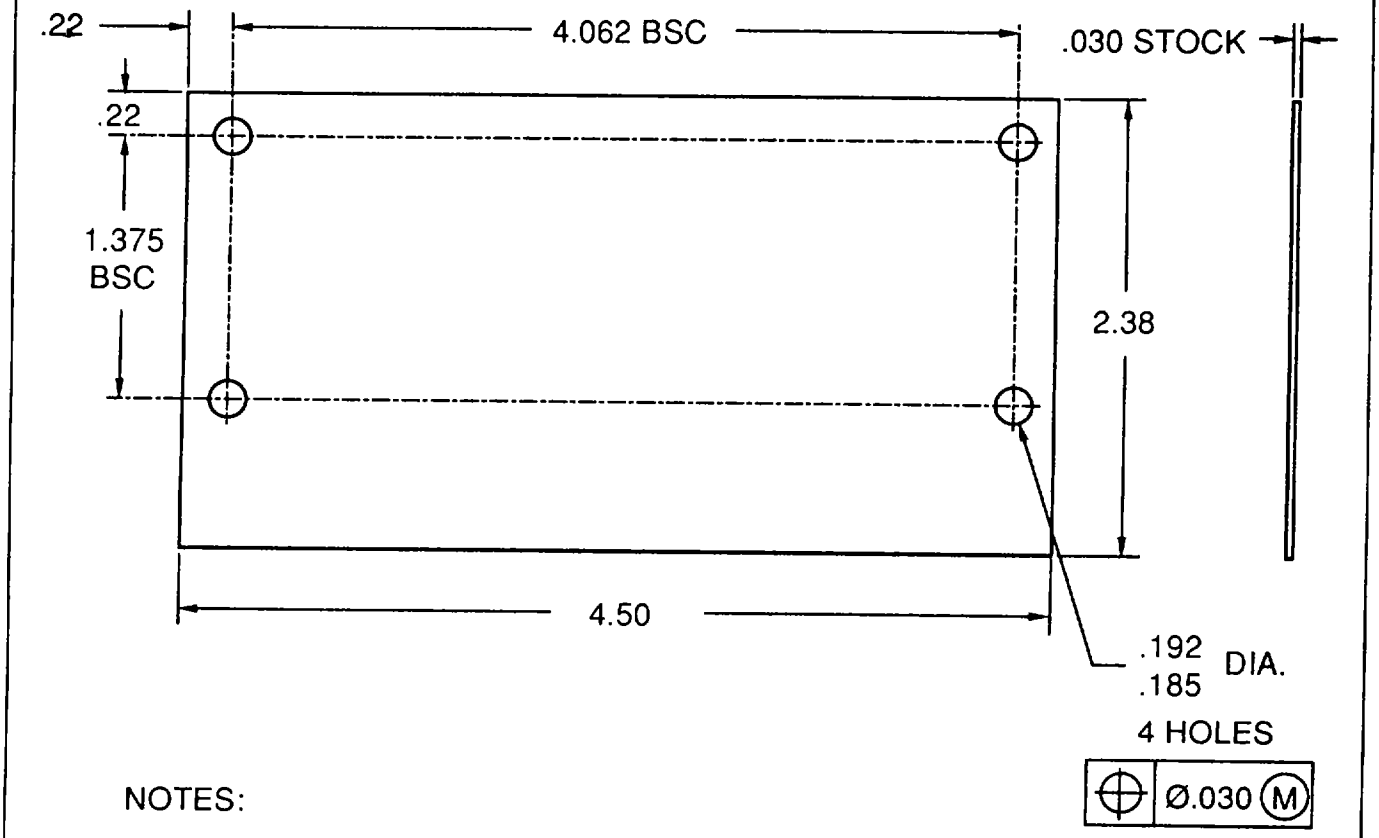


NOTES:

1. MATERIAL: PLASTIC PER MIL-I-14511.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.06 INCH UNLESS OTHERWISE STATED.

Figure F-34. Insulation, 13218E9890/220

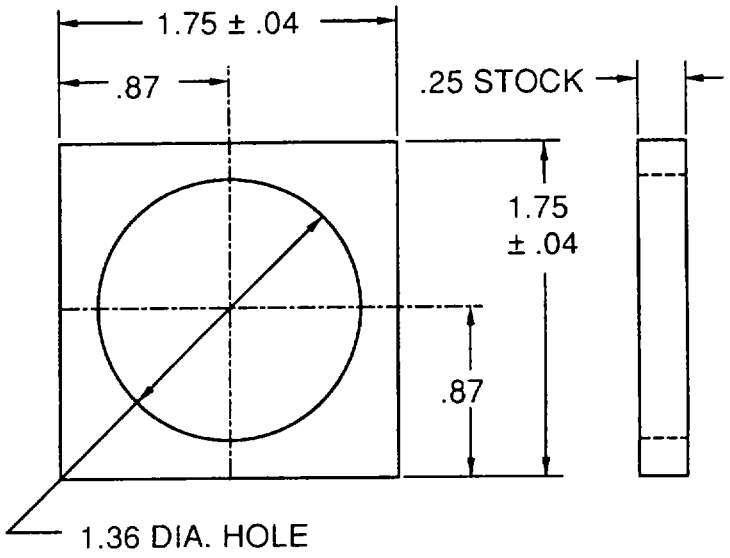
Section III MANUFACTURED ITEMS ILLUSTRATION (CONT)



NOTES:

1. MATERIAL: RUBBER PER MIL-R-900.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH UNLESS OTHERWISE STATED.

Figure F-35. Gasket, 13216E9519-2

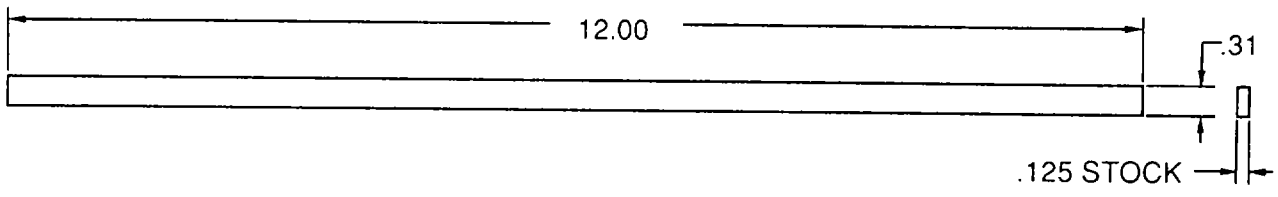


NOTES:

1. MATERIAL: SYNTHETIC RUBBER PER MIL-G-1149, TYPE I, CLASS I.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH UNLESS OTHERWISE STATED.

Figure F-36. Gasket, 13211E8255

Section III MANUFACTURED ITEMS ILLUSTRATIONS (cont)

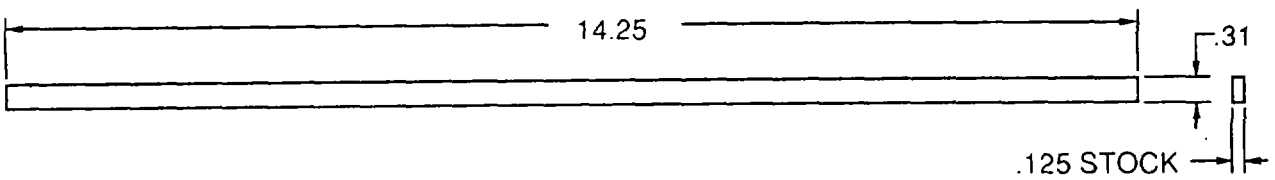


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-37. Gasket, 13220E6695-15

Section III MANUFACTURED ITEMS ILLUSTRATIONS (cont)

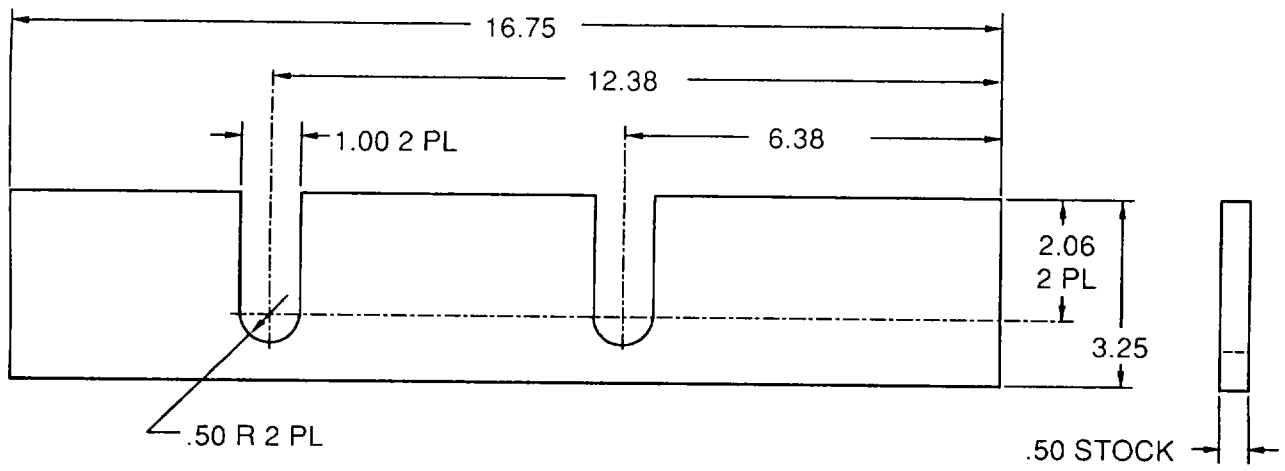


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.03 INCH FOR TWO PLACE DECIMALS AND± 0.015 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-38. Gasket, 13220E6695-16

Section III MANUFACTURED ITEMS ILLUSTRATIONS (cont)



NOTES:

1. MATERIAL: PLASTIC PER MIL-I-14511.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.06 INCH UNLESS OTHERWISE STATED.

Figure F-39. Insulation, 13218E9890/223

Section III MANUFACTURED ITEMS ILLUSTRATIONS (cont)

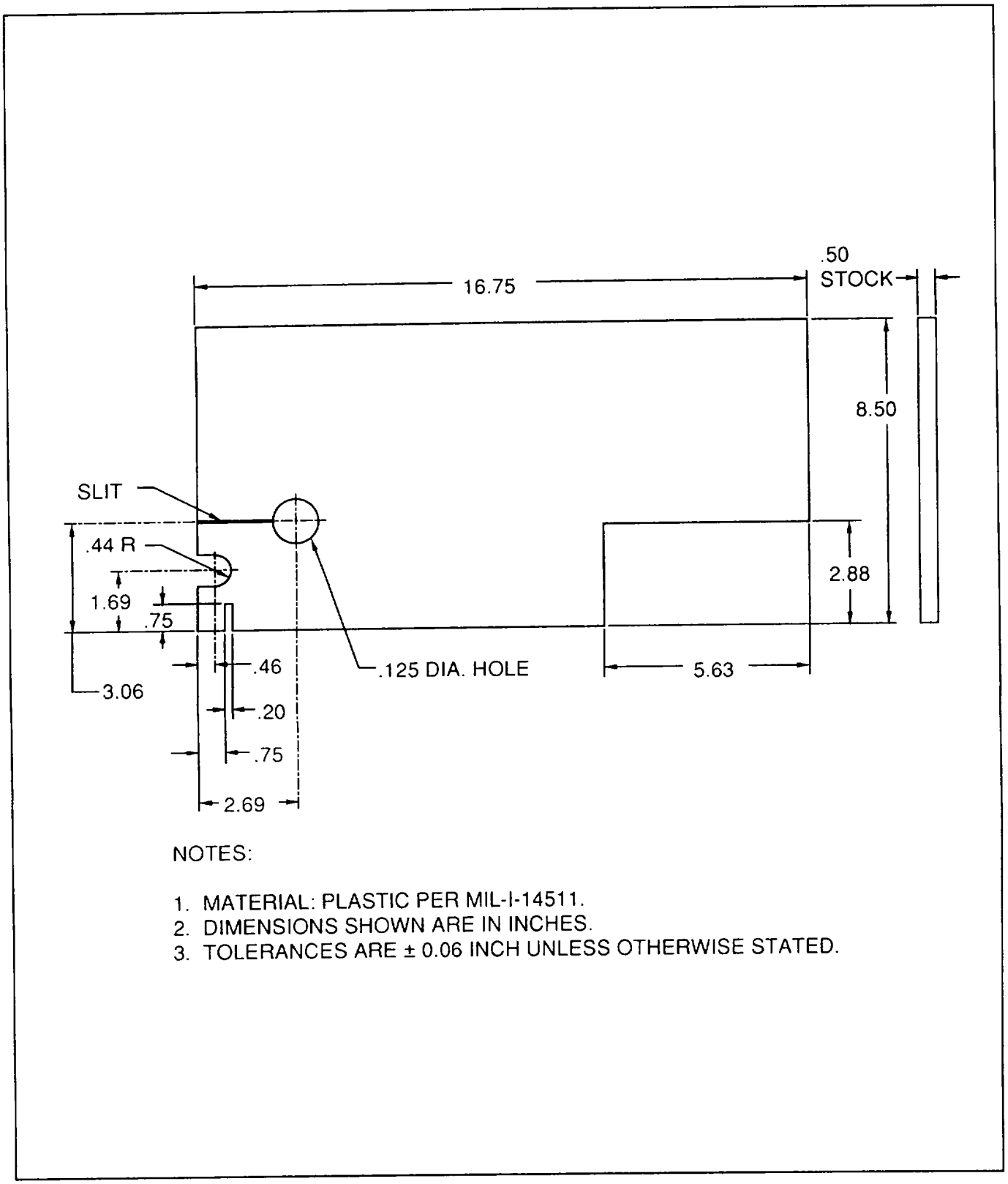
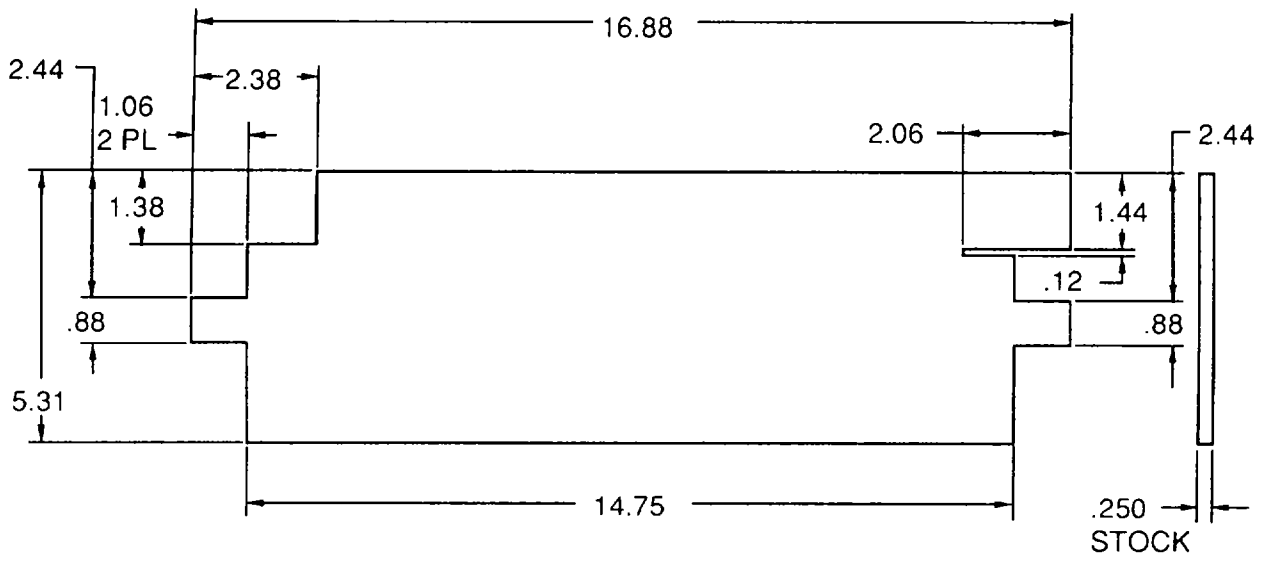


Figure F-40. Insulation, 13218E9890/226

Section III MANUFACTURED ITEMS ILLUSTRATIONS (cont)

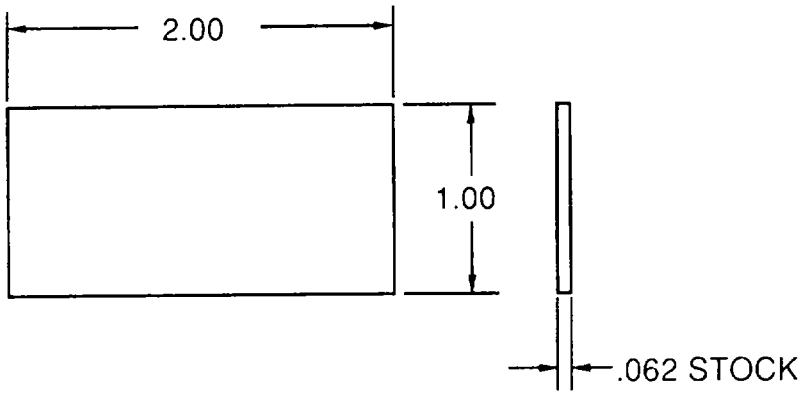


NOTES:

1. MATERIAL: PLASTIC PER MIL-I-14511.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.06 INCH FOR TWO PLACE DECIMALS AND± 0.030 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-41. Insulation, 13218E9890/225

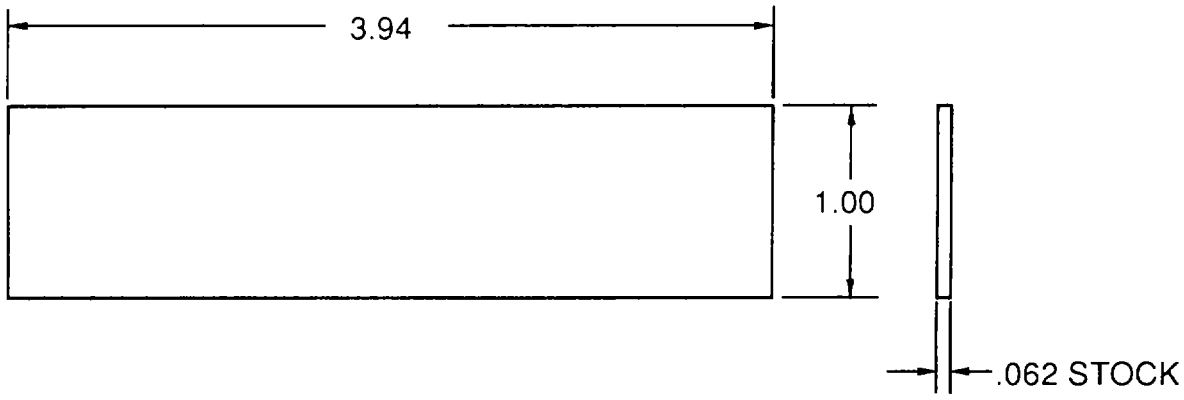
Section III MANUFACTURED ITEMS ILLUSTRATIONS (cont)



NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.06 INCH FOR TWO PLACE DECIMALS AND± 0.030 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-42. Gasket, 4944-142

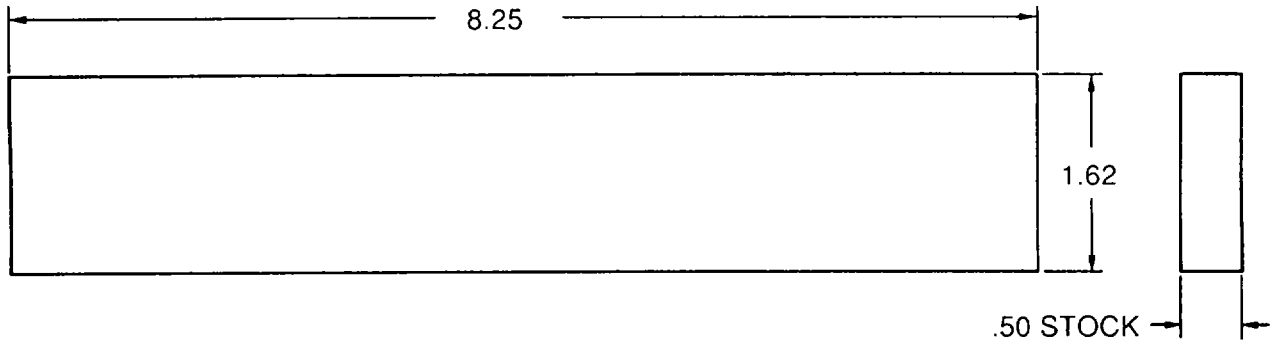


NOTES:

1. MATERIAL: RUBBER PER ASTM-D1056, PART NUMBER SBE42-CF2.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.06 INCH FOR TWO PLACE DECIMALS AND± 0.030 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-43. Gasket, 13218E9890/241

Section III MANUFACTURED ITEMS ILLUSTRATIONS (cont)

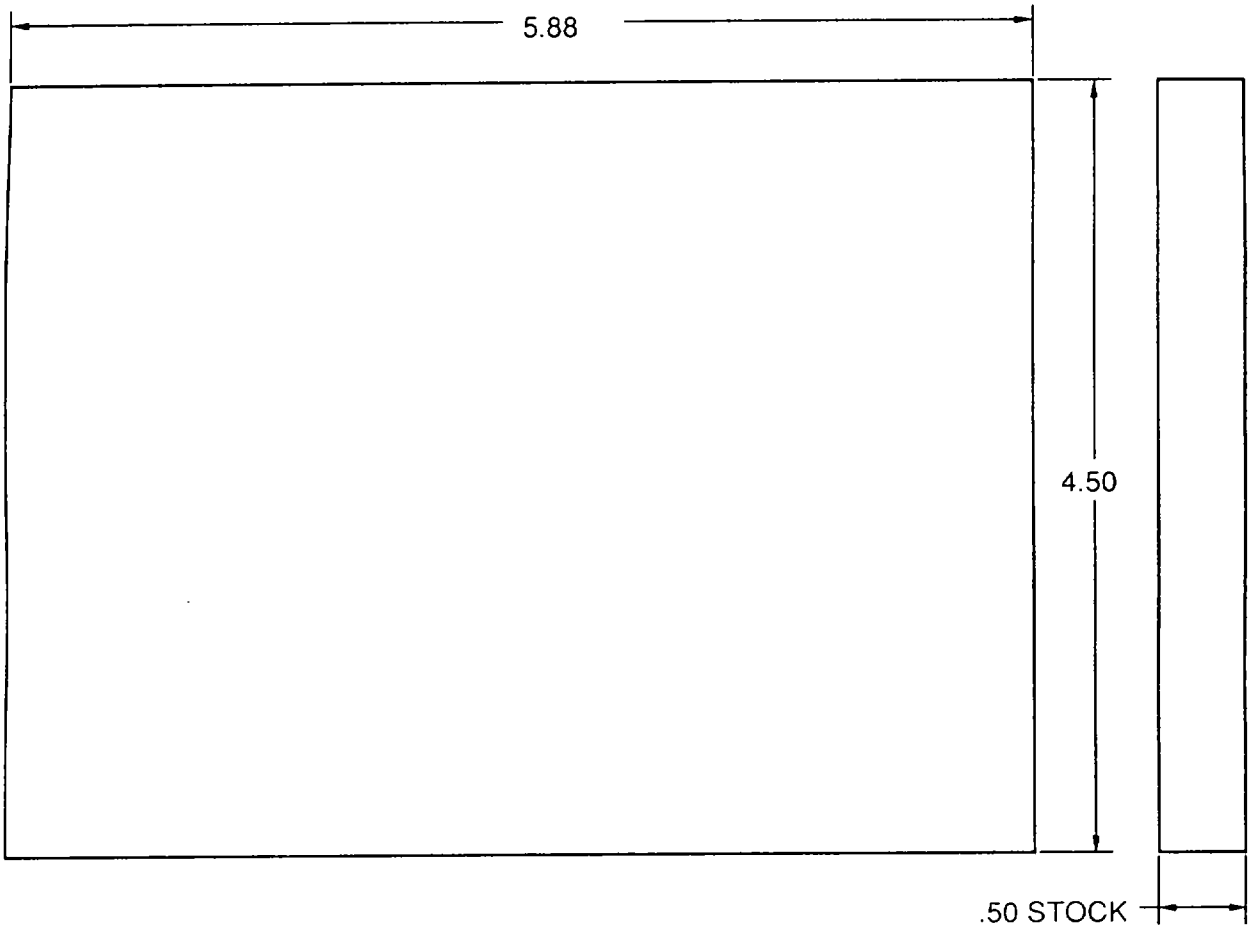


NOTES:

1. MATERIAL: PLASTIC PER MIL-I-14511.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.06 INCH UNLESS OTHERWISE STATED.

Figure F-44. Insulation, 13218E9890/219

Section III MANUFACTURED ITEMS ILLUSTRATIONS (cont)

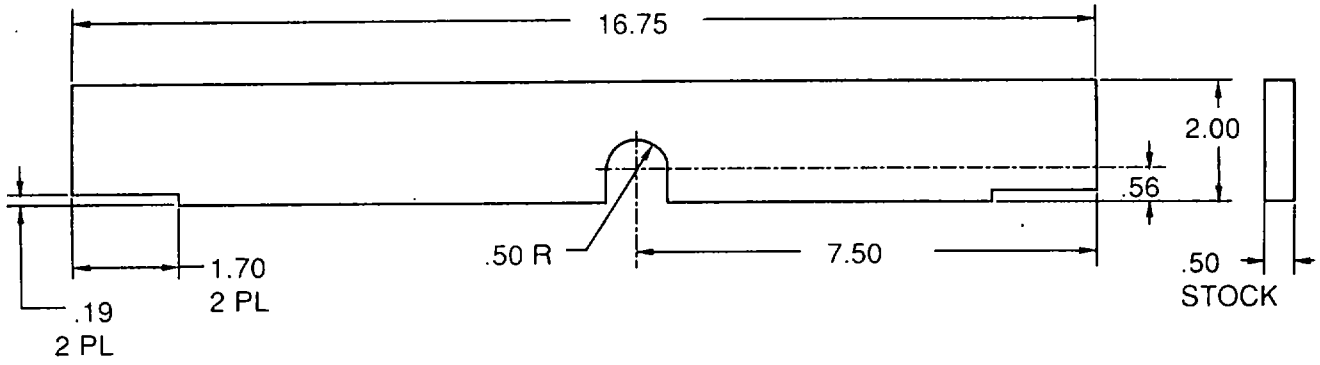


NOTES:

1. MATERIAL: PLASTIC PER MIL-I-14511.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.06 INCH UNLESS OTHERWISE STATED.

Figure F-45. Insulation, 13218E9890/227

Section III MANUFACTURED ITEMS ILLUSTRATIONS (cont)

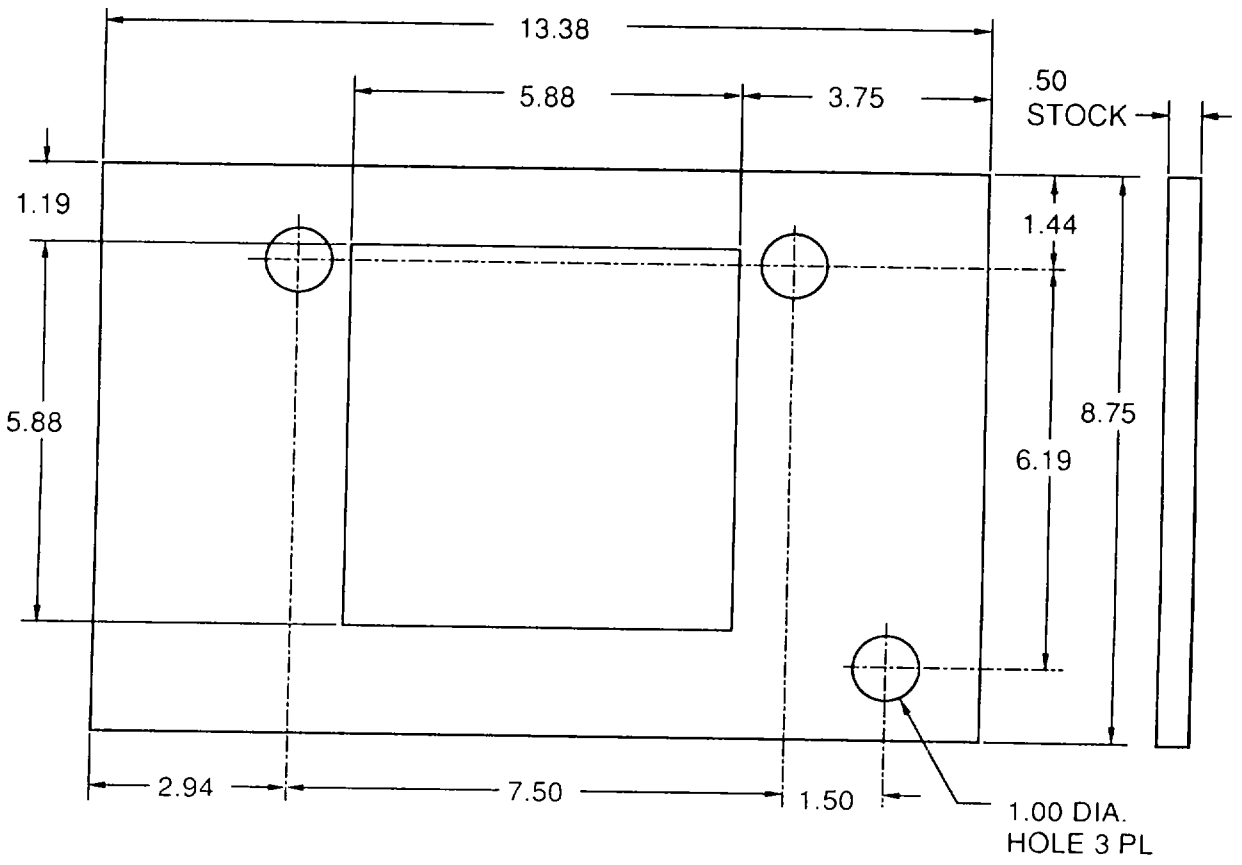


NOTES:

1. MATERIAL: PLASTIC PER MIL-I-14511.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0.06 INCH UNLESS OTHERWISE STATED.

Figure F-46. Insulation, 13218E9890/221

Section III MANUFACTURED ITEMS ILLUSTRATIONS (cont)



NOTES:

1. MATERIAL. PLASTIC PER MIL-I-14511.
2. DIMENSIONS SHOWN ARE IN INCHES.
3. TOLERANCES ARE ± 0 06 INCH UNLESS OTHERWISE STATED.

Figure F-47. Insulation, 13218E9890/222

Section III MANUFACTURED ITEMS ILLUSTRATIONS (cont)

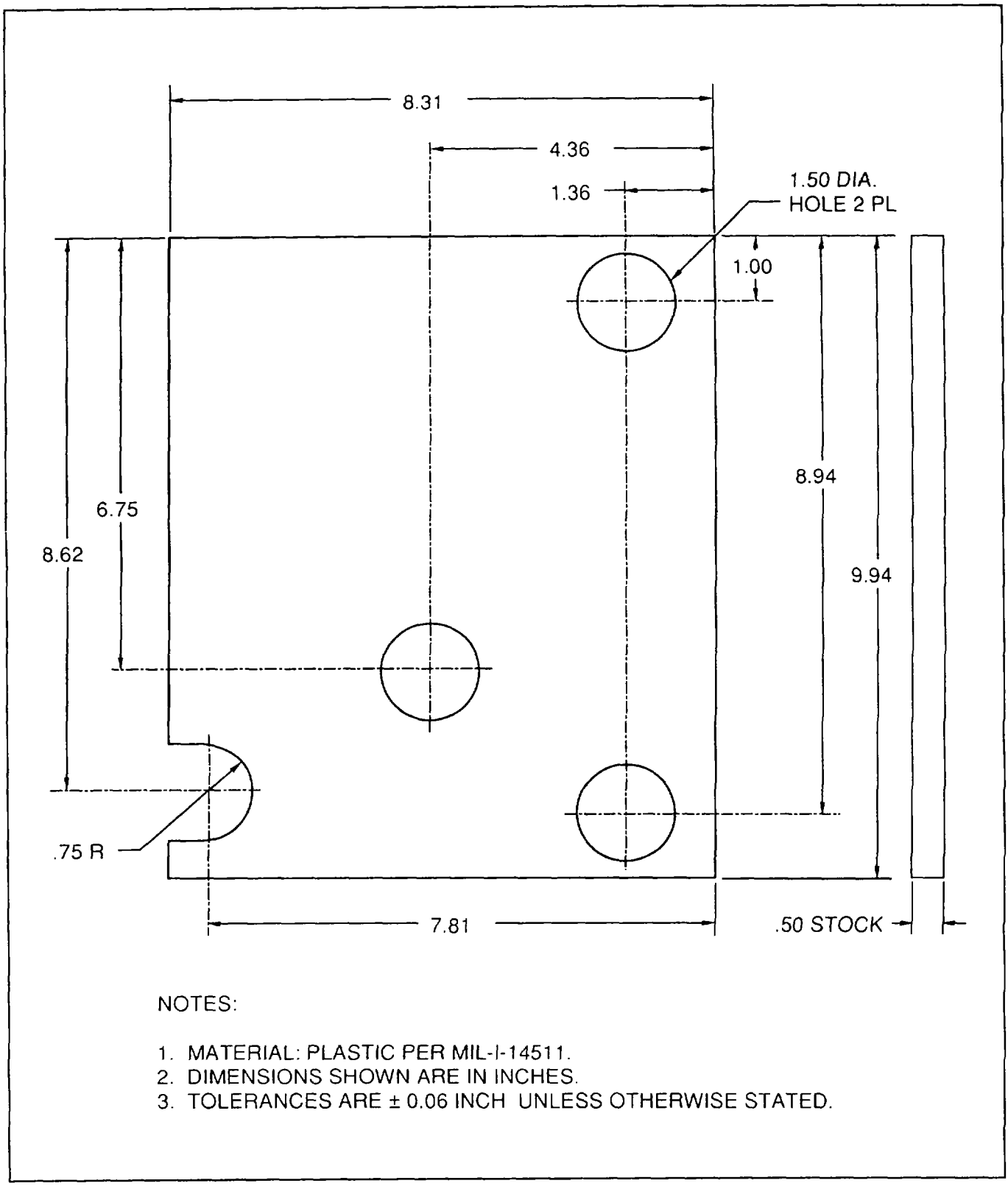
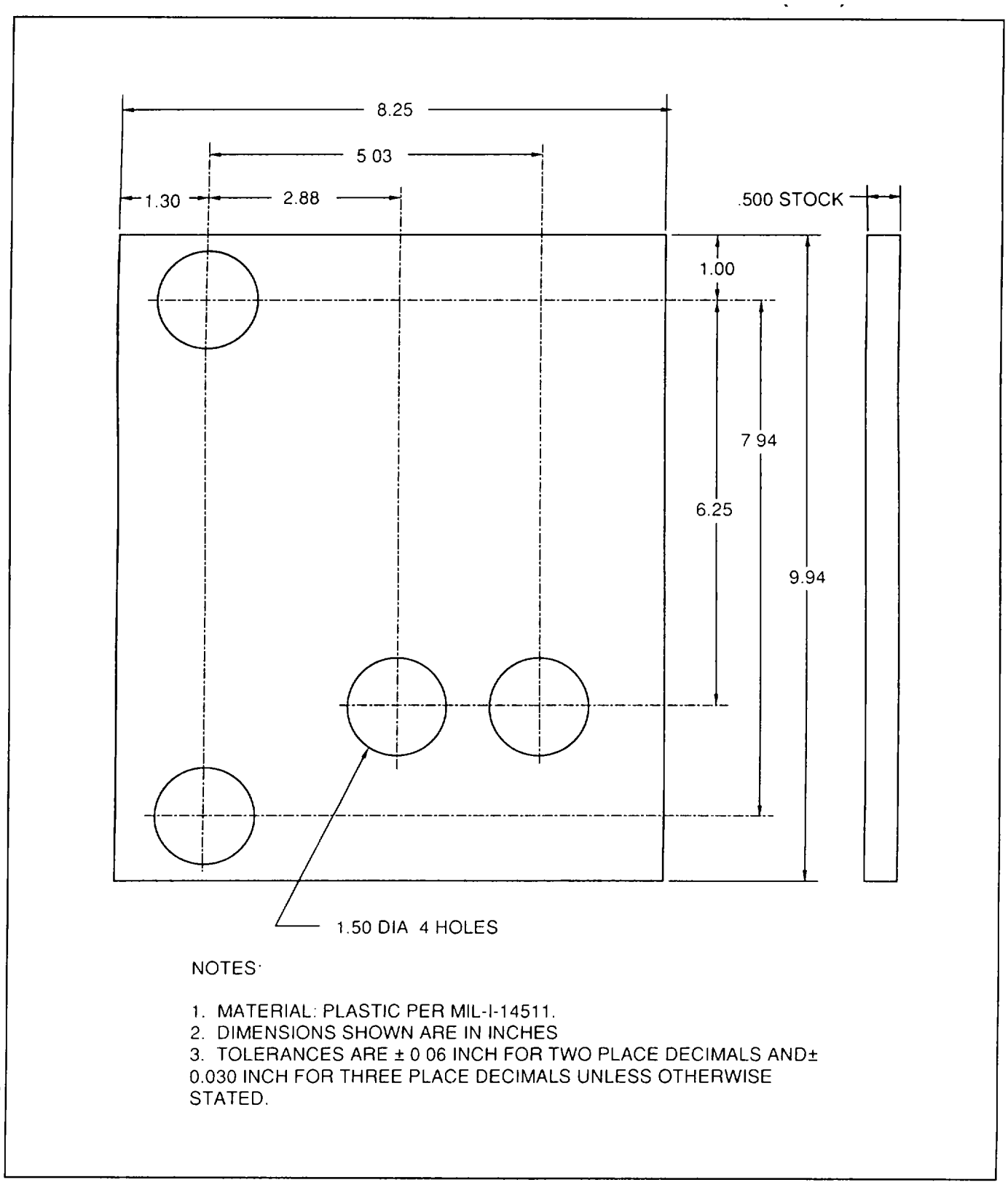


Figure F-48. Insulation, 13218E9890/224

Section III MANUFACTURED ITEMS ILLUSTRATIONS (cont)



NOTES·

1. MATERIAL: PLASTIC PER MIL-I-14511.
2. DIMENSIONS SHOWN ARE IN INCHES
3. TOLERANCES ARE ± 0 06 INCH FOR TWO PLACE DECIMALS AND± 0.030 INCH FOR THREE PLACE DECIMALS UNLESS OTHERWISE STATED.

Figure F-49. Insulation, 13218E9890/228

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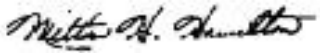
Official: 

MILTON H. HAMILTON
Administrative Assistant to the
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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 decagram = 10 grams = .35 ounce
acres
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .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

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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